Information Technology Practices and Performance Impacts

A Case of the Korean Hotel Industry

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Abstract: Successful introduction of information technology applications in various operations of hotel management is vital to most service firms. With the explosive growth of Internet usage in the 1990s, technologies of information, automation, and communication are increasingly recognized as an essential component of the strategic plan in hotel companies. In this study, 62 super-deluxe hotels (five star), deluxe hotels (four star), and tourist hotels (three star) in Korea are examined to identify the impacts of information technology services on guest' satisfaction, guest convenience, and operational & managerial efficiency. The differential impacts of information technology services among super-deluxe, deluxe, and tourist hotels are also analyzed. The findings generally suggest that the impacts of information technology-enhanced services vary according to different outcome variables. A well-balanced introduction and management program of technologies is needed to make their performance successful in both customer service and operational areas. The different sizes of hotels are found to call for somewhat different information technology-enhanced service variables to enhance specific performance results. The implications of the study are discussed.

Key Words: Information technology; satisfaction, convenience, efficiency

Introduction

Technologies related to information, communication, and automation has transformed many organizations in the service industry over the last two decades. A proliferation of the Internet has enabled and perhaps forced a revolution in the way business is conducted (Paraskevas and Buhalis 2002). The service sector has responded to this revolution with significant investments in information technology services. Organizations have realized that this is the only way to manage their resources effectively and remain strong in the emerging competitive arena (Buhalis 1998; Werthner and Klein 1999).

As Information technology (IT) and technology enabled services and

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amenities are becoming more pervasive, customers and employees expect these conveniences in hotels as well. Hotel companies that are sensitive to this continuously changing environment will enjoy a competitive edge. Specifically, 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. 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). Implementing information technology-enhanced services is expected to increase the effectiveness of day-to-day operations and management of hotels.

It has been pointed out that the information technology services have been widely implemented 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) indicate 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. This implies that information technology services have become a main source in sustaining a competitive edge and a strategic tool, especially in the service industry due to its pivotal role in the description, promotion, distribution, amalgamation, organization and delivery of service products (Main 2001). Technology can offer significant advantages in operational management such as property management system, tactical management such as financial modeling and yield management, and strategic management such as decision support system to hotel organizations.

However, there is also a skeptical view on the implication 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.

Therefore, the purpose of this study is to examine differences in the

practices and impacts of information technology services among hotel categories in Korea. More specifically, this study examines the relationships among three performance outcomes: User satisfaction, perception of convenience, and operational & managerial efficiency, among super-deluxe (five star) hotels, deluxe (four star) hotels, and tourist (three star) hotels.

Background of the Study

The service industry literature is deficient in establishing the relationship between the use of information technology and its impact on productivity. Within this existing literature base, much of the focus has been on information technology. In reviewing the application of information technology services within the service industry, it is useful initially to explore the meaning of this term within this paper. 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) has 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. Kirk and Pine (1998) have indicated that 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.

In the service industry, not only is technology itself an important factor, but also the way technology is introduced into and used by organizations is crucial to its successful utilization. Kirk and Pine (1998) have insisted that 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 to 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; IHA 1996). Information technology, for instance, has been viewed to provide not only improved quality and productivity, but also a competitive advantage, especially in servicing businesses when 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). According to Main (1995), only half of the responding independent hotels in UK used any form of information technology including software and hardware. The result indicated 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. Van Hoof et al. (1996) noted that guests did not use guest-operated devices effectively, although that sentiment was less strong among managers of properties that had actually installed such devices. 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

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and raising their awareness about its benefit were seen as essential to a property's future competitive position.

Information technology services are also having the effect of changing the ways in which hotel firms conduct their business - reservations and information management systems such as computer reservation systems and electronic point of sale in the service sector; the way companies communicate; how customers look for information and purchase travel goods and services. In terms of consumer access to technologies, the use of the Internet is perhaps the dominant force (Connell and Reynolds 1999) shaping the industry. Centralized regional reservation systems are attractive to customers as they can book a service package or an entire visit to an area in one telephone call, where availability and booking and payment can be handled online. The survival route for small and medium-sized hotels lies in regional online information networks and third party online reservation service providers.

In a study conducted by Van Hoof et al (1996), they 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 (Kirk and Pine 1998; Ray Pine 1992; Walker and Craig-Lees 2002). Van Hoof et al. (1995) also found in their survey 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. This study counts on the different aspects of outcome variables such as satisfaction, convenience, and efficiency to identify ways in which hotel firms can employ not only information technology-oriented but also user-oriented approach in designing successful application of technology-enabled services.

