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Robot chefs in gastronomy tourism: What's on the menu?

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ABSTRACT

The use of robots in hospitality and tourism is rapidly evolving. Restaurants progressively include robots as part of their staff, not only as waiters but also as chefs. The robotization of tourism and gastronomic experiences is a vital challenge that both service providers and customers need to cope with. Within this context, the paper investigates the perceptions of tourists towards the use of robots in restaurants. Drawing from a qualitative research design and built on a grounded theory approach, the results reveal the opportunities derived from the implementation of robots in hospitality and tourism. On the other hand, tourists also perceive the growing presence of robots in food services as a form of dehumanization of the gastronomic experience. Theoretical and practical implications are discussed with regard to a new experiencescape that is increasingly dominated by human-robot interactions.

1. Introduction and objective

The use of robots as service providers in the tourism and hospitality industries is rapidly growing (Ivanov, Gretzel, Berezina, Sigala, & Webster, 2019; Ivanov, Webster, & Garenko, 2018; Kuo, Chen, & Tseng, 2017; Murphy, Hofacker, & Gretzel, 2017). In a context where the experience economy lies at the core of the overall tourist experience (Andersson, 2007; Pine & Gilmore, 1998; Quan & Wang, 2004; Sidali, Kastenholz, & Bianchi, 2015), robotization leads to a new interaction between hosts and guests (De Kervenoael, Hasan, Schwob, & Goh, 2020; Mende, Scott, van Doorn, Grewal, & Shanks, 2019; Qiu, Li, Shu, & Bai, 2020). This is especially relevant in food services. The current paper departs from the understanding of food venues – such as restaurants – as part of food tourism practices, and is instead built on a framework using food as a significant factor in choosing a destination (Ab Karim & Chi, 2010; Björk & Kauppinen-Räisänen, 2019; Du Rand & Heath, 2006). Gastronomy has increasingly become a motivational factor in tourists' decision to visit a destination (Hall, 2016; Kim & Eves, 2012; Levitt, Zhang, DiPietro, & Meng, 2019), meaning that it influences tourism, an industry increasingly dominated by technology and artificial intelligence (see Berezina, Ciftci, & Cobanoglu, 2019). Drawing from a grounded theory approach, this research adds texture to this conversation. The purpose of the paper is to examine the opinions of tourists concerning the use of robots in the provision of food services. In particular, the paper examines perceptions of tourists towards the use of robot chefs in restaurants.

The industry is moving from human-to-human interaction to human-to-robot interaction. To this extent, Bowen and Morosan (2018) affirmed that this transition is already challenging the industry, which will struggle to maintain a feeling of hospitality within the new service environment. Robotization now includes not only industrial robots but service robots, which are defined as social agents that replace human providers in service experiences (Van Doorn et al., 2017). Additionally, personal service robots have the highest level of autonomy and the highest level of social interaction (Murphy et al., 2017, p.107). In a tourism context, they serve to assist both service providers and travelers with autonomy (Jörling, Böhm, & Paluch, 2019; Park, 2020). Choi, Oh, Choi, and Kim (2020) described the roles of service robots in the hospitality and restaurant industries. They pointed out that robot chefs are an example of service robots that have the function of cooking dishes to create engaging customer experiences (Choi et al., 2020). Furthermore, other authors also stated that service robots can be effectively used in operations such as food preparation and serving (Chui, Manyika, & Miremadi, 2016; Lukanova & Ilieva, 2019).

Service robots are used in many roles, such as bartenders, guides, or front-desk employees (Ivanov et al., 2019), among others. Recently, robots also started acting as chefs in restaurants (see Hong Zhu & Ping Chang, 2020). For example, CaliBurguer created a robot, Flippy, who cooks hamburgers in Pasadena, California (Otero, 2018). Moreover, a group of Massachusetts Institute of Technology students, together with celebrity chef Daniel Boulud, created a restaurant in Boston (Spyce) where the food is cooked by robots with a fully automated kitchen (Doyle, 2018). While this is considered the world's first restaurant with a robotic kitchen that cooks complex meals (Holley, 2018), new openings

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are coming soon around the globe (Rojo, 2019).

In this sense, the research aims to scrutinize how tourists perceive a restaurant experience where robots not only serve humans but also cook for humans. This is still an unexplored field of research, which is relevant for both industry and academia. Primarily, this study provides a further understanding of customer acceptance of robots in tourism (Murphy et al., 2017). This is critical to the food (tourism) industry, where service encounters in restaurants are increasingly focused on both the physical and symbolic consumption of cocreated experiences between humans and robots (Ivanov et al., 2019). Furthermore, the paper conceptualizes the use of robots in a specific tourism servicescape and critically discusses its implications for host-guest interactions. Drawing from the demand perspective, the findings specifically uncover the meanings that tourists attach to robots as potential cooks. The outcomes of this study also inform businesses and destinations about managerial and marketing challenges derived from this new scenario – a landscape where nonhuman food service providers became an active part of food tourist experiences.

2. Literature review: Restaurants, robots and rethinking (food) tourism

This section is divided into two subsections. First, the theoretical framework offers an approach to food tourism and, specifically, to restaurants as drivers that explain the growing significance of food tourism experiences. The second subsection reviews the role of robots in hospitality and tourism.

