

## A Comparative Study of ICT Adoption Influence on Performance of 3-5 Star Hotels

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### Abstract

The purpose of this study is to compare the influence of ICT adoption on the performance of three star and four & five star hotels in Phuket, Thailand. The three elements considered for measuring ICT adoption are: (i) availability of ICT components, (ii) integration of ICT components, and (iii) intensity of ICT usage. Operational productivity and customer satisfaction were utilized in order to measure hotel performance. To control for any effect of locational factors on hotel performance, the hotels were selected from the same geographical area, Phuket, Thailand. Operational productivity was gauged via Data Envelopment Analysis (DEA). A five-point likert-type scale was employed for assessing customer satisfaction. Multiple regression analysis was applied to evaluate the relationship between ICT adoption and hotel performance. ICT adoption has influenced operational productivity considerably in both three star and four & five star hotels. However, its' significant influence on customer satisfaction is confined to four & five star hotels only. The findings of this study have the potential to be of considerable assistance to the hotel industry through availing critical information to management in deciding which operational areas should adopt ICT as well as identifying the specific technologies that would improve hotel performance.

**Keywords:** Information and communication technology (ICT) adoption, hotel performance, operational productivity, customer satisfaction, user rating

### 1. Introduction

Hotels are increasingly adopting ICT in the face of an increasingly competitive environment (Seric, M., Gil-Saura, I. and Mollá-Descals, A. 2016). Online reservation systems, procurement and inventory systems, wireless internet, electronic transactions and video conference systems are some ICT applications that have been broadly implemented throughout the hotel industry (Ahmad, R. and Scott, N. 2019). Hotel managers believe ICT adoption can provide many benefits including improved hotel performance (Al-Adamat, A. 2015). In service organizations, such as hotels, customer relationships are critical because the nature of the hospitality business focuses more on human skill and intangible assets (Chevers, D. and Spencer, A. 2017). These lead to the increasing importance and value of people (employees and customers) within the hotel industry. Therefore, hotel performance evaluation should be viewed from both operational and customer perspectives (Johnston and Jones 2004). With regard to the operational perspective, performance is mostly measured using operational productivity as a benchmark, reflecting the efficiency level of the business operations. From the customer perspective, hotel performance is usually evaluated by assessing customer satisfaction. This indicates the process of building both long term customer relationships and the credibility of the hotel. However, some researchers indicated contradictory opinions on the relationship between ICT adoption and hotel performance. Some indicated that ICT adoption could improve hotel performance (Sigala., 2003), while others indicated that ICT adoption may not improve hotel performance (David, Grabski and Kasavana, 1996). These contradictions could be because of differences in the types of hotels under consideration, their locations and customer characteristics, such as employee & management training, organizational culture and management style. Thus, a comparative study of different categories of hotels could provide invaluable insight and would be useful from both academic and practitioner perspectives since most of the previous studies were conducted on only one category of hotel. Moreover, studies in a developing country context are limited in number, and research from this perspective would be useful to hotel management as the tourism and hospitality industry in these countries, especially in Asia, is growing rapidly.

### 2. Objectives

The purpose of this study is to compare the influences of ICT adoption on the performance of three star and four & five star hotels in Phuket, Thailand.

### 3. Scope of research

There were 74 five star hotels, 120 four star hotels and 152 three star hotels in Phuket registered with Department Of Provincial Administration. (Department of Provincial Administration, 2019). By using the Yamane formula with a 95% confidence level (Yamane, 1973), the sample sizes representing the 152 three star hotels and 194 four & five star hotels in Phuket are 85 and 109, respectively. Independent variables are ICT adoption and hotel performance, using the elements of ICT adoption, and operational productivity as well as customer satisfaction, as the dependent variables.

### 4. Conceptual framework of research

Our preliminary research framework arose from an examination and consideration of existing literatures in this field. Validity of our proposed research framework was assessed through canvassing the opinions of eighteen experts from both academic and practicing hospitality backgrounds. Our preliminary framework was refined in light of their feedback and suggestions. The research framework of this study is shown in figure 1.

