How Wired Are We?

The Selection and Use of New Technology in U.S. Hotels

by Karthik Namasivayam, Cathy A. Enz, and Judy A. Siguaw

In general, hotels have been conservative when it comes to adopting new technology, including those innovations that might benefit guests.

Relatively recent developments in information technology, and particularly the popularity of the internet, have forced all organizations, including hospitality-related firms, to appraise the way in which they use technology to manage their businesses. Industry managers are being called on to make choices from among rapidly proliferating technology products. Hence, operational and strategic issues are increasingly determined by the technology choices an organization makes. While the impetus for technology adoption should be driven both by consumer demand and environmental changes, the ability to create a sustainable competitive advantage should also be a crucial motivating factor. Regrettably, we find that the

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hospitality industry has not always used those criteria to decide on whether to adopt new technology.

Behind the Curve

The hospitality industry has often been accused of being "technology laggards." Moreover, some of those same detractors argue that while hospitality-industry executives purport to emphasize a customer-centered strategic focus, their technology initiatives do not support that contention.[1] Other analysts point out that the hotel industry is reactive in its stance to technology, motivating calls for a more proactive outlook.[2]

To determine whether the U.S. lodging industry has, indeed, balked at adopting technological innovation, and to encourage a strategic approach to adopting new technology, our study examined: **(1)** the various ways in which new technology has been employed by hotel firms to meet strategic objectives, and **(2)** the degree to which the various segments of the lodging industry actually use new technology.

Efficiency, Guest Service, and Revenue Enhancement

Technology can be employed to achieve numerous corporate objectives. Indeed, U.S. and European hotel executives have indicated plans to use information technology (IT) to reduce "operating costs...and... to improve sales productivity,"[3] to enable "both improvements in guest services and revenue management, as well as productivity enhancements,"[4] and to streamline "operations by reducing paperwork, speeding information dissemination, and increasing employee productivity—thereby increasing profitability."[5] In general, then, we noted that technologies can be grouped into three categories, namely, those implemented to **(1)** increase efficiency and employee productivity, **(2)** improve guest services, or **(3)** serve as a source of revenue.[6]

Accordingly, we used those categories to cluster ten specific technologies identified in a recent survey of the U.S. hotel industry on behalf of the AH&LA by RealTime Hotel Reports.[7] We placed three technologies in the guest-services category: in-room modem, in-room internet access, and in-room fax. Those applications can be categorized as such because guests do not have to make a separate purchase decision to obtain and use those amenities, as they are readily available to all guests. Voice-mail systems, interactive television guides, and management e-mail systems were categorized as technologies that enhance employee productivity and improve the efficiency of the operation. We reasoned that the voice mail and interactive TV guide automate the delivery of information to guests, thereby reducing the workload of the front-desk and concierge employees, and freeing them to handle other job functions. Management e-mail provides enhanced connectivity and allows for the rapid dissemination of organizational information. Of course, the ease of in-house communication and the acceleration of information dissemination among managers increase efficiency and effectiveness. Finally, internet bookings, teleconferencing, cell-phone rentals, and automatic teller machines (ATMs) are sources of direct or indirect revenue for the hotel. ATMs, teleconferencing, and cell phones add to profitability through rental fees, while internet bookings are an incremental source of revenue in addition to those from conventional sources of reservations. Internet reservations also reduce the cost of transactions because travel agents and their associated commissions are by-passed. Exhibit 1 summarizes the list of hotel technologies within each of the three broad classifications.

Exhibit 1
Classification of ten hotel technologies

Efficiency and productivity	Guest-service delivery	Revenue enhancement
Voice-mail systems	In-room modem	Internet booking
Interactive TV guide	In-room internet	Teleconferencing
Management e-mail	In-room fax	Cell-phone rental
		ATMs

[1] For example, see: Wonae Cho and Michael D. Olsen, "A Case Study Approach to Understanding the Impact of Information Technology on Competitive Advantage in the Lodging Industry," *Journal of Hospitality and Tourism Research*, Vol. 22, No. 4 (1998), pp. 376–394; Roger S. Cline, "Investing in Technology for Competitive Advantage—The Challenge Facing the Hospitality Industry," 1996 «www.hotel-online.com/Neo/Trends/Andersen/Investing_inTechnology.html» (as viewed in 1999); and Roger S. Cline, "Hospitality 2000—The Technology," *Lodging Hospitality*, June 1999, pp. 18–26.

[2] John Cavanaugh, "Spending Time, Not Dimes, to Get the Most from Your Automation," *Hotel & Restaurant Technology UPDATE*, Summer 1999, pp. 136–138.

[3] Barbara Clift, "Industry Survey Confirms Top Hotel IT Requirements for 1999," *Hotel and Restaurant Technology UPDATE*, Fall 1998, p. 108.

[4] Larry Chernevak, "Corporate Level Information Officers Talk Hotel Technology," *CKC Report*, June 1997, pp. 3–7.

