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Robot Chef Adoption: The New Industry Strategy To Combat Labor Shortages

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Executive Summary: Through interviews, the authors investigated how robot chefs can be implemented in order to strengthen the business flow of a restaurant and what value the adoption would bring to the market. Results showed that the ability of the robot chef to lack human error, maintain food quality, be reliable labor, and generate cost savings make it a desired asset to have in any restaurant. Despite its adoption initially being feared by consumers, once the labor cost savings are transferred over to menu prices and quality maintenance is observed, consumer acceptance of the adoption is predicted to surge. The findings suggest that social media advertising of the robot chef and its services are likely to further entice higher levels of business volume from the growing Generation Z and Generation Alpha consumers in the market. Restaurant companies should understand the values that robot chefs can offer to help strengthen their market and service quality.

KEYWORDS: *Robot chef, Restaurant labor, labor savings*

Introduction

The hospitality industry has historically had an average employee turnover rate ranging between 70% to 80% (Croes et al., 2021). The U.S Bureau of Labor Statistics data represents the hospitality industry as having the highest turnover rate out of all the industries (USDL, 2021). The minimum cost of employee turnover constitutes 5% of the total annual revenue for an operation (Wang & Chen, 2020). In spite of the effects of COVID-19 being minimized and

restaurant mandates being lifted, restaurant workers are continuing to leave the industry in droves (Hartmans, 2022). As a result, the rate of foodservice job openings has grown significantly from 5.8% to 8.4%, according to the Department of Labor Statistics (Fantozzi, 2022). The demand for and importance of the workforce is of no greater importance in any other industry when compared to the restaurant segment of the hospitality industry (Murphy et al., 2009).

Beginning efforts taken to rectify the labor shortage predicament have involved

restaurants adopting self-service kiosks, employing senior-aged individuals, decreasing hours of operation, and even reducing the number of offerings on the menu (Ivanov & Webster, 2023; NRA, 2022). Most of these efforts were not very fruitful for the restaurants. Even though self-service kiosks would help lower front-of-house labor, the products ordered would still require a feasible number of skilled back-of-house staff. Decreasing the hours of operation and reducing the menu helped decrease the number of labor hours needed to prep and produce the menu products, but profitability would decrease because of the lower operating hours and fewer menu items. Employing senior-aged individuals was the most effective option but only for a short-time period due to them lacking the proper skills, lacking a fast-learning rate of those skills, and being close to retirement (Murphy et al., 2009). The main issues of kitchen experience and lowered profitability were the most influential to the effectiveness of these initial strategies (Fantozzi, 2022).

In furthering efforts to overcome the labor crunch, restaurant owners are beginning to turn towards robots as part of the solution. An increasing number of restaurants and cafes have adopted robots, thereby increasing labor productivity, improving advertisement opportunities, and reducing labor costs (Shibata, 2019). The priority of robots within these restaurants is placed on automation in the kitchen and storage areas (Shibata, 2019). Robot chefs have ultimately become an ideal option for reducing human contact while enhancing food safety and sanitation as society continues to progress

into the endemic phase of COVID-19 (Chuah et al., 2022). The ultimate goal of applying robotic chefs into the restaurant landscape has been to ensure that the robots create customer value in terms of a better product, lower price, or both (Bowen & Morosan, 2018). This is only able to occur when lower food inventory costs and lower labor costs have resulted from the adoption of the robot chef. Those cost savings are then passed on to the customers. Spyce is one of the first restaurants in the U.S. to adopt the usage of robotic chefs into a profitable, fully automated restaurant (Fusté-Forné, 2021). In 2021, a southern style, Illinois restaurant called “One Meat Chicken” incorporated robotic chefs that are able to cook multiple recipes without any human intervention and customize each dish to the customers liking (Beaton, 2021). Caliburger has adopted a robotic chef that can cook hamburgers, sensing when they are done and picking them up to place them on a tray. Once on the tray, the human cooks take over finishing the product (Bowen & Morosan, 2018).