2.1. A restaurant as a food tourism attraction

Food is a crucial motivation for traveling (Hall, 2016; Kivela & Crotts, 2005; Quan & Wang, 2004), and local and regional foods and dishes are regarded as valuable and rewarding tourist attractions (Ab Karim & Chi, 2010; Fusté-Forné, 2019; Long, 2004). Thus, 'food' is an indispensable part of tourist experiences, and it heavily affects tourists' decisions, behavior, and satisfaction (Björk & Kauppinen-Räisänen, 2019). In particular, the relationship between food and tourism refers to a wide range of activities and experiences. According to Hall and Sharples (2003), food tourism includes visits to food producers, farmer's markets, food fairs and festivals, and other food-based tourist practices.

Food accounts for an important portion of travelers' expenditures. Previous research highlighted the economic impact of food (tourism) consumption on destinations (Telfer & Wall, 1996). Since restaurants became a key stakeholder in the promotion of food as a tourism attraction (Du Rand & Heath, 2006; Levitt et al., 2019), they have also contributed to destination choice (Ab Karim & Chi, 2010; Gálvez, Granda, López-Guzmán, & Coronel, 2017). According to Björk and Kauppinen-Räisänen (2017), food experiences are heavily influenced by a restaurant's global atmosphere, and foods and dishes stimulate authentic tourist experiences. In particular, Graziani (2003) pointed out that most restaurants' revenue is generated by travelers. This research understands that restaurantscapes are part of the servicescapes and experiencescapes of a destination (Björk & Kauppinen-Räisänen, 2019), which is the 'stage' where tourists and service staff cocreate experiences (Pine & Gilmore, 1998).

Food experiences also enhance the memorability of tourist experiences (Kauppinen-Räisänen, Gummerus, & Lehtola, 2013). Previous studies acknowledged the role of food-based tourist experiences as a pathway to exploring novelty and change in gastronomy (Cohen & Avieli, 2004; Fusté-Forné, 2020; Sidali et al., 2015). Travelers are constantly seeking new, unique, and memorable experiences (Pine & Gilmore, 1998). To illustrate it, "for some travelers, positive and memorable food experiences require culinary-gastronomic dining in a fine-dining restaurant, or experiences characterized not only by uniqueness and newness but also being [an] extraordinary once in a lifetime experience" (Björk & Kauppinen-Räisänen, 2017, p.11). In addition, these authors revealed that this can be applied to restaurants that are specifically designed to be experiential: for example, a robotic restaurant.

As explained below, examples include restaurants where robots serve (Otero, 2018) and even cook (Holley, 2018) as part of the provision of experiences focused on operational and experiential design (Pine & Gilmore, 1998; Quadri-Felitti & Fiore, 2012). In this context, "even the smallest cue can aid the creation of a unique experience. When a restaurant host says, 'Your table is ready', no particular cue is given; but when a […] host declares, 'Your adventure is about to begin', it sets the stage for something special" (Pine & Gilmore, 1998, p.103). While previous research also recognized how chefs, especially celebrity chefs, contribute to the creation of food tourism experiences (see, for example, Henderson, 2009), a research gap was identified: few previous studies approached the role of robot chefs in creating restaurant experiences (see Hong Zhu & Ping Chang, 2020). As outlined earlier, this paper analyses restaurants as spaces where experiences are co-created and co-consumed between humans and robots (Ivanov et al., 2019) and where this co-construction of value is expected to influence traveler acceptance of robots in general (Murphy et al., 2017) and restaurant service robots in particular (Lee, Lin, & Shih, 2018).

2.2. The use of robots in hospitality

Previous studies estimated that the impact of artificial intelligence on the global gross domestic product will be approximately 14% in 2030 (Generalitat de Catalunya, 2019). Both existing and new business models are increasingly adopting technology to improve production processes, increase personalization in service encounters, and create added value (see, for example, Barnett et al., 2014). The usage of technology also leads to competitive advantages in the hospitality and tourism industries (Kuo et al., 2017), where the implementation of robots is quickly growing (Murphy et al., 2017). Bowen and Morosan (2018) highlighted that demand for robots in hospitality organizations will progressively increase over the next decades, especially because of pull factors such as the need to offer memorable guest experiences and to reduce language barriers when communicating with a heterogeneous number of international tourists (Park, 2020); and push factors where demographic patterns emerge as the biggest driver of robotization in tourism (Webster & Ivanov, 2020).

This will also result in new consumption habits, specifically with regard to the service industries. In the framework of tourism experiences, the robotization of services will also provide innovative solutions to customers who are constantly demanding value-added attractions and services (Kuo et al., 2017). Here, it is also important to note that robots are integrated into a complex service system that involves not only employees and customers but also both physical and information technology infrastructure (Murphy et al., 2017). Park (2020) reported that robots can provide 24/7 availability and address multi-information requests. Additionally, robots must be able to effectively interact with people so that the encounters can become rewarding in a human-centered service environment (Rodriguez-Lizundia, Marcos, Zalama, Gómez-García-Bermejo, & Gordaliza, 2015).

Dining experiences are moving steadily towards this dominant robotic service landscape. Research on the relationships between robots and tourism has already addressed customers' intention to use and acceptance of robots in hospitality and tourism operations (see De Kervenoael et al., 2020). While tourism and hospitality companies have progressively improved service automation and robotization, in parallel, there appears to be a growing need to explore customers' willingness to interact with robots (Bowen & Morosan, 2018). In line with this, previous research explored human-to-robot interaction from the perspective of consumer perceptions of robots used in hotels (see Ivanov et al., 2018).

