

User Acceptance of Smart Housekeeping: A Study of TAM Model Prototype in Hotel Industry

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Abstract—An empirical assessment of the theoretical framework for this study included a survey of 120 employees that working in 4 hotels around Klang Valley that have an experience using smart housekeeping trolley. The resulting data were analyzed using the PLS-SEM methodology by using the SmartPLS 3.0 software. The findings suggested that Perceived Usefulness, Perceived Ease of Use, and Perceived Innovativeness give a positive significant impact towards Attitude. Besides that, Attitude, Perceived Usefulness, and Perceived Ease of Use simultaneously significantly affect Intentions. In addition, Attitude gives a partial mediating effect toward the relationship of Perceived Usefulness and Perceived Ease of Use toward Intentions, but give a full mediating effect toward the relationship of Perceived Innovativeness and Intentions.

Keywords—PLS-SEM, Mediating Analysis

1. Introduction

The rapid advancement and commercialization of new technologies have induced hotels and different hospitality related enterprises to progressively embrace innovations with technology [1]. Hotels have done so in the hope that the new technology-based procedures will help them improve their working efficiencies and ability to meet customers' needs [2]. Different technology enables hotels to improve performance, enhance administrative efficiency, and promote their businesses internationally. While technology had been utilized in the hotel industry since the late 1970s in the form of computerized reservation and global distribution systems, it was only in the 1990s that technology began to have a significant effect on the industry [1]. The impact of ICTs on the infrastructure of the hospitality industry has had substantial strategic implications for industry leaders. An increasing reliance on IT systems is the way of the future and is expected to continue to significantly alter operations [3].

Regardless of the rapid development, technology innovations are still underutilized in the hotel industry [4]. According to [4], innovation in the hotel industry lags far behind than in other industries. Over the last few decades, researchers have sought to determine the effects of IT on performance and productivity by using numerical measurements. Prior studies have found a positive relationship between investment in IT and the productivity and performance of a company [5,6]. Investigating employee perception of technology usefulness is thus important [7]. While prior literature has covered applications of technology in the hotel industry, hotel employees' perceptions of housekeeping technology in the Malaysia hotel industry have not yet been studied. To

understand how technology in housekeeping can improve the performance of hotel employees, this study aims to examine housekeeping technology applications in the Malaysia hotel industry, focusing on employees' perspectives based on the Technology Acceptance Model (TAM) as a theoretical background. TAM is an information technology theory which has developed to study the usage of newly introduced technologies [8].

The hotel industry plays a significant role, contributing to the overall economy of Malaysia. International brands, such as Marriot Hotels Malaysia, InterContinental Hotels Group and Holiday Inn group play a major role in attracting foreign investment. The hospitality industry is one of the top 10 sectors in Malaysia in attracting foreign direct investment. Revenue in the Hotels segment amounts to US\$733m in 2019. Revenue is expected to show an annual growth rate (CAGR 2019-2023) of 10.6%, resulting in a market volume of US\$1,095m by 2023 [9]. So doubt, rapid growth of hotel industry has become prevalence in developing country such as Malaysia. The Malaysian government has been aggressively promoting and undertaking various efforts to assist industry players in embracing Industry 4.0 (IR4.0) through the adoption of technology and automation. This trend has leads to accelerating to higher level of new technology practices in the Malaysian hotel industry which enable the industry to become more competitive.

In order to keep up with the intense competition in the industry, hotels should make sure they deliver superior quality of service [2, 3]. A good understanding of the service quality model through technology is crucial in ensuring high level of technological advancement which can lead to much better satisfaction of the demanding guests [4, 10, 11].

Technological advancement in hotel industry thus promoting tourism sustainable development. Linkages between perceived usefulness, perceived ease, perceived innovativeness in hotels industry is important towards guest's future intention. An information technologies range working together to let the guests have an honourable and convenient stay. It also does help preserve the ecosystem, environment sustainability and other favourable quality of life effects. This study aims to examine the influence of perceived usefulness, perceived ease, perceived innovativeness of technological advancement in housekeeping towards employee intention. When the benefits from adopting new smart technologies or norms are high, such as may be the case during a period of rapid environmental change [5,6] experiential intentions evolve and rapidly become dominant in the hospitality industry [12,13]

2. Literature Review

2.1 Perceived Usefulness

Perceived Usefulness According to TAM, user's behavioral intention to adopt a technology is determined by their perception on the technology's usefulness and ease of use [14]. [15] defined perceived usefulness as "the degree to which a person believes that using a particular system would enhance his or her job performance" (p. 320). The scholar also stated that perceived usefulness has a positive influence on behavioral intention. This relationship is supported by numerous recent studies [16]. For instance, consumer of online health services highlighted the importance of perceived usefulness both at the initial and latter stages of technology usage [17]. [14, 15, 18] reported that perceived usefulness has significant impact on consumers' intention to purchase traceable meat.