For the purposes of this study, a robotic chef has been defined as an automated cooking machine, programmable to perform the functions of preparing and plating cuisine for guests to consume and moving within the environment to perform such functions. By this definition, other humanoid-like robots used in the kitchen, such as robotic arms and humanoid cooking equipment, will also fall into the category of robotic chefs. Understanding the perceptions of restaurant owners and chefs, with regard to automated hospitality services, is necessary to understand how to

better implement robotic chefs into restaurants and understand the willingness to adopt robotic chefs into the restaurant infrastructure (Ivanov & Webster, 2022). Research has supported that the primary drivers of robot adoption are productivity, accessibility, and service augmentation (Alexis, 2017). On the contrary, it has also been supported that restaurant owner- and employee-resistance toward accepting the benefits of robots can halt the potential value that the robot would bring to their servicescape (Ivanov & Webster, 2017).

Business operator attitude often ranges from the positive appraisal of liberating humans of manual labor and establishing new business opportunities to the fear of making humans obsolete in a fully robotized society (Ivanov & Webster, 2017). Ivanov and Webster (2017) pushed for the notion that robots contributing to labor cost savings does not mean just substituting employees with the robot, but rather enhancing the employees. Restaurants are not going to replace their human employees with service automation on a massive scale but rather use the automation to improve productivity growth and serve more guests a consistent quality with the same number or slightly fewer employees (Ivanov & Webster, 2022).

In spite of the novelty of Ivanov's notions, very little research exists that supports them from a restaurant operator perspective. Seyitoğlu et al.'s (2021) findings showcase that restaurateurs would be more willing to adopt robots into their operation if they had more advanced AI socialization and interactive functions. This finding is further supported as Berezina and Cain

(2021) encountered the same finding in their study on evaluating bar owners' perspectives on adopting robotic bartenders. Coincidentally, it was found that restaurant and bar operators value how the entertainment appeal, that these anthropomorphic robots offer to their young consumer market, could be used as a competitive advantage, despite the chance of malfunction (Berezina & Cain, 2021; Seyitoğlu et al., 2021). With generational turnovers occurring within the industry, trust in robots and AI seem to be growing in Millennials, Generation Z, and Generation Alpha.

The primary purpose of this study was to understand the willingness of restaurateurs to adopt robotic chefs into their operation and educate their guests to build trust within their brand. The secondary purpose of this study was to determine if current restaurateurs are more willing to adopt robotic chefs into their operations due to current labor needs. An in-depth view was also obtained on what factors influence their willingness to adopt the robotic chefs and what efforts the restaurateurs have or may use to educate their guests and staff on the incorporation of the robotic chef. Key questions were developed to meet these goals.

RSQ1: What impacts would a robot chef's strengths and weaknesses have on restaurateurs' willingness to adopt them?

RSQ2: What impacts could robot chefs have on enhancing restaurant operation standards and human-to-robot interaction?

RSQ3: What education strategies could be the most effective towards inducing a higher degree of staff and consumer acceptance of the robot chef?

Methodology

Participants were selected based on two criteria. First, the participants had to be restaurant owners or chefs who held the position and duties of general manager. Second, the restaurant had to be currently open and operating. Initially, appointments were arranged to carry out the online interviews through Zoom, with seven participants. After completing the interviews with these participants, they were asked to recommend individuals suitable for the study. Furthermore, the suggested individuals were contacted through phones and/or their business email accounts and were then informed about the research objectives and details. The data collection process focused on open-ended question responses. Structured interviews with the seven participants were conducted in October 2022. The sample was recruited from restaurants in the neighboring states of Mississippi and Louisiana. The Mississippi participants consisted of a vice president, corporate executive chef, and property executive chef. The Louisiana participants

consisted of a casino food & beverage property executive chef, a restaurant general manager, and two restaurant sous chefs. The age range of the participants ranged from 35-45 years. The sample organizations included Aramark, Centerplate, Golden Nugget Resorts, and independent restaurants. The participants had also been employed with their corporation/restaurant for at least three years.