[5] Judy A. Siguaw and Cathy A. Enz, "Best Practices in Information Technology," *Cornell Hotel and Restaurant Administration Quarterly*, Vol. 40, No. 5 (1999), pp. 58–72.

[6] Judy A. Siguaw, Cathy A. Enz, and Karthik Namasivayam, "Adoption of Information Technology in U.S. Hotels: Strategically Driven Objectives," *Journal of Travel Research*, in press.

[7] The American Hotel and Motel Association (AH&MA) was renamed the American Hotel and Lodging Association (AH&LA) at its fall 2000 meeting.

Exhibit 2
Percentage of hotels by degree of technology use (N = 4,520)

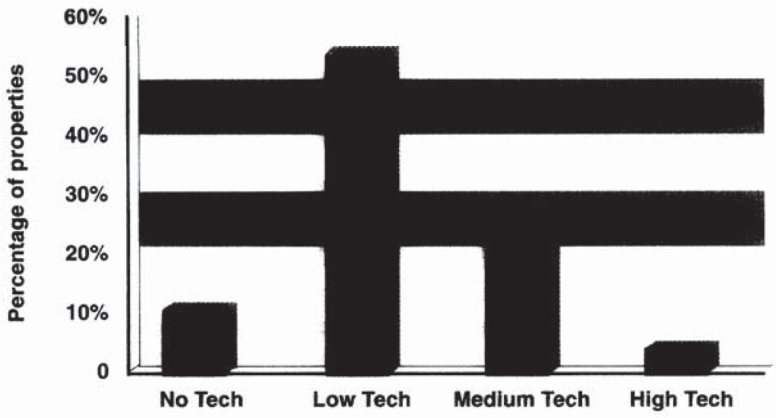
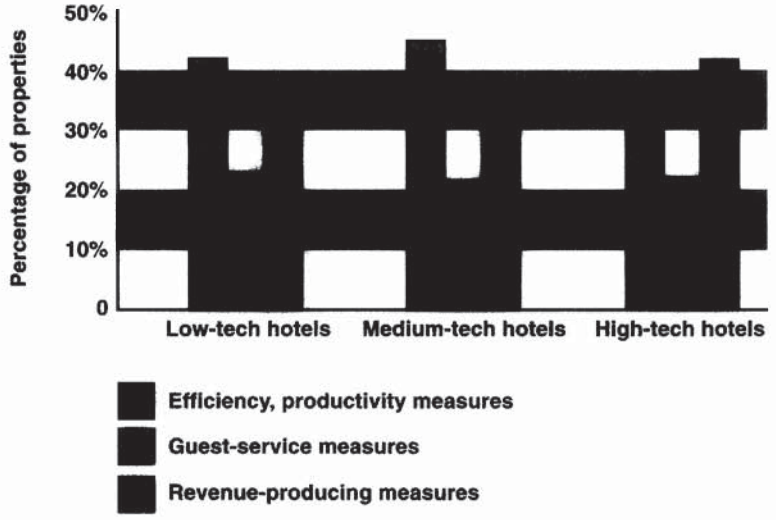


Exhibit 3
Hotels' technology adoption by classification



IT Use in U.S. Hotels

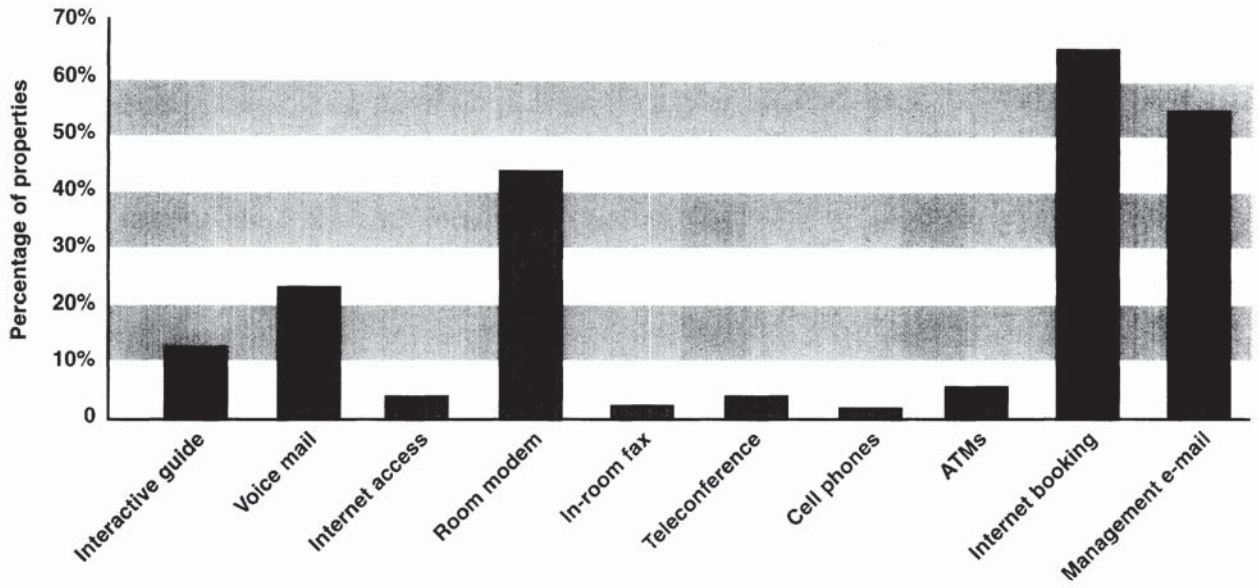
We examined the type and degree of IT use at 4,520 hotels. Our sample of lodging properties was drawn from the database of a larger investigation of hotel amenities conducted by RealTime Hotel Reports. Of their sample of 9,370 hotels, condominiums, and conference centers, we investigated just the 4,520 hotel properties which had indicated that they had adopted the technologies listed in Exhibit 1.

