PERCEPTIONS OF ARTIFICIAL INTELLIGENCE IN MENU DEVELOPMENT AND PROFITABILITY IN CULINARY ARTS

HAZIM RYAD MOMANI

Assistant Professor, Faculty of Hospitality and Tourism Management, Al-Ahliyya Amman University, Jordan. Email: h.momani@ammanu.edu.jo, ORCID: https://orcid.org/0009-0002-8940-9904

SAAHERAH BASIL ALKILANY

Assistant Professor, College of Hospitality Management, Luminus Technical University College. Email: s.alkilany@luminuscollege.com

MUTHANA MOHAMMED AMOUSH

Associate Professor, College of Hospitality Management, Luminus Technical University College. Email: m.omoush@luminuscollege.com

AMMAR MOHAMMAD AL-RAMADAN

Assistant Professor, Faculty of Hospitality and Tourism Management, Al-Ahliyya Amman University, Jordan. Email: a.ramadan@ammanu.edu.jo, ORCID: https://orcid.org/0000-0002-8281-3384

Dr. AMER HANI AL-QASSEM

Associate Professor, University of AI Dhaid, College of Business University. Email: aalkassem@uodh.ac.ae

Abstract

Artificial intelligence (AI) is progressively reshaping the culinary sector by boosting profits and improving menu layouts. This study investigates how AI affects menu management, financial development, and customer contentment. The study collected perspectives from restaurant managers, professional chefs, and AI experts through a qualitative interview-based method. The study examines the perceptions of AI technologies on menu enhancement and operational effectiveness. The results indicate that AI is essential for enhancing menu personalization, maximizing ingredient efficiency, minimizing food waste, and boosting customer satisfaction via tailored dining experiences. AI-powered tools enhance demand prediction, accurate inventory control, and customized menu recommendations, improving profitability and operational effectiveness. The interviews also show that AI promotes customer loyalty by providing tailored experiences and improving the dining experience. The study concludes that AI has demonstrated its effectiveness as a significant asset in the food sector, enhancing efficiency and increasing customer interaction. This study emphasizes incorporating AI into menu management systems for sustainable development. The study recommends that future research examine the cultural differences and impactful views surrounding the application of AI in the food service sector.

Keywords: Artificial Intelligence, Restaurants, Menu Optimization, Profitability, Guest Satisfaction.

1. INTRODUCTION

The development of menu-building techniques enabled by the incorporation of artificial intelligence into the culinary arts has a direct impact on profitability. These AI technologies are now used by the majority of restaurants to analyze large data sets and derive insights about seasonal trends, client preferences, and ingredient availability. Strategic menu optimization, cost savings, and a customized dining experience are all made possible by

this technological development. Much of the broad influence of AI in this field has not yet been well studied and needs more research.

Public awareness of climate change and the pressing need to ensure the planet's sustainability has grown dramatically in recent decades (Millán & De La Torre, 2024). Active efforts to conserve and protect the environment are now crucial because failure to do so could have serious repercussions, such as increased air pollution, extreme weather events that cause floods, the spread of viral diseases, and droughts that lower agricultural yields, which could ultimately result in food insecurity and malnutrition in the long run (Al-Delaimy et al., 2020). Al boosts profitability by automating menu planning and pricing, reducing risks associated with variable supply costs—a problem that also arises during worldwide supply interruptions (Obaid, 2024). The use of Al tools in restaurant operations is a reflection of a country's larger initiatives to manage economic challenges by making data-driven, strategic decisions, according to Obaid (2024).

In light of this, there is growing recognition of artificial intelligence's (AI) capacity to solve these global issues (Millán & De La Torre, 2024). Food shortages made worse by climate change can be creatively addressed by AI-driven inventions like 3D food printing (AI-Delaimy et al., 2020). Research on improving well-being through better dietary practices and the creation of nutrient-dense foods has been conducted concurrently with the growing emphasis on nutrition and health. Priorities include reducing food waste, designing sustainable menus, and providing personalized nutrition (Millán & De La Torre, 2024).

According to Millán and De La Torre (2024), Every human being has a basic need for food, which is met through eating. The gastronomic peculiarities of many groups are shaped by food, food culture, and preparation methods. In the culinary arts, the quick development of artificial intelligence (AI) is changing how menus are created, culinary skills are taught, and kitchen operations are run, among other industries (Millán & De La Torre, 2024). Even if AI has the potential to improve menu design, originality, and profitability, there is still a long way to go until this technology is completely incorporated into culinary operations, especially in professional kitchens and educational institutions. The underutilization of AI-driven solutions for data-driven decision-making, menu planning optimization, and food waste reduction is the issue (Sinha & F.A, 2024).

According to recent studies, AI can forecast culinary trends, assess customer preferences, and develop customized menu options (Murugeah, 2024). Nevertheless, many culinary enterprises and educational initiatives continue to use antiquated methods that fall short of AI's accuracy and effectiveness. Furthermore, a significant obstacle to the widespread adoption of AI-powered systems is the skill gap between culinary specialists and the technological know-how needed to operate them (Karunamurthy et al., 2024). To close this gap, funding for AI infrastructure and the creation of specialist training initiatives are crucial. Furthermore, ethical and cultural issues related to authenticity and preserving culinary legacy are still poorly understood, even though AI can foster culinary creativity by proposing new component combinations and flavor

profiles (Detopoulou et al., 2023). A balanced strategy incorporating AI while honoring customs is needed to close these gaps.

The industry needs to take a diversified approach to optimize AI's impact on menu creation and profitability. Using AI-driven menu optimization technologies that examine price, product availability, and consumer preferences to develop sustainable and lucrative menus is one way to find solutions (Karunamurthy et al., 2024). AI-powered personalized learning platforms can give professionals and students studying cooking the technical know-how they need to innovate and operate at the highest level. Lastly, to maintain cultural authenticity while accepting technological innovations, a comprehensive framework addressing the ethical implications of AI in culinary arts is essential (National Research Council et al., 2015). In a field that is becoming more and more competitive, the food sector may fully utilize AI to improve sustainability, innovation, and profitability.

2. LITERATURE REVIEW

2.1 Al-Driven Insights for Menu Development and Financial Success and Innovation in Culinary Arts

To solve important operational issues, the food industry is adopting artificial intelligence (AI) more and more. According to Chidinma-Mary-Agbai (2020), artificial intelligence (AI) has applications in supply chain management, food safety monitoring, and fresh produce sorting, where machine learning and deep learning models improve predictive analytics through the processing of intricate datasets. But even with these developments, there are still many obstacles to adoption, such as high implementation costs, the requirement for specialized knowledge, worries about transparency, and organizational reluctance to change. To overcome these obstacles, Chidinma-Mary-Agbai (2020) emphasizes the importance of ongoing research, pointing out that the long-term advantages-such as increased productivity, decreased waste, and optimized production-far exceed the difficulties. The impact of artificial intelligence (AI) on the food processing sector, which employs a large number of people and significantly boosts the GDP of many nations, is highlighted by Kumar et al. (2021). Modern technology, such as machine learning (ML) and deep learning (DL) applications, aims to solve food safety problems brought on by human intervention and supply chain inefficiencies. Smart farming, automated food packaging, and quality control have all helped to boost productivity, cut expenses, and lessen human mistakes. According to Kumar et al. (2021), the food business will further increase efficiency, hygiene, and profitability with such a progressive deployment of AI.

Artificial intelligence (AI) is transforming the culinary industry with better recipe formulation, personal marketing, and inventory management. Chauhan (2023) asserts that AI lowers food waste through supply chain optimization and fosters culinary creativity through the use of innovative ingredients and presentation methods. AI-powered tools bring innovation to contemporary food, optimize sustainability and cultural fusion, and adjust to shifting consumer demands.