Due to the topic of robot chefs being new within the restaurant industry, the robot chef definition was given to the participants. The robot chef was defined as an automated cooking machine programmable to perform the functions of preparing and plating cuisine for guests to consume and moving within the environment to perform such functions. An example of the robot chef is presented in Figures 1 and 2. The aim was to provide participants with a clear understanding of robot chefs and their potential roles in restaurant services. Each participant was asked questions concerning their thoughts towards potentially incorporating robot chefs into their operation, in order to determine how the adoption would affect their market and service landscape.



Figure 1. Image of Robot Chef Kitchen.

Note. Adapted from *Aramark Germany Begins Using Kitchen Robots in an Industry First* (<https://www.aramark.com/newsroom/news/germany-robotic-kitchen>). Copyright 2022 by Aramark.



Figure 2 Image of Moley Robotics Robot Chef. Note. Adapted from *The World's First Robot Chef Is Finally Here, and It Even Cleans Up After Itself* (<https://robbreport.com/gear/electronics/moley-robotics-robot-kitchen-uk-for-sale-1234590791/>). Copyright 2021 by Moley Robotics.

Each participant was asked 15 questions concerning their thoughts towards potentially incorporating robot chefs into their operation, in order to determine how the adoption would affect their market and service landscape. The questions were as follows:

- Are you currently experiencing a shortage of labor within your operation?
- What tactics have you utilized to overcome your lack of labor?
- What are your thoughts towards the notion that “a robot chef could produce the same consistent product quality that a human cook could produce if it is programmed correctly”?
- Due to the ongoing labor shortage within the restaurant industry, how would you utilize robot chefs to help solve this issue?
- In the event that you do not have enough staff to operate your restaurant, what strategies would you adopt in order to keep your restaurant open?
- How well do you think that human cooks would interact, task-wise, with a robot chef?
- What strategies would you utilize to educate your staff on the benefits of the robot chef?
- What values do you see a robot chef bringing into your establishment?
- What risks do you see a robotic chef bringing into your establishment?
- How do you think customers would react to their food being prepared by a robot chef?
- What strategies would you utilize to educate your guests about your robot chef?
- Considering that tech-savvy generations, such as Generation Z and Generation Alpha, are vastly entering the consumer market, what competitive advantages do you see a robotic chef offering?
- How do you think that a robot chef would help your operation generate more revenue?
- What other thoughts or ideas do you have towards the adoption of robot chefs within foodservice kitchens?
- Do you know of anyone else that I can talk to about this topic?

Findings

NVivo was utilized to perform data analysis. Using open coding, reoccurring words and comments were analyzed for frequency and grouped together based on their similarity to each other. Each group of codes was then axial coded into themes that represented the overall meaning reflected by each group of codes. As a result of this process, seven themes surfaced: (1) Fear of change, (2) Consistent Food Quality, (3) Streamlining Fast-Food, (4) Job Market Growth, (5) Social Media Hook, (6) Labor Reliance, and (7)

Labor Cost Savings. Even though seven participants may be perceived as too little to showcase valid data saturation, evidence has been provided to suggest otherwise. Schwaiger et al. (2022) also conducted a qualitative phenomenological study using fully structured interviews and were able to obtain data saturation from seven respondents. After the sixth interview, it became clear that participants were not suggesting new concepts or ideas. A seventh interview was conducted to further validate this assumption, revealing that the concept of interest within the study was new. Through conducting this, Schwaiger et al. (2022) validate that a low number of participants for data saturation can be used for this current study, as the concept of robot chefs is relatively new to the industry.

This study revealed that restaurant operators perceived robot chefs as bringing much value and benefits to a restaurant in three ways. The first way in which a robot chef would benefit a restaurant would be by enhancing the service flow. As emphasized

by the participants, the robot-to-human task interaction would speed up food production while consistently maintaining the specific food quality of the operation. The strengthened service flow would provide the operation with access to serving more customers within their specific consumer market. In addition, with less labor being required, the labor savings would be able to contribute towards lower menu prices. Faster service, consistent quality, and lower pricing would thus lead to higher revenue generation and customer satisfaction within the market. Lastly, the usage of the robot will provide a better work-life balance, causing a decrease in restaurant turnover. It will also open up opportunities for restaurant corporations to hire maintenance professionals to maintain the quality of the robot chef and its functions. As a result, the overall job market for restaurants would grow. A more in-depth description of these findings is provided below, along with the key insights from the participants being reflected in Table 1.

