International Journal of Hospitality Management 99 (2021) 103078

Contents lists available at ScienceDirect

International Journal of Hospitality Management

journal homepage: www.elsevier.com/locate/ijhm

Customer-robot interactions: Understanding customer experience with service robots

Dan Huang [a], Qiurong Chen [b], Jiahui Huang [b], Shaojun Kong [c,*], Zhiyong Li [b]

[a] Department of Tourism, Sport and Hotel Management, Griffith University, Australia
[b] Tourism School, Sichuan University, China
[c] Department of Gender and Cultural Studies, The University of Sydney, Australia

ARTICLE INFO

Keywords:
Service robot
Customer experience
Satisfaction
Acceptance
Artificial intelligence
Cognitive-affective-conative model

ABSTRACT

Technology developments relating to automation, artificial intelligence, and robots have transformed the landscape of service industries, including hospitality and tourism. Through a qualitative content analysis of online review data, this study seeks a comprehensive and grounded understanding of customer experience with service robots in hospitality and tourism settings. The analysis identified four categories of customer experience: (1) sensory experience (verbal language, physical appearance, kinesics, and paralanguage), (2) cognitive experience (utility, cuteness, autonomy, coolness, interactivity, and courtesy), (3) affective experience (enjoyment, novelty, negative emotion, and satisfaction), and (4) conative experience (approach/resistance). Results led to the development of a framework representing customer experience with service robots and to insights into customer-robot interactions. Most customers described positive experiences, and while service robots performed well in delivering functional and emotional value, social interaction skills need improvement.

1. Introduction

Owing to advances in mechanical engineering and computer science, especially artificial intelligence (AI) technologies, the use of robots has broadened from factories to complex human environments (Tung and Law, 2017), providing services in numerous sectors (Ivanov et al., 2019; Shin and Jeong, 2020). As a disruptive innovation (Belanche et al., 2020), service robots have permeated hospitality and tourism areas such as hotels, restaurants, airports, museums, and tourist attractions. They perform tasks such as checking in, greeting guests, providing information, showing the way, cleaning, delivering items, cooking food, and maintaining social distance during pandemics (Ivanov et al., 2019; Kim et al., 2021; Lu et al., 2021; Seyitoğlu and Ivanov, 2020).

While some of the above-mentioned tasks can be accomplished by using traditional self-service technologies such as touch screens, customer engagement with service robots augments frontline services with interactivity and enjoyment (Gursoy et al., 2019; Shin and Jeong, 2020). Due to their ability to provide consistent, accurate, and efficient services, hospitality and tourism businesses can benefit from using service robots to gain and sustain a competitive advantage in an ultra-competitive industry (de Kervenoael et al., 2020). However, some practitioners have been concerned that overwhelming employment of robot in service encounters may diminish humanist hospitality and customer experience (Choi et al., 2020; Fusté-Forné, 2021).

For hoteliers contemplating investment in a technology, a major consideration is whether the technology can enhance customer experience (Liu and Hung, 2021), and designing effective robotics for the hospitality and tourism sector depends critically on understanding how customers perceive and respond to service robots (Tussyadiah et al., 2020). Thus, exploration of customer experience with service robots is of practical importance. While previous robotics literature has examined customer preference (Kim et al., 2021), intention to use (Pillai and Sivathanu, 2020), and attitude (Fusté-Forné, 2021), researchers have not fully explored real-world customer experience with service robots (McLeay et al., 2021; Tung and Au, 2018).

Cognition, emotion and conation are significant elements constituting an individual' experience with, and responses to, a stimulus (Bagozzi, 1992), the information (e.g., shape and colour) of which is captured by sensation and translated into an individual's organism (Jansson-Boyd, 2010; Krishna, 2012). These elements reflect the interplay of environment, body and mental state, and integrating them provides a holistic picture of customer experience (Schmitt, 1999). Despite

* Corresponding author.
E-mail addresses: dan.huang2@griffithuni.edu.au (D. Huang), qrchen99@outlook.com (Q. Chen), jiahuihuang85@gmail.com (J. Huang), Skon5354@uni.sydney.edu.au (S. Kong), sculzy@scu.edu.cn (Z. Li).

https://doi.org/10.1016/j.ijhm.2021.103078
Received 19 March 2021; Received in revised form 27 July 2021; Accepted 20 September 2021
Available online 8 October 2021

their importance, few studies have taken these elements into consideration to explore customer experience with service robots. Additionally, robotic automation is likely to shift the currently theorised tourism experience (Tussyadiah, 2020), and exploring this new area, especially through qualitative enquiry, has the potential to achieve a novel understanding of customer-robot interactions.

In this vein, this study thus aims to explore customer experience with service robots by using a qualitative approach. The literature pertinent to environmental and cognitive psychology that provides insights to sensation, cognition, emotion, and conation, especially the cognitive-affective-behavioural model, serves as a broad theoretical underpinning to understand the experience. Inductive qualitative content analysis is used to analyse online reviews by customers who had encountered or been served by service robots in hotels, restaurants, and airports. This study contributes to knowledge on customer-robot interactions by providing a comprehensive understanding of customer experience with service robots in hospitality and tourism settings, enhancing research on robot servicescape. Additionally, this study provides an interactive and sequential perspective to understand different components of customer experiences by presenting a framework of customer-robot interactions. Study findings also offer new insights for research on consumer satisfaction with and acceptance of service robots.

2. Literature review

2.1. Customer experience

Customer experience refers to individuals' interpretations of and responses to stimuli as a result of encountering, undergoing, or living through things (Brakus et al., 2009; Meyer and Schwager, 2007; Schmitt, 1999). Such occurrences involve a set of consumer touchpoints with the offerings of a company or organisation (Gentile et al., 2007). Customer experience relates to sensory or participative consumption (Adhikari and Bhattacharya, 2016) and can occur through observing, hearing, tasting, touching, smelling, or directly engaging in activities. The formed experience leaves customers with positive or negative memories, resulting in either loyalty or abandonment behaviour (Mathayomchan and Taecharungroj, 2020).

The stimuli that give rise to customer experience often originate from encounters with the physical environment (mechanics) or social surroundings (humanics) (Carbone et al., 1994). These encounters have been researched in the hospitality and tourism literature largely with respect to physical servicescape (Hanks et al., 2017) or social servicescape encompassing employee-customer and customer-customer interactions (Hanks and Line, 2018; Jung and Yoon, 2011). Social servicescape has been found to be important in shaping customer experience in the hospitality and tourism industry (Hanks and Line, 2018; Jung and Yoon, 2011; Xu and Gursoy, 2021). Social servicescape comprises customer interactions with other social actors in a service environment (Line and Hanks, 2019). The features of these social actors, such as physical image and displayed emotions, serve as environmental stimuli that influence consumers' cognitive, affective, and conative responses (Pizam and Tasci, 2019).

As individuals' responses to stimuli vary in both intensity and nature, the multidimensionality of customer experience is well acknowledged in the literature. Schmitt (1999) distinguished five strategic experiential modules: *sense* (sensory experience), *feel* (inner feelings and emotions), *think* (creative cognitive experience), *act* (behaviours and lifestyles), and *relate* (e.g., connecting to a social group). Brakus et al. (2009) deconstructed brand experience into four dimensions: sensory, affective, intellectual, and behavioural experiences. The multidimensional nature has also been documented in the hospitality and tourism literature (Chan and Tung, 2019; Otto and Ritchie, 1996). Although these frameworks have been studied in different contexts, they have some elements in common with Brakus et al.'s (2009) four dimensions, which depict customer experience from the perspective of sensory, cognitive, affective, and conative experiences. The next section will discuss these dimensions and their relationships in detail based on literature related to the cognitive-affective-conative model and sensory experience.

2.2. The cognitive-affective-conative model and sensory experience

Grounded in appraisal theory (Lazarus and Folkman, 1985; Scherer et al., 2001), the cognitive-affective-conative model suggests that emotions are elicited by evaluations (appraisals) of objects or events which, in turn, affect individual behaviours (Bagozzi, 1992; Oliver et al., 1997). This model demonstrates and connects how one thinks about an object (cognitive experience), how one feels about an object (affective experience), and how one intentionally or behaviourally acts in an experience (conative experience). The model could be represented by three columns: cognitive processes, emotional reactions, and coping responses (Bagozzi, 1992).

Appraisal processes relate to the cognitive element where individuals' evaluative judgements and beliefs were formed based on their internal or situational conditions (Lazarus, 1991). The evaluated object can be an event that happened in the past or present, or may occur in the future (Bagozzi, 1992). The literature usually captures the cognitive element by considering the perceived attributes of an experience, product, or service, such as performance efficacy (Gursoy et al., 2019) and perceived service performance (Prentice et al., 2020).

Emotional reactions reflect the affective element of the cognitive-affective-conative model. Consumer emotional reactions are considered as subjective feelings elicited by evaluating an experience (Haim and Oliver, 1993). When one perceives an event to be negative, emotional reactions such as dissatisfaction, anger, sadness, disappointment, fear, and anxiety may arise; meanwhile, a pleasant experience can lead to positive emotional reactions such as satisfaction, pleasure, love, or joy (Bagozzi, 1992). Some customer experience literature treats emotion as only one category (e.g., Lin et al., 2020), while others consider discrete emotions with independent categories, such as positive emotion, negative emotion, and surprise (e.g., del Bosque and San Martín, 2008; Haim and Oliver, 1993).

Coping responses relate to the conative element of the model which captures intentional or behavioural aspects of coping. In a pleasant experience, specific intentions or behaviours (e.g., approach) serve as coping strategies to maintain or increase positive emotions; whereas, when an individual experiences negative emotions, intentions or behaviours (e.g., avoidance) serve as coping strategies to avoid undesirable outcomes (Bagozzi, 1992). For example, a decision not to visit a hotel again after an unpleasant experience is a coping response to relieve negative feelings.

Researchers have tried to extend the cognitive-affective-conative model by considering the interactions of the three elements. Most studies using this model consider that customer cognition, affect, and conation appear in a sequential manner. However, it is worth noting that appraisal theory contributors also acknowledge that the effects of cognition and emotion are bidirectional, with cognition influencing emotion and emotion impacting cognition (Izard et al., 1984; Lazarus, 1991). Therefore, some researchers integrate the idea of bidirectional effects into the cognitive-affective-conative model to understand individual psychological processes (e.g., Pachankis, 2007). Additionally, others suggest that cognition can also directly lead to conation (e.g., Sari et al., 2016; Taylor, 2020), even though affective aspects significantly mediate this relationship (Taylor, 2020).

The cognition-affect-conative model was named as an "intervening response system" that people use to process information based on individual inputs (e.g., personality) and environmental inputs (Holbrook and Hirschman, 1982). Environmental psychology literature also suggests that positive/negative internal responses to a service environment lead to approach/avoidance behaviours (Bitner, 1992; Pizam and Tasci, 2019). The channel linking environmental stimuli and the intervening response system comprises sensory experience (Bell et al., 1990;

Goldstein, 2007; Mehrabian and Russell, 1974).

Sensory experience includes visual, auditory, gustatory, olfactory, and tactile experiences. Sensory experience relates to what Gifford (2007) refers to as "environmental perception" (e.g., what perceivers see and hear) which is regarded as "the initial information-gathering phase" (p. 23) of the process where environmental information is appraised and assessed. As also suggested by Goldstein's (2007) sensation-perception model, environmental stimuli such as light, colour, sound, noise, heat, and smell are the source of information for sensory organs, the activation of which is called sensations that serve as initiators for individuals' interpretation of the environment. In their conceptualisation of the sensory dimension of tourist experience, Agapito et al. (2013) also claimed that sensory experiences initiate tourists' responses to environmental stimuli, which then lead to a series of internal responses such as cognitive and affective associations. In conclusion, these studies support the idea that sensory experience plays a channel role in person-environment relationships.

The above review shows the complexity of the relationship among sensory, cognitive, affective, and conative experiences. Acknowledging this complexity, and based on the four dimensions of customer experience, this study attempts to understand customer experience with service robots.

