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Abstract

Successful introduction of information technology applications in various operations of hotel management is vital to most service firms. In recent decades, technologies of information, automation, and communication are increasingly recognized as essential components of a hotel company's strategic plan. In this study, 62 super-deluxe hotels (5 star), deluxe hotels (4 star), and tourist hotels (3 star) in Korea are examined for differences in the impact of information technology services on guest' satisfaction, guest convenience, and operational efficiency. The findings generally suggest that the impacts of information technology-enhanced services vary according to the category of hotels in Korea. The results of the study are expected to assist managers in the selections and implementation of information technology systems in their hotel.

Differential Impacts of Information Technology Services in the Korean Hotel Industry: A Study of Management Perceptions

By A.J. Singh, Hong-bumm Kim, and Chang Huh

Successful introduction of information technology applications in various operations of hotel management is vital to most service firms. In recent decades, technologies of information, automation, and communication are increasingly recognized as essential components of a hotel company's strategic plan. In this study, 62 super-deluxe hotels (five star), deluxe hotels (four star), and tourist hotels (three star) in Korea are examined for differences in the impact of information technology services on guest satisfaction, guest convenience, and operational efficiency. The findings generally suggest that the impacts of information technology-enhanced services vary according to the category of hotels in Korea. The results of the study are expected to assist managers in the selection and implementation of information technology systems in their hotels.

Introduction

Technologies related to information, communication, and automation has transformed the operation of many organizations in the service industry over the last decade. As Information technology (IT) and technology enabled services and amenities are becoming more pervasive, customers and employees expect these conveniences in hotels as well. The service sector has responded to this revolution, in varying degrees, with significant investments in information technology services. Hotel companies that are sensitive to this continuously changing environment will enjoy a competitive edge. Managers of large properties, for instance, believe that information technology plays a key role in improving the effectiveness of the operations and enhancing customer satisfaction. (Van Hoof, Verbeeten and Combrink, 1996) Therefore, hotels will need to consider IT services which meet and exceed guest expectations at all hotel-guest interfaces, such as public areas, in-room and food and beverage outlets. Furthermore, hotels will need to consider the quality of information technology for all guest managed interfaces such as reservations, check-in, access and ease of information dissemination.

In general information technology services have been introduced in most guest contact and support areas of hotels such as rooms, food and beverage service areas, back office areas, maintenance and operations, and meetings and conventions. Van Hoof et al. (1996) indicated that the most common use of information technology in hotels is concentrated in the front desk, reservations, telephone department, and Management Information System (MIS) functions supported by the accounting department. The food and beverage department and housekeeping are next highest users of technology, and finally, the least computerized and automated department is engineering.

However, there is also a skeptical view on the importance of information technology services in the hotel industry. Cho & Connolly (1996) observed that many hotel managers remained reluctant about the value of investment in information technology services due to their inability to accept the long-term investment return horizons for large scale technology expenditures. This requires strategic vision and commitment to new technology, which will secure future diffusion of benefits through the industry and stakeholders, including customers.

Literature Review

The service industry literature is deficient in establishing a relationship between the use of information technology and its impact on productivity. In reviewing the application of information technology services within the service industry, it is useful initially to explore the meaning of the term, "technology" as it has a range of definitions.

Kirk and Pine (1998) provided a very broad scope for reviewing technology, covering such topics as building technology, environmental management technology, food production, service

technology, and information technology. Pine (2000) suggested a service-based descriptive definition which refers to technology being regarded as the skills, knowledge and methods for achieving plans in a changing environment, and thus encompasses management systems and techniques as well as the physical artifacts of technology, such as equipment and machines. The definition of technology which relates to the sustenance of the organization and the comfort of the client is more relevant to service, since technology cannot be considered in isolation of people, both within the organization and its customers. They have defined technology as any developments in scientific knowledge and understanding that can be used to improve the products and services of the service industry. (Kirk and Pine, 1998)

In the service industry, not only is technology itself an important factor, but also the way technology is introduced into and is used by organizations is crucial to its successful utilization. The successful utilization of any technology is not only dependent upon its technical aspects, but more so, on the way people interact with and accept the technology. Some previous research recognized the continuing importance of technology in the service industry, reporting that technology was shaping up to be the most significant competitive advantage service firms can have. (Go and Pine, 1995; Go, Pine and Yu, 1994 and 1996) Information technology, for instance, has been viewed to provide not only improved quality and productivity, but also a competitive advantage, especially in service businesses where technology is used to empower employees to better serve customers and to empower customers by making it easier for them to do business with the firm. (Go and Pine, 1995) A research study on the use of information technology indicated that only half of the responding independent hotels in UK used any form of information technology including software and hardware. (Main, 1995) The results revealed that those managers who did not use information technology were generally older and had fewer years of formal education. This might occur because a particular group was less likely to have been exposed to new technology and perhaps was unaware of the advantages it had to offer.

