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Using self-service technology to reduce customer waiting times[☆]

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ABSTRACT

An important perceived benefit of self-service technology has been its potential to reduce customer waiting-times. The purpose of this study was therefore to examine under which conditions the introduction of self-service technology in a service delivery process could reduce actual waiting-times and improve service levels. A simulation study showed that waiting-times and service levels in a hotel check-in process were influenced by the number of resources available to customers, the number of customers arriving to receive service, the processing speed of the self-service kiosk and the failure rate of the self-service kiosk. Specifically, results showed that longer self-service kiosk processing times and higher failure rates led to longer waiting-times, especially when customer demand was high. The authors recommend that service providers considering self-service technology implementation pay careful attention to the design and performance of the self-service technology.

1. Introduction

Waiting lines are a common occurrence in many service settings where capacity is fixed as peak-time demand can exceed the available supply. For example, hotel guests arriving in the evening to check-in may encounter a full lobby, while restaurant patrons may have to wait for a table during lunch time. As waiting lines have been associated with reduced service evaluations (Taylor, 1994), negative perceptions of service quality (Dube-Rioux et al., 1989), and reduced satisfaction (Katz et al., 1991), having to wait makes a customer's first experience of a service is a negative one (Baker and Cameron, 1996; Dickson et al., 2005; Maister, 1985). Consequently, waiting-time reduction has been a major objective of service providers.

Service providers have several strategies available to them to reduce customers' waiting-times. In theory, service providers could eliminate waiting lines by setting their capacity to peak demand (Dickson et al., 2005). However, most of this capacity would remain idle and would result in an unsustainable cost structure. Therefore, a more practical approach has been to use queuing theory and other operations management techniques to find the optimal point where the cost of providing service and customers' waiting-time are simultaneously minimized (Dickson et al., 2005; Hwang and Lambert, 2008; Lambert and Cullen, 1987).

A more recent and cost-effective approach to reduce waiting-times has been to introduce self-service technologies (SSTs) into the service delivery process. SSTs have been defined as technological interfaces that allow customers to produce services without a service employee's involvement (Meuter et al., 2000). For example, hotel guests can bypass the front desk and use a self-service kiosk (SSK) to check-in and receive their key cards without the direct contribution of a service employee (Dabholkar, 1996; Weijters et al., 2007). The simultaneous reduction of waiting-times and operating costs has been used by the self-service industry as a selling point for SSKs (Avery, 2008; IBM, 2009). However, there is no empirical evidence that introducing an SST alternative to the existing service delivery process can indeed help firms reduce waiting-times (Oh and Jeong, 2009).

An intuitive application of queuing theory suggests that adding a resource to the existing service delivery system would increase its capacity and therefore reduce waiting-times (Lambert and Cullen, 1987). Nevertheless, the addition of an SST alternative to the existing service delivery process can transform even the simplest system into a complex one with conditional logic and interactions. For example, a customer wanting to check-in will decide whether to use the SSK based on the lengths of the SSK and service employee waiting lines. The next customer arriving will encounter a different system, based on the previous customer's choice. While research on customer usage of SST has examined what influences customers' choice between service delivery alternatives (Weijters et al., 2007),

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the effect of this choice on system waiting-times is unclear. Similarly, previous research has examined the impact of SST failures on customers' satisfaction (Reinders et al., 2008; Weijters et al., 2007), but not their impact on system performance.

The purpose of this study was, therefore, to test if the introduction of SST in a service delivery process could reduce actual waiting-times and improve service levels. This study extends the SST literature by investigating whether a commonly held assumption of SST implementation holds true. This topic is particularly relevant for the hospitality industry. Self-service check-in in hotels has recently received attention in both the academic (Oh and Jeong, 2009) and practitioner literature (Avery, 2008). Furthermore, the 2010 Hospitality Technology SST survey found that 94% of responding hotel managers wanted to implement SST to improve customer satisfaction (Blair, 2010) while 68% of customers believed SST would reduce waiting lines, making this a timely topic for investigation.

2. Background of the study

2.1. Customer waiting-times as a source of dissatisfaction

Waiting-time is a well-documented predictor of perceived service quality and customer satisfaction. Evidence supports relationships between actual waiting-time, perceived waiting-time, perceived service quality and customer satisfaction (Baker and Cameron, 1996; Davis and Maggard, 1990; Hui and Tse, 1996; Katz et al., 1991; Taylor, 1994). However, customer satisfaction and perceived service quality have been found to be most strongly influenced by actual waiting-times (Durrande-Moreau, 1999). These findings were upheld in contexts as diverse as airports (Taylor, 1994) and fast food restaurants (Davis and Vollman, 1990). Consequently, in order to improve customer satisfaction and perceived service quality, service operators have focused their attention on decreasing actual waiting-times through the use of operations management techniques.

