

EXAMINING SELF-SERVICE KIOSKS IN QUICK-SERVICE RESTAURANT SETTINGS

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Research is needed that examines the effects of kiosk technology on restaurant operational performance measures, such as total sales. The study employs a 2X2 between-subjects field experimental design to empirically test the hypothesized relationships proposed in the research model. The data collection site was Burger King located in the student union of a large Tier 1 research university in southwest USA. The independent variables included ordering method (kiosk vs. cashier) and operational volume (peak vs. off-peak). The dependent variables were cognitive and affective attitudes, behavioral intention, satisfaction, sales per person, and order time. Consumers at Burger King were approached before they started ordering their meal to ask for voluntary participation. If they agreed to participate, they were randomly assigned into two test groups. Participants in one test group used kiosk technology to order their meals, while those in the other test groups spoke with a cashier to order their meals. The same number of participants were recruited from peak and non-peak volumes. The seconds used to order was observed and recorded after consumer engagement with the ordering method. After participants ordered, they completed a paper survey that measured their behaviors while ordering with each method and asked participants to indicate total purchase amount. Results of 192 surveys indicated to different extents that consumer behaviors were more positive with kiosk technology. Affective attitude results, however, were insignificant. On average, kiosk technology was found to be a faster method of ordering in quick-service restaurants, but it yielded less sales than when the consumer ordered from a cashier.

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By

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CHAPTER 1

INTRODUCTION

1.1 Problem Statement

Almost 30 years ago, research demonstrated that technology, demographics, and lifestyle patterns were dramatically affecting the restaurant industry (Goeldner, 1992). Technology applications are proven to improve merchandising and marketing for restaurant organizations and also to enhance the guest experience (Beldona, Buchanan, & Miller, 2014; Jin, Line, & Merkebu, 2015; Kim, Christodoulidou, & Choo, 2013). Technology applications, providing innovative solutions to operational demands, offer empirical evidence that they could improve successful capitalistic endeavors for decades (Burns & Stalker, 1961; Schumpeter, 1934). Technology innovations is rapidly evolving and changing the way operators conceive, develop, and deliver their services (Meuter, Bitner, Ostrom, & Brown, 2005).

The National Restaurant Association reported in 2018 that earnings and employment in the foodservice industry grew in the past year, in addition to having grown for over a decade, and are expected to continue to grow in the following six months. With the industry in regular growth and demand, operators continue to seek innovative solutions to cut costs. Rising minimum wages in states across the nation are impacting the restaurant industry (Foodable Network, 2018). Foodable Network (2018) also reported some major quick-service chains are utilizing new technology in their restaurants to alleviate their labor costs, including Panera, Wendy's, McDonald's, and Jack in the Box. Even if kiosk technology reduces labor cost, it remains to be determined if kiosk technology will generate more sales than employing a cashier might. Quick-service chains are not the only ones beginning to utilize kiosk technology. QSR Magazine (2018 March) reported that Subway is prepared to utilize kiosks in 2018, as are Taco

Bell and Shake Shack. In fact, Taco Bell had kiosk technology in 61 restaurants already, with plans to have them in all locations by the end of 2019 (QSR Magazine, 2018 September).

Kiosk technology is only an option for quick-service restaurants that can afford it. Even for the quick-service chains, it comes at a steep price. Fortune Magazine (2015) states that kiosk technology can cost franchisees a total between \$120,000 and \$160,000. QSR Magazine (2018 September) describes a kiosk business unit manager for a digital display manufacturing company called Peerless-AV, claiming that the typical cost per kiosk is about \$5,000. This price might make it impractical for small businesses. The same kiosk business unit manager cited above is quoted stating that restaurants will see “a significant return on [kiosk technology] investment,” but fails to provide data to substantiate such a statement. Toast Restaurant Blog even states that a kiosk model will see a 5-10% increase in average guest check, but this statement only applies to the kiosk model they were promoting. McDonald’s planned to invest \$2.4 billion of capital in 2018 (QSR Magazine, 2018 March). Furthermore, they are planning have kiosk technology in most of their 14,000 locations by the end of 2020 (Business Insider, 2018) McDonald’s plans to achieve such a task by adding kiosk technology to 1,000 stores every quarter for the next two years, according to CNBC (2018). These represent large sums of investment, with no empirical evidence for kiosk technology providing a return on investment provided.

QSR Magazine (2018) quotes the CEO of a computer technology company named Zivelo. The CEO of Zivelo stated that kiosk technology may improve consumer experiences, and that consumers won’t feel as if “there are people breathing down [their] neck” anymore. However, skeptics might claim that kiosk technology dehumanizes a restaurant experience, even if it is proven to provide a return on investment. In a recent poll, diners were 78% less inclined to go to a restaurant that has kiosk technology (MSN, 2018). Commercial Integrator (2017) reports

about a consumer experience with kiosk technology in a McDonald's location in the Boston area (MacCormack, 2017). The author of the article aforementioned is a consumer, D. Craig MacCormack, and says that kiosk technology is counterintuitive to its purpose of providing for quick services. He stated that the ordering process took him several minutes, all the while two McDonald's employees were standing over his shoulder and behind the counter, seemingly uninterested in helping him navigate the system. Thus, even if kiosk technology may provide a restaurant operator with a return on his or her investment, may it enhance the consumer experience as well, or will it only inhibit it?

1.2 Purpose of Study and Research Questions

New technology is adopted and implemented in operations as a process (Oronsky, Chathoth, 2006). Implementation encompasses the use of innovation and its impact on organizational performance (Brynjolfsson & Hitt, 2000; Fichman, 2000; Zhu & Kraemer, 2005). After investing time and financial resources, restaurant operators must justify their investment on utilizing the innovation for the organization.

This study explored the performance of self-service kiosks in quick-service settings from both consumers' and business' perspectives. A field experiment design was utilized to compare the kiosk ordering method with the cashier ordering method in a real quick-service restaurant (QSR) setting. From the consumer's perspective, the study examined consumer's attitude, behavioral intention, and level of satisfaction with ordering method. From the business' perspective, the study measured sales and waiting time reduction linked to consumers' use of ordering method. These effects were also examined in different operational volumes (peak vs. non-peak). The findings of this study provide insights for restaurateurs that facilitate the

decision-making process for them who are considering whether or not to invest in self-service kiosks. The study addressed four research questions:

1. Will kiosks affect guests' attitude, behavioral intention, and satisfaction in a QSR setting?
2. Will kiosks increase sales per person in a QSR setting?
3. Will kiosks decrease order time in a QSR settings?
4. Will the examined metrics differ between peak and off-peak volumes in a QSR setting?

1.3 Significance of Study

With the evolution of technology referenced previously, and growing popularity of related foodservices, this study offers important implications for restaurant management. Research of technology in restaurant operations is sparse (Ismail, Zorn, Boo, Murali, & Murphy, 2010). Although there are several studies on self-service kiosk applications in the hotel industry (Avery, 2008; Rosenbaum & Wong, 2015; Kim & Qu, 2014; Chen, Yen, Dunk & Widjaja, 2014), studies on the application of kiosk technology in the restaurant industry is lacking. A study that further examines kiosk technology is needed. This study was one of the first attempts to investigate performance of kiosk technology using a field experiment method. It significantly contributes to the existing literature on restaurant technology adoption.

The study also offers strong practical significance. As the primary target audience, restaurant operators are in need of empirical evidence to support their business investment decisions regarding kiosk technology. As indicated by Kincaid and Basolglu (2005), data is not available with regards to the impact of technology on sales in quick-service dining. Prior studies center on examining effects on behavioral constructs. Findings from this study offers empirical evidence supporting QSR operators in their investments of kiosk technology. With data collected

in an actual quick-service restaurant environment, this study provides realistic and meaningful insights for restaurant operators using kiosk technology. The findings of this study may assist restaurant operators in making business decisions, thus offering practical significance.

1.4 Definition of Key Terms

The following definitions are provided to briefly review key terms referenced in the study. They are supported with citations accordingly in the literature review.

