Self-service technology in supermarkets – Do frontline staff still matter?

Abstract

This paper uses the concept of psychological distance under construal level theory to explore the differences in the customers' evaluations of overall store quality, satisfaction and loyalty, based on their experiences with the traditional staff-checkout method and the relatively new self-checkout machines. Two empirical studies, a field survey with retail shoppers in UK (N1=313) and an online survey with members of a consumer panel in Australia (N2=474), show that the perceived quality of staff-checkout has a stronger positive impact on the overall store quality, satisfaction and loyalty, than the quality of self-checkout. Similarly, satisfaction with staff-checkout has a stronger positive effect on store satisfaction and loyalty, than the satisfaction with self-checkout. Finally, loyalty to staff-checkout also has a stronger positive influence on store loyalty, than the loyalty towards self-checkout. These results show that despite growing use of self-service technology, frontline staff continue to be important for overall store evaluations.

Keywords: checkout methods; self-service technology; store loyalty; store quality; supermarkets

1. Introduction

Self-Service Technologies (SSTs) are ubiquitous elements in modern consumers' everyday lives (Lowe et al., 2019), which provide retail service firms with new ways to engage and empower customers while saving costs (Inman and Nikolova, 2017; Roy et al., 2018; Wang, 2018). Use of SSTs in retail stores includes self-service checkout machines (Bulmer et al., 2018), handheld self-scanning devices (Marzocchi and Zammit, 2006), mobile wallets (Singh and Singh, 2020), artificial intelligence (Pillai et al., 2020) and automated social presence through robots (Van Doorn et al., 2017). Hence, it is not surprising to see retailers around the world using in-store technologies (Grewal et al., 2020; Roy et al., 2018), to enhance their service quality, customer satisfaction and loyalty, and to reduce their operating costs and improving operational efficiencies (Fernandes and Pedroso, 2017; Kazancoglu and Yarimoglu, 2018; Lee et al., 2010; Lee et al., 2013; Orel and Kara, 2014; Stark, 2020).

Past research on SSTs addresses five major themes: a) SST characteristics that encourage customers to adopt them (e.g., ease of use, convenience, usefulness, reliability and speed of service delivery); b) customer characteristics that affect their decisions to use or not to use SSTs (e.g., age, gender, education and income); c) customer traits that impact their preference for personal service over SSTs (e.g., technological anxiety, need for human interaction, innovativeness and technology readiness); d) customer perceptions, attitudes and behavioral intentions towards SSTs (e.g., enjoyment, newness, control, perceived risk, and security concerns); and e) situational factors that influence customers' choice between SSTs and human services (e.g., perceived waiting time, perceived task complexity, and companion influence) at the time of making the retail purchase (Fernandes and Pedroso, 2017; Inman and Nikolova,

2017; Larivière et al., 2017; Shin and Perdue, 2019). However, there are still many gaps in the research on SST usage in the retail sector about the impact of these technologies on the overall relationship between the retailers and their customers (Dekimpe et al., 2020).

First, there is little research on the antecedents and outcomes of staff-checkout method, possibly because it has been the default checkout option since the advent of modern retailing and thus it could have been treated as just another element of the overall shopping experience and a minor contributor to service quality and overall store quality (Evanschitzky et al., 2012; Van Riel et al., 2012). However, with the growing use of SST in today's multi-channel retail environment (Inman and Nikolova, 2017), it is important to understand how customer perceptions and evaluations of the relatively new self-checkout method may influence their attitudes and usage (Simon and Usunier, 2007). This knowledge could have significant implications for retail firms, including their ability to forecast the number of checkout counters needed at any given time, staffing costs for recruitment and training of checkout staff, and managing frontline service employees' motivation and remuneration systems (Bulmer et al., 2018; Singh et al., 2017).

Second, most recent research on checkout methods focuses on the factors that drive the choice and usage of self-checkout machines (Bulmer et al., 2018; Cebeci et al., 2020; Wang et al., 2012). However, there is hardly any research comparing the impact of the self-checkout method with the traditional staff-checkout method, despite growing evidence that a combination of human and technology-based services offers the best service encounter for the customers in the retail industry (Parasuraman et al., 2005; Reinders et al., 2008, 2015). Hence, there is a need to explore and understand the direct as well as combined effects of different checkout methods on customers' shopping experience and the impact such experiences are likely to have on the loyalty towards the retailer (Inman and Nikolova, 2017).

