

IMPACT OF ELECTRONIC BUSINESS AND INFORMATION TECHNOLOGY ADOPTION ON OPERATIONAL AND CUSTOMER PRODUCTIVITIES IN HOSPITALITY INDUSTRY

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ABSTRACT

This study aims to explore the impact of electronic business and information technology (EB&IT) adoption on the operational and customer productivities in hotel industry in Thailand. Levels of EB&IT adoption were measured by three elements: (i) EB&IT component availability; (ii) EB&IT component integration; and (iii) EB&IT utilization. Hotel productivities comprising operational and customer productivities were calculated by using data envelopment analysis (DEA). Multivariate analysis was used to assess the impact of level of electronic business and information technology adoption on hotel productivities. Data was collected through questionnaire survey of 190 hotel managers and 1900 customers in Phuket. In general, EB&IT adoption has a significant positive impact on both operational and customer productivities. However, some electronic business and information technology component adoption can increase either operational or customer productivity.

Index Terms— electronic business and information technology adoption, operational productivity, customer productivity, hotel productivity, Thailand

1. INTRODUCTION

Increasing competition and customer expectation lead hotels to search for more competitive advantage. Many hotels have adopted information and communication technology (EB&IT) as a way to cope with rapidly changing environments [13]. Internet, intranet, e-mail, electronic transaction, central reservation systems and web applications are some of EB&IT applications that have been broadly implemented throughout the industry [4]. The hotel managers believe EB&IT adoption is a key success factor for effective hotel performance [11, 13]. One of the important performance indicators for hotel industry is productivity since it relates to its efficiency [6].

1.1 EB&IT adoption in hotel industry

There are many benefits of EB&IT adoption in hotel industry [2, 3], which influence hotels to adopt EB&IT in their organization. The level of EB&IT adoption in hotel

industry is determined by three dimensions; availability of EB&IT component, integration of EB&IT components and EB&IT utilizations [12]. The availability of EB&IT in a hotel is measured in terms of EB&IT components that hotels were presently using. These EB&IT components offered the hotel various possibilities for increasing employee productivity, enhancing revenue and improving guest service [4, 13]. The integration of EB&IT components is measured from the number of the integration of EB&IT applications with property management systems (PMS) and amongst each other [12]. The EB&IT utilization is measured by the percentage of the operational activity carried out by using EB&IT. For example, the EB&IT utilization in reservation process can be measured from percentage of the transaction done through hotel website reservation system [10].

1.2 Productivity in Hotel Industry

Productivity is normally defined as “the ratio of what is produced by an operation of process to what is required to produce it, or put simply the ratio of actual output to input over a period of time” [1, 7]. Johnston and Jones (2004) provided a structure for analyzing productivity in hotel industry by distinguishing between operational and customer productivity.

Operational productivity is defined as a function of the ratio of operational outputs to inputs over a period of time where inputs include materials, equipment, and staff costs and outputs include revenue, number of goods or service sold, and number of customer processed. Customer productivity is defined as a function of the ratio of customers' inputs such as time, effort and financial cost, to customer outputs such as the emotions of enjoyment, judgements about satisfaction, value of money and intentions to repurchase or tell friends [6].

1.3 Relationship between EB&IT adoption and hotel productivity

In hotel industry, there are only few studies investigating the relationship between EB&IT adoption and productivity. Most of these studies are in the developed country contexts and their results are not consistent [3, 12]. Some have found that EB&IT investment could increase hotel productivity or performance [3, 9, 12]. Sigala., 2003 proposed that productivity gains from the full exploitation of EB&IT

networking and informalization capabilities. On the other hand, some researchers concluded that EB&IT investment may not increase hotel productivity [14]. David et al., (1996) observed that hotel operators have spent uncounted millions of dollars on computers and information systems but haven't always achieved enhanced productivity from all those expenditures. Therefore, it can be seen that more studies investigating relationship between EB&IT adoption and productivity in hotel industry are required. Moreover, the research in the developing country context is limited in number, and studies in this context will be interesting to the hotel manager because the tourism and hospitality industries in these countries especially in Asia are growing rapidly.