Conceptual Framework and Research Questions

The major focus of this study is to examine the practices and differential

performance impacts of employing information technology services in super-deluxe hotels (five star), deluxe hotels (four star), and tourist hotels (three star) in Korea. While this study assumes the hotel category to be a moderating variable on the relationship between information technology service variables and performance, the size itself may, in fact, be a determinant of the hotel's introduction and adaptation of information technology services at management and operational levels. The linkage between types of hotels and information technology usage behaviors has seldom been discussed in previous research. In particular, the causal position, relative importance, and measurement of organizational size, as it relates to various patterns of information technology usage behavior among and in hotels are becoming an increasingly debated and researched issue.

While it is easy to find examples of super-deluxe, deluxe, and tourist hotels that have grown as the result of being successful technology introducers, it is likely that they employ a different emphasis on the usage. Hence, it is useful to examine the nature of the moderating influence of hotel categories on the information technology service usage - performance relationship. Here, we suggest a conceptual framework that deluxe/relatively low price and small-scale hotels, for example, can achieve successful information technology service performance by employing their own inherent choice of technology usage as well as the large five star firms. The study formulated six 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 hotel managers about the effectiveness of employing technology services to increase user satisfaction?

RQ 3: Are there differences in the perception of hotel managers about the effectiveness of technology services increasing user convenience?

RQ 4: Are there differences in perception of hotel managers about the effectiveness of employing technology services to increase operational efficiency?

RQ 5: Do the categories of hotels have a significant effect on hotel managers' opinions about the impact of technology services to increase performance?

RQ 6: Do the categories of hotels have a significant effect on hotel managers' opinions about future investment in technology services for increasing their performance?

This study addresses these research questions; first by classifying the various technology enhanced services in Korean hotels; and then by determining whether the categories of hotels show specific similarities and differences in their usage patterns of technology services and the impact of these on performance results.

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 database of the Korean Hotel Association (KHA), which evaluates each of hotels and assigns them a star level (1-5) based on their strict rating system (e.g., services, facilities, and amenities). The star system consists of five categories: Super deluxe (five star) hotels, Deluxe (four star) hotels, Tourist hotels; first class (three star), second class (two star), third class (one star). In this study, Seoul, capital of Korea, was selected as a geographical sample region, because almost half (40%) of super-deluxe hotels, one-thirds (30%) of deluxe hotels, and one out of five (20%) tourist hotels are located in the study region. A total of Hotels in the study region accounts for 112. The sample of this study consisted of 62 hotels (52% of Hotels in Seoul), which included super-deluxe (five star) hotels (n=21), deluxe (four star) hotels (n=29), and tourist (three star) hotels (n=12). The unit of analysis was hotel managers at these properties.

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. The survey was conducted from April 14 to May 28, 2002. From an initial sample of 100 hotels, which were selected from a list of hotels in the 2002 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 fill only one questionnaire.

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Measurement

The questionnaire for this survey consisted of three parts. The first part examined the extent to which the respondents believed each of 20 information technology service variables in the operating departments: Rooms, Food & Beverage (F&B), back office, maintenance & operations, convention services-resulted in performance impacts of satisfaction, convenience, and operational & managerial efficiency. Responses to the questions were given on a five-point scale ranging from "1" equaling a strongly disagree rating to "5" equaling a strongly agree rating. The second part of the questionnaire was comprised of measuring how much the responding hotel perceived the necessity of investing in technology service amenities and equipment in the future. Respondents to the questions used a five-point scale ranging from "1" equaling a strongly disagree rating to "5" equaling a strongly agree rating. The third part consisted of measures regarding how actively each hotel used technology-enhanced services in their management and services to customers. 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 last part constituted a series of socio-demographic profile questions for the respondents and the corresponding hotel. The purpose of the socio-demographic profile questions was to examine whether perceptions on the technology-enhanced services would vary among different socio-demographic categories, particularly in the star category reflecting scale factors and service level. This article presents results from the first and second part 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 & 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. Finally, the degree to which hotels intended to invest in technology based services in the future and differences in this intention between hotel categories were examined.

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.