In addition, recent tourism research has also focused on trust in service robots (see Park, 2020) and revealed a correlation between

technology acceptance and purchase intention (Zhong, Sun, Law, & Zhang, 2020). Thus, positive or negative attitudes towards technology positively or negatively influence trust in robots (Tussyadiah, Zach, & Wang, 2020). Drawing from tourist perspectives on the robotization of gastronomic tourism experiences, this paper tries to shed further light on the nuanced associations that robot chefs create in tourists.

3. Study method

Based on a grounded theory approach, twelve travelers were interviewed. The semistructured interviews aimed to discover the views of tourists concerning robots as service providers in dining experiences. Two research questions are defined: how do tourists perceive a dining experience where service robots participate, and what are the reasons why tourists would or wouldn't visit restaurants where robots cook? The sample, ten female and two male tourists from twelve nationalities, provides a range of opinions from different social and cultural backgrounds. Previous research concludes that regardless of gender, age, and education level, a person's general attitude towards technology (Tussyadiah et al., 2020) and robots (Ivanov & Webster, 2019) is the best indicator to assess the willingness to use robots in hospitality and tourism. This method design contributes, from a qualitative approach, to analyzing individual perceptions that can help expand this conversation.

The author gained access to the participants from previous professional encounters in the field of tourism academia (see Smith & Xiao, 2008) and contacted each of the interviewees directly. This convenience sample allowed the researcher to establish rapport quickly, which, based on a positive relationship between the interviewer and the interviewees (McConnell-Henry, James, Chapman, & Francis, 2010), produced a comfortable and trustworthy environment (DiCicco-Bloom & Crabtree, 2006). Table 1 shows the sample characteristics. It is observed that the interviewees are active travelers, which was a prerequisite to include them in the sample and made these participants' views particularly relevant to the topic. They were specifically asked to respond to the interview from a tourist's perspective. The process of data collection included only twelve interviews because theoretical saturation was reached and no new information was emerging (Denzin & Lincoln, 1999; Hardy, 2005).

To respond to the research objective, an interview guide was designed (Appendix A). The interviews included two themes of discussion. The first block of questions aimed to discover the opinion of the interviewees about the role that robots play in the restaurant industry and what are the benefits and problems derived from the adoption of robotics by food services. The second block is particularly focused on the perception of the interviewees towards a restaurant experience offered by robot chefs and why or why they would not want to experience it. The 20- to 30-min interviews were conducted during September and October 2019.

Table 1
Sample characteristics.

Participant	Gender	Country of Origin	Age	Education	Number of nights spent traveling (last year)
1	Female	Belgium	23	Bachelor	20
2	Female	Bosnia and Herzegovina	33	PhD	45
3	Female	Brazil	38	Master	12
4	Female	India	54	PhD	100
5	Female	Italy	53	Bachelor	20
6	Female	Mexico	28	Master	60
7	Female	Nepal	33	Master	40
8	Male	New Zealand	32	Master	14
9	Female	Portugal	27	Bachelor	24
10	Female	Spain	42	Bachelor	30
11	Male	Tanzania	40	PhD	60
12	Female	Uruguay	50	PhD	32

After the interviews, data was analyzed and summarized for theory development by the author as part of a grounded theory approach (Glaser & Strauss, 1967; Matteucci & Gnoth, 2017). This method, which is increasingly applied to qualitative research in tourism, is especially appropriate in areas that are yet to be explored (Hu et al., 2020; Kim, Eves, & Scarles, 2009; Lumsdon & McGrath, 2011). Following the classic approach to grounded theory (Corbin & Strauss, 1990; Glaser & Strauss, 1967), the current research analyzed the data in three steps: first, the reading of the interviews to gather a broad understanding of data collected; second, the definition of categories from the analyzed data as a result of the researcher's judgment of data significance and previous literature; and third, the manual coding of interview transcripts.

A critical analysis of the transcripts allowed the author to identify the crucial themes that influence tourists' attitudes, motivations, and perceptions with regard to the use of robots in the restaurant, service, and experiencescapes of a destination, particularly robot chefs. As a result of the reading, analysis, and coding of the interviews, three labels were used: advantages, disadvantages, and uncertainties. As a consequence, three topics are developed in the next section: the opportunities derived from the use of robots in food and tourism as a welcome complement to human work; the growing presence of robots as a form of dehumanization in hospitality and tourism; and the fears attached to the implementation of robots in restaurants that are viewed as traditional spaces that commonly feature personal interaction and human-to-human relationships. These themes are used to structure the next section and are further discussed in the last section of the paper.

4. Results

The results of the interviews led to the emergence of three categories with regard to the advantages, disadvantages, and uncertainties of the implementation of robots in restaurants and dining experiences. In particular, the three parts of this section rely on the aforementioned three topics identified as part of the coding process. While most of the interviewees agreed on the increasing use of robots in restaurantscapes, only a few of them were able to provide specific examples. Additionally, the participants generally warned about the 'risks' of the adoption of robot chefs by restaurants. At the same time, some of them manifested their position against robots and in favor of human-to-human interaction as a 'must' towards an 'authentic' tourist experience.

4.1. Robots can behave 'better' with humans

Service robotization, in a humanoid robot form or not, is taking greater significance in food services. Some of the interviewees highlighted examples to illustrate the adoption of robots in hospitality and tourism, such as the case of service robots in hotel receptions or automated ordering services in cafes and restaurants, as explained below. All the interviewees admitted that robots help offer faster and more efficient service. One interviewee argued the following:

"due to technological development, robots are able to manage information and data that allow us to have better customer service. It is a technology that exceeds the human capacity to retain information, to improve services, better serve the customer, and develop products" [Interviewee 6].

