ISSN : 0974 - 7435 Volume 10 Issue 21

2014

BioTechnology

An Indian Journal

FULL PAPER

BTAIJ, 10(21), 2014 [13241-13246]

Exploring employees' perceptions of biometric technology adoption in hotels

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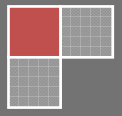
ABSTRACT

Biometric technology is quickly becoming a principal method of identification in today's fast-paced networked and security-conscious society. However, adoption of new technology is considered successful when employees embrace and use it effectively. The purpose of this study was to explore perceptions and acceptance of biometric technology by employees in hotels: trying to find out about the knowledge base available about biometrics among hotel employees. This study apply technology acceptance model (TAM) to conduct this research. The results indicated that 77% of employees are ready to adopt biometric systems in hotels, especially if they are perceived as useful.

KEYWORDS

Biometric technology; Technology acceptance model (TAM); Hotel.



INTRODUCTION

The use of technology in the hospitality industry is driven by the need to improve and refine customer service[1], improve operational efficiency[2], increase revenue and lower overall costs[3]. Consequently, the hospitality industry is apt to adopt and incorporate new technologies to ameliorate existing business process. One relatively new technological advance that has gained prominence and use in recent years is biometric technologies. The history of biometrics in the hotel industry is relatively short, but it is generally agreed that biometric systems could add value to guests' hotel stay experiences[4], as they are viewed as superior to traditional identification and access technologies. For hotels, biometric systems appear to be promising, as they can reduce costs and fraud, and increase accuracy in transaction processing, while offering users security and convenience[5]. Despite the potential benefits that the technology has to offer, acceptance and adoption of technology by employees and front line employees of hotels is essential for the success of implementation[6]. Understanding why individuals accept or reject information technology innovation has proved to be one of the most challenging issues in information technology research[6]. Thus, this study examines perceptions and acceptance of biometric technology by employees in hotels and formulates recommendations for the hotel industry about the potential use of biometric systems in hotels.

LITERATURE REVIEW

Biometrics Technology

Biometrics is the technology of identifying individuals or authenticating identity using distinctive physical or behavioral patterns[7]. Biometric systems require two operational dimensions: (a) enrollment, in which biometric data are obtained and linked with a person's identity and (b) authentication or recognition, in which new biometric data are compared with the stored data[8].

With biometrics, data from a fingerprint, for example, are collected and transmitted to a computer to processes to identify a match within the stored database, allow access to an area, and document the entry time of a given individual. This information can be printed or retrieved at a later time to determine all those who accessed the area in question. An inventory of biometric systems includes fingerprinting, face and voice recognition, hand geometry, handwriting pattern recognition, and iris and retinal scanning[5]. This data is accurate, convenient, and cannot be stolen or replicated because it is unique to only one subject[9]. Thus, they are considered more reliable than the traditional recognition and identification systems[10].

The wide spread application of biometrics in personal identification of consumer goods such as portable computers has led to $3 billion in sales in 2012[11]. Biometrics has also been applied in airports, by airlines, and check-out points of sales and has proven effective, convenient, and time saving[10]. These point to the increased acceptance and trust of this technology by consumers. However, adoption of new technology is considered successful when employees embrace and use it effectively[12]. The literature review revealed a gap in studies on biometrics acceptance by employees, yet employees are a major part of the equation when trying to implement such technology. Adoption of new technology is considered successful when employees embrace and use it effectively[12]. Therefore, the purpose of this study was to explore perceptions and acceptance of biometric technology by employees in hotels: trying to find out the factors that influence employees' attitudes and intentions to use biometric systems in hotels.

Research Model and Hypotheses

Generally, technology adoption has been a major topic for many scholars because of its importance in understanding technology diffusion[13]. In this context, many research models attempt to understand technology acceptance. The theory of reasoned action (TRA), popularized by Fishbein and Ajzen[14][15], suggested that subjective norm (beliefs, norm beliefs, and motivation to comply) and belief and evaluation influence attitudes towards technology, which in turn affects behavioral intention to use, translated into actions. Ajzen[15] developed the TPB, which was an extension of the TRA, and included the perceived behavior control under the influence of interior and exterior control factors.

