UNLV Theses, Dissertations, Professional Papers, and Capstones

Spring 2012

Exploration of Human-Computer Interaction (HCI) Applications in Hospitality Industry

Jia Wei
University of Nevada, Las Vegas

Repository Citation

Exploration of Human-Computer Interaction (HCI) Applications in Hospitality Industry

by

Jia Wei

Bachelor of Science
Xiamen University
2009

A professional paper submitted in partial fulfillment
of the requirements for the

Master of Science Hotel Administration
William F. Harrah College of Hotel Administration

Graduate College
University of Nevada, Las Vegas
May 2012
Chair: Dr. Mehmet Erdem

PART ONE

Introduction

Human-Computer Interaction (HCI), just as the name implies, refers to the interaction between humans and computer technologies. It has been around for decades and has impacted nearly every area of our daily lives. Not surprisingly, HCI has become more relevant for service industries. An increasing number of applications used in the service industry take HCI into consideration in design and implementation. The most common example is that more and more people are booking hotel rooms online or through mobile phones, instead of calling hotels, compared with decades ago. The exploration of the relationship between human and computers has quickly become one of the most important study fields. Because HCI studies the relationship between human and computers, it needs supporting knowledge on both the human and the machine side. Previous studies have more concentrated on the technology aspects of HCI, such as the programming languages and computer graphics. Some of the studies are concerned about using for military, such as future intelligence analysis, and for video games. Very little has been performed on the study of interacting with hospitality business systems in a typical HCI context.

In spite of the technological advances in the service industry and the traditional labor intensive nature of the service related tasks, HCI is an unexplored and under-researched topic within the hospitality industry. It will therefore be timely to explore the application of HCI in hospitality industry. On the one hand, a well-designed HCI system can minimize the barriers between the guests' or employees' recognitions of what they want to accomplish and how user friendly the technology being used is. On the other hand, the price that an organization pays for a poorly designed HCI system will be very high if we consider customers' disappointment with the company and employees' precious time wasted.

Purpose

The purpose of this professional paper is to explore and identify the best practices in Human-Computer Interaction (HCI) applications and use within the hospitality industry.

Statement of Objectives

To accomplish the stated purpose, first, the paper will provide the universal definition of HCI applications and define HCI within the context of hospitality industry. Second, the paper will gather and categorize information, such as the standards of designing HCI applications, from other fields of study such as informatics. Third, the paper will gather existing examples of HCI applications across different areas within the hospitality industry, such as the front desk and housekeeping department of a hotel. Finally, a set of recommendations will be given as a guide for managers of hospitality operations when purchasing a new technology or application that interact with their guests or employees.

Justification

Growing numbers of hotels, restaurants, and other hospitality businesses realize that a competitive strength and increase in profitability are dependent upon the interaction between high technology and their guests and employees. For instance, the housekeeping department of Wynn Las Vegas is using mobile phones to train their employees. When the housekeeper is not very clear about how to make the bed or how to put everything in a room, he or she can check the training video on the phone immediately and learn almost everything, over and over again if necessary, instead of checking the printed training manual or asking coworkers. Another example is that a lot of computer-based check-in systems, such as Check-Inn, Hotel 5000, and MICROS that replaced the original paper one, have been used for hotel front desk in recent years. However, faced with so many different kinds of applications that involve HCI, how should a

hospitality manager choose? What are the criteria to consider? In addition, the current practice

of HCI in the hospitality industry is an under-researched topic. Thus, to achieve the goal of

satisfying guests and effectively training employees when purchasing technologies, exploring

applications involving HCI within the hospitality setting is essential.

Constraints

One of the objectives of this paper is to gather and group the existing examples of HCI

applications from the hospitality industry and other industries. However, sometimes it is

difficult to gather the numerical examples of HCI applications among those businesses due to the

company privacy issues. For example, a hotel business would not be willing to share the internal

training method that using the HCI technology to the public.

In addition, there are thousands of applications that involve HCI. However, the study

will have to focus on a few most commonly used technologies that involve HCI in the service

industry setting.

Glossary

Human-Computer Interaction (HCI): Te'eni (2006) stated that "HCI is a design that

should produce a fit between the user, the machine, and the required services in order to achieve

a certain performance both in quality and optimality of the service" (p. 205).

PART TWO

LITERATURE REVIEW

Introduction

A review of important factors of the interaction between human and computers will help to explore applications of human-computer interaction (HCI) within the hospitality workplace. First, the definition of HCI must be clarified since there is no consensus on the exact definition of HCI applications within the service industry. Then, why and how people interact with computers in order to accomplish their personal goals and work must be described. For example, what are the interaction factors and constraints on the users' side?

Service industry researchers have identified that the customers' perception of service quality is a critical element that determined the nature of the service encounter between customers and the human or computer service provider. The quality of service may be highly undermined by purchasing a poorly designed HCI. If the computer action is not in tune with the service command, problems will occur resulting in frustrated customers and angered employees (McBride & Eleltagi, 2004). Thus, the applicability of HCI design within the hospitality workplace and considerations for successful implementation will be reviewed. For instance, what factors pleases or annoys the users, what makes HCI a satisfying experience or an experience that users do not want to repeat, and what makes the interaction usable and efficient? This knowledge is the foundation of HCI development. This literature review will provide information needed to address these questions. First, the general definition of HCI and the definition of HCI for the purpose of this paper that based on the service industry will be given. Second, the literature review will describe several aspects of HCI application in the workplace.

