

Hotel employee's artificial intelligence and robotics awareness and its impact on turnover intention: The moderating roles of perceived organizational support and competitive psychological climate

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ABSTRACT

The advent of machines powered by artificial intelligence (AI) and robotics technologies have already strongly influenced the hospitality industry, and the effects of its replacement upon the human workforce has been a highly debated topic. Despite this, empirical evidence in the form of published empirical studies have yet to appear in academic journals that present compelling evidence addressing what hospitality employees' awareness of those potential impacts could be pertaining to AI and robotics specifically applied within the context of their turnover intention and future employment prospects. The purpose of this study was to present new empirical findings on this issue using data from a sample of 468 full-time five star hotel employees in Guangzhou, China. AI and robotics awareness was found to be significantly associated with employee turnover intention. This relationship was moderated by perceived organizational support and competitive psychological climate. Implications and directions for future research are provided.

1. Introduction

Fueled by rapid advances in automation, robotics, and artificial intelligence (AI) technologies (Syam & Sharma, 2018), the emergence of the Industry 4.0 concept, or the fourth industrial revolution, has led to applications that are expected to prompt significant changes to many business sectors such as hospitality and tourism (Almada-Lobo, 2016). The Industry 4.0 movement, which has been directly responsible for increased data volumes and advanced algorithms, has now introduced AI, automation, and robotics technologies that hospitality businesses are strategically implementing as essential corporate functions for solving multiple daily management challenges (Makridakis, 2017). AI is appearing more frequently in various hospitality settings globally. Service automation systems now feature robots which are being used by airport management as substitutes for traveler information centers, while hotels are using AI to streamline processes and accelerate tasks traditionally conducted by front-line service employees for concierge, guest registration (check-in/out), room service, bartending, chatbots, and virtual voice assistance (Ivanov & Webster, 2017; Kuo, Chen, & Tseng, 2017; Tung & Law, 2017).

The emergence of this type of advanced technology in a constantly changing environment has enabled today's hoteliers to now use AI and

automation solutions to create a more personalized and memorable experience for lodging guests while also lowering the businesses' labor costs. However, the potential effects that the introduction of AI lodging systems may have upon the well-established working relationships related to increased productivity and reduced costs attributed to the replacement of human labor has been largely ignored. The introduction of AI robots into the workplace may inadvertently cause psychological damage to employees and their emotional feelings related to a sense of workplace belonging and dedication. This negative workplace attitude could motivate employees to contemplate and make alternative career choices. In consideration of this potential employment dilemma, the first objective of this study was to investigate the relationship between AI and robotics awareness and turnover intention among hotel employees.

Ongoing technological developments regarding AI, automation, and robotics will have significant effects upon workplace job profiles, hours worked, employee relationships with co-workers and managers, and remuneration models. Businesses are more likely to adopt new technologies involving AI since greater deployment of these cost-saving mechanisms could boost economic growth by improving efficiency in the workplace. However, employees need to acknowledge that AI and robotics must not be categorized as total labor-replacement, since it

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could only impact certain low-skilled positions (Brougham & Haar, 2017). The majority of jobs requiring human interaction are estimated to face the lowest risks of elimination given that the relatively high proportion of skills for these positions are seen as extremely difficult to automate. Corporate management should minimize potential threats to the workplace posed by AI and robotics through the establishment of an atmosphere with internal systems having excellent internal communications and smooth interactions between managers and employees (Ivanov & Webster, 2017). For example, the adoption of continuous training and technological support has been shown to be an effective method for promoting healthy employment relationships (Madden, Mathias, & Madden, 2015). Employees are known to respond to high levels of organizational support with high levels of organizational commitment and psychological attachment, obligation and loyalty (Brougham & Haar, 2017). Thus, the relationship between AI and robotics awareness and turnover intention could be attenuated by employees' perceptions concerning the extent to which the organization cares about their evolving professional objectives and benefits in the workplace. Thus, perceived organizational support (POS) can be considered as a potential moderator of the relationship between employees' AI and robotics awareness and their turnover intention such that the relationship would be weakened when those individuals perceive a higher level of organizational support. The second objective of this study was to examine whether hotel employees' POS moderates the relationship between AI and robotics awareness and turnover intention.

Today's organizations live in an era characterized by a variety of new technologies which have radically altered the way work is managed and performed (Anandarajan, Teo, & Simmers, 2014). Many businesses may now have an alternative for reducing labor costs and becoming more competitive by investing in high tech systems involving service automation, robotics and AI (Brougham & Haar, 2017). As technology development continues to become more advanced and autonomous, AI and intelligent robots will become more affordable, faster, and far more reliable than humans. Considering the precision, endless energy, and high skill levels of machines, today's businesses will save financial resources in most fields by using AI rather than using human employees to perform many tasks (Smith & Anderson, 2014). Under this competitive work environment, AI and robotics' usage will inevitably cause employees to compete against one another for recognition, bonuses and promotions (Schrock, Hughes, Fu, Richards, & Jones, 2016). Previous research has suggested that employees tend to quit jobs when they experience stress under competitive conditions (Gim, Desa, & Ramayah, 2015). The relationship between AI and robotics awareness and turnover intention is obviously strengthened where the perception of a highly competitive psychological climate (CPC) exists. It is therefore expected that within the hotel setting, CPC will moderate the relationship between AI and robotics awareness and employee turnover intention. It is expected CPC will strengthen the positive impact that AI and robotics awareness has upon an employee's intention to leave. Thus, the third objective of this study was to examine the CPC as a moderator of the relationship between AI and robotics awareness and turnover among hotel employees.