2.3. Service robots

Service robots, also termed social robots (Tung and Law, 2017), are "system-based autonomous and adaptable interfaces that interact, communicate and deliver service to an organization's customers" (Wirtz et al., 2018, p. 909). Robotics technology involves three characteristics that differentiate service robots from traditional technologies (e.g., self-service technologies) (Lu et al., 2019; Tuomi et al., 2021; van Doorn et al., 2017): (1) automatically sensing, learning, and reacting to environments; (2) engaging customers at a social level; and (3) requiring little learning effort from users. Service robots can be physically or virtually embodied. They interact directly or indirectly with customers in various service encounters that are regarded as a critical "moment of truth," where consumer judgement about service quality is formed (Lu et al., 2020).

Service robots can enhance the value of service experience through support (supporting employees), substitution (replacing employees), differentiation (automation for novelty), improvement (automation for better products), and upskilling (automation for better jobs) (Tuomi et al., 2021). They improve service experience by "adding some freshness to hospitality services" (Qiu et al., 2020, p. 264). Service robots demonstrate a clear advantage over human employees in performing repetitive tasks (de Kervenoael et al., 2020) and have various functional benefits, such as 24/7 availability for guests (Park, 2020), efficiency (Fuentes-Moraleda et al., 2020), and quality control (de Kervenoael et al., 2020). Often, they also add enjoyment and fun to the customer's experience (Fuentes-Moraleda et al., 2020).

However, some practitioners have expressed concern that using robots in service encounters may diminish the service experience (Choi et al., 2020; Fusté-Forné, 2021). Guests may expect to encounter hospitable human staff to feel welcomed (Kim et al., 2021) and may consider service by a robot as dehumanising the service by diminishing the sense of "human touch," threatening the meaning of hospitality owing to the lack of emotion (Fusté-Forné, 2021). Therefore, investigating customer experience with service robots can provide helpful insights for practitioners who are hesitant to invest in robots and are waiting to see the responses of the market.

Recognition of the importance of understanding customer responses towards robots has led to a growing number of studies focusing on customer-robot interactions. Researchers have examined various customer responses in customer-robot interactions, including, but not limited to, customer experiences (Tung and Law, 2017), trust (Tussyadiah, 2020), satisfaction (Leung and Wen, 2020), perception (Christou et al., 2020), and adoption/acceptance (Lu et al., 2019; Shin and Kang, 2020).

Several studies that predominantly focused on customer experience with service robots are worth mentioning. Tung and Law (2017) proposed a framework of presence-embodiment to understand customer experience through reviewing existing literature. Subsequently, Tung and Au (2018) deductively explored customer experience with service robots in hotels by drawing on five dimensions of user experience conceptually proposed by Weiss et al. (2009) in an evaluation framework for customer-robot interactions: embodiment (e.g., anthropomorphic, zoomorphic, and caricatured features), emotion, human-oriented perception, feeling of security, and co-experience. Additionally, Choi et al. (2020) examined the influence of culture on customer experience with service robots by analysing online reviews. These studies groundbreakingly contribute to the research of customer-robot experience and entail a promising research area in hospitality and tourism. As the phenomenon is new and previous studies mainly apply a deductive perspective, an inductive perspective can broaden the understanding of customer experience in naturalistic settings.

Adoption/acceptance is the dominant topic in customer-robot interactions. Drawing on traditional technological acceptance models, such as the technology acceptance model (TAM) (Davis, 1989), the unified theory of acceptance and use of technology (UTAUT) (Venkatesh et al., 2003), and UTAUT2 (Venkatesh et al., 2012), existing studies have examined influential factors of customer robot adoption such as perceived usefulness, perceived ease of use, performance efficacy, intrinsic motivation, social influence, facilitating conditions, and emotions (e.g., de Kervenoael et al., 2020; Lu et al., 2019; Pillai and Sivathanu, 2020; Stock and Merkle, 2017). Some studies also used the service robot acceptance model (sRAM) proposed by Wirtz et al. (2018) to understand the impact of functional dimensions, relational dimensions, and social-emotional dimensions on customer acceptance (e.g., Fernandes and Oliveira, 2021; Fuentes-Moraleda et al., 2020). Based on constructs from Lu et al. (2019) and appraisal theory, Gursoy et al. (2019) developed the artificially intelligent device use acceptance model which highlights the influence of cognition (e.g., performance efficacy) on customer acceptance through the mediating role of emotion. Although these studies focus on service robot acceptance, they implicitly reflect the importance of cognition and emotion involved in customer-robot interactions.

Customer-robot interactions are closely related to the communication of information (Tussyadiah and Park, 2018) which is carried by verbal (e.g., speech and language style) and non-verbal (e.g., facial expressions, shape, and pattern of movements) signals. These communication signals demonstrated by service robots trigger various consumer reactions (Young et al., 2011). An important non-verbal cue that attracts customer attention is physical embodiment, which can be categorised into three morphologies: anthropomorphic (i.e., human-like), zoomorphic (i.e., animal-like), and caricatured (e.g., basketball-like) robots (Tung and Law, 2017). The morphologies and physical appearance of service robots are likely to impact customers' attitudes (Lin and Mattila, 2021), perceived value (de Kervenoael et al., 2020), intention to adopt service robots (Shin and kang, 2020; Shin and Jeong, 2020), and emotional experiences (Zhang et al., 2010). For instance, Zhu and Chang (2020) found that anthropomorphism of robotic chefs, in terms of physical appearance, increases customers' warmth perception.

In addition to physical appearance, robot voice is also a dominant feature that stimulates service encounter evaluation and behavioural intentions (Lu et al., 2021). Zhang et al. (2010) found that, compared with a synthesised voice, a digitised voice (more human-like) leads to positive emotional responses. Other non-verbal cues such as head tilts (Yu and Ngan, 2019), eye colour changes, body movements (Rosenthal-von der Pütten et al., 2018), and gender (Tay et al., 2014) were also found to exert influence on customer perceptions and emotions in customer-robot interactions.

Language style is a powerful verbal cue that forms individuals'

perceptions of robots (Choi et al., 2019). For example, a human-like language style has a positive impact on service encounter evaluations (Lu et al., 2021). Literal (vs. figurative) language style used by the service robot leads to a more favourable evaluation of service encounters (Choi et al., 2019). Furthermore, Lv et al. (2021) found that cute language style increases customers' tolerance of service failure.

The studies discussed above provide important insights into customer-robot interactions. However, as most previous studies are conceptual papers or experiments with hypothetical scenarios, some researchers argue that exploring customer experience with service robots in real-world settings is needed for a more rounded understanding (e.g., McLeay et al., 2021; Tung and Au, 2018). Although service robots may play a role similar to that of traditional human service personnel or self-service technologies, they also manifest the characteristics of automated information systems and AI technologies, which are likely to fundamentally transform customer experience (Gursoy et al., 2019; Hoyer et al., 2020; McLeay et al., 2021). The distinction from traditional service encounters calls for exploratory studies to gain a grounded understanding of customer experience in customer-robot interactions. A qualitative approach based on user-generated content that gives data a void to "speak" comes to the fore.

2.4. User-generated content as a resource for customer experience research

With the rapid development of information technology and social media, the Internet provides an important venue for users to communicate online and exchange knowledge, making user-generated content an easily accessible instrument for researchers (Huang, 2017). User-generated content can be defined as the experiences and opinions that users post through various online platforms in the form of text, pictures or videos, which can be accessed by other users (Ayeh et al., 2013; Xiang and Gretzel, 2010). Mining user-generated content has become an essential instrument for researchers due to its value as a public data set (Huang, 2017).

Individuals' consumption experience is always reflected in the stories they tell (Huang, 2017; Volo, 2010). In consumer experience research, scholars often use traditional approaches such as in-depth interviews, structured surveys, and focus groups to collect customers' stories (Volo, 2010). Compared to traditional approaches, user-generated content provides a new perspective for understanding consumer experiences and has several advantages. Users are self-centred and not influenced by researchers when they generate content online, making the content more authentic, and researchers can always access up-to-date, rich and reliable information (Huang, 2017). Additionally, collecting such data is efficient and inexpensive for researchers (Lu and Stepchenkova, 2015; Zhou et al., 2014).

In the field of hospitality and tourism, scholars have investigated customer experiences using various forms of user-generated content such as blogs and online reviews (Lu and Stepchenkova, 2015). For example, Tse and Zhang (2013) analysed how mainland Chinese bloggers communicate their Hong Kong travel experiences. Xiang et al. (2015) deconstructed hotel guest experiences through consumer reviews from Expedia.com. By analysing online review comments, Cheng and Jin (2019) presented Airbnb users' experiences and Huang et al. (2020) explored the experiences that lead to users' discontinuance of using Airbnb. Zhou (2020) explored Chinese hitchhiking experiences through travel blogs. Thus, these articles have shown that user-generated content can be a credible source of data in tourism research, especially in the area of consumer experience.

The study of service robots is still in its infancy and using user-generated content as a data source is innovative and worth exploring, while only a few scholars have made contributions to this field (Fuentes-Moraleda et al., 2020). Researchers have used online reviews from travel websites (e.g., Choi et al., 2020; Tung and Au, 2018) and social media (e.g., Yu, 2020) to better understand human-robot interactions. For instance, Tung and Au (2018) explored consumer experience with robots through reviews on several travel websites. Yu (2020) illustrated individual perceptions towards human-like robot employees in the hotel industry based on YouTube reviews. Combining data from a hotel website and social media such as YouTube and Instagram, Gretzel and Murphy (2019) unveiled how ideological positions colour the consumer sensemaking process with service robots. These scholars have shown the effectiveness of user-generated content as a resource to conduct service robot research. Given the benefits of user-generated content and its reliability being proved by previous research, this study aims to understand customer experience with service robots by using user-generated data from Sina Weibo, a social media platform.

3. Methodology

To achieve the research goal, this study used a qualitative research design. Qualitative research lies in describing and classifying phenomena and observing how the concepts relate to each other (Dey, 1993). Owing to the fragmented knowledge of the current research phenomenon, qualitative content analysis was used to gain new insights and provide a comprehensive understanding of customer experience.

Data were collected from Sina Weibo, a widely used micro-blog platform in China that is similar to Twitter. Micro-blog data have been recognised as typical user-generated content, which provides researchers an unobtrusive form of research to unfold and interpret individuals' experience (Huang, 2017). This study was conducted using the Chinese platform because service robots are increasingly being used in hotels, restaurants, and airports in China, and China is one of the top robot markets in the world (Guerry, 2020).

Data were collected through purposive sampling. The keywords "hotel/restaurant/airport" and "robot" retrieved the reviews (blogs) that were published before 10 January 2021, which were manually acquired. As Weibo is mainly used by people who speak Chinese, only reviews in Chinese were collected. Two researchers read each downloaded review, retaining for analysis reviews that clearly indicated customers' experience, such as what customers saw and thought when encountering a service robot. Of the 1254 reviews downloaded, 109 reviews were deleted because they did not clearly indicate the experience or were advertisements and comments on others' blogs. The result was 1145 reviews for final analysis. To protect review poster privacy, in reporting the results, this study replaces users' names with serial numbers and avoids presenting quotes with sensitive information (Zimmer, 2010).

Fig. 1 provides an example of the data. Descriptive information about the reviews and review posters was also obtained (Table 1). The review posters were from various areas of China and most reviews were published after 2019. The reviews in 2020 have increased significantly and account for about 57.5% of the total reviews. This seems to show an increasing implementation of service robots after the outbreak of Covid-19, highlighting a significant role that service robots have played in the hospitality and tourism industry during the pandemic.

Data were analysed using qualitative content analysis with an inductive procedure (Elo and Kyngäs, 2008). First, two researchers independently open-coded the data. They read through the text material several times to become familiar with the phenomena and coded a word, term, phrase, sentence, paragraph or an emoji that indicated what customers had experienced (e.g., what they thought and how they felt). Second, the coded units were carefully examined and compared for similarities and differences, which generated sub-categories. Third, a constant comparison process was applied for sub-categories to generate categories with a higher level of abstraction. To facilitate comparison of the results with results of previous studies, the identified sub-categories and categories were mainly labelled on the basis of current literature. The two researchers discussed their coding results, and areas of disagreement were re-examined until a consensus was reached.

The above steps resulted in a coding book. According to the coding

Fig. 1. An example of online reviews.

Table 1
Descriptives of the review posters and reviews.

