

Restaurants and robots: public preferences for robot food and beverage services

Stanislav Ivanov and Craig Webster

Abstract

Purpose – The hospitality industry in developed countries is under pressure due to labor shortages and it is likely more food and beverage operations will have to be automated in the future. This research investigates the public's perceptions of the use of robots in food and beverage operations to learn about how the public perceives automation in food and beverage.

Design/methodology/approach – Data were collected from a survey disseminated online in 12 languages, resulting in a sample of 1,579 respondents. The data were analyzed using factor analysis and OLS regressions.

Findings – The data also reveal that generally positive attitudes toward the use of robots in tourism and hospitality is a strong indicator of positive attitudes toward the use of robots in an F&B setting. The data also illustrate that the public's perception of appropriateness of the use of robots in F&B operations is positively related to robots' perceived reliability, functionality and advantages compared to human employees.

Research limitations/implications – The implications illustrate that the public seems to be generally accepting robots in food and beverage operations, even considering the public's understanding and acceptance of the limitations of such technologies.

Practical implications – The research suggests that a critical element in terms of incorporating automation into future food and beverage operations is encouraging consumers to have generally positive attitudes toward the use of robots in hospitality and tourism industries.

Originality/value – This survey is based upon the data gathered in multiple countries to learn about how individuals perceive the use of robots in food and beverage operations, illustrating the attitudes that will assist or hinder the automation of this service industry.

Keywords Robots, Attitudes toward robots, Acceptance of robotic technologies, Food, Beverage

Paper type Research paper

(Information about the authors can be found at the end of this article.)

Introduction

By 2020, only a century after the invention of the word “robot” (NPR, 2011), robots were responsible for much manufacturing (Ross *et al.*, 2018) and are increasingly involved in the service economy (Belanche *et al.*, 2020; Wirtz *et al.*, 2018). However, it has only been in recent years that robots have been increasingly used to provide services to hospitality guests (Ivanov and Webster, 2019a). The integration of automation technologies in tourism and hospitality is inevitable because of the advancement of technology (Mihelj *et al.*, 2019) as well as demographic factors (Webster, 2021) that limit the human labor available for service industries. Here we discuss the use of robots in hospitality and explain several hypotheses with regard to perceptions of the use of robots in food and beverage operations. Then, we explain the data collection on the topic, analyze the data with regard to the hypotheses and conclude explaining how the findings inform the incorporation of robots into food and beverage operations in the future.

Currently, there is a growing body of research on robots in tourism and hospitality (see, for example, Murphy *et al.*, 2017; Samala *et al.*, 2020; Tung and Au, 2018; Tuomi *et al.*, 2021), including in food and beverage operations (e.g. Berezina *et al.*, 2019; Cha, 2020; Lee *et al.*, 2018;

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Fusté-Forné, 2021; Hwang *et al.*, 2020; Omar Parvez and Cobanoglu, 2021; Seyitoğlu and Ivanov, 2020; Seyitoğlu *et al.*, 2021; Tuomi *et al.*, 2019; Zemke *et al.*, 2020; Zhu and Chang, 2020). Previous studies have shown that robots can be used to automate dirty, dull, repetitive and dangerous jobs as well as create entertaining and novel experiences for tourists. Specifically, investigating the use of robots for food and beverage is critical since such operations are labor-intensive, critical to the hospitality industry, and typically suffer from high turnover rates. The automation of the delivery of food and beverage services may alleviate many of the headaches that managers in hospitality face and such automation has already been used in the food industry to reduce labor costs (Ivanov and Webster, 2019b) and to provide better services (Kincaid and Baloglu, 2005). While there is a great deal of speculation about issues linked with the incorporation of automation technologies into food and beverage operations (see, for example, Berezina *et al.*, 2019), much of what is known about the perceptions of managers and customers based upon empirical data is from small samples of semi-structured interviews (Seyitoğlu *et al.*, 2021; Tuomi *et al.*, 2021), case studies (Seyitoğlu and Ivanov, 2020), or single-country surveys (Cha, 2020; Hwang *et al.*, 2020). Thus, understanding the current perceptions of the public with regard to automated hospitality services is necessary to understand how to better implement fuller automation into hospitality operations, something that will be needed in the not-so-distant future due to labor shortages and the increasing effectiveness of the technology.

