

CHAPTER 8

# ICT and hospitality operations

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## Introduction

As reviews of information and communications technology (ICT) research demonstrate (Frew 2000; O'Connor and Murphy 2004), this subject has been researched from a variety of perspectives. However, because the technology often transcends traditional ways of managing operations and organizing activities, it is not easy to select specific research studies in the operations field or to categorize them. In particular, the Internet and web-based systems are enabling new business models and ways of doing things that blur the distinction between operations and marketing (as the previous chapter on electronic distribution demonstrates). Nonetheless, this chapter explores the types of technology now in use in the industry and how ICT has changed operations in particular. In doing this, three themes emerge: the first is how ICT has put more power in the hands of the guest; second, how ICT has improved the operational efficiency of service staff; and finally, how ICT has improved information flows to senior management thus providing more capacity for understanding, forecasting and strategic planning. Further, the exploration of these issues will also consider ways in which these emerging technologies can provide fresh insight into long-established service management theory.

These perspectives assume that there is a current benchmark of automation – such as hotels having a computerized reservation and rooms management system and bars with food and beverage management systems. Thus, the focus of this chapter will be on how new and emerging ICT will improve the efficacy and efficiency of these systems. For many years, up to around 2000, the hotel industry tended to operate 'bespoke' or custom-designed systems designed exclusively for use in their operations. Often these systems did not integrate with each other, as they were purchased from different vendors or used different platforms. Cline and Warner (1999) found that 82% of the 327 executives in their global survey believed that this had a negative financial impact on the industry. So important was this issue that the American Hotel and Lodging Association set up a working group to investigate the integration of different IT systems commonly used in the industry. More recently web-enabled platforms have been developed that address this issue.

The evolution of this technology needs to be seen in light of the ongoing development of the industry. Several authors (Connolly and Olsen 2001) have argued that the industry is abandoning some elements of its craft traditions and pursuing

a more ruthless, commercial agenda. Efficiency of resources, revenue growth and cost cutting are seen as essential management practices needed to drive shareholder value. At the same time, harnessing internal and external resources to meet guests' needs, wants and objectives while still earning profit is seen as paramount. High-speed, high-quality information flow between the guest and the hotel is seen as the key to driving revenue (by meeting guests' needs) and maximizing profit (by improving efficiency and cutting costs). However, at the same time, despite the proliferation of loyalty programs, the market has seen a decline in traditional notions of customer loyalty, further exacerbating the need to quickly and clearly understand the guests' needs and then marshal resources to meet them.

## More power to the guest

ICT has resulted in a blurring of work and leisure (Davis and Meyer 1998). People often combine business trips with pleasure and vice versa. Travellers today sport all of the high-technology appendages seen throughout the society: beepers, mobile phones and laptops. They bring these devices with them whether they are travelling for business or pleasure, and when they arrive at their destinations, they expect to have a place where they can readily use these devices without hassle or frustration. This requires hotels to provide a workspace, as well as access to the outside world via modems and the Internet, without the guest needing to search for appropriate access ports, re-wire the room, or re-arrange the furniture and lighting. A digital infrastructure is essential for competing in the future.

Guests therefore remain connected to their worlds no matter where they are physically and no matter why they are travelling. So the industry can no longer label travellers by the traditional, distinctive categories of business, leisure or group. Hence the behaviour of guests will increasingly reflect their individual lifestyle far more than their purpose of travel. Connolly and Olsen (2001) call such guest 'tribal travellers'. This will be the case throughout the so-called 'guest cycle'.

The first part of the guest cycle, which typically involves some form of information search, has been extensively expanded by the Internet<sup>1</sup>. Some of these information channels are formal and official, such as hotel websites, travel agent websites and even destination promotion websites.

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<sup>1</sup> This is discussed fully in Chapter 7.

However, there has also been explosive growth in external or informal information sources such as blogs and online travel forums that are maintained by individuals who do not have a vested interest in the commercial well-being of the hospitality industry. In some instances, these blogs have emerged as key, authoritative sources of 'inside information' for visitors. For example, it is possible to go online and read the personal reviews of people who have stayed at the hotel you are contemplating staying in when you next travel.