2. Literature review

2.1. Adoption of artificial intelligence and robotics in the hospitality industry

Artificial intelligence (AI) is the simulation of human intelligence processes that allows computer systems to automatically learn from experience and perform human-like tasks to improve efficiency of daily tasks (Aghaei, Nematbakhsh, & Farsani, 2012). AI can power robots to complete important tasks. The rise of collaborative robotics has opened

up new possibilities for humans to work alongside robots to maximize efficiencies. The usage of AI and robotics within the hospitality industry is becoming more commonplace, with applications ranging from artificially intelligent chatbots, designed to assist with guest service processes, to robot assistants used for smart concierge services, in an effort to improve the guest's on-site hotel experience (Ivanov & Webster, 2017). U.S. hotels such as The Wynn Las Vegas and Aloft have already installed virtual assistants in rooms that respond to guest requests. AI and robotics have also been adopted widely across different hotel departments including revenue management, sales & marketing, catering, and facility management (Ivanov & Webster, 2017).

2.2. The impact of artificial intelligence and robotics upon employment

Once AI and robots have been implemented on a global scale, a very natural question to ask related to AI is whether it will put millions of jobs at risk, causing massive unemployment and job loss (Smith & Anderson, 2014). The majority of prior research on human capital has focused on whether employees would be displaced by robotics and the emerging AI revolution. To illustrate this concern, using the Gaussian process classifier, Frey and Osborne (2013) estimated that nearly half of all U.S. jobs are likely to be automated in the coming decades. In an attempt to transfer Frey and Osborne (2013)'s study approach from the US to Europe, Bowles (2014) predicted that 54% of European occupations could be computerized by rapid automation. Lee (2017) applied the Frey-Osborne estimates to Asian countries and found that about one-quarter of Singaporean employment is at high risk of computerization. Another study, involving 1900 experts regarding the possible influence of machines with AI, stated that by 2025, a significant number of both blue and white-collar employees will be at risk of displacement by automated and networked AI applications (Smith & Anderson, 2014). Research conducted by Chui, Manyika, and Miremadi (2015), found that as the world becomes more technology-driven, AI and robotics could directly displace 45% of work activities previously performed by U.S. employees. Finally, research conducted by Acemoglu and Restrepo (2017) documented that an extra industrial robot per 1000 U.S. workers could reduce the employment-to-population ratio by 0.18–0.34 percentage points.

Recent studies have demonstrated the impact of rapid development of modern robotics and the AI influence on employee's attitudes and behaviors in the workplace. Chui et al. (2015) argued that it may inevitably lead to a potentially high turnover rate across different occupations and industries if companies continue taking advantage of the AI and robotics in the workplace (Chui et al., 2015). Brougham and Haar (2017) further underscored this point through their research findings that substantiated employees feel undervalued and unappreciated when employers actively explore today's advanced technological options for human labor, such as with AI and robotics. More specifically, researchers examined the effects of STARA (e.g., smart technology, AI, robotics, and algorithms) awareness on selected key job-related outcomes such as organizational commitment, career satisfaction, etc. and have provided evidence that a strong negative relationship exists between STARA awareness and job-related outcomes. One notable result of the Brougham and Haar (2017) study was that employees' STARA awareness exhibited a significantly positive effect on intention to quit. Thus, if advanced technologies make employees feel insecure or stressed enough about their future prospects and apprehensiveness in their jobs, then employees are more likely to contemplate resigning from their current position with their employer. Based on this previous body of literature, the following hypothesis is formulated:

Hypothesis 1. Hotel employees' AI and robotics awareness have a significantly positive effect on their turnover intention.

2.3. Moderating role of perceived organizational support

Employees develop beliefs concerning the degree to which their organizations trust them and recognize their contributions and take care of their well-being. These beliefs have been gaining importance and recognition as critical indicators in the assessment of their perceived organizational support (POS) (Arogundade, Arogundade, & Adebajo, 2015). POS focuses on incentives and vigorous support provided by the organization to motivate employees at all levels to develop a more productive mindset and create a winning work environment (Chiang & Hsieh, 2012). POS has become one of the top strategies to help employees dramatically reduce stress levels and regain control of their work-life balance (Duke, Goodman, Treadway, & Breland, 2009).

The technology sector has grown exponentially in recent decades. However, modern technology is one of the stressors in the work environment, attributed to generating highly negative job-related outcomes associated with damaging employment relations, causing high job insecurity levels, and creating ambiguity about future career development (Brougham & Haar, 2017). Today's employees must not only be able to tolerate the normal stresses of their daily workplace, but also be able to cope with the ever-changing effects of technology. When workers feel threatened as their expertise becomes eroded by continuously evolving advances in workplace technology, they tend to experience high levels of anxiety, sadness, and frustration (Gabriel & Pessl, 2016). Thus, management and occupational health care should remove those adverse environmental conditions to prevent and/or reduce any job-related emotional stress in order to devote more attention to providing employees with satisfactory working conditions.

A large body of evidence indicates a significant reduction in employee psychological strain and burnout when they perceived a high level of organizational support (Arogundade et al., 2015). An effective organizational support system includes such favorable job conditions as fairness, training, autonomy, rewarding and role stressor coping mechanisms, etc., all of which can reduce employees' overall stress levels and help them to regain a sense of control within the workplace (Duke et al., 2009). Organizational support guarantees employees that the firm is behind them as they handle stressful situations and execute their jobs (Chiang & Hsieh, 2012). Thus, by providing employees with a supportive work environment, manageable workloads, and increased autonomy, POS can help anticipate and mitigate the negative outcomes of AI and robotics application in the workplace by improving their employees' overall well-being and increasing their overall level of job satisfaction (Duke et al., 2009). Substantiating this position, one research study documented that employees were more satisfied with their jobs and were less likely to transfer or leave their positions at a work environment that was supportive of them (Cheng, Yang, Wan, & Chu, 2013). Thus, the influence of employees' AI and robotics awareness on their turnover intention is moderated by POS such that the relationship is weakened by a higher level of POS. The following hypothesis is proposed:

Hypothesis 2. POS affects the strength of the relationship between

hotel employees' AI and robotics awareness and turnover intentions. That is, the relationship is weakened when hotel employees perceive a high level of organizational support.