This research note aims to identify the F&B tasks that customers consider as appropriate for robotization and the drivers of the perceived appropriateness of robot use in F&B operations. More specifically, the paper looks at the role of perceived robot reliability, functionality, advantages and disadvantages compared to human employees, and demographic characteristics of respondents and their impact on the perceived appropriateness of robot use in F&B operations. In this way, the research will help managers address the factors that hinder or facilitate the implementation of the robot in F&B operations. Functionality of a robot shows that it possesses the technical features (e.g. sensors, actuators), software and overall design that allow it to implement its intended tasks (e.g. cook food, make a cocktail, serve dish) while a robot's reliability shows how well it will perform these tasks. That is why, previous studies have found that the reliability and functionality of robots are significant components of the trust in robots (Tussyadiah *et al.*, 2020). Additionally, reliability and functionality are positively related to the intentions of tourists to use robots (Tussyadiah *et al.*, 2017). The perceived advantages and disadvantages of robots compared to humans show how respondents perceive the potential provider of a particular tourism/hospitality service (a robot or a human employee). The perceived advantages of robots compared to human employees are found to have a positive relationship with the attitudes toward the use of robots in a hotel; the perceived disadvantages of robots have a negative effect, but it is washed out when the general attitudes toward robots are included in the regression models (Ivanov *et al.*, 2018). Positive relationship between the perceived advantages and the perceived appropriateness of robot application in museums was recently reported by Webster and Ivanov (2022). The same study showed that the respondents who had more positive attitudes toward robots considered that robots are appropriate for implementation in museum context. Attitudes are a significant driver of customer acceptance of service robot as well (Zhong *et al.*, 2021).

Therefore, the hypotheses of this research note are as follows:

- H1.* Perceived robot reliability is positively related to the appropriateness of robot use in F&B operations.
- H2.* Perceived robot functionality is positively related to the appropriateness of robot use in F&B operations.
- H3.* Perceived robot advantages compared to human employees are positively related to the appropriateness of robot use in F&B operations.
- H4.* Perceived robot disadvantages compared to human employees are negatively related to the appropriateness of robot use in F&B operations.

H5. The attitude toward service robots in travel, tourism and hospitality is positively related to the appropriateness of robot use in F&B operations.

Methodology

To investigate the public's perceptions of the use of robots in travel, tourism and hospitality, a global survey was run from March 2018 to October 2019. The survey was developed in English and subsequently translated into 11 other languages to make it accessible to as many people globally as possible. The survey questions were developed with the Technology Acceptance Model (Venkatesh and Davis, 2000) in mind while looking specifically into the question of how technology's incorporation into the tourism and hospitality ecosystem would be expected to be perceived by consumers of tourism and hospitality services. Questions pertaining to the advantages and disadvantages of robot labor were adapted and expanded from Ivanov *et al.* (2018).

To ensure that translations were accurate, native speakers translated the survey based on the original English language version. The survey was sponsored, allowing for researchers to offer incentives for participation in the survey, to ensure higher response rates. The incentive for participation was five gift cards that were given to those who completed the survey and wished to be considered for a drawing enabling each person who had indicated interest to win a 100\$ gift card. The funds for the incentive were provided by a research firm that supported the research to learn about consumer perceptions of automation in the industry. Permission was given by a US university's IRB board, permitting the survey to be launched and it was disseminated via social media and emails globally. The authors' social media and email contacts were the primary means by which the survey link was disseminated, with colleagues encouraged to forward the link to others.

This paper's sample includes 1,579 respondents who answered the questions related to the application of robots in food and beverage operations and had answered all questions asked in the survey. Since it was disseminated online, it would be impossible to estimate how many people saw the link but refused to take the survey, although there was a significant number who took part in the survey and terminated the survey at some point. Those that did not answer the relevant questions for this analysis were removed from the sample for this particular analysis. Table 1 illustrates the major characteristics of the sample.

To learn about perceptions toward the use of robots in food and beverage operations, several questions were asked, with responses being recorded with a seven-point scale. Respondents to the survey were asked, "Please indicate which activities do you personally consider as appropriate to be performed by service robots in travel, tourism, and hospitality," with responses of different activities in the food and beverage operations of hospitality. Table 2 illustrates the questions asked and the mean responses to the questions, based upon the seven-point scale. The scale consisted of one extreme "1 = Extremely inappropriate" and the other extreme "7 = Extremely appropriate." Several questions were also asked with regard to the reliability and functionality of robots as well as questions with regard to the advantages and disadvantages of robots relative to human employees, using a seven-point Likert scale.

In regressions, demographic data were added in the hopes that they would give insight into the perceptions of the appropriateness of using robots in food and beverage operations. The gender, age and education levels of the respondents were used as independent variables. However, in addition, the respondents perceived economic well-being and reported that frequency of travel was also added to the regressions. The respondent's subjective perception of economic well-being was added instead of a measure for their income levels, as income levels are a sensitive issue tending to lead to a refusal to answer. Such monetary data are hard to compare against respondents from many different countries. In addition, travel frequency was added, as it was suspected that frequent travelers may have a different relationship with hospitality industries than those who travel less frequently.