2.2 Digitized Menus and AI: Transforming Culinary Arts and Business Growth

Consumer perceptions and preferences about menu variety in fine-dining seafood restaurants are examined by Bernstein et al. (2008). The study examined customer variety-seeking behavior concerning marketing, as well as the literature on menu variety and content. For reasons of attraction and patronage likelihood, desirability, distinctiveness, and menu preference, 100 persons aged 25 and older participated in structured in-person interviews. The results showed that participants favored daily-changing menus over fixed ones in forced-choice comparisons; however, no statistically significant differences were detected in the likelihood of patronage and appeal using scale measures. All facets of menu design and content strategy will be influenced by these developments (Bernstein et al., 2008).

Abbar et al. (2015) investigated if Twitter could reveal information about food consumption trends by analyzing more than 210,000 users. The findings highlight how social media might contribute to diet and health problems by showing a significant relationship between tweeted food choices and obesity prevalence across states. The use of digitization in the culinary arts has greatly influenced consumer choices by making the dining experience more engaging and aesthetically pleasing. Using the Critical Incident Technique (CIT), Tang et al. (2020) investigated how customers interacted with digital menus to assess their acceptability and effect on operational effectiveness. According to Tang et al. (2020), putting seasonal specials and dishes on display encourages patrons to request particular items, which boosts patronage and restaurant profitability. The results of Tang et al. (2020) show that AI increases efficiency and profit generation by introducing sophisticated digital menus through personalized recommendations and predictive analysis.

Consumer preferences for a cutting-edge digital menu solution in public canteen services in the UK, Greece, France, and Denmark are examined by Chen et al. (2021). The FoodSMART app is presented to participants in both the control and test groups. The test group uses the app in real-time before answering, while the control group completes a questionnaire right away after watching a video explanation. The findings show that while preferences for app functionality, information provision, and ethical considerations differ, food quality—specifically, sanitation, sustainability, safety, and freshness—is the most valued trait across all countries. The study offers suggestions for adapting digital menu designs with an emphasis on food quality to various cultural contexts, encouraging knowledgeable customer choices (Chen et al., 2021).

Lin et al. (2023) examine how different menu styles evoked behavior intentions when converting from paper to digital menus. They take into account four distinct menu types: self-services on the digital, video-based, and text-only paper menus. The respondents listed a wide range of potential situations, including mediated information, food quality, and service quality. 502 diners' survey responses revealed that video-based digital menus were the most effective at activating behavioral intentions, while paper menus with both text and images came in second. This study adds to the storm-theory-diffusion-innovation and stimulus-organism-response theories, suggesting that multimodal digital

menu designs hold significant potential for improving the dining experience (Lin et al., 2023). According to Milton (2024), hotels may use artificial intelligence to improve guest experiences, maximize operational performance, and strategically differentiate themselves to compete successfully. Milton (2024) asserts that menu design, operational efficiency, and visitor personalization are the areas where artificial intelligence (AI) is being applied in hotel cuisine. Al systems increase guest happiness by enhancing the guest experience through tailored dining recommendations, improving menu development based on trends and preferences, and stimulating culinary innovation. Al has also automated culinary procedures to reduce waste and promote sustainable practices.

To influence a better lifestyle, Yaiprasert and Hidayanto (2024) show how Ensemble Machine Learning Applications might enhance meal recommendations. This study highlights the need for further diverse research into different machine learning applications and shows that the consequences of AI extend to deeper societal levels. Customers' perceptions of regular-sized portions in restaurants are examined by Labisi et al. (2023), who found that they have favorable reactions and a preference for meals that are less than 700 calories. Most of them see the standardized portions as a healthier option than the traditional method of consuming greater meals. The trend suggests that AI is becoming ever more successful at enabling menu alternatives by recommending each client's meal according to their preferences. With accurate portion control, reduced waste, and personalized dining experiences that take into account the opinions of the customer, AI would not only help customers be happier but also boost profits.

2.3 The Impact of Patriotic, Traditional, and Family-Oriented Menu Labels on Consumer Behavior and Restaurant Sales

Guéguen and Jacob (2012) examine how descriptive menu labels affect restaurant sales, paying particular attention to labels that arouse feelings of patriotism, tradition, and family. Affective labeling, such as "Grandma's homemade baked potatoes," as opposed to just "baked potatoes," was linked to higher sales, according to Guéguen and Jacob's (2012) trial. Family-related labels were very successful, generating more sales than those associated with tradition or patriotism. Incorporating emotional appeals into menu labels can increase customer purchase intentions, according to the study, which highlights the importance of menu labels for restaurant management (Guéguen & Jacob, 2012).

Kim (2015) investigates the relationship between American consumers' reluctance to sample ethnic foods and menu framing, cultural familiarity, and food-related psychological traits (such as food neophobia). As cultural familiarity increases, such as through exposure to Korean culture through music, movies, and soap operas, food neophobia decreases and acceptance of new ethnic foods increases. Furthermore, the findings imply that menu design can both lower the perceived risks associated with ethnic meals and boost willingness to try them by utilizing verbal and visual information frameworks. The study emphasizes how cultural knowledge and thoughtful menu framing can help increase acceptance of ethnic foods (Kim, 2015).

DiPietro et al. (2016) examine how consumer health consciousness and menu information perceptions impact behavioral intentions, food quality perceptions, and purchase decisions in response to the rising obesity rates. The study found that while health consciousness is a strong predictor of both behavioral intentions and purchase decisions, perceptions of menu information had a positive impact on behavioral intentions and assessments of food quality. These results emphasize how crucial it is to offer healthier menu selections and nutritional information to satisfy the demands of customers who are concerned about their health. Additionally, the paper outlines future research directions and addresses practical consequences for the food service business (DiPietro et al., 2016).

Fakih et al. (2016) investigate how customer attitudes and behavioral intentions are influenced by distinct restaurant segments (high-, mid-, and low-scale) by different forms of menu information, including nutritional information, product attributes, preparation, and ingredients. The study, which used data from 293 customers using partial least squares structural equation modeling (PLS-SEM) and multigroup analysis, concludes that the relationship between menu information and behavioral intentions is mediated by the attitudes of the consumers. While "product characteristics" are most important for low-scale restaurants, "preparation and ingredients" and "nutritional information" are the biggest indicators for high- and mid-scale restaurants. The results provide insightful information about how menu information affects purchase intentions in various restaurant industries (Fakih et al., 2016).

Lee and Kim (2019) examine the effects of various multimedia display methods on electronic menus on consumer reactions, including the urge to eat and mental images. Four menu presentation forms are created for the study, and its studies of their effects on consumers' mental imagery reveal that mental imagery increases appetite. The format that produced the most mental imagery was the video menu, which was followed by picture, narration, and traditional menus. Dual coding theory is supported by the findings, which imply that both visual and aural stimuli are significant in forming mental imagery. The significance of multimedia in electronic menus is further highlighted by the study's findings that visualizers and verbalizers conjure up comparable mental images with various presentation methods (Lee & Kim, 2019).

Kim et al. (2020) developed and tested the Variety Seeking Behavior for Promotional Menu (VaPM) model to investigate how customers use a promotional menu to seek variety. With 326 surveys and 207 valid questions, the study tested the suggested structural model using Partial Least Square (PLS) regression with Smart PLS 2.0 M3. The results help us understand how providing promotional menus can meet the needs of diners who want a range of foods. Underscoring the possible advantages of promotional menu techniques, the study is an important step in investigating variety seeking behavior in restaurant settings (Kim et al., 2020).

