



PREDICTING THE FUTURE of THE FOODSERVICE INDUSTRY: A ROBOT-BASED ECONOMY PERSPECTIVE

Ibrahim Ciftci^{a*}, Derya Demirdelen Alrawadieh^b

^aDepartment of Economics, Istanbul University, Istanbul, Türkiye;
ORCID: 0000-0001-7469-1906 / e-mail: ibrahim.ciftci@istanbul.edu.tr

^bPlato Vocational School, Istanbul Ayyansaray University, Istanbul, Türkiye;
ORCID: 0000-0002-7554-2256 / e-mail: deryademirdelen@ayvansaray.edu.tr

KEYWORDS

Foodservice industry
Robot-based economy
Foodservice experts
Future of the foodservice industry

ABSTRACT

This paper ascertains the perceptions of Turkish foodservice industry experts (i.e., executive chefs, business owners, and academicians) to predict the future of the foodservice industry in the robot-based economy. A content analysis was performed by drawing on the qualitative data that occurred through 18 semi-structured interviews. The findings illustrate the present and anticipated status of the usage of robots and AI and the possible impact of robotization and AI on employment in the foodservice industry based on its' experts' perspective. For instance, future robots and AI would take place in the production phase of the food and beverage industry; however, this would not eliminate human employment. Moreover, robotization would be more common in fast food establishments, leading to a change in people's nutrition habits; thus, more people are likely to return to a more traditional and straightforward way of life. Several theoretical and managerial implications are discussed according to findings that showcase a future trajectory for the foodservice industry in the robot-based economy era.

1. INTRODUCTION

In a robot-based economy, the growing reliance on robots and artificial intelligence (AI) has disrupted labor market structures and introduced both benefits and threats for the future of the foodservice industry (Ivanov, 2017). As one of the labor-intensive industries, the foodservice industry has witnessed the introduction of robots in both production and service delivery (Berezina et al., 2019). This industry is acknowledged as highly dynamic and prone to innovations in culinary technics, tools, and equipment. In this regard, several studies (e.g., Buhalis et al., 2019; Ivanov, 2017; Webster & Ivanov, 2020a; 2020b) suggested that digital transformation and its robot-based implications would cause some job shifting in labor-intensive industries such as the tourism and hospitality industry.

Despite increasing research endeavors addressing the robotization landscape in the foodservice industry (e.g., Cha, 2020; Fusté-Forné, 2021; Park et al., 2017; Zhu & Chang, 2020), there is limited understanding of how the economic ecosystem will look like in the industry over the next five decades and whether or not the robot-based economy will influence major operational models within the food industry including production and service delivery. Moreover, a considerable body of knowledge predicts a disruptive impact of robots on the future of some professions in the service industry (Ivanov & Webster, 2017a; Tuomi et al., 2019). Yet, the perceptions of individuals engaged in the foodservice industry about robots and AI and their potential impacts on their professional future have been largely overlooked. With these thoughts in mind, this study aimed to assess the future of the foodservice

industry through the lens of a robot-based economy. It also delved into the potential structural changes in professions within the industry. The study drew on qualitative data collected from food industry experts and academicians whose research areas are relevant to food or/and gastronomy. The study provides a significant theoretical contribution by assessing the future of the foodservice industry in the era of robots and AI.

Consequently, our research helps to improve current knowledge of how the foodservice industry will evolve in a robot-based economy concern. Based on these predictions of experts and academicians, the recent study contributes the food industry with the more sophisticated implications of robotization and AI. By comprehending the outcomes of this current study, responsible authorities can navigate the future of the foodservice industry more effectively. Lastly, it will provide an expert perspective on robotization and IA literature by delving into their predictions for the future of the food and beverage industry. Previous research demonstrates how robotization and IA are seen in the food and beverage industries, with the customer viewpoint being the primary source of prejudice (Belanche et al., 2020a,b). Therefore, the study from an expert perspective can help scholars better understand robotization and IA's effects on the food and beverage industry. The study also discusses several practical implications

*Corresponding Author.

Received 17.05.2022; Received in revised form 13.12.2022; Accepted 17.12.2022

This article is licensed under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/).

e-ISSN: 2687 - 3737 / © 2021 The Authors. Published by [Anadolu University](https://www.anadolu.edu.tr/).

<https://doi.org/10.48119/toleho.1118082>

for both employees and foodservice providers.

2. LITERATURE REVIEW

2.1 The robot-based economy and the service industry

Robots and Artificial Intelligence (AI) are subject to reshape the tourism and hospitality industry (Li et al., 2019). Recent studies (e.g., Gursoy et al., 2019; Ivanov et al., 2017; Tung & Law, 2017; Tuomi et al., 2019; Park, 2020) provide a comprehensive review of the current state of robots and AI in travel, tourism, and hospitality industry. From a demand-side perspective, several research endeavors attempt to understand, for example, the adoption of robots by hospitality companies (Kuo et al., 2017) and people's evaluations and attitudes toward robots (Ivanov et al., 2018; Ivanov & Webster, 2019a; 2019b; Tussyadiah & Park, 2018). From a supply-side perspective, however, several studies focus on conceptualizing how the tourism and hospitality industry could adapt to the usage of robots and AI in service-delivering processes and explain the current and potential usage of robots and AI in the future (Collins et al., 2017; Ivanov et al., 2020; Ivanov, Webster, & Berezina, 2017).