Table 1 Sample's characteristics

Characteristic		Total	Share
Gender	Female	847	53.6
	Male	732	46.4
Age	18–30	781	49.5
	31–40	381	24.1
	41–50	234	14.8
	51–60	120	7.6
	61+	63	4.0
Education	Secondary or lower	219	13.9
	Two year/Associate degree	105	6.6
	Bachelor	507	32.1
	Postgraduate (Master, Doctorate)	748	47.4
Economic well-being	Much less wealthy than average for the country	42	2.7
	Less wealthy than average for the country	103	6.5
	Slightly less wealthy than average for the country	168	10.6
	About the average for the country	521	33.0
	Slightly more wealthy than average for the country	449	28.4
	More wealthy than average for the country	235	14.9
	Much more wealthy than average for the country	61	3.9
Times stayed in hotels during the last 12 months	None	170	10.8
	1–3 times	733	46.4
	4–6 times	377	23.9
	7 times or more	296	18.7
	Missing	3	0.2
Country of residence	United States of America	387	24.5
	Bulgaria	318	20.1
	China	74	4.7
	Taiwan	62	3.9
	United Kingdom of Great Britain and Northern Ireland	58	3.7
	India	60	3.8
	Turkey	43	2.7
	Italy	45	2.8
	Russian Federation	36	2.3
	Portugal	34	2.2
	Malaysia	32	2.0
	United Arab Emirates	25	1.6
	Brazil	22	1.4
	Spain	21	1.3
	France	20	1.3
	Germany	20	1.3
Other (83 countries)	320	20.3	
Missing	2	0.1	
Total		1,579	100.0

Findings

Table 2 illustrates that respondents were most receptive to robots taking orders for room service ($m = 5.37$), followed by cleaning the table ($m = 5.19$), delivering food and drinks in room service ($m = 5.16$), and providing information about the menu ($m = 5.14$). The respondents were least receptive to robots cooking food ($m = 3.77$). These data show that respondents see some differences between the various tasks that they feel are appropriate for robots to do concerning food and beverage. The paired samples' t -test values showed that the differences between the mean responses to taking orders for room service, cooking food and the other tasks were statistically significant at $p < 0.001$. The data illustrate that the respondents generally seem to

Table 2 Exploratory factor analysis

Constructs and items	Mean	Standard deviation	Item loadings	Cronbach's alpha	Composite reliability	Variance extracted	KMO	Bartlett
<i>Perceived appropriateness of robot use in F&B operations^a</i>				0.931	0.959	62.129	0.931	11092.065***
Taking orders for room service	5.37	1.666	0.768					
Delivering food and drinks in room service	5.16	1.819	0.821					
Guiding guests to tables in the restaurant	4.84	1.918	0.816					
Providing information about the menu	5.14	1.832	0.763					
Taking orders in the restaurant	4.97	1.858	0.822					
Cooking food	3.77	1.966	0.672					
Serving food in the restaurant	4.54	1.953	0.871					
Making drinks (coffee, tea, cocktails) in the restaurant/bar	4.51	1.956	0.751					
Serving drinks in the restaurant/bar	4.52	1.979	0.861					
Cleaning the table	5.19	1.769	0.714					
<i>Perceived service robots reliability^b</i>				0.748	0.899	66.623	0.686	1100.577***
Service robots will usually provide error-free service	4.41	1.528	0.838					
Service robots will not fail me	3.91	1.515	0.814					
Service robots will perform their intended task properly, as they were designed to do	5.29	1.288	0.796					
<i>Perceived service robots functionality^b</i>				0.800	0.922	71.660	0.705	1509.220***
Service robots will have the physical features necessary to provide services	4.69	1.493	0.823					
Service robots will have the functionalities necessary to provide services	5.02	1.327	0.867					
Service robots will have the overall capabilities necessary to provide services	4.83	1.423	0.849					
<i>Perceived advantages of robots compared to human employees^b</i>				0.824	0.907	58.963	0.831	2628.398***
Service robots will provide more accurate information than human employees	4.71	1.534	0.757					
Service robots will make fewer mistakes than human employees	4.78	1.465	0.775					
Service robots will be able to provide information in more languages than human employees	6.01	1.191	0.729					
Service robots will be faster than human employees	5.15	1.411	0.773					
Service robots will deal with calculations better than human employees	5.70	1.310	0.803					
<i>Perceived disadvantages of robots compared to human employees^c</i>				0.736	0.870	55.983	0.763	1268.392***
Service robots will not be able to do special requests (r)	3.16	1.546	0.795					