Items	No.	Items	No.
Gender		**Release time of reviews**	
Male	285	2021	24
Female	860	2020	658
Residence		2019	251
East China	308	2018	55
South China	134	2017 and before	157
Central China	60	**Word number of reviews**	
North China	249	20 or less	174
Northwest China	28	21–50	425
Southwest China	66	51–100	277
Northeast China	34	101–200	203
Overseas	97	More than 200	66
Unknown	169		

book, a third researcher coded 20% of the data, which yields an acceptable agreement rate of 87.19%. Disagreement was discussed among researchers again and the coding was revised accordingly, resulting in an agreement rate of 95.44%. Most of the disagreement was due to the omission of information in the text by the third researcher. For instance, in the case of "Nobody but robots in the front desk. Dinosaur [an emoji of dinosaur]. So cute," the third researcher did not code "dinosaur" as a meaning unit in the sub-category of "physical appearance" and, after discussion, agreed that this should be regarded as "physical appearance." Additionally, to improve the trustworthiness of the analysis process (de Kleijn and van Leeuwen, 2018), an audit trial was conducted to record the researchers' consideration and justification during the data collection and analysis.

To provide more transparency as well as visualise the results and their co-occurrence relationships, a co-occurrence network was drawn using Gephi. Gephi is one of the leading tools to create and visualise networks (Cherven, 2013). The network usually reflects the connections between nodes (e.g., sub-categories), the connections of which are drawn from co-occurrences of nodes in the same sentence, same paragraph, or same document (Levallois, 2017). This study drew the co-occurrence network based on the occurrence of two sub-categories in the same document (i.e., online review).

4. Findings

As shown in Table 2, the analysis identified four main categories along with 15 sub-categories. Fig. 2 provides the co-occurrent network, drawn with Gephi software, that shows the 15 sub-categories. The connections between sub-categories of experience were weighted according to the co-occurrence in each review. The size of a circle was weighted according to the frequency of a sub-category appearing in the 1145 reviews. The co-occurrent network shows that most experience variables can co-occur in a single service encounter. For instance, when encountering a service robot, a customer may experience the physical appearance of the robot as well as its cuteness. As shown in Table 2 and Fig. 2, utility, cuteness, enjoyment, and novelty were the most frequently mentioned experiences. The following sections elaborate on the 15 sub-categories of experience.

Table 2
Frequency of sub-categories.

Categories	Sub-categories	Frequency			
		Hotels	Restaurants	Airports	Total
Sensory experience	Verbal language	93	16	5	114
	Physical appearance	89	11	14	114
	Kinesics	32	15	8	55
	Paralanguage	32	2	2	36
Cognitive experience	Utility	407	181	22	610
	Cuteness	412	130	54	596
	Autonomy	97	13	7	117
	Coolness	41	38	9	88
	Interactivity	38	8	9	55
	Courtesy	29	13	1	43
Affective experience	Enjoyment	181	52	41	274
	Novelty	122	112	14	248
	Satisfaction	96	44	12	152
	Negative emotion	16	12	3	31
Conative experience	Approach/ resistance	69	35	12	116

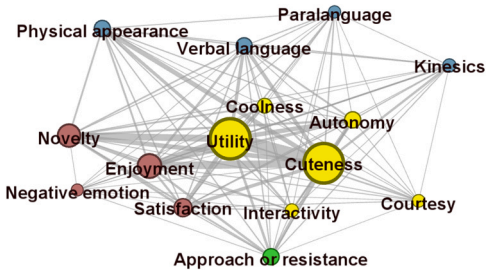

Fig. 2. Network for the sub-categories of experience. Blue, yellow, red, and green nodes present sensory, cognitive, affective, and conative experiences, respectively. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

4.1. Sensory experience

Sensory experience relates to what customers saw, heard, smelled, and tasted when encountering service robots. They mainly noted what they had seen and heard in the reviews. The category of sensory experience thus contains physical appearance, verbal language, kinesics, and paralanguage of service robots.

4.1.1. Physical appearance

Physical appearance refers to the outward look of service robots. Some consumers described the body shape of robots as "small," "round," "slim," and "chunky." Anthropomorphic (e.g., "humanoid robot"), zoomorphic (e.g., "panda-like," "dinosaur-like") and caricatured (e.g., "Minion-like") features were also mentioned in the reviews. Customers also noted the body parts or dress of robots, such as "neat bangs," "small eyes," "big head," and "little kerchief." These descriptions with human features indicate that customers sometimes anthropomorphise service robots. Some reviews used a metaphor to describe the physical appearance, such as "trash can," "washing machine," and "gas tank," as N.239 posted: "*I opened the door and found a robot that looked like a washing machine, hah-hah. it's so cute.*" This quotation indicates that the visual features form the first impression, serving as external stimuli that shape customers' subsequent experiences.

In line with employee-customer interactions (Baker and Kim, 2018; Hanks and Line, 2018), customers seem to use physical appearance as an important factor to make judgements about the traits of the robots. "Agreement in judgements of beauty relate predominantly to first impressions" (Rumsey and Harcourt, 2005, p. 5) and physical attractiveness tends to gain more positive impressions (Lorenzo et al., 2010). As a significant element of social servicescape, physical appearance has an impact on customer emotion and cognition (Hanks and Line, 2018; Jung and Yoon, 2011). In customer reviews, appearance descriptions are often followed by cognitive and emotional evaluations, as N.568 put it: "*encounter a food delivery robot with cute gait, small eyes, big head. Lovely, I cannot help but laugh, and really want to kiss it,*" and N.147 wrote: "*I went to Chengdu and the hotel's robot looked like a panda, which was so adorable.*"

4.1.2. Verbal language

Verbal language refers to words expressed through sound to communicate information. Many consumers shared what the robots said, directly quoting or paraphrasing what they had heard from the robots. Funny and humourous language was popular among robots and related content included: "Please give me a positive review and my mother will give me candy," "I'm still a baby," "You are the cutest person in the world," and "Mom called me home." Most of the verbal content expresses a sense of humour, which can bring laughter, amusement and fascination, and fosters interactions and the approval of others (Tsai et al., 2015). When humour and physical attractiveness are combined in service delivery, positive customer service evaluation is multiplied (Tsai et al., 2015).

The spoken content was intertwined with other cognitive, affective, and conative experiences, such as "*When she [the robot] entered the elevator, she said that 'this baby is getting into the elevator.' It's so cute. Hahhah*" (N.226). Thus, after hearing robots speak, consumers generated, for example, perceived cuteness, enjoyment, and novelty. Robots can praise guests regardless of interpersonal boundaries and people who are praised always tend to be happy, as N.143 wrote: "[The robot said] *'You are the cutest person in the world'—This is true [emoji of very happy].*" Flattering guests is often used as a strategy by service providers to please guests and prompt their buying behaviour. "Humans are susceptible to flattery from computers" (Fogg and Nass, 1997, p. 551) and an individual who is flattered is more likely to assign credibility to, and like, the flatterer (Vonk, 2002). The use of ingratiation (e.g., flattery) by service providers can increase customer satisfaction (Yagil, 2001). Thus, the expression of compliments to customers in the robot's verbal language may shorten the distance between the machine and human, building rapport in their relationship and increasing customer satisfaction. Exploring the flattery effects in human-robot interactions could be an interesting topic worthy of future research.

4.1.3. Kinesics

Kinesics represents the dynamic movements of the body as a whole or any parts of the body, such as a hand or the face. In the online reviews, 55 reviews involved this concept, the highest proportion of which are descriptions of body movements. Customers observed that robots could dance and spin, blink their lights, and change gestures and behaviour. As one review put it, "*The artificial intelligence robot at Kunming Changshui Airport is so cute! It can move its hands! I said goodbye to her, and she would also raise her little hand and wave goodbye to me!*" (N.616). Facial movements were also included in the kinesics experience, such as changes in facial expressions and eye contact: "*The robot can spin around and make facial expressions!*" (N.85) and "*The robot can make all kinds of eye contact and speak, so cute~*" (N.472).

A robot's kinesics embody its aliveness and motion is a key dimension of anthropomorphism (Epley et al., 2007). In human-robot communication, the movements, gestures and postures of the robot are likely to be given a meaning by customers. Human brains are programmed to pay attention to movements and even eye contact could serve as a key communication skill (Carol, 2008), as N.532 mentioned: "[The robot] *stared and listened to me. It was cute*" (N.532). Interestingly, a clumsy motion can be perceived as endearing by some customers who described the robot as "adorkable," probably due to the connection of the clumsy motions of a baby, while an overly mechanised feature of robots with a faster speed than that of human may bring about disturbing feelings in customers.

4.1.4. Paralanguage

Paralanguage is the non-verbal aspect of speech, such as intonation, tone, pitch, and rate of speaking. The robot's voice and tone were described as child-like, such as "children's voice," "baby voice," and "sweet voice," which gave customers a positive feeling. For example, N.715 commented: "*Today I was touched by a robot. I ordered the takeaway at the hotel….The voice was sweet and slightly childish.*" However, robots' paralanguage also created negative impressions. Some customers experienced the digital voice of robots as unnatural, weird, artificial, scary, and uncomfortable. Three customers mentioned that the voice was noisy. One customer mentioned the child-like voice made her uncomfortable. Though humans are born with a preference for baby-like features (Rumsey and Harcourt, 2005), customers might anthropomorphise a robot with a child-like voice and feel that they are served by a child who is under 18, which makes them uncomfortable.

Non-verbal behaviour is of great significance in impression management (Burgoon et al., 1990; Carol, 2008). The findings of this study echo prior studies on non-verbal communication that emphasise the role of paralanguage, kinesics, and physical appearance in

employee-customer interactions (Islam and Kirillova, 2020; Jung and Yoon, 2011). This indicates that research in employee-customer interactions can serve as knowledge foundation for future human-robot interaction research.

4.2. Cognitive experience

Cognitive experience denotes to consumers' cognitions and thoughts that involve a cognitive appraisal process. Six sub-categories were identified: utility, cuteness, autonomy, coolness, interactivity, and courtesy.

4.2.1. Utility

Utility refers to the level of perceived usefulness and instrumentality of a service robot in engaging in a task to serve customers. Consumers' attention was strongly focused on the practical utility of service robots in customers' descriptions of a specific service behaviour (e.g., room delivery, serving dishes, and leading the way) of service robots and the robot's functionality (e.g., the ability to speak multiple languages). They also used some abstract descriptions, such as "convenient," "practical," and "efficient" to express their cognitive understanding. Most customers appreciated the utility of service robots, exemplified by "*It is really good news for lazy people*" (N.127) and "*I used the robot service many times a day. I like this hotel and I don't have to go downstairs to get takeaway anymore*" (N.712). The latter quote shows that utility also connects to the customer's positive attitude towards the hotel. The experience of utility also changed the attitude of N.708:

> *In the past, I thought that hotel robots were more about gimmicks without practical value. But when I engaged in the scene to observe them, I found that they could really help the hotel solve the problem of staff shortage and enhance customer experience…guests do not need to go downstairs to pick up the meal anymore.*

A small number of customers did not experience utility and thought robots were "useless" and "just a gimmick," as N.593 wrote: "*Basically, they are just ornament, and only in charge of selling cuteness to catch customers' eyes*." The finding of utility is in line with perceived usefulness in the TAM (Davis, 1989) and reflects the functional element in the service robot acceptance model (sRAM) (Wirtz et al., 2018). The higher the usefulness perceived by users, the more positive the attitude and behavioural intention towards use (Schepers and Wetzels, 2007).

4.2.2. Cuteness

Cuteness refers to the extent to which guests perceive the service robot to be cute and adorable. It is a frequently mentioned category and an attractive feature of robots that provide frontline services. Customers used such words as "cute," "kawaii," "moe," and "adorable" to express their perception. The cuteness perception was mainly derived from the robots' features of a child-like voice, an endearing appearance, and a humourous expression, and was sometimes also stimulated by the robots' clumsy movement, as N.157 wrote: "*It went round and round, upstairs and downstairs, just can't find the room. Hah-hah, although the program is a little bit silly but I inexplicably thought it is a little bit cute*." This quotation reflects what Marcus et al. (2017) called "cuteness by contrast, " a different cuteness from "cuteness by attribute" (e.g., cute voice). The contrast between appearance, personality, behaviour, and identity can bring a cute perception (Marcus et al., 2017), such as the contrast between the high-tech attributes of AI robots and the clumsiness of their behaviours.