- *Consumer attitude* – Consumer’s positive or negative feelings about a product.
- *Consumer behaviors* – Feelings, thoughts, and/or related actions of consumers.
- *Consumer satisfaction* – Consumer’s positive or negative evaluation of a product.
- *Cue utilization theory* – Point of organizational contact with consumers.
- *Demand fluctuation* – Changes in consumer demand.
- *Self-service technology* – Technology enabling consumers to perform service tasks.
- *Self-service kiosk* – Stationary application of self-service technology.
- *Off-peak demand* – Organizational resources sufficiently meeting consumer demand.
- *Operational performance* – Outputs of the operation.
- *Ordering method* – Method used by consumers to order food.
- *Peak demand* – Time when consumer demand is overwhelming organizational resources.
- *Task technology fit* – Technology’s relevance to the task and the environment.
- *Technology performance chain* – Technology utilization and task technology fit.
- *Utilization* – Consumer’s behaviors when using technology.
- *Zone of proximal development* – Individual’s receptiveness to assistance when learning.

1.5 Organization of Study

The thesis is organized into five chapters. Chapter 1 provides an introduction to the topic. It presents the problem that the study seeks to address, its purpose and significance, the research questions, and definitions for key terms. Chapter 2 includes a review of the literature pertinent to the study and includes: self-service technology, self-service kiosks, demand fluctuation and technology usage. It also provides a review of the models and theories used to develop the hypotheses: Zone of Proximal Development, Cue Utilization Theory, and Task Technology Fit. The hypotheses are stated, and research design is presented. Chapter 3 outlines the research methodology. This includes measurement instruments, data collection procedures, and methods for data analysis. Chapter 4 describes results of the study. Chapter 5 concludes with a summary of findings, academic and managerial implications, potential limitations, and recommendations for future research.

CHAPTER 2

LITERATURE REVIEW

2.1 Self-Service Technology (SST)

New technologies can have a dramatic effect on businesses. In particular, SST may result in significant savings for organizations by getting consumers to perform services for themselves (Barrett, 1997; Blumberg, 1994). SST enable organizations to reallocate their human labor to provide more individualized service (Holman & Buzek, 2007). In addition to supporting the organization, SST can help consumers in making more informed purchase decisions by providing detailed product information (Porjes, 2008).

Restaurant operators are beginning to invest in SST to increase consumer satisfaction, as its importance in the hospitality industry continues to grow (Kim, Christodoulidou, & Choo, 2013). SST is defined as technology that enables consumers to produce services without a need for human labor, in which no interpersonal contact is required between the buyer and seller (Meuter et al., 2000). Examples of SST used in the restaurant industry include interactive tablet-based menus, self-service kiosks, and mobile apps (Ahn & Seo, 2018). SST may improve productivity and reduce operating costs (Lovelock & Young, 1979). Potential benefits of implementing SST include: improve service quality, differentiate service (Bitner *et al.*, 2000; Fishman, 2004), increase flexibility of operations, and increase revenue (Minnick, 2007; Bettencourt & Gwinner, 1998; Kim, Christodoulidou & Choo, 2013). Utilized in drive-thru services, SST bolstered drive-thru sales at Subway from 10.5 percent of total sales to 35 percent of total sales (Minnick, 2007).

Implementing SST may create competitive advantages for hospitality businesses (Koutroumanis, 2011). They can improve productivity, cut costs and even enhance some

perceptions of consumer service (Dabholkar & Bagozzi, 2002). An exploratory study by Baloglu and Kincaid (2005) determined that convenience is the most frequent feature of SST in restaurants sought after by consumers. SST enables consumers to customize their orders, and they assist managers as interfaces acquire knowledge about consumers' buying interests and patterns. Upscale restaurants like Chicago Cut Steakhouse have started using SST for wine selection, boosting their wine sales by 20 percent (Rousseau, 2011). Chili's tested different brands of SST and decided to implement Ziosk tablets corporate wide. Ziosk tablets can take orders, accept payments, and offer various games for the consumers. These are to name a few functionalities of this SST. Ziosks also distribute surveys to consumers after payment to capture feedback and to gauge their satisfaction and responsiveness to promotional offerings (Noone & Thomas, 2015). These technologies can transfer more information in interactive manners, enhancing merchandising of food products and restaurant offerings (Beldona *et al.*, 2014). They may also provide accurate information immediately to consumers, improving order accuracy dramatically (Xiang & Zhou, 2006).

Cost of investment in SSTs is high for many independent restaurants, thus these measures may be best used by chain enterprises (Kimes, 2008). Nevertheless, a company must determine the time that is right for them and their budgets (Oronsky & Chathoth, 2006). With many of these systems, they must be updated continually, or totally replaced over time (Yang *et al.*, 2007). Moreover, restaurants may not select and use information technology appropriately (Mills & Feinstein, 2007). Previous research has investigated the impact of technology failures on consumers' satisfaction (Reinders *et al.*, 2008; Weijters *et al.*, 2007). Kokkinou and Cranage (2013) found a need for effective performance and reliability in SSTs. Their findings indicate that restaurant operators need to strongly consider SST processing time. Processing time is

affected by the skills of consumers using the SST, design of the interface, and the number of options offered to consumers. While there is little control of consumers' related skills, limited labor may be needed to assist consumers with this functionality. In summary, operators need to consider the cost of investment, possible operational benefits, and guest reception when deciding to adopt any innovative technology in their operation (Kimes, 2011).

2.2 Self-Service Kiosk (SSK)

SSKs are a type of stationary SST. Some current applications include: airline check-in (Gelderman et al., 2011), hotel check-in (Oh et al., 2011), supermarket check-out (Wang et al., 2012), supermarket self-scanners (Weijters et al., 2007), and automated teller machines in banks (Rosenbaum & Wong, 2015). SSKs are a growing technology trend for QSR chains. This study examines SSKs' performance in QSR settings. An SSK provides consumers with benefits such as speedier services and opportunities for customization and co-creation (Weijters et al. 2007), which may improve consumer perceptions of restaurant image (Ryu, Han & Kim, 2008). An exploratory study (Ivkov, Blesic, Simat, Demirovic, Bozic & Stefanovic, 2016) found restaurant managers were 86% in agreement that customized service offers a new value-based experience for consumers and suggested it would lead dominant trends of the restaurant industry for the next 10 years. Involving the consumer in co-creation has been examined extensively (Ford & Heaton, 2001; Halbesleben & Buckley, 2004; Johnson & Jones, 2004; Lovelock & Young, 1979; Schier, 2004; Slywotzky & Morrison, 2001).

Restaurant organizations may implement an SSK to lower labor costs and increase operational performance (Lin & Hsieh, 2011), eliminating the cashier as a channel of ordering meals for the consumer. Kokkinou and Cranage (2015) found that consumers are increasingly motivated to use an SSK when waiting lines for the traditional method of speaking to a cashier

grows longer. Thus, the consumer may judge an SSK as more convenient than waiting in line to speak to a cashier. An SSK supports the consumer ordering meals more quickly and conveniently (Bitner *et al.* 2000). Some of these systems also save order history; this helps the operator decide which items need to be eliminated, modified or maintained in the menu in order to increase profits (Au Bon Pain, 2008). This also offers the operator an opportunity to offer the repeat consumer customized service and discounts, according to their past order histories, to further support their experience and increase sales.

SSKs may not only reduce labor costs but also waiting times (Avery, 2008; IBM, 2009). When restaurant operators seek to reduce waiting times, they may increase the number of channels for the consumer task of ordering and implement an SSK. SSKs were found to be an effective way to reduce waiting times and improve consumers' resulting satisfaction (Weijters, 2007). There is empirical evidence that waiting lines may negatively impact the consumer's perceptions of value (Taylor, 1994; Dube-Rious *et al.*, 1989; Katz *et al.*, 1991; Pruyn & Smidts, 1998; Tom & Lucey, 1995). When receiving services, first-time consumers find waiting to be a negative experience (Baker & Cameron, 1996; Dickson *et al.*, 2005; Maister, 1985). Consequently, reducing waiting times is often a major goal of restaurant operators. Evidence supports consumer satisfaction and perceived service quality are strongly influenced by waiting times (Durrande-Moreau, 1999). Moreover, these findings were upheld in QSRs (Davis & Vollman, 1990). By emphasizing reduced waiting time, marketers may improve a consumer's willingness to use SSKs (Durrande-Moreau, 1999; Taylor, 1994).