TAM, a well respected model used to understand human behavior and attitudes towards technology, focused on modeling how users come to accept and see technology and many of them being variants derived from the same class of attitudinal/behavioral factors relating to how and when they will use technology[16]. TAM reduced the beliefs in the TRA to two important beliefs; perceived ease of use and perceived usefulness[17]. In TAM, behavior is affected by intention to use which is a result of attitudes towards use of technology. Attitudes towards the use of technology are affected by perceived ease of use and perceived usefulness. Thus, the TAM proposes a direct belief–attitude–intention relationship[13]. The literature on technology adoption recognizes various extensions of TAM to fit various technological contexts[18], as some scholars argue that TAM, despite its broad validation, needs to be extended in order to provide a more comprehensive understanding of technology adoption. In an effort to understand what else drives users' adoption of technologies, Agarwal and Prasad[19] using Rogers's[20] diffusion of innovation framework, posited that the most immediate influences on an individual's cognitive assessment of information technology are represented by factors unique to the individual. Rogers found that individuals who are highly innovative are active seekers of new ideas, can cope with higher levels of uncertainty, and develop more positive intentions toward acceptance. Agarwal and Prasad[21] viewed personal innovativeness as expressing the risk-taking propensity that certain individuals possess, and defined it as an individual's willingness to try out a new technology. Thus, in an effort to increase the model's explanatory power. The TAM has been extended in this study by

adding a new hypothesized relationship between perceived innovativeness toward technology and perceived ease of use. Based on the literatures, the conceptual model is represented in Figure 1 and the following hypotheses are proposed:

Hypothesis 1: Employee perception of usefulness will positively influence their attitudes toward using biometric systems in hotels.

Hypothesis 2: Employee perception of ease of use will positively influence their attitudes toward using biometric systems in hotels.

Hypothesis 3: Employee perception of ease of use will positively influence their perceived usefulness of biometric systems in hotels.

Hypothesis 4: Employees' attitudes will positively influence their intentions to use biometric systems in hotels.

Hypothesis 5: Employees' perceived innovativeness toward information technology will positively influence perceive ease of use of biometric systems in hotels.

METHODOLOGY

A questionnaire was designed according to the literature on TAM to measure the acceptance of biometric systems in hotels. To measure perceived usefulness, the questionnaire included four items, measuring the extent to which biometric systems in hotels would enhance employees' working efficiency, and allow employees to do things better[22]. The questionnaire for perceived ease of use included four items, measuring the extent to which learning to use biometric systems in hotels would be easy[22], and would not require a lot of mental effort. To measure attitudes toward biometric systems in hotels, the scale include three items to measure that using biometric systems in hotels would be wise–foolish[23]; beneficial–not beneficial[24]. The scale for intentions to use biometric systems in hotels included three items, measuring that the respondents intend to use biometric systems in the future, whether it would be one of their favorite technologies to use[25]. The scale for perceived innovativeness toward information technology was adapted from the existing literature on domain-specific innovativeness[26]. It included four items measuring the extent to which the respondents were among the first to try out new technologies, liked to experiment with the new technologies, and liked to keep up with the latest technological developments in their areas of interest[26]. All items above have been anchored in 5 points, with values ranging from 1= strongly disagree to 5= strongly agree. This survey was conducted with employees and managers of five-star hotels in Taiwan during a period of 12 months. A number of 768 respondents completed the survey. After removing the records containing heavily missing values, a total of 621 responses remained in the analysis.

RESULTS

Structural equation modeling (SEM) was used to analyze this research model. Fitting the model to the sample resulted in a chi-square value of 277.11 ($p < .001$), with 147 degrees of freedom, and a normed-$\chi 2$ of 1.88. Furthermore, the model had a GFI value of.85, an AGFI value of.81, a NFI value of.90, an IFI value of.94, a TLI value of.93, and a RMSEA value of.07. All the fit measures exceeded their suggested values, and thus, it was concluded that the model fit was good.

The examination of convergent validity requires scrutiny of factor loadings and squared multiple correlations (SMCs) of the measurement items[27]. All factor loadings had values between.64 and.93 on their underlying constructs and were significant ($p<.001$). In addition, the SMCs were calculated for all items (TABLE 1).

All items had SMC values greater than the suggested value of.4[27]. On the other hand, according to Fornell and Larcker (1981)[28], discriminated validity is established if, for any two constructs, A and B, the average variance extracted (AVE) for A and the AVE for B exceed the squared correlation between A and B. The inter-construct correlations were calculated based on the averaged scales for these constructs, that is, items pertaining to each underlying construct were averaged. In this case, all AVE scores, ranging from.63 to.83, were greater than the suggested cut-off value of.5[28]. Furthermore, the AVE scores for any two constructs were greater than their corresponding squared interconstruct correlations[28]. In addition, the composite construct reliabilities (CCRs) were calculated for all constructs (TABLE 1). The composite reliability is a measure that depicts the extent to which a number of items indicate a common construct (Hair et al., 1998). In this study, all CCR values were greater than the acceptable level of.7[29]. Therefore, the conditions for convergent and discriminant validity were met for all constructs.