Currently, the usage of robots and AI in the tourism and hospitality industry is argued to be restricted to uncritical tasks as the current state of the robots, and AI does not allow for complex service tasks. Therefore, robots and AI are still viewed as 'extensions' of human employees rather than their substitutes (Ivanov & Webster, 2017; Ivanov et al., 2021). Current usage includes, for example, self-service check-in and check-out / information, porter, concierge, and delivery robots at hotels (Yu, 2019); chatbots, robot chefs, bartenders, baristas at restaurants (Berezina et al., 2019; Tuomi et al., 2019), information office and displays, audio guides in travel agencies and tourist information centers; museums (Virto & López, 2019); cleaning and bag drop robots at airports (Ivanov, Webster, & Berezina, 2017), and other transport types (Shiomi et al., 2011). Yet, research shows that not all service processes can be automated and that some factors, including customer experience and competitiveness, may determine the decision to robotize and automatize the service delivery process.

In the specific context of the foodservice industry, the usage of robots and AI is argued to be promising (Cha, 2020). According to a report by Oracle (2020), robots and AI would have a significantly greater impact on the foodservice industry by 2025. Seyitoglu and Ivanov (2020a) suggested that a robotic restaurant experience can have several advantages, including attraction for kids and enhanced memorable experiences. Robots and AI can also augment the quality of service and create value for customers since they offer novel, interactive, and attractive service delivery in engaging and congruent with customers by transforming the service delivery process entertaining (Kuo et al., 2017; Wang et al., 2017). Robots can also operate highly repetitive tasks rather than human workers without complaints and without forgetting to fulfill constantly in the best way (Berezina et al., 2019; Ivanov & Webster, 2017a; Larivière et al., 2017; Wirtz et al., 2018). However, robots and AI may have some major pitfalls on the opposing side. The two significant issues are the extra costs for new financial resources

(e.g., recruiting experts to actuate and maintain the robots) and the lack of inventiveness and encounters in the interactions (Ivanov, 2019; Li et al., 2019). Despite these advantages and disadvantages, our knowledge about the current and potential use of robots and AI remains obviously limited.

2.2 Robots and AI in the foodservice industry

During the last several years, an increasing academic interest has evolved around the transformative power of robots and service automation within the tourism and hospitality industry. According to the MIT Technology Review (2018) report, it is estimated that 2 billion jobs will be eliminated by 2030 with RAISA applications. It is stated in much research that RAISA applications have made and will make great changes in industries where manpower is predominant. Therefore, RAISA applications that also operate in foodservices where manpower is intense will show remarkable differences in this industry (Flavián & Casalo, 2021).

Specifically, several studies examine the consumer perceptions of which activities robots can deliver instead of human employees in the foodservice industry. For instance, a study by Ivanov and Webster (2019a) demonstrated that restaurant customers signified the best convenient areas of robotization applications in a restaurant context - i.e., tidying up the table, menu presentation, order-taking, and cooking. Numerous studies also have examined the effects of robotics and AI in a different context. Published studies (e.g., Kim, Christodoulidou, & Choo, 2013; Collins et al., 2017) mentioned that food orders might be taken via kiosks and tablets in the restaurant industry or the service of the various sushi bowls can be serviced with conveyor belt. Several studies also elaborated on the effects of self-service technology (SST) and kitchen display systems (KDS) on changing encounters of the services (Kokkinou & Cranage, 2013; Rosenbaum & Wong, 2015), the usage of robots as service employees to collect the different objects on tables, take/bringing orders and table settlement, and so forth (Claveau & Force, 2019).

In addition, the current COVID-19 pandemic seems to have stimulated innovation whereby an increasing number of enterprises now rely on robots and AI as indispensable solutions to cope with the current challenges (Zeng et al., 2020). This matter also holds for the foodservice industry (Blit, 2020). For instance, during the current COVID-19 pandemic, several service providers have widely started to use robots for delivering food and other items without putting their employees' health in danger while maintaining sanitation (e.g., UV disinfection of facilities) and physical distancing (Seyitoglu & Ivanov, 2020b), and limiting potential virus contamination by transferring goods from warehouses to trucks (Demaitre, 2020). This situation has promoted the notion of being "untouched by human hand" which is closely associated with food safety. However, it is still unclear how the current pandemic influences business models in the foodservice industry and how the later played roles in promoting robots and AI.

2.3 The disruptive impact of robots and AI

The tourism and hospitality industry is largely inclined to the technological transformation that can influence the labor market and employment

structure (Alrawadieh et al., 2020). Despite numerous financial and non-financial benefits that can be attributed to robots and AI, there might be some threats to the future of some jobs within the industry. In this vein, some studies have addressed the bright future of employees in the tourism and hospitality industry and the potential impacts of robots and AI on the labor market, including employee satisfaction (Tian & Pu, 2008), turnover intention (Li et al., 2019) and, resistance to adoption (Ashcroft et al., 2019). Overall, there is general agreement on the significant impacts of robots and AI on the labor market, such as eliminating some jobs, creating new ones, and changing the face of some (Frank et al., 2017). However, the robot-economy may encourage the need for new and innovative educational approaches, which will lead to the transformation of the requirements of humans in the workforce (Ivanov, 2019; Webster & Ivanov, 2020). According to Ivanov et al. (2019), advances in robotics and AI may impact university education and on-the-job training, as well as human employees may be required to work alongside robots and thus should be fully prepared for such a transition. In the case of the food industry, according to a report by Oracle (2020), robots will be widely used for cleaning tasks in restaurants by 2025. Although cooking robots are argued to be able to cook many dishes to cater to customers (Yan et al., 2007), there may still be some issues hindering more enormous reliance on robots in the restaurant kitchen.