In a study by Prendergast and Man (2002) that examined effects of SSKs in greater detail, they found evidence that supported functional attributes of store image, such as waiting time for service and greater influence on consumer loyalty. Average consumer waiting time is found to

have a causal relationship with the number of complaints and ratings of service quality (Adenso-Diaz et al., 2002). Thus, consumers' perceptions of the brand may be influenced greatly by functional attributes, such as waiting time for service (Bloemer & Ruyter, 1998). This consumer perception of the brand may have an enormous influence on consumers' perceptions of value and satisfaction (Kandampully & Suhartanto, 2000; Patterson & Spereng, 1997; Prendergast & Man, 2002). In retaining consumers, restaurant operators may even create a novel dining experience to support this perception (Jin, Line & Merkebu, 2015). New technology creates an innovative image and supports a novel dining experience, as perceived by the consumer, which generates positive word-of-mouth for the restaurant organization as well (Semeijn, van Riel & Ambrosini, 2004). An innovative image is also attributed to consumer satisfaction and loyalty (Ryu & Han, 2009), indicating a strong relationship with consumers' brand perceptions. Also, consumers' perception of a restaurant as innovative bolsters their intentions to return and recommend it to others (Jin, Line & Merkebu, 2015).

McDonald's uses SSKs in some locations to offer child-oriented content and opportunities for users to photograph or record themselves and others (Kim, Christodoulidou & Choo, 2013). This additional service may support the dining experience. An SSK also allows its consumers to access loyalty programs, increasing their extrinsic motivation with potential promotions and increased convenience (Kim, Christodoulidou & Choo, 2013). Extrinsic motivation is generated by an external reward. Integrating an award with loyalty programs provides restaurateurs with valuable demographic and usage data (Kim, Christodoulidou & Choo, 2013). SelfServiceWorld.com (2012) reported on Gandolfo's Deli restaurant where consumers' participation rate in the loyalty program increased by more than 250 percent after implementing related technology. Furthermore, the consumer is found to favor self-service

transactions and is intrinsically motivated by independent facilitation (Bateson, 1983).

Interestingly, in a study by Dabholkar, Bobbitt, and Lee (2003), consumers considered using SST to avoid interacting with cashiers. Given the panoply of support cited above, SSKs lead to consumer loyalty. SSKs were found to be a direct and indirect determinant of consumers' loyalty in retail store organizations (Lee, Fairhurst & Cho, 2013).

2.3 Demand Fluctuation and Technology Usage

As a restaurant manager attempts to alleviate labor costs by not employing cashiers to take orders, the consumer demand may fluctuate and increase average consumer waiting time. Demand fluctuates by times of the day, e.g. breakfast, lunch, and dinner; or time of the week, e.g. weekdays as opposed to weekends; and seasonally, e.g. holidays or winter and summer breaks from school. Time-series analyses have shown a relationship between productivity at an organization and the related fluctuations are stronger for service industries (Basu et al., 2006; Inklaar, 2007; Kawamoto, 2005; Miyagawa et al., 2006). Morikawa (2012) found productivity was significantly negatively affected in almost all of the examined service industries. In fact, "when demand varies by one standard deviation more, the productivity of the establishment is on average 10%-20% lower" (Morikawa, 2012, p. 256).

Capacity management is the act of aligning sufficient capacity to meet the current levels of demand (Klassen & Rohleder, 2002). Managing capacity is a critical component of fostering effective service quality (Armistead & Clark, 1994). If demand were to suddenly fluctuate, and it is higher than the operation's capacity, the restaurant organization may lose a consumer. Similarly, when the demand is less than capacity, the restaurant organization loses revenue in wasted labor.

Having excess capacity underutilizes available labor, increasing waste and price reductions that are made to increase demand (Davis & Heineke, 2005). Adopting strategies to continually operate at above or near full capacity to utilize demand exposes the restaurant organization to risks of diminishing service quality long-term (Heskett, 1990; Rust, 1996; Kurtz & Clow, 1998). In a study by Heskett (1986), increasing service quality is evident until 75% utilization of capacity after which it drops sharply. Ideally, an organization seeks 40% to 70% utilization of capacity; this was supported by Heskett (1986) who also found service quality diminishes below 40%. In implementing an SSK, a restaurant organization could eliminate the possibility of wasted capacity. A capacity decision reflects a proactive restaurant organization response to current and future market fluctuations (Getz, 1987; Johnson, 1993; O'Reilly, 1986). Implementing an SSK might be conceived as increasing capacity flexibility to respond to fluctuating demand (Schroeder, 2006). Kiosks may create room for error in methods of capacity management, such as the "chase and level strategy." In this strategy, organizations chase fluctuating demand by employing part-time employees or offering flexible working hours (Sasser, 1976).

A restaurant seeks efficiency in two critical stages of the dining cycle: (1) taking consumer orders, and (2) food production. A restaurant seeks efficiency in these stages to competitively retain consumers. When queue lines are long, in either of the two stages of the dining cycle, consumers may exit and be newly captured by competing restaurant organizations. Reducing consumer wait times would lead to greater profits and restaurant efficiency. Curin, Vosko, Chan, and Tsimhoni (2005) examined methods of reducing wait times in a Tim Hortons fast-food chain restaurant. They found that adding another cash register to take orders greatly reduced waiting time for consumers to order their meals. Adding another cash register to the

existing system was deemed clearly profitable, enabling Tim Hortons to serve twice as many consumers per hour. Although, a detailed cost analysis was not carried out in the study, it was clearly evident that “[adding another worker] would result in a relatively quick return on investment” (Curin et al., 2005, p. 2635). Decreased average waiting time was the most impactful out of the methods examined and offered a practical improvement of the existing system. This study does not suggest that a restaurant organization increase its labor cost. However, implementing an SSK would increase queue lines or channels for consumers to order meals, just as employing another cashier would do and Curin et al.’s (2005) study suggests this would result in greater revenues.

This study seeks empirical data to posit a timeline to expect a return on investment of an SSK. In restructuring the labor pool, a restaurant manager might consider transferring this front-of-house labor to food production. With consumers progressing more rapidly in the dining cycle, there would be an increase in consumers waiting on food production (Curin, Vosko, Chan, & Tsimhoni, 2005). This would increase capacity to meet these changes in demand.

2.4 Zone of Proximal Development (ZPD)

First introduced by Vygotsky (1978), ZPD is grounded in education psychology. It’s original application was to children’s mental development, as it is supported with education. ZPD proposes that conditions of subjects’ zones of proximal development will be accorded to their learning capacities (Vygotsky, 1935). For example, if one student were to enter school with a low IQ and a highly receptive attitude, while another has a high IQ and a lowly receptive attitude, these students would exit with roughly the same IQ (Bonzhovich, 2009). The discrepancy between a student’s actual learning capacity, and that of the capacity the student attains when performing tasks in collaboration, is what is termed ZPD (Vygotsky, 1982, p. 247).

“In other words, if instruction is too easy for the student, they will lose interest; if it is too hard, they will become frustrated” (Ferdig, 2006, p. 750). As Salomon (1992) explains it, an intellectual partnership is created with a computer tool. This is recognized as the ZPD whereby learners are capable of completing tasks only because the computer enables them, providing help and support for the learner.

In what may be interpreted as intuitiveness, Salomon (1992) continues to explain that this partnership with the computer tool “can both offer guidance that might be internalized to become self-guidance and stimulate the development of yet underdeveloped skills, resulting in a higher level of skill mastery” (p. 252). Ferdig (2006) analyzed cognitive and affective attitudes and determined technology to be effective in the task that it supported. ZPD has yet to be examined in a business context. The purpose of an SSK is considered to drive revenue. Ferdig (2006) also found technology to be effective in its unintended consequences, such as affective, social, and emotional changes taking place with students. In this study, both kiosks and cashiers are considered assistants while consumers order food in a restaurant. ZPD is applied to compare differences in the zones with different forms of assistance: technology or personal.

2.5 Cue Utilization Theory

A dining experience consists of an array of cues (e.g., food presentation, taste, interior design, menu variety, etc.). The Cue Utilization Theory suggests that consumers create various impressions of an organization, and its brand, derived from these cues (Cox, 1962; Jocaby, Olson & Haddock, 1971; Richardson et al., 1994). Ultimately, consumers are “exposed to a seemingly infinite number of cues” (Berger and Fitzsimons, 2008, p. 2). During the consumer experience, consumers will rely on these brand cues to generate evaluations that determine product quality (Jover et al., 2004; Lee & Lou, 1996; Steenkamp, 1990). Cues examined experimentally include

brand image (Allison & Uhl, 1964; Jacoby, Olson, & Haddock, 1971). These cues can be delineated as either extrinsic or intrinsic to an image (Lee & Lou, 1996; Olson & Jacoby, 1972). Intrinsic cues are those attributes of a product, like taste, while extrinsic cues are only product related, like an SSK for consumers to order meal (Olson & Jacoby, 1972). In product evaluations, consumers rely more heavily on extrinsic cues, rather than intrinsic cues (Dodd et al., 2005; Grunert et al., 2000).