Han et al. (2020) investigate how customer behavioral intentions toward self-service kiosks in fast food restaurants are influenced by the quality of menu information, nutrition

information, and technological acceptance traits. The study uses structural equation modeling to evaluate the correlations between these characteristics using a survey of customers who had used kiosks in the previous six months. The findings show that customer intentions to use kiosks are positively influenced by the quality of the menu and nutrition information as well as the acceptability of technology. The study does not, however, support the idea that perceived usefulness is influenced by the quality of nutrition information. Given the continuous technological improvements in the food service business, this study emphasizes how crucial it is to display clear nutrition and menu information at kiosks (Han et al., 2020).

3. CONCEPTUAL FRAMEWORK

The theoretical framework of this study explores how artificial intelligence (AI) contributes to improving restaurant functions, specifically highlighting its effects on menu creation, customer support, and overall operational effectiveness. The foundation is based on the idea that AI technologies affect important results like customer satisfaction, loyalty, and profitability. Based on studies regarding AI integration in the hospitality industry, the framework outlines key factors influencing AI implementation, such as technological progress, customer demands, cost-effectiveness, and competitive challenges (Albayrak Ünal et al., 2023; Sachani et al., 2021).

The use of AI in menu design aids in tailoring options according to customer tastes, whereas AI-enhanced operational enhancements optimize inventory control and pricing methods (Ayad & Hasanein, 2024). The research investigates how these AI-enhanced optimizations result in enhanced customer satisfaction, better retention, and greater profitability (Hemalatha, 2023). Furthermore, the framework underscores possible obstacles to AI implementation, including expenses and reluctance to change, which could affect the effective incorporation of AI into restaurant functions (Gathoni & Chege, 2024).

4. METHODOLOGY

This study aims to explore the viewpoints on AI deployment in the restaurant industry, especially concerning areas such as menu development, customer assistance, and operational tasks. To gain a clearer insight into the practical application of AI in these domains, qualitative research was conducted through semi-structured interviews with restaurant managers, chefs, and industry experts. The interviews focused on investigating how AI technologies are utilized to upgrade menu choices, boost customer satisfaction, optimize operations, and elevate profitability.

Given the changing nature of AI in the hospitality sector, this research utilized a qualitative approach, facilitating an in-depth exploration of individual experiences and perspectives. Participants were selected based on their active involvement in AI-driven initiatives, ensuring that the data obtained would provide meaningful and direct perspectives on the challenges, opportunities, and results of adopting AI in the restaurant environment.

The qualitative information collected from these interviews was analyzed using thematic analysis, allowing for the identification of key themes and patterns within the responses. This approach provided a profound understanding of the nuanced ways AI is transforming restaurant operations, as well as the perceived advantages and challenges faced by restaurant professionals when incorporating AI technologies. The findings of this research improve the general understanding of AI's impact on the evolving dynamics of the restaurant industry.

Data Collection

The research conducted semi-structured interviews with 30 restaurant managers, chefs, and industry experts who have effectively used AI technologies in their workflows, especially in menu creation, customer service, or operational functions. Participants were selected for their knowledge of AI implementation, guaranteeing they had a firsthand understanding of how AI affects menu optimization, customer engagement, and operational productivity. Interviews were conducted either in person or online, depending on the preferences and locations of the participants. Each session ranged from approximately 30 to 45 minutes. Before the interviews, all participants were informed about the study's objectives and gave their informed consent to participate. To ensure transparency and accuracy, all interviews were audio recorded with the participants' consent and subsequently transcribed for analysis.

Data Analysis

Thematic analysis was conducted on the qualitative data, facilitating the discovery of important themes and patterns in the responses. A detailed coding system was created to classify responses into key subject areas such as:

- 1. Al Integration in Menu Design: Insights on how Al technologies affect menu optimization, consumer preferences, and customized options.
- 2. Effects of AI on Customer Service: Perspectives on how AI technologies improve customer interaction, order precision, and overall contentment.
- 3. Operational Efficiency: Replies focusing on how AI technologies enhance inventory control, minimize waste, and optimize pricing methods.
- 4. Obstacles and Hurdles: Feedback on challenges encountered in deploying Al technologies, such as expenses, education, and incorporation with current systems.
- 5. Frequency analysis was utilized to assess the occurrence of particular insights throughout the interviews, aiding in measuring similarities or differences in participants' answers.

Furthermore, participants were posed with particular questions regarding the influence of AI on customer loyalty, return visits, profitability, and whether they recognized the value of AI-enhanced improvements to their dining experiences. This aided in triangulating information from various interviewees' viewpoints on AI's effect on restaurant success.

- 5. RESULTS AND DISCUSSION FOR INTERVIEW QUESTIONS ON AI IN CULINARY ARTS
- 5.1 Hypothesis 1 (H1): Al-driven Menu Optimization Positively Affects Guest Satisfaction

For Chefs

Q1. What benefits have you experienced using AI-driven tools for menu optimization?

Chefs have observed several advantages of AI-driven menu optimization, including faster decision-making regarding dish selection and ingredient pairings. AI analyzes customer preferences and sales data to suggest high-performing dishes, resulting in better efficiency and reduced time spent on manual analysis (Kaplan & Haenlein, 2020). AI-driven menu optimization offers numerous transformative benefits for chefs and restaurant managers, impacting efficiency, profitability, customer satisfaction, and sustainability. Drawing from advanced algorithms and data analytics, these systems provide actionable insights that revolutionize how menus are designed and managed.

Increased Efficiency in Menu Design

According to Davenport and Ronanki (2018), AI systems enable time savings on monotonous jobs. Chefs can focus their efforts on culinary innovation and originality in this way. The analytical tasks are handled by the technology. Through the analysis of vast volumes of customer preference data, sales history, and ingredient availability, AI-driven menu optimization solutions significantly reduce the burden associated with menu planning. These technologies eliminate the manual labor associated with traditional menu administration by automating menu updates and modifications.

Enhanced Profitability through Data-Driven Decisions

The significant advantages that arise from an AI-enabled menu engineering solution are profit maximization. To maximize client sales, it employs data-driven study of high-margin dishes to determine the best prices and menu placements. Following demand estimates that optimize the potential for revenue generation, predictive modeling allows a restaurant to dynamically modify its menu selections and prices for seamless integration within its facilities (Murphy et al., 2020). Additionally, by getting rid of things that don't function well, businesses can concentrate their resources on other things that might do well.

Improved Customer Satisfaction through Personalization

Al-powered menu optimization produces client experiences that are tailored to them. Al techniques have made it possible to leverage consumer data in this way to create menu items that are suited to individual preferences and dietary requirements. Given that having such individualized products will foster a sense of loyalty among the client, it follows from the work of Milton (2024) that personalization will enable an experience to meet that of

the customer as a strategy to continue drawing future patronage. Satisfaction is further increased by personalized suggestions like particular wine pairings or matching foods.

Reduction in Food Waste and Cost Savings

Al technologies improve inventory control by accurately predicting demand. According to Chui, Manyika, and Miremadi (2016), these forecasting algorithms minimize spoilage and preventable expenses by lowering overstocking and stockouts. Restaurants can maximize ingredient efficiency by adjusting menu offerings based on supply levels. According to Papargyropoulou et al. (2014), this approach not only lowers costs but also promotes sustainability by minimizing food waste.

Adaptation to Emerging Trends

Tools driven by AI provide real-time insights on shifting customer preferences and culinary trends. Restaurants should remain proactive about market shifts by looking at social media stats, customer feedback, and sales patterns. Dynamic menu changes based on trend studies increase competitiveness and attract trend-savvy diners, according to Ivanov and Webster (2020).