Finally, some concerns of standards for the implementation of HCI and the implementation of HCI in the hospitality workplace will be described.

Review of HCI definitions

General definition of HCI

HCI is an important topic in the studies of both computer science and human subject. HCI itself has over the last 20-25 years appeared as a concentrated research area with professional organizations, such as the Association for Computing Machinery Special Interest Group on Computer Human Interaction (ACM SIGCHI) and the Institute of Electrical and Electronic Engineers (IEEE) Computer Society.

Back in the 1970s, HCI was also called user interface or man-machine interface (Hakansson, 2005). By the mid-1980s, many researchers have provided different understanding of HCI. For instance, Tufte (1989) stated that HCI can be viewed as two powerful information processors, which are computer and human, that attempting to communicate with each other trough a narrow-bandwidth, highly constrained interface. Another opinion was given by Long & Dowell (1989) that HCI is the design of humans and computers interacting to perform work effectively. However, there was no general agreement upon the definition of HCI until ACM SIGCHI (1996) defined it as a discipline that concerned with the design, evaluation, and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them.

HCI involves many academic fields, such as the computer science, social and organizational psychology, human factors, engineering, interaction design, artificial intelligence, and anthropology. Researchers from different fields of study have varied opinions on the meaning of HCI. From a designer's perspective, Dix, Finlay, Abowd, and Beale (1998)

indicated that HCI involves the design implementation and evaluation of interactive systems in the context of the users. Danino (2001) also pointed out that HCI is the study, planning, and design of what happens when you and a computer work together. Psychologists may agree that psychological theories and methods can support setting stage for a better interface design and that interface design will reciprocally provide detailed practical domain in which to criticize and develop psychological theories (Carroll & Thomas, 1982). In addition, Stephanidis (2001) provided a comprehensive understanding of HCI that it is concerned with the design, implementation and evaluation of those interactive computer-based systems, as well as with the multi-disciplinary study of various issues affecting this interaction.

Definition of HCI in the context of service industry

The study of HCI generally has two starting points: the technology-driven and the user-concentrated design. From a computer science perspective, the focus is on technology because it runs the design of the interface which gives humans (users) the performance of the system; from a human perspective, the focus is on the users because they put demands on the functionality of the interface which runs the design of the technology (Hakansson, 2005).

Service industry is labor-intensive, which means it requires substantial labor relative to capital. It provides service to customers rather than goods. Thus, the analysis of HCI issue in service industry will focus on the human side. Based on the literature of HCI from different researchers, the author will define HCI within the context of service industry as the study of how employees and guests of service industry communicate with computer systems and how computer systems respond to the users. HCI, as the name implies, consists of three parts within the context of service industry: the user, the computer, and the ways they work together, which also called the interaction.

The user. The human or the user of HCI could be varying in the service industry setting. The most common example is a hotel guest as the user to book airline tickets and hotel rooms online. Another example is a front desk staff as the user to check-in and check-out hotel guests, using the paperless computer system. Indeed, the user is not limited to a single guest or employee; it could be a group of people who work together. Danino (2001) pointed out that the user of HCI is whoever using technology to try to get the job done. Thus, the user of HCI in the service industry setting will be any employee or guest, or a group of people who use computer technology to get their jobs done.

The computer. With the development of technology, the form that human interact with computers is not limited to the shape of a computer; it actually is the user interact with any device that installed with computer systems, such as the paperless check-in and check-out systems for hotel front desks, the menu order systems in restaurants, and even the applications of hospitality training programs that installed in mobile phones. Thus, the computer of HCI refers to any technology that involves from desktop computers to generalized computer systems; even an embedded system or an information processing engine can be viewed as "computer" (Danino, 2001). For example, when a guest is booking hotel rooms through hotel website, then the hotel website itself would be considered as "the computer" in HCI.

The interaction. Lew, Sebe, and Huang (2007) stated that humans generally interact with each other through speech, but sometimes also with body gestures to display an emotion or to emphasize a certain point of view. However, the non-cognitive effects of a computer system on the user must be taken into account, because humans always have a strong tendency to react on a computer in similar ways as they respond to the virtual world (Reeves & Nass, 1996).

Due to advancements in the technology of HCI, many application systems that used for service industry have implied varied devices which can be used together to input expressions. For example, the sensory perception and interactive input devices include speech recognition, keyboards, and touch-sensitive screens; the output devices include the printers and visual display; wireless devices such as the application of wireless internet; and the virtual reality devices.