In the context of online booking, perceived usefulness refers to the Internet users feeling that using online booking is useful in making online reservations or online payments. Perceived usefulness can be one of the determinants to predict whether or not they will use online booking [19, 17]. The effect of perceived usefulness of the smart housekeeping on employee usage intention is more than the effect of perceived ease of use [20]. Thus, the scholar suggested that functionality, efficiency and effectiveness of the housekeeping technology are more important than its ease of use. In contrast, perceived ease of use has no significant effect on perceived usefulness.

Technology has been proved as an important aspect in many industries as it helps a company enhance its profits and also satisfy and retain customers. Technological advancement is needed for businesses to become prevalence, there for research on the measurement of and improvement of service quality, has become essential [4]. Numerous studies of technology in hotel industry and its consequences have been done since it is a way to build and create a competitive advantage for a company [5]. However, in-depth understanding of technological advancement concepts is still in its fancy.

2.2 Perceived Ease of Use

[15] defined perceived ease of use as "the degree to which a person believes that using a particular system would be free of effort" (p. 320) and posited that perceived ease of use has a positive effect on perceived usefulness. It has been supported by a number of studies [18, 21, 22]. [18] found highly significant positive relationship between students' perception on the ease of use of e-portfolio system and perceived usefulness of the technology. In another study, meeting planners also agreed that ease of use factor influence their perception on the usefulness of social media [16, 17] found highly significant effects of perceived ease of use on perceived usefulness among online customers.

Hence, by improving the perceived ease of use of a technology, perceived usefulness could be enhanced and later translate into an increased behavior intention and acceptance of the technology. In the context of

technological advancement in housekeeping, perceived ease of use is defined as the degree to which hotel employees feel that technology is not difficult and free from much effort to use. If they feel technology in housekeeping is easy to use, they will normally perceive it as being useful to them. For instance, [21,22] used the TAM to investigate how hotel employees adopt housekeeping technology in the industry. They reported that perceived ease of use of housekeeping technology has a positive relationship with perceived usefulness.

2.3 Perceived Innovativeness

Product innovativeness is identified as customers' perceptions of newness and uniqueness of a product [24]). This notion allows assessment of differentiation between a new offering and previous ones [25] if any, which the new offering gains customers' perceptions of value, utility, and meaning. Particularly, customer-perceived innovativeness at the product level has typically focused on technology, demonstrated by a product's features and functionality [24]. The hospitality industry has ample options for adding innovativeness for products since customized and personalized offerings to customers have emerged as a major practice toward innovation. For example, in foodservice research, [26] indicated that adding new items to the menu is an important practice of product innovativeness, thereby contributing to expanding a restaurant's market share. [26] also described the process of developing menus as innovativeness for quick-service restaurants, thereby demonstrating innovativeness in menus to be an essential part of product innovativeness.

Innovativeness is the tendency to become a technological pioneer [27]. Among the factors constituting technology readiness, innovativeness has been most investigated in previous studies. Innovativeness is an important factor that is positively related to acceptance of a technology [14, 15]. Innovative people like to pursue the latest technologies and enjoy the challenge of finding technologies' utilities. When new technologies come into play, they like to own and use them before other people [27].

2.4 Attitudes

Attitude is an individual's feeling of the favourableness or unfavourableness of his/her performance of the behaviour [10, 11, 22]. Attitude towards housekeeping technology is an aggregate belief among other factors such as perceived usefulness, perceived ease of use, attitude and intention in our model. It somehow reflects the internal tendency towards technology acceptance. Few managers would be happy if their employees were simply using a system because of their obligation but who privately felt very negative about the system. [23] argued that employee's attitude towards the acceptance of hotel technology would affect the intention of technology adoption. Employee's productivity facet can also influence customer satisfaction through better customer service which also is considered as an antecedent of firm incomes.