Ivanov and Webster (2017a) noted that employees should be trained to comply with advanced technology to overcome these issues. Currently, in the restaurant industry, food orders can be taken via kiosks, and the tablets can be serviced with a conveyor belt (Collins et al., 2017; Kim, Christodoulidou, & Choo, 2013). Numerous studies also illustrate robots can perform as service employees to collect different objects from tables (Claveau & Force, 2019), taking orders and bringing them from the kitchen (Kamruzzaman & Tareq, 2017), automated menu-recommender (Tan et al., 2012) and catering service robot (Chen et al., 2010). Further, Tuomi et al. (2019) examined how robotics transforms the roles of restaurant service employees. Although a current study by Seyitoğlu et al. (2021) provides a clue about the perceived mixed service delivery system regarding human-robot collaboration, it unlucky offers limited knowledge since the power of the IA technology was neglected in robotization. Therefore, this current investigation attempts to understand how robots and AI may jointly influence future jobs within the foodservice industry.

3. METHODOLOGY

Given the relative recency and the paucity of theoretical considerations on robots and AI in the tourism and hospitality industry in general and the foodservice industry in particular, the current investigation adopted an exploratory qualitative research approach. To predict the forthcoming of the foodservice industry in the context of a robot-based economy, semi-structured interviews were conducted with industry experts (e.g., executive chefs and business owners) as well as academicians.

A purposive sampling approach was adopted. The purposive sample approach was used in order to reach prospective participants since robotics and artificial intelligence (IA) technologies are arguably

now in their infancy, and most stakeholders are likely unaware of their potential and implications (Vu et al., 2022). Through an online search from one of the prominent social media source (e.g., LinkedIn), a total of 30 food industry experts and academicians were invited to participate in the study by messaging them on the related media source. As a result, 18 informants agreed to participate (nine food industry experts and nine academicians). Although around 25 interviews were planned, the authors agreed that with 18 interviews, data-saturated and thus further interviews would yield little additional insights (Saunders et al., 2018).

The interviews were conducted over a period of three weeks between July and August 2020. Given the ongoing pandemic and the resulting social distancing rules, all the interviews were conducted remotely, either by phone or via online meeting programs. The interviews were audiotaped with consent and verbatim transcribed, as well as lasted an average of 25 minutes. The interview procedure and questions were established using recent studies on robotics and artificial intelligence in the tourism and hospitality field (Berezina et al., 2019; Ivanov et al., 2021; Park et al., 2017; Seyitoglu, & Ivanov, 2020a; Tuomi et al., 2019; Virto & López, 2019; Webster & Ivanov, 2020a; 2020b). Two academics reviewed the questions in the tourism and hospitality fields before the start of interviews; just a few word changes were made. Five respondents were also recruited for a pilot test to evaluate the questions' clarity; confirmed their usability of the questions. Informants were initially asked about their perceptions of robots and AI usage and whether this would be common in the food industry. Then they were asked whether they support greater reliance on robots and AI in core business activities (e.g., cooking, service delivery). Informants were also asked about the possible impacts of robots and AI on the current employment structure in the field and whether more dependency on robots and AI would disrupt existing jobs in the food industry. Other questions were also asked to understand informants' perceptions toward changing consumer behavior; the possible impacts of the current COVID-19 pandemic on the process adoption of robots and AI, and the future of the food industry in the coming decades (For more, please see Appendix).

The six-stage content analysis guidelines recommended by Braun and Clarke (2006) were followed. The authors read the transcripts independently, discussed, and compared their findings before reaching a consensus on a final framework. All interviews were conducted and transcribed in Turkish based on Esfehni and Walters's (2018) recommendation of examining transcriptions in the source language. This approach is argued to be highly reliable (Esfehni & Walters, 2018) and proved to be effective in other recent research using cross-language thematic analysis (Alrawadieh et al., 2020). Despite its inherent limitation, the decision to include both academicians and industry experts was encouraged by the need to gain deep insights from different perspectives. To ensure validity, many original quotes from our interviewees were also shared (Elo & Kyngas, 2007). The descriptive profile of the participants is presented in Table 1.

(Please insert Table 1 here)

4. FINDINGS AND DISCUSSION

4.1 The Usage of Robots and AI in The Foodservice Industry

One of the study's primary purposes was to anticipate the future of robotics and artificial intelligence in the foodservice industry. A considerable portion of the informants agrees that robots and AI would be common in the foodservice industry. Informants supported their predictions based on the benefits that robots and AI provide. For instance, P6 noted:

"Robots will not require either annual leave or overtime. Staff payments have always been the major source of expenditure for businesses. The less you cut down on the staff [payments], the better your business is. Robots are easier to manage, with no mobbing [and so on]. So I think it will be more common in many aspects".

Despite the general support for introducing robots and AI into the industry, there are also some "however's." Specifically, the cultural factor, generational differences, the indispensable need for a human touch, and the type of food (fast-food vs. fine dining) were frequently mentioned as central issues moderating the extent to which robots and AI are used in the industry. P14 suggested, "they [robots and AI] will definitely be introduced into the industry, yet this may be limited as there will always be needed for human support." P5 noted that

"They [robots and AI] will not be common in the Middle East. However, I believe they will be widely employed in developed countries [...]. In this part of the world, I so do not think they will be successful".