Similarly, another participant added the following:

"robots will behave much better than humans. Robots do exactly what humans want them to do. This will reduce the number of employees and the cost of employment. Automated services are systematic, timely, [and] avoid human errors and negligence. Robots do not get tired; they are not aging. Very few robots are needed to work. It is going to cut down operation costs, but you need to spend a lot of initial investment" [Interviewee 11].

This raises a debate on the convenience, or not, of robot adoption by tourism services, since this will result in a loss of human employment, or, at very least, in a change of employees' roles. In this sense, some

interviewees noted that robots are useful in developing complicated tasks that are difficult for humans to process. For example:

"robots can do the most expensive and mechanical tasks without interfering with working people, I mean without taking away their jobs. For example, cleaning dishes, taking out [the] trash, carrying boxes, everything that people do not want to do, or is harder to do" [Interviewee 5].

Another interviewee underlined that robots can effectively perform "tasks that are not humanly possible such as the collection of information and data, or the delivery of magical experiences" [Interviewee 6]. These perspectives understand robots' work as complementary to human labor.

Furthermore, the use of robotics in food services is recommended to provide faster and more efficient services. For example, in terms of hygienic conditions. To exemplify it, a participant stated that robots contribute:

"to speed up the provision of services, minimize negative impacts of delays, and faster responses. Automation produces, above all, a benefit as part of cleanliness and hygiene. However, I cannot imagine replacing the human factor in the restaurant. Only in an auxiliary way, to optimize the processes, the times" [Interviewee 12].

Similar to the above quote, most of the interviewees envisioned robotics as support for human labor that contributes to the effective provision of a service, such as with regard to checking processes and queue management. One of the interviewees reported the following:

"robots speed up the process. If there is a robot you create a process that is faster, you remove the manual process. It seems to me right if the robot does the most technical part, for example, the check-in. The customers are thankful. It is innovative. However, I need to do the interfacing with the client, the most sentimental part. The technical part is made by the robot, the emotional one by me. As a complement, it is a good combination. Because with the robot no conversation is created, and very important is the link with the client, to create loyalty" [Interviewee 1].

Robots in restaurants and food services as part of gastronomic experiences are regarded as a new and innovative factor that is gathering increasing attention. The interviewees highlighted the positive role robots can play in the provision of tourism services, for example, in developing difficult tasks and *a priori* to reduce operational costs, as well as in kitchen activities. Its role in efficiency improvement is noticeable. Robots are viewed as examples of 'good' behavior, only from the technical side. In this sense, most of the interviewees expressed that the implementation of robots in food services cannot replace people but can complement them since the capabilities of humans and robots are completely different.

4.2. Robots do not have 'emotions'

All the interviewees noted that the use of robots in food experiences will lead to the dehumanization of services. In general terms, the participants argued that the value of experience will be lost due to human-robot interactions. They said that robots are 'only' programmed machines. Robots do not have emotions, and as a consequence, they do not have common sense and cannot empathize with customers. One of the interviewees reported that "I would not like to go to a place where [I am] served only by robots instead of people. It is very futuristic" [Interviewee 5]. In this sense, one of the major problems identified by the participants with regards to the implementation of robots is the reduction of human-to-human interaction.

Additionally, a subject that was commonly highlighted by the interviewees is whether robots can help to solve unexpected issues in food and tourism experiences. As reported by one of the respondents:

"the problem with the robotization of this type of service is that the machine does not reason. The machine can never solve a problem for you. You go into a loop. In addition, the conclusion is that anyone cares about [it]. The robot is not ready for situations outside the configuration, and there are quite a lot" [Interviewee 10].

Similarly, another participant stated that "[everything is] all good unless you have a problem… [then you'll want to] speak to a person. When there is an issue or a problem, to talk to a robot may be frustrating to people, it may be more efficient, but you wouldn't like robots serving you…" [Interviewee 4].

In this sense, a food tourism experience is a 'personal' experience, which includes, according to the interviewees, the co-creation and co-sharing of experiences with host communities:

"in tourism, much of the experience relies on the relationship with the locals. Experiences are key in tourism. They are about people. From the internal point of view of a tourism business, in tourism you sell services, and I do not see robotization as something linked to the dining sector. I do not think it works or people demand it. In addition, is it efficient? The human being needs to put a face to places. If the human part is omitted, the nature of the experience is lost" [Interviewee 10].

Some of the participants are worried about the lack of empathy (for example, a lack of smiling) and communication in human-robot interaction:

"going to a place has the possibility of dialogue, of conversation, not only the dish to taste. A restaurant is a space for exchanging experiences and interpersonal relationships. Efficiency has this cost. However, there are many people who do not care about efficiency so much but sharing. What happens in a place when eating? It goes beyond food. To know other ways of thinking, reflected in the people who inhabit there, this is the charm of traveling" [Interviewee 12].