With rapid advances in telecommunications, advancements in computer capabilities, and the development of sophisticated software support the delivery of services, technologies related with computer hardware and software have become a major factor in the operation of service businesses. The convergence of technological applications places knowledge and information at the core of the competitive profile of tomorrow's service enterprise. The premise of this "information age" is that hotel firms in the future will build their success on how much they know about their customers; how they will provide them with information about their products and services, and how they will profitably distribute those products and services in an information-based environment. The focus in this case is building a sustainable competitive advantage by knowing more about what customers, competitors, suppliers, and regulators will do in the future. This combination of future-oriented thinking supported by knowledge-based systems will also require a retrained labor force capable of implementing these systems to add value to the firm. This suggests that the service firm of tomorrow will look and behave differently than what is familiar today. (Olsen and Connolly, 2000)

With the help of computer technologies, most hotels have increasingly pursued a fully integrated and automated property management system which provides hotel management with an effective means with which to monitor and control many front office and back office activities. (Kasavana and Cahill, 2003) Automation has simplified many auxiliary guest services and guest-operated devices such that interfacing auxiliary guest services to a property management system lies in the comprehensive coordination and tracking of guest-related functions. User friendly, guest-operated devices, such as information kiosks, have been located in the public area of many hotels. A research study indicated that guests do not use guest-operated devices effectively, although that sentiment was less strong among managers of properties that had actually installed such devices. (Van Hood, et. al. 1996) A lack of proper training, high turnover rates, and limited financial resources were considered major barriers to the successful

use and implementation of technology services. Nevertheless, training both guests and employees in the use of technology and raising their awareness about its benefit were seen as essential to a property's future competitive position.

In a study conducted by Van Hoof, et al., (1996) found that the size of a property, its level of automation, and its automation history were the main determinants of how lodging managers perceived technology. Managers of large hotel properties appeared to be more comfortable with technology and more appreciative of its benefits than managers of small properties. Technology needs, technology awareness among management and staff, and the use of technology to enhance guest satisfaction all increased with property size. For this reason, this study makes the a priori assumption that there will be a differential impact of technology based services on different categories of hotels. There may be, of course, a danger of technology push, particularly if hotel customers do not have a need for these technology-oriented facilities and devices. Indeed, some research warns against the dangers of infatuation with technology's physical manifestation, such as acquiring machines and equipment simply because they are the most up-to-date or sophisticated models available on the market. In their survey, Van Hoof, et al. (1996) found that customers benefited from improved in-room facilities, but did not always gain full benefit, possibly because of a lack of awareness of how to use them.

Study Purpose and Research Questions

The major focus of this study was to examine the differential impacts of information technology services between five star (super-deluxe) hotels, four star (deluxe) hotels and three star (tourist) in Korea. The linkage between types of hotels and information technology usage and impacts has never been discussed in previous research for hotels specific to Korea. In particular, the identification of relative importance, and differential impacts based on hotel categories will make a significant contribution to the literature and operational practices in the Asian hotel industry.

The study formulated four research questions to operationalize the construct.

- RQ 1:* Are there differences in how hotel managers perceive the use of technology services in various areas of a hotel?
- RQ 2:* Are there differences in the perceptions of Super Deluxe, Deluxe and Tourist Hotel managers about the effectiveness of employing technology services to increase guest satisfaction?
- RQ 3:* Are there differences in the perception of Super Deluxe, Deluxe and Tourist Hotel managers about the effectiveness of technology services on user convenience?
- RQ 4:* Are there differences in perception of Super Deluxe, Deluxe and Tourist Hotel managers about the effectiveness of employing technology services increase operational efficiency?