<p style="text-align:center">Foundations of HCI applications</p>

The focus of this part is on how human interact with computers. The field of HCI continues undergoing fast changes with the development of new multi-sensory user interface and metaphors. Smart devices, information processing engine, and large interactive displays have become more permeate (Gouin & Lavigne, 2010). It has been widely accepted that the use activity has three interaction levels: physical, cognitive, and affective. The technology is developing so rapidly that HCI is now attempting to combine the generally accepted interaction methods together with the other advanced technologies such as animation and networking (Karray, Alemzadeh, Saleh, & Arab, 2008). The new advances can be categorized in three aspects: wireless, wearable, and virtual reality devices. The paper will focus on reviewing the generally accepted aspects of interaction.

Physical

Te'eni, Carey, and Zhang (2007) in their book pointed out that the physical aspect combines the study of human body mechanics and physical limitations with industrial psychology to reach a fit between human and computer and accordingly improving the performance and the user's well-being. They also stated that there are basically three performance-related goals of physical engineering: 1) to improve the human ability to handle

<p style="text-align:center">9</p>

demands of the work situation; 2) to improve quality of performance, such as reducing errors and time required to complete tasks; and 3) to improve end user acceptance of the system.

Moreover, the existing physical technologies for HCI generally can be organized by input, output, and other devices. Among them, input devices are the most obvious interactive technologies (Te'eni et al., 2007). These devices are generally organized around the human senses including vision, audition, and touch.

Vision. Vision is an important aspect in computer usage. It is the human process of seeing and comprehending objectives (Te'eni et al., 2007). For example, the size of the characters, the color of the foreground and background on the screen, and the angle and brightness of screen are all aspects of vision that may affect the interaction between users and computers. The devices that rely on vision are widely used. Among them, input devices include pointing device, such as mice, touch pads, and pen-based input, and switch-based devices, such as keyboard; the output devices include visual displays and printers (Te'eni et al., 2007).

Audition. The sense of hearing also plays an important role in human performance. Speech recognition is generally considered as the ability of computer to recognize human speech, usually with an audition device. Those difficult-to-build devices require advanced technologies to narrow the gap between human and computer. Alarms, beeps, and turn-by-turn navigation commands of a GPS device are common examples (Karray et al., 2008).

Touch. The sense of touch helps human beings understand the world at large. Touch is extremely important for the visually impaired. The keyboard and other direct manipulation devices such as the mouse have some relation to touch (Te'eni et al., 2007).

Cognitive

The cognitive aspect of interaction deals with ways of human understanding and interacting with computer systems. Cognitive engineering is a discipline that applies the combined knowledge of cognitive psychology and information technology to the design of artifacts. It aims to reduce complexity of interaction (Te'eni et al., 2007). Generally, cognitive performance is the speed and accuracy of the information-processing task.

Affective

Affect refers to psychological processes and states including feelings, emotions, attitudes, satisfaction, and affective impressions. The affective aspect of interaction attempts to make the interaction with a cheerful experience and to affect the user to continue using the machine by changing their attitudes and emotions. Affect and cognition can hardly be separately treated because both affective and cognitive processes generate attitudes. At the same time, attitudes can be seen to affect the formation of emotions (Te'eni et al., 2007).

<div align="center">

Implementation of HCI in the workplace

</div>

This part of literature will focus on the applicability of HCI design and considerations for successful implementation of HCI in workplace. To understand what the good characteristics of a well-designed HCI are, the goals of HCI should be reviewed first.

Goals of HCI

Stephanidis (2001) pointed out that a main concern of HCI is to ensure "ease-of-use", operability, discoverability, simplicity, safety, utility, effectiveness, efficiency, accessibility, usability, and flexibility. Te'eni et al. (2007) also stated that HCI should be designed to achieve a fit between the user, computer, and tasks so as to optimize the human resources needed to accomplish the task, and it should do so for a given context. In addition, they presented that a well-designed computer interfaces must consider human limitations and the physical

characteristics of vision, audition, touch, and motor-related activities. Moreover, computer interfaces, such as screens, keyboards, mice, and monitors must all be designed to support improved performance and overcome human limitations.

Quality of HCI

Users are not only interested in designs that grab their attention, but also concerned about what they put into the system, what they get out of the system, and how the whole experience of interaction feels. The users are expecting any computer systems to be usable. Te'eni et al. (2007) stated that usability is the extent to which a system with given functionality can be used efficiently, effectively, and satisfactorily by specified users to achieve specified goals in a specified context of use.

<div align="center">

Implementation of HCI in the hospitality workplace

</div>

A large amount of applications of human-computer interaction (HCI) were used by both employees and guests within the hospitality workplace. Some major hotel chains, including Marriott and Hyatt Corporation, introduced and expanded the management systems that control all hotel operations with a central computer since 1980s (New York Times, 1987). This part will gather and group existing examples of HCI applications within the hospitality workplace to give readers a comprehensive understanding of HCI.