The potential for the loss of the meaning of 'hospitality' is the most important fear that emerged from the potential incorporation of service robots and robot chefs to food experiences, and tourism experiences in general. The participants expressed that a robotic environment results in a reduction of the *real* connection with a place, its culture, and its people. For example:

"when you arrive at a hotel or a restaurant, you want to talk to a person. You have questions about the space, recommendations, suggestions. This is lost with machines. They can also do it, but the human captures the profile of people. If you are young, you want a pizzeria, it is different than if you are an older couple. It can be more dynamic to order dishes through a digital program or to ask for the bill. However, we do not have the opportunity to talk with the chef. The opportunity to ask about a dish. Personal interaction is lost. Maybe for fast consumption, it is a good solution" [Interviewee 3].

Success in the adoption of robots by tourism businesses will also depend on the extent to which they are able to satisfy customers' needs and desires in each service encounter. Additionally, this latter statement offers an interesting bridge between robots and *fast-food* tourism activities, in contrast with the philosophy attached to *slow* food tourism practices, as it is further explored in the next paragraph and discussed later.

The context of the experience is very significant. The use and implementation of robots can be more (or less) positive, depending on issues such as the nature of the experience, tourists' profile, or their country of origin, as illustrated by some of the interviewees – also in previous examples:

"from a speed perspective, robots might be helpful probably in fast-food restaurants and take away services. Additionally, for in-home delivery. However, if you are heading [to] a restaurant and you want to enjoy the experience with friends, etcetera, that wouldn't work. Technology changes the world, but personal experience is also important. Food delivery and vending machines, not being in a restaurant scenario… however, the experience scenario is different. The business hotel is okay, McDonald's is okay, the restaurant is not okay. Interact with the people and staff at the restaurant. They make a difference. Robots can? When I have coffee in the mornings and the waiter comes, it means personal connection. The way he approaches, how he talks. Robots may be quite annoying" [Interviewee 4].

In summary, the interviewees strongly believe that robots do not

experience feelings, and they are not reasonable since they do not have common-sense knowledge. As a consequence, the participants' major concern is how the robotization of dining experiences will threaten the meaning of hospitality. According to the interviewees, robots are able to offer only a 'limited' experience.

4.3. 'A robot chef'? Really?

Robot chefs are described by the interviewees as a futuristic innovation. Some of them referred to a restaurant-based experience where robots cook as "in case it would be". Additionally, most of them affirmed that they would visit a robotic restaurant because of the 'experience': a meal entirely cooked by robots. However, there is a diversity of opinions on the notion of robots as 'real' chefs. On the one hand, a respondent supported the visit to a robotic restaurant because:

"robots are smart, fast, and clean. More so than human beings. Some chefs do not cover their ears, or speak when they cook… I go for robots. Robots are too fast. Five minutes is five minutes. Not human beings. And sometimes human beings tend to forget. Robots never forget" [Interviewee 11].

Additionally, robots in food services can explain restaurant menus in any language. For example, the same participant added that "if you can't communicate, then robots are useful. They can serve whatever kind of person; they can speak any language" [Interviewee 11].

In contrast, another participant reported the following:

"I truly would not go because I like human contact so much, to know who the chefs are. It would be depressing to see that human issues are being done by machines. Maybe I would be curious and go to see how the service is. You can tell the waiter not to put this or that, or instead of putting rice put pasta, or that the dish needs to be heated. I do not know to what degree the robot can reach. I want to go to local places, where they make grandma's recipes, authentic. In addition, build personal relationships. In the restaurant, you need a lot of human assistance" [Interviewee 6].

The feeling attached to this last quotation was commonly expressed by the interviewees.

Furthermore, the interviewees particularly underlined previous experiences that illustrate the use of robots in dining experiences – for example, robots as waiters – or as delivery machines. For example, an interviewee remembered that "in New York, there is a delivery machine where you order what you want and it delivers the food directly in a box. It's how they serve [it] in some fast-food chains – automated, divinely, quickly and efficiently" [interviewee 5]. A similar experience is reported by another participant:

"in France, I saw that they prepare dessert… pancakes, at the moment in a machine. I was excited to see what the result was but afraid that the instructions I gave weren't the correct ones. Emotion and fear! They recommended it to me, I went to see it. Not for the taste, but for the technology that caught my attention" [Interviewee 6].

Most of them provided these examples as first-time experiences where novelty and curiosity were the reasons to visit:

"a restaurant in Kathmandu has a robot service. First, when it was started, it was truly in the hype. Robots were serving you dinner. It was fun. It was new. You order the food and the robot brings the food to the table. We went to see robots serving. Wow, robots serving? We should go there, not for the food but for the robots. It is not interactive. The robot comes and leaves the food. That's it. However, robot chefs? On the funny side, I would go to see, just to experience. It sounds a little scary. To have a few machines to have a better facility is okay. However, to have robots to replace human beings is scary" [Interviewee 7].

In line with this last example, the interviewees also informed the researcher about some fears and doubts. For example, the use of robots and their success will depend extraordinarily on the type of activity and experience, as pointed out above. "The tourism sector is very personalized. Robots can sell you a ticket. However, if you go to a hotel, a restaurant, what you like is dealing with people, not robots" [Interviewee 9]. One of the interviewees said, "put a robot in a rural hotel and you'll see how many customers go" [Interviewee 5]. While the taste of food is one of the most critical issues in restaurantscapes, it is not the only issue. Here, the interviewees referred to both the skills of chefs and their abilities as 'human' cooks: "the food can't be so tasty. How can robots have these skills? Grams of this, grams of that, is okay. However, then nobody will study to be a chef in a restaurant! The recipe is okay, but not tasty" [interviewee 2]. In a similar vein, another respondent expressed the following:

"surely the recipe is millimetrically perfect. However, the love that the chef puts into cooking? There are things that come out of the human instinct that are lost. Rich recipes but with a lack of soul. In mechanized processes, it can work, for example, with some supermarket products, but in a restaurant, you [go to] have an experience. In certain ways, the current trend of returning to the origin, the slow consumption, is greater than that of robotization" [Interviewee 10].