The second phase of the guest cycle, involving the purchase decision, has also been significantly changed by the emergence of ICTs. Whether directly with the hotel, through an airline or travel agent or through a major online consolidator such as Amadeus or Galileo, the ICT-literate guest can compare prices between properties and book, secure and pay for their room online all during the one computer session, irrespective of the prospective guest's location or time of day.

In the next stage of the guest cycle, check-in and residence, it is now possible for guests to pre-allocate their room via the Internet, and in some instances, via their personal digital assistant (PDA) or mobile phone as they approach the hotel. In this environment, it is possible for a guest to book and allocate their room online, alert the hotel of their impending arrival in advance and thus collect their pre-coded room key from the concierge or porter on arrival without ever having to speak to any other hotel staff or stop and queue at the front desk. Just as credit cards can now be used to access, pay and exit boom gates at car parks, hotel room locks and other outlets in the hotel can be programmed to read a credit card. The emerging PDA technology could see PDAs emit a signal to unlock the hotel door by pressing a pin number electronically issued by the hotel without needing a hotel-issued security card or the guest's credit card.

Finally, in the last part of the guest cycle, check out, the guest can simply depart the hotel without having to check out at the front desk. Some hotel companies are now developing policies wherein if the guest has stayed previously, not argued the bill and paid by credit card, then in subsequent visits the guest only needs to indicate that they will pay by the same credit card and the hotel will not require any formal check-in procedure, signature or check-out procedure – the guest is free to come and go. The account is settled when the hotel staff confirm that the room is vacated – all charging information is on electronic file – and so there is no need to disturb the guest whatsoever.

As can be seen, the advent of these technologies places greater control in the hand of the guests. They can more critically shop around, compare prices and choose exactly what

room they want (within the price category they pay), and movement and expenditure in and around and out of the hotel is greatly expedited. While there is no evidence of this trend in foodservice yet, it is also entirely feasible for guests to book and allocate their own tables in a restaurant in the same fashion as they can for hotel rooms and airline seats.

## Power to the staff

It is now appropriate to look at how these emerging technologies can improve the operating performance of hospitality operations. Consistent with Michael Porter's various theories relating to competitive advantage (Porter 1985), a hospitality operation can use the technology to pursue either a least cost producer strategy or a high value-added strategy. In the first instance, the technology can be used to improve the operating efficiency of staff, thus creating the potential for the business to pass on savings. However, in the second instance, it can be used to improve the richness of the customer experience and thus justify maintaining high prices.

For example, it is feasible for hotels to fully automate their reservations systems – in the same fashion as airlines have. By having guests book and allocate their own rooms, the hotel can generate considerable savings by reducing its reservation staff. These cost savings can then be passed onto the consumer in the form of lower prices.

The technology also presents many opportunities in full-service restaurants. Each waiter can be issued with a PDA which enables her to take orders at the table which are then directly transmitted to the kitchen. When the food is ready, the PDA can immediately alert the waiter. As a result of these arrangements, the waiter does not have to leave the dining room to place the order and will spend a minimum of time out of the room collecting food for serving. How the restaurant elects to utilize this technology will be a function of the competitive advantage it seeks to pursue. If the restaurant sees itself as a 'low cost' producer, it will use this technology to employ less wait staff with a view to passing some of the cost savings onto the guests. In contrast, if the restaurant is a 'value added' producer, the time saved by the waiter can be spent in the dining room enhancing the level of service and, by implication, the guest experience.

Somewhat ironically, until fairly recently hospitality firms were not using ICT as the means to train employees in the use of ICT! Cline and Warner (1999) found that training in technology was predominantly on-the-job, with CD-Rom (32%),

interactive television (20%) and the Internet (5%) relatively little used. This has now changed significantly. For instance, Hilton University is one of the world's most sophisticated web-based, online training and development systems ([www.hilton-university.com](http://www.hilton-university.com)).

## Power to the managers

These systems can be used by management to better control operations and understand the business and thus better forecast and plan for the future (Gates 1999).