Kao, Hill, and Troshani (2017) found deal popularity to have positively predicted consumers' expected service quality. The study was based on the premise that consumers rely on extrinsic cues to make inferences about the quality of a product or service, with the extrinsic cue in this study being deal popularity of the product offering. Zeithami (1988) describes conditions where extrinsic cues, such as the SSK in a QSR setting, may be relied on by consumers to a greater extent. One of these conditions is described as unavailable intrinsic cues, such as they are often unavailable in QSR settings, being that one cannot taste the food before it is ordered. Restaurant operators seek to establish a conducive store brand to provide an external cue that fosters consumer loyalty.

Roest and Rindfleish (2009) examined cues with regard to their influence on restaurant purchase intention based on consumers' overwhelmingly abundant array of options to dine at restaurants in today's competitive market. These phenomena are referenced as selection burden on the consumer (Iyengar & Lepper, 2000; Schwartz, 2000) and, to reduce this burden, consumers rely increasingly on cues (Dick et al., 1990; Janiszewski & van Osselaer, 2005; Oxoby & Finnigan, 2007; Paulins, 2005).

Typicality cues pertain to a subcategory of the product or service. For example, restaurants are often labeled as quick-service, full service, or fine dining. This definition is based

on research that shows consumers have well-established notions of a product or service based on prior experience evaluating and choosing related offerings (Alba & Hutchinson, 1987; Meng & Elliot, 2008). Roest and Rindfleisch (2009) found significantly positive relationships between service quality and typicality cues. This implies that restaurant brand and marketing managers should focus their efforts on typicality cues in their product design and marketing communications. More QSR chains implement SSKs now than they have done so in the past. Thus, a new typicality of the QSR setting might be developing.

2.6 Task Technology Fit

Information sciences (IS) exists to help end users and organizations make more effective use of information systems such as SSKs being examined. For an SSK to have a positive impact on the operation, the technology must (1) be utilized by consumers, and also (2) be a good fit with the tasks it supports. These criteria use and fit two streams of research supported by the Technology Performance Chain (TPC). The first stream of research about consumer use applies theories of attitudes and behavior, leading to intentions to utilize technology and increased utilization (Bagozzi, 1982; Fishbein & Ajzen, 1975; Triandis, 1980). TPC extends these attributes and is consistent with DeLone and McLean's (1992) model, which considers both utilization and the second related stream of research. Task-Technology Fit (TTF) was only implicit in previous models. In TTF, a technology provides features that directly relate to the task at hand. One might consider it to be the ideal "fit" for the task. The task is defined by Goodhue and Thompson (1995) as the actions that turn inputs into outputs. Vessey (1991) suggested that when there are mismatches between the technology and task, decision-making performance is slowed by requiring additional decision processes.

Schrier, Erdem, and Brewer (2010) examined the TTF model and found significant insights for understanding its complexities. They determined task characteristics and technology characteristics were good indicators of a “fit.” Whereas, in opposing Goodhue and Thomson (1995), individual characteristics of consumers were not a good indicator of a “fit.” The following are examples of previous “fits” with SST. Applying TTF theory, Lin and Huang (2008) found that consumers would use mobile devices to purchase tourism products, because capabilities of the mobile tourism shopping technology matched the needs of the consumer. For example, geo-location abilities of devices enable mobile shoppers to search for offers that interest them in their immediate environment, saving both time and effort. This location information has been identified by Junglas et al. (2008) as matching the technology with the task at hand, implying a strong “fit” and applying the TTF theory. TTF is even identified as an extrinsic motivator for consumers utilizing hotel information systems (Kim, Christodoulidou & Choo, 2013). That is, in the study by Kim, Christodoulidou, and Choo (2013), TTF was found to positively relate to perceived ease of use and perceived usefulness, given the needs of the situation with consumers.

In 2004, Staples and Seddon tested the Technology to Performance Chain (TPC). The methods used in the study examined the TPC model in two settings: (1) voluntary use and (2) mandatory use. This is of interest, because in the QSR setting, it only employs one cash register but utilizes four SSKs. Although an option in the traditional method of ordering is available, it was limited. The findings of the study by Staples and Seddon (2004) apply in this context. Goodhue and Thompson (1995) suggested that the strength of these relationships should vary in the two settings, but they did not test these constructs. Findings in the study by Staples and Seddon (2004) correlated with those of Goodhue and Thompson (1995). That is, a stronger

relationship was evident from TTF than from utilization. Also, findings were congruent for the argument that TTF becomes more relevant as utilization becomes mandatory. This implies a strong need for a “fit” in the context of this study. However, “[Staples and Seddon] did find support for the impact of TTF on beliefs and attitudes regarding use of a system, relationships that Goodhue and Thompson (1995) proposed but did not test” (Staples & Seddon, 2004, p. 30). That is, even in voluntary use settings, a strong “fit” is very important. Furthermore, it was moderately supported that the impact of utilization on operational performance would be stronger than in a mandatory setting. In the study, by offering only one cashier, the QSR setting creates a limited voluntariness for consumers. This is supported in the study by Staples and Seddon (2004) to be conducive to improving operational performance.

Understanding factors in consumer acceptance of technology is essential in improving successful implementation of technology, because it can be costly otherwise (Kim & Qu, 2013). Dishaw and Strong (1999) found that TTF was more effective than TAM for predicting utilization in the work-related tasks, such as submitting orders and processing payments. However, Klopping and McKinney (2004) found that blending the two work-related tasks into an extended model is superior than either one model alone. They also found that TTF affects perceived ease of use but not perceived usefulness. This implies that the SSK needs to be easy to use, greater than it needs to be perceived as useful for the user, in order to have a strong TTF and effect on operational performance. Bagozzi and Dabholkar (2002) indicated marketers should promote ease of use when their target market is likely to have a high need for interaction with a cashier. They also suggested marketers promote SST as fun for consumers.

2.7 Research Model and Hypotheses Development

Originally, ZPD refers to an area of learning that occurs when a person is assisted by a

teacher or peer with a higher skill set. Given the demographics of the contemporary emerging consumer market, ZPD has strong application in supporting consumers' learning to use SSKs while they are in a restaurant to order food. In this current study, the respondents were offered computer aids to order their meals. This is considered a method of collaboration in learning. This study applies ZPD to technology usage in the restaurant environment and posits that, with the help of service technology, restaurant consumers achieve both cognitive and affective development in their dining experience. Multiple studies provide evidence that relates service quality to attitude (Cronin & Taylor, 1992; Parasuramen et al., 1988). In defining attitude, Oliver (1997) describes attitude as a consumer's inclination toward a product based on previous experience. Thus, in examining attitude, the study determined hypothesis one:

H_{1a}: Consumer affective attitude improves upon utilizing SSK in a QSR setting.

H_{1b}: Consumer cognitive attitude improves upon utilizing SSK in a QSR setting.

Cue utilization theory (Olson, 1972) is applied in measuring perceived quality and consumer satisfaction. It postulates that products or services consist of both intrinsic and extrinsic cues that serve as indicators of product or service quality. This study is based on the premise that consumers rely on extrinsic cues to make inferences about the quality of a product or service, with the extrinsic cue in this study being food ordering methods. This study suggests usage of SSKs in the restaurant environment as one of the cues that improves perceived quality, guest satisfaction, and behavioral intention. Therefore, in further examining consumer behaviors, the study proposed hypotheses two and three:

H₂: Consumer satisfaction improves upon utilizing SSK in a QSR setting.

H₃: Consumer behavioral intention improves upon utilizing SSK in a QSR setting.

TTF is a technology theory often used to investigate the impact of technology on performance. It assumes that the good fit between task and technology helps to increase task performance, such as improved efficiency, effectiveness, and/or higher quality (Goodhue & Thompson, 1995). Although an option of traditional method for consumers to order meals is available, SSKs may be perceived as an involuntary method of ordering meals, being that they make for four out of the five ordering methods that are available. The cashier as well, being directed to the kitchen at times, cannot be employed as freely by consumers. These factors place greater emphasis on TTF. Based on TTF, this study proposes that the usage of SSKs in the restaurant environment will increase sales and productivity for restaurants. Hypotheses three and four are presented as follows:

H₄: SSKs improves order time at a QSR setting.

H₅: SSKs increases sales of a QSR setting.