To continue, the participants wondered whether robots would be able to create a unique and memorable experience: "if you go to Spain, Dubai, Australia…and there is a robot. What's the difference? You go and meet local people and know about local culture. If you interact with robots, where is the experience?" [Interviewee 4]. Most of the interviewees affirmed that they would like to experience a restaurant with a robot chef at least once, but they were also afraid about service flexibility and the 'soul' of the experience. This quotation illustrates this perception:

"food is not just a product. I pay for it because I pay for a service to share with people who serve and who cook. I would like to know who the chef is. It is not only the taste of the food that I enjoy but also the experience with the waiters and the owners. Not only the food but also all the personal interaction, and with robots, I will miss all of those" [Interviewee 8].

Robots cook and perform human work, but it is commonly expected that a restaurant experience lies in a co-shared space where human-to-human interaction is required, and this is also true in restaurant kitchens.

5. Discussion and conclusions

This research contributes to the understanding of the relationships between customer experiences, the hospitality industry, and the robotization of food tourism practices. As previous research acknowledged, the implementation of robots in tourism is growing (see, for example, Belanche, Casaló, & Flavián, 2020; Cain, Thomas, & Alonso Jr, 2019; Ivanov et al., 2019), and it has become an important challenge for hospitality businesses (Bowen & Morosan, 2018). In this context, a research gap was identified to explore customers' motivations to interact with robots in tourism from a qualitative perspective. The review of the literature demonstrates that service robots were approached from different perspectives. In particular, previous studies have analyzed managers' (Lee et al., 2018) and customers' attitudes on the implementation of robots in hospitality (Ivanov et al., 2018). Additionally, very recent research has explored the link between the intention to adopt bartending or delivery robots and customer trust (Tussyadiah et al., 2020). The results of their study revealed that individual attitudes towards technology highly affect trust in specialist service robots. Drawing from the concept of service robots (Choi et al., 2020; Murphy et al., 2017; Park, 2020; Van Doorn et al., 2017), this paper studied the opinions of tourists regarding the use of robots in dining experiences. As stated earlier, this research aimed to study how tourists perceive the adoption of robots by restaurants – with particular attention given to robot chefs – as part of the food tourism experiences of a destination.

This research provides a basis for further research with regard to tourists' perceptions about the implementation of robots in restaurants. A crucial question emerged, particularly focused on the development and promotion of robots as chefs. Can robots co-create *unique*

experiences? While previous research has reported that experiences can be co-created and co-consumed between humans and robots (Ivanov et al., 2019; Mende et al., 2019; Naumov, 2019), some interviewees in this study questioned this view. However, further implementation of robots in gastronomy tourism is required to confirm the correlation between the co-creation of value and its influence on customer acceptance of robots (see Murphy et al., 2017). Similarly, a key debate also emerged from the study that pushes both academics and practitioners to focus on how to keep the notion of hospitality in hospitality when robots substitute humans (Bowen & Morosan, 2018).

Restaurants are defined as a crucial factor in tourists' attraction to a location. Restaurants are regarded by the vast majority of the interviewees as spaces where human-to-human interaction is featured. This study confirmed the complicated nature of robots as part of a food-based tourism experience. Using a grounded theory approach, the results of this research are based on three categories: 1) advantages – the opportunities derived from the use of robots as human partners; 2) disadvantages – the relationship between the growing implementation of robots and a dehumanization of the hospitality and tourism industries; and 3) uncertainties – doubts and fears about robots that are (or can be) in charge of food services and restaurant kitchens.

First, in terms of the opportunities offered by the adoption of robots in tourism, the interviewees particularly manifested that the role of robots in gastronomy 'must' be planned as an added value to human labor. While they affirmed that robots cannot replace human tasks that require human skills, such as the host-guest relationship in a service provision context, the growing presence of robots in tourism will lead to a change in employees' tasks (Ivanov & Webster, 2019). Recent research suggests that service robots will either support or substitute employees in service encounters, and their implementation in hospitality and tourism will also contribute to improving human skills (Tuomi, Tussyadiah, & Stienmetz, 2020). The participants noted that robots are faster and cleaner than humans; however, every individual customer will need to decide if efficiency is more important than human-to-human interaction. This will be highly affected by personal circumstances (for example, sociocultural context), previous tourist experiences, and the type of encounter, as observed in this study. In this sense, the interviewees were very concerned about how the increasing adoption of robots by hospitality and tourism providers will result not only in dehumanization but also in the depersonalization of food services. In particular, the results have revealed that robot chefs are still a utopia. The interviewees mentioned that a robotic restaurant will be worth a visit to 'experience', but many of them confessed that the human skills of a 'true' chef cannot be replaced by a robot chef.

Figs. 1 and 2 summarize the results of the paper and its theoretical and practical contributions. While previous research explored the interaction between humans and robots in a tourism context, earlier studies were heavily dependent upon data obtained from large surveys (see, for example, Ivanov et al., 2018). This work stands in contrast to them by adding a qualitative approach to this conversation. Fig. 1 shows that robots are expected to contribute to the improvement of human work, especially in terms of efficiency and precision, which will result in greater human acceptance of robots. On the other hand, robots are judged as 'machinery' possessing far from human abilities, and as having a lack of capacity to make tourists feel. This exemplifies the most decisive challenge to the use of service robots and robot chefs in restaurant, service, and experiencescapes, as discussed in the next paragraph.