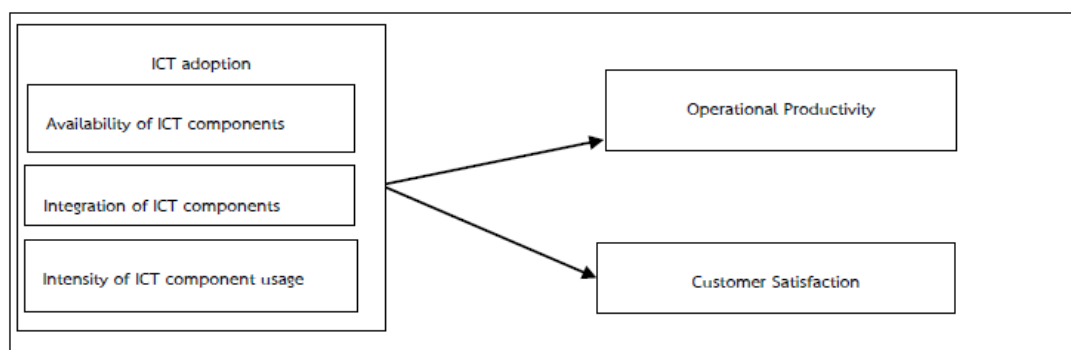


Figure1. Research Framework

As the core purpose of ICT adoption by hotels is to attain improved performance, merely possessing ICT components in itself is not sufficient. The contribution of the available ICTs towards enhancing performance depends on their integration within various operational areas together with the intensity of their use. Thus, ICT adoption encompasses three major elements: (i) availability of ICT components, (ii) integration of ICT components and (iii) intensity of ICT usage. The availability of ICT components was measured using the number of ICT units available in the hotel. Integration of ICT components was assessed through calculating the number of ICT linkages between a particular operational domain to other operational domains or to main server systems. The intensity of ICT component use reflects how frequently the hoteliers/customers utilize available ICT components. Thus, intensity of ICT component usage was measured by the percentage of hotel operations undertaken via ICT. The operational productivity of the hotel was calculated from the items of operational outputs and inputs using Data Envelopment Analysis (DEA). Operational outputs constitute: (i) yearly hotel revenue, (ii) room occupancy rate and (iii) seat turnover rate for food and beverage. Operational inputs comprise (i) yearly hotel expenses, (ii) total number of guest rooms and (iii) seating capacity of restaurants. Customer satisfaction was assessed through customer satisfaction level with hotel services.

### 5. Methodology

In addition to ICT adoption, hotel productivity can also be influenced by a number of factors, such as management style, materials, employee training, customer and marketing, working conditions and other external factors. Broadly, these factors can be grouped into (i) employee and management characteristic factors. To control for the influence of locational factors Ham et al, (2005) used hotels located in one city only, i.e. Seoul, Korea.

To control for the influence of locational factors on performance, we followed the study of Ham et al., (2005) and hotels were chosen from one location - Phuket. For the comparative study, two distinct categories of hotels i.e. three star and four & five star hotels were chosen for investigation. In this study, four and five star hotels were grouped together since they are upscale hotels and have similar management and customer characteristics (Kotler et, al 2007). The three star hotels are considered of average standard & their management and customer characteristics are different from four & five star hotels.

In light of the research framework outlined in previous section, preliminary questionnaires were constructed for hotel management staff and hotel customers. Subsequently, these questionnaires were pre-tested using management staff from forty hotels, together with four hundred hotel guests (ten from each hotel) and then refined before beginning the survey. The questionnaire for hotel management personnel has three sections: hotel demographics, ICT adoption, and operational productivity. The questionnaire for hotel customers has three sections: customer characteristics, intensity of in-room ICT usage and customer satisfaction.

There were 74 five star hotels, 120 four star hotels and 152 three star hotels in Phuket registered with Department Of Provincial Administration. (Department Of Provincial Administration, 2019). By using the Yamane formula with a 95% confidence level (Yamane, 1973), the sample sizes representing the 152 three star hotels and 194 four & five star hotels in Phuket are 85 and 109, respectively. Table 1 shows the total number and the target sample sizes of the categorized hotels.

**Table 1.** Total number of hotels, target sample sizes and the responses at the different stages

Hotel Size	Total number of hotels	Target sample size	Number of hotels responding in 1st stage	Number of hotels responding after persuasion in 2nd stage	Total number of hotels surveyed
3 star hotels	152	85	59 (38.8%)	26	85
4&5 star hotels	194	109	78 (40.2%)	31	109

The questionnaires were dispatched to all three and four & five star hotels in Phuket. One member of management staff (General Manager or Resident Manager) and ten customers from each hotel were targeted to fill out their appropriate questionnaires. To elicit required information from hoteliers, they were assured that their responses would be used for research purposes only and the hotel's identity would be confidential. Furthermore, some sensitive information such as operational revenue / expenses was presented within band ranges of equal intervals instead of points. In the first stage of the survey, the response rate was 38.8% for three star hotels and 40.2% for four & five star hotels as only 59 three star hotels and 78 four & five star hotels replied to questionnaires, respectively. To attain the desired sample size we proceeded to endeavor (second stage) to persuade hoteliers personally or through phone contact to respond to questionnaires until the target sample size was reached. Table III shows the number of responses in the first and second stages of the survey. Customers of respective hotels were surveyed both at the hotel lobby and at the airport. The survey of the customers continued until the target number of 10 customers from each hotel was attained. It took about three months to complete the survey.