Hotel: Front Desk Operations

The major brands of hospitality industry are interested in clearing long check-in/check-out lines in hotel lobby by introducing the new ideas of paperless check-in, self-service kiosks, and even the online web check-in systems. Many people may remember the big board behind the front desk with all the room numbers on board and keys on chains before hotels have computer systems. The paper-based check-in is time consuming and inefficient. Nowadays,

people have seen a lot of innovations happened to the hotel lobby where new technologies constantly implemented. One important change is the installation of computerized check-in system. Date back to early 1970s, the Westin Hotels and Resorts (then Western International Hotels) developed their own computerized reservation system named "Westron" which became the industry standard in subsequent years (Hospitality Technology Consulting, 1995/1996). With the computerized reservation systems, hotel front desk can easily check the resource of the hotel reservations, record guests' information, and check available rooms. Tourists can easily book hotel rooms through online travel companies and booking systems. This also allows hotels to spend less on expensive labor costs and to maximize room occupancy without wasting a lot of money on advertising. Moreover, it allows hotels to get efficient and rapid feedback form guests, so that hotels could predict the guests' preference and give them customized service.

Starwood first implemented paperless check-in system globally that relies on credit card swipes rather than signed registration cards in 1999. It takes less than one minute to help a guest check into the hotel (Giannak, 2004). The other reason that hotels use paperless is to reduce paper waste. For example, Kerry Hotel, Pudong, Shanghai introduced paperless check-in/check-out system recently. Guests will use stylus pen to sign on a tablet to complete check-in and check-out with the electronic receipts emailed upon check-out from the hotel (Haridasani, 2012).

However, the old computerized check-in/check-out systems used for hotel front desk in today's world are not efficient enough to satisfy hotel guests because people are still experiencing with crowed tourists who waiting in long lines in hotel lobbies. It still needs employees to interact with the machine when guests have to wait in lines. To solve this problem, self-service kiosk has been introduced to hotel lobbies in recent years. Hilton implemented about 100 self-service kiosks in its hotels in the year of 2004 (Giannak, 2004). The check-

in/check-out kiosks help hotel guests to view their reservation and to get the room key; by the end of their stay, guests could also view and confirm their bill and print the receipt (Avery, Good, Harper, Fincher, & Grove, 2008). These hotel check-in/check-out kiosks increase guests' satisfaction by reducing waiting time. In addition, the kiosks are usually connected to hotels own technology platform, allowing guest service agents to provide their guests with value-added services according to their preference. Moreover, with the self-service kiosks, employees' effectiveness can be maximized because the staff would have more time to provide personalized customer service (Avery et al., 2008).

Hilton was also the first one to offer airline kiosks in hotel lobbies in 2004 to enable hotel guests to print boarding passes. The guests can view the airline websites to check in their flights, change seats, and request upgrades by using these kiosks (Giannak, 2004).

Besides the self-service kiosks, a mobile phone check-in system and web-based check-in system are more and more popular among many hotels. Hilton provided mobile check-in system to their loyal guests in 2010; Starwood distributed the radio frequency identification (RFID) keycards to loyalty customers, so that the guests can directly go to the room using card sensor on the doorknob to unlock their room; InterContinental introduced a program that customers can scan an emailed barcode contained in their phone to the door's sensor for entry (Yu, 2010). Radisson allowed their guests to check into any of its branded hotels through internet seven days before arrival (Giannak, 2004).

Hotel: Room Division

The innovation of HCI in hotels rooms or housekeeping department has been around for many years to please hotels guests. One change related to hotel check-in is the use of room keycards. The early hotel room keys were made of brass or bronze along with metal tags. But

this kind of keys were heavy to carry and easy to duplicate, thus increased the possibility of illegal break-ins. Some guests even kept the keys as souvenir thus increased hotel costs to make those keys. In order to prevent burglaries, larger hotels such as Marriott start to use electronic key cards in late 1990s, which enhanced room safety for guests (Beck, 2007). The e-keycards have a magnetic strip which coded by hotel check-in computers and valid for one lock per stay. Although with the same key card, a new guest will have a different code that distributed by computer system. Thus, it is nearly impossible for burglar and illegal break-ins by duplicating a card (Jump, 1998). One of the electronic key cards systems help hotels significantly reduces energy waste by using room key cards switch that located at the main entry door. When guests take out the key cards and left hotel room, the light will power off automatically. Also, the guests will never worried about losing track of their key cards again since they needs their key cards to power the lights (Lighting Controls Association, 2007).

However, some drawbacks of electronic key cards system caused inconvenient to hotels and guests. First, the key cards are easily demagnetized when put near by cell phones or other magnetic strip cards. Second, sometimes the key cards do not work when they encoded incorrectly or swiped the wrong way. Third, the locks won't open when they are out of batteries (Kohler, 2012). Moreover, guests worried about ID theft when their private information is encoded (Bosworth, 2006). In order to provide more convenience, some hotels start to try new room key programs, such as smart phone check-in program. This program integrates check-in procedure and room key system. Guests can just scan the barcode contained their phone on the door sensor to unlock the door instead of using a real key (Yu, 2010). However, this is still not an ideal room key especially when guests lost their phones.

With hotel guests expecting a luxury home experience, hotel operators complete premium accommodation with installation of high technology in rooms. For example, the Aria Resort & Casino Las Vegas installs the Control4 system, a remote control system displayed by room touch panel. Guests can control everything with just one-touch. Guests can play audio through connecting personal media devices to audio/visual connection panel; adjust room temperature and lights; request cleaning services; view room bills and check-out; check flight schedule; open or close the curtains in room; and set up a customized wake-up event such as wake up by opening the curtains or turning on the lights at a specific time (Home Theater Review, 2009).