## Understanding the customer

Each interaction with a customer or potential customer is a chance to learn and collect more information about these individuals and update their profiles. Creating repositories to store and share this information and these profiles throughout the entire enterprise becomes a fundamental operating principle of the knowledge economy. Connolly and Olsen (2001) argue that 'knowledge, knowledge, knowledge' will replace 'location, location, location' as the three most important sources of competitive advantage. They suggest that companies must focus on developing guest intelligence systems with the same diligence that military organizations pursue intelligence gathering. This implies seeking, collecting and storing the right data, validating the data, sharing the data throughout the entire organization and using this data throughout all levels of the organization to create personalized, unique customer experiences. New tools for data warehousing and data mining and Internet tools such as Firefly, BroadVision, Jango and others are emerging to help collect this raw data, analyze it and decipher intelligent meaning from it.

While hotel companies today have rich customer databases, they are often ineffectively utilized. Moreover, the data are incomplete or inaccurate and stored across multiple, incompatible databases. It is important to recognize that data, like knowledge, are perishable. To that end, hotel companies should continually update their guest databases and use every customer interaction point as a knowledge-building opportunity. Each customer interaction is a learning experience, and each contact is a chance to collect new information about that guest. These data can then be used to determine what needs guests have and what they are seeking to have fulfilled so that these needs can be pre-empted. If used appropriately, these

data become the critical link in creating the 'magic experience' that guests seek. Because these interactions represent important relationship-building opportunities, hotel companies must be cautious of relinquishing control of these processes in favor of third parties and intermediaries. The value of guest data is too important and too valuable to be placed in the hands of others. Who knows how these data may be used in the future to steer one's loyal customer base to a competitor or alternative product or service offering? Technology has placed greater control in the hands of the guest within the guest cycle. While the traditional structure of the guest cycle remains relatively unchanged, the level of engagement and activity undertaken by the guest has increased significantly.

## Controlling the business

Given that the hospitality industry operates on strict adherence to operating standards, the technology can be employed to ensure that operating standards, particularly with regards to timeliness, are met. For example, when the waitress places an order on her PDA, the time of placing the order and the time of collecting the order, including the name of the sous chef, can be recorded for subsequent analysis such as comparing this time to the kitchen operating standards. Similarly, in the dining room, the time taken by the waitress to respond to her PDA to collect the food from the kitchen can be recorded so that efficiency in the dining room can also be monitored.

The technology can also be used to improve operational control in bars. Rather than have staff use swipe cards to activate the cash register, bar staff can wear a unique identifying, magnetized wrist band, not unlike a wrist watch. The beverage pourers (spirit, soft drink and beer) and the cash register can then be activated by sensing the unique wrist band. By tracking the pouring actions, the cash register can automatically compile and cost the order thus saving the bar person having to key any sales information. While this can expedite service, it also provides a means of securing high-value beverages; they cannot be poured without sensing an authorized wrist band and once beverages are poured the system expects the staff to account for the pour by way of charging a guest.

These cash registers can be integrated into the property's security system. Any unauthorized access of either the pourers or the cash register, or too long delay between the pouring of a drink and the processing of the sale on the cash can trigger an alarm. For example, if the cash register is tampered with, the

duty manager's PDA could emit an alarm. The PDAs can even be programmed to immediately report abnormally high levels of activity. In highly sophisticated systems, this alarm can trigger an appropriately positioned closed-circuit television camera, which in turn can broadcast an image of the cash register and surrounds on the duty manager's PDA screen. Therefore, irrespective of where the duty manager is, she can quickly view the screen, ascertain the situation, make a decision and then communicate her decision to staff.

## Understanding the business

These advanced cash registers and pouring systems can be integrated into a more comprehensive, contemporaneous stock control and payroll system. Detailed reports on beverage popularity and profitability can be promptly produced at the end of each trading period. Similarly, staff activity, showing what beverages are sold, average check and other staff performance measures can be produced at the end of each shift. This system can also act as the basis of detailed activity-based accounting systems, which can provide management with highly detailed accounting information about the operational and financial performance of the bars, selling points, staff and beverages as well as trading periods, and even types of guests. For example, the system can calculate typical order and average spend by different type of settlement method.