In utilizing an SSK, a restaurant organization will increase the channels for consumers to order meals. An experimental study by Curin, Vosko, Chan, and Tsimhoni, (2005) found that increasing channels for consumers to order meals led to serving more consumers and earning more revenue. With this unutilized labor, a restaurant manager may restructure his or her labor pool to strengthen the resulting increase in food production, thus decreasing waiting times in this stage of the dining cycle. The combined effects will improve order time and increase revenues. Given the masses of consumers during peak volume in the operation, a large quantity of SSKs fit into the environment, where interpersonal interaction with cashiers are not valued as much as consumer independence might be. Thus, this study proposes that the usage of SSKs during peak volume will have a positive impact on consumers' behaviors and operational performance. Supporting hypotheses six and seven are stated below:

H₆: Consumers using SSKs during peak volume of a QSR setting show more improvements in consumer behaviors than those using SSKs during off-peak volume.

H₇: The effects of SSKs improves operational performances of a QSR setting to a greater extent during peak volume than during off-peak volume.

Figure 1 visualizes the proposed hypotheses in the research framework. The two independent variables of the study are ordering method (kiosk vs. cashier) and operational volume (peak vs. non-peak). The dependent variables are cognitive and affective consumer attitude, behavioral intention, satisfaction, sales per person, and order time.

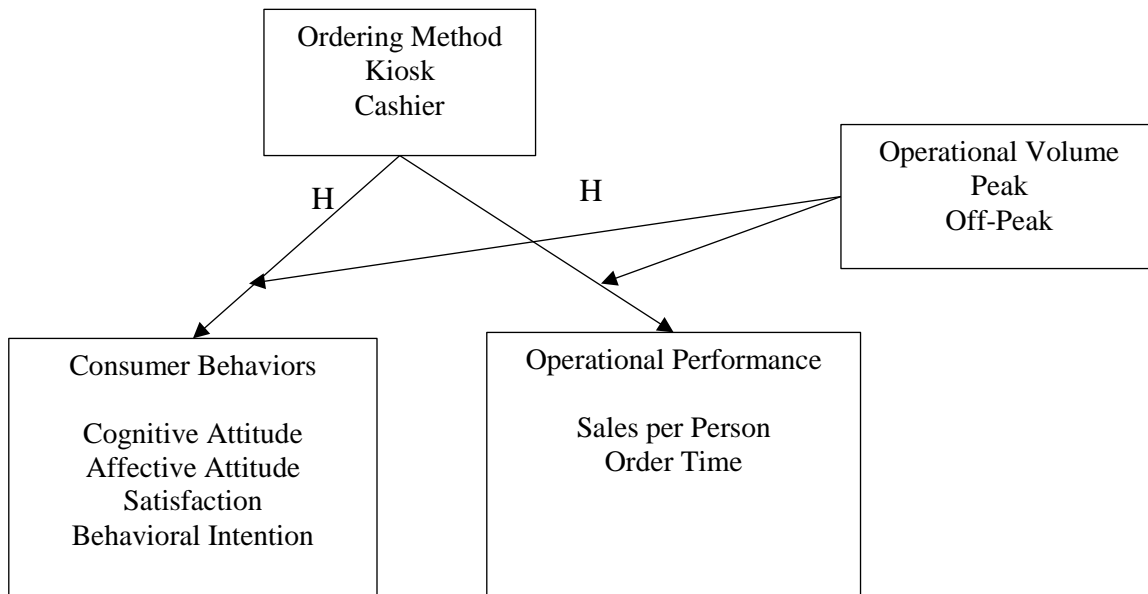


Figure 1: Research Framework

CHAPTER 3

METHODOLOGY

3.1 Research Design

This study employed a 2X2 between-subjects experiment design to empirically test the hypothesized relationships proposed in the research model. The two factors (independent variables) are ordering method (kiosk vs. cashier) and operational volume (peak vs. off-peak). The data collection site was a QSR setting located in the student union of a large Tier 1 research university in southwest USA. This created conditions to foster ideal TTF for consumers. Results of the seven hypotheses may potentially offer significant practical implications for restaurant managers in similar environments. Five restaurant brands are utilizing SSKs at the university union being examined: Chick-fil-a, Taco Bueno, Burger King, Fuzzy's Tacos, and Krispy Krunchy Chicken. Due to its greater variety of customization options, Burger King was chosen for the site of the study. QSR settings that do not offer a wide variety of opportunities to customize orders in SSKs may not yield results that indicate greater co-creation for consumers.

Operational volume was used as the other manipulating factor in the experiment based on demand fluctuation theories. In this study, peak volume was defined as whenever the restaurant's capacity cannot meet the consumer demand (Morikawa, 2012). Identified by Heskett (1986), when more than 75% of capacity is being utilized to meet consumer demand, productivity declines. In the study, when four out of the five ordering methods were occupied, it implied that 80% of ordering capacity was being utilized. This determined peak volume for the researcher. In every one of these instances, there were also consumers waiting for food production to be completed, and all employees were engaging in work related tasks.

Data was collected from Monday-Friday, November 12-16, 2018; Sunday-Tuesday, November 18-20, 2018; and Monday, January 21, 2019. A total of 232 surveys were acquired between the hours of 10:30 a.m. and 5 p.m., except for the Sunday date where the surveys were collected between 5 p.m. and 9 p.m.. After discussion with management at the location, these hours were identified as hours that would fulfill the parameters of the study. Of the 232 respondents, 192 surveys are completed in full, yielding an 82.8 percent response rate that composes the sample.

The researcher approached consumers of Burger King before they started ordering their meal to ask for voluntary participation. If they agreed to participate, they were randomly assigned into one of the two test groups. One test group used SSK to order their meals, while the other test group used the cashier to order meal. The researcher timed consumers as they were engaging in the order. This was measured on a stopwatch and began with the first click of the kiosk, or the first spoken word with the cashier, and stopped after consumers received the receipt. After finishing the ordering process, all participants completed a paper survey.

The dependent variables in this study were categorized as either consumer behavior measures or operational performance measures. Consumer behavior measures included attitudes toward technology and satisfaction with using technology, which are measured in the survey. Operational performance measures included sales per person, measured in dollars, and order time, measured in seconds of consumer engagement with ordering method. Finally, respondents were thanked for their time, and some respondents were given koozies as incentives.

3.2 Instrument Development

The survey used in the study consisted of three sections. Section one contained questions measuring attitude. Attitude consisted of three items measuring affective attitude and four items

measuring cognitive attitude based on work by Murray and Arroyo (2002) and Lee and Yun (2015). All items for attitude constructs were measured using seven-point semantic differential scales anchored from one representing negative words to seven representing positive words. Section two consisted of questions measuring satisfaction and behavioral intention. Satisfaction and behavioral intention were each measured by three items adapted from Ryu, Han, and Kim (2008), and Andaleeb and Conway (2006). All items for the satisfaction construct were measured using a seven-point Likert-type scale which ranged from one representing strongly disagree to seven representing strongly agree. Section three included demographic questions depicting the respondents' level of education or student status, gender, and age.

Table 1: Measurement items of the constructs

Constructs	Measurement items
Affective Attitude	<ul style="list-style-type: none"> • Unpleasant / Pleasant • Boring/Fun • Dull/Interesting
Cognitive Attitude	<ul style="list-style-type: none"> • Difficult/Easy • Useless/Useful • Harmful/Beneficial • Confusing/Clear
Satisfaction	<ul style="list-style-type: none"> • The choice to use the kiosk/cashier to order food was a wise decision. • Ordering through the kiosk/cashier met all of my needs. • Overall, I was satisfied with the ordering process.
Behavioral Intention	<ul style="list-style-type: none"> • I would like to use kiosk/cashier to order again in the future. • I would recommend ordering through the kiosk/cashier to others. • I would say positive things about ordering through the kiosk/cashier to my friends and others

Affective Attitude supported by Murray & Arroyo (2002)

Cognitive Attitude supported by Lee & Yun (2015)

Satisfaction supported by Ryu, Han, & Kim (2008); and Andaleeb & Conway (2006)

Behavioral Intention supported by Ryu, Han, & Kim (2008); and Andaleeb & Conway (2006)

3.3 Data Analysis

Data collected in the study were first cleaned, and all or incomplete data were deleted. The complete data set was analyzed by using the Statistical Package for the Social Sciences (SPSS, Version 25.0). Factor analysis was conducted by Principal Axis Factoring with Oblimin rotation to assess measurement validity. Cronbach's alphas were calculated to assess reliability. Then, multivariate analysis of variance (MANOVA) was conducted to test both main effects and interactions from the two manipulated factors.