(continued)

Table 2 Continued

Constructs and items	Mean	Standard deviation	Item loadings	Cronbach's alpha	Composite reliability	Variance extracted	KMO	Bartlett
Service robots will only be able to deal with/operate in standard situations (<i>r</i>)	2.79	1.356	0.736					
Service robots will not understand if a guest is satisfied with service (<i>r</i>)	3.29	1.612	0.735					
Service robots will misunderstand a question/order (<i>r</i>)	3.44	1.415	0.724					

Note(s): 1. Extraction method: Principal Component Analysis; Rotation method: Varimax with Kaiser Normalization
2. Coding: ^a1-Extremely inappropriate, 7-Extremely appropriate; ^b1-Strongly disagree, 7-Strongly agree; ^c1-Strongly agree, 7-Strongly disagree; (*r*) – reverse coding
3. Sources for statements: *Perceived appropriateness* – developed by the authors; *Perceived advantages* and *Perceived disadvantages* – based on Ivanov et al. (2018); *Service robots reliability* and *Service robots functionality* – adapted from Tussyadiah et al. (2017)
4. ***Significant at $p < 0.001$

believe that cooking food is the task that is best left to humans while taking orders, cleaning tables, supplying information, and delivering food to guests could be delegated to robots.

Exploratory factor analysis was also employed and the results are shown in Table 2, illustrating that the data could be condensed into five meaningful factors. Table 3 presents the discriminant validity matrix. The results show that the constructs have high internal consistency and discriminant validity.

For a full analysis of the perceived appropriateness of robot application in the food and beverage industries, multiple OLS regressions were performed and the results are reported in Table 4. The first model used two independent variables – reliability and functionality of robots. The model seems to have relatively high levels of predictability, with an adjusted R-squared of 0.324, as Table 4 illustrates. Also, perceptions toward the reliability and functionality of robots are systematically and positively related to the perceived appropriateness of using robots in food and beverage operations, regardless of the control variables added.

The other regressions are also insightful, illustrating the additional power of the regressions given the added independent variables. The second model illustrates that the addition of two independent variables that indicate perceptions of the advantages and disadvantages of robots compared to human employees is also positively related to the dependent variable. The subsequent models demonstrate some interesting findings, showing that the addition of the variable to measure a general attitude toward robots seems to have two substantial impacts. First, the independent variable that indicates a generally positive attitude toward robots increases the adjusted R-squared value to 0.41 (Models 3 and 4). Another interesting finding is that the addition of the demographic data suggests that only the age of respondents is associated with the dependent variables (Model 4). Most of the demographic variables failed to show any relationship

Table 3 Discriminant validity matrix

	Appropriateness	Reliability	Functionality	Advantages	Disadvantages
Perceived appropriateness of robot use in F&B operations	0.7882				
Perceived service robots reliability	0.498***	0.8162			
Perceived service robots functionality	0.545***	0.680***	0.8465		
Perceived advantages of robots compared to human employees	0.488***	0.706***	0.671***	0.7679	
Perceived disadvantages of robots compared to human employees	0.296***	0.261***	0.285***	0.165***	0.7482

Note(s): 1. The diagonal cells indicate the square root of AVE. Bivariate Pearson correlations in the cells below the diagonal. 2. Levels of significance: *** $p < 0.001$

Table 4 Regression analysis

Dependent variable: Perceived appropriateness of robot use in F&B operations	Model 1 Standardized coefficients			Model 2 Standardized coefficients			Model 3 Standardized coefficients			Model 4 Standardized coefficients		
	B	Beta	t	B	Beta	t	B	Beta	t	B	Beta	t
Constant	-0.002 [0.021]		-0.094	-0.002 [0.020]		-0.107	-0.874 [0.075]		-11.632***	-0.668 [0.125]		-5.341***
Reliability	0.232 [0.028]	0.232	8.200***	0.132 [0.031]	0.132	4.185***	0.079 [0.030]	0.079	2.585**	0.092 [0.031]	0.092	3.008**
Functionality	0.387 [0.028]	0.386	13.654***	0.296 [0.030]	0.296	9.827***	0.199 [0.030]	0.199	6.632***	0.185 [0.030]	0.185	6.141***
Advantages				0.172 [0.031]	0.171	5.542***	0.137 [0.030]	0.136	4.576***	0.135 [0.030]	0.134	4.536***
Disadvantages (r)				0.153 [0.021]	0.153	7.155***	0.121 [0.021]	0.121	5.836***	0.125 [0.021]	0.125	6.029***
Attitude toward service robots in travel, tourism and hospitality							0.179 [0.015]	0.294	12.011***	0.177 [0.015]	0.291	11.894***
Gender												
Age												
Education												
Economic well- being												
Travel frequency												
<i>Model summary</i>												
R	0.570			0.596			0.641			0.646		
R ²	0.325			0.356			0.410			0.417		
Adjusted R ²	0.324			0.354			0.408			0.413		
F-statistic	375.808***			215.485***			217.062***			111.247***		
Standard error of the estimate	0.8211			0.8025			0.7681			0.7649		
ΔF ²	0.325			0.031			0.055			0.007		
ΔF	375.808***			61.397***			128.386***			3.194**		