2.4. Competitive psychological climate as a moderator

The role of competitive psychological climate (CPC) reflects the extent to which employees perceive their job performance, and is dependent upon their relative standing among their peers (Brown, Cron, & Slocum Jr., 1998). The majority of organizations attempt to differentiate their products from others in a competitive market. Competition among firms increase efficiencies, develops better services and products, and minimizes costs while establishing greater operational stability (Brown, Cron, & Slocum, 1998).

An AI platform can be designed to improve operational efficiencies, accelerate the development of new products, eliminate duplicate-materials inventory and redundant processes, enhance customer service, and create new revenue streams (Makridakis, 2017). However, an AI robot solution could be a double-edged sword for employers in the workplace. AI robots can spur employees' continuous improvement efforts, using performance of machines as an inspiring yardstick (Makridakis, 2017). However, an AI robot solution can also lead to a stressful environment since workplace competitiveness can divide coworkers by hoarding information and not sharing knowledge or expertise with one another, creating a toxic workplace (Brougham & Haar, 2017). The emergence of AI robots has led to applications which are now having a profound impact on the workplace. Due to the lack of job security, and because of these advanced technologies, employees are forced to compete against each other for more recognition, bonuses, and promotions from their employers. Thus, with AI robots' evolving presence in the daily routine, competition between employees has significantly intensified (Frey & Osborne, 2017).

Employees have begun to feel a higher level of CPC because employers are actively comparing their performances to other coworkers during the course of the very intense and stressful day-to-day environment with AI and robotics applications. A higher level of CPC in the workplace has shown to add more unpleasant tasks and errands, and has shown to provide long-term negative effects on employees' attitudes and behaviors, triggering low productivity (Bolumole, Grawe, & Daugherty, 2016). Thus, employees who work in a higher level of CPC are most likely to quit their jobs because of increasing internal pressure from competitive peers and higher thresholds of expectations from higher-level managers (Gim et al., 2015). (See Fig. 1) According to these arguments, the following hypothesis is formulated:

Hypothesis 3. CPC affects the strength of the relationship between hotel employees' AI and robotics awareness and turnover intentions. Specifically, the relationship is strengthened when hotel employees perceive a high level of CPC.

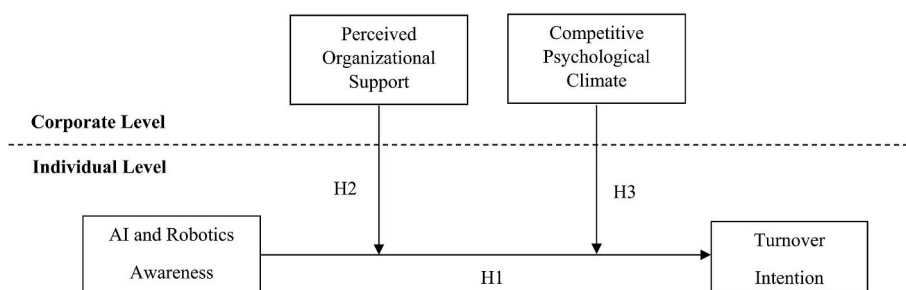


Fig. 1. Multilevel research model.

3. Methodology

3.1. Samples

The traditional face-to-face and voice-to-voice contact between employees and guests is changing. In today's workplace, many hotels use automation technologies, such as self-service check-in kiosks and mobile service requests, to minimize costs and maximize operations efficiencies. This study was conducted among luxury hotels in Guangzhou, China, a major international metropolis and innovative South China city. Guangzhou has become an international science and technology innovation hub. Many hotels in this global city are taking advanced technologies to a new level by introducing robots into guest service roles. Accordingly, hotel employees in Guangzhou are subjected to advanced technology pressures. Thus, Guangzhou luxury hotel employees were selected as the research participants. To generate samples, one of the authors contacted human resources (HR) managers at 35 hotels from a list provided by the local tourism administration office to seek their approval to participate in this study. A total of 12 hotel HR managers agreed to participate in this study. These 12 properties were all five-star rated 'luxury' hotels, offering the opportunity to interview various employees from different positions within similar departments or teams, offering the highest level of accommodations and guest services in Guangzhou.

A team of research assistants distributed surveys at random to employees beginning their work shifts once written permission was obtained from the top management of all hotel properties. A total of 550 questionnaires were distributed among these 12 hotels with ten properties receiving 46 surveys and two properties receiving 45 surveys. A total of 468 valid, and useable responses were returned from these 12 hotel properties. The duty roster for each hotel as reported by the human resource staff determined that about 80% of all total employees at all 12 properties worked primarily in three departments representing Food and Beverage, Housekeeping and the Front Office. Thus, 80 percent of the surveys, or 37 surveys out of 46 for the 10 hotel properties, and 36 out of 45 surveys for the two other hotel properties were distributed to employees working in those three departments at random during a one-week period in early 2018. The remaining 8 or 9 surveys for each property were distributed at random to employees in various other departments including engineering, maintenance, security, spa and fitness following the same procedure. Because social desirability bias could possibly affect the validity of the questionnaire since this study attempted to collect socially sensitive data, participants were required to return their completed questionnaires by ballot boxes to further guarantee their anonymity. Results from this effort showed that nearly 42 percent of those participants had at least a four-year university degree. The average age of all respondents was 31.2 years and 61.6 percent of all respondents held non-management jobs. Women represented 52 percent of all respondents. In addition, the mean job tenure for all participants was 2.5 years.