The operational productivity of each hotel was determined using Data Envelopment Analysis (DEA) frontier software. DEA frontier software is a non-parametric multivariate technique that has been extensively utilized within productivity measurement in the hospitality industry (Akarapong, and Mingsarn, 2009). By employing the concept of performance frontiers, DEA benchmarks the surveyed productivity inputs and outputs simultaneously and generates results in a relative form. As the unit of analysis is a hotel, the responses of ten customers from each hotel were averaged. Multiple regression analysis was employed to evaluate the relationship between ICT adoption and hotel performance, using the elements of ICT adoption as independent variables, and operational productivity as well as customer satisfaction, as the dependent variables. Multiple regression analysis was performed in two levels: (i) the composite level (taking variables from all elements of ICT adoption as independent variables together in the regression analysis) and (ii) the individual element's level (taking variables only from one element of ICT adoption as independent variables within the regression analysis). To avoid the effects of different scales used, standardized regression coefficients were estimated.

## 6. Results and Discussion

Profiles of the hotels and their customers

Table 2 summarizes the demographic profiles of the hotels and their customers.

**Table 2.** Descriptive Statistics of Hotels and their Customers

Hotel Characteristics	3 star hotel (%)	4 & 5 star hotel (%)	Customer Characteristics	3 star hotel (%)	4 & 5 star hotel (%)
<b>Total Number of Hotel Room</b>			<b>Customer Gender</b>		
Less than 100 rooms	49.4	34.48	Female	55.1	55.7
100 - 150 rooms	28.9	18.97	Male	44.9	44.3
151 - 200 rooms	7.6	8.62	<b>Customer Age</b>		
Above 200 rooms	14.1	37.93	Below 25 yrs	16.9	15.2
<b>Yearly Average Room Rate per Night</b>			25 - 35 yrs	33.4	26.3
Less than 1,500 baht	2.4	0.9	35 - 45 yrs	20	24.9
1,500 - 3,000 baht	57.6	3.5	45 - 55 yrs	13.3	18.1
3,001 - 4,500 baht	14.1	11.2	Above 55 yrs	16.4	16.5
4,501 - 6,000 baht	7.1	14.6	<b>Customer Education</b>		
Above 6,000 baht	18.8	69.8	below bachelor degree	29	27.4
<b>Room Occupancy Rate</b>			bachelor degree	46.3	45.5
Less than 60%	9.41	3.45	master degree or higher	24.7	27.1
60-80%	29.41	14.66	<b>Customer's Country</b>		
Above 80%	61.18	81.9	Europe	35.7	36.9
<b>Total Number of Restaurant Seats</b>			North America	33	35.7
Less than 100 seats	4.7	6	South America	10.1	12.2
100 - 150 seats	44.7	27.6	Asia	12.1	8.1
151 - 200 seats	29.4	20.7	Oceania	9.1	7.1
201 - 250 seats	14.1	10.1			
Above 250 seats	7.1	35.6			
<b>Restaurant Seat Turnover Rate</b>					
Less than 4		30.59	16.38		
4-4.9		36.47	35.34		
5 and Above	32.94	48.28			
<b>Yearly Hotel Revenue</b>					
Less than 20 million baht	15.29	4.31			
20 - 39.9 million baht	40	48.28			
40 - 59.9 million baht	18.82	8.62			
60 - 79.9 million baht	11.76	10.34			
80 million baht and above	14.11	28.44			
<b>Yearly Hotel Expenses</b>					
Less than 20 million baht	4.71	2.59			
20 - 29.9 million baht	10.59	6.03			
30 - 39.9 million baht	14.12	12.93			
40 - 49.9 million baht	55.29	44.83			
50 million baht and above	15.29	33.62			
<b>DEA score for Operational Productivity</b>					
0.90 - 1.00	31.7	51.73			
0.80 - 0.89	41.46	20.69			
Less than 0.80	26.84	27.59			