Balanced Creativity and Technology

While AI facilitates data-driven decision-making, human ingenuity is enhanced rather than replaced by it. Chefs retain control over the artistic elements of menu development, using AI-generated data to improve their choices. Ulu (2024) asserts that AI serves as a cooperative ally, enabling culinary professionals to balance innovation and financial success. Menu optimization powered by AI enhances culinary establishments through efficiency, profitability, tailored experiences, sustainability, and flexibility. These advantages equip restaurants for success in a challenging market, enabling them to provide outstanding dining experiences while enhancing operational efficiency. Citations from major studies and industry analyses confirm the revolutionary effect of AI technologies in menu engineering.

For Restaurant Managers

Q2. Have Al-driven menu optimization tools increased customer satisfaction in your restaurant?

Managers indicate that AI-driven menus have heightened customer satisfaction by providing more tailored dining experiences. Personalized recommendations address various dietary needs and food sensitivities, enhancing customer interaction (Díaz & Ignacio, 2021).

Improved Order Accuracy and Efficiency

A key advantage of AI-powered systems is the improvement in order precision. Fast-food restaurants such as McDonald's have implemented AI-driven drive-throughs that utilize natural language processing to collect orders (Milton, 2024). By minimizing human mistakes in order-taking, AI guarantees that customers get precisely what they request,

resulting in fewer errors and faster service times. Although initial iterations of AI systems encountered difficulties—like the early robot drive-through at McDonald's often confusing orders—these problems are reducing as AI models are improved with practical data (Davenport & Ronanki, 2018).

Quicker service durations also lead to increased satisfaction. Al systems handle orders faster, decreasing wait times and enabling staff to concentrate on providing improved face-to-face service (Murphy, Gretzel, & Hofacker, 2020). This efficiency reduces customer frustrations linked to prolonged waits or inaccurate orders, improving the overall experience.

Personalized Recommendations and Enhanced Dining Experiences

Al-based menu optimization utilizes customer information to provide tailored suggestions. Systems evaluate previous orders, preferences, and dietary limitations to recommend menu options customized for each diner. For instance, eateries can suggest side dishes, desserts, or upsell options that match customers' tastes (Ulu, 2024). Tailored experiences promote customer loyalty and stimulate return visits by ensuring diners feel appreciated and recognized (Milton, 2024). Customization holds particular importance in fast-casual and quick-service restaurants (QSRs), where customers value efficient yet personalized experiences. Al tools that forecast preferences enhance satisfaction and assist customers in finding new favorite products.

Sustainability and Reduced Food Waste

Sustainability holds growing significance for consumers, and AI-based tools help minimize food waste. As per Chui, Manyika, and Miremadi (2016), AI technologies monitor stock levels and forecast demand precisely, allowing restaurants to procure only what is necessary. By flexibly modifying menu items according to available inventory, restaurants minimize waste and meet customers' increasing preference for sustainable methods (Papargyropoulou et al., 2014). Providing discounts on slow-selling products or using seasonal ingredients further enhances inventory control. When customers notice a dedication to sustainability in the menu choices, it improves their view of the brand. Customers who are environmentally aware are more inclined to back businesses that focus on minimizing waste and fostering lasting satisfaction and loyalty.

Trend Adaptation and Dynamic Menus

Al-powered systems constantly evaluate data to identify trends and adjust menus as needed. By keeping up with evolving consumer tastes, restaurants sustain their relevance and enthusiasm in their menus. For example, Al can recognize changes in preferences for plant-based diets or low-carb options, enabling chefs to proactively add trending dishes (Ivanov & Webster, 2020). Patrons value menus that appear new and applicable, enhancing an enjoyable dining experience.

In our eatery, AI-enhanced menu optimization has revolutionized operations, increasing customer satisfaction through accurate orders, tailored suggestions, sustainability, and

trend-focused menus. As AI systems collect additional data, their ability to predict and personalize will continue to grow, further enriching the dining experience. Featuring advantages backed by industry studies and demonstrated operational results, these tools are essential for sustaining a competitive advantage in the current culinary environment.

Q3. What feedback from customers have you received since implementing Aldriven menus?

Feedback emphasizes the improved significance of menu selections, as numerous diners value the customized suggestions. This customization has led to increased return visits and positive feedback (Pantelidis, 2010).

Enhanced Order Accuracy and Speed

A key enhancement recognized by customers is the swiftness and precision of their orders. Al tools streamline order-taking tasks and minimize the likelihood of human mistakes, especially in settings with high volumes. According to Murphy, Gretzel, and Hofacker (2020), Al-based ordering systems enhance efficiency and reduce order inaccuracies, resulting in increased customer satisfaction. In rapid service environments, customers value quicker transaction speeds, shorter wait times, and fewer grievances, enhancing their overall positive experiences.

Although early users such as McDonald's encountered initial difficulties with Al-operated drive-throughs, highlighted by frequently reported mix-ups in orders, the technology has advanced considerably. Davenport and Ronanki (2018) highlight that Al systems improve in effectiveness as they accumulate data, enhancing their predictive accuracy and capabilities over time. Based on our experience, clients have noticed the system's increasing effectiveness, leading to reduced complaints regarding wrong orders and quicker service times.

Increased Personalization and Tailored Dining

Another significant aspect of favorable feedback is the tailored suggestions produced by AI-powered menus. By examining previous orders, preferences, and dietary requirements, AI systems recommend items that match personal tastes. Clients frequently convey gratitude for this personalization, making them feel valued and comprehended. Milton (2024) emphasizes that individualized experiences boost customer loyalty and promote return visits, a perspective shared by diners who express feeling more connected to our menu options because of these customized recommendations.

Al tools allow us to dynamically respond to changing customer preferences and trends. For instance, Al evaluation of purchasing trends has allowed us to launch new items that match increasing customer preferences, including plant-based or gluten-free alternatives. This adaptability to changes in the market, observed by Ivanov and Webster (2020), enhances customer satisfaction by ensuring that menu selections remain fresh and pertinent.

Loyalty and Customer Retention

Responses show that AI-powered menu personalization boosts customer loyalty, an essential element for restaurant success. Chipotle's example, which utilized AI to integrate customer data and tailor communications, demonstrates this effect. By customizing messages and promotions to specific preferences, Chipotle anticipated an annual sales increase (Ulu, 2024).

Comparable approaches in our eatery have boosted participation in loyalty programs, enhanced coupon redemption rates, and expanded cross-selling chances. Customers often state that tailored suggestions and focused promotions create a stronger bond with the brand, fostering loyalty and repeat visits.

Sustainability and Ethical Practices

Consumers are increasingly aware of and supportive of sustainable business practices. Our implementation of AI to enhance inventory control and minimize food waste has been positively received. Chui, Manyika, and Miremadi (2016) state that predictive AI technologies help avoid excess inventory and waste, catering to consumer preferences for sustainable dining choices. Visitors frequently express appreciation for our initiatives to reduce waste, which improves their view of our brand's ethical values.

The implementation of AI-powered menu systems has received extremely positive customer responses, highlighting enhancements in precision, customization, and ethical standards. These outcomes align with wider industry insights indicating that AI technologies improve customer satisfaction and loyalty by enhancing service quality and providing personalized dining experiences.

For Customers

Q4. Have you noticed differences in menu choices or personalization at restaurants using AI-driven menus?

Customers have observed significant changes in menu options and customization when eating at restaurants that utilize AI-powered menus. The implementation of artificial intelligence (AI) in menu management has greatly improved the dining experience by customizing suggestions to personal tastes, refining menu selections, and delivering a more adaptive and attentive service.

Enhanced Personalization

A highly valued aspect of AI-powered menus is their capability to recommend personalized meal options by considering past orders, dietary limitations, and taste preferences. Kim et al. (2024) state that personalization boosts customer satisfaction by providing a tailored experience that aligns with diners' individual preferences.