3.2. Measures

Initially, a total of 20 hotel employees were invited to participate in a pilot survey that verified the survey questionnaire and identified any ambiguities. Data were collected for five different measures: AI and robotics awareness, perceived organizational support, competitive psychological climate, turnover intention, and personal background (see the [Appendix](#) for the complete questionnaire).

AI and robotics awareness. Four items were taken and modified from [Brougham and Haar \(2017\)](#)'s study to better align them within the context of hotels. All AI and robotics awareness items were measured using seven-point Likert scales ranging from 1 (strongly disagree) to 7 (strongly agree). Sample items included: "I think my job has a high risk of bowing to automation and will be replaced by machines with AI" and "I am quite pessimistic about my future in this hotel due to employees

possibly being replaced by an artificial intelligence system".

Perceived organizational support. Eight items were adapted from prior studies ([Eisenberger, Huntington, Hutchison, & Sowa, 1986](#)) and modified to fit the study's hotel context. POS was measured using a seven-point Likert-type scale ranging from strongly disagree (1) to strongly agree (7). Sample items included: "Our hotel cares about the voice of employees," "Our hotel genuinely cares about each individual's well-being," and "I can get immediate assistance if I need it".

Competitive psychological climate. Four scale items were taken from [Fletcher, Major, and Davis \(2008\)](#) with modified wording used to fit the context of the research. Responses were given a seven point rating scale (from strongly disagree = 1 to strongly agree = 7). Sample questions included "The reward I receive depends upon my performance compared to my colleagues" and "Everyone wants to be recognized as a top performer in this hotel".

Turnover intention. A five-item scale developed by [Wayne, Shore, and Liden \(1997\)](#) was used to measure turnover intention. Respondents were asked to evaluate these five items on a 7-point Likert scale, ranging from "strongly disagree = 1" to "strongly agree = 7". For example, respondents were asked if they agreed that "I think it might be time to seriously consider quitting", or on the contrary, "I will not leave my current position".

3.3. Analyses

This study investigated cross-level relationships with POS and CPC at the hotel level and AI and robotics awareness and turnover intentions at the employee level. However, because there are methodological and conceptual weaknesses for both analyses, hierarchical linear modeling (HLM) was used to remedy the methodological biases and limitations. As an example, using the individual level analysis with the disaggregation method could provide a biased estimate of standard errors, whereas the statistical testing power could be seriously weakened by using the aggregation method within the organizational level. Thus, hierarchical linear modeling (HLM) software version 7.01 was used to analyze this unique nature of the multilevel data.

3.4. Data aggregation

A two-level model was identified using an outcome variable to represent turnover intentions and two independent variables were used at the hotel-level to represent the POS and CPC. The direct consensus model was performed to assess POS and CPC; that is, to estimate the within-group agreement in the employee's POS and CPC for each hotel by aggregating the lower-level units to higher level variables. To justify the suitability of aggregating POS and CPC at the hotel level, both γ_{wg} and intra-class correlations (ICCs) were calculated. The $\gamma_{wg(j)}$ were 0.90 for POS and 0.83 for CPC, which were well above the recommended threshold value of 0.7. Thus, the results do support the underlying assumption that employees within hotels generally agreed on their POS and CPC. In addition, the ICC (1) was 0.19 and ICC (2) was 0.76 ($F = 4.46, p < .001$) for POS, the ICC (1) was 0.17 and ICC (2) was 0.70 ($F = 3.04, p < .001$), providing sufficient evidence for both within-group agreement and between-group reliability.

4. Results

4.1. Descriptive statistics

Table 1 presents the summary of descriptive statistics. Cronbach's alpha coefficients were computed to assess the internal consistency of these multiple Likert-type scales and items. The values of Cronbach's alpha coefficients all exceeded the recommended value of 0.7. The correlation coefficients support the hypotheses proposed in the present study. AI and robotics awareness was shown to be significantly related to turnover intentions ($\gamma = 0.23, p < .001$) and CPC ($\gamma = 0.11,$

Table 1
Means, standard deviations and correlations of study variables.

Variables	M	SD	1	2	3	4
1. AI and robotics awareness	5.08	1.14	0.90			
2. Perceived organizational support	4.70	1.08	0.04	0.93		
3. Competitive psychological climate	4.27	0.92	0.11**	−0.08	0.85	
4. Turnover intentions	4.62	1.28	0.23***	−0.55**	0.24**	0.92

Note: N = 468, SD = standard deviation; Individual-level scale reliability in bold along diagonal.

***p < .001; **p < .05; *p < .10.

Table 2
Model comparisons.

Models	Factors	χ^2	df	CFI	GFI	RMSEA	comparison	Δ^2	Δdf
Model 1	Four factors	293.41	183	0.95	0.94	0.04			
Model 2	Three factors; based on Model 1, AI awareness and perceived organizational support were combined into one factor	464.93	186	0.64	0.91	0.06	2 vs. 1	171.52**	3
Model 3	Two factors; based on Model 1, AI awareness, perceived organizational support, and competitive psychological climate were combined into one factor	620.05	188	0.44	0.87	0.07	3 vs. 1	326.64**	5
Model 4	One factor; all four factors were combined into one factor.	760.99	189	0.25	0.84	0.08	4 vs. 1	467.58**	6

***p < .001; **p < .05; *p < .10.

$p < .05$). POS was negatively related to turnover intentions ($\gamma = -0.55$, $p < .05$). However, CPC correlated with turnover intentions positively ($\gamma = 0.24$, $p < .05$).

