

ABSTRACT

This research investigates the effects of robotic service on guest evaluations of hotel brand experience, and examines the moderating effects of hotel segment via a 2 (service delivery video: human or robot) x 3 (hotel segment: budget, midscale, or luxury) between-subjects experimental design. The findings suggest higher levels of sensory and intellectual experience from robotic service but lower levels of affective experience. For behavioral experience, robotic service influenced a higher rating for midscale and budget hotels, but not for a luxury hotel. Overall, robotic service may not necessarily enhance brand experience as influenced by the moderating role of hotel segment.

KEYWORDS: brand experience; service robots; customer service; hotel segment; customer experience

Introduction

There is increasing interest in the application of robotic technology in tourism and hospitality. For example, Starwood's Aloft Hotel deployed a robotic butler to deliver amenities to hotel guests (Crook, 2014). Royal Caribbean's Quantum of the Seas installed robotic arms to act as bartenders (Golden, 2014). Singapore tested a robotic virtual agent to offer information and assistance for tourists (Niculescu *et al.*, 2014).

Similarly, an increasing number of studies in tourism and hospitality are examining the deployment of robotic technology. For example, Kuo, Chen & Tseng (2017) investigated supply and demand-side factors for hotels to consider before developing robots, such as financial ability, development of technology and talent, government support, and the development of the overall hotel industry and robotic market. Ivanov, Webster and Berezina (2017) considered the costs and benefits of adopting robotic technology, such as maintenance and labor costs, as well as the potentially enhanced perceived quality via high-tech innovations from users. Pinillos *et al.* (2016) identified areas of challenges for deploying robots in hotels, such as the shortage of battery, and damage from children.

Despite valuable insights from past research, there are relatively fewer studies on guest evaluations of robotics. While Tung and Au (2018) explored consumer reviews with robotics at four hotels (i.e., Yotel New York, Aloft Cupertino, Henn-na Hotel Japan, and Marriott Residence Inn LAX), no study to-date have experimentally examined how service from a robot, or robotic service, could affect guest evaluations of a hotel's brand experience. Conveying positive brand experience is important for maintaining long-term relationships with customers and for differentiating a brand from others (Lee, Lee & Feick, 2001). Enhancing brand experience could also improve customer loyalty to the organization (Iglesias, Singh & Batista-Foguet, 2011),

The present research seeks to address this question through two related experiments. To begin, the objective of Study 1 is to investigate the effects of robotic service on guest evaluations of hotel brand experience compared to service delivery by a human staff. There are four dimensions of brand experience: intellectual, affective, behavioral, and sensory. Study 1 seeks to demonstrate the potential extent to which robotic service could influence specific dimensions of brand experience (e.g., intellectual) rather than others (e.g., affective). Additionally, Study 1 provides initial evidence on the limitations of robotic service on facilitating affective experiences compared to a human staff.

Extending from Study 1, the objective of Study 2 is to examine the moderating effects of hotel segment on brand experiences via a 2 (service delivery: human or robot) x 3 (hotel segment: budget, midscale, or luxury) between-subjects experimental design. Hotel segment is a relevant consideration as different luxury brands are introducing robotics in their properties (Fetterling, 2016). Luxury hotel guests could demand different levels of service quality compared to guests who stay at midscale and budget hotels; hence, deployment of robotic service compared to human staff at this level could potentially affect perceptions of brand experience (Monty & Skidmore, 2003; Zhang, Ye & Law, 2011). Taken together, Study 1 and 2 contributes to the hospitality and tourism literature by connecting research attention in robotics with the important body of work on brand experiences. From a managerial perspective, this research highlights that robotic service may not necessarily enhance brand experience as influenced by the moderating role of hotel segment in which the hotel operates.

Literature Review

Service robots

Industrial robots could be considered as the precursor to service robots. Industrial robots rapidly developed during the industrial revolution in the early 1960s to save production cost and reduce potential dangers from risky and repetitive work (Bard, 1986). For example, they are often used for welding, polishing, and assembling in large-scale manufacturing environments (Garcia, Jimenez, De Santos & Armada, 2007). As the service sector developed, interest in adopting robotics to the service environment to assist employees and serve customers began to grow accordingly as well.