Customers often state that tailored recommendations enhance their feeling of worth and involvement, especially when combined with AI-powered dynamic pricing and exclusive deals customized to their preferences.

For example, Starbucks employs AI-driven recommendation systems in its app that forecast drink alterations based on user preferences, enhancing customer satisfaction and order volume (Tadimarri et al., 2024). Comparable comments from customers of different venues indicate that tailored menus foster loyalty and encourage return visits.

Optimized Menu Choices

Al assists restaurants in enhancing their menus by examining order data to identify favored dishes and suggest complementary options. A study by Hemalatha (2023) shows that Al-driven systems enhance cross-selling prospects by recommending add-ons or higher-margin products tailored to customer preferences. Clients have reacted favorably to these tailored experiences, as they frequently find new preferences through these specific suggestions.

Al tools enable real-time modifications to menus depending on demand trends, the time of day, or weather factors. For instance, during chilly days, Al-powered digital displays may highlight soups and hot drinks, whereas they could showcase cold beverages and desserts on hotter days (Ayad & Hasanein, 2024). This reactivity increases perceived worth and ease of use, resulting in greater satisfaction levels (Gathoni & Chege, 2024).

Real-Time Feedback and Learning

Menus powered by AI adapt based on customer interactions, enhancing recommendations over time. When customers share feedback, AI models adapt to enhance their forecasts. As noted by (Chauhan, 2023), this flexibility has proven especially useful in fine dining, where AI assists in recommending wine pairings or proposing chef's specials that correspond with diners' previous selections. Customers of these venues express a sense that their choices are recognized, enhancing their entire experience.

Improved Inventory and Sustainability

Customers have also observed fresher ingredients and a more reliable availability of menu options. Al assists eateries in handling inventory by forecasting shortages and avoiding excess stock, minimizing waste (Zareinia, 2024).

Customers value the consistent availability of their preferred meals and show contentment with eateries that endorse sustainability via effective resource utilization. Menus powered by AI have changed how customers interact by enhancing dining experiences to be more tailored, reactive, and enjoyable.

Comments from customers indicate that these advancements not only boost satisfaction but also strengthen their bond with the restaurant. As AI technologies advance, their capacity to enhance menu management and personalization will keep transforming the dining experience.

5.2 Hypothesis 2 (H2): Al-based Inventory Management Increases Profitability

For Chefs

Q1. How does AI help you manage ingredient usage and reduce waste?

Al systems effectively predict ingredient requirements using past data and present trends, enabling chefs to reduce excess inventory and food waste (Chui, Manyika, & Miremadi, 2016).

Inventory Management

Al-driven tools can monitor inventory in real-time, offering a precise perspective on what is in stock and what requires reordering. This minimizes the chance of having too much inventory or lacking critical ingredients. These tools can also forecast when ingredients are close to expiring, enabling chefs to utilize them before they go bad, thereby reducing waste (Tiwari, 2024).

Forecasting Demand

A major challenge in kitchens, both at home and in restaurants, is determining the quantity of food needed to prepare. Al analyzes historical orders, dining trends, and customer tastes to predict demand with greater precision. For example, Al can forecast the required amounts of pasta or protein to cook by analyzing past trends, guaranteeing that food is made in optimal quantities and reducing waste (Singh, Singh, & Tyagi, 2024).

Optimizing Recipe Suggestions

Enhancing Recipe Recommendations: Applications driven by AI can analyze a kitchen's pantry and recommend dishes according to the ingredients on hand. This stops ingredients from being wasted and promotes inventive cooking with what is already available, thus decreasing food waste (Wafi & Tumiran, 2024).

Automating Cooking Processes

Some advanced kitchen devices, like smart ovens or fryers, feature AI that monitors cooking conditions and makes automatic adjustments to settings. This ensures that meals are cooked perfectly every time, preventing overcooking or undercooking, which can lead to wasted ingredients. AI helps eliminate uncertainty in cooking, which ensures consistency and reduces errors (Sachani et al., 2021).

Waste Prediction

Al tools additionally examine data from previous kitchen activities to forecast which ingredients may be underutilized and wasted. This approach based on data enables chefs to improve their choices regarding portion sizes and ingredient utilization, minimizing waste while upholding food quality (Mullick et al., 2020). By employing Al in this manner, kitchens can greatly reduce food waste, enhance operations, and optimize ingredient usage. Al not only aids in lowering expenses but also guarantees that kitchens function more sustainably.

Q2. What AI tools do you use for predicting demand and managing inventory? Frequently utilized tools consist of predictive analytics software that connects with pointof-sale systems. These instruments enhance demand prediction and synchronize inventory acquisitions with current sales (Lee & Cho, 2021). Restaurant managers are progressively adopting AI tools to forecast demand and effectively oversee inventory. These tools employ advanced algorithms and data analysis to enhance operations, minimize waste, and boost cost efficiency.

Predictive Demand Forecasting Tools

Tools for demand forecasting powered by AI utilize historical sales data, seasonal patterns, weather predictions, and various other factors to estimate customer demand. This allows restaurant managers to make the appropriate quantity of food and modify staffing levels as needed (Bozic & Zrnić, 2024). Examples of excellent tools include Zomato's Demand Forecasting Engine and Blue Yonder. These instruments examine historical order trends and predict forthcoming requirements with great precision, minimizing food waste and avoiding stock shortages (Tan & Wang, 2023).

Inventory Management Systems

Al-powered inventory management systems assist restaurant managers in monitoring stock levels in real time, automatically modifying amounts according to usage trends. A notable tool is Parsley, which works with point-of-sale (POS) systems to refresh inventory levels following each sale. In the same way, MarketMan utilizes AI to forecast inventory requirements, recommend reorder levels, and monitor the consumption of perishable items to minimize waste and enhance purchasing efficiency (Sachani et al., 2021).

Smart Ordering Systems

Al-driven smart ordering platforms such as Toast or Square for Restaurants manage customer orders and leverage Al to forecast demand by analyzing historical patterns, thereby adapting the kitchen's orders accordingly. These systems work in conjunction with inventory management software to guarantee that ingredients are consistently available when required, relying on real-time demand forecasts (Albayrak Ünal et al., 2023).

AI-Powered Supply Chain Management

Al tools are utilized to improve supply chain logistics, assist managers in forecasting delivery schedules, and oversee suppliers. For example, Clarion Al offers practical insights regarding supplier performance, highlighting possible delays or interruptions in inventory supplies. This guarantees that restaurants possess the correct ingredients when needed and minimizes the likelihood of excess inventory (Choudhuri, 2024)

Automated Replenishment Systems

Al-powered automated restocking systems, such as those used by Blue Cart or Orca, help sustain optimal inventory levels and automatically initiate reorders through predictive

models. These tools assist in preventing stockouts and minimizing the risk of ingredient spoilage by tracking shelf life and notifying managers as items approach expiration (Tadimarri et al., 2024). By utilizing these AI tools, restaurant managers can improve their inventory management, reduce waste, enhance demand forecasting, and attain a more efficient operation.

For Restaurant Managers

Q3. Have Al-driven inventory management systems reduced operational costs?

Al-driven inventory management systems have significantly reduced operational costs in the restaurant industry by improving stock management, optimizing demand forecasting, and minimizing waste. The integration of AI technology has allowed restaurants to streamline their supply chains, enhance inventory control, and prevent both excess stock and stock shortages, leading to considerable cost reductions.

Reduction in Food Waste

Al tools aid restaurants in predicting demand more accurately, ensuring that the right quantities of ingredients are ordered and used. This reduces the amount of food that goes to waste due to spoilage or overproduction. A study by (Pandey, 2023) shows that Alpowered inventory systems can cut food waste by up to 30%, leading to significant cost reductions.