CHAPTER 4

RESULTS

4.1 Sample Profile

Table 2 summarizes demographic information in the data set used in the analyses. U.S. News and World Report (n.d.) displays the gender mix of students at UNT at 48 percent male and 52 percent female. The following ages of students at UNT are reported by College Factual (n.d.): 22 percent at 18-19 years, 26.4 percent at 20-21 years, 23.6 percent at 22-24 years, 12.9 percent at 25-29 years, 5.7 percent at 30-34 years, and 7.9 percent at 35 years and over.

Table 2: Demographics of Sample (N = 192)

		Frequency	Percent
Gender	Male	126	66
	Female	62	32
	Prefer Not to Answer	4	2
Age	18 years	39	20
	19 years	40	21
	20 years	33	17
	21 years	31	16
	22 years	19	10
	23-29 years	21	11
	30+ years	9	5
Student Status	Freshman	47	25
	Sophomore	41	21
	Junior	55	29
	Senior	32	17
	Graduate	9	5
	Not Student	8	4

The gender mix of students might support those that are not motivated to prepare meals and more likely to be dining at services offered in the university union instead (66 percent male vs. 32 percent female; approximately at a 2:1 male to female ratio). The ages also display this

same principle, as more students 20 years of age and under were found dining at the university union than students that were 21 years of age and over (112 vs. 80 respectively).

Concerning student statuses, seniors were the least likely of undergraduate students to be dining at the university union (32 frequency at 17 percent). Seniors are likely to be more independent with less free time committed to being on campus perhaps. Juniors, the most abundant in the sample (55 frequency at 29 percent), may be the least motivated to prepare meals on campus or travel off campus. There were also high number of freshmen in the sample (47 frequency at 25 percent). The novelty of campus life may appeal to first-year students to a greater extent. Also, the sample had nearly 10 percent respondents who were not undergraduate students. They were evenly split between graduate students and non-students (9 frequency vs. 8 frequency respectively).

4.2 Measurement Validity and Reliability

Table 3 depicts the factor analysis grouping for four categories: (1) affective attitude, (2) cognitive attitude, (3) satisfaction, and (4) behavioral intention. Principal Axis Factoring was used as the extraction method and Oblimin as the rotation method. All items had high loadings on the construct they were expected to measure and low loadings on all other constructs, demonstrating good measurement validity.

Table 3: Measurement Validity and Reliability

		Factor Loadings	Cronbach's Alpha
Cognitive Attitude	Harmful-Beneficial	0.757	0.854
	Useless-Useful	0.825	
	Difficult-Easy	0.800	
	Confusing-Clear	0.706	
Affective Attitude	Dull-Interesting	0.931	0.826
	Boring-Fun	0.905	
	Unpleasant-Pleasant	0.436	

		Factor Loadings	Cronbach's Alpha
Satisfaction	Was Satisfied with Ordering Method	0.872	0.919
	Ordering Method Met All My Needs	0.795	
	Felt Contented with Ordering Method	0.647	
Behavioral Intention	Would Like to Reuse in the Future	-0.805	0.918
	Would Recommend to Others	-0.763	
	Would Say Positive Things to Others	-0.526	

Measurement reliability was assessed by calculating Cronbach's alpha values for each construct. These returned high reliability scores in each of the factors. Cognitive Attitude was found at 0.906 reliability. Affective Attitude was found at 0.886 reliability. Behavioral Intention was found at 0.922 reliability. Satisfaction was found at 0.919 reliability. Lastly, the following items were univariate: Sales per Person (measured in dollars), and Order Time (measured in seconds).

4.3 Descriptive Statistics

Both validity and reliability tests indicated that the measurements were well designed. Thus, average scores were calculated for the four constructs returned in the factor analysis, which were cognitive attitude, affective attitude, satisfaction, and behavioral intention, for further analyses. The remaining dependent variables are univariate: Sales per Person (measured in dollars), and Order time (measured in seconds).

Descriptive statistics are displayed in Table 4 to Table 9. Means and standard deviations are classified by ordering method (kiosk vs. cashier), which are proceeded to be classified by survey time (peak vs. non-peak) identifying operational volume at time of survey.

In items related to cognitive attitude, the mean scores for kiosks were moderately higher than mean scores for cashiers (6.278 vs. 5.611 respectively). They were measured on a seven-point Likert-type scale. They are found consistently higher in both peak volume and non-peak

volume. Of interest, though, is the standard deviation of peak volume at a cashier. This is abnormally higher than the other standard deviations in cognitive attitude.

Table 4: Descriptive Statistics for Mean Score for Cognitive Attitude

Ordering Method	Volume	Mean	Standard Deviation
Kiosk	Peak	6.229	1.249
	Non-Peak	6.326	0.919
	Total	6.278	1.092
Cashier	Peak	5.528	1.489
	Non-Peak	5.694	1.268
	Total	5.611	1.378
Total	Peak	5.879	1.412
	Non-Peak	6.010	1.146
	Total	5.944	1.284

In items related to affective attitude, they were found to be higher for kiosks than cashiers. Although, its deferential between ordering methods was found to be of the least extent among the four factors that were examined. Considering that this is later identified with a high sig. value at 0.096 it is not a noteworthy result of the study.

Table 5: Descriptive Statistics for Mean Score for Affective Attitude

Ordering Method	Volume	Mean	Standard Deviation
Kiosk	Peak	5.104	0.985
	Non-Peak	5.083	1.256
	Total	5.094	1.123
Cashier	Peak	4.792	1.262
	Non-Peak	4.840	1.078
	Total	4.816	1.168
Total	Peak	4.948	1.137
	Non-Peak	4.962	1.171
	Total	4.955	1.151

The factor behavioral intention was found in descriptive statistics with the greatest differential between ordering methods. These items were measured on a seven-point Likert-type scale. Mean scores are substantially higher for kiosks than cashiers (6.188 vs. 5.063 respectively), and they are found to differ to a greater extent in peak volume of the operation (6.285 vs. 5.035 respectively). These mean that consumers will behave more positively with regards to kiosks as a method of ordering in the future. The standard deviations are greater in surveys for cashiers (1.536) than found for kiosks (0.957). This suggests cashiers are inconsistent in providing acceptable customer service, at least more so than consumers perceive kiosks to provide acceptable customer service.

Table 6: Descriptive Statistics of Mean Score for Behavioral Intention

Ordering Method	Volume	Mean	Standard Deviation
Kiosk	Peak	6.285	0.842
	Non-Peak	6.090	1.060
	Total	6.188	0.957
Cashier	Peak	5.035	1.603
	Non-Peak	5.090	1.482
	Total	5.063	1.536
Total	Peak	5.660	1.420
	Non-Peak	5.590	1.377
	Total	5.625	1.395

Satisfaction was measured on a 7-point Likert-type scale. Mean scores were higher for kiosks (6.291) than for cashiers (5.844). Standard deviations also showed higher positive results for kiosks than for cashiers (0.937 vs. 1.176 respectively). These scores differ more dramatically during peak volume, where kiosks return a mean score at 6.472 and cashiers return a mean score at 5.799. Examining peak volume further, standard deviations indicate kiosks more consistent than cashiers (0.707 vs. 1.214 respectively) than previously noted with regards to total scores.

Table 7: Descriptive Statistics of Mean Score for Satisfaction

Ordering Method	Volume	Mean	Standard Deviation
Kiosk	Peak	6.472	0.707
	Non-Peak	6.090	1.095
	Total	6.281	0.937
Cashier	Peak	5.799	1.214
	Non-Peak	5.889	1.147
	Total	5.844	1.176
Total	Peak	6.135	1.045
	Non-Peak	5.990	1.120
	Total	6.063	1.083

Order time differed little in peak volume of operation but differed by nearly 20 seconds in non-peak volume of operation. Consumers were spending nearly a minute on average at cashiers. Cumulatively, between peak volume and non-peak volumes, order time for cashiers was found to be over 58 seconds. For kiosks, it was found to be over 48 seconds. This makes for 10 seconds faster order time on average. Though, considering that an operation may employ more kiosks than cashiers, they may be considered highly more efficient means for consumers to order meals. This is determined by the operator and organizational resources. Lastly, standard deviations were found with mixed results between peak volume and non-peak volume of operation but were each found to vary 25-28 seconds when considered in total.