Service robots could be defined as systems that function as programmable tools that can sense, think, and act to enhance human productivity and/or engage in social interactions (Bartneck & Forlizzi, 2004). The difference between industrial and service robots lie on three dimensions: cognition, manipulation, and interaction (Wood, 2016). Cognition is the ability to coordinate thought and act to achieve goals (Miller & Wallis, 2009). It allows service robots to work in unconstrained environments and perform not only repetitive, but also more complicated tasks since they can learn from challenges. The second dimension, manipulation, is the stability and ability to accomplish a particular task (Bicchi, 2000). Service robots tend to have a higher degree of dexterity than industrial robots, and are capable of performing a wider range of service functions (e.g., security, rehabilitation, and medical function) (Garcia, Jimenez, De Santos & Armada, 2007). The third dimension, interaction, reflects the design of service robots as more human-centric (Miller & Wallis, 2009). For example, service robots at hotels need to manage their proximity to users and cooperate alongside human staff and other guests via verbal and non-verbal communication.

Connecting research on brand experience with service robots

Brand experience represents the perception of the consumers during moments of contact with a brand (Alloza, 2008). It includes consumers' subjective, internal, and

behavioral responses from a brand's design, identity, packaging, communication, and environment (Brakus, Schmitt & Zarantonello, 2009). There are four dimensions of brand experience: sensory, affective, intellectual, and behavioral. These four dimensions reflect different types of experiences that could be facilitated through consumers' senses, emotions, thoughts, and actions (Schmitt, 1999).

First, brands could facilitate sensory experiences by making a strong impression on consumers' visual or other senses, and being interesting in a sensory way. In this regard, service robots could potentially affect sensory experiences through intermixed morphologies (Tung & Law, 2017). For example, robots could be designed in non-humanoid and/or zoomorphic forms such as rabbits and dogs while performing complex and novel human tasks (Pfeifer, Lungarella & Iida, 2007). In addition to leaving alternative impressions on guests' visual senses, robots could also imitate other animals or human sounds to stimulate unique auditory experiences.

Affective experiences refer to a brand's ability to leave strong emotions for customers, and induce feelings and sentiments (Brakus *et al.*, 2009). In hospitality settings, service encounters such as delivering room service could affect guests' emotions toward service providers (Price, Arnould & Deibler, 1995). Guests and hotel staff may engage in authentic conversations during their encounters, and induce positive emotional responses for the brand. In contrast, robots can neither display the types of emotional expressions as humans nor perform as sincerely and genuinely as humans given current focus on robotic functions and standardization (Fellous & Arbib, 2005).

A brand facilitating intellectual experiences should stimulate consumers' curiosity and problem solving, and engage customers in thinking when they encounter the brand (Brakus *et al.*, 2009). From ordering meals to receiving desired in-room products or services, hotel guests are typically familiar with the procedures of room service delivered by human

employees. In contrast, service robots could be a newer concept for many guests as one of the first hotels to deploy robotics, such as Henn-na Hotel in Japan, was opened only relatively recently (Lewis-Kraus, 2016). As a result, robotic service could engage guests in a different level of thinking and foster a certain extent of critical thinking and problem solving, especially in the event that a robot becomes faulty (Kamali & Fahim, 2011).

Finally, behavioral experience refers to the extent to which a brand is action-oriented, and engages customers in physical actions and behaviors (Brakus *et al.*, 2009). For example, guests would be required to be more physically involved in the context of robotic service delivery. When a robot arrives with food or other deliverable to a room, guests will need to engage the robot, take the deliverables by themselves from the robot, complete the transaction, and then press a button on the robot's screen to direct it to leave. In contrast, a human staff can smoothly bring in the desired deliverables for a guest directly to his/her room. This is a very straightforward service encounter with a human staff, but service robots would require guests to engage in a higher level of physical involvement as robots by themselves may face sensory and mobility difficulties in tighter indoor spaces (Lee and Chung, 2006).