Repeated measures of ANOVA were also conducted to examine the differential effects of each information technology services (user' satisfaction, degree of providing convenience, and operational & managerial efficiency) in hotels. If the results indicated higher effects on a particular performance outcome, the managerial implications would be significant. To test the assumption of repeated measures of ANOVA, that all possible differences come from the same population variance, Mauchly's test of sphericity was employed. If Mauchly's test indicated statistical significance (i.e., $p < .05$), the Greenhouse-Geisser correction was applied to satisfy the assumption of repeated measures of ANOVA. SPSS version 12.0 was used for these analyses.

Finally, independent samples t-tests were conducted to determine if significant mean differences exist between super-deluxe and deluxe/tourist hotels in their intention to make future investments in technology based services at their hotel.

Results and Discussion

The respondent profile consisted of 64.5 percent males and 35.5 percent females. With regard to the hotel as the unit of analysis, a third of respondents (33.9%) were super-deluxe hotels (five star), half of them (46.8%) were deluxe hotels (four star), and the remaining (19.4%) were tourist hotels (three star). 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.

As shown in Table 1, the use of information technology services is widely different between the three hotel categories in Korea. The results reflected in ANOVA indicate 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 indicate that super-deluxe hotels (overall mean = 3.68) exhibited highest usage patterns 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 (M = 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 (M = 3.41).

The least used in-room technology application at super-deluxe and deluxe hotels is the in-room fax (M = 2.90 and M = 1.55, respectively). As guests are relying more on Internet based communication media, 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.

In addition, "remote check-in and check-out" was also less utilized across all three hotel categories, with no statistically significant difference (M = 2.0, 1.58, 1.25, respectively). These devices, are typically located in the lobbies hotels and can also be accessed through guestroom televisions or telephones (Kasavana and Cahill 2003). 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 the 2000s, 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.

Regarding Internet booking, super-deluxe (five star) and deluxe hotels (four star) that compose most international chain hotels in Korea, more managers indicate stronger agreement that they utilized this technology for reservations at their hotels (M = 4.04 and M = 3.82, respectively) as compared to tourist hotels (M = 2.50). As tourist hotels are primarily independent hotels catering 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 (M = 3.0) as to the use of this technology, while this was almost non-existent at tourist hotels (M = 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 indicate 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.

Table 2 summarizes the impact of information technology applications on user' satisfaction, user convenience, and operational & managerial efficiency in Korean Hotels. Results of the analysis indicate that hotel managers perceive differences in the impact among the three repeatedly measured groups of performance variables.

With regard to in-room and guest service technology applications, in-room modem/Internet hookup, in-room cable TV, and Internet bookings had the highest effects and were mainly perceived as providing guest convenience. Other in-room and guest service technology, such as in-room fax, remote check-in and check-out, cell phone rental and voice-mail systems also had fairly high effects and also primarily impacted guest convenience.

In the food and beverage area of Korean hotels, the respondents agreed that wireless technology applications primarily impacted operational efficiency. Furthermore, other back office technology applications such as e-mail, electronic file transactions, and customer information systems also primarily affected operational efficiency. The back office applications with the highest effect on operational efficiency are the customer information management systems.

Some of the maintenance and operations technology applications were viewed as primarily guest convenience, while others were viewed as providing operational efficiency. For example, ATM machines impacted guest convenience while ventilation, waste management and electronic management cards were viewed as providing operational efficiency. There was no statistically significant difference in the impact of electronic locking systems and energy management systems across the three performance variables. Finally, video conferencing was viewed as a guest convenience application while electronic office management systems have an equally strong effect on all performance variables.

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			
ROOM — 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)***
Maint-enance — 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)
Opera-tion — 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)***
Conv-ention — 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 $\alpha = .05, .01,$ and $.001$.

After synthesizing the usage patterns (Table 1) with the performance variables (Table 2), 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 ($M = 4.03$), 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.

The results presented in Table 3 show management intentions of investing in information technology-enhanced services in the future. This need would reflect, of course, their perception on the gap between their current capabilities of the services and the expected level of the services from guests. The results indicate that super-deluxe hotels and deluxe/tourist hotels exhibited significant differences in their intentions to make technological investments. In general, super deluxe hotel managers show a higher propensity to spend on technology such as cell phone rental, voice mail systems, electronic file transactions, and ATMs, as compared to their deluxe and tourist hotel counter parts. On the other hand, deluxe and tourist hotel managers were more apt to spend on in-room modem/Internet hook-up and energy management systems, compared to super deluxe hotels. While differences exist in the degree of importance placed by managers at super-deluxe hotels vs. deluxe/tourist hotels, the