In a similar fashion, in residential hotels, detailed accounting reports can analyse the revenue and profitability of different room types and rate brackets, market segments, days of the week and even wings or floors of the hotel. The ability to analyse and re-analyse from various perspectives gives the hospitality manager a high level of insight into the way the business operates. This information can greatly help improve operating performance.

While customer satisfaction research has a long and chequered history, in-room technology can greatly enhance a hotel's appreciation of the needs and wants of its guests. Online surveys through television or Internet service, obviously with an appropriate incentive, can be employed to get a better understanding of the guest's needs. Because these surveys are online, no delays, errors or other problems associated with data re-keying can occur, thus improving the quality of the data. Clever, innovative and interesting survey design can also help improve guest response rates.

In highly sophisticated systems, geographical information systems can be used to produce maps showing the property's

catchments and capacity to draw different market segments. For example, by getting a guest's zip code or even telephone prefix, a restaurant can produce a map of the city showing which suburbs produce the most customers, or which produce the highest average check and so on. These data can even be integrated with census-level population statistics to show how well a restaurant penetrates particular sociodemographic segments in the community.

## Forecasting the business

Several new ICT methods and systems can help significantly improve forecasting activities in hospitality operations, be they in full service residential hotels, resorts, casinos or food and beverage operations.

First, data warehousing is the technique of storing all operating transactions (including food ordered, mini bar, pay TV and so on) permanently on a computer. This storage, or data warehouse, can contain vast amounts of information about all aspects of the business; in fact, anything that is captured on a cash register or computer can be stored in the data warehouse. The ready availability of all of these data in the warehouse then facilitates the 'data mining' activities wherein extensive and recursive statistical analysis is undertaken of the data to identify patterns and relationships. These data patterns can point to the existence of key trading patterns such as higher average room rates on particular days of the week, higher average food and beverage checks when particular meals are ordered and so on. They can even point to operational standards such as the individual or overall level of compliance with the time allowed in the kitchen to prepare a particular order, as noted previously when discussing PDAs in dining rooms. Data mining can also be used to identify market segments that are more sophisticated and potentially more profitable than traditional segments such as 'groups' and 'corporates'. It can also facilitate customer lifetime value analysis.

The statistical analysis can also more accurately assess the cost structure of the hospitality operation, especially in terms of identifying cost drivers and the nature of the fixed and variable components of stepped costs which can further enhance the quality of budgeting models and forecasts. Highly sophisticated statistical forecasting techniques can also be used to estimate likely volumes of room sales. The most common instance where this large-scale analysis takes place is in yield management. Armed with this information, the hotel can then

more accurately forecast and change upcoming room rates to maximize profit. Similarly, the long-term data from the warehouse can assist in trend analysis of market segments, operating statistics, staff efficiency, financial performance and so on.

## Planning for the business

Rather than struggle to produce standard pro forma reports in the hustle and bustle of daily operations, all of this aforementioned information can be extracted out of the system and fullsomely and thoughtfully, yet quickly and cheaply, analysed and synthesized into a strategic and coherent plan for the future of the business, be it hotel, bar or restaurant. Modern 'productivity' software such as PowerPoint, Excel and Word can be used to seamlessly integrate and present a raft of information in a simple, digestible manner. This is vital in long-term strategic planning and thus reinforces the value of ICT to the hospitality industry.