Some informants predicted that robots and AI would be more common in the fast-food sector, given the highly standardized production and service delivery process. Likewise, Ivanov (2020) noted that the operating procedures, processes, and tasks might be based on the types of restaurants (e.g., fine-dining restaurants vs. low-cost restaurants). This matter is understandable since the fine-dining concept depends mainly on service quality, such as employees' communication skills (Kim et al., 2012). P8 pointed out that:

"[Robots and AI] will be an incredible opportunity for fast-food restaurants. This is different when it comes to fine dining restaurants. [...]. I would not go for a fine dining restaurant [that highly depends on robots and AI]. When I choose a fine dining restaurant, I look for something elite. Interaction with the waiter, his/her service matter".

However, some informants seem to adopt a conservative attitude toward robots and AI. These typically refer to the nature of the service industry whereby the human factor is crucial in the customer experience. P4 suggested:

"I don't think they [robots and AI] will become widespread in our country [Turkey]; our people are sentimental; they look for someone to talk to and chat with [...]. They may be used in other fields, but not in the food and beverage industry".

Regardless of their support or opposition to robots and AI, informants agree on the notion that customer behavior will change as robots and AI will dominate the food and beverage landscape. For instance, P6 suggested that "people would prefer food cooked by robots as they will perceive higher safety." However, P4 noted that the robot-based service model would

make customers "feel lonely." Similarly, P1 suggests that robots "will harm the atmosphere and thus reduce the added value." Overall, whereas customer behavior will probably undergo significant change, its outcomes, either positive or negative, seem to be unpredictable.

When asked whether the current COVID-19 pandemic enhances (or would enhance) greater adoption of robots and AI, the majority of the informants stated that if the pandemic persists, the adoption process will accelerate. P3 suggested, "If the pandemic continues [...] they [robots and AI] may be attractive [...] in the sense that people may perceive more safety in places where machines rather than people deliver food". However, the cultural factor seems to be relevant here as well. P2 stated, "[the impact of Covid-19] may vary from one society to another [...]. Perhaps a European or a Chinese tourist will be more conservative. For them, robotized restaurants may make them feel safe regarding hygiene and sanitation. One may assume that pandemics such as the current COVID-19 may encourage the adaptation of robots in the coming few decades, not only in the foodservice industry but in several other industries. Acknowledging the role of the foodservice industry in competitiveness among destinations might be led to cultivating more tolerant policies to adapt to the robots in several destinations over the globe within the next five decades.

4.2 The Impact of Robots And AI On Employment

One of the study's main goals was to understand how robots and AI can impact the employment structure within the food industry. A study by Fusté-Forné (2021) demonstrated that consumers already perceive dehumanization in the foodservice industry due to the advent presence of robots in the gastronomic experience. Moreover, several studies (e.g., David et al., 2017; Ivanov, 2020; Ivanov & Webster, 2019c) point out both the enhancement (i.e., increasing productivity) and substitution (i.e., eliminating human) effects of automation on jobs in the tourism and hospitality industry. Therefore, informants were asked as to whether the increasing adoption of robots and AI would threaten the existing jobs in the food industry. The content analysis results demonstrate that most informants perceive a disruptive effect of robots and AI on the employment structure within the industry. Specifically, informants expect robots and AI to reduce dependency on human employees, resulting in a higher unemployment rate in the foodservice sector. P13 put it this way "of course," it will [threaten existing jobs] in a terrible way! You may find 20 employees in a tiny restaurant now, so if robots are introduced, unemployment will significantly increase".

The potential change in the labor market due to the introduction of robots and AI is not restricted to substitution and inherently unemployment. In fact, some informants noted that new jobs could emerge, and others may be subject to structural change due to internalizing robots and AI in some production stages. For instance, P6: "some jobs will definitely vanish, but some others may emerge [...]. Even businesses that rely on service automation will need directive chefs [...] those will have to work alongside robots".

Similarly, the disruptive impact of robots and AI seem to be greater for some jobs than others. For

instance, P10 suggested that:

“A change [in the current job structure] can happen but only in the service delivery, not in the kitchen. I do not think robots will have the same skills as kitchen chefs. However, they [robots] can affect the jobs of service personnel; these jobs may decrease over time”.

4.3 What Next?

Although it may be hard to predict the future of the foodservice industry within the near future, an attempt was made to understand informants' predictions based on a robot-based economy perspective. The content analysis of the data provides mixed findings. Specifically, two conflicting and contradictive themes emerge from the data. A significant portion of the informants believes that the foodservice industry will probably undergo an important standardization with more dependence on robots and AI. According to P4:

“There will be a huge standardization. [...] this will be enhanced by the growing concerns about food safety. While this might not hold for Turkey since our society is largely traditional, the Far East and Europe are very open to technology, they are open to change, so they are more prone to robotization”.

In the next coming decades, restaurants will probably have fewer human employees and more robots. The growing adoption of human-like robots will smoothen the customers' resistance to robots. However, there will be a human-robot collaboration whereby human chefs will add creativity, and robots will enhance productivity in the production process.

Some informants, however, claim that the foodservice industry is unique in the sense that it addresses people's basic need for food. Thus it is unlikely to undergo significant changes despite the growing adoption of robots and AI in several other economic activities. Some informants even went beyond predicting that people's nutrition habits may change with more people willing to return to a more traditional and straightforward way of life. P11 proposed:

“We can already witness a trend of backward turn. I personally think that the kitchen will return to its traditional past instead of becoming robotics. I mean [...] people have started to touch the soil; they have started to descend to the field and to consume the products in their regions. [...]. Especially during the current pandemic, we, the chefs, have been wondering about ‘what if some products are no longer imported from abroad or if their prices increase? Thus, we must return to our fields and use whatever our people produce”.