4.2. Confirmatory factor analysis

Four competing measurement models were evaluated first to assess which model provided perfect fit to the given data (e.g., a single-factor model versus a multiple-factor model). Table 2 illustrates the results of a systematic comparison of the four model comparison. First, a four-dimensional structure with items associated to it was identified (Model 1: $\chi^2 = 293.41$; $df = 183$; CFI = 0.95; GFI = 0.94; RMSEA = 0.04). Three competing measurement models were then specified and compared to Model 1. A three-factor model with AI and robotics awareness and POS combined into one single factor was developed (Model 2: $\chi^2 = 464.93$; $df = 186$; CFI = 0.64; GFI = 0.91; RMSEA = 0.06). A two-factor model combined the AI and robotics awareness, POS, and CPC statements into a single factor was then identified (Model 3: $\chi^2 = 620.05$; $df = 188$; CFI = 0.44; GFI = 0.87; RMSEA = 0.07). A global unidimensional model with all items joined together was finally compared with the four-factor model (Model 4: $\chi^2 = 760.99$; $df = 189$; CFI = 0.25; GFI = 0.84; RMSEA = 0.08). The four-factor solution proved to be clearly superior to the other competing models and provided an adequate fit to the given data.

Table 3 demonstrated the average variance extracted (AVE) and composite reliability (CR) for the all reflective latent factors (AI and robotics awareness, POS, CPC, and TI) and loadings, t-values, etc. for their items. The factor loadings for these indicators ranged from 0.76 to 0.87, with all values statistically significant, validating that these indicators adequately represent these reflective factors. The values of composite reliability (CR) in Table 3 exceeded the recommended accepted threshold of 0.7. Moreover, the value of AVE for each construct was very close to the benchmark of 0.6, indicating a high discriminant validity.

4.3. Hypotheses testing

The cross-level interaction hypotheses were tested using the method suggested by Mathieu and Taylor (2007). First, an individual null hierarchical model was identified without specifying any predictor variables. Second, this step examined the random coefficient regression model where the level-one variable, AI and robotics awareness, was added. Third, two intercept-as-outcomes models were computed.

Lastly, slope-as-outcomes models were computed to assess moderating effects with interaction terms between hotel-level variables (POS and CPC) and individual level variable (AI and robotics awareness) to predict employees' turnover intentions. The effects of socio-economic factors such as gender, age, educational qualification, and job tenure were controlled as prior research has shown their linkages with turnover intentions (Brougham & Haar, 2017).

4.3.1. Null hierarchical model

The null model was first proposed without independent variables to calculate the within- and between-group variance for turnover intentions. The obtained chi-square statistics (106.75, $\tau_{00} = 0.04$, $p < .001$) demonstrated that employees' turnover intentions can be explained by the percentage of the between groups variation. Further, the results demonstrated significant differences among hotels regarding employees' turnover intentions, thereby justifying the addition of the between-level predictor variables at a higher level analysis.

4.3.2. Random coefficient model with individual-level variables only

AI and robotics awareness was entered to the individual level model with no predictors specified for the hotel-level model. The R^2 for the relationship between AI and robotics awareness and turnover intentions accounted for 14% of the within-group variance. Specifically, the impact of AI and robotics awareness on employees' turnover intentions was significantly positive ($\gamma_{10} = 0.42$, $p < .05$). Therefore, Hypothesis 1 is supported. The hotel-level variables such as POS and CPC may explain the remaining variation among individual and group differences since the between-group variance ($\chi^2 = 132.83$, $p < .001$) was still significant after entering the AI awareness in the analysis.

4.3.3. Intercept-as-outcomes models

Two intercept-as-outcomes models were then analyzed to identify if the variance component for the level 1 slope associated with observed hotel-level variables (POS and CPC). The results of the intercepts-as-outcomes models showed that the POS and CPC do have a significant impact on turnover intentions ($\gamma_{01} = -0.86$, $p < .05$; $\gamma_{02} = 0.58$, $p < .05$).

4.3.4. Slope-as-outcomes model (cross-level moderating model)

Two slopes-as-outcomes models were computed, as demonstrated in Table 3, and POS and CPC variables were multiplied with AI and robotics awareness. The results showed that the relationship between AI and robotics awareness and turnover intentions was moderated by POS

Table 3
Measurement model.

