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Week 8 Research Article: Implementation of Robotic Automation in Foodservice

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Week 8 Assignment: Research Article

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Abstract

Studies have been conducted to examine the recent increase in the implementation of robotic automation in foodservice. These studies conclude that serving robots do exist currently, primarily in countries outside of the United States. In addition, studies suggest that customers have a better customer service experience with serving robots if they go into the interaction with a positive perception. Therefore, the implementation of robotic automation in the foodservice industry will possibly continue to be implemented in countries where it has not yet currently been brought to the markets.

Keywords: robotic, automation, foodservice, implementation

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Introduction

Robotic automation, a process that does not include the need for a human worker, has been transforming the restaurant industry. Automation in the industry results in the improvement of efficiency, the reduction of a workspace (Zongwei, 2015), and cost reduction (Rene et al., 2010; Bogue, 2009). In 2013 alone, the International Federation of Robotics (IFR) reported that 6,200 industrial robots were sold specifically for the food and beverage industry (DLG-Expert Report, 2015). Since the early 2000s, there has been an uptick in robotic automation in foodservice. The use of robotic automation, specifically, has become a competitive advantage to those who have implemented it. On the contrary, there are perceived risks to automation in restaurants from both customers and the restaurants (Jang & Lee, 2020).

This paper aims to review the implementation of robotic automation in the restaurant industry since the early 2000s. The remainder of this research paper will consist of the following. First is the literature review of the implementation of serving robots and the perception of their use. Second, the methodology of the research will be discussed. Lastly, the paper will conclude with a brief conclusion and details on further research.

Literature Review

The goal of the literature review is to provide a summary of sources that provided information on the research of robotic automation in foodservice. The research conducted is significant to the larger field of study on this topic. These papers that were researched and studied present different perspectives as they were conducted in different countries, primarily Asian countries.

Serving Robots

The study conducted by Jang and Lee (2020) was a collection of data from individuals who had visited at least a single establishment that utilized robotic automation. Their study employed descriptive statistical analysis, frequency analysis, exploratory factor analysis (EFA), reliability analysis using SPSS, and confirmatory factor analysis (CFA). The serving robots' attributes were divided into five concepts; all eigenvalues are more than 1, Kaiser-Meyer-Olkin (KMO) = 0.899, total variance explained = 72.620 (Jang & Lee, 2020). The attributes that the participants examined in their experiences with the serving robots were described as *anthropomorphism, animacy, likeability, intelligence, and safety* (Jang & Lee, 2020). The results of the CFA, Tucker–Lewis index (TLI) = 0.932; comparative fit index (CFI) = 0.940; incremental fit index (IFI) = 0.940; and root mean square error of approximation (RMSEA) = 0.053, were consistent with standards put in place (Jang & Lee, 2020). Jang and Lee (2020) suggest that implementing robotic automation in restaurants can be an effective strategy for more customers.

Three important positive areas of the implementation of robotic automation have received critical attention: perceived value, the roles of robots, and perceptions of their implementation of them. The data sample collected by Jang and Lee was composed of individuals who had visited a restaurant that implemented the use of serving robots within the past three months of the survey. The self-administered survey was used to verify that customers perceived the value of a restaurant's use of technological automation has a positive effect on the customers' level of satisfaction (Jang & Lee, 2020). This study suggests that the implementation of robots in the restaurant industry satisfies the perceived value the customer had prior to entering the restaurant.

Tuomi et al. (2020) took on an exploratory qualitative approach when surveying service robots concerning service production and delivery. On-site observations and interviews with executives of 14 different organizations were utilized for this research (Tuomi et al., 2020). In addition, an observation guide was developed using Lillicrap and Cousins' (2010) service sequence model, which divides the delivery of hospitality services into distinct encounters (Tuomi et al., 2020). Specifically for this study, the critical areas observed were (a) meet and greet, (b) ordering/check-in, (c) eating, clearing, and room service, (d) paying/check-out, and (e) pre-arrival of guests (Tuomi et al., 2020). In comparison to Jang and Lee (2020), Tuomi et al. (2020) concluded that there is a spread of service robots into dynamic human environments, such as the hospitality and foodservice industry.