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Table 2
Impact of Technology-Enhanced Services [a]

Technology-enhanced Services In Hotel Management		Effects			Wilks' λ (F) [c]	Mauchly's W (χ^2) [d]	Greenhouse-Geisser F [e]
		User Satisfaction	Providing Convenience	Operational Efficiency			
R O O M	In room modem/Internet hook-Up	4.39 (.84) [b]	4.60 (.71)	4.26 (.81)	.754 (9.770)***	.748 (17.422)***	6.690**
	In room cable/satellite Broadcasting	4.42 (.62)	4.47 (.67)	4.13 (.78)	.834 (5.805)***	.662 (24.759)***	7.083**
	In room fax	3.52 (1.18)	3.84 (1.16)	3.71 (.98)	.804 (7.316)**	.820 (11.908)**	4.817*
	Remote check-in and check-Out	3.55 (1.07)	3.74 (.99)	3.69 (1.14)	.937 (2.022)	.766 (15.987)***	1.455
	Internet booking	4.21 (.70)	4.32 (.88)	4.31 (.93)	.986 (.428)	.915 (5.324)	.406
	Cell-phone rental	3.45 (1.00)	3.71 (.86)	3.40 (1.00)	.869 (4.526)*	.904 (6.033)*	3.758*
	Interactive TV guide	3.74 (.87)	3.95 (.80)	3.76 (.94)	.907 (3.062)	.789 (14.232)**	1.746
	Voice-mail system	3.61 (1.08)	3.87 (1.00)	3.85 (.97)	.886 (3.862)*	.881 (7.606)*	3.157
F&B	Wireless POS	3.55 (1.20)	3.71 (1.11)	4.03 (1.02)	.860 (4.899)*	.915 (5.330)	4.083**
Back-Office	E-mail correspondence and Communication	4.02 (.98)	4.08 (.89)	4.15 (.74)	.980 (.597)	.969 (1.873)	.654
	Electronic file transactions/ Documentation	3.37 (1.13)	3.56 (1.05)	3.77 (.95)	.862 (4.796)*	.935 (4.045)	5.530**
	Real time data logging/ auto display mode	3.74 (1.17)	3.87 (1.06)	3.90 (.88)	.969 (.964)	.994 (.378)	1.012
	Customer Information management system	4.08 (1.04)	4.21 (.77)	4.40 (.69)	.862 (4.807)*	.882 (7.551)*	5.148**
Maintenance & Operation	ATMs (Automatic Teller Machines)	3.69 (1.24)	4.10 (.95)	3.87 (1.00)	.798 (7.585)**	.893 (6.801)*	6.677**
	Electronic locking system	3.92 (1.16)	4.13 (.97)	4.08 (.93)	.933 (2.149)	.948 (3.217)	2.289
	Electronic management card	3.73 (1.01)	3.79 (1.12)	4.10 (.84)	.832 (6.054)**	.953 (2.860)	7.343**
	Automatic ventilation and waste management system	4.00 (.92)	4.23 (.84)	4.27 (.81)	.836 (5.865)**	.978 (1.336)	6.565**
	Energy management system	4.29 (.88)	4.44 (.74)	4.44 (.69)	.917 (2.704)	.986 (.829)	2.684
Convention	Remote teleconferencing/ video meeting system	3.66 (1.34)	3.98 (1.02)	3.61 (1.15)	.778 (8.554)**	.757 (16.743)***	4.594*
	Copy machine & Printer	4.27 (.79)	4.37 (.71)	4.34 (.72)	.963 (1.137)	.838 (10.579)**	0.715

a. GLM Repeated Measures routine in SPSS was employed to analyze Repeated measure ANOVA
b. Means and standard deviations(parenthesis) of 62 hotels. 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.
c. Statistic for testing the within-subjects factor in Repeated Measure ANOVA.
d. Test statistic of sphericity for verifying the variance-covariance matrix of the dependent variables.
e. Corrected test to adjust the degrees of freedom for the averaged tests of significance in case the variance-covariance matrix assumption is not satisfied.
*, **, *** refer the corresponding statistic is significant respectively under α = .05, .01, and .001.

summary mean scores (Table 3) clearly delineate the technology services identified for future investment.

Guest convenience and increased guest expectations are the primary reasons why managers at all three-hotel categories intend to invest in "In

room modem/Internet hook-up." Increasingly, business hotels are equipping guest rooms with high-speed Internet access (HSIA) as a standard amenity both for new developments and renovated properties. Franchise and management companies have started to include this feature as a part of their brand standards for franchisees. Therefore, it is not surprising the mean score for their investment plans at super deluxe hotels was 4.14 and deluxe/tourist hotels were 4.51, both showing agreement with the statement.