The features discussed above form a "cuteness capital" of service robots, which can increase customers' tolerance of service failure (Lv et al., 2021) and encourage their recommendation intention, as N.81 wrote: "*I recommend this hotel not because the breakfast is delicious or the room is good, but because the service robot is so cute*." Perceived cuteness not only relates to *kindchenschema* (i.e., aspects of a cute infant) but also a whimsical cuteness associated with fun and playfulness (Nenkov and Scott, 2014), illustrated by "*So cute! It can praise you for being good--looking!*" (N.342). Two reviews indicated that robots are not cute enough, and one customer stated: "*It would be better if it could be cuter*" (N.148).

Cuteness is a powerful tool for gaining customer acceptance as humans have a strong will to physically approach a cute object (Dale et al., 2017). Thus, designing cuteness cues is a smart strategy for facilitating the diffusion of innovation for robots. According to existing literature and online reviews collected by this study, round, soft, small-sized, and sociable attributes such as large round heads, large eyes, and child-like voice are highly related to cuteness (e.g., Mara and Appel, 2015; Marcus et al., 2017).

4.2.3. Autonomy

Autonomy, based on customer perception, is the extent to which the service robot can sense and act to perform tasks on its own without direct human intervention. Most of the online reviews involving this concept relate to autonomy of behaviour. Customers frequently mentioned that service robots were able to independently finish the task, such as taking items (e.g., food and beverage) to a guest's room, taking the elevator, charging itself, and avoiding obstacles without staff intervention, as exemplified by "*It can return to the charging pile on its own to automatically charge itself*" (N.605) and "*I saw a live robot…it really can take the elevator up and down by itself*" (N.747).

Several customers also noted sensing autonomy of service robots that can identify the surrounding environment and make judgements, as N.143 noted: "*Unexpectedly, it knows to wait and talk after I open the door! So smart!*" Autonomy is an important feature of AI robots (Beer et al., 2014), as service robots' autonomy leads customers to infer that robots have not only the ability to do things by themselves but also to feel, which reflects the *agency* and *experience* in mind perception theory (Gray et al., 2007; Gray and Wegner, 2010). One of the differences between AI robots and mechanical robots is autonomy, which easily leads to a sense of novelty (Warren and Campbell, 2014). As AI robots become increasingly intelligent, autonomy will be perceived more broadly in the consumer experience.

4.2.4. Coolness

Coolness is a positive attribute of service robots when consumers perceive robots as being cool and on the cutting edge. Some customers expressed the feeling of coolness or a sense of technology owing to the robots' advanced development and intelligence: "*Exploring the first intelligent hotel in Chongqing. Experiencing intelligent voice assistant and robot services. It is very cool!*" (N.402).

Consumers believed that robots represent technology development and modernisation, and they praised AI robots for improving the service level of the hotel. The finding of coolness in customer experience echoes Cha's (2020) study, which highlighted the important role of coolness in generating customers' acceptance of service robots. More than one consumer has expressed their perception of "coolness" by mocking themselves as old-fashioned and out of step with the times. Nevertheless, perceived coolness has been found to positively influence customer satisfaction (Liu and Mattila, 2019) and intention to use (Bogicevic et al., 2021; Cha, 2020).

4.2.5. Interactivity

Interactivity is the extent to which the service robot is perceived to be able to facilitate and respond to communication. This communication can be verbal or non-verbal interaction, such as chatting, inviting customers to take photos together, and proactively greeting customers by moving towards them. Few customers mentioned the interactivity of robots, although customers wrote positive comments if the robots interacted with them, especially when the robots responded to their questions: "*Yesterday, I talked with it (robot) till late at night. It is really excellent company*" (N.248). Three customers indicated that the robots

lacked interactivity, and N.965 expressed her aspiration: "*I hope that robots can have more functions in the future, such as accompanying, chatting, and nursing*."

Interactions are at the heart of customer experiences (Bolton et al., 2018; Campos et al., 2015). Customers' need for interactivity reflects the importance of the social element in generating positive experience. The finding of interactivity resonates with Baddoura and Venture (2013) who proved that sociable robots are more likely to bring positive affective states in the communication process. Owing to the significant role of the interactivity of robots in service encounters, it is critical to consider this factor in hospitality and tourism experience design.

4.2.6. Courtesy

Courtesy refers to the extent to which the service robot is perceived to be polite, respectful, thoughtful, and friendly. Forty-three reviews were pertinent to courtesy, with some customers appreciating the caring and politeness of the robots and a few others complaining that robots lacked human kindness and warmth. Consumers perceived courtesy through the action and verbal expression of service robots: "*The hotel sent a small robot to bring it (takeaway) to me…I think this little thing is so thoughtful*" (N.85) and "*Sometimes when there were people [in front of the elevator], the robot would politely step back and say, 'guest first'*" (N.6).

Courtesy is considered to be an important factor in assessing the service quality of the human staff (Parasuraman et al., 1985). The finding of courtesy as part of customers' cognitive experience with service robots reflects the computers-are-social-actors (CASA) paradigm (Nass et al., 1994; Reeves and Nass, 1996), which holds that users apply social norms (e.g., politeness) in evaluating computers. Interestingly, this evaluation may have different expectations regarding the social behaviour of robots and human staff. An example is that a customer tended to forgive the robot that violated social rules: "*What is even more outrageous is that the robot in the hotel was very rude, rushing in and out of the elevator. Forget it, I shouldn't fuss about the AI after all*" (N.676).

Courtesy or politeness is considered as an important service quality standard (Parasuraman et al., 1985). Politeness is the social bond that lubricates the relationship between individuals (Meyer et al., 2016). In addition to humans, individuals also apply social rules and expectations, such as politeness, to machines (Nass and Moon, 2000). Some researchers have found that the level of politeness can influence customer assessment and interaction with robots (Salem et al., 2014). However, the influence of politeness in human-robot interactions is complex and perceived differently by consumers (Lee et al., 2017; Salem et al., 2014). Polite interfaces rely on contexts such as consumer profile, location, and external environment (Ohbyung and Sukjae, 2009). As exemplified in our findings, a less polite robot was sometimes perceived as rude, making customers angry.

When [I] was staying in a hotel and taking the elevator upstairs, as soon as the door opened, there was a robot outside the elevator door preparing to go downstairs, blocking the elevator door entirely and saying "please let me in." He sounded polite but didn't move a step for guest. [emoji of angry] We had to move the suitcases to stand aside desperately to make room for it (N.735).

However, similar behaviour may not cause negative feelings among other customers. For example, N.674 mentioned, "*I saw this little robot walk in from the 20th floor, and kept saying 'please give way, I will stand in the middle. Thank you'. It was so cute!*" (N.674).

4.3. Affective experience

Customers mentioned four main thematic categories of affective experience: enjoyment, novelty, satisfaction, and negative emotion.

4.3.1. Enjoyment

Enjoyment refers to the extent to which customers perceive interacting with service robots to be enjoyable. A large number of reviewers characterised their experience with service robots as pleasant. Customers not only used direct text descriptions, such as "very happy," "I smiled," "amusing," "funny," "interesting," "source of happiness" and "I laughed my ass off," but also some mimetic words, such as "hah-hah," "hee-hee," and "ho-ho," as well as emojis to express their enjoyment. N.55 vividly described her delight: "*Hah-hah-hah, the robot in … Hotel… stimulates my good mood for the day.*" Some customers felt cheerful when seeing the robot and some felt happy after directly interacting with the robot. The attractive appearance, cute voice, humorous language, friendly service, and a compliment can be very effective, as N.147 wrote: "*Frankly, who would be in a bad mood after being praised by this robot?*".

While enjoyment is similar to the intrinsic motivation or hedonic motivation discussed in previous literature (Lee et al., 2021; Lu et al., 2019), it is more about the experience derived from the interaction but intrinsic motivation relates to expected enjoyment. After proposing TAM (Davis, 1989), Davis et al. (1992) found that, in addition to perceived usefulness and ease of use, enjoyment is also a key variable that affects user acceptance. As a positive emotion, enjoyment can also increase customer satisfaction (Füller and Matzler, 2008) and bring positive attitudes towards using a new technology (Lee et al., 2012; Moon and Kim, 2001).

4.3.2. Novelty

Novelty refers to a customer's feeling of experiencing something new and different when encountering service robots. Novelty arises from the surprise and unexpectedness of encountering or being served by a service robot. As N.688 described: "*In the evening, I asked the hotel for more slippers, which were delivered by a robot. It was very polite. I was a little bit surprised.*" The novelty of service robots triggered customers' novelty-seeking intentions, as N.1040 wrote: "*I saw a small robot delivering food in the restaurant where I was eating. I thought it was novel. So, I observed its trajectory for quite a while.*" Some customers indicated that their first opportunity to experience service robots became the reason for their consumption, as N.1097 expressed: "*It was the first time for me to experience a restaurant with an intelligent robot. Though I was stuffed, I still wanted to come in and have a look.*"

Novelty is fundamental to the tourist experience (Mitas and Bastiaansen, 2018) and the novelty that emerged from customer-robot interactions constitutes an essential component of customers' memorable experiences. Most of the novelty experience is due to unexpected surprise. This is a good phenomenon because "unexpected gains bring more pleasure than expected gains" (Valenzuela et al., 2010, p. 792). Some customers in this study chose a hotel or restaurant with service robots due to curiosity, reflecting that novelty-seeking is a motivation for customer selection (Crompton, 1979; Dedeoglu et al., 2018; Petrick, 2002). As one of the special qualities of robots, novelty is associated with customer satisfaction (Albaity and Melhem, 2017; Chua et al., 2015).

4.3.3. Satisfaction

Satisfaction also represents an important part of the robotic service experience. Customers shared their satisfied feeling by using praise words such as "good," "five-star praise," "satisfactory," and "deserves praise" and emojis such as "applause" and "thumbs-up." In addition to expressing satisfaction with service robots, customers also complimented the hotels, restaurants, or airports, and even the destinations because of the services provided by robots, as N.399 mentioned: "*The robot asked me to open the door by calling…it left after selling cuteness. Give the hotel a thumbs up [emoji of thumbs up].*" Some parents also shared their children's satisfaction, as N.1082 wrote: "*The two brothers once again strongly urged eating at the robot restaurant. The children really liked such a restaurant.*"

Many satisfied customers have mentioned the novelty of the robot. This may be explained by the relationship between satisfaction and customer expectations (Oliver, 1980). Since robots are still new in the hospitality and tourism industry, experiencing the service provided by a robot can exceed consumer expectations, leading to customer satisfaction. Satisfaction is a favourable outcome because high satisfaction often leads to word-of-mouth, positive brand image and customer loyalty (Lin

and Wang, 2006; Woisetschlager et al., 2008).

4.3.4. Negative emotion

This smallest sub-category contains all the negative emotions explicitly involved in online reviews. Only 10 reviews mentioned common negative emotions, such as "dissatisfaction," "anger," "disappointment," and "embarrassment," while the rest related to fear, expressed as "horrible," "scared me," "creepy," and "a feeling of terror." The fear mainly resulted from unexpectedness, concern that robots would conquer human civilisation, and the voice of robots. Some customers felt scared especially at the night, as N.1110 wrote: "*I returned to my room late at night, when the elevator door opened, a spooky robot was standing in front of me, and greeted me in a terrifying voice, scaring me into a cold sweat.*"

Most of the current research has discussed consumers' negative emotions with uncanny valley, which delineates a precipitous dip in affinity of human-robot relationship when the robot's human-likeness reaches a certain level (Mori et al., 2012). However, in this study, the negative emotions experienced by customers are mainly due to unexpectedness rather than uncanny valley. This may be because practitioners have recognised the importance of leveraging the level of human-likeness in robot design and most robots implemented in the Chinese hospitality and tourism settings are not highly human-like in their appearance. Interestingly, unexpectedness not only relates to the feeling of newness and difference which contain a positive connotation as discussed in the category of novelty but also links to negative emotions. This highlights that unexpectedness or surprise can be followed by either positive or negative emotion (Noordewier and Breugelmans, 2013; Vanhamme, 2000). Surprise could be regarded as an interruption mechanism (Meyer et al., 1997), which interrupts ongoing thoughts and activities, leading to uncomfortable experience (Noordewier and Breugelmans, 2013).

4.4. Conative experience

This category covers the behavioural and intentional experience of customers trying to approach or resist AI service robots.