This paper investigates the relationship between EB&IT adoption and productivity in hotel industry in Phuket, Thailand. Thailand is one of the major world class tourist destinations. About 14.46 million tourists from around the world visited Thailand in the year 2007, up 4.65% over 2006, generating an income of 547 billion Baht. [15]. Hotel productivity can be significantly influenced by the location factors such as competition among hotels in location, demand patterns and variability, customer type, area management style, public utility availability and labor market [11, 13]. This research controlled the variations of the locational factors by selecting the hotel samples only from a single area: Phuket of Thailand. Phuket is the biggest island in Thailand and is a major destination of tourists. Phuket also has the highest percentages of number of hotel having computer, number of hotel having internet connection and number of hotel having website [8].

The following sections of this paper present the research framework and methodology, which is followed by finding and analyses, contribution and managerial implication.

2. STUDY FRAMEWORK

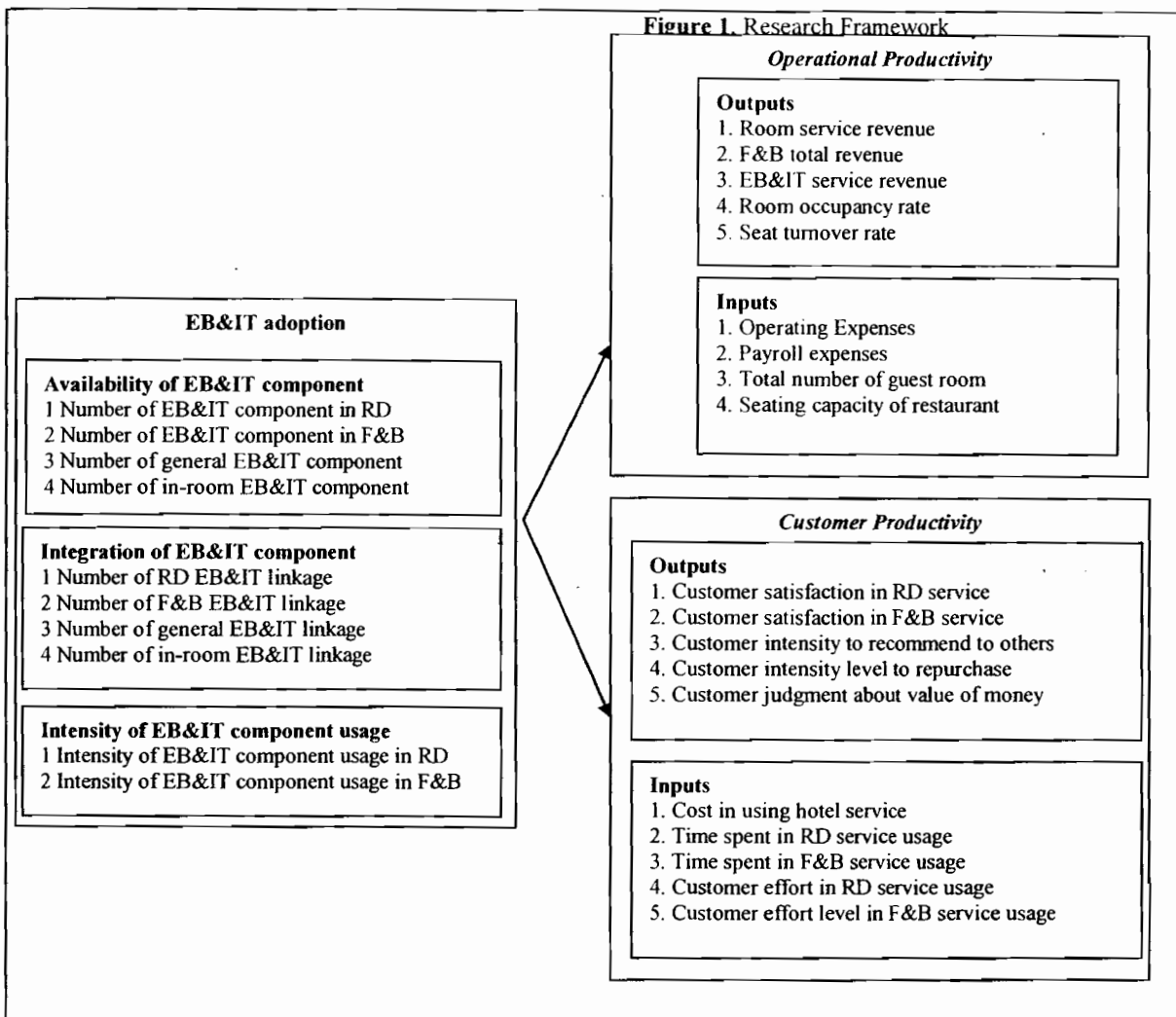
The preliminary research framework was developed based on the literature review. Then, it was tested through expert opinions. Twenty experts from both academic and practitioner sides were selected and interviewed. Their comments and recommendations were used to refine preliminary framework. The research framework, used in this study, is shown in figure 1.