Finally, past research on the use of SST checkout methods focuses on the perceived quality of these methods but ignores customer satisfaction with self-checkout machines (Fernandes and Pedroso, 2017; Lee et al., 2010; Lee et al., 2013; Orel and Kara, 2014). Others study the impact of SSTs on consumers' usage of kiosks at convenience stores (Wang, 2012) and supermarkets (Wang et al., 2013) but not on their overall store quality, satisfaction and loyalty (Marzocchi and Zammit, 2006). Moreover, it is not clear to what extent perceived incompatibility and uncertainty may hinder the adoption of technological innovations by consumers (Roy et al., 2018). Hence, there is a need to understand to what extent retail shoppers are satisfied with different types of checkout methods and how these differences may affect their overall store evaluations.

To address these research gaps, this paper begins with a review of the relevant literature on self-service technologies including the antecedents and outcomes of their adoption and usage in the retail sector as well as the different check-out methods used in retail stores and their evaluations. As different check-out methods might have distinct features and impacts on customers' checkout experiences, this paper concentrates on the self-checkout machines as a specific example for practical purposes. Specifically, the authors use the construal level theory (CLT) to develop a comprehensive conceptual model incorporating customers' perceived quality, satisfaction and loyalty for two checkout methods (staff vs. self) and hypothesize their effects on the overall quality, satisfaction and loyalty towards the store. Next, this paper describes the findings from two empirical studies, a field survey with retail shoppers in UK (N1=313) and an online survey with members of a consumer panel in Australia (N2=474), to help test each hypothesis. Finally, the authors discuss the conceptual contribution and managerial implications of their findings along with some limitations of their two studies and directions for future research in this fascinating research area with growing importance and relevance.

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2. Literature review

2.1. Self-service technologies

SSTs are those technological interfaces that allow customers to create services without the physical presence or involvement of service employees (Meuter et al., 2005). SSTs are used quite commonly in consumers' everyday lives reflecting how these technologies continue to permeate into the consumption experiences across a wide range of contexts, particularly in retail shopping (Djelassi et al., 2018; Gummerus et al., 2019). SSTs offer both opportunities and challenges for customers and service providers (Inman and Nikolova, 2017; Kimes and Collier, 2015; Lee and Coughlin, 2015; Van Riel et al., 2012; Wang et al., 2012, 2013).

Typical advantages of SSTs for customers include faster service, convenience, saving time and money, variety of service choice (Marzocchi and Zammit, 2006), avoiding unnecessary interactions with service staff (Meuter et al., 2005), and greater control over the service production process (Wang, 2012). Advantages of SSTs for firms include lower labor costs (Orel and Kara, 2014; Weijters et al., 2007), ability to tap new market segments (Elliott et al., 2012), greater productivity and perceived service quality (Wang, 2012; Weijters et al., 2007), and improved customer satisfaction and loyalty (Fernandes and Pedroso, 2017; McWilliams et al., 2016; Orel and Kara, 2014; Robertson et al., 2016; Wang et al., 2013).

Whilst SSTs do provide clear benefits, they may also pose some challenges for customers, including the high stress levels experienced by some customers due to their lack of knowledge and/or past experience with SSTs (Lee and Coughlin, 2015), higher perceived risk compared to interpersonal services (Featherman and Hajli, 2016), along with the possibility of longer queues and waiting time for the self-service options (Van Riel et al., 2012), among others. Similarly,

challenges associated with providing SST experiences for retailers and service providers may include poor customers' acceptance (Wang et al., 2012; Zhao et al., 2008).

This may stem directly from the lack of personal contact between staff and customers which could result in weaker social bonds and customer loyalty (Scherer et al., 2015), fewer chances for cross- and up-selling due to lack of personal contact (Lee and Coughlin, 2015), limited appeal of SSTs to mainly tech-savvy customer segments (Inman and Nikolova, 2017; Lee and Coughlin, 2015; Marzocchi and Zammit, 2006; Parasuraman and Colby, 2015), and firms' technology readiness (Ramaseshan et al., 2015). Each of these challenges may have a direct effect upon how retailers may configure their frontline operations (e.g., checkout systems) to optimize the overall customer retail experience and at the same time improve operational efficiencies and customer loyalty.