Technology use. We grouped those 4,520 lodging properties by the degree to which they have adopted the ten technologies noted in Exhibit 1. No such technology use was reported by 12.2 percent (550) of the lodging properties. Those properties that had adopted from one to three different technologies we labeled the low-technology (low-tech) hotels. That group constituted the largest percentage of hotels in our sample, 57.4 percent (2,594). The second-largest subset was the 1,218 hotels (26.9 percent) that had adopted four to six technologies, which we called our medium-technology (medium-tech) hotels. Finally, the high technology (high-tech) lodging properties were those that reported adopting seven to ten of the listed technologies, or 3.5 percent (158).

Regrettably, those numbers give credence to the claim that the lodging industry is largely composed of technological laggards, as almost 70 percent of the hotels in our study had few to no technologies. Exhibit 2 presents a summary of the percentage of hotels in each of those groups.

No-tech hotels. Given that technology has made rapid inroads into every aspect of lodging management, we were surprised to find that so many hotels had adopted none of the technologies included in our survey. To understand the types of hotels that this group represents, we created a profile of the typical "no

Exhibit 4a
Adoption of technology in low-tech hotels



tech" hotel (see table below). On average, properties that reported using none of the technologies that we looked at were independent budget or economy motels located near highways.

No-tech properties: Characteristic	Percentage (N = 550)
Independent	64.4 percent
Motel	77.3 percent
Located on highway	46.7 percent
Budget	42.3 percent
Economy	36.8 percent

Patterns of IT Adoption

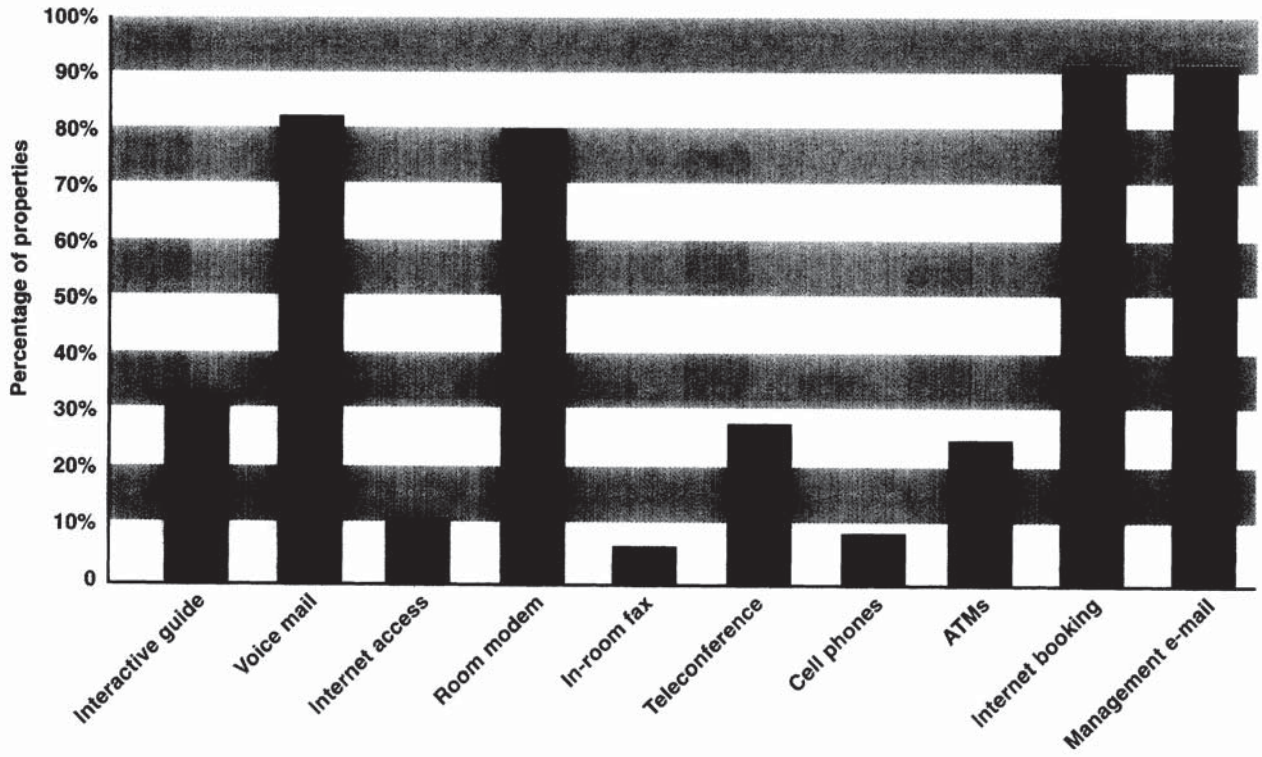
Relying on our classification scheme for the different types of technology (i.e., efficiency and productivity, revenue, and guest-service delivery), we explored whether there was a pattern to technology use among our different hotel groups (i.e., low-, medium-, and high-tech properties). Exhibit 3 shows that the hotels, irrespective of group membership, adopt guest-service technologies at a lower rate than they do productivity- or revenue-oriented technologies. The graph shows the percentage distribution of technologies by classification within each hotel group. Approximately 40 percent of the technologies adopted by hotels in the low-tech group were to increase efficiency or productivity while a similar percentage of technologies adopted by the high-tech hotels are revenue enhancing.