Methods

Sampling and Procedure

Initially, the researchers were faced with the problem of creating a valid and consistent scale factor of the hotels in the study sample. The hotels in Korea consist of a cross section of relatively small-to-large-sized hotels. For this reason, the sampling frame identified for the study was the Korean Hotel Association (KHA) database, which categorizes hotels based on a "star system." The sample consisted of 62 hotels, which included super-deluxe (five star) hotels (n=21), deluxe (four star) hotels (n=29), and tourist (three star) hotels (n=12) located in Seoul, the capital of Korea. The reason for selecting Seoul as a geographical sample region was that almost half of super-deluxe hotels (40%), one-thirds of deluxe hotels (30%), and one out of five tourist hotels (20%) are located in the study region. The unit of analysis in this study was hotel managers at these properties. The respondent profile consisted of 64.5 percent males and 35.5 percent females. Over two-third of respondents (71%) had between 5 and 10 years experience in hotels, and the remaining (29%) had more than 10 years of work experience at hotels.

A self-administered questionnaire was addressed to the hotel managers who were requested to deliver them to the appropriate managers responsible for implementing information technology services in their respective hotels. The delimitation of this study was a hotel management centric perception of the impact of technology based services on performance. As such, the study was designed with an overtly in-built bias focusing on the management perception of the research questions. The authors recognize that customer perceptions on the same questions may be different from the management perspective, which may be the topic of a separate study. From an initial sample of 100 hotels, which were selected from a list of hotels in the 2003 annual report of KHA, a total of 62 hotels replied to the questionnaire for an effective response rate of 62%. Personal visits to all of the 100 hotels and persistent telephone follow-up were largely responsible for the exceptionally high response rate [1]. At each hotel, a respondent was permitted to complete only one questionnaire.

Measurement

The questionnaire consisted of four parts. The first part examined the extent to which the respondents believed each of 20 information technology service variables in the operating departments impacted user satisfaction, convenience, and operational efficiency. The second part measured management feedback on the use of Information technology services in their hotels. Here, all respondents were asked to respond to the extent the 20 technology-based services were incorporated into their guestrooms, F&B areas, meeting and convention facilities, and back-office areas. The survey instrument adopted a five-point Likert-like scale with "1" indicating strong disagreement and "5" indicating strong agreement with the statement. Part three and four of the questionnaire addressed the issue of future investments in technology and socio-demographic profile of the respondents. This article presents results from the first two parts of the questionnaire.

Data Analysis

Twenty technology-enhanced service variables were identified, which constituted the specific elements of the hotel's five managerial and operational dimensions. Three performance outcome variables: user satisfaction, perception of convenience, and operational and managerial efficiencies, were also presumed to be closely linked to technology service variables. A categorization scheme of a star system was used to distinguish hotels according to their size and service quality, and was designed to test for differences in the impact of a hotel's technology-based services on satisfaction, convenience and operational efficiency/performance.

To determine which of the 20 technology-enhanced service variables differed significantly in their technology usage across the three different categories of hotels, a one-way ANOVA (analysis of variance) was conducted. Levene's test was applied before drawing valid explanation of the ANOVA test, because the three independent groups exhibited different sample sizes and this may have violated the assumption regarding the homogeneity of variance. In this regard, Kruskal-Wallis test was additionally introduced in case Levene's test showed significant variances across the three independent groups.

Results and Discussion

Table 1 summarizes the impact of information technology services on user satisfaction and analyzes differences between hotel categories. Based on management perceptions, it was clear that in-room internet connectivity, in-room cable, internet bookings, energy management systems and copy machine and printers were technology services with the highest impacts on user satisfaction. There was no statistically significant difference in management perception of these impacts between three hotel categories. Furthermore, customer relationship management systems were perceived by Super-Deluxe hotel managers to have higher impact user satisfaction as compared to deluxe and tourist hotel managers. Technology services with perceived differences in user satisfaction between hotel categories were, cell phone rental, voice messaging systems, ATM machines, electronic locking systems and automatic ventilation and management

systems. In each of these applications, super-deluxe hotel managers perceived their impact on user satisfaction, higher than deluxe and tourist hotels.

{Editor's Note: All tables are located at the conclusion of this article}

In general, managers at Super Deluxe and Deluxe hotels perceived technology to have a higher impact on user satisfaction as compared with tourist hotels (overall mean: 4.2, 3.8 and 3.5 respectively).