4.4.1. Approach or resistance

Approach refers to the intention to accept service robots, while resistance in this study represents the intention to avoid service robots because of preferring human service. In terms of approach, it was reflected in both intentional and behavioural levels. The intention includes wanting to "experience," "experience again" to "hug," to "own," to "take it home," or even "willing to be ruled by robots," exemplified by "*The little robot waiter in the hotel was busy talking and walking around. Every time, I wanted to ask to it come over to play with me*" (N.884). Importantly, service robots were able to trigger customers' buying intention, as N.671 mentioned, "*The little robot that delivers food in the hotel is so cute, which makes me want to order a midnight snack*." This quote shows that cuteness may stimulate customers' conative experience. The conative experience associated with cuteness can sometimes be aggressive, as one customer wrote: "*The robot in the hotel is so cute and I wanted to sit on it till it dies*." (N.108). This rarely-happening phenomenon is called "cute aggression," which is the urge to squeeze, crush, and bite cute things (Stavropoulos and Alba, 2018).

At the behavioural level, approach relates to having fun with the robot and proactively engaging in interactions such as following and chatting with it. For instance, N.631 described their experience in the airport: "*I saw this cute robot at the airport. It walked around a long time, but nobody paid attention to it. So, I went over to chat with it. I asked it to speak in Chinese and take me to the bathroom.*" Service robots also stimulate some customers' actual buying behaviour, as mentioned by N.597: "*Robot restaurant…to satisfy my curiosity…[we] ordered a meal without being hungry*." It is worth noting that the stimulated buying behaviour may add workload to the service robot as some customers buy multiple times in order to see the robot, exemplified by "*As the delivering robot in the hotel was so cute, [I] ordered takeaways for many times*" (N.20) In general, the approach behaviour is positive and allows the development of customer engagement.

Resistance behaviour/intention appeared in only 11 reviews. Customers compared robots with human staff and expressed their preference for personal attention, communication, and warmth between people, as N.968 wrote: "*I went to…robot restaurant…I still prefer that the waiter is human, which is warmer, not so cold. Sometimes it is fun to make jokes with the waiter*." Thus, customers may not revisit the place, as N.502 said, "*It's just a gimmick, one experience is enough. [I] will just go to the traditional one in the future*." Consumer resistance behaviour is a common phenomenon in innovation diffusion (Huang et al., 2021), and the relatively fewer customers describing resistance behaviour in their reviews reflect that, currently, most customers welcome the use of service robots in the frontline service of hospitality and tourism.

4.5. Other experiences

Other experiences with relatively lower weighted degrees included the taste of food made by robot chefs, future anticipation about AI robots, concerns about future employment, and feelings of safety.

5. Discussion and conclusion

As the deployment of service robots in hospitality and tourism is growing rapidly, the purpose of this study was to understand the customer experience with service robots, which could have implications for service experience management, robot investment, and design improvement.

The findings of this qualitative study yielded a simplified framework for a better comprehension of customers' experience with service robots (Fig. 3). From a theoretical viewpoint, the framework is underpinned by literature pertinent to the interplay of environment, sensory experience, cognition, emotion, and behaviour (e.g., Bagozzi, 1992; Gifford, 2007; Goldstein, 2007; Lazarus, 1991). To customers, the interaction with service robots is like interactions with a technology (or an information system) along with a social actor. The interaction results in a multi-dimensional and hierarchical customer experience. The framework depicts four categories of customer experience identified by this study—sensory, cognitive, affective, and conative experiences—that echo the *sense, think, feel,* and *act* dimensions proposed by Schmitt (1999), supporting the multidimensionality of customer experience.

As discussed in the literature review, environmental psychology theories (Bell et al., 1990; Gifford, 2007; Mehrabian and Russell, 1974) and Goldstein's (2007) sensations-perceptions model propose that sensory experience plays a channel role linking environmental stimuli and individuals' intervening response systems. This specific system involves elements of cognition, emotion, and conation (Holbrook and Hirschman, 1982). The interplay of the three elements was mainly discussed based on the cognitive-affective-conative model which suggests that cognitive evaluation of an object triggers individuals' emotion which, in turn, affects behaviours (Bagozzi, 1992; Oliver et al., 1997). Notably, the effects of cognition and emotion can be bidirectional (Izard et al., 1984; Lazarus, 1991). Based on the above theoretical understanding and the findings of this study, the developed framework (Fig. 3) constitutes a hierarchical structure of customer experience, with sensory experience in the outer layer, cognitive and affective experiences in the middle layer, and conative experience in the core layer. The physical appearance, voice, language, and movement of service robots seem to stimulate customers' visual and hearing senses, which might then trigger their cognitive and affective experiences. Sensory, cognitive, and affective experiences are likely to jointly shape customers' approach or resistance behaviour.

Both verbal and non-verbal communication plays a significant role in initiating customer experiences. This function seems to be achieved by

Fig. 3. Customer experience with service robots.

either an independent verbal/non-verbal cue or a combination of multiple cues which is reflected in the co-occurrence network (Fig. 2). Studies on verbal and non-verbal cues of service robots mainly pay attention to the influence of independent cues (e.g., Choi et al., 2019; Lin and Mattila, 2021), neglecting the fact that multi-sensory inputs may jointly influence consumption outcomes (Lu et al., 2021). As proposed by Bell et al. (1990), "the experienced environment is an event in time whose components are so intermeshed that no part is understandable without the simultaneous inclusion of other aspects of the instant" (p. 30). It is, thus, important to tell the whole story by examining an integral unit of service robots which involve customers' multi-sensory experiences.

Findings of cognitive experience such as "courtesy" and "interactivity" reinforce the notion that robots are social actors. Interestingly, customers might use social norms to evaluate service robots, but they may not require robots to behave in a socially accepted way as humans do. In other words, people possibly anthropomorphise a robot and evaluate it as another social entity, but they are also mindful that the robot is simply a technology and could tolerate any behaviour that violates social norms. Additionally, this study found that "utility" and "autonomy" are dominant cognitive experiences which reflect technological aspects of service robots, holding no brief for the assertion by Young et al. (2011) that "interacting with a robot is more like interacting with an animal or another person than with a technology" (p. 54). As the elements of a social actor and a technology seem to be blended in individuals' evaluation of a service robot, this study posits that human-robot interactions in hospitality and tourism settings involve an amalgamation of elements from these two roles.

"Cuteness" is an often-mentioned cognitive experience and is highly related to customers' enjoyment, satisfaction, and approaching behaviour, coinciding with earlier findings that cuteness is important in inducing feelings of fun and pleasure (Nenkov and Scott, 2014). This indicates that cuteness is a common feature in the design of service robots in real-world practices. Existing literature heavily emphasises anthropomorphic features of service robots (e.g., Melián-González et al., 2021; Zhu and Chang, 2020), while cuteness as a dominant real-world customer experience has gained only very limited academic attention. The imbalance between reality and academic research shows that more studies are needed to understand the antecedents and consequences of cuteness from both design and culture perspectives, which can help increase robot acceptance among customers.

Four distinct affective experiences were identified: enjoyment, novelty, satisfaction, and negative emotion. As reflected in the co-occurrent links among these experiences (Fig. 2), one customer might experience multiple emotions during the service encounter. This indicates that several emotions can occur simultaneously or within a single encounter, supporting the notion that emotions can be treated as discrete categories (Lazarus, 1991).

Novelty is somewhat fundamental to the tourist experience and leads to positive emotions (Mitas and Bastiaansen, 2018). The experience of novelty impresses customers and encourages them to spread positive word-of-mouth. The unexpectedness and surprise of being served by a service robot were frequently mentioned in the online reviews, indicating that service robots are still new to most hospitality and tourism customers. Thus, the "first-mover advantage" is still pronounced for hospitality and tourism businesses that adopt service robots, although some researchers and practitioners are concerned that novelty will fade as the use of robots increases in the industry (Ivanov et al., 2019; Tuomi et al., 2021). However, this study's results suggest that while the novelty of being served by a service robot may decrease with time, presently the novelty experience with service robots can be managed by designing and improving various features of service robots such as language style (e.g., humour) and intelligence level.

The various variables relating to cognitive and affective experiences demonstrate at least three elements of value that service robots bring to customers (Fig. 3): functional value (e.g., utility), emotional value (e.g., enjoyment and novelty), and social interaction value (e.g., interactivity and courtesy). The ubiquity of emotional value contradicts Lin and Mattila's (2021) assumption that the value of service robots in the hotel context is currently limited to functional elements. This seems to highlight a discrepancy regarding customer perceptions of service robots between imagined and actual interactions as Lin and Mattila's (2021) study uses scenarios to trigger customer responses, while this study focuses on actual customer experiences. The discrepancy indicates a need

for more research on real-time and post-implementation experiences.

Although the "robot touch" may have different ingredients from "human touch," it still can offer limited social interaction. However, the functional and emotional aspects dominate the customer experience, with fewer customers experiencing the social element, and for some customers the social experience is even negative. At present, the use of service robots is apparently not overtly disruptive since robots lack the ability to fully satisfy customers' social needs. However, if Moore's law continues to be valid, the progress rate of technologies may soon propel robot service to the next level (Davidow and Malone, 2014), when—according to disruptive innovation theory (Christensen, 2006)—massive replacement of traditional frontline staff is possible and humans serve a profitable niche segment of customers at the very high end (Yu and Hang, 2010).

Judging from the data set collected in this study, the number of reviews about service robots increased significantly in 2020 compared to previous years. Since 2020, the hospitality and tourism industry has experienced a substantial fall in tourist arrivals and revenues due to the outbreak of Covid-19 (Gursoy and Chi, 2020; Xu et al., 2021). The reviews increased even during this devastating crisis, echoing the observation that the Covid-19 pandemic has brought forth new prospects for robots in response to the need for social distancing and safety (Seyitoğlu and Ivanov, 2020; Zeng et al., 2020). The adoption of technological innovations such as robots was regarded as an important risk reduction strategy for the recovery of the hospitality and tourism industry (Pillai et al., 2021; Shin and Kang, 2020). From the customers' perspective, their preference for service robots has increased in the context of the Covid-19 crisis as service robots increase their perceived safety (Kim et al., 2021). In conclusion, it could posit that the Covid-19 pandemic, serving as an external environment, has facilitated the diffusion of service robots in the hospitality and tourism industry.

5.1. Theoretical implications

This study's results have two main theoretical implications. First, this study contributes to technology literature in general and robotics literature in particular by providing a comprehensive understanding of customer experience with service robots in the hospitality and tourism domain. In particular, the articulation through the lens of the interplay of sensory experience, cognition, emotion, and conation provides novel insights into human-robot interactions, complementing previous research that has focused on embodiment, emotion, human-oriented perception, feelings of security, and co-experiences (Tung and Au, 2018). The experience with service robots is a dynamic process involving multiple dimensions. Through a qualitative approach, this study identified a set of constructs that have not been adequately captured by previous quantitative research or are dispersed in various prior studies. Hence, this study provides a holistic conception of customer responses to service robots involving sensory, cognitive, affective, and conative realms, thereby answering the calls for more empirical studies on the outcomes of customer-robot interactions in real-world settings (Ivanov et al., 2019; Lu et al., 2020). Overall, the variables identified in this study provide a foundation for future quantitative investigation.

This study also contributes to the human-robot interaction literature by highlighting the role of both verbal and non-verbal communication relevant to customer cognition and emotion. While existing research has investigated the impact of physical appearance, voice, or language style of service robots on customer cognition and emotion (e.g., de Kervenoael et al., 2020; Lin and Mattila, 2021), they mainly focus on general cognitive or emotional outcomes such as perceived value and service encounter evaluation. The rich findings of this study provide potential outcomes of verbal and non-verbal communication that warrant future research attention, such as cuteness, courtesy, and novelty. In addition, this study highlights the role of various features of physical appearance, verbal language, kinesics, and paralanguage of service robots, some of which have been ignored by previous human-robot interaction research. For example, the verbal language that flatters guests, humorous language style, child-like voice, and various movements can play a powerful rule in influencing customer reactions, providing fruitful directions for future research. Furthermore, current research mainly considers the verbal or non-verbal cues in a singular design feature (Lu et al., 2021), while this study suggests that experiencing service robots usually involves customers' visual and hearing senses simultaneously, indicating the need for combining various features (e.g., physical appearance, kinesics, and verbal language) to understand human-robot interactions.