ICT and the Internet are also making a significant impact on labour management and productivity, as reported in *Hospitality Technology* (January 2005), particularly through Internet-based labour scheduling. It reports on two US-based systems – *eRestaurant Services* in use in the 140 company restaurants of California Pizza Kitchen, and *TMx 5.0 Labour Management System* adopted by Bertuccis in their 91 locations. In the United Kingdom, *eProductive Systems* has been adopted in a number of hotel chains. In such hotel chains, it is often department heads or supervisors who devise staff rosters, sometimes still using simple pen and paper 'systems'. One hotel that *eProductive* worked with had 55 different people scheduling staff. In this environment, labour management is post-operational, that is, the cost of labour is established after it has been used, when hours worked are calculated and staff are paid. But the Internet can provide an interface that enables all managers with scheduling responsibility to do so in a standard way and incorporate forecasts of how busy the hotel will be, along with 'rules' preventing those doing the schedule to over-staff. Hence Internet-based scheduling can provide immediate feedback to these managers as to the likely outcome of their decision by forecasting labour cost against forecast revenue. Moreover, more senior managers can examine aggregate data or the schedules themselves to see that the plan will not lead to excessive cost. One trial in an international chain found that this system led to a 25% reduction in labour cost in the house-keeping department.

ICT also has the potential to contribute to the management of the supply chain through e-procurement. Hotel chains have used e-purchasing for many years (Lawlor and Jayawardena 2003), that is, they have used the Internet as a transmission vehicle to send information. In e-procurement, everything is web based, greatly facilitating the coordination of material, information and financial flows between suppliers and customers. One outcome of this is Avendra, a procurement consortium of some of the world's largest hotel chains (Hyatt, Marriott and IHG, among others). Although not just an e-marketplace, it does make use of sophisticated web-based technology. In a detailed study of 14 hotels in Philadelphia, Kothari et al. (2005) found 'lukewarm enthusiasm for e-procurement' due to concerns about their level of control, security and privacy. This was despite the fact that experience in other industries had demonstrated that e-procurement had reduced labour costs in the purchasing process through less paperwork and fewer mistakes; increased access to world markets and hence lower prices; and improved relationships with suppliers.

## Impact of ICT on performance

The examples above of how ICT can transform hospitality operations would suggest that the performance of the industry has been significantly improved by the adoption of these systems. However, Weicher et al. (2005) identify that although 85% of IT spending in the 1980s was in the service sector, productivity in this sector increased only 1.9%, while productivity in the manufacturing sector rose 44%. This is because there is a danger that ICT can be a disabler. This is especially the case if it is never used to challenge why things are done in a company, but instead justify and reinforce the way they are done. IT systems in the service sector have been used to generate more unneeded reports, speed up superfluous work steps, generate unnecessary information, encourage shoddy thinking and misdirect attention to spurious details.

An early, largely qualitative study by David et al. (1996) of chief financial officers in the top 100 hotel chains in the United States reported that 'managers often implemented the technology knowing that they would probably not see measurable productivity improvements ... Nevertheless, (they) went ahead ahead with implementation ...'. This was because they saw ICT at this time as boosting customer service levels and augmenting the number of services offered. From their study of 411 hotel managers in the United States, Canada and the United

Kingdom, Van Hoof et al. (1996) also reported that 'much new technology is designed for guest use'.

Paradoxically, a slightly later quantitative study of 5287 individual hotels by Siguaw et al. (2000) reported that 'the U.S. lodging industry has focused on employing technologies that improve productivity and enhance revenue but has not given strategic priority to technologies designed to improve guest services'. They identified that 84% of hotels had adopted technologies that they argued would help with productivity (management e-mail system, voice mail and interactive television guide), 80% had adopted revenue-enhancing technologies (Internet reservations, teleconferencing, automatic teller machines and mobile phone rentals) and 60% had new technology that enhanced guest services (in-room Internet access, in-room fax machines, and in-room modems). There were significant differences between lodging segments. This was largely in terms of the number of these new technologies that had been adopted – budget hotels had fewer upscale properties, with the latter adopting guest service-focused ICT. The study also found differences in the adoption of ICT between nine types of hotel property (all suite, extended stay, convention, casino, conference, condo, standard, motel and bed-and-breakfast). Chain hotels had also adopted more technologies than independents.