Table 2 summarizes the impact of information technology services on user convenience and analyzes differences between hotel categories. The responses of the impact of information technology services on user convenience are similar to the impact on user satisfaction previously summarized. In room connectivity, cable, internet bookings, energy management systems and copy machine/printers had the highest impact on user convenience based on management responses. However, it was interesting to note that on average, the tourist hotel managers perceived in-room connectivity as higher impact on user convenience than the two other hotel categories. Some of the differences in the management response of impact on user convenience include cell phone rental, voice message systems, e-mail software, and customer relationship management software.

In general, managers at Super Deluxe, Deluxe and Tourist hotels perceived technology to have similar impact on user convenience (overall mean: 4.23, 3.9 and 4.0 respectively).

Table 3 is a summary of the impact of information technology services on operational efficiency. As noted in the table, Super-deluxe hotel managers technologies associated with in-room internet, customer information, waste and energy management with the highest impact on operational efficiency. Tourist hotel managers perceived internet booking applications to have the highest impact, followed by customer information systems. Applications that scored high across all three categories included customer management systems, automatic ventilation and waste management, copy machines and in-room connectivity. Overall, there was more similarity of responses among managers on the question of information technology services impacting operational efficiency. Voice messaging systems were perceived to have a higher impact by Super-deluxe hotel managers compared to the tourist hotels.

In general, managers at Super Deluxe, Deluxe and Tourist hotels perceived technology to have similar impact on operational efficiency (overall mean: 4.2, 3.9 and 3.9 respectively).

As shown in Table 4, the use of information technology services is widely different between the three hotel categories in Korea. The results reflected in ANOVA indicated that statistically significant variations existed in the degree of technology usage between the three hotel categories, with the exception of "Remote check-in and check-out," and "Electronic management card." The results also indicated that super-deluxe hotels (overall mean: 3.68) exhibited highest usage pattern in information technology services in all five aspects of hotel services, whereas tourist hotels had considerably less information technology services, with an overall mean of 1.94.

The two most popular uses of in-room information technology applications in Korean super-deluxe and deluxe hotels are in-room communication (modem/Internet access) and cable television. Based on the market served, tourist hotels, not surprisingly, had negligible (mean: 1.41) use of in-room Internet or modem services. On the other hand, the only in-room information technology services used in tourist hotels is cable television (mean: 3.41).

The least used in-room technology application at super-deluxe and deluxe hotels is the in-room fax (mean: 2.90 and 1.55, respectively). As guests are relying more on Internet based communication mediums, the low use of in-room faxes is not surprising. Based on the results, in-room technology applications at tourist hotels in Korea is almost non-existent, with mean responses of less than 2.0 for all in-room applications, with the exception of the TV.

Remote check-in and check-out was less utilized across all three hotel categories, with no statistically significant difference (mean: 2.0, 1.58, 1.25, respectively). These devices are typically located in the hotel lobby and can also be accessed through guestroom televisions or telephones.¹⁹ Based on the results of the study, it appears that Korean hotels still value personalized service, with regard to the initial guest contact (check-in) and departure process (check-out). In recent years, remote check-in and check-out applications, such as self check-in kiosks, and Interactive TV's are increasing at U.S. hotels serving business travelers. The value of these applications is seen in their efficiency as they reduce the time it takes to process guest registrations, check-ins, and check-outs.

For Internet booking, super-deluxe (five star) and deluxe hotels (four star) that compose most international chain hotels in Korea, more managers indicated stronger agreement that they utilized this technology for reservations at their hotels (mean: 4.04 and 3.82, respectively) as compared to tourist hotels (mean: 2.50). Tourist hotels are primarily independent hotels catering to the domestic market. They rely on the traditional distribution channels such as travel agencies and direct phone reservations.

With regard to food and beverage technology applications, wireless applications are almost non-existent in Korean hotels. Managers at super-deluxe hotels were neutral in their response (mean: 3.0) as to the use of this technology, while this was almost non-existent at tourist hotels (mean: 1.0).

Wide differences exist between hotel categories with regard to the use of information technology for back office applications. The two most used back office applications at super-deluxe and deluxe hotels are e-mail and customer information systems. As with other hotel services, tourist hotels do not use much information technology to support their back office functions.