Exhibits 4a, 4b, and 4c provide a detailed examination of the ten technologies' use. Internet bookings and management e-mail were adopted at the highest rate, while in-room fax machines and cell phones were adopted at the lowest rate. While those technologies aimed at improving productivity and increasing revenues were predominant among all hotels, only those properties in the medium- and high-tech groups reliably installed guest-service technologies such as in-room fax and internet access. Approximately 40 percent of the hotels in the high-tech group said they had installed in-room fax machines (compared to only about 6 percent in the medium-tech and 1 percent in the low-tech group). Similarly, about 54 percent of the hotels in the high-tech group had in-room internet access (compared to about 11 percent in the medium-tech and 3 percent in the low-tech group). That pattern of adoption suggests to us that hotels embrace new technologies in phases. We discuss that theory more completely later in this paper.

There may be valid reasons for hotels' adopting some technologies and not others. Under conditions of uncertainty, for example, some organizations tend to mimic similar organizations that are seen as successful—what researchers call isomorphic tendencies.[8] Normative isomorphism occurs when organizations adopt technologies seen as "appropriate" by other members of the industry. This mechanism may

[8] Paul J. DiMaggio and Walter W. Powell, "The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organizational Fields," *American Sociological Review*, Vol. 48 (1983), pp. 147–160.

Exhibit 4b
Adoption of technology in medium-tech hotels



be an especially powerful force in the hospitality industry given its widespread franchising model and highly mobile workforce.

Other research suggests that some organizations tend to adopt technologies that are consistent with their strategic orientation.[9] In other words, a hotel's target market (e.g., business travelers) or sector (e.g., budget) determines whether a particular technology is appropriate for adoption. We explore that idea next by examining how a hotel's positioning affects the property's technology adoption.

Adoption by Lodging Sector

Some researchers have suggested that the sector in which a particular hotel operates (e.g., budget, upscale) may actually determine which technologies get adopted.[10] Those researchers speculated that technologies designed to improve efficiency and employee productivity should be adopted at a high rate by hotels in the budget and economy segments. Conversely, hotels that are at the high end of the value-added spectrum would adopt technologies designed to enhance guest services. According to that view, upscale hotels will sacrifice some productivity gains to provide greater guest service. To determine the accuracy of those conjectures, we analyzed our data by market segment (Exhibit 5).

Our data show that, irrespective of the hotel's market segment, productivity-enhancing technologies were adopted at the highest rate. That finding supports the contention that the hospitality industry has paid relatively little attention to technologies that enhance guest service.[11] As we see it, the data suggest that neither the hotel's market segment nor its customers' needs seem to drive technology adoption, suggesting that strategic orientation may not guide technology adoption in any clear or straightforward fashion.