2.2. Operations management approaches to waiting-time reduction

While waiting lines mostly occur at peak times, they can appear at any time when the demand for a service exceeds the capacity of the process to provide it (Krajewski et al., 2009; Lambert and Cullen, 1987). Several operations management techniques have been used to examine the relationship between resources and waiting-times. For example, Lambert and Cullen (1987) used queuing theory to determine the number of resources needed to achieve an acceptable waiting-time. In a different context, Hueter and Swart (1998) used simulation-based modeling to determine the optimal labor schedule that will provide a desirable service level.

2.2.1. Queuing theory

Queuing theory is an analytical approach to system performance analysis (Gautam, 2008; Lambert and Cullen, 1987). Queuing models are particularly appropriate when an analyst wants to quickly compare several what-if situations, determine the best course of action for a given set of parameters, or gain insights into the relationship between arrival and processing times (Gautam, 2008). From a practical perspective, service operators can use queuing theory to examine whether the staffing, facilities, and equipment of a service facility are sufficient to serve customers within a reasonable length of time (Lambert and Cullen, 1987). For example, Lambert and Cullen used queuing theory to examine whether including an SSK could help reduce waiting-times in a hotel check-in context and found that adding a SSK could eliminate waiting lines.

While queuing models can be used to study a variety of system configurations (including single station and multi-station settings, single server and multiple server systems, exponential and general arrival and processing distributions, situations where customers are not patient and either balk or renege on service; Gautam, 2008), they have a number of limiting assumptions. For example, queuing models cannot accommodate conditional logic and interactions in a system (Harmonosky, 2008). Also, queuing models only give information about a process when it exhibits steady-state behavior after initialization effects have worn off, an assumption that is untenable for many hotel processes (Kelton et al., 2007). Consequently, in the context of hospitality services, researchers have frequently turned to simulation as a way to investigate the relationships between capacity decisions and waiting-times under a more valid set of assumptions.

2.2.2. Simulation

A simulation is a model of the operation of a real-world system for the purpose of evaluating that system (Goldsman, 2007) and is useful when analyzing systems that are too complex to be analyzed using analytical models such as queuing theory (Law, 2007). Like queuing theory, simulation allows the researcher to experiment quickly and efficiently (Goldsman, 2007) and maintain tighter control over experimental conditions than if experimenting with the system itself (Law, 2007). Simulation also allows experimentation with lower risk and at lower cost (Sanchez, 2007; Thompson and Verma, 2003).

In the context of hospitality services, simulation has been used to examine the impact of changes in staffing, facilities, and equipment on performance measures of interest to service providers. For example, simulation has been used to reduce labor costs by improving schedules at Burger King restaurants (Swart and Donno, 1981) and to analyze parking lots and traffic configuration for Taco Bell sites (Jaynes and Hoffman, 1994). Simulation has also been used to evaluate possible table mixes for restaurants (Kimes and Thompson, 2004; Thompson, 2002), table assignment policies (Thompson and Kwortnik, 2008) and reservations policies in restaurants (Lambert and Lambert, 1988b) as well as hotels (Lambert and Lambert, 1988a; Lambert et al., 1989).

Simulation has also been used extensively to examine the impact of operational changes on customer waiting-times. For instance, simulation was used to examine the impact of changing line configurations and of adding an extra service employee on customer waiting-times in a restaurant (Chou and Liu, 1999), to determine the distance between the drive-thru ordering window and pick-up window that would minimize customer waiting-time at Burger King (Swart and Donno, 1981), to determine the minimum staffing required to meet a pre-specified customer service level at Taco Bell (Godward and Swart, 1994), and to examine the interactions of restaurant resources (tables, servers and cooks) on waiting-times in a multi-stage restaurant (Hwang and Lambert, 2008).

Simulation, like other operations management techniques, has thus allowed service operators to examine the trade-offs between the cost of providing service and customers' waiting-time (Hwang and Lambert, 2008; Paul and Stevens, 1971), effectively helping them balance operational concerns with marketing promises (Kwortnik and Thompson, 2009). Simulation is therefore well suited to examine the assumption that SST can reduce waiting-times, a selling point put forward by the SSK industry (Avery, 2008; IBM, 2009).

2.3. Self-service technologies

Service providers such as hotels, restaurants, and banks, are increasingly using SSTs to supplement or replace their