The two most common uses of maintenance and operations functions in Korean hotels are to support physical facilities such as ventilation, waste and energy management. While there were statistically significant differences in the patterns of usage between hotel categories, the mean scores indicated agreement among hotels, in particular super-deluxe and deluxe hotels. Electronic locking systems and ATM machines are also commonly used in super-deluxe and deluxe hotels. With the exception of energy management systems, in general tourist hotels do not use information technology to support these operations.

Conclusion

After synthesizing the usage patterns (Table 4) with the performance variables (Tables 1-3), it was logical to expect a relationship between the impact of the technology application and actual usage patterns in Korean hotels. If the technology was deemed to provide user satisfaction, convenience or operational efficiency, we expected to see a higher usage. This relationship was not consistent across all hotel technologies and hotel categories. In general we found the gap between usefulness of technology and actual usage to be higher across all technological applications in the deluxe and tourist hotels, when compared to the super-deluxe hotels.

With regard to room applications, we found gaps in the performance means and actual usage of technology applications such as in-room fax, remote check-in, cell phone rental, and interactive TV guide. In each case, the technology was perceived to either provide user satisfaction, convenience or operational efficiency but had low mean scores for utilization. While wireless applications were seen as providing operational efficiency, its actual usage varied from neutral in super-deluxe hotels to non-existent in tourist hotels.

The back office applications indicated a much stronger relationship between the usefulness of the technology (impact) and actual usage in super-deluxe hotels. The highest effect of these applications, as indicated previously, was on operational efficiency and there was consistent

agreement on their use in these hotels. On the other hand, as with other applications, while managers at tourist hotels find these applications useful (high impact on operational efficiency), in actual practice very few hotels use these technologies.

In the case of maintenance and operations technology we found a closer match between impact and usage for super-deluxe and deluxe hotels as compared to the tourist hotels. The only application that had some consistency between impact and usage in tourist hotels was energy management systems. Finally, while video conferencing was perceived to be useful in providing convenience, hotels across all three categories do not use this technology.

We believe that the remaining parts of our study, and the data collection process used throughout, will, hopefully, shed more light on the subject, and will be of use to the Korean Hotel Industry. The techniques incorporated in this study can be used in studies concerning the differential impacts of information technology services in other countries as well. This is an area of research with broad application throughout the hospitality industry.

a. One-way ANOVA routine in SPSS was employed to analyze mean differences in three types of hotels.
 b. Mean scored based on a 5-point scale where 1 equals strongly disagree, 2 equals disagree, 3 equals neutral, 4 equals agree, and 5 equals strongly agree. Overall means of each hotel are 4.2 (super-deluxe hotel), 3.8 (deluxe hotel), and 3.5 (tourist hotel).
 c. Statistic for testing mean differences between subjects in One-way ANOVA
 d. Test statistic of homogeneity for variances in three independent groups.
 e. Corrected non-parametric test for testing mean differences in case the homogeneity variance assumption is not satisfied.
 *, **, ***, **** refer the corresponding statistic is significant respectively under $\alpha = .05, .01, \text{ and } .001$.

Types of Hotels	In Hotel Management Technology-Enhanced Services	Tourist Hotels (n=12)			Deluxe Hotels (Four Star) (n=29)			Super-deluxe Hotels (Five Star) (n=21)		
		Mean	SD	Significance	Mean	SD	Significance	Mean	SD	Significance
R O O M	In room modem/Internet hook-Up	4.62 ^b	4.24	4.33	4.25	4.28	4.24	4.62 ^b	4.24	4.33
	In room cable/satellite broadcasting	4.57	4.38	4.25	4.25	4.38	4.25	4.57	4.38	4.25
	In room fax	3.76	3.38	3.42	3.42	3.38	3.42	3.76	3.38	3.42
	Remote check-in and check-out	3.67	3.59	3.25	3.25	3.59	3.25	3.67	3.59	3.25
	Internet booking	4.43	4.24	3.75	3.75	4.24	3.75	4.43	4.24	3.75
	Cell-phone rental	3.95	3.24	3.08	3.08	3.24	3.08	3.95	3.24	3.08
	Interactive TV guide	4.10	3.62	3.42	3.42	3.62	3.42	4.10	3.62	3.42
	Voice-mail system	4.19	3.38	3.17	3.17	3.38	3.17	4.19	3.38	3.17
	Wireless POS	4.00	3.41	3.08	3.08	3.41	3.08	4.00	3.41	3.08
	E-mail correspondence and Communication	4.33	3.90	3.75	3.75	3.90	3.75	4.33	3.90	3.75
	Electronic file transactions/Documentation	3.76	3.34	2.75	2.75	3.34	2.75	3.76	3.34	2.75
	Real time data logging/auto display mode	4.14	3.79	2.91	2.91	3.79	2.91	4.14	3.79	2.91
Customer information management system	4.52	4.03	3.42	3.42	4.03	3.42	4.52	4.03	3.42	
ATMs (Automatic Teller Machines)	4.33	3.55	2.92	2.92	3.55	2.92	4.33	3.55	2.92	
Electronic locking system	4.14	4.03	3.25	3.25	4.03	3.25	4.14	4.03	3.25	
Electronic management card	3.86	3.76	3.42	3.42	3.76	3.42	3.86	3.76	3.42	
Operate- Automatic ventilation and waste management system	4.43	3.90	3.50	3.50	3.90	3.50	4.43	3.90	3.50	
Energy management system	4.52	4.28	3.92	3.92	4.28	3.92	4.52	4.28	3.92	
Remote teleconferencing/video meeting system	4.00	3.45	3.58	3.58	3.45	3.58	4.00	3.45	3.58	
Copy machine & Printer	4.52	4.10	4.25	4.25	4.10	4.25	4.52	4.10	4.25	