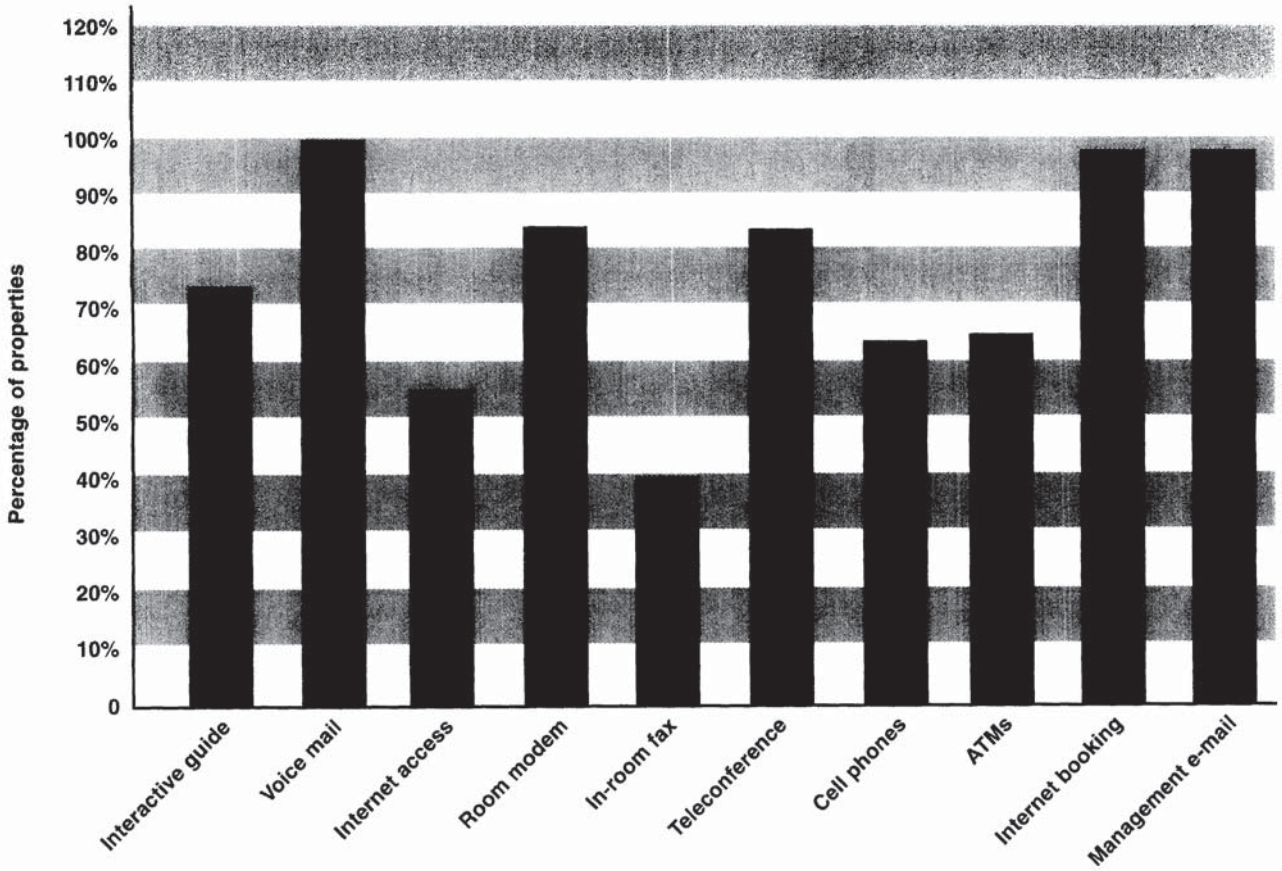
The apparent uniformity in technology use raises the possibility that other variables may influence the type and rate of hotels' technology adoption. To test that notion, we

[9] Richard H. Hall, *Organizations: Structures, Processes and Outcomes* (Englewood Cliffs, NJ: Prentice-Hall, Inc., 1999).

[10] Brent Keltner, David Feingold, Geoff Mason, and Karin Wagner, "Market Segmentation Strategies and Service Sector Productivity," *California Management Review*, Vol. 41, No. 4 (Summer 1999), pp. 84–102.

[11] Cline, 1999, *op. cit.*

Exhibit 4c
Adoption of technology in high-tech hotels



looked at two more factors: **(1)** the characteristics of the technology adopted and **(2)** franchise participation.

Characteristics Influencing Technology Adoption

In the context of this article the adoption of any new technology is considered an innovation to the adopting organization, even if such an idea or product exists elsewhere. Researchers suggest that widespread adoption of an innovation is determined by five main characteristics:[12]

(1) The *relative advantage* an innovation enjoys over the idea or product it supercedes motivates its rapid diffusion. The advantage derived from the adoption of an innovation may be economic, and it can also be related to social prestige, legitimacy, and convenience.