Moderating role of hotel segments

Hotel segments could be considered in three broad categories: luxury, midscale, and budget. Previous studies have used 'luxury' to describe hotels such as Four Seasons and The Ritz-Carlton that provide personalized services to enhance customer satisfaction and brand loyalty, brand awareness, and perceived quality (Kim & Kim, 2005). In contrast, 'midscale' have been used to describe brands such as Holiday Inn and Four Points by Sheraton (Rauch, Collins, Nale and Barr, 2015), and 'budget' hotels such as Ibis reflect favorable cost propositions but provides limited services (Brotherton, 2004). In addition to these influences

on value and service propositions, hotel segments could also potentially moderate guest evaluations of brand experiences (e.g., behavioral, affective, intellectual, and sensory) in the context of robotic service.

For behavioral experiences, guests at luxury hotels may perceive a lower level of brand experience if services were provided by a robot given current mobility and technological issues in performing complicated tasks (Lee and Chung, 2006). Luxury hotels are exemplified by scale, tasteful aesthetics, physical surroundings, and high quality human-to-human interactions (Walls, Okumus, Wang, & Kwun, 2011). Furthermore, a high level of personalized service is one of the factors for luxury hotels to differentiate from others (Mattila, 1999). In contrast, guests at midscale and budget hotels may expect high degrees of standardized services (Fiorentino, 1995). These guests may consider personalized or prestige services, such as gourmet restaurants and concierge services, as less important compared to guests who stay at luxury hotels (Griffin, Shea & Weaver, 1997). As a result, guests who stay at midscale and budget hotels could be more open to standardized robotic services compared to guests who at luxury hotels, where tailored services from human staff are considered important.

A brand with high intellectual experience engages consumers, and current robotic technology may not be able to provide high levels of expected thoughtfulness and attention to detail (Brakus *et al.*, 2009). For example, personal communication is required by service staff to carefully understand guests' needs (Cetin & Walls, 2016). While there may be fewer employees in budget and midscale hotels to provide guest services, luxury hotels employ a larger number of staff as customers are often less tolerant of insufficient attention (Mattila, 1999). Furthermore, luxury hotels may provide high levels of personalized services and training for staff to further improve guest experiences (Maroudas, Kyriakidou & Vacharis, 2008).

To facilitate affective experiences, luxury hotels may impress their guests by employing and training service specialists. Service specialists are trained to recognize and respond to guest emotions, and consequently, guests may perceive luxury hotels that deploy standardized robotic services as a weakness. Conversely, opportunities for developing affective experiences with human employees could be more limited at midscale and budget properties since they tend to offer basic and limited services (e.g., fewer range of restaurants, spas, and fitness centers) (Gilbert & Arnold, 1989; Justus, 1991); hence, guests at midscale and budget hotels may be more receptive to robotics in their service environment.

Finally, hotels that appeal to the senses can enhance their brand's sensory experience (Brakus *et al.*, 2009). Hotels across all three segments – budget, midscale, and luxury – typically train their staff on impression management, covering non-verbal aspects such as body language, posture, and behaviour, to make a strong sensory impression (Manzur & Jogaratnam, 2007). These are human dimensions that robotics cannot yet imitate. However, robotics may be able to provide a different type of impression as they could be embodied with different morphology, both humanoid and/or zoomorphic appearances, as well as mimic other creatures to stimulate different visual and auditory senses (Pfeifer, Lungarella & Iida, 2007). Depending on the hotel segment, guests at luxury hotels, for example, may prefer sensory experiences with a human-touch, while guests at budget and midscale hotels may be more receptive to potential ambiguity from robotics.

Methodology

There are two related experiments in the present research. Study 1 seeks to provide initial evidence on the potential effects of robotic service on guest evaluations of hotel brand experience via a between-subjects experimental design with two conditions (service delivery: human or robot). Study 2 further investigates the moderating effects of hotel segment on

brand experiences via a 2 (service delivery: human or robot) x 3 (hotel segment: budget, midscale, or luxury) between-subjects experimental design.