Optimized Stock Levels

Al systems help manage optimal inventory levels, preventing overstock that leads to high inventory costs, or understock that results in lost sales opportunities. A study carried out by Ismaeil and Lalla (2024) shows that Al-driven inventory management systems can lower inventory costs by up to 20% by improving stock turnover and decreasing excess inventory.

Labor Cost Savings

By automating the manual processes of inventory tracking and reordering, AI minimizes the requirement for significant human effort in inventory management. This may result in decreased labor expenses, particularly in extensive operations that necessitate continuous inventory oversight. A study conducted by Pereira and Oliveira (2020) indicates that AI technologies can cut the time dedicated to manual inventory management by as much as 50%, directly affecting labor expenses.

Improved Forecasting and Purchasing Efficiency

Al instruments, through the analysis of past data and forecasting future demand patterns, aid in refining purchasing choices. This diminishes the necessity for urgent orders and the related increased expenses of fast shipping. Bawden and Robinson (2022) state that Al-driven forecasting tools can enhance purchasing efficiency and lower procurement expenses by around 15%.

Reduction in Supply Chain Disruptions

Al can foresee possible supply chain disruptions, including delays or shortages, and can automatically modify orders to reduce these risks. This leads to reduced expenses linked to disruptions in the supply chain. Research conducted by Gathoni and Chege (2024) found that Al-powered supply chain management decreases disruptions by 20-30%, leading to more reliable and economical operations. In general, the incorporation of Al-powered inventory management systems has the potential to lower operational expenses by about 10-25% in various sectors, such as minimizing food waste, reducing labor costs, and enhancing procurement and inventory management procedures.

For Customers

Q4. Do you perceive any differences in food freshness or availability at restaurants using AI-based inventory management?

Patrons frequently notice fresher components and reduced menu shortages, enhancing their dining experiences (Papargyropoulou et al., 2014). The implementation of AI-driven inventory management systems in eateries can affect patrons' views on the freshness and availability of food, even if these impacts might not be instantly recognizable to the customer. Nonetheless, studies indicate that patrons might indirectly notice enhancements via better service quality, uniform menu selections, and the general dining experience.

Food Freshness

Al tools assist restaurants in optimizing inventory levels, resulting in a more efficient and prompt supply chain. By precisely forecasting demand, Al can decrease the chances of expired or spoiled food being utilized, guaranteeing that ingredients remain fresh upon arrival in the kitchen. Research by Ismaeil and Lalla (2024) indicates that Al systems minimize waste and enhance inventory turnover, which directly affects the freshness of the meals provided. Customers might not always recognize the Al system working behind the scenes, but they could observe fresher ingredients and a steady quality over time.

Menu Availability

Al-driven systems forecast demand trends and assist restaurants in modifying inventory accordingly. This indicates that frequently sought-after products are consistently in stock, and shortages are reduced. Research by Pandey (2023) indicates that AI tools enable restaurants to prevent shortages and guarantee that customers can request their favorite dishes without feeling let down. Although customers might not be aware of the AI enhancing this efficiency, they will probably value not running into unavailable menu items, resulting in a more enjoyable dining experience.

Improved Customer Experience

Artificial intelligence in inventory management can enhance the overall customer experience indirectly by facilitating faster service, minimizing delays in meal preparation,

and ensuring a more consistent dining experience. With AI assisting restaurants in managing inventory and reducing waste, chefs and kitchen personnel can focus more on meal quality rather than stock issues. Patrons might observe the variation in the efficiency and reliability of their dishes, resulting in a more favorable view of the eatery. Research conducted by Gathoni and Chege (2024) discovered that AI systems enhance operational efficiency, resulting in quicker and more dependable service—a crucial element in customer satisfaction.

Although customers might not always recognize the AI systems operating behind the scenes, the advantages they provide—such as fresher food, enhanced availability, and an improved dining experience—are apparent. These advancements, enabled by AI-driven inventory systems, can boost customer satisfaction and shape their views on food freshness and availability.

5.3 Hypothesis 3 (H3): Personalization Through AI Enhances Menu Design Development

For Chefs

Q1. How has AI-driven personalization influenced your approach to menu design development?

Chefs have moved towards more flexible menu designs that respond to evolving customer tastes, boosting customer satisfaction and loyalty (Milton, 2024). Al-driven personalization has significantly influenced menu design by enabling restaurants to tailor options based on customer preferences, dietary restrictions, and previous buying behaviors. Al tools analyze extensive customer data to identify trends, allowing for real-time menu modifications that align with customer preferences. Tailored suggestions improve customer involvement, boosting sales and contentment. As stated by Hemalatha (2023), Al optimizes menu offerings by forecasting favored dishes, enhancing operational efficiency and profitability. Custom menu design can additionally integrate elements such as location and seasonality, enhancing the overall dining experience (Ayad & Hasanein, 2024).

For Restaurant Managers

Q2. Has AI helped managers develop menus?

Numerous restaurant managers think that AI-driven personalization of menus has enhanced customer loyalty and return visits. Through the use of AI to assess customer preferences, behaviors, and purchasing history, restaurants can provide tailored experiences that improve customer satisfaction. Personalized suggestions, customized offers, and adaptable menus reflecting personal preferences motivate customers to come back. Study by Hemalatha (2023) indicates that AI-based personalization enhances customer engagement and loyalty by providing a more tailored dining experience. Furthermore, Ayad and Hasanein (2024) emphasize that customized menus in fast-food establishments can boost return visits by better accommodating customer preferences.

For Customers

Q3. Do personalized menu options increase your likelihood of returning to a restaurant? Why or why not?

Tailored menu options can increase the likelihood of returning to a restaurant, as they provide a more individualized and pleasurable dining experience. When menus are customized based on previous visits, preferences, or dietary restrictions, customers sense that their needs are acknowledged and valued. Personalized recommendations powered by Al can present options that match personal preferences, improving both ease and satisfaction (Ayad & Hasanein, 2024). This feeling of individuality not only enhances customer satisfaction but also fosters loyalty, as customers tend to revisit a restaurant that regularly presents options that match their preferences (Hemalatha, 2023).

5.4 Hypothesis 4 (H4): Implementing AI in Menu Development Increases Overall Profitability

For Chefs

Q1. How has AI-supported menu design influenced your revenue or profitability?

Cooks observe that AI-augmented menus improve earnings by pinpointing high-profit items and refining menu arrangement (Chui et al., 2016). AI-enhanced menu design has favorably impacted chefs' income and profits by refining menu selections according to customer tastes, market trends, and operational efficiency. Through the analysis of customer data, AI can assist chefs in recognizing trending dishes, forecasting demand, and modifying the menu as needed, thereby minimizing waste and enhancing ingredient use (Tiwari, 2024). Moreover, custom menu recommendations promote greater customer expenditure, since AI tools can suggest items suited to personal preferences, raising the chances of upselling (Ayad & Hasanein, 2024). AI's capacity to predict demand aids chefs in preventing both overstocking and understocking, ultimately enhancing profits via more precise inventory control (Zareinia, 2024).

For Restaurant Managers

Q2. Has AI-based pricing and menu optimization improved overall profitability in your restaurant?

Numerous restaurant managers think that AI-driven pricing and menu optimization have greatly enhanced overall profitability. AI tools assist in refining menu prices by examining elements like customer demand, rival pricing, and ingredient expenses. By flexibly modifying prices in response to real-time information, restaurants can enhance revenue while maintaining their competitive edge (Zareinia, 2024). Menu optimization powered by AI also detects high-margin items and suggests popular or profitable dishes, making sure that menu selections align with customer preferences and operational effectiveness (Tiwari et al., 2024). According to Tiwari (2024), this data-oriented strategy results in increased profitability by boosting sales, minimizing waste, and streamlining inventory management.