Sigala et al. (2004) proposed a new way of assessing ICT productivity, using a non-parametric technique called data envelopment analysis (DEA).<sup>2</sup> Their study of 93 three-star hotels in the United Kingdom identified the nature and type of ICT in use in each property and measured the level of performance of each department within each hotel. Their empirical findings revealed that the hotels had fairly similar ICT infrastructures, but there were significant differences in performance between the hotels, which they categorized into four groups: 58 inefficient hotels, 19 market efficient, 2 operational efficient and only 14 both market and operational efficient. They concluded that 'productivity gains accrue not from investments per se, but from the full exploitation of the ICT networking and informatization capabilities'. In other words, ICT alone does not lead to improved performance; it is how it is implemented and exploited that makes the difference.

Ham et al. (2005) also researched the effect of information technology on performance. In their sample of 21 upscale hotels in South Korea, they surveyed 638 employees, asking

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<sup>2</sup>See Chapter 12.

for their assessment of how IT applications had affected performance in their department within the hotel. Front office applications emerged as having the highest perceived impact on performance, followed by restaurant and banquet management systems.

Finally, in one of the few studies of IT implementation in the foodservice sector, Huo (1998) investigated its impact in 57 US-based restaurant chains. This study in particular investigated the factors that were needed to be in place in order for investment in a new IT system to be sustainable. The two most significant factors were identified as investment intensity and asset turnover in capital intensity.

## ICT best practice

ICT clearly cannot be dismissed as irrelevant to hospitality operations. The advent of this technology is being driven by powerful market forces and is readily explained by well-established theory.

In the first instance, the seminal work of Peter Keen at Harvard in the late 1980s and the early 1990s set the framework for the way management should deal with the technology. He argued that the pervasive power of the technology means that it should underpin all strategic decisions of the organization (Keen 1993). He went on to identify a model wherein the failure of management to deal with the challenge of this technology, including opportunity and threat, will result in a sub-optimal outcome for the organization. In contrast, he argued that enlightened management will see a 'compelling business vision' for the integration of ICT capacity into their long-term strategic planning.

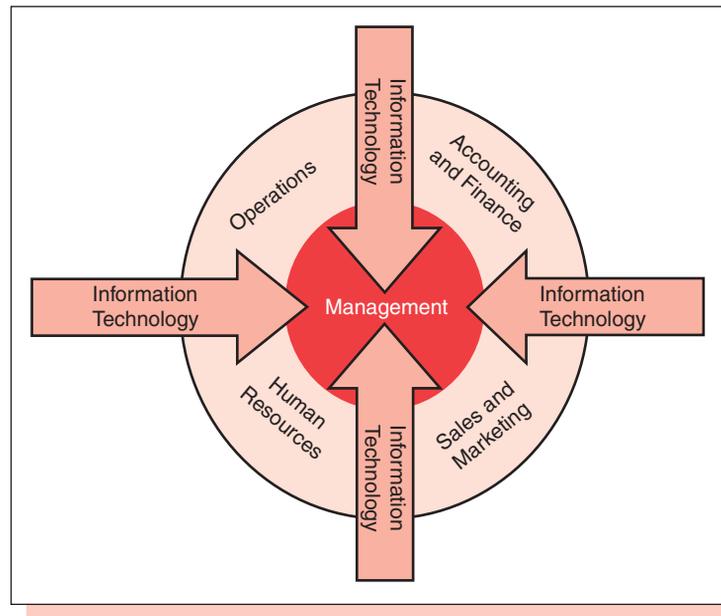
In the 1970s, John Rockart established the parameters of the information needs of executives. In essence, Rockart (1979) argued that executives and managers should identify those key critical things that drive the success of their business (he called them critical success factors) and that the information system should report only this information. According to him, if something is not vital to your success, then you do not really need to know about it and certainly do not need to waste time and money reporting it. Rockart's work emphasized two key phrases in information systems management: 'You cannot manage what you do not measure' and 'what gets measured gets managed'. Therefore, the critical thing is to measure and report only those things that are worthy of valuable executive time. Exception reporting, wherein only deviations outside

pre-defined acceptable performance boundaries are reported, is the logical conclusion of this thinking. Therefore, it is possible to imagine a hospitality manager who looks at only a single page report to identify those aspects of the business 'not performing to plan', the rest, given that it is performing to plan does not require the manager's intervention.