Study 1

Process

Two videos depicting room service delivery were prepared for each of the two experimental conditions (i.e., human or robot). The first video, adopted from Muratec, a Japanese machinery company, showed a cylinder-shaped robot with a mini-LED screen carrying three cups of drinks in a Japanese hotel. In this video, when the robot approached the guest room that requested room service, it automatically sent a message to an electronic screen in the room and invited the guest to open the door. When the guest acknowledged the delivery on the robot's LED screen, a small door on the robot unlocked and the guest picked up the drinks. Finally, the guest pressed a button on the LED screen and the robot left.

The second video highlighted room service by a human staff. The researchers made utmost efforts to prepare this video to parallel the hotel environment and context of the robotic demonstration. First, the lead researcher scouted and filmed this video at a hotel in Japan that has comparable décor to the hotel in the robotic video (note: a different hotel was used because the lead researcher received permission from hotel management to film at one property only). The interior of the hotels depicted in both videos were largely comparable (e.g., similar color for the doorframes, wall, and carpet). In addition to equivalent décor and setting, both videos were prepared with the same background music and the timing of the actions performed by the human staff was similar to the robot. For example, the robot and the human staff both arrived at the guest room at the 14-second mark.

Participants and design

Sixty participants were recruited via convenience sampling at a large university and randomly assigned to participate in a between-subjects experimental design with two conditions: service delivery: human or robot (i.e., 51.7% female and 48.3% male; 91.7% between the age of 18 to 24 at the undergraduate level). Participants have taken an average of three trips and stayed in three different hotel brands in the last two years.

At the beginning of the study, participants were told: “Please watch a short video that was filmed in a hotel regarding a robot (or a human employee) delivering room service and complete a short survey afterwards”. In an effort to minimize potential response bias, participants who were randomly assigned to watch the robotic video did not know there was a corresponding video with a human staff, and vice versa. Additionally, participants were not informed of the hotel brand and filming location of the videos.

After watching the video, participants completed the brand experience scale based on Brakus *et al.* (2009). This scale included 12 items rated on a seven-point Likert-type scale (1 = strongly disagree to 7 = strongly agree) (e.g., I find this hotel interesting in a sensory way; This hotel induces feelings and sentiments). Participants were also asked to indicate the level of the hotel (i.e., from one star to five stars) that would they expect to receive the room service from the video.

Results

Reliability measures were calculated for each of the four dimensions of brand experience: sensory ($\alpha = .86$), affective ($\alpha = .80$), intellectual ($\alpha = .89$), and behavioral ($\alpha = .67$). Three of the four dimensions had reliability scores greater than .70, although the behavioral dimension was slightly under, which suggested the scale was largely acceptable (Nunnally, 1978) (see Table I).

--- Insert Table I here ---

Independent sample t-tests were conducted to compare the effects of robotic service on the four dimensions of hotel brand experience compared to service delivery by a human staff. Participants rated affective experiences by human staff ($M = 4.90, SD = 0.85$) significantly higher than service provide by a robot ($M = 3.68, SD = 0.84$), $t(58) = 5.613, p < .001$. However, participants rated robotic service significantly higher in sensory experience ($M = 5.07, SD = 0.69$) than service from a human employee ($M = 3.66, SD = 0.77$), $t(58) = 7.492, p < .001$. Robotic service also scored significant higher in both behavioral [robotic $M = 4.41, SD = 0.71$; human $M = 4.01, SD = 0.59$], $t(58) = 2.374, p = .021$] and intellectual experiences [robotic $M = 5.41, SD = 0.85$; human $M = 3.70, SD = 0.90$], $t(58) = 7.570, p < .001$]. Overall, the composite mean of the four dimensions of hotel brand experience for robotic service ($M = 4.64, SD = 0.48$) was also significantly higher than the human condition ($M = 4.07, SD = 0.36$), $t(58) = 5.246, p < .001$ (see Figure 1).

--- Insert Figure 1 here ---

Finally, there was also a significant difference in ratings (i.e., from one to five stars) between the two conditions. While participants in both conditions perceived the hotel depicted in the videos as largely at, or above, a four-star level, participants rated the hotel with the robotic service at a higher level ($M = 4.32, SD = 0.50$) than the hotel that showed service by the human staff ($M = 3.95, SD = 0.33$), $t(58) = 3.351, p = .002$.