Restaurant: Food Ordering

Similar as hotels, restaurants are also constantly introducing new technology. Although people experienced with face-to-face interaction when ordering food in most restaurants, some fast food restaurants such as McDonald's and Jack-in-the-Box installed self-service food ordering kiosks several years ago. The self-service food ordering kiosk is based on computer system that allows customers to order food directly and to pay checks themselves, using a touch screen with no employees involved (Tanneeru, 2010). After an order is placed, customer would wait for the order number to be called to get the meal. According to Fox News (2004), McDonald's has introduced such kiosks in the year of 2004, reducing the ordering waiting lines. Jack-in-the-Box also offered self-service kiosk in 2010 not only to reduce the waiting line but also to cut labor cost (Shulman, 2010).

The online food ordering website allows customer to place an order with a local restaurant or a food cooperative (Wiki, 2012). Some of these service websites make frequent ordering convenient by encouraging customers to keep accounts with them. Many restaurants use their own websites providing online food ordering as an alternative to help them provide

more convenience to customers and expand business. For example, Pizza Hut in 2007 offered online ordering that allows customers to create "pizza playlists" with their favorite pizza orders for future visits (PizzaMarketPlace, 2007); Papa John's International announced that its online sales were growing from $21.4 million in 2001 to $400 million in 2007, a big increase (Kuban, 2008).

With growing trend of using iPad, some restaurants are also considering using iPads to order food. For instance, at Chicago Cut Steakhouse, Chicago, servers carry iPads with wine menus, containing detailed introductions and images of the products. Servers at Jose Garces' Jaleo at the Cosmopolitan Hotel, LasVegas, also use iPads for wine and cocktail menus (Levin, 2011).

A more recent innovation of food ordering solution introduced is restaurant e-tablets, such as MenuPad and eTab software. It allows customers to order and to pay at their tables through the touch screen computer. ETab uses a digital-menu interface wirelessly connect table to the restaurant's staff and point-of-sale system (Hospitality Technology, 2011). It gives customers comprehensive understating of menu by providing abundant pictures of varies dishes; lets customers control ordering and paying time; and reduces restaurant order errors. In addition, the system accepts either cash or credit card payment and allows splitting bills, with receipts directly emailed or printed for customers (Liddle, 2011). Moreover, restaurant could easily remove or add items to menus according to operation needs.

Restaurant: Shift Scheduling

Scheduling employees' work shifts perhaps annoy many restaurant managers, who may spend a lot of time on it but still get unsatisfied employees. However, there are some software such as RestaurantScheduler (2010) which helps restaurant managers schedule employees' shifts

efficiently at work or home at anytime. The software adopts drag-and-drop technology that allows managers quickly drag and drop employees on the specific shifts and easily change schedules. It can also automatically assign employees to available shifts. Moreover, it reduces communication errors between managers and employees by providing an online platform to record the employees' special request for managers (RestaurantScheduler, 2010).

Casino: Gaming technology

The Cosmopolitan of Las Vegas opened in December of 2010 with sbX Experience Management System, a server-based slot gaming system developed by International Game Technology (IGT) (Stratton, 2010). Before sbX, casino slot technicians would spend hours going from one machine to another and individually change computer chips and slot machine theme programs. With sbX system, casino operators can easily download variety of game themes from the sbX sever network to individual electronic gaming machine. In addition, the system can distinguish the most popular games on the floor by tracking playing data from each machine and player. With the analyzed data reports, casino can effectively advertise to the target slot machine players.

Conclusion

The literature review presented the general definition of HCI and provided a definition of HCI in the service industry setting by giving detailed descriptions of three aspects of HCI: user, computer, and interaction. To help the readers better understand what HCI is and how human interact with computers, the literature also viewed three aspects of interaction levels: physical, cognitive, and affective. Among them, the physical aspects of interaction generally can be organized around the human senses including vision, audition, and touch. Cognitive deals with

understanding between human and computer. Affective refers to making the interaction between human and computer system a pleasurable experience.

In addition, the review has shown that the goal of HCI is to achieve a fit between the user, computer, and tasks so as to optimize the human resources needed to accomplish the task, and it should do so within a given context (Te'eni et al. 2007). Also, the usability is an important criterion to evaluate the quality of HCI. Moreover, this part presents many existing examples of HCI applications within the hospitality industry, giving readers a clear understanding of the concept of HCI.

PART THREE

Introduction

Hospitality industry is a service-oriented and labor-intensive industry. As its main product is the service that delivered in person to its guests, maintaining good host-to-guest relationship is essential for this industry. Service capabilities could be maximized by using the Human-Computer Interaction (HCI) applications. However, with so many different kinds of digital tools on the market, it is difficult to decide which one to choose. In addition, users of HCI may be frustrated by the gap between the user's request and the computer system's response.