Notes: 1. Standard errors in square brackets; 2. Coding: Gender: 0 – Female, 1 – Male; Economic well-being: 1 – Much lower than the average for the country, 7 – Much higher than the average for the country; (r) – reverse coding. 3. *** Significant at $p < 0.001$. ** Significant at $p < 0.01$. * Significant at $p < 0.05$

with the dependent variable, apart from the age of respondents, showing that the younger respondents were more accepting of the use of robots in food and beverage operations.

In general, the regressions illustrate that the perceived functionality and reliability of robots are positively associated with the perceived appropriateness of the use of robots for food and beverage operations, providing support to hypotheses [H1](#) and [H2](#). Furthermore, the findings show that the perceived advantages of robots compared to employees are strongly and positively related to the perceived appropriateness of their application in the F&B context in all three models with that variable, while the perceived disadvantages are negatively related (the variable was reverse coded); thus supporting [H3](#) and [H4](#). Moreover, the attitude toward the use of robots in travel, tourism and hospitality is positively related to the perceived appropriateness of robot use in F&B, hence supporting [H5](#). Therefore, the respondents accept the use of robots in F&B operations when they trust the reliability and functionality of the robots, their advantages over human employees, and when they have generally positive attitudes toward robots in tourism, while the perceived disadvantages of robots decrease respondents' acceptance of service robots in F&B.

Discussion and conclusion

The findings illustrate a great deal in regard to the perceptions of the use of robots in food and beverage operations. The results show that one of the hardest things to sell to the public will be that cooking will be done by robots. While previous research has researched scenarios in which robots were involved in food production and delivery ([Seo and Jee, 2021](#)), any concerns about specific tasks done by robots in the scenarios were not explored. Thus, the findings in this current research illustrate a hesitancy of the public to accept robots doing the specific task of cooking, since the methodology allowed for an assessment of the consumers' acceptance of using technology for specific tasks in a food and beverage ecosystem. This also stands in contrast with previous research that was based upon the viewpoints of scholars and robot manufacturers, as [Berezina et al.'s \(2019\)](#) exploration of the topic. It may be noted that there may be a commonly held belief among the public that the cooking of food requires not just the human's ability to mechanically manipulate and create foods but some sort of spiritual/artistic element. Overcoming this may be easier than one would expect if the cooking of food is presented as something that is fun to watch and can result in a tasty result. Demystifying the cult of the celebrity chef will face an uphill battle, though, as it may be that the public has a love for their celebrity chefs, seeing them as entertainment ([Caraher et al., 2000](#); [Demirkol and Cifci, 2020](#)), so it may be that robotic chefs may also be used as entertainment. This feeds into a larger issue with regard to automation versus authenticity in service industries ([Seyitoğlu, 2021](#)), with different markets and different consumers demanding automation or authentic service provision by humans.

Consistent with previous studies, the general attitudes toward robots are associated with the particular use of robots in service industries (see, for example, [Malchus et al., 2013](#); [Ivanov et al., 2018](#)). This suggests that to understand whether a person accepts the application of robots in a specific context (e.g. in F&B operations), it is necessary to learn about a person's general attitude toward robots.

Additionally, the results show that gender does not play a role in influencing attitudes toward the use of robots in food and beverage operations. While much of the research (see, for example, [Hudson et al., 2017](#); [Katz and Halpern, 2014](#); [Pochwatko et al., 2015](#)) suggests that gender conditions attitudes toward robots, the findings in this research suggest that food and beverage operations may be quite different from many other applications of robots, without having substantial gender differences in perceptions. The data also suggest that there is a generational rift, illustrating that younger people are more accepting of robotic technologies in F&B operations. As such, this research fits neatly into the current research that looks into how different age groups perceive automation technologies (see, for example, [Ezer et al., 2009](#); [Xu et al., 2015](#)), although some findings contend that age differences may not account for many of the differences in perception of robots ([Backonja et al., 2018](#)). At any rate, it seems that the generational rift and perceptions of people of different ages warrant further investigation.