With the increasing number of electronic distribution channels, the Internet is becoming one of the most important sources for hotel reservations. A survey of the top 50 hotel companies conducted in 2001 showed that 90 percent had a web site and 95 percent were designed for direct booking through these sites (O' Conner and Frew 2002). Currently, hotel companies are competing for hotel guests with the third party online booking channels, such as Expedia, Travelocity, and Hotels.com. As a result, large hotel companies such as Starwood, Marriott Hotels, Hilton, and others are spending vast sums to promote their Internet booking sites and are offering "best rate guarantees," and other incentives for guests to book directly with them. Therefore, the results of this analysis, which points to higher planned expenditures on Internet bookings ($M = 4.32$ and $M = 4.30$, respectively), is consistent with the overall trend in the global hotel industry.

According to Forrester Research, approximately two-thirds of U.S. households have adopted some form of cell phone technology, increasing from approximately 50 percent in 2000 (Forrester Research, 2004). If this trend continues into the future, telephone departments will become cost centers. This was further substantiated by a recent Delphi study where 85 percent of the panelists supported this prediction (Singh and Schmidgall 2004). The summary mean score of 3.64 by the super-deluxe hotel managers shows that they are aware of the opportunity for revenue enhancement by providing travelers an option to rent phones at the hotel instead of relying on airport vendors. Deluxe and tourist hotel managers did not see as strong a need to invest in this area, their response was closer to neutral ($M = 3.09$).

Computer systems have become an integral part of both front and back office systems and have evolved from being a business tool to a driver of business processes in a hotel. Based on the analysis in Table 2, property Management Systems and related interfaces, which facilitate the electronic file transfers and documentation between departments showed the higher effects on operational efficiency ($M = 3.77$). As a result, it appears from this research that super-deluxe hotel managers to a larger degree ($M = 4.05$) and deluxe/tourist hotel managers to a lesser degree ($M = 3.53$) intend to continue

investing in this technology.

Customization of a guest's experience in a hotel has become the key feature in the competitive strategy of successful hotel companies. With the launch of Wyndham Hotel's "Wyndham by Request" program, the popularity of boutique hotel chains such as the "W" and Kimpton, customer centricity is a focal point in professionally managed hotels. This trend is indicative of the need to understand not just the customer demographics but also the psychographic profile of the guest. Information gleaned from this analysis provides important clues to tailor a unique experience for each guest. Both, managers at super-deluxe hotels and their deluxe/tourist hotel counterparts understand the importance of this and have indicated their intention to spend more on technology which provides information about the customer ($M = 4.36$ and $M = 4.17$, respectively). As a result it is expected that these hotels will invest in technology such as "Data warehousing" and "Data mining" programs to increase their understanding of customer needs. The intention to spend more on this technology is consistent with the strong effect of this information technology-enhanced services on user satisfaction, convenience, and operational efficiency (see Table 2).

Energy costs for hotels in the USA range from 4 to 5 percent of total sales (Smith Travel Research, 2003). The effect of energy management systems on customer satisfaction, user convenience, and improving operational efficiency is supported by management responses in Table 2 ($M = 4.29$, $M = 4.44$, and $M = 4.44$, respectively). Managers of deluxe and tourist hotels show a higher propensity to spend on Energy management systems than super-deluxe hotels ($M = 4.38$ vs. $M = 3.95$). While important for both, it is likely that the five star hotels may already have sophisticated systems in place and therefore indicates a marginally lower mean score in their response to this question.

One of the primary concerns for hotels is the cost of disposing solid waste. Research indicates that hospitality businesses in the USA spend an average of 3.2 percent of their total operating costs on waste removal per year (Stipanuk and Roffman 1996). As the cost of disposing waste keeps increasing each year, hotels are looking at alternate ways to dispose solid waste. Most of these waste management systems reduce the source of waste, reuse the waste by diverting it to other uses, transform the waste into a less costly alternative, or recycle it by converting the waste into something useable. Given the importance of this to the performance of hotels, Korean managers' at all three hotel categories expressed intentions to invest in this technology.