Table 1. Participants’ Main Insights Towards Main Themes

Themes	Quotes
Fear of Change	<p><i>“The consumers would feel a loss of human touch to the cuisine and be less willing to accept this change, due to fear robots and AI taking over.”</i></p> <p><i>“It is the desire of that “human touch” that many consumers within the current market do not want robot chefs to cause restaurants to abandon.”</i></p>

<p>Consistent Food Quality</p>	<p><i>“You have little human error, and it will follow the recipe that is programmed into its AI each and every second of operation hours.”</i></p> <p><i>“Consistent food production time and consistent food quality maintenance capability of robot chefs are its two key benefits.”</i></p>
<p>Streamlining Fast-Food</p>	<p><i>“Fast food is all about production speed, consistent quality, and time efficiency, which would make the tasks I mentioned perfect for the robot to implicate in that segment.”</i></p> <p><i>“Robot chefs could be useful in streamlining a casual kitchen, such as: Apple Bees, Texas Roadhouse, and other chain fast-casual restaurants.”</i></p>
<p>Job Market Growth</p>	<p><i>“With more robot chefs to continuously be adopted, more qualified robot technicians will be needed in order to keep the robots properly functioning.”</i></p> <p><i>“Less entry-level chefs will be employed, but greater amounts of robot maintenance and engineering trade jobs would result.”</i></p>
<p>Social Media Hook</p>	<p><i>“The more social media viewers see the posted experiences within the videos, the more willing they will want to have that same experience.”</i></p> <p><i>“With the younger generation having a higher social media usage and attraction to modern trends, they would be more curious to videotape and record an experience with the new trend of robot chefs.”</i></p>
<p>Labor Reliance</p>	<p><i>“The robot chef would be reliable labor due to lack of no call-no show, repeated shift callouts, coming in hungover, upset from being overworked, and mood swings.”</i></p> <p><i>“To not have to worry about a robot chef’s call-outs or emotional behavior negatively impacting my food service production and food quality makes it a reliable tool to have in my kitchen.”</i></p>
<p>Labor Cost Savings</p>	<p><i>“With a robot chef, I would be saving \$3,050 that I would normally have to spend each time that I hire a new cook every three months.”</i></p>

	<p><i>"I would be able to slightly lower my menu prices."</i></p> <p><i>"I do worry if the saved costs would be eaten up by the maintenance costs."</i></p>
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Industry Takeaways

Robot chefs are predicted to be a staple component of restaurant growth and success. In order for robot chefs to enhance the productivity and success of the restaurant venue, restaurant operators need to take certain actions. The labor needs of the restaurant operation in conjunction with the business volume. As showcased in this study, the robot chef is not a standalone piece of technology. It is a technology that is dependent on task interaction. By being knowledgeable about their current labor, projected labor, and forecasted sales volume, restaurateurs will be able to adopt an accurate number of robot chefs to meet their business needs. Loss of the human touch to the restaurant kitchen service and potential decreases in the quantity of restaurant kitchen positions were perceived as the two highest reasons that adopting a robot chef would minimize consumer satisfaction and acceptance. In order to limit these risks, it is highly recommended that restaurant managers re-evaluate the job duties and tasks of their kitchen employees. This will allow the managers to better redesign kitchen employees' job positions to where they will be able to remain physically employed with the restaurant, perform less time-demanding duties, and still receive their standard work pay.

Due to robot chefs' dependability on task interaction, this study also recommends that robot chefs are adopted into a streamlined kitchen setup. It is essential that restaurant managers also take this notion into consideration during the planning phase of adopting robot chefs. As emphasized by the sample, streamlining is not a kitchen setup that is only useful in quick service operations. Streamline kitchen setups can be very beneficial and further enhance the task interaction that occurs in the food production process within casual restaurant concepts as well. With higher levels of task interaction between the robot chef and human cooks occurring within a streamlined kitchen setting, the chance of a faster production rate and the ability for the restaurant operation to successfully serve more customers increases. A lack of accountability for this notion could jeopardize the product and revenue stream of the restaurant operation.