As can be seen from figure 1, the EB&IT adoption, is comprised of (i) availability of EB&IT component, (ii) integration of EB&IT component and (iii) EB&IT utilization. The availability of EB&IT was measured in terms of number of EB&IT components presently adopted by hotel. These components were categorized into four groups; (i) room division (RD), (ii) food and beverage division (F&B), (iii) general and (iv) in-room EB&ITs [4, 13]. The integration or linkage of EB&IT components was

measured by the number of linkages between EB&IT in each categorized group to other group or to main control systems [12]. The intensity of EB&IT component usage was measured by asking the hoteliers about the percentage of hotel operations processed through EB&IT components [10, 12]. For example, the intensity of website system usage was measured by asking the hoteliers about the percentage of room reservation with the customers that occurred through website systems. In this study, the EB&IT component intensity of use measurement was limited only on room division (RD) and food & beverage (F&B) division because of two reasons. Firstly, both of them are the core operations in hotel service [11]. Secondly, the revenue from these two divisions is approximately 80% of Thailand total hotel revenue in 2006 [8]. Further, the extent of EB&IT uses by the customers in room is not known by anybody but the customers.

The operational productivity of each hotel was measured in term of operational outputs divided by operational inputs. Operational outputs include of (i) room revenue: refers to yearly revenues from room sales; (ii) food and beverages revenue: refers to yearly revenues from hotel restaurants, coffee room and night club; (iii) EB&IT revenues: refers to yearly receipts from telephone, fax and internet service; (iv) room occupancy rate: refers to yearly total number of occupied rooms divided by total number of rooms; and (v) seat turnover rate: refers to yearly average number of times each seat in a restaurant is occupied per day. Operational inputs consist of (i) operating expenses: including yearly housekeeping expenses, yearly food and beverage expenses, yearly telephone, fax and internet service expenses and yearly repair, maintenance and license expenses of computer accessories and cost of training (ii) payroll expenses: including salaries, service charge and bonus of room and food and beverage division employees; (iii) total number of guest room: refers to number of available guest rooms in the hotel; and (iv) seating capacity of restaurant: refers to number of available guest seating in the hotel restaurant.

Customer productivity was measured in term of customer outputs divided by customer inputs. Customer outputs consist of five items: (i) customer satisfaction in room division service: refers to the average perceived customer satisfaction level measured from five room division services; room reservation service, check-in service, room cleanliness, room service facility and check-out and billing service. (ii) customer satisfaction in food and beverages division service: refers to the average perceived customer satisfaction level measured from five food and beverages division services of the hotel customer stayed; table reservation service, food ordering service,



food serving service, quality of food and beverage and billing and payment service; (iii) customer intensity level to recommend to others; (iv) customer intensity level to repurchase and (v) customer judgment about value of money. A five-point likert type scale anchored from 1 (highly dissatisfied) to 5 (highly satisfied) was usage for each question in item (i) and (ii) and from 1 (not very likely) to 5 (very likely) was usage for each question in item (iii) – (v).

Customer inputs consist of 5 items: (i) cost in using hotel service: including amount paid in using room division services per day, amount paid in using food and beverage division services per day, and amount paid in using telephone, computer and internet services per day; (ii) time spent in room division service usage: including duration of hotel service usage for room reservation completion; for check in completion, for in-room service using completion and for check out and billing completion; (iii) time spent in

food and beverage division service usage: including duration of hotel service usage for table reservation completion, for seat and menu providing completion, for food serving completion and for billing and payment completion; (iv) customer effort level in room division service usage: refers to the average customer convenient level measured from five room division service usages; room reservation service usage, check-in service usage, in-room service using service usage, check out service usage and billing and folio producing service usage and (v) customer effort level in food and beverage division service usage: refers to the average customer convenient level measured from three room division service usages; table reservation service usage, food ordering service usage and billing and payment service usage. All items concerning customer effort level were rated on a 5-point, likert-type scale ranging from 1 (highly inconvenient) to 5 (highly convenient).