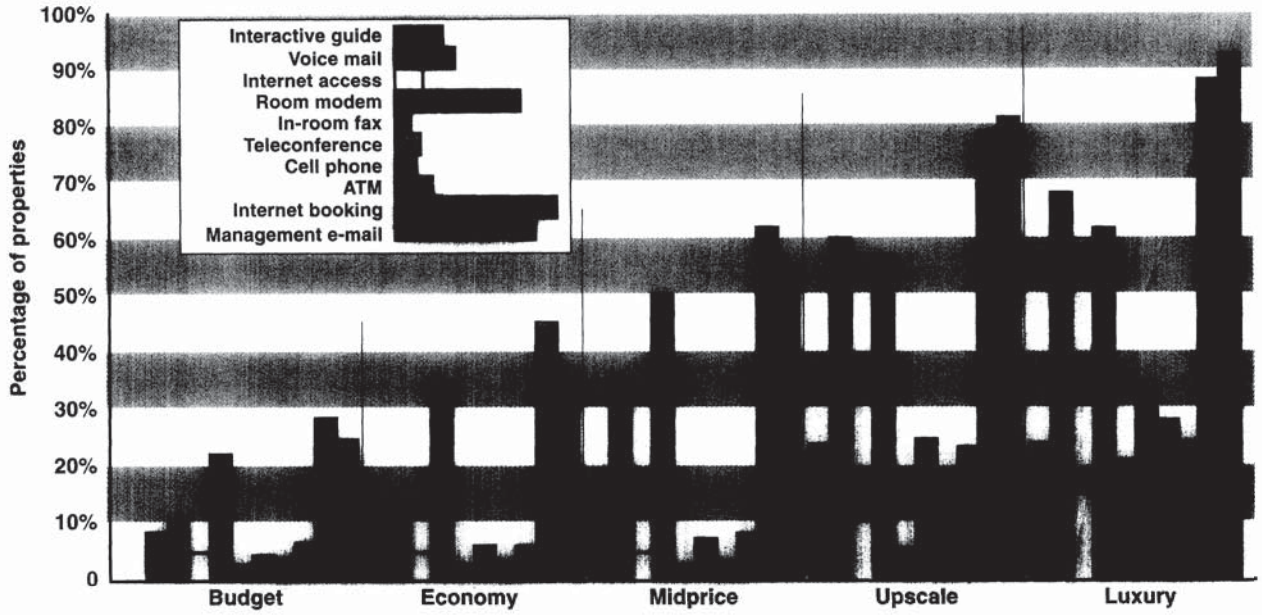
(2) *Compatibility* with existing values and strategies of the adopting organization is essential to diffusion. A product that is incompatible with existing systems and strategies and thus requires changing those systems will necessarily be adopted at a lower rate.

(3) The perceived *complexity* of an innovation determines its rate of adoption. Technologies that are complex and require the development of new skills and understanding take longer to diffuse.

(4) The product's "*trialability,*" or the relative ease of (and managers' confidence in) incorporating a new product, affects its adoption. In other words, products or tools that can be easily tried and tested within the framework of an organization's current capabilities are more likely to be adopted than are complicated, untested technologies. By reducing uncertainty associated with issues such as ease of operation and the value deriving from the adoption, trialability reduces risk to the organization.

[12] Everett M. Rogers, *Diffusion of Innovations* (New York: The Free Press, 1995).

Exhibit 5
Technology adoption by market segment



(5) Finally, *visibility* can prompt a product's use in the sense that the greater the degree to which the product's results or benefits will be clearly visible to customers and competitors, the greater the likelihood that the product will be adopted.

Our earlier analysis indicated that hotels of all types adopt internet bookings, management e-mail, and in-room modems at the highest rate (see Exhibits 4 a–c). Hotels may consider those technologies as least intrusive to current operating strategies. Not only are they compatible with existing communication systems, they provide easily identifiable (i.e., visible) economic advantages. Moreover, minimal additional investment is required to give hotels an internet presence and to enable e-mail communication. In many cases an internet presence is limited to a listing on the franchisor's web site. Data-port telephones or attachments to standard telephones provide "room modems"' at negligible cost and low complexity (relative to the prospect of rewiring guest rooms for additional phone lines). The increasing number of businesspeople on the road who want to stay in touch with their offices through e-mail and the internet is accelerating the demand for in-room modems. As such, those hotels that can deliver that capability immediately will earn a positive reputation among travelers and will gain a distinct advantage over those hotels that are approaching such innovation slowly or piecemeal.

In comparison to guest-room modems and e-mail, in-room internet access and fax machines are among those technologies with the lowest adoption rates. Rewiring rooms to enable internet access or dedicated fax machines is clearly an issue of high cost, low advantage, and low visibility. Perceived economic uncertainty is high—the advantage to any hotel of increasing guests' convenience cannot always be directly estimated. Whether and how soon guest-service technology will translate into bottom-line results is uncertain. Additionally, some traditional sources of revenue, such as long-distance telephone charges, may be lost due to the introduction of new technologies, thereby prompting a reorientation of operational and revenue strategies.

Overall, the characteristics of the few technologies that have been widely adopted across the lodging industry are those that:

(1) are compatible with current systems,
(2) offer little implementation complexity, and
(3) provide highly visible results.

Those technologies that have been less readily embraced by the industry are those that:

(1) are complex to implement,
(2) offer few if any visible advantages, and

(3) are somewhat incompatible with existing operating procedures.