This paper provides readers a comprehensive introduction of HCI applications within the hospitality industry. First of all, with the literature reviews of the concept of HCI in other fields of study, this paper gave a detailed definition of HCI based on hospitality industry. Second, this paper gathered and grouped the existing examples of HCI application within hospitality industry for readers to better understand it in different stages and different roles. Part Three of this paper identifies some standards and design considerations of HCI applications within the hospitality industry as guidelines for hospitality management when purchasing a HCI application. The purpose of this paper presented in Part One will thus be accomplished.

Guidelines

Based on the concept of HCI and the existing examples of HCI applications within the hospitality workplace, a well designed HCI application should have some characteristics, which are listed below, for hospitality management to consider:

Safety – the HCI application should not only keep physical safety of users, hardware, and software, but also keep data entry security.

It is important that a HCI application is safe to use. First of all, hospitality properties should provide safe environment for their guests. That is the basic requirement for a hospitality property. Then the HCI applications that placed in the hospitality properties should be safe to use. Also, the HCI application should keep personal and private information of the user secure. For example, before giving a room key card to a guest, a hotel should make sure that the card is not duplicable by others to use. When installing a self-service check-in kiosk to hotel, the manager should make sure that the kiosk could keep guests' personal information confidential. Names, addresses, and credit cards information must not be stolen.

Efficient – the HCI application should not be time wasting, especially for employees.

Hospitality management is choosing more and more efficient HCI applications within the hospitality workplace. Efficiency means that when using the HCI machine, the user can complete the same task with less time, reduced errors, and improved quality. For instance, The Cosmopolitan of Las Vegas uses IGT Tournament Manager application to streamline its slot tournament operations. The system is designed to be efficient by allowing players to self-register for tournaments through self-service kiosks and offering an automated method for recording scores and reporting (IGT, 2009). This helps casino to run more tournament sessions and reduces labor cost and operator errors.

Convenient – the HCI application should contains useful functions.

A well designed HCI application should integrate useful functions. For example, when a hotel guest uses the self-service kiosk to check-out from a hotel, he or she might also want to check the flight information at the same time. Thus, a kiosk that integrates the check-in/check-out, flights information, and may be a map is better than the kiosk contains just one function. The control panel is another good example that takes convenient into consideration by

integrating various functions such as TV remote controller, air conditioning controller, and lights switches on the device. The Aria and The Cosmopolitan of Las Vegas are good examples of using such advanced in-room technology.

Physical design – the HCI application should be attractive, easy, and comfortable to use.

A well-designed HCI application should achieve a fit between human characteristics of vision, audition, touch, and responder-related activities and the machine (Te'eni, Carey, & Zhang, 2007). It should also take into consideration of human limitations and psychology. That is, computer interfaces such as mice, screens, keyboards, any output devices, and synthesized sounds should all be designed to support improving user performance and overcoming human limitations.

Attractive could be accomplished by a colorful display screen, funny sound, or a vivid animation. For example, housekeeping employees may not be willing to read the printed training manual to learn to make the bed. It is time consuming and inefficient. Instead, employees may be much happier to watch a video with a real person or an animation to introduce all of the regulations or requirements.

Easy to use means it is simple for the user to understand how to use or control the HCI application. Sometimes people are not willing to use a new technology because they are afraid of others laughing at them when they do not understand the prolonged instruction of how to use it. Especially for the senior people who do not grow up with computers. Simplicity is a must for the instruction of HCI application.

Comfortable means that when operating a HCI application, the user will feel well both physically and mentally. For example, the words of a display screen should not be too small to

read; the color should not be too dark or too bright to look; or the sound from the machine should not be too noisy to hear.

Table 1 shows the guidelines for physical characteristics of HCI applications concluded by researchers and authorities, which are applicable for hospitality industry (Te'eni, Carey, & Zhang, 2007):

Table 1

Guidelines for Physical Characteristics of human-computer interaction applications

Vision Displays
Characters in displays must be readable from a distance that is representative of the normal range;
The typical height of a single screen character for a word processor is approximately 5 mm;
The width of a character should be 3/5 of the height;
Fonts should ne as simple as possible; Fancy fonts may lead to difficulty in understanding;
Character definition should be as sharp as possible without leading to eyestrain;
Characters should sufficiently contrast with the background;
There should be adequate space surrounding each character;
Highlighting should facilitate the task and not be distracting;
Levels of intensity should not lead to fatigue;
Underscoring should be used appropriately;
Attention devices such as blinking and serve video should be used sparingly;
Displays should be relatively inert; Excessive movement and change in placement is distracting;
Displays should read from left to right and from top to bottom in order to conform to natural tendencies (assuming cultural);

Navigation within the screen and form screen to screen should be consistent and easy to understand;
The display rate should be fast enough to combat frustration but not too fast.

Audition Messages
The message should be short;
Auditory messages are useful when a response is time-critical;
Auditory messages are useful when the user's visual field is overburdened;
Auditory messages are useful when the user is already focusing visual attention elsewhere;
Auditory messages should be of high enough frequency and intensity to be heard by the user but not so high and intense that they annoy the user;
The auditory message duration is important. If the message is designed to alert the user to perform some action, the message should continue until the user adequately performs the task or turns off the sound manually;
Modulated sound will attract more attention than a continuous sound.