Table 1: Impact of Technology on User Satisfaction
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TABLE 2: Impact of Technology on Convenience

Technology-Enhanced Services In Hotel Management ^a	Types of Hotels			One-Way ANOVA F (p) ^c	Levent Test χ^2 (p) ^d	Kruskal- Wallis Test χ^2 (p) ^e	
	Super-deluxe Hotels (Five Star) n=21	Deluxe Hotels (Four Star) n=29	Tourist Hotels (Three Star) n=12				
R O O M	In room modem/Internet hook-Up	4.71 ^b	4.38	4.91	3.041 (.055)	7.533 (.001) ^{***}	7.101 (.029) [*]
	In room cable/satellite Broadcasting	4.57	4.31	4.67	1.609 (.209)	.855 (.430)	5.237 (.073)
	In room fax	4.10	3.48	4.25	2.776 (.070)	1.626 (.205)	5.491 (.064)
	Remote check-in and check- Out	4.00	3.72	3.33	1.782 (.177)	2.443 (.093)	3.803 (.149)
	Internet booking	4.48	4.21	4.33	.559 (.575)	1.419 (.250)	1.246 (.536)
	Cell-phone rental	4.10	3.55	3.42	3.605 (.033) [*]	.212 (.810)	6.952 (.031) [*]
	Interactive TV guide	4.29	3.62	4.17	5.467 (.007) [*]	.309 (.736)	10.445 (.005) [*]
	Voice-mail system	4.38	3.59	3.67	4.658 (.013) [*]	.579 (.563)	10.777 (.005) [*]
F&B	Wireless POS	4.00	3.59	3.50	1.122 (.332)	1.428 (.248)	2.045 (.360)
Back- Office	E-mail correspondence and Communication	4.48	3.86	3.92	3.379 (.041) [*]	.187 (.830)	7.485 (.024) [*]
	Electronic file transactions/ Documentation	3.81	3.62	3.00	2.460 (.094)	.616 (.543)	5.256 (.072)
	Real time data logging/auto display mode	4.00	3.86	3.67	.369 (.693)	1.522 (.227)	2.001 (.368)
	Customer information management system	4.48	4.21	3.75	3.684 (.031) [*]	1.729 (.186)	7.150 (.028) [*]
Maint- enance	ATMs (Automatic Teller Machines)	4.52	3.83	4.00	3.611 (.033) [*]	1.249 (.294)	6.607 (.037)
	Electronic locking system	4.19	4.10	4.08	.064 (.938)	1.175 (.316)	.465 (.793)
& Opera- tion	Electronic management card	3.81	3.86	3.58	.262 (.770)	1.412 (.252)	.708 (.702)
	Automatic ventilation and waste management system	4.38	4.07	4.33	.965 (.387)	4.494 (.015) [*]	5.664 (.059)
	Energy management system	4.57	4.38	4.33	.547 (.582)	.628 (.537)	1.790 (.409)
Conv- ention	Remote teleconferencing/ video meeting system	4.10	3.90	4.00	.229 (.796)	1.897 (.159)	.229 (.892)
	Copy machine & Printer	4.48	4.21	4.58	1.586 (.213)	3.237 (.046) [*]	2.162 (.339)

a. One-way ANOVA routine in SPSS was employed to analyze mean differences in three types of hotels.