The main limitation of this research is that data collection was finalized just before the outbreak of the COVID-19 pandemic. It may be that the global pandemic has changed the public's perceptions of service robots in F&B operations. That is why future research needs to reassess the perceptions to check whether they have changed. Future research should explore a great deal more regarding the use of automation technologies in food and beverage since there is a predictable shortage of available labor in developed countries (Webster, 2021). Future research may focus on the willingness to pay for robot-delivered F&B services and the role of robots in creating memorable F&B experiences.

All-in-all, this research note illustrates that the further automation of food and beverage will occur upon the foundation of a population that seems to recognize the strengths and weaknesses of more automated operations. In terms of theory and methodology, the findings illustrate the value of breaking down operations into tasks that may be automated. Such a methodology illustrates that some specific tasks are deemed by the public as being more acceptable for robots to do. This suggests that future research should investigate tasks, rather than scenarios with robots involved, as the public seems to have a somewhat different view of the use of robots based upon tasks, rather than grand scenarios in which a person has to imagine being served food. What is especially interesting is that the findings highlight that the public seems to recognize the disadvantages of robots in such operations but it does not seem to undermine the general attitude toward the appropriateness of the use of such technology. In terms of actionable elements from the research, it seems that cultivating a population that has generally positive attitudes toward service robots will play a helpful role in terms of allowing for robots to become more integrated into food and beverage operations. However, there is also an indication that the public, in general, will be willing to accept greater automation of food and beverage services depending upon what the task is, meaning that some tasks will not just be easier to automate but will also have less consumer resistance to the use of robots for such tasks.

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References

- Backonja, U., Hall, A.K., Painter, I., Kneale, L., Lazar, A., Cakmak, M., Thompson, H.J. and Demiris, G. (2018), "Comfort and attitudes towards robots among young, middle-aged, and older adults: a cross-sectional study", *Journal of Nursing Scholarship*, Vol. 50 No. 6, pp. 623-633, doi: [10.1111/jnu.12430](https://doi.org/10.1111/jnu.12430).
- Belanche, D., Casalo, L.V., Flavián, C. and Schepers, J. (2020), "Service robot implementation: a theoretical framework and research agenda", *The Service Industries Journal*, Vol. 40 Nos 3-4, pp. 203-225.
- Berezina, K., Giftci, O. and Cobanoglu, C. (2019), "Robots, artificial intelligence, and service automation in restaurants", in Ivanov, S. and Webster, C. (Eds), *Robots, Artificial Intelligence and Service Automation in Travel, Tourism and Hospitality*, Emerald Publishing, Bingley, pp. 185-219.
- Caraher, M., Lange, T. and Dixon, P. (2000), "The influence of TV and celebrity chefs on public attitudes and behavior among the English public", *Journal for the Study of Food and Society*, Vol. 4 No. 1, pp. 27-46, doi: [10.2752/152897900786690805](https://doi.org/10.2752/152897900786690805).
- 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*, Vol. 32 No. 9, pp. 2947-2968, doi: [10.1108/IJCHM-01-2020-0046](https://doi.org/10.1108/IJCHM-01-2020-0046).