5. CONCLUSION

5.1 Theoretical Implications

The present study is grounded on qualitative data obtained from in-depth interviews with food industry experts and academicians whose research areas are relevant to food or/and gastronomy. Overall, while informants acknowledge the benefits of robots and AI, they are divided on whether they will be widely employed in the foodservice industry. Specifically, there seems to be no conclusive idea of where and when robots and AI should be relied on in the industry since several factors, including culture and type of food, play a central role in this issue. Prior research endeavor has been broadly

biased on how customers view robotization and IA in the food and beverage industries (Belanche et al., 2020a,b). Thus, there has been scant knowledge concerning expert perspectives on the future of the food and beverage industry in the robot-based economy concern. Theoretically, to the best of the authors' knowledge, this current research is the first to attempt to evaluate the perspective of robot-based economy concerns in the food industry from the expert and academicians' perspectives.

Furthermore, for the current standing, a review of empirical studies indicates that the perception of a robot-based economy harms people's decision to work in food and beverage (e.g., David et al., 2017; Ivanov, 2020; Ivanov & Webster, 2019c). Nevertheless, our findings revealed that there would be a human-robot collaboration whereby human employees will add creativity, and robot and IA applications will enhance productivity in the production process. Previous research also shows that the one-size-fits-all notion does not apply to robots and AI (Ivanov & Webster, 2017a). Yet, evidence exists on the role of the current COVID-19 pandemic in enhancing the greater adoption process of robots and AI in the foodservice industry. This matter aligns with some recent findings (Blit, 2020; Seyitoglu & Ivanov, 2020b; Zeng et al., 2020). In the next five decades, however, robots and AI may be present in every aspect of life, and the food industry is no exception. The opposition from both the demand (customers) and supply (foodservice businesses) sides will likely be inexistent.

The findings reveal a wide agreement on the potential disruptive impact of robots and AI on the labor market within the foodservice industry. This disruptive impact can be in the form of increased unemployment, emerging new jobs, and structural change in some current jobs. Overall, our findings support similar works emphasizing the role of robots and AI in changing the labor landscape in tourism and hospitality in general (Ivanov & Webster, 2017a) and the foodservice industry in particular (Tuomi et al., 2019). This role will probably be much more salient in the future, with more reliance on robots in several production and delivery stages.

5.2 Practical Implications

The current study suggests some implications for foodservice businesses. First, the study shows that we may witness a more fabulous presence of robots and AI in the foodservice industry. To achieve a competitive advantage, foodservice businesses (the fast-food segment in particular) should proactively adapt to the current advancements. This, however, requires that service providers gain a good understanding of their customers' cultural preferences and generational differences. For instance, as evidenced by the data, robots and AI may appeal to young customers rather than seniors. Second, the current pandemic seems to provide an opportunity in the adoption process of robots and AI. Therefore, service providers should invest in modern customers' concerns about food safety and hygiene issues.

Finally, some jobs within the foodservice industry may be at risk. Therefore, employees should plan their occupational trajectories considering potential structural changes in the labor market in the robot-based economy. However, our findings indicate that there will be a human-robot partnership in

which human cooks will offer ingenuity, and robots will increase productivity in the production line. Therefore, future workers have to be ready for this shift. This possible shift can be ensured through the adaptation of university education and on-the-job training for the industries' future, as Ivanov et al. (2019) suggested. In this light, using an experimental teaching style in universities can open up new possibilities in a range of robot-based economic contexts.

5.3 Limitations and Suggestions For Future Studies

The present study also provides initial insights into how the food industry would seem in a robot-based economy in the coming decades and how this could influence specific jobs within the industry. The findings cannot be generalized without further research using different methods. It also goes without saying that the results are context-specific. Further research may need to validate the findings using quantitative or innovative methods with larger samples in different cultural contexts. Lastly, current research also supports prior research endeavors suggesting that a robot-based economy would change the nature of the food industry's employee structure (e.g., David et al., 2017; Ivanov, 2020; Ivanov & Webster, 2019c). However, the future perspective of gastronomy students for the robot-based industry is among the topics that this perspective has not addressed (Belanche et al., 2021). Future studies may produce more academic results if they include the view of undergraduate students.

Lastly, given the uncertainty in the global economic outlook (Işık et al., 2019) and such ongoing pandemics (e.g., COVID-19: Cifci et al., 2022), a robot-based economy can be a panacea for calibrating demand in the foodservice industry. Therefore, it is better also for future studies to focus more on demand-related topics in forecasting futuristic economic concerns.