2.5 Intention

As the majority of hotel employees are equipped with technology, their capability of using them not only for personal communications, but also for work-related activities is assumed to be high [28] stated that more than one-third of the hotel industry's employees consisted of Generation Y or Millennials, born between the early 1980s and the early 2000s, who are tech-savvy and digital natives. Considering the characteristics of the current workforce in the hotel industry, most employees are believed to be ready to use technology for their work. In responding to the changes in the current workforce, housekeeping department in hotels should seriously consider accommodating employees' technological needs to retain and attract the new generation of employees who will appreciate the use of technology in their workplace [29].

Mobile research firms (i.e., Nielsen, Forrester) strongly purported that enabling employees to use technology significantly increased their productivity and engagement with customers [28]. Hotel employees can efficiently perform various work-related tasks at any places by building more personalized and interactive relationships with their customers, compliant with hotels' cohesive technology strategies. However, the overall effects of emerging technological advancement on work-related outcomes such as perceived usefulness, perceived ease of use, attitude and intention have not been thoroughly and empirically examined [30]. Nevertheless, the expected benefits of technology have been discussed in a recent study, including increased employee responsiveness and decision-making speed, resolving internal issues faster, and increasing employee productivity [28]). Indeed, it is a timely topic to identify how employees perceive their mobile device usage in the workplace and their subsequent outcomes related to their jobs by adopting [28]. By reviewing employees' perceived usefulness, perceived ease of use and attitude, this study attempted to identify the overall framework for employees' technology usage in a housekeeping context.

3. Theoretical Framework

Figure 1 shows the proposed theoretical framework for this study based on the systematic review above. The theoretical framework consists of three independent variables, and there exists one mediator and dependent variable in the theoretical framework. Therefore, the following hypotheses were developed:

H1: Perceived Usefulness has significantly affect toward Attitude.

H2: Perceived Ease of Use has significantly affect toward Attitude.

H3: Perceived Innovativeness has significantly affect toward Attitude.

H4: Attitude has significantly affect toward Intention.

H5: Attitude mediates the relationship between Perceived Usefulness and Intention.

H6: Attitude mediates the relationship between Perceived Ease of Use and Intention.

H7: Attitude mediates the relationship between Perceived Innovativeness and Intention.

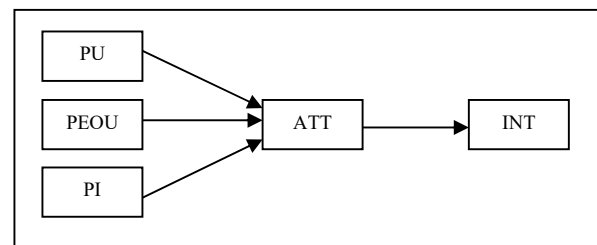


Figure 1: Theoretical Framework

Note: PU = Perceived Usefulness; PEOU = Perceived Ease of Use; PI = Perceived Innovativeness; ATT = Attitude; INT = Intentions

4. Methodology

4.1 Sample

The data used in this study consists of questionnaire responses from employees that working at hotel industry around Klang Valley areas. In this study, 4 prototypes were sent it to the selected 4 hotels around the Klang Valley. Around 120 employees from these 4 hotels participates in this study, where all the respondents will used this prototype around two months duration test, and then they will give their responses accordingly to the questions in the questionnaire. Before conducting this research, a cover letter and also brief explanation about this prototype has been given to the targeted respondents, for ensuring the response will not bias. After two months, a telephone call has been used to remind the person in charge (i.e. Head Division of Human Resources) that the questionnaire will be collected.

4.2 Analytical Method

Second generations of multivariate analysis method which is Structural Equation Modeling analysis was employed in this research. Since the sample size for this study can be considered averagely small [31] and relatively was an exploratory study [32], Partial Least Square (i.e. PLS-SEM) estimation method was used to test the developed hypotheses among the targeted constructs [31] with the 5000 bootstrapping replication to get reliable results [33]. Besides that, this technique can be used to test the convergent and discriminant validities of the measurement model that being proposed [34, 35].