Paths	Loadings (t – value)	Reliability	Skewness; Kurtosis	Error variance	Item R-Square
AI awareness (AIA)					
AIA → AIA1	0.83***	CR = 0.90, AVE = 0.69	−0.81; 0.42	0.31	0.69
AIA → AIA2	0.83***(19.91)		−0.48; −0.34	0.31	0.69
AIA → AIA3	0.87*** (20.76)		−0.63; −0.02	0.24	0.76
AIA → AIA4	0.80*** (17.01)		−0.51; −0.07	0.36	0.64
Perceived organizational support (POS)					
POS → POS1	0.83***	CR = 0.94, AVE = 0.66	−0.16;-0.57	0.31	0.69
POS → POS2	0.82*** (19.67)		0.06; −0.92	0.33	0.67
POS → POS3	0.80*** (20.30)		−0.34; −0.55	0.36	0.64
POS → POS4	0.80*** (20.03)		0.01; −0.63	0.36	0.64
POS → POS5	0.83*** (19.25)		−0.08; −0.46	0.31	0.69
POS → POS6	0.81*** (19.43)		0.12;-0.75	0.34	0.66
POS → POS7	0.81*** (18.11)		−0.30; −0.54	0.34	0.66
POS → POS8	0.81*** (18.72)		−0.04; −0.67	0.34	0.66
Competitive psychological climate (CPC)					
CPC → CPC1	0.78***	CR = 0.85, AVE = 0.59	0.28;-0.29	0.39	0.61
CPC → CPC2	0.77*** (15.12)		0.36;-0.24	0.41	0.59
CPC → CPC3	0.76*** (15.59)		0.16;-0.34	0.42	0.58
CPC → CPC4	0.77*** (15.17)		0.37; 0.03	0.41	0.59
Turnover intentions (TI)					
TI → TI1	0.85***	CR = 0.93, AVE = 0.71	−0.32;-0.32	0.28	0.72
TI → TI2	0.83*** (21.89)		−0.31;-0.42	0.31	0.69
TI → TI3	0.84*** (22.35)		−0.38;-0.42	0.29	0.71
TI → TI4	0.87*** (22.73)		−0.40;-0.19	0.24	0.76
TI → TI5	0.83*** (19.76)		−0.38; 0.15	0.31	0.69
Fit indices of the reflective measurement model: $\chi^2(\text{d.f.}) = 293.41$ (183), $p < .00$ ($\chi^2/\text{d.f.} = 1.60$); CFI = 0.95; GFI = 0.94; NFI = 0.96; RMSEA = 0.04; SRMR = 0.03					

Note. *** $p < .001$; ** $p < .05$; * $p < .10$. The average variance extracted (AVE) and the composite reliability (CR) appear in the reflective scales to evidence reliability.

($\gamma_{21} = -0.26$, $p < .05$). Further, the relationship between AI awareness and employees' turnover intentions was moderated by CPC ($\gamma_{31} = 0.40$, $p < .01$). Approximately 4% and 5% of the variances in the level-one slope were attributed to the addition of the interaction terms. Thus, the second and third hypotheses were supported (see Table 4).

5. Discussion and conclusions

5.1. Theoretical implications

Organizations in today's competitive market require unprecedented levels of flexibility, offering a wide and varied array of services and products. As well, organizations must be effective, responsive, and cost-efficient, almost to the point beyond what is now expected from human employees. The fast-moving field of robotics, AI, and service automation is accelerating at unprecedented levels, creating new business opportunities leading to future growth potential (Lee & Lee, 2015). The development of robots, AI, and service automation has gained more sophisticated sensors in the past decade or so, and they have increasingly been used in the travel, tourism and hospitality industry (Ivanov & Webster, 2017). When applied to hotel operations, the typical benefits for using AI are reduced costs, increased speed, improved accuracy and consistency. In addition, AI applications could enhance perceived service quality through new, attractive and interactive methods for service delivery, and also for communicating with and engaging hotel guests. Thus, increasing numbers of hotels are adapting robotics into their guest services operations to provide what they envision as vitally necessary technology to enhance their already successful business models. Although AI implementation for hotel service automation is now advancing at a rapid pace, little attention to its impact on employment among hotel front line service career employees has yet to be addressed. This study contributes to this void by providing a detailed understanding of the interfaces between hotel employees, their AI awareness and employment relations for the lodging industry.

This current study contributes to new theory within the context of

hotels specifically regarding employee perceptions of AI and robotics as a significant predictor of their intention to leave the lodging company, and perhaps the industry overall. These findings supported previous research conducted in non-hospitality settings that indicated those employees deciding to remain with their organizations would be influenced by robotics, machine learning and AI (Brougham & Haar, 2017). Employee turnover and retention has historically been one of the main concerns facing the hospitality industry (Bonn & Forbringer, 1992), and remains as the industry's major challenge (Zopiatis, Constanti, & Theocharous, 2014). In particular, turnover intention is proposed to have a predominantly negative impact on organizations, and especially with respect to low productivity and low staff morale (Li, Kim, & Zhao, 2017). For lodging properties to reduce turnover rates, they must first understand the main causes for why employees defect to other lodging companies, or other industries. Thus, it is important to identify the antecedents of turnover intention as early as possible for lodging organizations to be able to increase employees' enthusiasm and commitment to work and fully leverage a strong competitive advantage (Kim, Lee, & Carlson, 2010). Because the majority of hotel employees work in front line service positions where they have very little control over how changes in daily operations are actually implemented and controlled, they might be more aware of impending changes involving new AI applications, which provide them the motivation for developing perceptions of higher levels of turnover intent. This study's findings corroborate that hotel employees having higher perceptions of AI are likely to have higher adverse effects on turnover intentions. This finding alone adds tremendous value to the existing theoretical base regarding lodging employee perceptions pertaining to AI and their turnover intentions. If human resource management departments within lodging properties can now anticipate high levels of anticipated turnover intent with service employees whenever the operation is initiating AI programs within various lodging departments, there can be actions developed by the lodging property to counter these negative feelings and minimize workforce defects. Theoretical testing still needs to be assessed according to lodging departmental areas (housekeeping, food and beverage, front desk, engineering, etc.) to determine if differences

Table 4
Hierarchical linear modeling results.