Table 8: Descriptive Statistics of Mean Score for Order Time

Ordering Method	Volume	Mean	Standard Deviation
Kiosk	Peak	54.52	29.79
	Non-Peak	43.27	18.41
	Total	48.90	25.27
Cashier	Peak	54.72	17.35
	Non-Peak	62.67	34.79
	Total	58.70	27.63

Ordering Method	Volume	Mean	Standard Deviation
Total	Peak	54.62	24.25
	Non-Peak	52.97	29.35
	Total	53.80	26.86

The total purchase amount was divided by quantity to determine Sales per Person. Quantity was determined by the number of people for which orders were placed. In both peak volume and non-peak volume of operation, cashiers were found to generate more dollars than kiosks. This is the only dependent variable in favor of cashiers over kiosks, but this may be significant to operators, nonetheless. In only examining the method of ordering, cashiers were found to earn three quarters more than kiosks. Furthermore, in peak volume of the operation, cashiers were earning over a dollar in sales more than kiosks. Where cashiers had the opportunity to upsell, kiosks may have missed opportunities to generate more sales. Finally, standard deviations indicated trends that contrast those that were previously observed, as they were in favor for cashiers instead of kiosks as well. Standard deviations differed to a greater extent in peak volume of the operation, as the results varied by 2.70 for kiosks and 1.93 for cashiers.

Table 9: Descriptive Statistics of Mean Score for Sales per Person

Ordering Method	Volume	Mean	Standard Deviation
Kiosk	Peak	5.43	2.70
	Non-Peak	5.69	2.21
	Total	5.56	2.46
Cashier	Peak	6.49	1.93
	Non-Peak	6.03	2.19
	Total	6.26	2.06
Total	Peak	5.96	2.39
	Non-Peak	5.86	2.19
	Total	5.91	2.29

4.4 Main Effects of Ordering Method

Multivariate analysis of variance (MANOVA) was conducted to compare dependent variables among the two ordering methods. The independent variable in the MANOVA was ordering method (kiosk vs. cashier). The dependent variables are cognitive attitude, affective attitude, behavioral intention, satisfaction, order time, and sales per person, as proposed in the research model. These main effects of ordering method were found with a Pillai's Trace value of 0.224 ($F = 8.802$; $p < 0.001$).

Table 10: Main Effects of Ordering Method

Variables	Mean (Kiosk)	Mean (Cashier)	F	Sig.
Cognitive Attitude	6.278	5.611	13.701	0.000**
Affective Attitude	5.094	4.816	2.794	0.096 ^{N.S.}
Satisfaction	6.281	5.844	8.185	0.005**
Behavioral Intention	6.188	5.063	36.823	0.000**
Sales per Person	5.56	6.26	4.614	0.033*
Order Time	48.90	58.70	6.736	0.010*

Note: ** $p < 0.01$; * $p < 0.05$; ^{N.S.} $p \geq 0.05$

There were significant findings related to the method of ordering. There appears to be some differential in all of the average scores. However, no significant difference was found in affective attitude between kiosks and cashiers, failing to support H_{1a} that stated affective attitude will improve upon utilizing SSK in a QSR setting. The sample had more positive perception in cognitive attitude at kiosks (6.278 vs. 5.611), supporting H_{1b} that stated cognitive attitude will improve upon utilizing SSK in a QSR setting. Results with regards to satisfaction were also in favor of kiosks (6.281 vs. 5.844), supporting also H_2 that stated consumer satisfaction will improve upon utilizing SSK in a QSR setting. The average behavioral intention was found with higher scores at kiosks than cashiers (6.188 vs. 5.063). This supported H_3 that stated consumer

behavioral intention will improve upon utilizing SSK in a QSR setting. Having a positive behavioral intention implies that consumers are anticipating repetitive positive behaviors in the future. This is highly related to satisfaction. This was supported by both constructs which favored kiosks over cashiers. Results all support kiosks as effective tools to influence consumers' perception of ordering meals at quick-service restaurants. This indicates that kiosks may positively influence consumers' perception of service quality while at the operation.

There are relevant findings in sales per person as well. Consumers spent three quarters more when assisted by cashiers as opposed to using kiosks (6.26 vs. 5.56), also yielding a satisfactory sig. value at 0.033. This may be due to consumers having greater control of their order at kiosks. As a college student, some respondents may be more inclined to save money. It may also be due to interface design of the SSK at the research site. These results rejected H_5 that stated SSKs will increase revenues of a QSR setting, as findings indicated that SSKs actually decreased revenues of a QSR setting. Related to order time, kiosks were found to be faster and more efficient for consumers by nearly ten seconds (48.90 vs. 58.70), also yielding a satisfactory sig. value at 0.010. These results supported H_4 which stated that SSKs will improve order time of a QSR setting.

4.5 Interaction Effects

The results with regards to volume at operation were varied throughout the data collection. This is discussed in more detail as a potential for future research. Only one dependent variable had significance. All other dependent variables returned with unsatisfactory sig. values. These interaction effects are displayed in greater detail in Table 11.

Table 11: Interaction Effects between Ordering Method and Operational Volume

Variables	F	Sig.
Cognitive Attitude	0.037	0.847 ^{N.S.}
Affective Attitude	0.044	0.835 ^{N.S.}
Satisfaction	2.384	0.124 ^{N.S.}
Behavioral Intention	0.455	0.501 ^{N.S.}
Sales per Person	1.213	0.272 ^{N.S.}
Order Time	6.459	0.012*

Note: ** $p < 0.01$; * $p < 0.05$; ^{N.S.} $p \geq 0.05$

Order Time yielded a sig. value at 0.012, indicating that kiosks were indeed faster for consumers compared to ordering with a cashier. The interaction effects between ordering method and operational volume were found significant with a Pillai’s Trace value of 0.070 ($F = 2.298$; $p = 0.037$). The following Figure 2 illustrates the interaction effect of Order Time between the independent variables in the study.

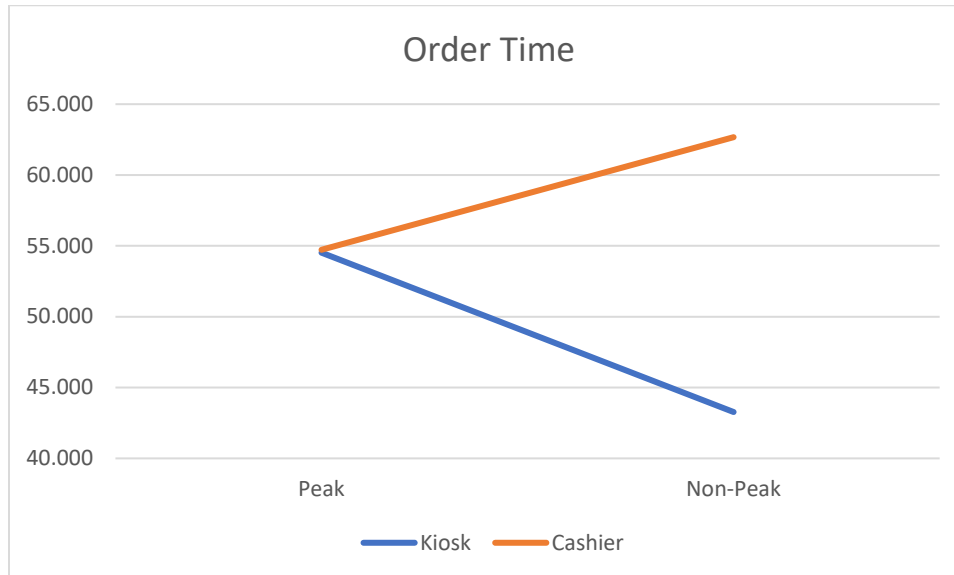


Figure 2: Interaction Effects with Order Time

The graph depicts that order time for each ordering method was within half a second of each other during peak volume of the operation, with kiosks at 54.53 and cashiers at 54.72. This

is contrary, though, during non-peak volume in the operation, as the results differed more dramatically. In non-peak volume of operation, consumers at kiosks were faster (48.90), and consumers with cashiers were slower (62.67).

It may be that consumers spend more time at kiosks during non-peak volume because they believe their order will be prepared immediately, and thus are eager to progress in the dining cycle. At cashiers, however, consumers may spend longer considering their menu options and viewing the visuals overhead instead. No other interaction effects were supported with satisfactory results though, so neither *H6* nor *H7* were supported.