b. Mean scored based on a 5-point scale where 1 equals strongly disagree, 2 equals disagree, 3 equals neutral, 4 equals agree, and 5 equals strongly agree. Overall means of each hotel are 4.3 (super-deluxe hotel), 3.9 (deluxe hotel), and 4.0 (tourist hotel).

c. Statistic for testing mean differences between subjects in One-way ANOVA

d. Test statistic of homogeneity for variances in three independent groups.

e. Corrected non-parametric test for testing mean differences in case the homogeneity variance assumption is not satisfied.

*, **, *** refer the corresponding statistic is significant respectively under $\alpha = .05, .01, \text{ and } .001$.

TABLE 3: Impact of Technology on Operational Efficiency

Technology-Enhanced Services In Hotel Management ^a	Types of Hotels			One-Way ANOVA F (p) ^c	Levene Test χ^2 (p) ^d	Kruskal- Wallis Test χ^2 (p) ^e	
	Super-deluxe Hotels (Five Star) n=21	Deluxe Hotels (Four Star) n=29	Tourist Hotels (Three Star) n=12				
R O O M	In room modem/Internet hook-Up	4.67 ^b	4.00	4.17	4.758 (.012) [*]	.005 (.995)	10.460 (.005) [*]
	In room cable/satellite Broadcasting	4.38	3.97	4.08	1.807 (.173)	2.013 (.143)	3.721 (.156)
	In room fax	3.86	3.52	3.92	1.063 (.352)	2.831 (.067)	1.905 (.386)
	Remote check-in and check- Out	3.62	3.62	4.00	.530 (.591)	1.474 (.237)	.955 (.620)
	Internet booking	4.24	4.21	4.67	1.119 (.334)	3.457 (.038) [*]	3.081 (.214)
	Cell-phone rental	3.67	3.41	2.92	2.241 (.115)	8.988 (.000) ^{***}	5.507 (.064)
	Interactive TV guide	4.05	3.62	3.58	1.556 (.219)	.819 (.446)	4.359 (.113)
	Voice-mail system	4.43	3.52	3.67	6.673 (.002) ^{***}	.713 (.494)	11.644 (.003) ^{***}
F&B	Wireless POS	4.10	3.90	4.25	.558 (.576)	.641 (.530)	1.223 (.543)
Back- Office	E-mail correspondence and Communication	4.43	3.93	4.17	2.907 (.063)	2.200 (.120)	6.004 (.050)
	Electronic file transactions/ Documentation	4.14	3.72	3.25	3.777 (.029) [*]	1.221 (.302)	7.317 (.026) [*]
	Real time data logging/auto display mode	4.10	3.86	3.67	.960 (.389)	.793 (.457)	2.230 (.328)
	Customer information management system	4.62	4.24	4.42	1.889 (.160)	.860 (.428)	4.160 (.125)
Mainte- nance & Opera- tion	ATMs (Automatic Teller Machines)	4.14	3.76	3.67	1.219 (.303)	3.205 (.048)	2.667 (.264)
	Electronic locking system	4.19	4.17	3.67	1.506 (.230)	.646 (.528)	5.005 (.082)
	Electronic management card	4.33	4.03	3.83	1.515 (.228)	1.248 (.295)	3.787 (.151)
	Automatic ventilation and waste management system	4.48	4.21	4.08	1.081 (.346)	.270 (.764)	2.432 (.296)
	Energy management system	4.67	4.48	3.92	5.249 (.008) [*]	2.980 (.059)	11.696 (.003) ^{***}
Conv- ention	Remote teleconferencing/ video meeting system	4.00	3.48	3.25	2.039 (.139)	1.283 (.285)	4.356 (.113)
	Copy machine & Printer	4.48	4.34	4.08	1.134 (.329)	1.655 (.200)	2.669 (.263)

a. One-way ANOVA routine in SPSS was employed to analyze mean differences in three types of hotels.

b. Mean scored based on a 5-point scale where 1 equals strongly disagree, 2 equals disagree, 3 equals neutral, 4 equals agree, and 5 equals strongly agree. Overall means of each hotel are 4.2 (super-deluxe hotel), 3.9 (deluxe hotel), and 3.9 (tourist hotel).

c. Statistic for testing mean differences between subjects in One-way ANOVA

d. Test statistic of homogeneity for variances in three independent groups.

e. Corrected non-parametric test for testing mean differences in case the homogeneity variance assumption is not satisfied.