Touch Devices
The keyboards should afford tilting, be separable from the display and be easy to use without causing fatigue in the arms or hands;

Note. Adapted from "Human Computer Interaction: Developing Effective Organizational Information Systems," by D. Te'eni, J. Carey, and P. Zhang, 2007, p. 73-77. Copyright 2007 by John Wiley & Sons, Inc.

Sustainable – the HCI application should consider of environmental issues.

With increased consciousness of protecting environment, more and more people are choosing to use devices that are environmental friendly. The good examples of applications that applied the concept of sustainable within the hospitality workplace are the paperless check-in

method and the hotel room control panel. These HCI applications save energy and help reduce paper wasting, which also reduces operating expense and attracts environmentally-conscious customers.

Multicultural – the HCI application should respect and consider multicultural background of the users.

The invention of Internet makes much closer relationship among people around the world. Nowadays people have more opportunities to go out of their home country for traveling, studying, and working. Many multinational hotel chains would like to provide customized service that involves cultural issue to satisfy their guests. The Bellagio Casino and Resort on Las Vegas Strip decorates Chinese style garden every year to celebrate Chinese New Year, attracting many international tourists to visit. Likewise, a well-designed HCI application should consider multicultural background of its users. For instance, MGM Resorts International has different language selections available on its properties' websites to benefit customers from all over the world.

<div align="center">

Conclusion

</div>

From the existing examples of HCI applications that implemented in hospitality industry, it is obvious that most leaders of the business, such as Marriott and Hilton, are always interested in introducing the most advanced HCI applications. Well-designed HCI application can close the gap between the user and the machine, thus reduce time wasting and improve work efficiency to make happy and satisfied users.

The guidelines above are very important for hospitality industry. First, the guidelines provide readers better understanding of HCI application. The current practice of HCI is an under-researched topic within the hospitality industry. The guidelines cover most characteristics

of well-designed HCI applications within the context of hospitality industry. Second, the guidelines give hospitality managers some ideas of the best practice of HCI applications and how to choose a well-deigned HCI application for their business or property. They would prevent hospitality managers from paying too high price when implemented a poorly-designed HCI application frustrating customers or employees.

Recommendations

Not all of the characteristics listed in the guidelines are applicable for any HCI application. For example, some of the characteristics such as safety and easy to use are suitable for the self-service check-in kiosk for hotel; and some of the characteristics such as convenient and sustainability are appropriated for hotel room key cards. Thus, when implementing a new HCI application, hospitality managers should distinguish those identities according to their various needs.

The recommendation for further research is to carry out guidelines of characteristics of HCI applications within the hospitality industry that continue keeping abreast of the times. With the rapid development of high technology, the innovation HCI applications that used for hospitality industry are renewed everyday. The guidelines of characteristics of HCI application in this paper are concluded based on the existing examples and products' current development situation as a reference. As for the future invention of HCI applications, there are some new characteristics need to take into consideration.

References

ACM SIGCHI. (1996). *Curricula for human-computer interaction.* Retrieved from

 http://old.sigchi.org/cdg/cdg2.html

Avery, P., Good, D., Harper, T., Fincher, B., & Grove, J. (2008). *Self-service check-in at hotels*

 and motels [Adobe Digital Editions version]. Retrieved from

 http://www.customerfacingsolutions.com/pdfs/FinalHotelGuideSelfServOnlineMag.pdf

Beck, S. (2007). *Start a collection of old hotel keys*. Retrieved from http://voices.yahoo.com

Bosworth, M. H. (2006). *Hotel key cards: Identity theft risk or not?* Retrieved from

 http://www.consumeraffairs.com/news04/2006/10/travel_hotel_keys.html

Carroll, J. M., & Thomas, J. C. (1982). Metaphor and the cognitive representation of computer

 systems. *IEEE Transactions on Systems, Man, and Cybernetics, 12*(2), 107-115.

Danino, N. (2001). *Human-computer interaction and your site*. Retrieved from

 http://www.sitepoint.com/computer-interaction-site

Dix, A. J., Finlay, J., Abowd, G., & Beale, R. (1998). *Human-computer interaction* (2nd ed.).

 Englewood Cliffs, NJ: Prentice Hall.

FoxNews. (2004, June 19). *McDonald's testing kiosk ordering system.* Retrieved from

 http://www.foxnews.com

Giannak, K. (2004). *The great kiosk comeback.* Retrieved from

 http://www.hotelinteractive.com/article.aspx?articleID=3677

Gouin, D., & Lavigne, V. (2010). *Trends in human-computer interaction to support future*

 Intelligence analysis capabilities. Paper presented at the Sixteenth International

 Command and Control Research and Technology Symposium, Quebec City, Canada.

27

Hakansson, M. (2005). *Lecture on human-computer interaction.* Archives of the Intelligent

    System Design, IT University, Denmark.