Brief discussion of Study 1 and introduction to Study 2

Study 1 provided initial evidence that guests who viewed robotic service reported higher ratings in overall brand experience than guests who viewed service from a human

employee. However, these effects were not consistent among all four specific dimensions of brand experience; that is, while participants rated sensory, behavioral, and intellectual experiences higher from robotic service, they nevertheless rated affective experiences lower than the human condition. Participants indicated that service from a human staff induced stronger emotions towards the hotel brand than robotic service.

Additionally, there were differences in ratings given to hotels between the two conditions. This provided evidence that the level of hotel could be a relevant consideration in evaluations of robotic service on brand experience. In this regard, Study 2 further investigates the moderating effects of hotel segment on brand experiences via a 2 (service delivery: human or robot) x 3 (hotel segment: budget, midscale, or luxury) between-subjects experimental design.

Study 2

Participants and design

Study 2 sought to recruit a non-local, non-student sample of participants were recruited at the entrance of Tsim Sha Tsui Star Ferry Pier in Hong Kong, a major tourist transportation hub. A total of 180 participants were recruited and randomly assigned to a 2 (service delivery: human or robot) x 3 (hotel segment: budget, midscale, or luxury) between-subjects experimental design. The majority of participants were non-local residents (90.6%), older than 30 years old (60.5%), and took an average of three trips in the past two years. The sample also had equal gender representation (50% male and female).

First, participants were primed with the level of hotel for each of the conditions of hotel segment (i.e., budget, midscale, or luxury) prior to watching the videos. They were primed: "Please answer the questions based on the below video. Imagine this video was

filmed in a luxury hotel (or midscale hotel or budget hotel, depending on the condition) (e.g., Four Seasons, Holiday Inn, or Ibis)".

Next, participants were shown one of two videos for service delivery as per Study 1 (i.e., human or robot) with an iPad onsite. They were then asked to complete a paper questionnaire with the 12-item measure of hotel brand experience on a seven-point Likert-type scale (1 = strongly disagree to 7 = strongly agree) (Brakus *et al.*, 2009). As per Study 1, participants were neither informed of a corresponding video with human staff and vice versa, nor the filming location of the videos, to minimize potential response bias.

Results

First, the reliability measures for each of the four dimensions of brand experience were assessed. The reliability measures were acceptable and greater than 0.70 (Nunnally, 1978) (sensory $\alpha = .79$; affective $\alpha = .86$; intellectual $\alpha = .87$), except for behavioral experience which was slightly lower ($\alpha = .64$).

Next, analysis of variance (ANOVA) was used to evaluate the effects of service delivery (i.e., human or robot) and hotel segment (i.e., budget, midscale, or luxury) on composite brand experience. The results showed a significant main effect for service delivery, $F(1, 174) = 89.199, p < .001$ as composite brand experience from robotic service ($M = 4.66, SD = 0.40$) was higher than service by the human staff ($M = 4.16, SD = 0.37$), $t(178) = -8.719, p < .001$. There was no significant main effect for hotel segment, $F(2, 174) = 1.131, p = .325$, but there was a significant interaction effect for service delivery and hotel segment, $F(2, 174) = 16.304, p < .001$. The interaction effect suggested that the difference in composite brand experience from human or robotic service depended on the level of the hotel. For both midscale and budget hotels, composite brand experience from robotic service (midscale hotel $M = 4.73, SD = 0.34$; budget hotel $M = 4.76, SD = 0.49$) was significantly

higher than room service by a human employee (midscale hotel $M = 4.05$, $SD = 0.33$; budget hotel $M = 4.00$, $SD = 0.28$), $t(58) = -7.747$, $p < .001$. However, for luxury hotels, there was no significant difference on composite brand experience between robotic service ($M = 4.43$, $SD = 0.34$) and human staff ($M = 4.51$, $SD = 0.30$), $t(58) = -.900$, $p = .372$. Taken together, the findings suggested that robotic service resulted in higher composite ratings of brand experience than service by a human staff in midscale and budget hotel conditions, but in the luxury hotel condition (see Figure 2).