Among the three star premises and four & five star hotels surveyed, the number of rooms of four & five star hotels is higher than that of the three star hotels. Half of the three star hotels are small in size, having less than 100 rooms, while 38% of the four & five star hotels are large in size, having more than 200 rooms. The average room rate of the four & five star hotels is higher than the corresponding three star hotels. Two-thirds of the four & five star hotels charge above 6,000 baht per night while 58% of the three star hotels charge 1,500 - 3,000 baht per night. The occupancy rate of the majority of both categories is more than 80%. The number of restaurant seats of four & five



star hotels is higher than that of three star hotels. About 45% of 3-star hotels have 100–150 restaurant seats, whereas 35% of four & five star hotels have more than 250 restaurant seats. The restaurant seat turnover rates of the majority of both categories of hotels is four and above. The majority of both categories of hotels have yearly revenues in the range of 20 – 39.9 million baht, with yearly expenses in the range of 40-49.9 million baht. DEA scores of operational productivity of 52% of four & five star hotels are in the range of 0.90 – 1.00, while DEA scores of 41% of the three star hotels are in the range of 0.80-0.89. Among the three and four & five star hotel customers surveyed, 55% were female with most between 25 – 35 years old. About 36% of customers came from Europe and roughly one-third from North America. Approximately half of the customers had a bachelor degree.

#### Relationship between ICT Adoption and Hotel Performance

The outcome of composite (taking the variables of all the elements of ICT adoption together) regression analysis between ICT adoption and hotel performance is shown in table 3. It can be seen that ICT adoption has a significant relationship with operational productivity in both three and four & five star hotels (p-value for the F-test of regression analysis = 0.00). However, ICT adoption has a significant relationship with customer satisfaction in four & five star hotels only (p-value < 0.05).

**Table 3** Relationship between ICT Adoption and Hotel Performance

ICT adoption	Operational Productivity				Customer Satisfaction			
	Three star		Four & five star		Three star		Four & five star	
	Standardized Coefficients (Beta)	p-value	Standardized Coefficients (Beta)	p-value	Standardized Coefficients (Beta)	p-value	Standardized Coefficients (Beta)	p-value
<b>ICT Availability</b>								
Number of ICT components in RD	<b>0.753</b>	<b>0.021</b>	<b>0.498</b>	<b>0.004</b>	-0.303	0.472	-0.137	0.568
Number of ICT components in F&B	0.108	0.701	0.034	0.803	-0.124	0.735	0.051	0.793
Number of general ICT components	-0.094	0.667	-0.069	0.579	0.419	0.147	-0.187	0.250
Number of in-room ICT components	0.421	0.109	0.193	0.147	0.261	0.446	0.270	0.444
<b>ICT Integration</b>								
Number of ICT integration in RD	0.010	0.957	0.202	0.133	-0.120	0.632	0.070	0.698
Number of ICT integration in F&B	-0.381	0.066	0.046	0.760	0.145	0.589	0.145	0.485
Number of general ICT integration	<b>0.320</b>	<b>0.013</b>	<b>0.297</b>	<b>0.037</b>	-0.667	0.154	-0.618	0.100
Number of in-room ICT integration	-0.164	0.644	-0.403	0.146	0.353	0.463	<b>0.334</b>	<b>0.021</b>
<b>Intensity of ICT use</b>								
Intensity of RD ICT usage	<b>0.343</b>	<b>0.042</b>	<b>0.140</b>	<b>0.000</b>	0.188	0.735	0.270	0.250
Intensity of FB ICT usage	0.336	0.220	0.135	0.271	0.009	0.980	0.166	0.296
Intensity of General ICT usage	0.422	0.137	0.149	0.337	-0.078	0.832	0.280	0.166
Intensity of In-room ICT usage	-0.058	0.641	0.094	0.410	0.450	0.107	<b>0.232</b>	<b>0.012</b>
R2	0.519		0.453		0.172		0.396	
Adjusted R2	0.439		0.389		0.034		0.290	
F	6.475		7.109		1.249		2.774	
p-value	<b>0.000</b>		<b>0.000</b>		0.268		<b>0.003</b>	

When assessing ICT adoption in particular operational domains we uncovered that ICT availability and intensity of ICT usage in room division and integration of general ICT record a significant positive relationship with operational productivity in both three and four & five star hotels. ICT integration and the intensity of use of in-room ICTs have a significant positive relationship with customer satisfaction in four & five star hotels only. The absence of a significant relationship of ICT adoption with the customer satisfaction in 3-star hotels may be explained by the fact that most of the 3-star hotel customers concern the room price as the first priority. They mostly use the hotel rooms for resting purpose only, so the ICTs are secondary issue for them.