CHAPTER 5

DISCUSSION

5.1 Findings

This study examined SSKs and their effects on total sales and order time in a QSR setting. The study also examined effects on consumer behaviors. A review of related literature and theories across multiple fields of research was used to compose six hypotheses, all of which are addressed conclusively in results described in chapter 4.4. The theoretical framework included independent variables of ordering method (Kiosk vs. Cashier) and operational volume (Peak vs. Off-Peak). Effects were measured on consumer behaviors (Cognitive Attitude, Affective Attitude, Satisfaction, and Behavioral Intention) and operational performances (Sales per Person and Order Time). All consumer behavior items were measured on a seven-point Likert-type scale. Operational performance measured Sales per Person by final ticket price in dollars divided by quantity, and order time in seconds.

The researcher worked closely with management at the research site, a QSR setting (Burger King) at the student union of a public Tier 1 research university in the southwest USA. Consumers were approached before they ordered, requested consented to participating in the study, and asked to complete a survey while they waited on the order. The respondents yielded 197 completed surveys used for analyses.

Kiosks were perceived more positively by consumers, with a positive effect on cognitive attitude, behavioral intention, and satisfaction. This is in congruence with past literature that suggests value-based experiences will be the dominant trend of the restaurant industry in the coming decade (Ivkov, Blesic, Simat, Demirovic, Bonzic, & Stefanovic, 2016). Kiosks grant

more control at the hands of consumers, providing for a customized service that delivers more value.

Also supported was the hypotheses with regards to order time. Kiosks were found to be nearly 10 seconds faster on average. This difference in time potentially grew larger during non-peak volume of the operation. This supported a study by Bitner *et al* (2000) that found SSKs to more quickly and conveniently provide services for consumers. Waiting times have been found to be reduced by SSKs used in operations (Avery, 2008; IBM, 2009), potentially leading to greater satisfaction levels. This was confirmed in the study. Not only may operators utilize human capital by other means, when implementing SSKs, but SSKs will expedite consumers through the ordering process faster. This may lead to greater operational efficiencies and more satisfied consumers.

Consumers have been found to use SSKs to avoid interacting with cashiers (Dabholkar, Bobbitt, & Lee, 2003). Considering the positive effects for kiosks, and negative effects for cashiers, the study by Dalboholkar *et al.* (2003) may also be supported by this study's findings. Consumers in the sample may be guided by such independent facilitation that SSKs require of consumers to input their orders.

5.2 Implications

The study supports fully or partially supports all theories that were used to develop the hypotheses, including knowledge with regards to cue utilization theory (Cox, 1962; Jocaby, Olson, & Haddock, 1971; Richardson et al., 1994), TTF (DeLone & McLean, 1992), and ZPD (Vygotsky, 1978). Although, support for TTF and ZPD of the education psychology were mixed. With regards to TTF, kiosks were not found to earn greater revenues, implying a potential need for operators to fit the technology with operational objectives and not merely the task it supports.

With regards to ZPD of the education psychology, affective attitude may take on different meanings in younger generations. These sig. values were not satisfactory. Furthermore, the experimental study by Curin, Vosko, Chang, and Tsimnoni (2005) was not supported. Results with regards to increasing channels in the operation were inconclusive. Even with the additional channels of ordering, peak volume in the operation did not yield more or less revenue per person. It was inconsistent and did not yield any significant findings.

The results imply the need for operators to design the interface of SSK technology appropriately with regards to specific objectives for the company. Appropriate visuals need to be utilized, and timing is critical. With application though, operators will learn which features to seek in SSK design. The operator can determine the results as practical or not, because the differences in units are measured in seconds. The research site used all four SSKs, during all hours of operation, as opposed to some restaurants that employ varying numbers of cashiers at various hours of the operation. The latter example is a more consistent approach to managing labor. Additionally, SSKs can decrease labor costs for the organization. Employing cashiers would increase labor cost and imply greater significance in anticipating demand fluctuations with some level of accuracy. SSK technology would mitigate the losses for each of these in a quick-service restaurant.

Findings for the study may suggest marketing opportunities for SSK technology in a restaurant organization. This study implied that consumers greatly prefer SSK technology over the traditional ordering method of speaking with a cashier. For example, consumers perceive SSK technology as useful and using them as wise. Consumers even intend to reuse SSK technology in the future. Since the end goal of ordering a meal is accomplished in either method of ordering, it may be that SSK technology is perceived as more convenient for consumers. It

may be simpler for consumers to use it in QSR settings. Utilizing an SSK might even require fewer skills to accomplish the task. This raises the question of changing skills in consumers. It may be that consumers judge it inconvenient to speak with cashiers because they are disinclined to engage in social settings.

Kiosks were found to have a greater impact on behavioral intention, implying that consumers heavily favored kiosks over cashiers and intended to use them again in the future. With such a finding, restaurant managers that wish to offer convenient and innovative services may invest in SSKs.

In conclusion, sales per person and order time had some differences by different ordering methods. Dependent variables of satisfaction, behavioral intention, and average scores for cognitive and affective attitudes were found to be more strongly in favor of kiosks as a method of ordering rather than cashiers. While the study examined these dependent variables under peak volume and off-peak volume in operation, as another set of independent variables, there were no significant differences except with regards to order time.

Findings of this study supports convenience and speed of SSKs in QSR settings. The marketing effectiveness of SSKs is evident. Unexpectedly, however, and even though consumers were found to greatly prefer SSKs, cashiers actually generated more sales for the operation. This may be due to cashiers taking the opportunity to upsell, and kiosks not having the opportunity to do so as actively. Although, effective design of the digital interface might incorporate this strategy. Upon further investigation, it was observed that kiosks being used at Burger King displayed prices on icons for menu items. Consumers who ordered at cashiers were not presented prices at the point-of-sale in the same manner. This implies greater control in the hands of consumers at SSKs, which is indicated in previous literature and referenced as co-creation

(Weijters et al. 2007). Opportunities to earn more sales in such co-creation will be found among consumers who have higher incomes, which is not reflective of the demographics describing the sample in this study. This suggests the need to select SSK interfaces effectively when considering a company's objectives.

5.3 Limitations of the Study

The study implies great potential for SSK technology. However, the following limitations need to be considered when reviewing results of the study. Some details of the research site limited the study. Upon reaching agreement with a QSR setting to conduct the study, designing the interface of the SSK was not possible with kiosks that were already employed. For example, it was evident that some variables were missing on the interface. These variables may have influenced the consumer in his or her purchase decision. Though pictures were provided on the digital menu board above the counter, pictures were not provided on the SSK. These may have been useful for the operation if they were provided where potential for further co-creation was possible. Prices of menu items were displayed before consumers committed to their order on SSKs. It may be more effective in generating sales to display prices only at the confirmation screen. Finally, also with regards to the interface, more opportunities for upselling may have been promoted. However, some QSR settings do not offer consumers an opportunity to customize their meal, as standardizing training for QSR staff becomes more challenging.

The measurement for operational volume is another limitation to be considered. There are multiple ways to measure this broad concept. The one used in the study may not have yielded significant results, but others might in different research designs. For example, capacity may be measured in other ways, rather than by the number of ordering methods that were being used. Another example might be measuring operational volume by time of day, instead of measuring it

by operational capacity. Consumers at different times of the day have different motivations that determine their purchase behaviors. Whereas in the study, even during lunch rush, when only three of the five ordering methods were being used, this was determined as non-peak volume. However, these consumers in the sample may not have been influenced any differently.

Finally, one final limitation is noted. Freshmen compose 25 percent of the sample. They may be scrutinized because freshmen are required by UNT to live in a dorm on campus. The students that live in a dorm are required to purchase meal plans. Thus, they may be subject to details according to which meal plan they have purchased. For example, they may only have certain funds remaining for the day, or they may be motivated to purchase a meal to use funding that is only available for them on a certain day.

5.4 Future Research Potentialities

Research that yields results with greater significances needs to be completed with a restaurant operation before and after implementation of SSK technology. Effects may be examined before SSK technology, and again after its implementation. The before and after comparisons offer real world examples of how organizations perceive SSKs, and whether they are better or worse than prior situations. There might be potential for this research to be conducted alongside SSK designers as well. Vendors may provide data they have collected from clients, or they might permit the researcher to study the site before and after delivering the SSK technology for the organization. It would provide a researcher with some great potential if they were permitted limited access to the design itself. For example, the researcher might suggest a restaurant acquire visuals to be displayed on the interface. This might expand the consumer's engagement with the SSK and might impact sales.

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