The method of study in 2018 defined the roles of robots in the industry. Data was collected from Japan, the United States, and the United Kingdom. To participate, the organizations needed to be up to date with current state-of-the-art service robotics and had a comprehensive understanding of how and why the technology was used in their organization (Tuomi et al., 2020). The conclusion of the observational data study implies that the role of robots is broken down into five themes: support, substitute, differentiate, improve, and upskill. One or more of these themes were seen in each study sample.

Chiang and Trimi (2020) studied the performance of service robots within five constructs of tangibility, reliability, responsiveness, assurance, and empathy. The same size for this study was 201 participants, the majority of them being females between the ages of 20 and 29. The results revealed that customers' top priorities for robots' service quality are assurance and reliability, while tangible and empathy were not as important (Chiang & Trimi, 2020). In addition, the responsiveness of the robots, which was an important variable, left the customers unsatisfied.

Chiang and Trimi (2020) conducted a study at a location that was strictly staffed by service robots. Data for this study was collected through questionnaires that contained two questions about the expectations of the services and the participant's overall satisfaction (Chiang & Trimi, 2020). When examining reliability and validity during this study, Chiang and Trimi (2020) found that Cronbach's alpha values were between 0.643 and 0.889, indicating that the measures are all reliable. To determine if a difference between the expectations and experience of service robots is evident, a paired-sample t-test, using SPSS software, was performed (Chiang & Trimi, 2020). The results for reliability were negative and significant ($p<0.001$, $t=-4.622$), indicating that customers' experience of the performance reliability of service robots (i.e., their ability to perform the service accurately) was less than expectations. The results for responsiveness were negative and significant ($p<0.01$, $t=-3.104$), which implies that customers perceived that the service robots' response speed was not on par with their expectations. The results of the assurance test were negative and significant ($p<0.01$, $t=-3.315$). Therefore, customers believed that their expectations in confidence and trust in professional knowledge, affinity, and ability of service robots were not higher than actual experience (Chiang & Trimi, 2020). The Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) ranking analysis indicated that when customers evaluate their expectations and the actual performance of the robot, they pay the most attention to tangibles, followed by reliability, assurance, and so on (Chiang & Trimi, 2020). The results of important-performance analysis (IPA) indicated that the degree of importance that customers feel about empathy (low) and tangibles (high) seemed to have no significant impact on customer satisfaction with service robots' actual performance (Chiang & Trimi, 2020).

Perception on the Use of Robots

Preusse et al. (2021) recruited 78 students to participate in their online survey. The online Qualtrics survey consisted of two parts. The first is a simulated video interaction with Pepper as a restaurant greeter (interaction), followed by a series of questions regarding participants' experience of their interaction with Pepper (reaction) (Preusse et al., 2021). In the beginning portion of the survey, the students were asked to envision going to a restaurant and being greeted by a robot at the door. Within the second portion, they were asked to respond based on how they perceived interacting with Pepper in their specific group condition (individual, pre-formed group, or new-formed group) (Preusse et al., 2021). The results of the study found that participants did not differ in their number of simulated verbal interactions with Pepper based on the type of group they imagined themselves to be in (Preusse et al., 2021). In addition, the students in the pre-formed group reported being more accepting of Pepper rather than those identified as individuals. Participants of the study did not interact less with Pepper based on a perceived group that they were a part of (Preusse et al., 2021). The study suggests that the participants were accepting of Pepper, the robot.

Zhang et al.'s first study was conducted in hopes to draw a conclusion on the attributes of serving robots in the foodservice industry that made guests feel comfortable interacting with them. The qualitative investigation was conducted in China and included thirteen participants, the majority being males between the ages of 31and 50 (Zhang et al., 2022). Interviews of the individuals, which lasted around an hour, were conducted in Chinese and then translated into English. The respondents were asked about their experience and engagement with the service robot(s), the role of the service robot(s) in restaurant service delivery, their expectations of service robots and the service robots' performance, as well as their overall evaluation of service robots in creating a memorable restaurant experience (Zhang et al., 2022). During this process,

the respondents were also asked to provide details on any challenges they faced while interacting with the robots during their service. The author's findings suggest that the evaluation of service robots in the industry could be organized into four major themes, including their experience with service robots, service robots' value facilitation, service robots' attributes, and interaction comfort (Zhang et al., 2022).