These two very technological perspectives argue that hospitality managers need to take an assertive and considered approach to how they employ technology to achieve operative efficiency and access to better information for higher quality decision making. There is a danger that managers will only see ICT in terms of tactical improvements. Armijos et al. (2002) in their study of 90 subscribers to *Hospitality Technology* magazine found that this might have been the case, but that a "clear trend is that industry is moving from a state of merely automating manual processes to one of enhancing business performance and sales through enabling technologies". As Siguaw et al. (2000) point out – "the importance of aligning IT choices with the strategic objectives of a hotel will increase in importance as hospitality executives search for additional mechanisms to obtain competitive advantage".

This is not to suggest that traditional hospitality management needs to be taken over by technology. But to apply ICT effectively in this way, managers themselves must be proficient at understanding information technology and its capabilities and limitations. Connolly and Olsen (2001) argue that as technology becomes more pervasive, requires more investment capital and creates greater impact on the organization, it becomes difficult, if not impossible, to separate technology decisions from business decisions. It is one of the largest corporate investments in organizations today, a trend that is likely to continue for several more years, and as such, it has come into the purview of the organization's top executives. Marketing, finance, human resources and operations executives will be required to take information technology into account when making important company decisions. If they are not proficient in information technology or its abilities and limitations, they could be running an ineffective organization. Hence ICT has a boundary-spanning role, as illustrated in Figure 8.1.

In view of this, ICT as a management activity must have a status in the organization similar to other functions within the firm. Within the corporate hierarchy, it should be managed at executive level and integrated into the key initiatives of the business. Cline and Warner (1999) reported that the chief financial officer had the greatest involvement in IT. But forward-thinking and techno-savvy organizations are expanding



**Figure 8.1**

IT as the boundary spanner (Source: Connolly and Olsen 2001).

and elevating a number of technology positions in the executive ranks to demonstrate a company's commitment toward creating a high-technology infrastructure and to aid in pursuing high-technology strategic initiatives so that along with the chief information officer, there are also the chief technology officer, chief knowledge officer and chief web officer (Connolly and Olsen 2001).

## Summary and conclusions

Frew (2000) argued that 1994 was a 'milestone year' in the ICT research literature. In the mid-1990s, there was a major upswing in the studies being undertaken and reported in journals. Shortly afterwards, Frew (2000) identified three major industry-led think-tanks concerned with the impact that ICT was having on tourism and hospitality. The first of these was in Europe under the 5th Framework Programme looking at Informations Society Applications for Transport and Associated Services. In 1997, the Strategic Advisory Group published a report, which led directly to the proposal of specific research fields in this area. Second, between 1997 and 1999, a series of

think-tanks were organized by the International Hotel and Restaurant Association leading to major report on ICT in the hospitality industry (Connolly and Olsen 1999). And finally, in 1999 the Hospitality Industry Technology Association wrote a major report (Hamilton 1999) from a more technology-centric perspective, which was published in the first edition of a new journal devoted to ICT in hospitality.

It might be thought that as a result of these initiatives, ICT research in hospitality operations would grow significantly in the early 2000s. In fact this has not been the case. There has been sustained research into ICT, but this has tended to be in tourism rather than hospitality, with focus on marketing rather than operations. And of the research that has been done, especially into the impact that ICT has had on operational performance, the majority has tended to research managerial perceptions of this impact rather than empirically test the actual impact. More research is required in the area of ICT's measurable impact on productivity, employee satisfaction, service quality and innovation.

In conclusion, the advent of the technology presents many opportunities and threats to the hospitality industry. Those that seek to understand the technology and harness it will still be able to offer traditional hospitality, albeit with modern efficiency and effectiveness. Cline and Warner (1999) found that firms were investing 3.1% of their revenue in ICT and were planning to invest more in the future. In contrast, those that fail to invest run the risk of being strategically exposed and ill-equipped to compete with their more technologically literate competitors. It can be said that ICT changes nothing, in the sense that hospitality still requires guest staff interaction to drive guest satisfaction, yet it changes everything, in the sense that it creates a new competitive dynamic.

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