- Demirkol, S. and Cifci, I. (2020), "Delving into the role of celebrity chefs and gourmets in culinary destination marketing", *European Journal of Tourism Research*, Vol. 26, p. 2603.
- Ezer, N., Fisk, A.D. and Rogers, W.A. (2009), "More than a servant: self-reported willingness of younger and older adults to having a robot perform interactive and critical tasks in the home", *Proceedings of the Human Factors and Ergonomics Society*, Vol. 53 No. 2, pp. 136-140, doi: [10.1177/154193120905300206](https://doi.org/10.1177/154193120905300206).
- Fusté-Forné, F. (2021), "Robot chefs in gastronomy tourism: what's on the menu?", *Tourism Management Perspectives*, Vol. 37, p. 100774.
- Hudson, J., Orviska, M. and Hunady, J. (2017), "People's attitudes to robots in caring for the elderly", *International Journal of Social Robotics*, Vol. 9 No. 2, pp. 199-210, doi: [10.1007/s12369-016-0384-5](https://doi.org/10.1007/s12369-016-0384-5).
- Hwang, J., Park, S. and Kim, I. (2020), "Understanding motivated consumer innovativeness in the context of a robotic restaurant: the moderating role of product knowledge", *Journal of Hospitality and Tourism Management*, Vol. 44, pp. 272-282.
- Ivanov, S. and Webster, C. (Eds) (2019a) *Robots, Artificial Intelligence and Service Automation in Travel, Tourism and Hospitality*, Emerald Publishing, Bingley.
- Ivanov, S. and Webster, C. (2019b), "Economic fundamentals of the use of robots, artificial intelligence and service automation in travel, tourism and hospitality", in Ivanov, S. and Webster, C. (Eds), *Robots, Artificial Intelligence and Service Automation in Travel, Tourism and Hospitality*, Emerald Publishing, Bingley, pp. 39-55, doi: [10.1108/978-1-78756-687-320191002](https://doi.org/10.1108/978-1-78756-687-320191002).
- Ivanov, S., Webster, C. and Garenko, A. (2018), "Young Russian adults' attitudes towards the potential use of robots in hotels", *Technology in Society*, Vol. 55, pp. 24-32, doi: [10.1016/j.techsoc.2018.06.004](https://doi.org/10.1016/j.techsoc.2018.06.004).
- Katz, J.E. and Halpern, D. (2014), "Attitudes towards robots suitability for various jobs as affected robot appearance", *Behaviour and Information Technology*, Vol. 33 No. 9, pp. 941-953, doi: [10.1080/0144929X.2013.783115](https://doi.org/10.1080/0144929X.2013.783115).
- Kincaid, S. and Baloglu, S. (2005), "An exploratory study on the impact of self-service technology", *Journal of Foodservice Business Research*, Vol. 8 No. 3, pp. 35-54.
- Lee, W.H., Lin, C.W. and Shih, K.H. (2018), "A technology acceptance model for the perception of restaurant service robots for trust, interactivity, and output quality", *International Journal of Mobile Communications*, Vol. 16 No. 4, pp. 361-376.
- Malchus, K., Jaecks, P., Wrede, B. and Stenneken, P. (2013), "Application of social robots in speech and language therapy?! An investigation into speech and language pathologists' attitudes towards embodied agents [Einsatz sozialer Roboter in der Sprachtherapie?! Erhebung eines Stimmungsbildes von SprachtherapeutInnen]", *L.O.G.O.S. Interdisziplinair*, Vol. 21 No. 2, pp. 106-116.
- Mihelj, M., Bajd, T., Ude, A., Lenarčič, J., Stanovnik, A., Munih, M., Rejc, J. and Šlajpah, S. (2019), *Robotics*, 2nd ed., Springer, Cham.
- Murphy, J., Hofacker, C. and Gretzel, U. (2017), "Dawning of the age of robots in hospitality and tourism: challenges for teaching and research", *European Journal of Tourism Research*, Vol. 15, pp. 104-111, doi: [10.54055/ejtr.v15i.265](https://doi.org/10.54055/ejtr.v15i.265).
- NPR (2011), "Science diction: the origin of the word 'robot'", available at: <https://www.npr.org/2011/04/22/135634400/science-diction-the-origin-of-the-word-robot> (accessed 18 December 2020).
- Omar Parvez, M. and Cobanoglu, C. (2021), "Opportunities and challenges of utilizing service robots in tourism industry: a tool for recovery from COVID-19 pandemic", *Journal of Smart Tourism*, Vol. 1 No. 3, pp. 17-20.
- Pochwatko, G., Giger, J.-C., Róžańska-Walczyk, M., Świdrak, J., Kukielka, K., Możaryn, J. and Piçarra, N. (2015), "Polish version of the negative attitude toward robots scale (NARS-PL)", *Journal of Automation, Mobile Robotics and Intelligent Systems*, Vol. 9 No. 3, pp. 65-72.
- Ross, L.T., Fardo, S.W. and Walach, M.F. (2018), *Industrial Robotics Fundamentals: Theory and Applications*, Goodheart-Willcox, Tinley Park, IL.
- Samala, N., Katkam, B.S., Bellamkonda, R.S. and Rodriguez, R.V. (2020), "Impact of AI and robotics in the tourism sector: a critical insight", *Journal of Tourism Futures*, Vol. 8 No. 1, pp. 73-87, doi: [10.1108/JTF-07-2019-006](https://doi.org/10.1108/JTF-07-2019-006).
- Seo, K.H. and Jee, H.L. (2021), "The emergence of service robots at restaurants: integrating trust, perceived risk, and satisfaction", *Sustainability*, Vol. 13 No. 8, p. 4431, doi: [10.3390/su13084431](https://doi.org/10.3390/su13084431).