3. METHODOLOGY

Based on the research framework, the questionnaires were developed for hotel management personnel and hotel customers. The questionnaire for hotel management personnel is composed of three sections: hotel demographic, EB&IT adoption, and operational productivity. The questionnaire for hotel customer is composed of two sections: customer characteristics and customer productivity. In 2007, there were 368 hotels in Phuket, Thailand [8]. By using Yamane equation, 190 hotels were selected randomly to be the research samples. Then, questionnaire survey was conducted to them. One management personnel (general manager or residence manager) and ten customers of each hotel were selected randomly to complete their respective questionnaires.

Operational and customer productivities were calculated by using Data Envelopment Analysis (DEA) frontier software. DEA frontier software is a non-parametric multivariate technique that has been widely used for productivity measurement in hotel industry, as well as for assessing the EB&IT productivity impact [5]. By using the concept of performance frontier, DEA benchmarks the surveyed productivity inputs and outputs simultaneously and provides the calculated results in relative form. As the DEA scores for operational and customer productivities were available, multiple regression analysis was conducted to identify whether EB&IT adoption level had any impact on operational and customer productivities.

4. FINDING AND ANALYSIS

4.1. Profiles of the hotels and their customers

Table I summaries the demographic profiles of the hotels and their customers. Among the 190 hotels surveyed, most of the hotel is resort type hotel with 3 star rating. Forty five percent of hotels are small size hotel, with less than 100 rooms and more than half of hotels charged less than 3,000 baht per night. One-third of hotels are 3-9 years old and another one third hotels are more than 15 years old. Among 1,900 hotel customers surveyed, roughly half of them are female. Most of customers are between 30 – 40 years old. One –third of customers came from Europe and had duration of stay in the hotel between 3 – 5 days.

4.2. Impact of the availability of EB&IT components on operational and customer productivities

The impact of the availability of EB&IT component on operational and customer productivities is shown in table II.

It can be seen that the availability of EB&IT components has significant impact on the operational and customer productivities (p -value < 0.05). This implies that when the number of hotel EB&IT component increases, operational and customer productivities are also increased.

It is seen that the number of room division EB&IT components has significant positive impact on both operational and customer productivities. This indicates that the hotel having higher amount of room division EB&IT has higher hotel productivities. The availability of these EB&IT not only improves employee efficiency, reduces cost and increases revenue, but also enhances customer satisfaction and convenience. For example, check in system can reduce paper cost and can reduce work load for hotel front office staffs. It also increases customer satisfaction since it reduces the register duration.

The number of in-room EB&IT components was found to have significant positive impact only on customer productivity, indicating that the availability of in-room EB&IT components increases the customer satisfaction and loyalty that are necessary indicators for hotel long-term success. On the other hand, the number of general EB&IT components was found to have positive significant impact only with the operational productivity. Since most of general EB&IT components are used by hotel persons for improving their efficiencies in both routine and management tasks, the customers have a little involvement in these processes. As a results, little customer productivity enhancement from general EB&IT component availability could be expected.

The number of food and beverage division EB&IT components do not have significant impact on both operational and customer productivities. Phuket is a tourist island, and there are many restaurants around the hotels. Therefore, the hotel customers, while roaming around, walk in and normally take their meals in the restaurants of their choice. This may lead to the insignificant impact of EB&IT on both contribution to operational and customer productivity.

4.3. Impact of the integration of EB&IT components on operational and customer productivities

The impact of the integration of EB&IT component on operational and customer productivities is shown in table III. It can be seen that the integration of hotel EB&IT components was found to be significant with both operational and customer productivities. The R2 values of 0.449 and 0.340 indicate an acceptable fit for the model.

Table I. Profiles of the hotels and their customers

Hotel Characteristics	Percentage	Customer Characteristics	Percentage
Hotel Type		Customer Gender	
Resort hotel	62.11	Female	52.32
Boutique hotel	16.32	Male	47.68
Guesthouse	11.58	Customer Age	
City hotel	8.42	Below 20 yrs	15.37
Yearly average room rate per night		20 – 30 yrs	25.89
Less than 3,000 baht	52.1	30 - 40 yrs	30.21
3,000 – 6,000 baht	21	Above 40 yrs	28.53
Above 6,000 baht	26.8	Customer's country	
Hotel Star rating		Europe	32.79
2 star or less	13.16	North America	27.74
3 star	43.68	Asia	14.21
4 star	15.79	Oceania	13.89
5 star	27.37	South America	11.37
Hotel Age		Duration of stay of customer	
Less than 3 years	4.21	Less than 3 days	23.42
3 - 9 years	33.2	3-5 days	62.5
9 - 15 years	30.6	more than 5 days	14.1
Above 15 years	32.11		
Total number of room			
100 rooms or less	45.15		
101 - 250 rooms	42.71		
Above 250 rooms	12.14		

This implies that the increasing number of hotel EB&IT integration enhances the operational and customer productivities.