In this sense, the results revealed that robot chefs in gastronomy tourism can fit better with rapid 'fast food' practices because 'slow food' activities are contextualized as a set of experiences where locals and visitors actively co-create, co-promote and co-share diverse food cultures and sustainable ways of life (Fusté-Forné & Jamal, 2020). However, in this complex system, as observed in Fig. 2, robots can offer a memorable experience that can be applied to both fast and slow food tourism activities and practices. Why? Robots are able to process vast amounts of data, in terms of 'what a restaurant offers' (not only the menu but also the philosophy and context of the eatery) and 'who the customers are' (not only demographic but also psychographic profiles), and as a consequence, they can satisfy a diverse clientele. While this undoubtedly needs further research, the current paper advocates that robots can also create a meaningful experience based on local narratives. The placement of robots in the center of host-guest interactions will result in a further understanding of the *soul* of robots and how they can add to human-to-human interactions – apart from their efficiency in service provision. In particular, an in-depth analysis of customer-robot rapport building in service encounters (Qiu et al., 2020) will help anticipate future intentions to purchase robot-based experiences in hospitality and tourism (Kazandzhieva & Filipova, 2019).

Furthermore, this research is also relevant to food tourism planning. In terms of practical implications, the results of this paper inform stakeholders prior to the implementation of robot chefs in dining experiences. Restaurants are a key ingredient in (food) tourism experiences. In this sense, previous research has reported how a food experience not only affects travel satisfaction (Björk & Kauppinen-Räisänen, 2017) but is also a significant motivating factor to visit and revisit a destination (see Quan & Wang, 2004). Tourists' fears, with regard to robots that perform human tasks, are crucial in planning, implementing, and marketing robot-based experiences. How can we

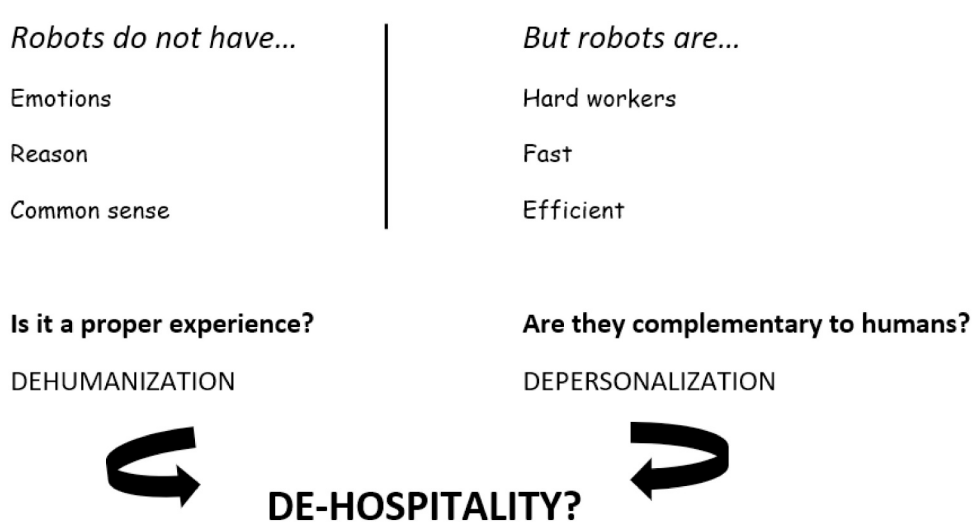

Fig. 1. Tourists' perceptions of the use of robots as chefs in food services.