Finally, the findings of this study shed light on the customer satisfaction with and acceptance of service robots in the post-use phase by identifying various constructs that have the potential to influence customers' conative experience. Most previous studies have regarded human-robot interactions as a new research context and have adopted concepts that are often used in innovation and technology research such as customer trust (e.g., Park, 2020; Tussyadiah et al., 2020), perceived usefulness (Turja et al., 2020; Zhong et al., 2020), and ease of use (e.g., Fernandes and Oliveira, 2021; Pillai and Sivathanu, 2020), which provide useful insights to understanding the acceptance of service robots. However, they may not present a holistic and contextualised on-site experience. The various on-site experience variables revealed in this research add new insights to robot acceptance studies. For instance, apart from functional value (e.g., utility), the cuteness and courtesy of service robots also require research attention to understand customer experience and behaviour. Despite previous human-robot interaction studies having recognised the role of emotion in determining customer behaviours (e.g., Gursoy et al., 2019; Lin et al., 2020), they only regarded emotion as one category. The discrete emotions including enjoyment, novelty, satisfaction, and negative emotion identified by this study call for more studies to enrich the dimensions of emotions in human-robot interactions and investigate how various emotions serve as psychological pathways to customer behavioural outcomes.

5.2. Practical implications

This study also has some important practical implications for the application of service robots in the hospitality and tourism industry. This study highlighted that positive cognitive, affective, and conative experiences dominated customer reviews. Therefore, hospitality businesses that have already adopted service robots can use them to attract customers. Marketing materials could disseminate not only hedonic value such as enjoyment and novelty but also functional and social value such as utility, autonomy, and courtesy. The first-mover advantage is still pronounced, and hospitality businesses that are currently hesitant to adopt service robots may want to consider making the investment. The utility of service robots is an important indicator of the value of this investment: some customers who had dismissed service robots as just a "gimmick stunt" without practical value appreciated the service robots after experiencing their utility value. It is, thus, necessary for managers to ensure that robots could deliver efficient, reliable and accurate services in a smooth fashion (Lin and Mattila, 2021). Importantly, during the Covid-19 pandemic, it is encouraged to deliver "safety + experience" in the value proposition of hospitality and tourism companies (Seyitoğlu and Ivanov, 2020).

Both verbal and non-verbal cues found in this study provide practitioners with hints on designing socially acceptable robots. A robot talking in a child-like voice or language style, sometimes with cartoon-like body features, is likely to be perceived as cute by customers, which ultimately leads to their acceptance of service robots. Thus, leveraging cuteness capital is an effective way to humanise new technologies. In addition to the baby schema (i.e., infantile physical features such as large eyes), the whimsical nature of an object (e.g., capricious humour and playful disposition) can also connect to experience of cuteness (Nenkov and Scott, 2014), as also evidenced in our study. Therefore, a

robot with a humorous language style is considered extremely useful in triggering customer acceptance.

The findings of this study could also provide implications for affective design to transfer customers' emotional needs into robot design elements which, consequently, enhances customer experience. Emotions serve as a key substrate of consumption and emotional value is of key importance to customer experience (Holbrook and Hirschman, 1982). Apart from the cuteness discussed above, the role of praise or flattery expressed in the robot's verbal language is also powerful in eliciting positive customer emotions. Thus, flattery or sincere praise (if possible) is encouraged to apply to the verbal language of robots. Additionally, it is also helpful for hotels, restaurants or airports to adopt robots that are courteous and polite, both verbally and behaviourally, to ensure pleasant customer experiences. As novelty is a mechanism of customer enjoyment (Mitas and Bastiaansen, 2018), affective design should take novelty into consideration. Novelty not only relates to being served by a robot for the first time, but also many other attributes such as robots' physical appearance, verbal language, kinesics, and various functions. Harnessing these attributes by designing new voice packages, appearances and interactive methods is also promising to deliver a novel experience.

Despite positive experiences being dominant in the reviews, customers' negative experiences suggest areas for improvement. In particular, unprecedentedness and surprise can link to not only positive but also negative emotions. A typical case is that customers could experience negative emotions (e.g., embarrassment) when a service robot unexpectedly sings the birthday song for a customer in public. Hence, companies should be cautious that surprising customers is not free of costs (Vanhamme, 2000). Additionally, some robots work with a blue light on during the night, which some customers may find threatening. Changing the colour of the light may be helpful.

Meanwhile, hospitality and tourism practitioners or robot designers may consider improving the interactivity of service robots to gain customer engagement and co-creation values. This study suggests that most customers who mentioned the interactivity of robots had positive comments, while the total number of customers who have experienced interactivity is limited. It is, therefore, still necessary to improve the communication skills of service robots to facilitate human-robot interactions. Other measures such as increasing robots' initiative could also engage customers. A successful example is robots inviting customers to take photos with them.

As continuation of the trend towards use of service robots seems inevitable, with service robots becoming a "new normal" and taking on much of the traditional human labour, stakeholders in the hospitality and tourism sector have to prepare for the change. Managers can incorporate service robots by redesigning service procedures, restructuring the service team, and providing supporting functions (Xiao and Kumar, 2021).

5.3. Limitations and future research avenues

This study has some limitations. First, this study relies on data from online reviews which may limit our understanding of human-robot interactions. Online reviews are relatively short, possibly constraining their interpretation. Future research could use in-depth interviews to complement the findings of this study. The vast majority of reviews were from females. Since gender can play a role in customer experience (Rajaobelina, 2018), future research may consider the influence of gender on the various experience variables identified by this study, especially through quantitative methods. The number of reviews in the three service settings (hotels, restaurants, and airports) are different, which may influence interpretation of the results. Future research should compare customer experiences across different contexts using quantitative research.

Further, when service robots penetrate the mainstream hospitality and tourism industry, customer experience may present a new landscape, suggesting the need for a longitudinal investigation. Additionally, as this study is exploratory in nature, future quantitative studies can build on the identified constructs to investigate the interactions between different constructs and explore the potential impact of customer acceptance and satisfaction. For example, future research can examine the influence of non-verbal communication (e.g., physical appearance, paralanguage, and kinesics) on customer enjoyment and satisfaction.

In summary, the use of service robots in hospitality and tourism is an emerging research topic. Future research is encouraged to expand understanding of this phenomenon not only from a customer perspective, but also from the perspective of service providers, managers, and robot providers.

Data availability

Data will be made available on request.

References

Adhikari, A., Bhattacharya, S., 2016. Appraisal of literature on customer experience in tourism sector: review and framework. Curr. Issues Tour. 19 (4), 296–321.

Agapito, D., Mendes, J., Valle, P., 2013. Exploring the conceptualization of the sensory dimension of tourist experiences. J. Destin. Mark. Manag. 2 (2), 62–73.

Albaity, M., Melhem, S.B., 2017. Novelty seeking, image, and loyalty—The mediating role of satisfaction and moderating role of length of stay: international tourists' perspective. Tour. Manag. Perspect. 23, 30–37.

Ayeh, J.K., Au, N., Law, R., 2013. Predicting the intention to use consumer-generated media for travel planning. Tour. Manag. 35, 132–143.

Baddoura, R., Venture, G., 2013. Social vs. useful HRI: experiencing the familiar, perceiving the robot as a sociable partner and responding to its actions. Int. J. Soc. Robot. 5 (4), 529–547.

Bagozzi, R.P., 1992. The self-regulation of attitudes, intentions, and behavior. Soc. Psychol. Q. 55 (2), 178–204.

Baker, M.A., Kim, K., 2018. The role of language, appearance, and smile on perceptions of authenticity versus rapport. Int. J. Hosp. Manag. 74, 171–179.

Beer, Jenay M., Fisk, A.D., Rogers, W.A., 2014. Toward a framework for levels of robot autonomy in customer-robot interaction. J. Hum. Robot Interact. 3 (2), 74–99.

Belanche, D., Casaló, L.V., Flavián, C., Schepers, J., 2020. Service robot implementation: a theoretical framework and research agenda. Serv. Ind. J. 40 (3–4), 203–225.

Bell, P.A., Fisher, J.D., Baum, A., Green, T., 1990. Environmental Psychology. Holt, Rinehart and Winston, Inc.

Bitner, M.J., 1992. Servicescapes: the impact of physical surroundings on customers and employees. J. Mark. 56 (2), 69–82.

Bogicevic, V., Liu, S.Q., Seo, S., Kandampully, J., Rudd, N.A., 2021. Virtual reality is so cool! How technology innovativeness shapes consumer responses to service preview modes. Int. J. Hosp. Manag. 93.

Bolton, R.N., McColl-Kennedy, J.R., Cheung, L., Gallan, A., Orsingher, C., Witell, L., Zaki, M., 2018. Customer experience challenges: bringing together digital, physical and social realms. J. Serv. Manag. 29 (5), 776–808.

Brakus, J.J., Schmitt, B.H., Zarantonello, L., 2009. Brand experience: what is it? How is it measured? Does it affect loyalty? J. Mark. 73 (3), 52–68.

Burgoon, J.K., Birk, T., Pfau, M., 1990. Nonverbal behaviors, persuasion, and credibility. Hum. Commun. Res. 17 (1), 140–169.

Campos, A.C., Mendes, J., do Valle, P.O., Scott, N., 2015. Co-creation of tourist experiences: a literature review. Curr. Issues Tour. 21 (4), 369–400.

Carbone, Lewis P., Haeckel, Stephan, H., 1994. Engineering customer experiences. Mark. Manag. 3 (3), 8–19.

Carol, K.G., 2008. The Nonverbal Advantage: Secrets and Science of Body Language at Work. Berrett-Koehler Publishers, Inc., San Francisco, California.

Cha, S.S., 2020. Customers' intention to use robot-serviced restaurants in Korea: relationship of coolness and MCI factors. Int. J. Contemp. Hosp. Manag. 32 (9), 2947–2968.

Chan, A.P.H., Tung, V.W.S., 2019. Examining the effects of robotic service on brand experience: the moderating role of hotel segment. J. Travel Tour. Mark. 36 (4), 458–468.

Cheng, M., Jin, X., 2019. What do Airbnb users care about? An analysis of online review comments. Int. J. Hosp. Manag. 76, 58–70.

Cherven, K., 2013. Network Graph Analysis and Visualization with Gephi. Packt Publishing Ltd.

Choi, S., Liu, S.Q., Mattila, A.S., 2019. "How may I help you?" Says a robot: examining language styles in the service encounter. Int. J. Hosp. Manag. 82, 32–38.

Choi, Y., Choi, M., Oh, M., Kim, S., 2020. Service robots in hotels: understanding the service quality perceptions of human-robot interaction. J. Hosp. Mark. Manag. 29 (6), 613–635.

Christensen, C.M., 2006. The ongoing process of building a theory of disruption. J. Prod. Innov. Manag. 23 (1), 39–55.

Christou, P., Simillidou, A., Stylianou, M.C., 2020. Tourists' perceptions regarding the use of anthropomorphic robots in tourism and hospitality. Int. J. Contemp. Hosp. Manag. 32 (11), 3665–3683.