Thus, our contention that the characteristics of the technological innovations themselves may serve to drive adoption, rather than customer demand or other environmental forces, appears correct.

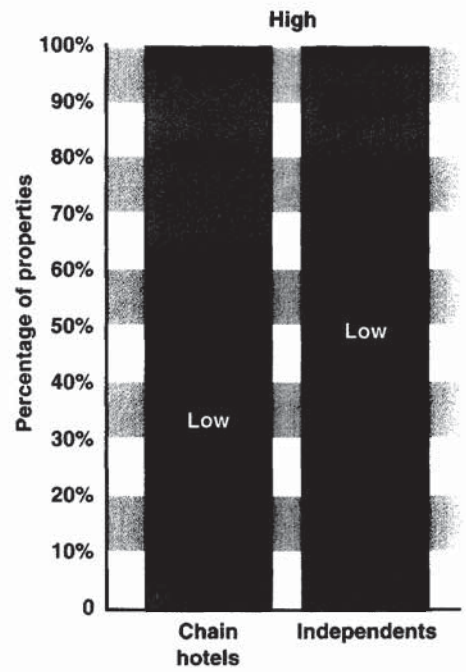
Franchises and New Technology

While the nature of any technology may in and of itself create the conditions necessary for its adoption, being part of a franchise may create further positive conditions for adoption.

Franchisors aim to provide consistent service and product bundles across all their franchisees. As such, we expect that chain properties may adopt technologies at a greater rate than do independents. Additionally, holding a franchise makes new technology less risky to the franchisee (in part because the innovation has already been tested at the corporate or property level) and that confidence factor may prompt quick diffusion among the rest of the chain's properties.[13]

Exhibit 6 shows the difference in the pattern of technology adoption between independent hotels and chain properties. Overall, more independent properties reported adopting none of the surveyed technologies than did chain-affiliated properties (19.5 percent versus 7.3 percent). There does not seem to be a wide difference regarding level of adoption between independents and chains in the low-adopter group (60.2 percent versus 55.5 percent) or in the high-adopter group (2.2 percent vs. 4.4 percent). In the medium-adopter group, however, chain hotels reported having between four and six technologies at nearly twice the rate of independent hotels' use (32.9 percent versus 18.2 percent). Furthermore, using *t*-tests we found significant differences between chain-affiliated and independent properties within all four of our technology-use groups (i.e., no tech, low tech, medium tech, and high tech).[14] Overall, our data indicate that chain properties adopt technologies at a higher rate than do independents, and that chain hotels are more frequently represented in the medium- and high-tech groups.

Exhibit 6
Adoption-of-technology comparison



Phases of Technology Adoption

The data and discussions presented above suggest that hotel operators move through distinct phases of technology adoption. We identified six such phases (see Exhibit 7, on the next page). In the first phase, which we term "consumer signaling," hotel operators implement technologies that announce their technological capability to the market. This type of technology adoption is used to **(1)** establish a technological posture in the marketplace, **(2)** legitimatize the hotel as a serious contender in its market sector, and **(3)** signal the property's ability to meet guests' technology needs.