REFERENCES

- Alrawadieh, Z., Alrawadieh, Z., & Cetin, G. (2020). Digital transformation and revenue management: Evidence from the hotel industry. *Tourism Economics*, <https://doi.org/10.1177/1354816620901928>
- Ashcroft, E., Tuomi, A., Wang, M., & Solnet, D. (2019). Resistance to the Adoption of ICTs in Independent Restaurants: Insights from China and the UK. *e-Review of Tourism Research (eRTR)*, *16*(2/3), 105-114.
- Berezina, K., Ciftci, O., & Cobanoglu, C. (2019). Robots, Artificial Intelligence, and Service Automation in Restaurants. In S. Ivanov, & C. Webster (Eds.), *Robots, Artificial Intelligence, and Service Automation in Travel, Tourism and Hospitality* (pp. 185-219). Emerald Publishing Limited.
- Belanche, D., Casaló, L.V., Flavián, C. & Schepers, J. (2020a). Robots or frontline employees? Exploring customers' attributions of responsibility and stability after service failure or success, *Journal of Service Management*, *31*(2), 267-289.
- Belanche, D., Casaló, V., Flavián, C. & Schepers, J. (2020b) Service robot implementation: a theoretical framework and research agenda. *The Service Industries Journal*, *40*(3-4), 203-225.
- Belanche, D., Casaló, L. V., Schepers, J., & Flavián, C. (2021). Examining the effects of robots' physical appearance, warmth, and competence in frontline services: The Humanness-Value-Loyalty model. *Psychology & Marketing*. <https://doi.org/10.1002/mar.21532>.
- Blit, J. (2020). Automation and Reallocation: Will COVID-19 Usher in the Future of Work? *Canadian Public Policy*, *46*(2), 192-202.
- Braun, V., & Clarke, V. (2006). Using Thematic Analysis in Psychology. *Qualitative Research in Psychology*, *3*(2), 77-101.
- Cha, S. S. (2020). Customers' intention to use robot-serviced restaurants in Korea: relationship of coolness and MCI factors. *International Journal of Contemporary Hospitality Management*, *32*(9), 2947-2968.
- Chen, C., Gao, Q., Song, Z., Liping, O., & Wu, X. (2010). Catering Service Robot. Proceedings of the 8th World Congress on Intelligent Control and Automation, July 6-9 2010, Jinan, China, 599-604.
- Choi, Y., Oh, M., Choi, M., & Kim, S. (2020). Exploring the influence of culture on tourist experiences with robots in the service delivery environment. *Current Issues in Tourism*, 1-17. <https://doi.org/10.1080/13683500.2020.1735318>.
- Cifci, İ., Öğretmenoğlu, M., Şengel, T., Demirçiftçi, T. & Kandemir-Altunel, G. (2022). Effects of tourists' street food experience and food neophobia on their post-travel behaviors: the roles of destination image and corona-phobia. *Journal of Quality Assurance in Hospitality & Tourism*. <https://doi.org/10.1080/1528008X.2022.2151550>
- Claveau, D., & Force, S. (2019). A mobile social bar table based on a retired security robot. In J. H. Kim, H. Myung, J. Kim, W. Xu, E. Matson, & J. Jung (Eds.), *Robot Intelligence Technology and Applications 5. RiTA* (pp. 263-271). Springer.
- Collins, G., Cobanoglu, C., Bilgihan, A., & Berezina, K. (2017). Automation and Robotics in the Hospitality Industry. *Hospitality Information Technology: Learning How to Use it* (pp. 413-449). Dubuque, IA: Kendall/Hunt Publishing Co.
- David, K., Fernández-Macías, E. & Antón, J. (2017). Do robots really destroy jobs? Evidence from Europe. *Economic and Industrial Democracy*, *26*, 1-37.
- Demaitre, E. (2020). COVID-19 pandemic prompts more robot usage worldwide. *The ROBOTREPORT: Exploring the Business and Applications of Robotics*. Retrieved March 18, 2020, from <https://www.therobotreport.com/covid-19-pandemic-prompts-more-robot-usage-worldwide/>.
- Elo, S., & Kyngas, H. (2007). The Qualitative Content Analysis Process. *Journal of Advanced Nursing*, *62*(1), 107-115.
- Frank, M., Roehring, P., & Pring, B. (2017). *What to do when machines do everything: How to get ahead in a world of AI, algorithms, bots and big data*. Hoboken, NJ: John Wiley & Sons, Inc.
- Flavián, C. & Casaló, L.V. (2021). Artificial intelligence in services: current trends, benefits and challenges. *The Service Industries Journal*, *41*(13-14), 853-859.
- Fusté-Forné, F. (2021). Robot chefs in gastronomy tourism: What's on the menu? *Tourism Management Perspectives* *37*, 100774.
- Gursoy, D., Chi, O., Lu, L., & Nunkoo, R. (2019). Consumers acceptance of artificially intelligent (AI) device use in service delivery. *International Journal of Information Management*, *49*, 157-169.
- Ho, C., & MacDorman, K. (2010). Revisiting the uncanny valley theory: Developing and validating an alternative to the godspeed indices. *Computers in Human Behavior*, *26*(6), 1508-1518.
- Işık, C., Sirakaya-Turk, E. & Ongan, S. (2019). Testing the efficacy of the economic policy uncertainty index on tourism demand in USMCA: Theory and evidence. *Tourism Economics*, *26*(8), 1344-1357.
- Ivanov, S. (2017). Robonomics - principles, benefits, challenges, solutions. *Yearbook of Varna University of Management*, *10*, 283-293.
- Ivanov, S. (2019). Ultimate transformation: How will automation technologies disrupt the travel, tourism and