In order to heighten the staff and consumers' acceptance of the adoption, it is recommended that restaurant managers utilize face-to-face verbal education strategies. In order to limit the effects of the previously mentioned weaknesses of the robot chef, restaurant operators need to verbally communicate the work-life balance benefits, time-management benefits, and task interaction functions of the robot chef to their staff. Restaurant operators need to also communicate to their guests, about

how the lower labor costs from the adoption are allowing the restaurant to offer a lower-priced menu, offer high-quality products, and still have a human element within their food production process. Through educating guests on there still being a human cook behind the kitchen line throughout the production process, consumers will feel reassured that the products will still have the unique flavor and appeal that they have received throughout their patronage of the restaurants. High degrees of trust and acceptance from consumers and staff are likely to occur from both education strategies.

It is also essential for restaurant operators to advertise their robot chef and its task

interaction with their employees on social media. Due to consumers from the younger generation found to be lovers of technology and social media and their presence growing within the market, this marketing strategy will expand the market reach of the restaurants’ brand and attract more business volume to their operation. At the same time, this social media marketing strategy will also continue to educate and attract business from older-aged consumers within the restaurants’ current market. A list of recommendations is provided below in Table 2. Nonetheless, restaurant operators need to be knowledgeable of the initial fees and projected revenue that the robot chef would come with.

Table 2. Recommendations to Enhance Marketing and Consumer Acceptance of Robot Chef

Operation Aspect	Recommendation
Marketing	<ul style="list-style-type: none"> • Post pictures and short videos on social media of the robot chef and employee-robot interactions. • Create contests where guests can share their unique experiences with the robot chef service on social media. • Host a small community gathering to discuss the adoption of the robot chef. • Advertise a short commercial on the robot chefs adoption and its perks to the restaurant brand.
Consumer Acceptance	<ul style="list-style-type: none"> • Educate guests on the perks of the robot chef. • Offer food quality reassurance to guests.

	<ul style="list-style-type: none"> • Host a small tasting event where guests can see the robot chef in action. • Contribute the cost savings from the robot chef to lower menu prices.
Human Resources	<ul style="list-style-type: none"> • Reconduct job analysis on all kitchen job positions. • Re-design all kitchen job positions based on the results of the job analysis.

Labor needs, targeted labor cost, forecasted revenue, and the size of the kitchen are the key components that are predicted to aid restaurateurs in determining the optimal amount of robot chefs to adopt and ensure that the targeted return on investment is successfully achieved from the adoption. Ideally, a restaurant that possesses high amounts of open kitchen positions with little to no qualified personnel interested in the positions will require more robot chefs to be adopted. A robot chef can work over 40 hours without the need to pay overtime. A comparison analysis of labor costs before the adoption and the targeted labor cost goal would be crucial in helping determine the number of robot chefs needed. Average US. overtime costs consume an additional 15% of the revenue for the operation. In addition, projected revenue will also need to be considered, to where a higher projected revenue is likely to require more usage of a robot chef. The Cooking Robotics Market Report reveals that the average monthly for QSR and Casual restaurants is around \$110,000; thus, for every \$50,000 dollars in monthly projected revenue, one robot chef should be adopted ([Research Nester](#), 2020, as cited in Globe Newswire,

2020). Furthermore, to optimally balance the number of robot chefs needed to entice productive robot-employee interaction, the size of the kitchen production line needs to be taken into account. The space must be sufficient to promote a smooth and productive flow of food. Most importantly, restaurateurs need to consider having their kitchen employees participate in a training session led by a representative from the company that the robot chef was purchased from before the robot chef is fully adopted into the restaurant. This provides the restaurant staff with the opportunity to grow accustomed to the specific task and level of interaction that will be conducted between the robot chef and the worker while also educating them on the benefits that the robot chef will provide. As a result, staff are more likely to develop a strong work-task relationship with the robot chef. Restaurateurs possessing this knowledge will be able to honestly and accurately validate whether or not the robot chef would strengthen the operations' profitability and market.

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