	TI	TI	TI	TI	TI	TI
Null model	Random coefficient model	Intercept as outcomes model (1)	Intercept as outcomes model (2)	Slope as outcomes model moderating model 1)	Slope as outcomes model (Cross-level moderating model 2)	TI
Individual level (level 1)						
Intercept (γ_{00})	4.64*** (13.37***)	4.60** (19.47)	4.60*** (14.06)	4.61*** (12.01)	4.67*** (14.20)	
AIA (γ_{10})	0.42*** (1.99**)	0.42** (2.00**)	0.42** (1.99**)	0.32** (2.32**)	0.24*** (5.19***)	
Hotel level						
(level 2)						
POS (γ_{01})		−0.86** (−3.73**)	0.58** (2.40)			
CPC (γ_{02})				−0.26** (−2.03**)		
Gross level						
AIA × POS (γ_{21})						
AIA × CPC (γ_{31})						
Total R ²	0.03	0.07	0.09	0.14	0.13	
Deviance	748.93	739.41	745.11	733.39	674.76	
Number of estimated parameters	2	2	2	2	2	
Level-1	TI _{ij} = β_{0j} + γ_{ij}	TI _{ij} = β_{0j} + β_{1j} × AIA _{ij} + γ_{ij}	TI _{ij} = β_{0j} + β_{1j} × AIA _{ij} + γ_{ij}	TI _{ij} = β_{0j} + β_{1j} × AIA _{ij} + γ_{ij}	TI _{ij} = β_{0j} + β_{1j} × AIA _{ij} + γ_{ij}	
Level-2	β_{0j} = γ_{00} + v_{0j}	β_{0j} = γ_{00} + γ_{01} × POS _j + v_{0j}	β_{0j} = γ_{00} + γ_{01} × POS _j + v_{0j}	β_{0j} = γ_{00} + v_{0j}	β_{0j} = γ_{00} + v_{0j}	
		β_{1j} = γ_{10}	β_{1j} = γ_{10}	β_{1j} = γ_{10} + γ_{11} × POS _j	β_{1j} = γ_{10} + γ_{11} × POS _j	
Mixed model	TI _{ij} = γ_{00} + v_{0j} + γ_{ij}	TI _{ij} = γ_{00} + γ_{01} × POS _j + γ_{10} × AIA _{ij} + v_{0j} + γ_{ij}	TI _{ij} = γ_{00} + γ_{01} × POS _j + γ_{10} × AIA _{ij} + v_{0j} + γ_{ij}	TI _{ij} = γ_{00} + γ_{10} × AIA _{ij} + γ_{11} × POS _j × AIA _{ij} + v_{0j} + γ_{ij}	TI _{ij} = γ_{00} + γ_{10} × AIA _{ij} + γ_{11} × POS _j × AIA _{ij} + v_{0j} + γ_{ij}	

Note: AIA = AI awareness, POS = perceived organizational support, CPC = competitive psychological climate, TI = turnover intentions.

***p < .01; **p < .05; *p < .10.

may exist in levels of employee perceptions regarding negative perceptions about AI program implementation and turnover intention. As well, theoretical testing related to rewards programs and what types of employee recognition would be considered most effective is necessary.

This study also contributed to new theoretical knowledge regarding AI when its findings confirmed that employee perceptions of organizational support weakens the relationship between AI awareness and turnover intentions. Brougham and Haar's research (2017) called for more focus on moderators in studying employees' perceptions of robotics and AI related to work outcomes. This current research not only answers Brougham and Haar's (2017) call, but sheds new, additional theoretical knowledge on examining how AI awareness and POS when combined, affect employee turnover intention. These new study findings demonstrate that the relationship between AI awareness and turnover intentions weaken with greater support received by employees from their organization when those employee behaviors and actions are recognized and rewarded. Previous empirical studies in other disciplines have found a moderating role of POS on the relationship between work attitude and work behavior (Duke et al., 2009; Erdogan & Enders, 2007), where POS was found to reduce the negative effect of perceived stressors on performance. Using hotels as the context, this current study again confirmed the role of POS as a moderator suggesting that POS moderates the relationship between AI awareness and turnover intentions in such a way that it will weaken the positive impact of AI awareness on turnover intention as more support is given by these hotels to their employees. The present results are consistent with prior research findings that documents enhancing organizational support from top management has been shown to be effective in increasing productivity and minimizing stressors. This suggests that those hotel employees who receive adequate recognition and feel their contribution is valued are more energized and productive than those who do not feel appreciated and valued in their workplace.

Perhaps the most significant theoretical contribution made by this research is through the findings associated with examining the moderator 'Competitive Psychological Climate', regarding the relationship between AI awareness and turnover intentions among hotel employees. Previous studies have proposed and identified the moderator of CPC at the individual level analysis (Arnold, Flaherty, Voss, & Mowen, 2009). This study contributes to the body of knowledge of turnover by introducing the corporate level variable, CPC, which has been mostly absent from the literature. Results supported that CPC moderates the relationship between AI awareness and turnover intentions. As expected, the positive relationship between AI awareness and turnover intentions strengthened when high levels of CPC were present in the workplace. This suggests that the relationship between AI awareness and turnover intentions were stronger when employees felt that they were working in a highly competitive environment. This finding has major theoretical implications since this was the first attempt to identify the possible moderating role of CPC in the employment relationships in AI's business coming of age. Designing AI platforms to improve human efficiencies is an interesting concept, but ultimately it is the employee that competes against one another. Competitive Psychological Climates create negative relationships in the workplace, leading to high levels of job defection and job dissatisfaction. This study clearly demonstrates that AI awareness and turnover intent were strongest when employees felt they were working in a highly competitive environment. Theoretical contributions are significant with these findings because organizations use competition to gain advantage over their rivals. If organizations cannot maintain a motivated and productive workforce that is loyal to the business, the opportunity for those businesses to hold a competitive advantage diminishes. Ultimately, turnover plays a role in having a negative impact upon morale and productivity. Thus, the identification of those factors causing a negative competitive psychological climate are critical to the businesses' survival and ultimate success. CPC theory documents this correlation with hotel employee turnover intent and its influence by robotics.