Bootstrap-t confidence interval was used to access the significant path of the relationship and also the significant path of the indirect effect [37]. For deciding the effect of the mediating effect, [38] and [39] also recommend the following procedure for deciding the mediating effect. The procedures are:

- 1) If the indirect effect is significant but the path of *Independent* → *Dependent* is not significant, then there exists a full mediation effect.
- 2) If the indirect effect is significant but the path of *Independent* → *Dependent* is also significant, then there exists a partial mediation effect.

5. Findings

5.1 Measurement Model

The analysis reported in Table 1 indicated that, all indicators meet the minimum requirement of loading values which is above .70 [32, 33]. Besides that, the analysis also indicated that, both reliability analyses were also meet the minimum value, which is above .70 [32], and the AVE value for each variable were also above .50 [38]. As for discriminant analysis, the analysis of HTMT ratio test indicated that, each latent variable was totally discriminant to each other [36], since each ratio value reported in Table 2 was below than .90.

The HTMT ratio (i.e. Table 2) test were also less than 0.90, hence it confirms that, each latent variable was totally discriminant to each other [40]. Hence, the LVS can be used at the second-order measurement model since it passes the requirement of convergent and discriminant validities assessment.

Table 1: Convergent Validity for Measurement Model

LV	Indicator	Loading	AVE	γ	α
PU	PU1	.800**	.560	.835	.834
	PU2	.733**			
	PU3	.709**			
	PU4	.748**			
PEOU	PEOU1	.800**	.664	.888	.887
	PEOU2	.832**			
	PEOU3	.805**			
	PEOU4	.820**			
PI	PI1	.865**	.842	.955	.955
	PI2	.918**			
	PI3	.903**			
	PI4	.981**			
ATT	ATT1	.925**	.805	.943	.943
	ATT2	.927**			
	ATT3	.894**			
	ATT4	.840**			
INT	INT1	.838**	.681	.864	.862
	INT2	.877**			
	INT3	.755**			

Note: LV = Latent Variable; PU = Perceived Usefulness; PEOU = Perceived Ease of Use; PI = Perceived Innovativeness; ATT = Attitude; INT = Intentions; AVE = Average Variance Explained; γ = Composite Reliability; α = Cronbach's Alpha; **p < .01.

Table 2: HTMT Analysis for Measurement Model

LV	PU	PEOU	PI	ATT	INT
PU	-				
PEOU	.703	-			
PI	.489	.666	-		
ATT	.628	.679	.627	-	
INT	.717	.690	.549	.672	-

Note: LV = Latent Variable; PU = Perceived Usefulness; PEOU = Perceived Ease of Use; PI = Perceived Innovativeness; ATT = Attitude; INT = Intentions.

5.2 Structural Model

The analysis of PLS-SEM indicated that, all three independent variables can explained around 55.9% ($R^2 = .559$) of variance explained toward Attitude. In the same way, a combination of Attitude and these three independent variables can gives around 61.8% ($R^2 = .618$) of variance explained toward Intentions. In addition, the effect size (i.e. f^2) and predictive relevance (i.e. q^2) for each path can be considered as weak to moderate effects [39].

Table 3: Structural Model Assessment

	β	t-value	95% BCa CI ^a	f^2	q^2
PU→ATT	0.289	3.259**	(0.105, 0.409)	.096	.085
PEOU→ATT	0.273	2.861**	(0.085, 0.463)	.063	.056
PI→ATT	0.305	3.902**	(0.163, 0.485)	.117	.106
ATT→INT	0.245	2.957**	(0.094, 0.436)	.069	.061
PU→INT	0.388	4.077**	(0.158, 0.454)	.183	.123
PEOU→INT	0.198	2.333*	(0.039, 0.384)	.036	.018
PI→INT	0.073	0.876 ^b	(-0.100, 0.296)	.007	.003

Note: PU = Perceived Usefulness; PEOU = Perceived Ease of Use; PI = Perceived Innovativeness; ATT = Attitude; INT = Intentions; β = Standardized Beta Coefficient; BCa = Bias Corrected and Accelerated; f^2 = Effect Size; q^2 = Predictive Relevance; ^aThe bootstrap samples was 5000 samples; **p < .01; *p < .05; ^bNot Significant.