Significance of the path loadings provided results for hypothesis testing (Figure 2). Perceived usefulness ($\beta=.76$, $p<.001$) was a significant predictor of attitudes, thus providing support for Hypothesis 1. In hotels, employees' use of biometric systems that are perceived as useful are likely to lead to the development of positive attitudes toward using biometric systems. Perceived ease of use ($\beta=.25$, $p<.01$) had a significant direct impact on attitudes toward using biometric systems in hotels, providing support for Hypothesis 2. In hotel settings, users who perceive biometric systems as easy to use are likely to develop positive attitudes toward using biometric systems. As indicated by the SMCs, perceived usefulness and ease of use together explained 82% of the variability in attitudes toward biometric systems in hotels. Hotel employees will develop positive attitudes toward using biometric systems if such systems are perceived as useful and easy to use. The path coefficients of the two predictors of attitudes indicated that perceived usefulness was a stronger predictor of attitudes than was perceived ease of use. Employees' attitudes toward use of biometric systems in hotels seem to be more strongly influenced by perceptions of usefulness than by perceptions of effort-free use. Furthermore, perceived ease of use was a significant predictor of perceived usefulness ($\beta=.67$, $p<.001$), explaining 49% of the variability in perceived usefulness, and

thus, providing support for Hypothesis 3. The easier to use a biometric system is perceived to be by hotel guests, the more likely it is that they find it useful. On the other hand, attitudes toward use of biometric systems explained approximately 77% in the variability of intentions to use biometric systems in hotels (β=.88, p<.001), thus providing support for Hypothesis 4. This result suggests that guests who develop positive attitudes toward the use of biometric systems in hotels are likely to use these systems.

TABLE 1: Confirmatory Factor Analysis

Constructs and Items	Item Loadings	Squared Multiple Correlations (SMC)	Composite Construct Reliabilities (CCR)
Perceived usefulness			.912
pu1	.72	.51	
pu2	.83	.71	
Pu3	.81	.66	
Pu4	.92	.86	
Perceived ease of use			.816
pe1	.68	.45	
pe2	.77	.55	
pe3	.86	.73	
pe4	.66	.41	
Perceived innovativeness			.853
pi1	.81	.62	
pi2	.76	.52	
pi3	.77	.64	
pi4	.82	.68	
Attitudes			.878
at1	.88	.76	
at2	.91	.85	
at3	.64	.42	
at4	.77	.56	
Intentions			.923
in1	.89	.76	
in2	.87	.82	
in3	.93	.86	

TABLE 2 : Convergent and Discriminated Validity

	A	B	C	D	E
A Perceived usefulness	.83				
B Perceived ease of use	.41	.76			
C Perceived innovativeness	.03	.04	.63		
D Attitudes	.51	.38	.07	.68	
E Intentions	.61	.36	.05	.56	.72

Although explaining only 9% of variability in perceived ease of use, perceived innovativeness (β=.31, p<.01) was found to be a significant predictor of ease of use, thus supporting Hypothesis 5. A fit seems to exist between employees inclined toward technology and their perceptions of ease of use of biometric systems. That is, for employees with a general inclination toward technology, biometric systems would eventually seem easier to use than it would be for employees not inclined toward technology. As expected, all the hypotheses were supported providing empirical validation of this variant of TAM, which can be used to examine employees' intentions to use biometric systems in the hotel industry.