Haridasani, A. (2012, February). Kerry hotel Pudong Shanghai installs paperless check-in and

    check-out. *Business Traveller Asia-Pacific*. Retrieved from

    http://www.businesstraveller.asia

Home Theater Review. (2009, December). *New Aria Resort at Las Vegas' City Center wired*

    with Control4 automation products. Retrieved from http://hometheaterreview.com/new-

    aria-resort-at-las-vegas-city-center-wired-with-control4-automation-products/

Hospitality Technology. (2011, August 3). *Are printed menus destined to fall by the wayside?*

    Retrieved from http://hospitalitytechnology.edgl.com

Hospitality Technology Consulting. (1995/1996). Hospitality marketing through global

    distribution systems. *HSMAI Marketing Review, 12*(3). Retrieved from http://www.burns-

    htc.com/articles/hospitality-marketing-through-global-distribution-systems.html

IGT. (2009). *Tournament manager: Making tournaments more convenient and profitable* [Adobe

    Digital Editions version]. Retrieved from http://igt.com

Jump, S. K. (1998, October). Electronic cards are the new key to hotel safety. *Dayton Business*

    Journal. Retrieved from

    http://www.bizjournals.com/dayton/stories/1998/10/05/focus2.html

Karray, F., Alemzadeh, M., Saleh, J. A., & Arab, M. N. (2008). Human-computer interaction:

    overview on state of the art. *International Journal on Smart Sensing and Intelligent*

    Systems, 1(1), 137-159.

Kohler, M. (2012). *Fairwind Hotel & Suites is first U.S. hotel to get Cutting-edge Salto Systems, Inc. key lock system.* Retrieved from

http://translationenglishtospanish.net/foll/requi516871puter/tices523170

Kuban, A. (2008). *Papa John's hits online ordering milestone.* Retrieved from

http://slice.seriouseats.com/archives/2008/05/papa-johns-hits-online-ordering-milestone.html

Levin, A. (2011, October). Touch tablet technology in the kitchen and dining room. *Food Service Equipment & Supplies*. Retrieved from http://www.fesmag.com

Lew, M., Sebe, N., & Huang, T. S. (2007). The age of human computer interaction [Editorial]. (2007). *Image and Vision Computing, 25,* 1833-1835.

Liddle, A. J. (2011, August 8). The magic touch: Restaurants embrace operational, marketing benefits of self-service tech. *Nations Restaurant News*. Retrieved from

http://nrn.com/article/magic-touch

Lighting Controls Association. (2007). *Watt Stopper/Legrand's new card key switches achieve energy savings and guest satisfaction for hospitality.* Retrieved from

http://lightingcontrolsassociation.org

Long, J., & Dowell, J. (1989). Conceptions of the discipline of HCI: Craft, applied science, and engineering. In A. Sutcliffe, & L. Macaulay (Eds.), *Proceedings of the fifth conference of the British computer society human computer interaction specialist group - people and computers* (pp. 9-32). Cambridge, UK: CUP.

McBride, N., & Elbeltagi, I. (2004). Service-oriented human computer interaction and scripting. In S. Anabela (Ed.), *Issues of human computer interaction* (pp. 1-20). Hershey PA: IRM Press.

Pizza Market Place. (2007, June 4). *Pizza Hut launches system-wide online ordering.* Retrieved
from http://www.pizzamarketplace.com/article/105486/Pizza-Hut-launches-system-wide-online-ordering

Reeves, B., & Nass, C. (1996). *The media equation: How people treat computers, television, and
new media like real people and places.* Cambridge, UK: Cambridge University Press.

RestaurantScheduler. (2010). *Product information.* Retrieved from
http://www.restaurantscheduler.com/

Shulman, N. (2010). *Self-serve fast food.* Retrieved from
http://www.slashfood.com/2010/04/20/self-serve-fast-food

Stephanidis, C. (2001). *Interfaces for all – Concepts, methods, and tools.* Mahwah, NJ:
Lawrence Erlbaum Associates.

Stratton, D. (2010). *New Cosmopolitan Resort to feature IGT server system.* Retrieved from
http://gamingtoday.com

Tanneeru. (2010, November 30). Re: *What are your opinions on self-service food ordering
kiosks?* [Online forum comment]. Retrieved from
http://www.roadfood.com/Forums/What-are-your-opinions-on-selfservice-food-ordering-kiosks-m625950.aspx

Te'eni, D. (2006). Designs that fit: An overview of fit conceptualization in HCI. In P. Zhang &
D. Galletta (Eds.), *Human-computer interaction and management information systems:
foundations.* Armonk, NY: M.E. Sharp.

Te'eni, D., Carey, J., & Zhang, P. (2007). *Human computer interaction: Developing effective
organizational information systems.* Hoboken, NJ: John Wiley & Sons, Inc.

The New York Times. (1987, September 02). Business technology: Ordering breakfast by hotel

      computer. *The New York Times*. Retrieved from http://www.nytimes.com

Tufte, E. R. (1989). *Visual design of the user interface.* Armonk, NY: IBM Corporation.

Yu, R. (2010, March 10). Smart phones have changed the way we travel. *USA Today*. Retrieved

      from http://www.usatoday.com/travel/flights/2010-03-05-airphones05_CV_N.htm