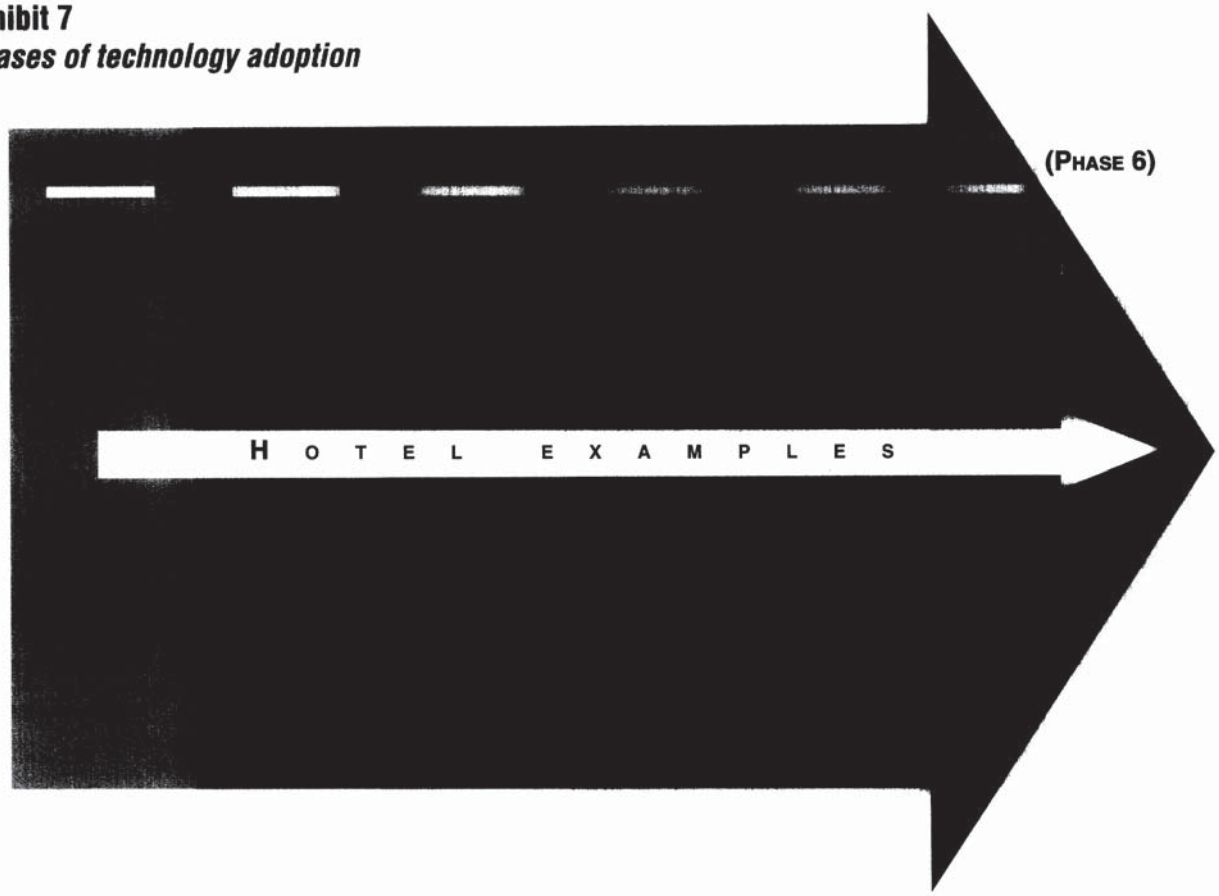
We refer to both of the next two phases of IT adoption as "enabling-communications technology" because our findings suggest that, having signaled to the market that they are "technologically capable," hotels then concentrate on implementing communication technologies that address management productivity (enabling-communications technology I), and employee productivity (enabling-communications technology II).

First, hotels invest in e-mail systems that serve to improve management productivity through continuous connectivity throughout the firms' networks. Such technology can facilitate the rapid dissemination of operating information and reduces the need for paper and distribution costs. Moreover, prompt management responses can improve overall performance. After increasing management efficiency, hotel properties then adopt additional technologies—voice mail for guests, for instance—to help employee productivity. (In that example, the voice-mail system transmits calls directly to the guest and intervention by hotel employees is therefore minimized, freeing up their time for other duties.)

[13] In only a few cases can a franchisor insist that its franchisees adopt specific technologies. As such, franchisees are free to select and use alternative technologies (e.g., less expensive), provided that they can deliver the level of service required by the franchisor.

[14] The *t*-test results are as follows: "no tech" group ($t = 80.4$, $df = 549$, $p = 0.000$); low tech ($t = 146.6$, $df = 2593$, $p = 0.000$); medium tech ($t = 99.7$, $df = 1217$, $p = 0.000$); and high tech ($t = 36.1$, $df = 157$, $p = 0.000$).

Exhibit 7
Phases of technology adoption



Next, hotels invest in technologies that move them toward two "customer service" phases. The first we termed "revenue add-ons," in which hotels invest in customer-oriented technologies that are also revenue generators (e.g., teleconference facilities and ATMs). In the second customer-service phase, which we term "value add-ons," hotels provide guest-service technologies that provide little, if any, incremental revenue, but do enhance guests' perceptions of the service that's available. For example, technologies such as internet access, cell phones, and fax machines in the guest room may bring no additional revenue to the hotel, but are nevertheless important to many guests. Hence, value add-ons may be used strategically to **(1)** promote additional sales and **(2)** create and enhance guest loyalty.

In the sixth and final phase, labeled "next-wave technologies," hotels adopt relatively advanced technologies. The complexity of those technologies may limit their immediate widespread adoption. In the year 2000 such technologies included curbside check-in, voice recognition, and biometric payment systems.[15] The use of next-wave technologies is adopted first by the most innovative high-tech hotels.

It is our contention that the hotels wishing to retain leadership in the industry have to move quickly through the six phases of technology adoption that we've identified. Our data indicate that while a number of hotels have already reached the productivity-enabling communications-technology phases, there are few that are in the customer-service phase. That finding points to a strategic opportunity for hotel operators who dare to be innovative regarding adopting technology. **CQ**

[15] For example, see: Geneva Reinhart, "Biometric Payment: The New Age of Currency," «www.hotel-online.com/Neo/News/Pre…ses2000_1stMar00_BiometricCurrency.html» (as viewed in 1999); and Nicky Robertshaw, "Improved Kiosk Technology Becoming More Popular," *Hotel and Motel Management,* Vol. 215, No. 4 (March 6, 2000), p. 54. The term "biometric" refers to using human characteristics such as a palm print or facial characteristics to recognize and accept payment from guests in the place of credit cards.