--- Insert Figure 2 here ---

Multivariate analysis of variance (MANOVA) was conducted to assess the effects of service delivery (i.e., human or robot) on each of the four dimensions of brand experience (i.e., sensory, affective, behavioral, and intellectual) across the three different hotel segments (i.e., budget, midscale, or luxury). There was no significant difference in the four dimensions of brand experience among different hotel segments (Wilks's $\lambda = .963$), $F(8, 342) = .809$, $p = .595$. However, there were significant differences in the four dimensions of brand experience between human or robotic service (Wilks's $\lambda = .182$), $F(4, 171) = 192.526$, $p < .001$. Additionally, there was a significant interaction effect between hotel segment and service delivery (Wilks's $\lambda = .800$), $F(8, 342) = 5.049$, $p < .001$. This suggested that evaluations across the specific dimensions of brand experience from human or robotic service depended on hotel segment (see Table II for the mean and standard deviation for each of the four dimensions of brand experience across conditions).

--- Insert Table II here ---

More specifically, for sensory experience, there was no significant main effect for hotel segment, $F(2, 174) = .088, p = .916$. There was a significant main effect for human or robotic service, $F(1, 174) = 192.299, p < .001$. Sensory experience from robotic service was higher at luxury ($M = 4.93, SD = 0.70$), midscale ($M = 5.08, SD = 0.57$), and budget hotels ($M = 5.02, SD = 0.68$) than service by a human staff (luxury hotel $M = 3.86, SD = 0.54, t(58) = -6.674, p < .001$; midscale hotel $M = 3.73, SD = 0.49, t(58) = -9.773, p < .001$; and budget hotel $M = 3.70, SD = 0.61, t(58) = -7.914, p < .001$). However, there was no significant interaction effect between hotel segment and human or robotic service, $F(2, 174) = .901, p = .408$. Together, the results suggested that robotic service provided a higher level of sensory experience than service by a human staff across all hotel segments.

For the behavioral dimension, there was no significant main effect for hotel segment, $F(2, 174) = 1.373, p = .256$. However, there was a significant main effect for human or robotic service, $F(1, 174) = 5.840, p = .017$, as well as a significant interaction effect, $F(2, 174) = 7.797, p = .001$. Robotic service at midscale ($M = 4.47, SD = 0.63$) and budget hotels ($M = 4.52, SD = 0.77$) resulted in a significantly higher behavioral experience than service by a human staff (midscale hotel $M = 4.01, SD = 0.63, t(58) = -2.794, p = .007$; budget hotel $M = 3.94, SD = 0.62, t(58) = -3.198, p = .002$). In contrast, there was no significant difference in behavioral experience at the luxury hotel condition between human ($M = 4.57, SD = 0.81$) and robotic service ($M = 4.26, SD = 0.49, t(58) = 1.793, p = .079$).

For the intellectual dimension, there was no significant main effect for hotel segment, $F(2, 174) = .293, p = .746$. Nevertheless, there was a significant main effect for human or robotic service, $F(1, 174) = 527.011, p < .011$, as well as a significant interaction effect, $F(2, 174) = 6.968, p = .001$. Robotic service at luxury ($M = 5.31, SD = 0.60$), midscale ($M = 5.71, SD = 0.68$), and budget hotels ($M = 5.70, SD = 0.64$) resulted in significantly higher intellectual experiences than service by a human staff (luxury hotel $M = 3.84, SD = 0.54,$

$t(58) = -9.973, p < .001$; midscale hotel $M = 3.57, SD = 0.37, t(58) = -15.204, p < .001$; budget hotel $M = 3.60, SD = 0.45, t(58) = -14.714, p < .001$).