The number of room division EB&IT component integration, general EB&IT component integration, and in-room EB&IT component integration have significant positive impact on both operational and customer productivity. The positive impact could be explained from the fact that if the procurement managers have information regarding hotel occupation and guest reservation patterns, they can better forecast and operate purchasing plan. As a result, the hotel staff can provide the prompt service to the customers with a minimum cost.

The number of EB&IT integration in F&B division was found to be positive significant impact only with the customer productivity. This indicates that the integration of F&B division EB&IT increases customer satisfaction and convenience. For instance, it is more comfortable for the customers, if their meal charges at hotel restaurant could be sent to the room division system. Thus, they could pay only one time as they checked out.

4.4. Impact of the EB&IT utilization on operational and customer productivities

The impact of the intensity of individual EB&IT usage on operational and customer productivities is shown in table IV. It can be seen that the EB&IT utilization has significant impact with both operational and customer productivities. The R2 values of 0.363 and 0.328 indicate an acceptable fit for the model. This implies that the higher EB&IT utilization increases the operational and customer productivities. However, as can be seen from the table IV that the intensity of use of only a few EB&IT component have significant impact on productivity.

The intensities of global distribution system and room status & housekeeping system usage have significant positive impact on both operational and customer productivity, revealing that hotels with higher percent of these EB&IT components usage achieved significantly higher hotel productivities than those having lower percent of EB&IT components usage. For example, if the hoteliers use room status & housekeeping system, they can check and serve the customers quicker. The customers also satisfy with the prompt service. In addition, the hotel staff capabilities are increased since they can manage more rooms by using the same amount of staff.

Table II. Impact of the availability of individual EB&IT components on operational and customer productivities

The availability of EB&IT component	Operational productivity					Customer productivity				
	Unstandardized Coefficients		Standardized Coefficients (Beta)	t-value	p-value	Unstandardized Coefficients		Standardized Coefficients (Beta)	t-value	p-value
	B	SE				B	SE			
(Constant)	0.39	0.05		8.00	0.00	0.46	0.04		12.9	0.00
Number of EB&IT components in RD	0.03	0.01	0.20	2.13	0.03	0.03	0.01	0.27	2.94	0.00
Number of EB&IT components in F&B	0.02	0.02	0.12	1.26	0.21	0.02	0.01	0.16	1.79	0.08
Number of general EB&IT components	0.03	0.01	0.23	2.24	0.03	9.00	0.01	92.00	0.90	0.37
Number of in-room EB&IT components	0.02	0.02	0.09	1.04	0.30	0.04	0.01	0.28	3.19	0.00
Notes:	R ² = 0.284; Adjusted R ² = 0.268; F = 18.33; p-value = .000					R ² = 0.287; Adjusted R ² = 0.272; F = 18.65; p-value = 0.000				

Table III. Impact of the integration of EB&IT component on operational and customer productivities

The integration of EB&IT component	Operational productivity					Customer productivity				
	Unstandardized Coefficients		Standardized Coefficients (Beta)	t-value	p-value	Unstandardized Coefficients		Standardized Coefficients (Beta)	t-value	p-value
	B	SE				B	SE			
(Constant)	0.34	0.05		7.26	0.00	0.46	0.04		12.4	0.00
Number of EB&IT integration in RD	0.28	0.04	0.42	7.26	0.00	0.10	0.03	0.22	3.42	0.00
Number of EB&IT integration in F&B	0.04	0.03	0.09	1.47	0.14	0.14	0.02	0.38	5.94	0.00
Number of general EB&IT integration	0.10	0.04	0.16	2.92	0.00	0.08	0.03	0.16	2.68	0.01
Number of in-room EB&IT integration	0.16	0.03	0.34	5.83	0.00	0.06	0.02	0.18	2.75	0.01
	R ² = 0.449; Adjusted R ² = 0.437; F = 37.10; p-value = 0.000					R ² = 0.340; Adjusted R ² = 0.325; F = 23.12; p-value = 0.000				

Table IV. Impact of the intensity of EB&IT usage on operational and customer productivities