Referring to Table 3, Perceived Usefulness ($\beta = 0.289$, $t = 3.259$, $p < .01$; 95% BCa CI: (0.105, 0.409)), Perceived Ease of Use ($\beta = 0.273$, $t = 2.861$, $p < .01$; 95% BCa CI: (0.085, 0.463)), and Perceived Innovativeness ($\beta = 0.305$, $t = 3.902$, $p < .01$; 95% BCa CI: (0.163, 0.485)), can be concluded having a positive significant effect toward Attitude. Besides that, in the simultaneous concept, Attitude ($\beta = 0.245$, $t = 2.957$, $p < .01$; 95% BCa CI: (0.094, 0.436)), Perceived Usefulness ($\beta = 0.388$, $t = 4.077$, $p < .01$; 95% BCa CI: (0.158, 0.458)), and Perceived Ease of Use ($\beta = 0.198$, $t = 2.333$, $p < .05$; 95% BCa CI: (0.039, 0.384)) gives a positive significant effect toward Intentions but the analysis also indicated that, Perceived Innovativeness ($\beta = 0.078$, $t = 0.876$, $p = .381$; 95% BCa CI: (-0.100, 0.296)) did not gives a significant effect toward Intentions. Figure 2 and Figure 3 shows the analysis of PLS-SEM accordingly to the theoretical framework.

5.3 Mediating Analysis

As for the mediating analysis, Table 4 indicated that, Attitude were mediated the relationship between Perceived Usefulness, Perceived Ease of Use, and Perceived Innovativeness toward Intentions. It is because the indirect coefficients for these three indirect relationships were significant from the aspect of t-value (i.e. all t-values > 1.96) and also bootstrapping analysis (i.e. all bootstrap confidence interval does not include zero).

Table 4: Mediating Analysis

	β	t-value	95% BCa CI ^a	Type
PU→ATT→INT	0.071	2.137*	(0.021, 0.153)	Partial
PEOU→ATT→INT	0.067	2.079*	(0.019, 0.160)	Partial
PI→ATT→INT	0.075	2.276*	(0.027, 0.173)	Full

Note: PU = Perceived Usefulness; PEOU = Perceived Ease of Use; PI = Perceived Innovativeness; ATT = Attitude; INT = Intentions; β = Indirect Coefficient; BCa = Bias Corrected and Accelerated; ^aThe bootstrap samples was 5000 samples; *p <.05.

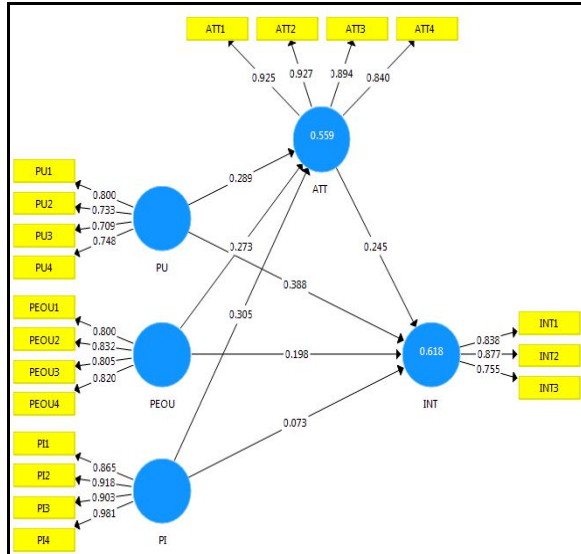


Figure 2: Loading Assessment

Note: PU = Perceived Usefulness; PEOU = Perceived Ease of Use; PI = Perceived Innovativeness; ATT = Attitude; INT = Intentions