Finally, for affective experience, there was no significant main effect for hotel segment, $F(2, 174) = 2.145, p = .120$. However, there was a significant main effect for human or robotic service, $F(1, 174) = 199.373, p < .001$, as well as a significant interaction effect, $F(2, 174) = 8.124, p < .001$, which suggested that the differences in affective experience depended on hotel segment. Affective experiences were rated higher from service by a human staff at luxury ($M = 5.46, SD = 0.74$), midscale ($M = 4.90, SD = 0.79$), and budget hotels ($M = 4.77, SD = 0.60$) than robotic service at these levels (luxury hotel $M = 3.52, SD = 0.58, t(58) = 11.272, p < .001$; midscale hotel $M = 3.64, SD = 0.55, t(58) = 7.139, p < .001$; budget hotel $M = 3.78, SD = 0.67, t(58) = 5.996, p < .001$) (see Figure 3).

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Brief discussion of Study 2

The results of Study 2 provided additional support for Study 1, and showed that robotic service could potentially influence higher levels of overall hotel brand experience. However, the results in Study 2 also demonstrated that the effects of human or robotic service depends on the level of the hotel (i.e., luxury, midscale, or budget). While higher levels of overall brand experience were reported from robotic service at midscale and budget hotels, no significant differences were found in luxury hotels. This finding provided support on the potential moderating role of hotel segment on overall brand experience from human or robotic service.

Furthermore, hotel segment also moderated the effects of human or robotic service on specific dimensions of brand experience. For example, there were higher reported levels of

sensory and intellectual experience from robotic service across all levels of hotel; yet, on the contrary, robotic service resulted in lower affective experience. For behavioral experience, robotic service influenced a higher rating for midscale and budget hotels, but not for a luxury hotel.

General Discussion

The primary goal of this research was to evaluate the effects of robotic service on guest evaluations of hotel brand experience. Study 1 served as an initial study and showed the differing effects of human and robotic service. More specifically, while robotic service enhanced levels of sensory, behavioral, and intellectual experiences, it nevertheless resulted in a lower level of affective experience compared to service from a human staff. Study 2 sought to extend the results of Study 1, and examined the moderating effects of hotel segment on guest evaluations of brand experiences. Study 2 showed that robotic service at a luxury hotel may have little impact on overall brand experience compared to service by a human employee. Furthermore, robotic service enhanced ratings of behavioral experience for midscale and budget hotels, but not for a luxury property. Again, affective experiences were rated lower with robotic service compared to service from a human staff.

Theoretical Contributions

This research contributed to the tourism and hospitality literature by connecting work in robotics with research on brand experiences. It added to the growing line of work on robotic adoption in hotels (e.g., Kuo, Chen & Tseng, 2017; Ivanov, Webster & Berezina, 2017; Pinillos *et al.*, 2016) by presenting experimental evidence on how robotic service could potentially affect intellectual, behavioral, sensory, and affective dimensions of hotel brand experience.

Additionally, this research contributed to the literature by highlighting the moderating role of hotel segment. More specifically, while Study 1 provided initial evidence on the potential benefits of robotic service on brand experience, Study 2 was designed to highlight that such enhancement could depend on the level of the hotel as robotic service facilitated higher overall brand experience only in midscale and budget properties, but not in the luxury

hotel condition. While luxury hotels seek to provide deluxe and personalized services (Kim & Kim, 2005), midscale and budget hotels oftentimes strive to satisfy guest needs through limited service (Brotherton, 2004; Rauch *et al.*, 2015). Robotic service did not differentiate levels of brand experience between midscale and budget hotels; instead, support for service by a human staff was highly relevant for the luxury hotel condition.

This research also contributed to the general literature on brand experience. The findings showed that there could be different directional results among the four specific dimensions. For instance, among all levels of hotels, robotic service decreased affective experience. A possible reason for this result is the limitations of current robotic technology as service robots cannot mimic humans to the same extent in terms of feelings and expressions (Fellous & Arbib, 2005). In contrast, robotic service enhanced both sensory and intellectual experiences. This could be potentially explained by the novelty of robotic technology; that is, since robotic service is a relatively new experience for individuals, they are required to think more actively about the process before they become familiar with it (Kamali & Fahim, 2011). Furthermore, robotic service could potentially appeal to guests' visual senses given that the robot was in unique, non-humanoid form. In doing so, robotic technology could stimulate user senses, engagement, and curiosity (Tung & Law, 2017).