Having seen the overall relationship between ICT adoption and hotel performance, let us now look into the relationship between individual element of the ICT adoption (ICT availability, ICT integration and intensity of ICT use) and hotel performance.

Relationship between the Availability of ICT Components and Hotel Performance

The outcome of the regression analysis between availability of ICT components and hotel performance is shown in table 4. It can be seen that the availability of ICT components has a significant relationship with operational productivity in both categories of hotels ( $p$ -value < 0.05). However, the availability of ICT components has a significant relationship with customer satisfaction in four & five star hotels, only.

**Table 4** Relationship between the Availability of ICT Components and Hotel Performance

The availability of ICT components	Operational Productivity				Customer Satisfaction			
	Three star		Four & five star		Three star		Four & five star	
	Standardized Coefficients (Beta)	p-value	Standardized Coefficients (Beta)	p-value	Standardized Coefficients (Beta)	p-value	Standardized Coefficients (Beta)	p-value
Number of ICT components in RD	0.897	0.000	0.618	0.000	-0.103	0.744	-0.062	0.761
Number of ICT components in F&B	0.165	0.248	-0.021	0.875	-0.358	0.238	0.083	0.648
Number of general ICT components	-0.056	0.783	-0.009	0.943	0.292	0.267	0.299	0.176
Number of in-room ICT components	-0.540	0.101	-0.045	0.604	0.042	0.834	0.250	0.045
R2	0.416		0.336		0.046		0.190	
Adjusted R2	0.387		0.312		-0.002		0.148	
F	14.237		14.025		0.959		2.148	
p-value	0.000		0.000		0.434		0.048	

When looking into ICT component availability in specific operational domains, the number of ICT components in room division has a significant positive relationship with operational productivity in both categories of hotels ( $p$ -value < 0.05). This is similar to the findings of the composite regression analysis (table 3). The availability of in-room ICT components has a significant positive relationship with customer satisfaction in four & five star hotels only. In the composite regression (table 3), this variable had an insignificant relationship with customer satisfaction in both categories of hotel. When the variables of all the elements of ICT adoption are considered together, influences of other factors might have overshadowed the influence of the availability of in-room ICT components in four & five star hotels. Also, the adjusted R square is less than the composite one.

Relationship between ICT Integration and Hotel Performance

The outcome of the regression analysis between ICT integration and hotel performance is shown in table 5. ICT integration has a significant positive relationship with operational productivity in both categories of hotels ( $p$ -value < 0.05). However, ICT integration has a significant positive relationship with customer satisfaction in four & five star hotels only.

**Table 5** Relationship between ICT Integration and Hotel Performance

The integration of ICT components	Operational Productivity				Customer Satisfaction			
	Three star		Four & five star		Three star		Four & five star	
	Standardized Coefficients (Beta)	p-value	Standardized Coefficients (Beta)	p-value	Standardized Coefficients (Beta)	p-value	Standardized Coefficients (Beta)	p-value
Number of ICT integration in RD	-0.138	0.424	0.099	0.456	-0.147	0.490	0.178	0.272
Number of ICT integration in F&B	-0.223	0.254	0.103	0.493	-0.012	0.961	-0.054	0.765
Number of general ICT integration	0.630	0.036	0.345	0.017	-0.186	0.613	0.711	0.000
Number of in-room ICT integration	0.453	0.101	0.081	0.583	0.151	0.697	0.600	0.001
R2	0.371		0.330		0.037		0.177	
Adjusted R2	0.340		0.306		-0.011		0.139	
F	11.798		13.660		0.768		4.686	
p-value	0.000		0.000		0.549		0.002	

When looking to specific hotel operational domain, general ICT integration was found to have a significant relationship with operational productivity in both categories of hotel. This is similar to the composite regression findings (table 3). The integration of general ICT and in-room ICT was found to have a significant positive relationship

with customer satisfaction in four & five star hotels only. It is different from the composite regression (table 3), where only in-room ICT integration has a significant positive relationship with customer satisfaction in four & five star hotels.

#### Relationship between the Intensity of ICT Usage and Hotel Performance

The outcome of the regression analysis between the intensity of ICT usage and hotel performance is shown in table 6. The intensity of ICT usage has a significant relationship with operational productivity as well as customer satisfaction in both categories of hotel.