Seyitoğlu, F. (2021), "Automation vs authenticity in services", *ROBONOMICS: The Journal of the Automated Economy*, Vol. 2, Article 20, available at: <https://journal.robonomics.science/index.php/rj/article/view/20>.

Seyitoğlu, F. and Ivanov, S. (2020), "Understanding the robotic restaurant experience: a multiple case study", *Journal of Tourism Futures*, Vol. 8 No. 1, pp. 55-72, doi: [10.1108/JTF-04-2020-0070](https://doi.org/10.1108/JTF-04-2020-0070).

Seyitoğlu, F., Ivanov, S., Atsız, O. and Çifçi, İ. (2021), "Robots as restaurant employees - a double-barrelled detective story", *Technology in Society*, Vol. 67, doi: [10.1016/j.techsoc.2021.101779](https://doi.org/10.1016/j.techsoc.2021.101779).

Tung, V.W.S. and Au, N. (2018), "Exploring customer experiences with robotics in hospitality", *International Journal of Contemporary Hospitality Management*, Vol. 30 No. 7, pp. 2680-2697, doi: [10.1108/ijchm-06-2017-0322](https://doi.org/10.1108/ijchm-06-2017-0322).

Tuomi, A., Tussyadiah, I. and Stienmetz, J. (2019), "Service robots and the changing roles of employees in restaurants: a cross cultural study", *E-Review of Tourism Research*, Vol. 17 No. 5, pp. 662-673.

Tuomi, A., Tussyadiah, I.P. and Stienmetz, J. (2021), "Applications and implications of service robots in hospitality", *Cornell Hospitality Quarterly*, Vol. 62 No. 2, pp. 232-247, doi: [10.1177/1938965520923961](https://doi.org/10.1177/1938965520923961).

Tussyadiah, I., Zach, F. and Wang, J. (2017), "Attitudes toward autonomous on demand mobility system: the case of self-driving taxi", in Schegg, R. and Stangl, B. (Eds), *Information and Communication Technologies in Tourism 2017, Proceedings of the International Conference in Rome, Italy, 24-26 January, 2017*, pp. 755-766.

Tussyadiah, I.P., Zach, F.J. and Wang, J. (2020), "Do travelers trust intelligent service robots?", *Annals of Tourism Research*, Vol. 81, p. 102886.

Venkatesh, V. and Davis, F.D. (2000), "A theoretical extension of the technology acceptance model: four longitudinal field studies", *Management Science*, Vol. 46 No. 2, pp. 186-204.

Webster, C. (2021), "Demography as a driver of robonomics", *ROBONOMICS: The Journal of the Automated Economy*, Vol. 1, pp. 1-12.

Webster, C. and Ivanov, S. (2022), "Public perceptions of the appropriateness of robots in museums and galleries", *Journal of Smart Tourism*, Vol. 2 No. 1, pp. 33-39.

Wirtz, J., Patterson, P., Kunz, W., Gruber, T., Lu, V.N., Paluch, S. and Martins, A. (2018), "Brave new world: service robots in the frontline", *Journal of Service Management*, Vol. 29 No. 5, pp. 907-931.

Xu, Q., Ng, J.S.L., Tan, O.Y. and Huang, Z. (2015), "Needs and attitudes of Singaporeans towards home service robots: a multi-generational perspective", *Universal Access in the Information Society*, Vol. 14, pp. 477-486, doi: [10.1007/s10209-014-0355-2](https://doi.org/10.1007/s10209-014-0355-2).

Zemke, D.M.V., Tang, J., Raab, C. and Kim, J. (2020), "How to build a better robot... for quick-service restaurants", *Journal of Hospitality and Tourism Research*, Vol. 44 No. 8, pp. 1235-1269.

Zhong, L., Zhang, X., Rong, J., Chan, H.K., Xiao, J. and Kong, H. (2021), "Construction and empirical research on acceptance model of service robots applied in hotel industry", *Industrial Management and Data Systems*, Vol. 121 No. 6, pp. 1325-1352, doi: [10.1108/IMDS-11-2019-0603](https://doi.org/10.1108/IMDS-11-2019-0603).

Zhu, D.H. and 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*, Vol. 32 No. 3, pp. 1367-1383, doi: [10.1108/IJCHM-10-2019-0904](https://doi.org/10.1108/IJCHM-10-2019-0904).

Author affiliations

Stanislav Ivanov is based at the Varna University of Management, Varna, Bulgaria.

Craig Webster is based at the Department of Management, Ball State University, Muncie, Indiana, USA.

Corresponding author

Craig Webster can be contacted at: cwebster3@bsu.edu

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