Chua, B.L., Lee, S., Goh, B., Han, H., 2015. Impacts of cruise service quality and price on vacationers' cruise experience: moderating role of price sensitivity. Int. J. Hosp. Manag. 44, 131–145.
Crompton, J.L., 1979. Motivations for pleasure vacation. Ann. Tour. Res. 6 (4), 408–424.
Dale, J.P., Goggin, J., Leyda, J., McIntyre, A.P., Negra, D., 2017. The Aesthetics and Affects of Cuteness. Routledge.
Davidow, W.H., Malone, M.S., 2014. What happens to society when robots replace workers? Retrieved 03 January, 2021 from ⟨https://hbr.org/2014/12/what-happens-to-society-when-robots-replace-workers⟩.
Davis, F.D., 1989. Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Q.: Manag. Inf. Syst. 13 (3), 319–339.
Davis, F.D., Bagozzi, R.P., Warshaw, P.R., 1992. Extrinsic and intrinsic motivation to use computers in the workplace. J. Appl. Soc. Psychol. 22 (14), 1111–1132.
Dedeoglu, B.B., Bilgihan, A., Ye, B.H., Buonincontri, P., Okumus, F., 2018. The impact of servicescape on hedonic value and behavioral intentions: the importance of previous experience. Int. J. Hosp. Manag. 72, 10–20.
del Bosque, I.R., San Martín, H., 2008. Tourist satisfaction a cognitive-affective model. Ann. Tour. Res. 35 (2), 551–573.
Dey, I., 1993. Qualitative Data Analysis: A User-friendly Guide for Social Scientists. Routledge, New York.
Elo, S., Kyngäs, H., 2008. The qualitative content analysis process. J. Adv. Nurs. 62 (1), 107–115.
Epley, N., Waytz, A., Cacioppo, J.T., 2007. On seeing human: a three-factor theory of anthropomorphism. Psychol. Rev. 114 (4), 864–886.
Fernandes, T., Oliveira, E., 2021. Understanding consumers' acceptance of automated technologies in service encounters: drivers of digital voice assistants adoption. J. Bus. Res. 122, 180–191.
Fogg, B.J., Nass, C., 1997. Silicon sycophants: the effects of computers that flatter. Int. J. Hum. -Comput. Stud. 46 (5), 551–561.
Fuentes-Moraleda, L., Díaz-Pérez, P., Orea-Giner, A., Muñoz- Mazón, A., Villacé-Molinero, T., 2020. Interaction between hotel service robots and humans: a hotel-specific service robot acceptance model (sRAM). Tour. Manag. Perspect. 36, 100751.
Füller, J., Matzler, K., 2008. Customer delight and market segmentation: an application of the three-factor theory of customer satisfaction on life style groups. Tour. Manag. 29 (1), 116–126.
Fusté-Forné, F., 2021. Robot chefs in gastronomy tourism: what's on the menu? Tour. Manag. Perspect. 37.
Gentile, C., Spiller, N., Noci, G., 2007. How to sustain the customer experience: an overview of experience components that co-create value with the customer. Eur. Manag. J. 25 (5), 395–410.
Gifford, R., 2007. Environmental Psychology: Principles and Practice. WA: Optimal Books, Colville.
Goldstein, E.B., 2007. Sensation and Perception, seventh ed. Thomson/Wadsworth, Australia.
Gray, H.M., Gray, K., Wegner, D.M., 2007. Dimensions of mind perception. Science 315 (5812), 619.
Gray, K., Wegner, D.M., 2010. Blaming god for our pain: human suffering and the divine mind. Personal. Soc. Psychol. Rev. 14 (1), 7–16.
Gretzel, U., Murphy, J., 2019. Making sense of robots: consumer discourse on robots in tourism and hospitality service settings. In: Ivanov, S., Webster, C. (Eds.), Robots, Artificial Intelligence and Service Automation in Travel, Tourism and Hospitality. Emerald Publishing Limited, Bingley, pp. 93–104.
Guerry, M., 2020. President's report by Milton Guerry. Retrieved 21 February, 2021 from ⟨https://ifr.org/ifr-press-releases/news/presidents-report-by-milton-guerry-3rd-quarter⟩.
Gursoy, D., Chi, C.G., 2020. Effects of COVID-19 pandemic on hospitality industry: review of the current situations and a research agenda. J. Hosp. Mark. Manag. 29 (5), 527–529.
Gursoy, D., Chi, O.H., Lu, L., Nunkoo, R., 2019. Consumers acceptance of artificially intelligent (AI) device use in service delivery. Int. J. Inf. Manag. 49, 157–169.
Haim, M., Oliver, R.L., 1993. Assessing the dimensionality and structure of the consumption experience: evaluation, feeling, and satisfaction. J. Consum. Res. 3, 451–466.
Hanks, L., Line, N., 2018. The restaurant social servicescape: establishing a nomological framework. Int. J. Hosp. Manag. 74, 13–21.
Hanks, L., Line, N., Kim, W.G.W., 2017. The impact of the social servicescape, density, and restaurant type on perceptions of interpersonal service quality. Int. J. Hosp. Manag. 61, 35–44.
Holbrook, M.B., Hirschman, E.C., 1982. The experiential aspects of consumption: consumer fantasies, feelings, and fun. J. Consum. Res. 2, 132–140.
Hoyer, W.D., Kroschke, M., Schmitt, B., Kraume, K., Shankar, V., 2020. Transforming the customer experience through new technologies. J. Interact. Mark. 51, 57–71.
Huang, D., Coghlan, A., Jin, X., 2020. Understanding the drivers of Airbnb discontinuance. Ann. Tour. Res. 80, 102798.
Huang, D., Jin, X., Coghlan, A., 2021. Advances in consumer innovation resistance research: a review and research agenda. Technol. Forecast. Soc. Change 166.
Huang, J., 2017. The dining experience of Beijing Roast Duck: a comparative study of the Chinese and English online consumer reviews. Int. J. Hosp. Manag. 66, 117–129.
Islam, M.S., Kirillova, K., 2020. Non-verbal communication in hospitality: at the intersection of religion and gender. Int. J. Hosp. Manag. 84, 102326.
Ivanov, S., Gretzel, U., Berezina, K., Sigala, M., Webster, C., 2019. Progress on robotics in hospitality and tourism: a review of the literature. J. Hosp. Tour. Technol. 10 (4), 489–521.
Izard, C.E., Kagan, J., Zajonc, R.B., 1984. Emotions, Cognition, and Behavior. Cambridge University Press.
Jansson-Boyd, C.V., 2010. Consumer Psychology. Open University Press, New York.
Jung, H.S., Yoon, H.H., 2011. The effects of nonverbal communication of employees in the family restaurant upon customers' emotional responses and customer satisfaction. Int. J. Hosp. Manag. 30 (3), 542–550.
de Kervenoael, R., Hasan, R., Schwob, A., Goh, E., 2020. Leveraging human-robot interaction in hospitality services: incorporating the role of perceived value, empathy, and information sharing into visitors' intentions to use social robots. Tour. Manag. 78, 104042.
Kim, S.S., Kim, J., Badu-Baiden, F., Giroux, M., Choi, Y., 2021. Preference for robot service or human service in hotels? Impacts of the COVID-19 pandemic. Int. J. Hosp. Manag. 93.
de Kleijn, R., van Leeuwen, A., 2018. Reflections and review on the audit procedure: guidelines for more transparency. Int. J. Qual. Methods 17, 1–8.
Krishna, A., 2012. An integrative review of sensory marketing: engaging the senses to affect perception, judgment and behavior. J. Consum. Psychol. 22 (3), 332–351.
Lazarus, R., 1991. Emotion and Adaptation. Oxford University Press on Demand.
Lazarus, R., Folkman, S., 1985. Stress and Coping, New York.
Lee, N., Kim, J., Kim, E., Kwon, O., 2017. The influence of politeness behavior on user compliance with social robots in a healthcare service setting. Int. J. Soc. Robot. 9 (5), 727–743.
Lee, W., Xiong, L., Hu, C., 2012. The effect of Facebook users' arousal and valence on intention to go to the festival: applying an extension of the technology acceptance model. Int. J. Hosp. Manag. 31 (3), 819–827.
Lee, Y., Lee, S., Kim, D.Y., 2021. Exploring hotel guests' perceptions of using robot assistants. Tour. Manag. Perspect. 37.
Leung, X.Y., Wen, H., 2020. Chatbot usage in restaurant takeout orders: a comparison study of three ordering methods. J. Hosp. Tour. Manag. 45, 377–386.
Levallois C., 2017. Working with text in Gephi. Retrieved 20 July, 2021 from https://seinecle.github.io/gephi-tutorials/generated-html/working-with-text-en.html#_1_co_occurrences.
Lin, H., Gursoy, D., Zhang, M., 2020. Impact of customer-to-customer interactions on overall service experience: a social servicescape perspective. Int. J. Hosp. Manag. 87, 102376.
Lin, H.H., Wang, Y.S., 2006. An examination of the determinants of customer loyalty in mobile commerce contexts. Inf. Manag. 43 (3), 271–282.
Lin, I.Y., Mattila, A.S., 2021. The value of service robots from the hotel guest's perspective: a mixed-method approach. Int. J. Hosp. Manag. 94.
Line, N.D., Hanks, L., 2019. The social servicescape: understanding the effects in the full-service hotel industry. Int. J. Contemp. Hosp. Manag. 31 (2), 753–770.
Liu, C., Hung, K., 2021. A multilevel study on preferences for self-service technology versus human staff: insights from hotels in China. Int. J. Hosp. Manag. 94.
Liu, S.Q., Mattila, A.S., 2019. Apple Pay: coolness and embarrassment in the service encounter. Int. J. Hosp. Manag. 78, 268–275.
Lorenzo, G.L., Biesanz, J.C., Human, L.J., 2010. What is beautiful is good and more accurately understood: physical attractiveness and accuracy in first impressions of personality. Psychol. Sci. 21 (12), 1777–1782.
Lu, L., Cai, R., Gursoy, D., 2019. Developing and validating a service robot integration willingness scale. Int. J. Hosp. Manag. 80, 36–51.
Lu, L., Zhang, P., Zhang, T.C., 2021. Leveraging "human-likeness" of robotic service at restaurants. Int. J. Hosp. Manag. 94.
Lu, V.N., Wirtz, J., Kunz, W.H., Paluch, S., Gruber, T., Martins, A., Patterson, P.G., 2020. Service robots, customers and service employees: what can we learn from the academic literature and where are the gaps. J. Serv. Theory Pract. 30 (3), 361–391.
Lu, W., Stepchenkova, S., 2015. User-generated content as a research mode in tourism and hospitality applications: topics, methods, and software. J. Hosp. Mark. Manag. 24 (2), 119–154. https://doi.org/10.1080/19368623.2014.907758.
Lv, X., Liu, Y., Luo, J., Liu, Y., Li, C., 2021. Does a cute artificial intelligence assistant soften the blow? The impact of cuteness on customer tolerance of assistant service failure. Ann. Tour. Res. 87.
Mara, M., Appel, M., 2015. Effects of lateral head tilt on user perceptions of humanoid and android robots. Comput. Hum. Behav. 44, 326–334.
Marcus, A., Kurosu, M., Ma, X., Hashizume, A., 2017. Cuteness Engineering: Designing Adorable Products and Services, first ed. Springer International Publishing.
Mathayomchan, B., Taecharungroj, V., 2020. "How was your meal?" Examining customer experience using Google maps reviews. Int. J. Hosp. Manag. 90, 102641.
McLeay, F., Osburg, V.S., Yoganathan, V., Patterson, A., 2021. Replaced by a robot: service implications in the age of the machine. J. Serv. Res. 24 (1), 104–121.
Mehrabian, A., Russell, J.A., 1974. An Approach to Environmental Psychology. MIT Press.
Melián-González, S., Gutiérrez-Taño, D., Bulchand-Gidumal, J., 2021. Predicting the intentions to use chatbots for travel and tourism. Curr. Issues Tour. 24 (2), 192–210.
Meyer, C., Schwager, A., 2007. Understanding customer experience. Harv. Bus. Rev. 85 (2), 116–126+157.
Meyer, J., Miller, C., Hancock, P., De Visser, E.J., Dorneich, M., 2016. Politeness in machine-human and human-human interaction 2016. Paper presented at the. Proceedings of the Human Factors and Ergonomics Society.
Meyer, W.U., Reisenzein, R., Schützwohl, A., 1997. Toward a process analysis of emotions: The case of surprise. Motiv. Emot. 21 (3), 251–274.
Mitas, O., Bastiaansen, M., 2018. Novelty: a mechanism of tourists' enjoyment. Ann. Tour. Res. 98–108.
Moon, J.W., Kim, Y.G., 2001. Extending the TAM for a world-wide-web context. Inf. Manag. 38 (4), 217–230.
Mori, M., MacDorman, K.F., Kageki, N., 2012. The uncanny valley. IEEE Robot. Autom. Mag. 19 (2), 98–100.
Nass, C., Moon, Y., 2000. Machines and mindlessness: social responses to computers. J. Soc. Issues 56 (1), 81–103. https://doi.org/10.1111/0022-4537.00153.