**Table 6** Relationship between the Intensity of ICT Usage and Hotel Performance

The intensity of ICT usage	Operational Productivity				Customer Satisfaction			
	Three star		Four & five star		Three star		Four & five star	
	Standardized Coefficients (Beta)	p-value	Standardized Coefficients (Beta)	p-value	Standardized Coefficient (Beta)	p-value	Standardized Coefficient (Beta)	p-value
Intensity of RD ICT usage	<b>0.876</b>	<b>0.001</b>	<b>0.388</b>	<b>0.011</b>	-0.42	0.101	-0.437	0.124
Intensity of FB ICT usage	<b>0.568</b>	<b>0.047</b>	<b>0.216</b>	<b>0.048</b>	-0.083	0.796	0.195	0.222
Intensity of General ICT usage	-0.016	0.957	0.211	0.164	0.137	0.669	0.232	0.246
Intensity of In-room ICT usage	0	1	0.173	0.089	<b>0.396</b>	<b>0.005</b>	<b>0.271</b>	<b>0.04</b>
R2	0.297		0.388		0.127		0.102	
Adjusted R2	0.256		0.372		0.084		0.061	
F	4.895		11.741		2.921		2.468	
p-value	<b>0.001</b>		<b>0</b>		<b>0.026</b>		<b>0.048</b>	

When looking at specific hotel operational domains, the intensity of room division ICT and food and beverage division ICT usage have a significant positive relationship with operational productivity in both categories of hotel. In the composite regression analysis (table 3), only the intensity of room division ICT usage was found to have a significant positive relationship with operational productivity. Probably, the intensity of food and beverage division ICT usage might have been overshadowed by other factors in the composite regression analysis.

The intensity of in-room ICT usage was found to have a positive significant relationship with customer satisfaction in both three and four & five star hotels. In the composite regression (table 3), this variable had insignificant relationship with customer satisfaction in three star hotels. As indicated before, when the variables of all the elements of ICT adoption were considered together in composite regression, the influences of other factors might have overshadowed the influence of the intensity of in-room ICT usage. Also, the adjusted R square is less than the composite one.

## 7. Conclusion and Recommendation

This study compares the influence of ICT adoption on hotel performance between three and four & five star hotels in Phuket, Thailand. The results reveal that ICT adoption has an influence on operational productivity significantly for both three and four & five star hotels. However, ICT adoption has a significant influence on customer satisfaction in four & five star hotels, while only intensity of ICT usage in room-division has an influence on the customer satisfaction of three star hotels. The results exhibit that the influence of ICT adoption on hotel performance varies depending on the type of hotel and their guest characteristics. This may partly explain the contradicting opinions concerning the relationship between ICT adoption and hotel performance in previous studies.

It may be mentioned that Phuket is a tourist island. The findings from this paper may be useful for other tourist islands or beach area hotels that have similar surrounding conditions. However, the hotels in this study are operating within a very specific set of locational and operational characteristics. The findings should be used carefully keeping in mind the specific contextual aspects.

## 8. Management Implications

The findings of this study have significant management implications. The research results pinpoint areas in which hotel management in each category of hotel (three or four & five star hotel) need to pay attention to enhance performance.

If the management of both categories of hotels emphasize operational productivity, they may consider increasing the number of the ICT components in room division, enhancing the integration of the general ICT, as well as emphasizing the intensity of usage of both room and food and beverage division ICT.

In order to enhance customer satisfaction, the management of three star hotels may consider increasing the intensity of usage of in-room ICT, whereas the management of four & five star hotels may consider enhancing the number of the in-room ICT components, increasing the number of the general ICT units and in-room ICT integration as well as emphasizing the intensity of use of in-room ICT. Whether the customers will use it or not, in-room ICT should be made available and easy-to-use by the guest.

This study has a significant contribution to make to the academic literature. Most the previous studies were carried out on only one category of hotel. A comparative study of different categories of hotel provides a broader picture and indicates that the influence of ICT adoption on hotel performance varies depending on the type of hotel under consideration. Additionally, it fills a gap in terms of the requirement of more studies exploring the relationship between ICT adoption and hotel performance within different contexts, as indicated in the introduction to this paper. Available studies are mostly in the context of developed countries. This study is from a developing country's perspective. Furthermore, the location of the study is an island which is a major tourist destination in Thailand and which possesses a specific set of locational and operational characteristics. Thus, it helps to foster understanding of the topic from a different context.

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