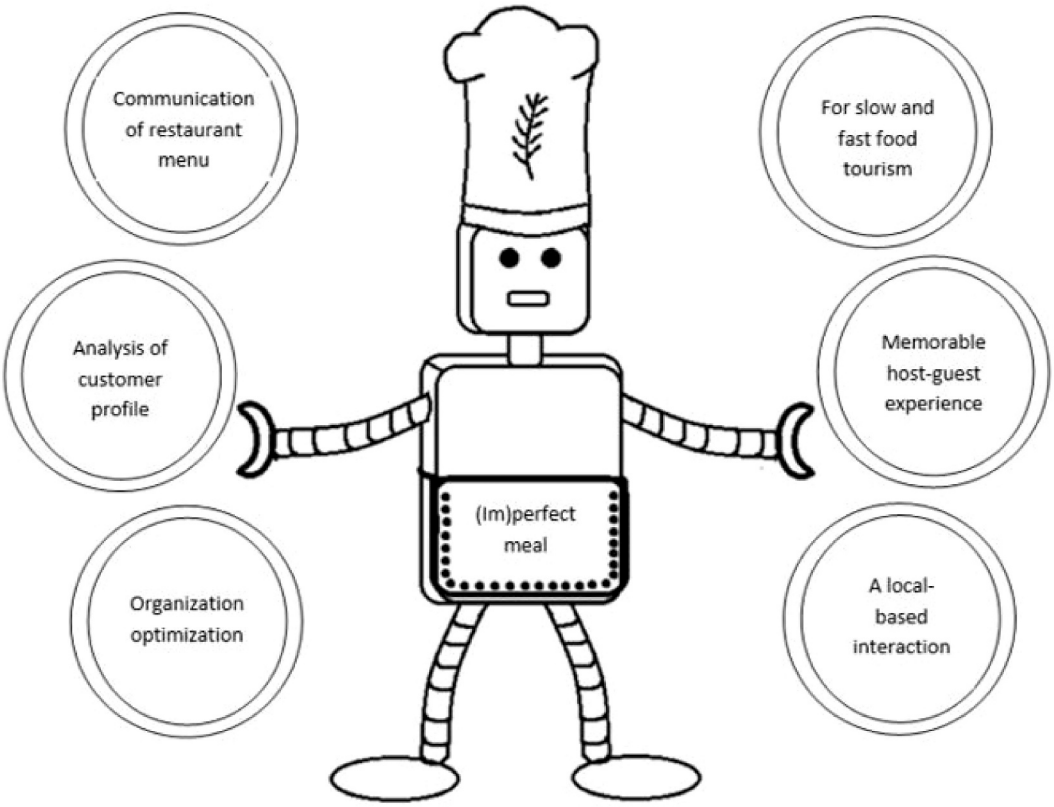

Fig. 2. A robot, a distinct and (im)perfect chef.

deal with it? For example, by theming the experience. As Pine and Gilmore (1998) stated, restaurants need to focus on the concept of 'eatertainment', where service robots and robot chefs contribute both to the 'eating experience' and the 'entertainment experience'. As food tourists seek novel experiences in their journeys (Cohen & Avieli, 2004), tourists in this study also mentioned that they would visit a robotic restaurant as a unique experience – to some extent, a 'once in a lifetime experience' (Björk & Kauppinen-Räisänen, 2017, p.11). In addition, the results have demonstrated that tourists focus not only on the 'food' experience but on the whole dining experience. While participants revealed a lack of confidence surrounding the 'soul' of food, they also acknowledged curiosity towards a menu cooked by a robot – in parallel to the strong need for a close human-to-human relationship in a restaurant scenario. In this context, further research will also contribute to identifying the perceived differences between service employees and service robots and between human chefs and robot chefs.

Robot chefs can cook and serve. Examples of recent use of robot chefs, such as the Spyce fully automated kitchen (Doyle, 2018), confirm that this paper is timely and innovative. However, there are many unsolved questions surrounding the implementation of robots as chefs. The most critical limitation of this qualitative research is its sample size and structure. While the geographically diverse background of the participants increases the validity of qualitative results, the sample is limited in nature, and the results cannot be generalized. Additionally, we must note that (both food and robot) experiences are highly subjective (Björk & Kauppinen-Räisänen, 2017; Ivanov & Webster, 2019). Nevertheless, the study offers insights into the factors that influence the perceptions of tourists regarding the use of robots in dining experiences. With regard to the specific context of back-of-house robots in food tourism, how can robots as chefs continue to stimulate the memorability of food tourism experiences in restaurants? Further research is required to analyze it from the perspectives of restaurant employees, owners, and human chefs in different geographical contexts.

However, according to Ivanov et al. (2018), the acceptance or resistance of humans towards the implementation of technologies in hospitality and tourism relies on personal attitudes, and service providers also need to consider the influence of each individual's cultural context (Choi et al., 2020). Moreover, it is interesting to analyze how the use of robot chefs is perceived differently by those who have or have not been involved in culinary encounters with robots. How does the role of the robot, or its design, affect traveler acceptance? Does a previous experience with robots influence their feelings? While recent research confirms that previous knowledge about a robot service influences consumers' purchase intention (Zhong et al., 2020), many unanswered questions suggest and urge further research on the topic.

Within this context, more research is also needed in terms of economic, ethical, legal, moral, security, and privacy concerns related to human-to-robot interactions in tourism (Ivanov et al., 2019). What is clear is that "self-service provision via [the] technology of service robots implies that this promising technology may enhance the quality of service marketing and management [which] generates a sense of market opportunities with new technologies that can actively enable hotels to adapt to the changing environment" (Kuo et al., 2017, p.1306). Recent research has also highlighted the role of anthropomorphism in marketing robot-based services in hospitality and tourism (Murphy, Gretzel, & Pesonen, 2019). Specifically, Hong Zhu and Ping Chang (2020) revealed that anthropomorphic designs of robot chefs will unquestionably contribute to the further implementation of artificial intelligence and service automation in restaurants. This research can lead to further studies that discuss how robotization shapes gastronomy tourism experiences and contributes to the creation of competitive advantage and differentiation (see Tuomi et al., 2020).

While this study was carried out before the current health crisis (Covid-19), further research about the impact of pandemics on food tourism is required. In particular, more robust scrutiny of restaurants with robot chefs is yet to come, with extraordinary practical

implications. The immediate future offers a great opportunity for studies focused on the relationships between robots and tourism, fostered by a context in which people are advised to avoid human contact (Seyitoğlu & Ivanov, 2020) and services are shifting 'from high-touch to high-tech' (Zeng, Chen, & Lew, 2020). This field of research can also contribute to the expansion of bridges between academia and industry to further implement service automation systems and robots rapidly and effectively. However, the use of robots in tourism cannot imply the standardization of food and tourism experiences: robot chefs must ensure the personalization of food tourism experiences, built on technological developments that improve products and services, and add value to human-to-human interaction.

Declaration of Competing Interest

The author declares that there is no conflict of interest.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.tmp.2020.100774.

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