- hospitality industries? *Zeitschrift für Tourismuswissenschaft*, 11(1). <https://doi.org/10.1515/tw-2019-0003>
- Ivanov, S. (2020). The impact of automation on tourism and hospitality jobs. *Information Technology & Tourism*, 22, 205–215.
- Ivanov, S. H., & Webster, C. (2017a). Adoption of robots, artificial intelligence and service automation by travel, tourism and hospitality companies—a cost-benefit analysis. *International Scientific Conference “Contemporary tourism – traditions and innovations*. Sofia: Sofia University.
- Ivanov, S., & Webster, C. (2019a). What should robots do? A comparative analysis of industry professionals, In J. Pesonen, & J. Neidhardt (Eds.), *Information and communication technologies in tourism 2019- Proceedings of the International Conference in Nicosia, Cyprus, January 30–February 1*, (pp. 249-262). Springer, Cham, <https://doi.org/10.1007/978-3-030-05940-8>.
- Ivanov, S., & Webster, C. (2017b). Designing robot-friendly hospitality facilities. *Proceedings of the Scientific Conference “Tourism. Innovations. Strategies”*, 13–14 October 2017, Bourgas, Bulgaria, (pp. 74–81), Available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3053206.
- Ivanov, S., & Webster, C. (2019b). Perceived appropriateness and intention to use service robots in tourism. In Pesonen, J. & Neidhardt, J. (Eds.). *Information and Communication Technologies in Tourism 2019, Proceedings of the International Conference in Nicosia, Cyprus, 30.01-01.02.2019*, 237-248.
- Ivanov S., & Webster, C. (2019c). Economic fundamentals of the use of robots, artificial intelligence and service automation in travel, tourism and hospitality. In Ivanov, S. & Webster, C. (Eds.). *Robots, artificial intelligence and service automation in travel, tourism and hospitality* (pp. 39-55). Emerald Publishing, Bingley.
- Ivanov, S., Gretzel, U., Berezina, K., Sigala, M., & Webster, C. (2019). Progress on robotics in hospitality and tourism: a review of the literature. *Journal of Hospitality and Tourism Technology*, 10(4), 489-521.
- Ivanov, S., Seyitoğlu, F., & Markova, M. (2021). Hotel managers' perceptions towards the use of robots: a mixed-methods approach. *Information Technology & Tourism*, 22, 505–535.
- Ivanov, S., Webster, C., & Berezina, K. (2017). Adoption of robots and service automation by tourism and hospitality companies. *Revista Turismo & Desenvolvimento* (27/28), 1501-1517.
- Ivanov, S., Webster, C., & Garenko, A. (2018). Young Russian adults' attitudes towards the potential use of robots in hotels. *Technology in Society*, 55, 24-32.
- Kamruzzaman, M., & Tareq, M. (2017). Design and Implementation of a Robotic Technique Based Waiter. 3rd International Conference on Electrical Information and Communication Technology (EICT), 7-9 December 2017. Khulna, Bangladesh.
- Kim, J., Christodoulidou, N., & Choo, Y. (2013). Factors influencing customer acceptance of kiosks at quick service restaurants. *Journal of Hospitality and Tourism Technology*, 4(1), 40-63.
- Kim, T.T., Yoo, J.J.E., Lee, G., & Kim, J. (2012). Emotional intelligence and emotional labor acting strategies among frontline hotel employees. *International Journal of Contemporary Hospitality Management*, 24(7), 1029–1046
- Larivière, B., Bowen, D., Andreassen, W., Kunz, W., Sirianni, J., Voss, C., Wunderlich N. V., Keyser, A. (2017). “Service encounter 2.0”: An investigation into the roles of technology, employees and customers. *Journal of Business Research*, 79, 238–246.
- Kuo, C.-M., Chen, L.-C., & Tseng, C.-Y. (2017). Investigating an innovative service with hospitality robots. *International Journal of Contemporary Hospitality Management*, 29(5), 1305-1321.
- Kokkinou, A., & Cranage, D. (2013). Using self-service technology to reduce customer waiting times. *International Journal of Hospitality Management*, 33, 435–445.
- Li, J. J., Bonn, M., & Ye, B. (2019). Hotel employee's artificial intelligence and robotics awareness and its impact on turnover intention: The moderating roles of perceived organizational support and competitive psychological climate. *Tourism Management*, 73, 172-181.
- MA. Buhalis, D., Harwood, T., & Bogicevic, V. (2019). Technological disruptions in services: lessons from tourism and hospitality. *Journal of Service Management*, 30(4), 484-506.
- MIT Technology Review (2022). 10 Breakthrough Technologies, Retrieved 5 July 2022, from <https://www.technologyreview.com/magazines/10-breakthrough-technologies-2018/>
- Oracle. (2020). Restaurant 2025: Emerging technologies destined to reshape our business. Retrieved August, 28, 2020 from https://www.oracle.com/webfolder/s/delivery_production/docs/FY16h1/doc36/Restaurant-2025-Oracle-Hospitality.pdf.
- Park, S. (2020). Multifaceted trust in tourism service robots. *Annals of Tourism Research*, 81, 1–12.
- Park, S. Y., Kim, S., & Leifer, L. (2017). “Human Chef” to “Computer Chef”: Culinary Interactions Framework for Understanding HCI in the Food Industry. *Conference: International Conference on Human-Computer Interaction*, https://doi.org/10.1007/978-3-319-58071-5_17.
- Qui, H., Li, M., Shu, B., & Bai, B. (2020). Enhancing hospitality experience with service robots: The mediating role of rapport building. *Journal of Hospitality Marketing & Management*, 29(3), 247-268.
- Rosenbaum, M., & Wong, I. (2015). If you install it, will they use it? Understanding why hospitality customers take “technological pauses” from self-service technology. *Journal of Business Research*, 68, 1862-1868.
- Saunders, B., Sim, J., Kingstone, T., Baker, S., Waterfield, J., Bartlam, B., Burroughs H., & Jinks, C. (2018). Saturation in qualitative research: exploring its conceptualization and operationalization. *Quality & Quantity*, 52(4), 1893-1907.
- Seyitoglu, F., & Ivanov, S. (2020a). Understanding the Robotic Restaurant Experience: A Multiple Case Study. *Journal of Tourism Futures*. <https://doi.org/10.1108/JTF-04-2020-0070>.
- Seyitoğlu, F., & Ivanov, S. (2020b). Service robots as a tool for physical distancing in tourism. *Current Issues in Tourism*, <https://doi.org/10.1080/13683500.2020.1774518>.
- Seyitoğlu, F., Ivanov, S., Atsız, O & Çifçi, İ. (2021). Robots as restaurant employees - A double-barrelled detective story. *Technology in Society* 67. 101779. <https://doi.org/10.1016/j.techsoc.2021.101779>
- Shiomi, M., Sakamoto, D., Kanda, T., Ishi, C., Ishiguro, H., & Hagita, N. (2011). Field trial of a networked robot at a train station. *International Journal of Social Robotics*, 3(1), 27-40.
- Tan, T.-H., Chang, C.-S., & Chen, Y.-F. (2012). Developing an Intelligent e-Restaurant with a Menu Recommender for Customer-Centric Service,” in *Systems, Man, and Cybernetics, Part C: Applications and Reviews*. *IEEE Transactions*, 42, 775-78.
- Tian, X., & Pu, Y. (2008). An artificial neural network approach to hotel employee satisfaction: The case of China. *Social Behavior and Personality: an international journal*, 36(4), 467-482.
- Tung, V., & Au, N. (2018). Exploring customer experiences with robotics in hospitality. *International Journal of*