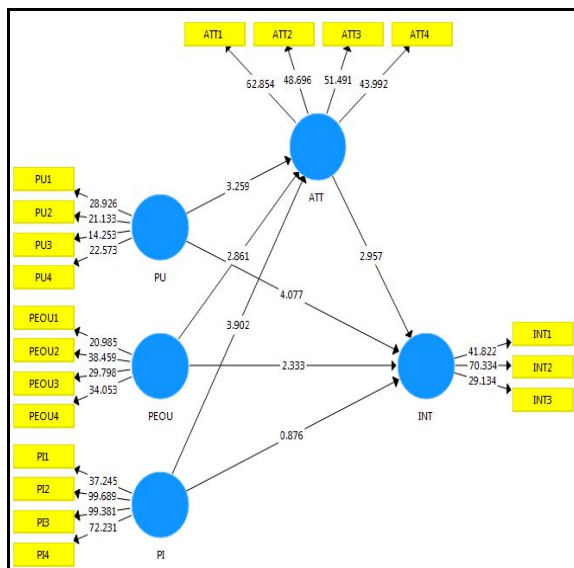


Figure 3: Bootstrapping Assessment

Note: PU = Perceived Usefulness; PEOU = Perceived Ease of Use; PI = Perceived Innovativeness; ATT = Attitude; INT = Intentions

6. Discussions and Future Research

6.1 Discussions

The core objective of this research is about to explore the advanced TAM models in the context of the application of Smart Housekeeping. The theoretical framework that was

developed in Figure 1 produced seven hypotheses that were tested using the PLS-SEM analysis. The analysis indicated that, Perceived Usefulness (H1), Perceived Ease of Use (H2), and Perceived Innovativeness (H3) have a positive significant effect toward Attitude. In the same way, Attitude (H4) was also gives a positive significant effect toward Intentions. Based on these findings, it is indicate that, if the average level of Perceived Usefulness, Perceived Ease of Use, and Perceived Innovativeness were high, then the level of Attitude was also high. Besides that, in the same way, when the average level of Attitude was high, then the average of Intentions tends to be high. Furthermore, the increments of Intentions level actually also can be described from the effect of Perceived Usefulness and Perceived Ease of Use, except for Perceived Innovativeness.

From the analysis findings, Attitude gives a partial mediating effect toward the relationships of Perceived Usefulness (H5) and Perceived Ease of Use (H6) toward Intentions, since both direct effects (i.e. PU→INT and PEOU→INT) were significant. However, in the simultaneous concept, Attitude gives a full mediating effect toward the relationships of Perceived Innovativeness (H7) toward Intentions, since the direct effect (i.e. PI→INT) was not significant. Hence, it is indicated that, Attitude can be described play an important role for increasing the Intention to use Smart Housekeeping for the Perceived Innovativeness, whereas Attitude can be described as a second factor for increasing Intentions to use Smart Housekeeping when the existence of Perceived Usefulness and Perceived Ease of Use were significant.

6.2 Future Directions

There are two major limitations worth noting in this study, which are relating to the sample size and the industry involved. Since this study is confined to green hotel guests in Klang Valley area, generalizability of the findings may be rather limited. Therefore, future research may need to focus on green hotel guests in other states, in order to gain more comprehensive perspective and stronger representativeness of the study in the local context. Future research also may extend in other service industries such as retail or public transportation industry as no such research has been conducted in those industries in Malaysia.

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Appendix A

Measurement Scales

PU1	Using Smart Housekeeping would enhance the effectiveness of my job at the hotel.
PU2	Using Smart Housekeeping would improve the quality of my job at the hotel.
PU3	Using Smart Housekeeping would allow me to do my job better in the hotel.
PU4	Overall, I believe Smart Housekeeping are useful in hotels.
PEOU1	Learning to deal with Smart Housekeeping in hotels would be easy for me.
PEOU2	My interactions with Smart Housekeeping in hotels would be clear and understandable.
PEOU3	My interactions with Smart Housekeeping in hotels would not require a lot of mental effort
PEOU4	Overall, I believe Smart Housekeeping are easy to use.
PI1	In general, I am among the first to try out new technologies.
PI2	In general, I am interested in experimenting with new technologies as soon as I hear about them.
PI3	In general, I like to experiment with the new technologies.
PI4	In general, I keep up with the latest technological developments in my areas of interest.
ATT1	Using Smart Housekeeping in hotels is a good ↔ bad idea.
ATT2	Using Smart Housekeeping in hotels is a wise ↔ foolish.
ATT3	Using Smart Housekeeping in hotels is beneficial ↔ not beneficial.
ATT4	Using Smart Housekeeping in hotels is enjoyable ↔ not enjoyable.
INT1	I will use Smart Housekeeping in hotels in the future.
INT2	Smart Housekeeping would be one of my favourite technologies in hotel.
INT3	I will strongly recommend others to use Smart Housekeeping in hotels.