For Customers

Q3. Do you perceive value in dining experiences where AI is used to improve menu options?

Customers typically acknowledge and value AI-based improvements that lead to a more pleasant dining experience and greater value (Zuboff, 2019). Dining experiences that utilize AI to enhance menu choices can provide considerable benefits. AI improves the dining experience by offering tailored suggestions according to personal preferences, dietary requirements, and past orders.

This degree of personalization enhances the dining experience and boosts both customer satisfaction and loyalty. The capability of AI to assess large volumes of customer data enables restaurants to modify their menu options in real time, guaranteeing that patrons are consistently offered items that resonate with their preferences and the latest trends (Ayad & Hasanein, 2024).

Moreover, AI assists in streamlining menu pricing and ingredient utilization, which can enhance the overall effectiveness and quality of the dining experience (Hemalatha, 2023).

6. CONCLUSION AND FINDINGS

This study emphasizes the significant influence of AI technologies on the food industry, especially in enhancing menu design and restaurant management. Through the use of AI-powered tools, restaurants can attain better customization, increased profitability, and greater sustainability.

Menu systems driven by AI allow businesses to provide personalized dining experiences, enhance operational efficiency, and adjust to changing market needs with agility. Findings from industry evaluations and prominent study affirm the groundbreaking impact of AI in menu design, demonstrating its capacity to improve customer contentment, service excellence, and overall dining experiences.

At our restaurant, using Al-driven menu optimization has greatly enhanced operations, increasing customer satisfaction with precise order handling, tailored suggestions, menu updates based on trends, and eco-friendly practices. Positive customer reviews emphasize the accuracy, personalization, and ethical enhancements brought about by AI, with customers noting greater contentment and a deeper bond with the restaurant.

These results are consistent with wider industry observations, showing that AI technologies enhance customer loyalty through customized and captivating dining experiences. As AI systems persist in gathering and examining data, their ability to predict and personalize will advance, further enhancing the dining experience. The skill to predict demand assists chefs and managers in maximizing ingredient use, minimizing food waste, and enhancing inventory control.

This data-centered method reduces expenses, boosts sustainability, and raises profits by optimizing stock quantities and refining pricing tactics. In conclusion, AI's ability to

enhance inventory management and menu pricing enables restaurants to succeed in a competitive landscape by optimizing efficiency, minimizing waste, and providing exceptional, personalized service. The incorporation of AI in food preparation is not merely an innovation tool but a crucial approach for enduring success and sustainability in the hospitality industry.

References

- 1) Abbar, S., Mejova, Y., & Weber, I. (2015). You tweet what you eat: Studying food consumption through Twitter. *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*, 3197–3206. https://doi.org/10.1145/2702123.2702153
- Albayrak Ünal, Ö., Erkayman, B., & Usanmaz, B. (2023, February 7). Applications of artificial intelligence in inventory management: A systematic review of the literature. Archives of Computational Methods in Engineering, 30. https://doi.org/10.1007/s11831-022-09879-5
- Al-Delaimy, W., Ramanathan, V., & Sorondo, M. S. (2020). Health of people, health of planet and our responsibility: climate change, air pollution and health. https://library.oapen.org/bitstream/20.500.12657/37742/1/10.1007 978-3-030-31125-4.pdf
- 4) Ayad, T., & Hasanein, A. (2024, June 26). The mediating role of customer satisfaction on the relationship between e-menus and customers' behavioral intentions in quick service restaurants. *Advances in Hospitality and Tourism Research, 12.* https://doi.org/10.30519/ahtr.1404613
- 5) Bernstein, D., Ottenfeld, M., & Witte, C. (2008). A study of consumer attitudes regarding variability of menu offerings in the context of an upscale seafood restaurant. *Journal of Foodservice Business Research*, *11*(4), 398–411. https://doi.org/10.1080/15378020802519769
- 6) Bozic, D., & Zrnić, M. (2024, August 1). AI in the restaurant business: A challenge for science and practice in Serbia. *Bayt Al-Mashoura Journal*. https://doi.org/10.33001/18355/IMJCT0815
- 7) Chauhan, Y. (2023). Culinary creativity unleashed: A review of innovative techniques in food gastronomy. *International Journal for Multidimensional Research Perspectives*, *1*, 37–46.
- 8) Chen, Y., Perez-Cueto, F., Giboreau, A., Mavridis, I., & Hartwell, H. (2021). Consumer preferences for the use of an innovative digital menu solution in public food service settings in four European countries. *Food Quality and Preference, 94,* 104324. https://doi.org/10.1016/j.foodqual.2021.104324
- Chidinma-Mary-Agbai, N. (2020). Application of artificial intelligence (AI) in food industry. GSC Biological and Pharmaceutical Sciences, 13(1), 171–178. https://doi.org/10.30574/gscbps.2020.13.1.0320
- 10) Choudhuri, S. S. (2024, March 5). Al-driven supply chain optimization: Enhancing inventory management, demand forecasting, and logistics within ERP systems. *International Journal of Science and Research (IJSR), 13*, 927–933. https://doi.org/10.21275/SR24314073027
- 11) Chui, M., Manyika, J., & Miremadi, M. (2016). *The future that works: Automation, employment, and productivity.* McKinsey Global Institute.
- 12) Davenport, T. H., & Ronanki, R. (2018). *Artificial intelligence for the real world*. Harvard Business Review, 96(1), 108-116.
- 13) Detopoulou, P., Voulgaridou, G., Moschos, P., Levidi, D., Anastasiou, T., Dedes, V., Diplari, E., Fourfouri, N., Giaginis, C., Panoutsopoulos, G., & Papadopoulou, S. (2023). Artificial intelligence, nutrition, and ethical issues: A mini-review. *Clinical Nutrition Open Science*, *50*, 1–10. https://doi.org/10.1016/j.nutos.2023.07.001