Contemporary Hospitality Management, 30(7), 2680–2697.

Tung, V., & Law, R. (2017). The potential for tourism and hospitality experience research in human-robot interactions. *International Journal of Contemporary Hospitality Management*, 29(10), 2498-2513.

Tuomi, A., Tussyadiah, I., & Stienmetz, J. (2019). Service Robots and the Changing Roles of Employees in Restaurants: A Cross Cultural Study. *e-Review of Tourism Research (eRTR)*, 17(5), 662-673.

Tussyadiah, I., & Park, S. (2018). Consumer evaluation of hotel service robots. In B. Stangl, & J. Pesone (Eds.), *Information and Communication Technologies in Tourism* (pp. 308–320). Cham: Springer.

Virto, N., & López, M. (2019). Robots, Artificial Intelligence, and Service Automation to the Core: Remastering Experiences at Museums. In S. Ivanov, & C. Webster (Eds.), *Robots, Artificial Intelligence, and Service Automation in Travel, Tourism and Hospitality* (pp. 239-253). Emerald Publishing Limited.

Vu, N., Ghadge, A., & Bourlakis, M. (2022). Evidence-driven model for implementing Blockchain in food supply chains. *International Journal of Logistics Research and Applications*. <https://doi.org/10.1080/13675567.2022.2115987>.

Wang, C., Luo, C., & Tai, F. (2017). Implementation of delightful services: From the perspective of frontline service employees. *Journal of Hospitality and Tourism Management*, 31, 90–104.

Webster, C., & Ivanov, S. (2020b). Robotics, artificial intelligence, and the evolving nature of work. In B. George, & J. Paul (Eds.), *Digital Transformation in Business and Society Theory and Cases* (pp. 127-143). Palgrave-MacMillan.

Webster, C., & Ivanov, S. (2020a). Future tourism in a robot-based economy: a perspective article. *Tourism Review*, 75(1), 329-332.

Wirtz, J., Patterson, P., Kunz, W., Gruber, T., & Lu, V. (2018). Brave new world: Service robots in the frontline. *Journal of Service Management*, 29(5), 907-931.

Yan, W., Fu, Z., Liu, Y., Zhao, Y., & Zhou, X. (2007). A novel automatic cooking robot for Chinese dishes. *Robotica*, 25, 1-6.

Yu, E. (2019). Humanlike robots as employees in the hotel industry: Thematic content analysis of online reviews. *Journal of Hospitality Marketing & Management*, 29, 22-38.

Zeng, Z., Chen, P., & Lew, A. (2020). From high-touch to high-tech: COVID-19 drives robotics adoption. *Tourism Geographies*, 22(3), 724-734.

Zhu, D.H., & Chang, Y.P., (2020). Robot with humanoid hands cooks food better? Effect of robotic chef anthropomorphism on food quality prediction. *International Journal of Contemporary Hospitality Management*, 32(3), 1367-1383.



Ibrahim Cifci, MBA, PhD, is an Associate Professor and associate editor of the *Journal of Tourismology* at Istanbul University, Turkey (ibrahim.cifci@istanbul.edu.tr). His research interests include faith tourism, sustainable tourism, sharing economy, destination marketing, gastronomy and science-based cooking. He has published widely in high-impact journals such as *Current Issues in Tourism*, *Journal of Hospitality and Tourism Management*, *Journal of Vacation Marketing*, *Journal of Tourism and Cultural Change*, *British Food Journal*, *International Journal of Gastronomy and Food Science*, *Leisure Sciences*, among others. Cifci, serves as an Editorial Team Member and Reviewer of several reputed SSCI Journals. He loves cooking and is particularly interested in all food-related matters.

ORCID: 0000-0001-7469-1906



Derya Demirdelen Alrawadieh, MBA, PhD, is an Associate Professor in the Plato Vocational School at Istanbul Ayyansaray University, Turkey (deryademirdelen@ayvansaray.edu.tr). She obtained his PhD and Master's degree in *Tourism Management* (Turkey). Her research interests include the sharing economy, sustainable tourism and management in tourism. She has published widely in high-impact journals such as the *Journal of Sustainable Tourism*, *Journal of Hospitality, Leisure, Sport & Tourism Education*, and *International Journal of Culture, Tourism and Hospitality Research*.

ORCID: 0000-0002-7554-2256