5.2. Managerial implications

Given the high costs associated with turnover intention, it is important for hotel human resource professionals to implement various mitigation measures to reduce or alleviate the severity of those negative impacts of AI applications. Hotels should understand through these research findings that lower skilled positions involving routine, repetitive service tasks are at risk of being replaced by AI. To reduce employee turnover in hotels and assure employees are remaining current with marketplace trends and new practices, human resource professionals should consider developing and implementing internal training programs on a regularly scheduled and long-term basis to assist employees in establishing a positive outlook towards their personal skills development. The bottom line is that these study's findings will provide excellent developmental information for human resource managers working in the lodging setting challenged by retention issues caused by employees that express intentions to leave their jobs due to AI implementation. Study results have clearly documented that there is a relationship between employee turnover intention and their AI awareness. But results of this study also prove that turnover intention weakens when greater employee support is provided from the organization. Organizational support can take many forms, including soft skill development such as communications (achieve clarity and concision), team work and team building (define roles within teams and involve collaborative tasks), problem solving (use initiative and develop suitable solutions), analytical thinking (evaluate information and make a good decision), learning (learn throughout life more effectively), leadership (motivate and inspire other people to engage with a vision), interpersonal skills (communicate and interact with people), creative thinking (devise new ways to carry out tasks), time management (control over the amount of time to increase effectiveness and efficiency), and conflict resolution (facilitate the peaceful ending of conflict and retribution). Evidence shows employees that have to incorporate these essential soft skills into daily routines in today's fast changing, technology-driven world tend to tolerate normal job stresses and improve their overall well-being (Duke et al., 2009).

Second, these study findings documented that the consequence of turnover intentions was weakened when organizational support was perceived to be high, supporting findings from studies in non-hospitality industries (Arogundade et al., 2015). Therefore, in order to promote prosocial work behaviors towards other individuals, hotel organizations should ensure that support is available to their employees. Since human capital is a critical component of any organization's success, effort must be devoted to improve employees' POS, in order to make them feel more appreciated and valued, which results in a healthy organizational climate, and ultimately leads to maintaining a low turnover rate, which is essential in achieving higher output levels. There are several ways hotel executive management can demonstrate their appreciation for employees. For example, managers could design support mechanisms in place and encourage frontline service employees to build positive relationships. One way could be by providing coffee breaks or meal breaks during shifts to improve internal communications by requiring all team members to participate in friendly discussions and brainstorming exercises. In addition, managers should recognize the importance of work-life balance to maintain a healthy workforce. Encouraging employees to pursue hobbies (e.g., bike riding, gardening, golfing, etc.) outside of their work-related responsibilities is an important part of life and support work-life balance. Those hobbies can help them feel equipped to reduce stress and better establish their own priorities. Further, managers could implement and manage workplace flexibility by designing better working arrangements and supporting their employees in planning their work (Cheng et al., 2013).

Finally, this study confirmed that CPC as a moderator can increase the prediction of the relationship between AI awareness and intention to terminate their position. A positive level of CPC is linked to superior business performance with increased profitability and employee

productivity (Brown, Cron & Slocum Jr., 1998). A healthy competitive workplace thrives on harmony, mutual benefits, trust, and respect, which could reduce the potential for work-life conflict and the pressure that goes with it. Employees or personnel will be more motivated and engaged if their managers are choosing to adopt a competitive strategy in their hotels to increase the well-being of their staff. However, an employee that works at a level of severe work pressure and in a competitive work environment with a desire to outperform their colleagues could remove the pleasure out of daily tasks, and experience direct negative effects on their job-related affective well-being and physical and mental health. The stress and pressure that pushes them to perform more, better, and faster could lead to a lower level of work quality and increased health costs and actually decrease employee retention. To minimize competition in the workplace, lodging managers should create a working environment with integrity and honesty in all situations based on trust, respect, and caring. As an example, lodging managers could establish a culture of credibility by conducting staff meetings that encourage individuals to ask questions and discuss their expectations to increase trust and mutual respect. Lodging properties should continuously promote interactions with employees to foster a sense of community among members at work. Human resource professionals within lodging organizations must maintain and encourage a healthy rapport with and among their employees to increase their feelings of being a part of the hotel property which should be seen as one of the key aspects for promoting employee retention. Of high importance, this study's findings reveal the significance of understanding the relationship between lodging employees' AI awareness and their turnover intention. But most significant is the ability for human resource managers to be able to identify what tools to use that are most effective in mitigating or weakening the effects caused by AI and employee turnover intention through the intervention and delivery of organizational support programs for employees.

6. Limitations and suggestions for future research

There are a number of limitations to the study that offer direction for future research. First, given that the data were collected in a single geographical area of just one country, future studies should include different countries from different economic backgrounds to further validate the results. Second, only a limited number of moderators were identified. Future research might additionally consider other working environment characteristics such as mutual trust as a possible moderator of the influence of AI and robotics awareness on turnover intentions. Third, the upscale luxury hotel segment was used in this research. Future research should use different lodging types to determine if findings are similar. Third, the results of this study were based on 12 five-star hotels in one area of China. This restricts generalizability and calls for future research in the hospitality sector, across different hotel categories (e.g., boutique, three and four-star hotels, etc.). Finally, another research framework with different research questions should be developed to conduct studies across other service industries to include boutique hotels, convention hotels, resort properties, full-service restaurants, condominium hotels, etc.

Authorship contribution statement

The three authors made substantial contributions to conception and design and participated in drafting the article or revising it critically for important intellectual content. They made the broadest range of different contributions. For example, these three authors developed this research design together. Dr. Li was in charge of the data collection, data analysis, and interpretation. Dr. Bonn and Dr. Ye provided critical revisions of the article. These three authors gave final approval of the version to be submitted.

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Appendix A. Supplementary data

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