^{*}, ^{**}, ^{***} refer the corresponding statistic is significant respectively under $\alpha = .05$, $.01$, and $.001$.

TABLE 4: Use of Information Technology Services by Hotel Category

Technology-Enhanced Services In Hotel Management	Types of Hotels			One-Way ANOVA F (p) ^c	Levene Test χ^2 (p) ^d	Kruskal- Wallis Test χ^2 (p) ^e
	Super-deluxe Hotels (Five Star) n=21	Deluxe Hotels (Four Star) n=29	Tourist Hotels (Three Star) n=12			
In room modem/Internet hook-Up	4.28 ^b	3.93	1.41	33.902 (.000)***	1.046 (.358)	25.876 (.000)***
In room cable/satellite Broadcasting	4.61	4.10	3.41	6.021 (.004)**	.361 (.698)	16.042 (.000)***
In room fax	2.90	1.55	1.25	10.253 (.000)***	5.134 (.009)**	16.285 (.000)***
Remote check-in and check- Out	2.00	1.58	1.25	2.216 (.118)	1.990 (.146)	6.163 (.046)*
Internet booking	4.04	3.82	2.50	6.303 (.003)**	10.947 (.000)***	5.873 (.053)
Cell-phone rental	2.66	2.03	1.41	3.875 (.026)*	5.709 (.005)**	6.541 (.038)*
Interactive TV guide	3.28	2.48	1.33	7.689 (.001)***	9.887 (.000)***	13.030 (.001)***
Voice-mail system	3.52	2.00	1.00	13.000 (.000)***	18.332 (.000)***	19.301 (.000)***
F&B						
Wireless POS	3.09	2.55	1.00	7.716 (.001)***	21.514 (.000)***	14.630 (.001)***
Back- Office						
E-mail correspondence and Communication	4.33	3.75	2.33	9.841 (.000)***	1.911 (.157)	16.355 (.000)***
Electronic file transactions/ Documentation	3.66	2.17	1.41	13.257 (.000)***	1.908 (.157)	17.849 (.000)***
Real time data logging/auto display mode	3.61	2.17	1.41	12.825 (.000)***	2.782 (.070)	17.772 (.000)***
Customer information management system	4.57	3.96	2.25	16.674 (.000)***	2.725 (.074)	23.032 (.000)***
Mainte- nance & Opera- tion						
ATMs (Automatic Teller Machines)	3.95	2.82	1.25	13.413 (.365)	15.409 (.000)***	19.938 (.000)***
Electronic locking system	3.61	3.48	1.50	7.412 (.001)***	6.257 (.003)**	11.286 (.004)**
Electronic management card	3.38	3.10	3.08	.214 (.808)	1.543 (.222)	.740 (.691)
Automatic ventilation and waste management system	4.33	3.58	2.91	5.146 (.009)**	.235 (.791)	12.081 (.002)**
Energy management system	4.66	4.51	3.75	6.365 (.003)**	1.084 (.345)	14.269 (.001)***
Conven- tion						
Remote teleconferencing/ video meeting system	2.52	1.44	1.00	10.365 (.000)***	67.064 (.000)***	13.142 (.001)***
Copy machine & Printer	4.76	4.68	3.41	11.893 (.000)***	12.505 (.000)***	16.592 (.000)***

a. One-way ANOVA routine in SPSS was employed to analyze mean differences in three types of hotels.

b. Mean scored based on a 5-point scale where 1 equals strongly disagree, 2 equals disagree, 3 equals neutral, 4 equals agree, and 5 equals strongly agree. Overall means of each hotel are 3.7 (super-deluxe hotel), 3.0 (deluxe hotel), and 1.9 (tourist hotel).

c. Statistic for testing mean differences between subjects in One-way ANOVA

d. Test statistic of homogeneity for variances in three independent groups.

e. Corrected non-parametric test for testing mean differences in case the homogeneity variance assumption is not satisfied.

*, **, *** refer the corresponding statistic is significant respectively under $\alpha = .05, .01, \text{ and } .001$.

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