Recent innovations in electronic locking systems go beyond the security

Table 3
Plans for Future Investments in Technology-enhanced Services

Technology-enhanced Services In Hotel Management	Types of Hotels		Independent Samples *t*-t [a] (Mean Differen-
	Super-deluxe Hotels (Five Star) (*n= 21*)	Deluxe & tourist Hotels (Four & Three Star) (*n= 41*)	
R O O M — In room modem/Internet hook-up	4.14 (1.04) [b]	4.51 (.50)	**-2.099****
In room cable/satellite broadcasting	3.77 (1.15)	4.00 (.73)	-.856
In room fax	3.36 (1.09)	3.60 (.91)	-.983
Remote check-in and check-out	3.68 (.95)	3.47 (1.12)	.772
Internet booking	4.32 (.72)	4.30 (.82)	.081
Cell-phone rental	3.64 (1.09)	3.09 (.88)	**2.254****
Interactive TV guide	3.45 (1.18)	3.68 (.89)	-.800
Voice-mail system	3.95 (.90)	3.36 (.96)	**2.488****
F&B — Wireless POS	3.95 (1.00)	3.85 (1.05)	.403
Back-Office — E-mail correspondence and Communication	3.86 (1.04)	3.75 (1.07)	.404
Electronic file transactions/ Documentation	4.05 (.79)	3.53 (.99)	**2.175****
Real time data logging/ auto display Mode	3.95 (1.05)	3.53 (1.05)	1.604
Customer information management System	4.36 (.73)	4.17 (.89)	.901
Maint-enance & Opera-tion — ATMs (Automatic Teller Machines)	3.91 (.81)	3.53 (1.01)	**1.716***
Electronic locking system	3.95 (.90)	4.00 (1.07)	-.175
Electronic management card	3.91 (.92)	3.96 (.83)	-.244
Automatic ventilation and waste management system	4.05 (.84)	4.28 (.79)	-1.159
Energy management system	3.95 (.90)	4.38 (.69)	**-2.214****
Conv-ention — Remote teleconferencing/ video meeting system	3.91 (1.11)	3.53 (1.28)	1.217
Copy machine & Printer	4.14 (.89)	4.15 (.82)	-.069

a. T-statistic for testing mean differences between two independent groups.
b. Means and standard deviations (parenthesis) of 62 hotels. 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.
*, **, *** refer the corresponding statistic is significant respectively under α = .05, .01, and .001

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enhancement features of the early models. The current systems are feature rich and can tie-in with, back-of- house systems, property management systems, POS, loyalty programs and energy management systems (Lefebvre 2004). Hotel managers participating in the present study, appeared to show an inclination towards spending to improve electronic locking systems in the future.

First applications of wireless POS systems involved restaurant orders placed by servers directly to a kitchen printer. By reducing the server's time away from the restaurant, the systems were designed to increase customer interaction and operational efficiency. As a logical extension of the wireless POS technology, Intercontinental Hotels Group developed the "E-menu," as a prototype in January 2004. The system places an ergonomically designed electronic menu tablet on each table and allows the guest to order directly. The E-menu has the ability to track customer preferences, suggest complimentary foods and wines, and calculate calories and recommend specific items on the menu to suit specific dietary needs (Rock 2004). While this technology holds promise in the future, the current applications are few. Therefore, it is not surprising that the hotel mangers in the study did not display strong intentions of investing in wireless based POS applications.

Conclusion

This study revealed that the extent to which information technology applications were used in Korean hotels was dependent on the hotel category. Clearly, super-deluxe and deluxe hotels had more technology applications as compared to tourist hotels, which tend to be smaller and perhaps do not see the economic feasibility in such investments. The research also identified the impact of these applications on various performance measures. Most rooms' related applications had the highest impact on providing guest convenience, while the back office and facilities maintenance technology impacted operational efficiency. While user satisfaction ranked high for various technology applications, convenience and efficiency had higher impacts across the board. The relationship between the impact of various technologies and its actual usage in Korean hotels was inconsistent. There was no unanimous indication that higher impacts were associated with more usage in hotels. This gap was particularly apparent in tourist hotels. Finally, across all hotel categories, Korean hotel managers appeared have consistent plans to implement information technology in their hotels in the future.

There were two limitations of this study that should be cautious about interpreting the results. First, the samples of tourist hotels were rather small

(n=12) comparing to other two types of hotels. Second, in this study, data were collected from hotel mangers who responded to their perceived guest stratification in relation to the impact of technology-enhanced services. If this study used annual surveys or other systematic measures of satisfaction, the response would be more robust.

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