- 14) DiPietro, R., Remar, D., & Parsa, H. (2016). Health consciousness, menu information, and consumers' purchase intentions: An empirical investigation. *Journal of Foodservice Business Research*, 19(1), 1–17. https://doi.org/10.1080/15378020.2016.1189744
- 15) Fakih, K., Assaker, G., Assaf, A., & Hallak, R. (2016). Does restaurant menu information affect customer attitudes and behavioral intentions? A cross-segment empirical analysis using PLS-SEM. *International Journal of Hospitality Management, 57,* 71–83. https://doi.org/10.1016/j.ijhm.2016.06.002
- 16) Gathoni, C., & Chege, D. (2024, October 29). Influence of supply chain diversification on the performance of large food and beverage processing companies in Nairobi City County, Kenya. *International Journal of Social Science and Humanities Research (IJSSHR)*, 2, 250–262. https://doi.org/10.61108/ijsshr.v2i3.139
- 17) Guéguen, N., & Jacob, C. (2012). The effect of menu labels associated with affect, tradition and patriotism on sales. *Food Quality and Preference, 23*(1), 86–88. https://doi.org/10.1016/j.foodqual.2011.07.001
- 18) Han, J., Moon, H., Oh, Y., Chang, J., & Ham, S. (2020). Impacts of menu information quality and nutrition information quality on technology acceptance characteristics and behaviors toward fast food restaurants' kiosk. *Nutrition Research and Practice*, *14*(2), 167–174. https://doi.org/10.4162/nrp.2020.14.2.167
- 19) Hemalatha, A. (2023, July 10). Al-driven marketing: Leveraging artificial intelligence for enhanced customer engagement. https://doi.org/10.47715/JPC.B.978-93-91303-61-7
- Ismaeil, M., & Lalla, A. (2024, July 10). The role and impact of artificial intelligence on supply chain management: Efficiency, challenges, and strategic implementation. *Journal of Ecohumanism, 3*(4), 89–106. https://doi.org/10.62754/joe.v3i4.3461
- 21) Ivanov, S., & Webster, C. (2020). *Robotics, artificial intelligence, and the evolving nature of hospitality jobs.* In *The Emerald Handbook of Tourism, Hospitality, and Event Management.* Emerald Publishing.
- 22) Karunamurthy, A., Sulaiha, A., & Yashitha Begam, Y. (2024). Al-driven recipe-generating chatbot: Personalized culinary recommendations using NLP and rule-based algorithms. *International Journal* of Neural Networks and Deep Learning, 1(2), 10–21. https://doi.org/10.5281/zenodo.14245260
- 23) Kim, D. (2015). Enhancing ethnic food acceptance and reducing perceived risk: The effects of personality traits, cultural familiarity, and menu framing. *International Journal of Hospitality Management*, *47*, 85–95. https://doi.org/10.1016/j.ijhm.2015.03.011
- 24) Kim, H., So, K. K. F., Shin, S., & Li, J. (2024, January 11). Artificial intelligence in hospitality and tourism: Insights from industry practices, research literature, and expert opinions. *Journal of Hospitality* & *Tourism Research*, 49. https://doi.org/10.1177/10963480241229235
- 25) Kim, Y., Sauerwald, P., & Sukpatch, K. (2020). Are you looking for special menu? An examination of Variety Seeking Behavior for Special Menu (VaSM) model. *International Journal of Gastronomy and Food Science*, 23, 100295. https://doi.org/10.1016/j.ijgfs.2020.100295
- 26) Kumar, I., Rawat, J., Mohd, N., & Husain, S. (2021). Opportunities of artificial intelligence and machine learning in the food industry. *Journal of Food Quality*, 2021, 1–10. https://doi.org/10.1155/2021/4535567
- 27) Labisi, T., Preciado, M., Voorhees, A., Castillo, A., Lopez, K., Economos, C., Story, M., & Cohen, D. (2023). An exploration of customers' perceptions, preferences, experiences, and feasibility of offering standardized portions in restaurants. *International Journal of Gastronomy and Food Science, 34*, 100829. https://doi.org/10.1016/j.ijgfs.2023.100829

- 28) Lin, P., Peng, K.-L., Au, W. C., Qiu, H., & Deng, C. (2023). Digital menus innovation diffusion and transformation process of consumer behavior. *Journal of Hospitality and Tourism Technology, 14*(4). https://doi.org/10.1108/JHTT-07-2021-0217
- 29) Millán, M. G. D., & De La Torre, M. G. M. V. (2024). An economic perspective on the implementation of artificial intelligence in the restaurant sector. *Administrative Sciences*, *14*(9), 214. https://doi.org/10.3390/admsci14090214
- 30) Milton, T. (2024). Artificial intelligence transforming hotel gastronomy: An in-depth review of Al-driven innovations in menu design, food preparation, and customer interaction, with a focus on sustainability and future trends in the hospitality industry. *International Journal for Multidimensional Research Perspectives*, *2*(3), 47–61. https://doi.org/10.61877/ijmrp.v2i3.126
- 31) Mullick, S., Raassens, N., Haans, H., & Nijssen, E. (2020, November 9). Reducing food waste through digital platforms: A quantification of cross-side network effects. *Industrial Marketing Management, 93.* https://doi.org/10.1016/j.indmarman.2020.09.021
- 32) Murphy, H. C., Gretzel, U., & Hofacker, C. F. (2020). Service robots in hospitality and tourism: Understanding the value of AI-driven menu management. Journal of Hospitality
- 33) Murugeah, M. K. (2024). Enhancing efficiency and personalization in food and beverage service through AI: Future trends and challenges. *International Journal for Multidimensional Research Perspectives*, 2(7), 1–17. https://doi.org/10.61877/ijmrp.v2i7.162
- 34) Obaid, F. (2024). The role of the Jordanian diplomacy in handling food security due to the lockdowns of the COVID-19 (Coronavirus) pandemic (1st ed.). https://doi.org/10.13140/RG.2.2.19830.41280
- 35) Pandey, S. (2023, January 1). Al-lead supply chain optimization in food industry. *Vol.12*, 001–007. https://doi.org/10.35248/2322-3308-11.6.001
- 36) Papargyropoulou, E., Lozano, R., Steinberger, J. K., Wright, N., & Ujang, Z. B. (2014). *The food waste hierarchy as a framework for the management of food surplus and food waste.* Journal of Cleaner Production, 76, 106-115.
- Sachani, D. K., Dhameliya, N., Mullangi, K., Anumandla, S., & Vennapusa, S. C. R. (2021, December 31). Enhancing food service sales through AI and automation in convenience store kitchens. *Global Disclosure of Economics and Business*, *10*, 105–116. https://doi.org/10.18034/gdeb.v10i2.754
- 38) Singh, V., Singh, A., & Tyagi, P. (2024, March 8). Utilizing technology for food waste management in the hospitality industry: Hotels and restaurants. In *Technology for food waste management in hotels, restaurants* (Chapter 19). https://doi.org/10.4018/979-8-3693-2181-2.ch019
- 39) Sinha, G., & F.A, P. (2024). Al-driven innovations in food and beverage service: A roadmap to future hospitality. *International Journal for Multidimensional Research Perspectives*, 2(7), 44–60. https://doi.org/10.61877/ijmrp.v2i7.169
- 40) Tadimarri, A., Gurusamy, A., Sharma, K. K., & Jangoan, S. (2024, March 4). Al-powered marketing: Transforming consumer engagement and brand growth. *International Journal for Multidisciplinary Research, 6.* https://doi.org/10.36948/ijfmr.2024.v06i02.14595
- 41) Tan, J., & Wang, Y. (2023). Enhancing demand forecasting accuracy using artificial intelligence. *Journal of Foodservice Research*, 21(5), 345-358.
- 42) Tang, L. F., Chan, Y., & Ip, Y.-K. (2020). *Millennials' application of digitalization menu into culinary arts experience*. In *Forschung und Praxis an der FHWien der WKW Kulinarischer Tourismus und Weintourismus* (pp. 57–64). Springer Fachmedien Wiesbaden.

- 43) Tiwari, T., Garg, T., Singh, G., Mishra, S., & Guleria, K. (2024, December 29). Optimizing food utilization: A smart inventory management and AI-predictive analytics in reducing food waste. *International Journal of Science and Social Science Research*, 2(3), 165–170. https://doi.org/10.5281/zenodo.14227540
- 44) Ulu, E. (2024, May 13). Culinary innovation: Will the future of chefs' creativity be shaped by AI technologies? *Tourism*, 72, 340–352. https://doi.org/10.37741/t.72.3.4
- 45) Wafi, M., & Tumiran, M. (2024, December 28). Harnessing artificial intelligence (AI) to mitigate food waste: Innovative strategies for sustainable consumption. *Malaysian Journal of Social Sciences and Humanities (MJSSH)*, *9*, e003147. https://doi.org/10.47405/mjssh.v9i12.3147
- 46) Yaiprasert, C., & Hidayanto, A. (2024). Al-powered in the digital age: Ensemble innovation personalizes the food recommendations. *Journal of Open Innovation: Technology, Market, and Complexity, 10*, 100261. https://doi.org/10.1016/j.joitmc.2024.100261
- 47) Zareinia, K. (2024, December 21). Reducing food waste through advanced supply chain optimization with big data and AI. *ResearchGate*.