The intensity of EB&IT usage	Operational productivity					Customer productivity				
	Unstandardized Coefficients		Standardized Coefficients (Beta)	t-value	p-value	Unstandardized Coefficients		Standardized Coefficients (Beta)	t-value	p-value
	B	SE	B			SE				
(Constant)	0.47	0.06		8.12	0.00	0.56	0.04		12.83	0.00
Room division										
- Telephone & fax system	0.00	0.00	-0.15	-2.12	0.04	0.00	0.00	-0.16	-2.09	0.04
- Website & email system	0.00	0.00	0.24	3.13	0.00	0.00	0.00	0.02	0.32	0.75
- Global distribution system	0.00	0.00	0.15	1.98	0.05	0.00	0.00	0.34	4.37	0.00
- Check in system	0.00	0.00	0.18	2.17	0.03	0.00	0.00	0.11	1.32	0.19
- Room status & housekeeping system	0.00	0.00	0.22	3.10	0.00	0.00	0.00	0.22	3.11	0.00
- Guest account management system	0.00	0.00	0.02	0.20	0.85	0.00	0.00	0.04	0.47	0.64
- Check out system	0.00	0.00	0.06	0.73	0.47	0.00	0.00	0.05	0.57	0.57
- Customer service system	0.00	0.00	0.05	0.69	0.49	0.00	0.00	0.04	0.48	0.63
- Statistic and reports system	0.00	0.00	0.02	0.30	0.77	0.00	0.00	0.02	0.34	0.73
Food and Beverage division										
- Table reservation system	0.00	0.00	0.09	1.23	0.22	0.00	0.00	0.09	1.28	0.20
- Food ordering management system	0.00	0.00	0.02	0.28	0.78	0.00	0.00	0.08	1.01	0.31
- Inventory system	0.00	0.00	0.02	0.34	0.73	0.00	0.00	0.00	0.00	1.00
- Point of sale system	0.00	0.00	0.01	0.13	0.89	0.00	0.00	0.02	0.30	0.77
- Menu costing system	0.00	0.00	0.11	1.55	0.12	0.00	0.00	0.01	0.13	0.90
- Food and beverage report system	0.00	0.00	0.01	0.21	0.84	0.00	0.00	0.15	2.03	0.05
Notes:	R ² = 0.363; Adjusted R ² = 0.308; F =6.602; p-value = 0.000					R ² = 0.328; Adjusted R ² = 0.270; F =5.663; p-value = 0.000				

The intensities of website & email system and check in system use were found to be significant positive impact only with the operational productivity. If the hotel has high percentage of website & email system usage, it means most of the hotel customers make the reservation from web site channel. The operation cost from this channel is cheaper than other channels, since it is paperless, low-transaction and non-intermediate (direct-sale) channel. As a result, it leads to higher profit and higher operational productivity.

For telephone and fax system, the intensity of usage was found to have negative significant impact on both operational and customer productivities. The costs of room reservation completion occurred through this system such as room deposit invoice sending or room confirmations are very expensive since most of the hotel customers are foreigners, stayed in distance countries. In addition, reservation through this channel is not convenience for customer because it may have problems in communication and is expensive. These lead to a negative impact of telephone and fax system usage on both operational and customer productivities.

Intensity of use of food and beverage division EB&IT was found to have insignificant impact on the hotel productivity. We have seen before that EB&IT adoption in F&B division does not have significant impact on hotel productivity.

5. Conclusion

Improving productivity is seen as a key issue for the survival and success in long term for hotel industry. Many hotels adopted EB&IT for that purpose. This study was conducted to find out the relationship between EB&IT adoption and hotel productivity in Phuket, Thailand. Results reveal that EB&IT adoption, including EB&IT availability, EB&IT integration and the EB&IT utilization, has a significant positive impact on both operational and customer productivities.

It is interesting to find that although most of EB&IT adoptions can enhance both operational and customer productivities, some EB&IT component adoption can increase either operational or customer productivity only. Some EB&IT adoption - e.g. the availability of in-room EB&IT component - did not provide the operation profits, but it enhanced customer satisfactions. Some EB&IT adoption - e.g. the availability of general EB&IT component - increased the staff efficiency, but it did not provide the customer benefits.

It may be mentioned that Phuket is a tourist island. The hotels in this area are operating within a very specific set of locational characteristics. Therefore, the findings should be used carefully keeping in mind the locational context.

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