Finally, this research showed that robotic service led to higher behavioral experience in midscale and budget conditions, but not in a luxury hotel. A possible reason for this interaction effect is guests' different behavioral expectations toward hotel segments. Guests staying at luxury hotels may expect higher levels of tailored services, such as short conversations with employees so that employees recognize their needs. In contrast, guests at midscale and budget hotels may expect to receive higher degrees of standardized services (Fiorentino, 1995), which supports the current delivery of robotic technology.

Overall, this research contributed to the literature by highlighting that there could be improvements to intellectual and sensory experiences, yet reductions to affective experiences, coupled by interaction effects on behavioral experiences from different hotel segments that deploy robotic service. As a result, this research showed the relevance of evaluating each dimension specifically when connecting robotic technology with tourism and hospitality experience research.

Practical Implications

There are important managerial implications for hotels at different levels that are considering robotic service. From the guests' perspective, the results suggested that midscale and budget hotels could consider robotic technology to improve brand experience. However, the research findings also suggested that guests may be unable to differentiate between brand experiences of midscale and budget hotels that deploy robotic services. For midscale hotels, there was no significant improvement in brand experiences compared to budget hotels; thus, midscale hotels may need to consider other core competencies instead of robotic technology to differentiate themselves.

The impact of robotic service on intellectual experience was highly noted. Across all hotel segments, intellectual experience was rated the highest among the four dimensions of brand experience from robotic service. However, this could pose a dilemma for hotel managers: on one hand, robotic service could improve intellectual experience by engaging the curiosity of guests; but on the other hand, there is potential that robotic service could be too complicated for guests to operate. Consequently, managers need to be cognizant of the level of difficulty from robots that could affect the overall brand experience. For example, the target market of a hotel could be an important factor for determining such level of difficulty. A hotel targeting younger individuals could be more receptive to potential intellectual

experiences from robotic service than a hotel targeting more elderly guests as the former target market could be more comfortable with advanced technology than the latter cohort who tend to use relatively more mainstream devices (Selwyn, 2004).

Finally, affective experience was the lowest rated dimension of brand experience. Hotels that pride themselves on facilitating emotional experiences should be cognizant of adopting robotic service, as affective evaluations could be inconsistent with their mandate. This is particularly relevant for luxury hotels that focus on affective experiences given the existing state of technology. In this regard, the limitations of robotic service may outweigh its benefits.

Limitations and Future Research

There are limitations and opportunities for future research. The setting of a video in an experimental design could be a limitation (Gong & Tung, 2017). For example, although participants were told to imagine it as midscale or a budget hotel, depending on condition, the internal design of a luxury hotel could nevertheless influence their visual experience. This research was conducted in Hong Kong, which could limit the generalizability of the findings to participants from other cultures. For example, if this research was conducted in Japan, Japanese participants could potentially rate the intellectual experience from robotic service at hotels differently because they have been exposed to robotic technology at an earlier stage (Lewis-Kraus, 2016). Correspondingly, Japanese participants could be more familiar with robotics and the technology may not stimulate their curiosity to a similar extent.

There could be gender considerations that could affect the interpretation of the study results. There is an opportunity for future research to consider gender effects as the sample size in the current research may be too limited to conduct a fair analysis for gender. Future research could also examine the effects of prior memories of robotic service on brand

experiences as previous experience could affect the novelty of such encounters (Tung & Ritchie, 2011; Tung et al., 2017).

Although this research attempted to show the moderating effects of hotel segment from robotic experience on brand experience, there are nevertheless some boutique hotels that are positioned in between segments. For example, there could be ambiguity for boutique hotels that are positioned between luxury and midscale levels. Future studies are needed to examine the effects of robotic service on such hotels.

Finally, future research could also investigate the effects of robotic service on other variables such as attitude towards a hotel and purchase intention, as well as the antecedents and outcomes of robotic service on hotel brand experience. While this research examined guest perspectives, future research could also evaluate the role of employee responsiveness, particularly if there are problems with faulty robotic service (Tung, Chen, & Schuckert, 2017).

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