Nass, C., Steuer, J., Tauber, E.R., 1994. Computer are social actors. Paper presented at the conference of Human Factors in Computing Systems, Boston, USA.
Nenkov, G.Y., Scott, M.L., 2014. "So cute I could eat it up": priming effects of cute products on indulgent consumption. J. Consum. Res. 41 (2), 326–341.
Noordewier, M.K., Breugelmans, S.M., 2013. On the valence of surprise. Cogn. Emot. 27 (7), 1326–1334.
Ohbyung, K., Sukjae, C., 2009. Context-aware selection of politeness level for polite mobile service in Korea. Expert Syst. Appl. 36 (3), 4198–4206.
Oliver, R.L., 1980. A cognitive model of the antecedents and consequences of satisfaction decisions. J. Mark. Res. 17 (4), 460–469.
Oliver, R.L., Rust, R.T., Varki, S., 1997. Customer delight: foundations, findings, and managerial insight. J. Retail. 73 (3), 311–336.
Otto, J.E., Ritchie, J.R.B., 1996. The service experience in tourism. Tour. Manag. 17 (3), 165–174.
Pachankis, J.E., 2007. The psychological implications of concealing a stigma: a cognitive-affective-behavioral model. Psychol. Bull. 133 (2), 328–345.
Parasuraman, A., Zeithaml, Valarie, A., Berry, Leonard, L., 1985. A conceptual model of service quality and its implications for future research. J. Mark. 49 (4), 41–50.
Park, S., 2020. Multifaceted trust in tourism service robots. Ann. Tour. Res. 81, 102888.
Petrick, J.F., 2002. An examination of golf vacationers' novelty. Ann. Tour. Res. 29 (2), 384–400.
Pillai, R., Sivathanu, B., 2020. Adoption of AI-based chatbots for hospitality and tourism. Int. J. Contemp. Hosp. Manag. 32 (10), 3199–3226.
Pillai, S.G., Haldorai, K., Seo, W.S., Kim, W.G., 2021. The effect of COVID-19 lockdowns on paediatric lower limb orthopaedic presentations. Arch. Orthop. Trauma Surg. 94.
Pizam, A., Tasci, A.D.A., 2019. Experienscape: expanding the concept of servicescape with a multi-stakeholder and multi-disciplinary approach. Int. J. Hosp. Manag. 76, 25–37.
Prentice, C., Weaven, S., Wong, I.A., 2020. Linking AI quality performance and customer engagement: the moderating effect of AI preference. Int. J. Hosp. Manag. 90, 102629.
Qiu, H., Li, M., Shu, B., Bai, B., 2020. Enhancing hospitality experience with service robots: the mediating role of rapport building. J. Hosp. Mark. Manag. 29 (3), 247–268.
Rajaobelina, L., 2018. The impact of customer experience on relationship quality with travel agencies in a multichannel environment. J. Travel Res. 57 (2), 206–217.
Reeves, B., Nass, C., 1996. The media equation: how people treat computers. Television, and New Media Like Real People. Cambridge University Press, Cambridge, UK.
Rosenthal-von der Pütten, A.M., Krämer, N.C., Herrmann, J., 2018. The effects of humanlike and robot-specific affective nonverbal behavior on perception, emotion, and behavior. Int. J. Soc. Robot. 10 (5), 569–582.
Rumsey, N., Harcourt, D., 2005. The Psychology of Appearance. Open University Press.
Salem, M., Ziadee, M., Sakr, M., 2014. Marhaba, how may I help you? Effects of politeness and culture on robot acceptance and anthropomorphization. Paper presented at the ACM/IEEE International Conference on Human-Robot Interaction.
Sari, F.O., Bulut, C., Pirnar, I., 2016. Adaptation of hospitality service quality scales for marina services. Int. J. Hosp. Manag. 54, 95–103.
Schepers, J., Wetzels, M., 2007. A meta-analysis of the technology acceptance model: investigating subjective norm and moderation effects. Inf. Manag. 44 (1), 90–103.
Scherer, K.R., Schorr, A., Johnstone, T., 2001. Appraisal processes in emotion: theory. Methods, Research. Oxford University Press.
Schmitt, B., 1999. Experiential marketing. J. Mark. Manag. 15 (1–3), 53–67.
Seyitoğlu, F., Ivanov, S., 2020. A conceptual framework of the service delivery system design for hospitality firms in the (post-)viral world: the role of service robots. Int. J. Hosp. Manag. 91, 102661.
Shin, H., Kang, J., 2020. Reducing perceived health risk to attract hotel customers in the COVID-19 pandemic era: Focused on technology innovation for social distancing and cleanliness. Int. J. Hosp. Manag. 91, 102664 https://doi.org/10.1016/j.ijhm.2020.102664.
Shin, H.H., Jeong, M., 2020. Guests' perceptions of robot concierge and their adoption intentions. Int. J. Contemp. Hosp. Manag. 32 (8), 2613–2633.
Stavropoulos, K.K.M., Alba, L.A., 2018. "It's so cute I could crush it!": Understanding neural mechanisms of cute aggression. Frontiers in Behav. Neurosci. 12.
Stock, R.M., Merkle, M., 2017. A service robot acceptance model: user acceptance of humanoid robots during service encounters. Paper presented at the 2017 IEEE International Conference on Pervasive Computing and Communications Workshops, PerCom Workshops 2017.
Tay, B., Jung, Y., Park, T., 2014. When stereotypes meet robots: the double-edge sword of robot gender and personality in human-robot interaction. Comput. Hum. Behav. 38, 75–84.
Taylor, S., 2020. The socially distant servicescape: an investigation of consumer preference's during the re-opening phase. Int. J. Hosp. Manag. 91, 102692.
Tsai, C.Y., Wang, M.T., Tseng, H.T., 2015. The impact of tour guides' physical attractiveness, sense of humor, and seniority on guide attention and efficiency. J. Travel Tour. Mark. 33 (6), 824–836.
Tse, T.S.M., Zhang, E.Y., 2013. Analysis of blogs and microblogs: a case study of Chinese bloggers sharing their Hong Kong travel experiences. Asia Pac. J. Tour. Res. 18 (4), 314–329.
Tung, V.W.S., Au, N., 2018. Exploring customer experiences with robotics in hospitality. Int. J. Contemp. Hosp. Manag. 30 (7), 2680–2697.
Tung, V.W.S., Law, R., 2017. The potential for tourism and hospitality experience research in human-robot interactions. Int. J. Contemp. Hosp. Manag. 29 (10), 2498–2513.
Tuomi, A., Tussyadiah, I., Stienmetz, J., 2021. Applications and implications of service robots in hospitality. Cornell Hospitality Quarterly. Cornell Hospit. Quart. 62 (2), 232–247.
Turja, T., Aaltonen, I., Taipale, S., Oksanen, A., 2020. Robot acceptance model for care (RAM-care): a principled approach to the intention to use care robots. Inf. Manag. 57 (5), 103220.
Tussyadiah, I., 2020. A review of research into automation in tourism: launching the Annals of Tourism Research curated collection on artificial intelligence and robotics in tourism. Ann. Tour. Res. 81, 102883.
Tussyadiah, I., Park, S., 2018. Consumer evaluation of hotel service robots. Information and Communication Technologies in Tourism 2018. Springer, Cham.
Tussyadiah, I., Zach, F.J., Wang, J., 2020. Do travelers trust intelligent service robots? Ann. Tour. Res. 81, 102886.
Valenzuela, A., Mellers, B., Strebel, J., 2010. Pleasurable surprises: a cross-cultural study of consumer responses to unexpected incentives. J. Consum. Res. 36 (5), 792–805.
van Doorn, J., Mende, M., Noble, S.M., Hulland, J., Ostrom, A.L., Grewal, D., Petersen, J. A., 2017. Domo Arigato Mr. Roboto: emergence of automated social presence in organizational frontlines and customers' service experiences. J. Serv. Res. 20 (1), 43–58.
Vanhamme, J., 2000. The link between surprise and satisfaction: an exploratory research on how best to measure surprise. J. Mark. Manag. 16 (6), 565–582.
Venkatesh, V., Morris, M.G., Davis, G.B., Davis, F.D., 2003. User acceptance of information technology: toward a unified view. MIS Q.: Manag. Inf. Syst. 27 (3), 425–478.
Venkatesh, V., Thong, J.Y.L., Xu, X., 2012. Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology. MIS Q.: Manag. Inf. Syst. 36 (1), 157–178.
Volo, S., 2010. Bloggers' reported tourist experiences: their utility as a tourism data source and their effect on prospective tourists. J. Vacat. Mark. 16 (4), 297–311.
Vonk, R., 2002. Self-serving interpretations of flattery: why ingratiation works. J. Personal. Soc. Psychol. 82 (4), 515–526.
Warren, C., Campbell, M.C., 2014. What makes things cool? How autonomy influences perceived coolness. J. Consum. Res. 41 (2), 543–563.
Weiss, A., Bernhaupt, R., Lankes, M., Tscheligi, M., 2009. The USUS evaluation framework for human -robot interaction. Retrieved 05 October, 2021 from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.160.2694&rep=rep1&type=pdf.
Wirtz, J., Patterson, P.G., Kunz, W.H., Gruber, T., Lu, V.N., Paluch, S., Martins, A., 2018. Brave new world: service robots in the frontline. J. Serv. Manag. 29 (5), 907–931.
Woisetschlager, D.M., Hartleb, V., Blut, M., 2008. How to make brand communities work: antecedents and consequences of consumer participation. J. Relatsh. Mark. 7 (3), 237–256.
Xiang, Z., Gretzel, U., 2010. Role of social media in online travel information search. Tour. Manag. 31 (2), 179–188.
Xiang, Z., Schwartz, Z., Gerdes, J.H., Uysal, M., 2015. What can big data and text analytics tell us about hotel guest experience and satisfaction? Int. J. Hosp. Manag. 44, 120–130.
Xiao, L., Kumar, V., 2021. Robotics for customer service: a useful complement or an ultimate substitute? J. Serv. Res. 24 (1), 9–29.
Xu, X., Gursoy, D., 2021. STHRSCAPE: developing and validating a collaborative economy based short-term hospitality rental servicescape scale. Int. J. Hosp. Manag. 94.
Xu, X., Huang, D., Chen, Q., 2021. Stress and coping among micro-entrepreneurs of peer-to-peer accommodation. Int. J. Hosp. Manag. 97, 103009.
Yagil, D., 2001. Ingratiation and assertiveness in the service provider–customer dyad. J. Serv. Res. 3 (4), 345–353.
Young, J.E., Sung, J., Voida, A., Sharlin, E., Igarashi, T., Christensen, H.I., Grinter, R.E., 2011. Evaluating human-robot interaction: focusing on the holistic interaction experience. Int. J. Soc. Robot. 3 (1), 53–67.
Yu, C.E., 2020. Humanlike robots as employees in the hotel industry: thematic content analysis of online reviews. J. Hosp. Mark. Manag. 29 (1), 22–38.
Yu, C.E., Ngan, H.F.B., 2019. The power of head tilts: gender and cultural differences of perceived human vs human-like robot smile in service. Tour. Rev. 74 (3), 428–442.
Yu, D., Hang, C.C., 2010. A reflective review of disruptive innovation theory. Int. J. Manag. Rev. 12 (4), 435–452.
Zeng, Z., Chen, P.J., Lew, A.A., 2020. From high-touch to high-tech: COVID-19 drives robotics adoption. Tour. Geogr. 22 (3), 724–734.
Zhang, T., Kaber, D.B., Zhu, B., Swangnetr, M., Mosaly, P., Hodge, L., 2010. Service robot feature design effects on user perceptions and emotional responses. Intell. Serv. Robot. 3 (2), 73–88.
Zhong, L., Zhang, X., Rong, J., Chan, H.K., Xiao, J., Kong, H., 2020. Construction and empirical research on acceptance model of service robots applied in hotel industry. Ind. Manag. Data Syst. 121 (6), 1325–1352.
Zhou, L., 2020. Hitchhiking tourism and social trust: exploring Chinese experiences through travel blogs. Ann. Tour. Res. 81, 102853.
Zhou, L., Ye, S., Pearce, P.L., Wu, M.Y., 2014. Refreshing hotel satisfaction studies by reconfiguring customer review data. Int. J. Hosp. Manag. 38, 1–10.
Zhu, D.H., Chang, Y.P., 2020. Robot with humanoid hands cooks food better? Effect of robotic chef anthropomorphism on food quality prediction. Int. J. Contemp. Hosp. Manag. 32 (3), 1367–1383.
Zimmer, M., 2010. "But the data is already public": on the ethics of research in Facebook. Ethics Inf. Technol. 12 (4), 313–325.