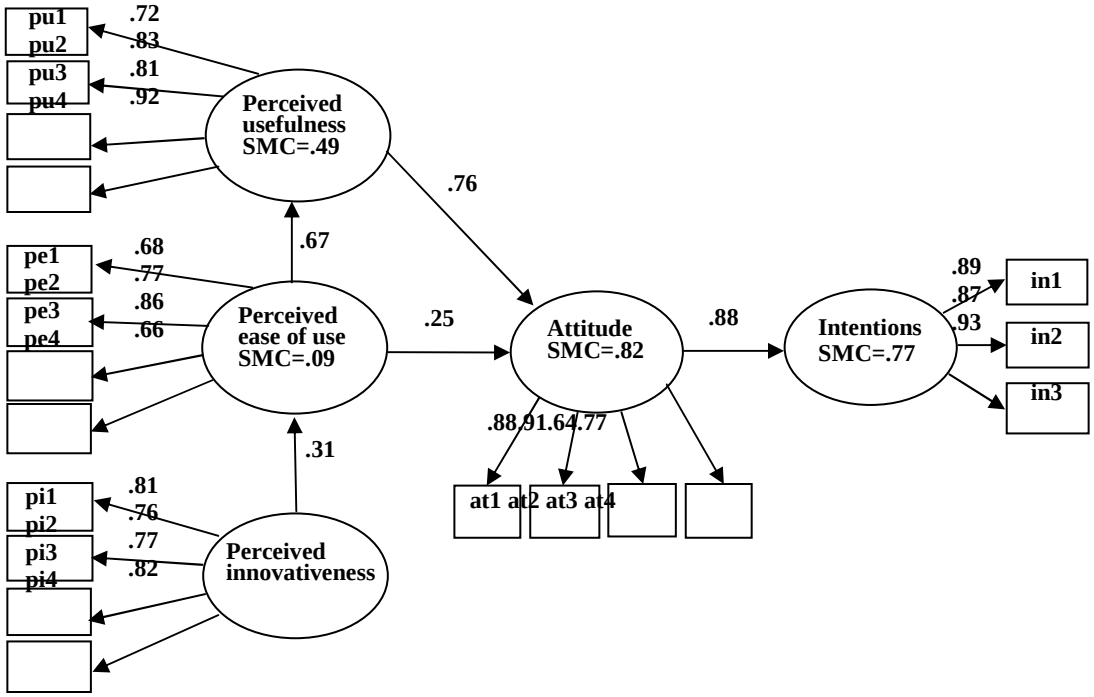


Figure 1: Model Testing Results

CONCLUSIONS

The purpose of this study was to determine the manner in which employees' perceptions of usefulness and ease of use affected their attitudes toward and intentions to use biometric systems in hotels. As the results indicated, the strongest predictor of attitudes was perceived usefulness. Accordingly, biometric systems should provide evidence of superiority relative to the alternative systems. As biometric systems become increasingly available, hotels might explain potential benefits to employees in an effort to stir their curiosity about these systems. This approach might stimulate employees' cognitions related to system performance. In turn, this may trigger exploratory use, which is believed to impact perceived usefulness, with a direct impact on attitudes and intentions to use[30].

To increase usefulness, hotels could pursue the integration of biometric systems with other information systems. In that sense, a number of advantages can be foreseen, especially in terms of increasing efficiency, accuracy and cost saving. Firstly, a fully integrated system that allows employees to use the same biometrics at multiple properties would definitely increase working efficiency. Furthermore, an integration of biometrics into other systems that employees have already adopted would eventually result in an easier adoption of the biometric component, as their perceptions of usefulness may transfer from the existing to the new parts of the integrated system.

Although another factor, perceived ease of use, was not a strong predictor of attitudes, it strongly impacted perceived usefulness. It means that employees who learn easily how to use biometric systems also may see more clearly their benefits in performing tasks.

Thus, once hotels offer biometric systems, they need to convince employees about the convenience and usefulness of such systems. As perceived ease of use was a weaker predictor of attitudes than was perceived usefulness, hotels need to implement biometric systems that are high in ease of use. At the same time, they must emphasize that such systems would eventually optimize their interactions with a hotel.

Perceived innovativeness toward technology was found to be a strong predictor of perceived ease of use. This seems to suggest that innovative people, who have a natural inclination toward technology and are willing to take risks, would easily learn how to use such systems, and in turn, their beliefs about system usefulness may strengthen. However, this might be a challenging task for hotels as it is difficult to distinguish and classify employees based on their innovativeness. One way in which hotels can move a step closer to identifying the most innovative employees is to examine their previous behavior in terms of technology adoption and usage. This may provide substantial hints into employees' perceived innovativeness toward information technologies.

Overall, a large percentage (77%) of the variability in intentions to adopt biometric systems in hotels was explained by its predictors, indicating that this extended variant of TAM is an appropriate theoretical framework to examine employees' intentions to use biometric systems in hotels. In hotel employees, perceived innovativeness had a significant impact on perceived ease of use. In turn perceived usefulness and ease of use had significant impacts on attitudes toward using biometric systems, and further, on intentions to use biometric systems in hotels. Thus, it can be concluded that, in spite of their limited use by hotels, biometric systems are ready to be adopted by employees.

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