Meidute-Kavaliauskiene et al. had a sample of 1,408 individuals who were over the age of eighteen years old in Turkey. The results of the study consisted mostly of females, and the participants were between the ages of 26 to 45. The data for this study were collected between February and May of 2021. The online questionnaire consisted of two parts: The first part was used to collect data on the demographics of the respondents. The second part consisted of questions to measure research variables such as Advantage (ADV), Disadvantage (DIS), Perceived Value (PV), Intention to Use (ITU) on a 1–5 Likert scale, 1 being strongly disagreed and 5 being strongly agreed (Meidute-Kavaliauskiene et al., 2021). Results concluded that the hypotheses developed were in fact, accurate (Meidute-Kavaliauskiene et al., 2021). Perceived advantages and disadvantages affect the intentions to use service robots, both positively and negatively. In addition, the perceived value of service robots positively influences the intention to use them (Meidute-Kavaliauskiene et al., 2021).

The item with the highest average for the advantage scale was "Robots will be able to provide information in more languages than human employees", and the item with the lowest average was "Robots will be more polite than human employees." For the disadvantage scale, "Robots cannot understand a guest's emotions" had the highest average item, and "I think robot technology restricts the experience in a service environment" had the lowest average. The item "Using service robots can increase hotel service efficiency" had the highest average for perceived value. The item "Compared to the cost of service I need to pay, the use of robots in a

service environment offers value for money" had the lowest average (Meidute-Kavaliauskiene et al., 2021). Overall, the customers' perceived value made them more likely to utilize the service robots.

Methodology

The primary purpose of this section is to validate the rationale for the data collection and the analysis used. The main objective of this paper is to summarize and assess the research on robotic automation in foodservice. In addition, the hope is to demonstrate how significant the information is to a larger field of study.

The methodology for this review is secondary research-based. This study will review various studies that examine the implications and effects of robotic automation in restaurants. Based on the understanding of the studies, a positive or negative conclusion will be drawn. This paper is a working paper, and therefore it is a subjective comparison. Furthermore, the analysis is subjective by the author comparing and contrasting.

Findings

This section will describe the results of the findings logically and sequentially. This will be achieved utilizing the data from the secondary research. A comparison of the studies can be found throughout this section.

Serving Robots

The implementation of serving robots in the foodservice sector of the hospitality industry has been expanding throughout the world over the past years. The studies imply that in countries primarily outside of the United States, the use of robotic automation has no negative effect on a customer's experience at a foodservice establishment. It is implied that the use of robots can potentially put a restaurant at a competitive advantage if they were to choose to utilize this

advanced technology. This technological development is quite complex yet yields multiple benefits to both the business at large and its customers.

Perception on the Use of Robots

When facing something new, there is often a preconceived perception drawn amongst individuals. The studies used in this literature review suggest that customers did not have a negative perception of the use of robots in the restaurants in which robotic automation has been implemented. In addition, their experience was not in any form tainted by interacting with robots. This suggests that, again, the implementation of robotic automation in foodservice overall yields a positive perception and acceptance of this technology.

Limitations and Implications

A common limitation in each study mentioned is the locations in which the studies were conducted. The studies were conducted in South Korea, Japan, the United States, the United Kingdom, Taiwan, and Turkey. These set group limitations are based on individual studies. They speak only to the experiences in the areas mentioned, not considering the various other cultures and how serving robots affect those areas. In addition, the implementation of robotic automation in the industry is relatively new. Whereas humans are fallible and full of emotions, robots are not. Due to the relatively new aspect of the implementation of robots, data and study materials are limited. For example, one study mentioned that the robot, Pepper, could not recognize the participants as humans due to mask-wearing during the study. In addition, these studies involved individuals who had encountered service robots. Findings could be skewed if these studies included individuals who have not engaged with service robots.

Topics for Future Research

The Coronavirus pandemic was mentioned throughout research on service robots. It has been suggested that robotic automation could be used to stifle the labor shortage that the hospitality industry is currently facing. Further research focused on if robots will fill the lack of employees and if they will be as effective as human workers is suggested for confirmation.

Conclusion

Research has attempted to define the implementation of robotic automation and its perceived value, the roles of robots, and perceptions of their implementation. These studies suggest that the widespread use of robots in restaurants benefits the overall business. However, many implications affect society when automation is implemented in restaurants. Further research could examine strategies to make the use of robots a sustainable advantage for restaurants during a time of COVID-19 adjustments.

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