2.2. SST adoption and usage - Antecedents and outcomes

Past research categorizes the factors driving the adoption and use of SSTs into three categories; a) SST characteristics, b) customer characteristics, and c) situational factors. *SST characteristics* include perceived ease of use (Wang et al., 2012), usefulness (Wang et al., 2013;), convenience (Lee et al., 2013), reliability (Elliott et al., 2012; Fernandes and Pedroso, 2017), newness (Weijters et al., 2007), perceived control (Wang, 2012), and perceived risk (Featherman and Hajli, 2016). *Customer characteristics* include perceived self-efficacy (Wang et al., 2013; Zhao et al., 2008), demographics (Lee et al., 2010; Lee et al., 2013), technology anxiety, need for human interaction and innovativeness (Lee et al., 2010), technology readiness (Elliott et al., 2012), and behavioral inertia (Wang et al., 2012). Finally, *Situational factors* include perceived waiting time, task complexity and presence of others (Collier et al., 2015;

Wang et al., 2012). In comparison to the studies exploring the antecedents of SST adoption and usage, fewer studies examine the outcomes of using SSTs, especially in terms of customer evaluations (e.g., perceived service quality and customer satisfaction) and behavioral responses (e.g., customer loyalty and repeat patronage). This paper addresses this important research gap by studying the relative impact of SSTs such as self and staff-checkout methods on overall store evaluations (e.g., quality, satisfaction and loyalty).

2.3. SST adoption and usage in retail sector

SSTs are replacing those service elements of retail operations that do not need interpersonal interactions and this has resulted in many frontline service roles being substituted by either on-site machine-assisted services or by off-site electronic services that are available 24/7, as predicted by Fitzsimmons (2003). In retail stores, especially supermarkets, staff-checkout counters are the most visible example of interpersonal interactions that involve staff members who are trained to handle cash registers and credit card machines as well as interact with customers. However, the advent of SSTs in retail sector has led to proliferation of self-checkout machines (Bulmer et al., 2018; Reynolds-McIlnay and Morrin, 2019) and self-scanning hand-held devices (Marzocchi and Zammit, 2006) and growing use of technology-mediated service environments to improve efficiency and reduce labor costs (Patti et al., 2020). With such growing popularity, SSTs are likely to shape the future of retail sector (Grewal et al., 2017; Inman and Nikolova, 2017). Self-checkout machines are computerized system which permits customers to scan, bag and pay for their shopping by themselves (Lee et al., 2013). Self-scanning devices are hand-held terminals that can scan product barcodes and display the price, which allow the shoppers to pack the product directly into their own bag and track their spending as they shop, and making payments in a designated area without unpacking (Marzocchi and

Zammit, 2006). More recently, new technologies such as mobile wallets (Singh and Singh, 2020), artificial intelligence (Pillai et al., 2020) and automated social presence through robots (Van Doorn et al., 2017) as well as machine learning, augmented reality and automation are also being used in retail sector (Patti et al., 2020).

With the growing popularity of these SSTs in retail outlets, many studies explore customers' responses to self-checkout machines (Demoulin and Djelassi, 2016; Fernandes and Pedroso, 2017; Lee et al., 2010; Orel and Kara, 2014; Van Riel et al., 2012) but not on the impact of staff-checkout quality on store satisfaction (e.g., Van Riel et al., 2012), possibly because the quality of service provided by the checkout staff may be evaluated as a part of overall store quality (Fernandes and Pedroso, 2017; Orel and Kara, 2014). Thus, despite growing research on the use of self-service technologies in frontline sales and service operations (De Keyser et al., 2019; Marinova et al., 2017), little is known about their impact on customer perceptions of overall store quality, satisfaction and loyalty in the presence of the traditional staff-checkout option. This is important because not only is 'closing the sale' is an important aspect of retailing but the well-documented 'recency effect' also shows that customers are likely to rely heavily upon this critical frontline service to form overall perceptions about their retail experience (Sivakumar et al., 2014). Hence, customers' overall evaluations of a retailer could be largely driven by their evaluations of each checkout option based on their personal experiences with them.

Indeed, most stores provide both self and staff-checkout choices to the customers, which reflects the view held by researchers about the need to highlight the importance of interpersonal service and interactions with service staff even in the presence of SSTs because customers who do not use self-checkout would still require the traditional staff-checkout (Bulmer et al., 2018; Lee, 2015; Lee and Yang, 2013). Therefore, as can be inferred from one of the three major

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drivers of SST usage patterns, namely situational factors, even customers who use self-checkout may still need to use the staff-checkout option when they have too many products or items that cannot be scanned (Wang et al., 2012). Clearly, the arrival of new SSTs such as self-checkout machines has not replaced the traditional staff-checkout counters and may not do so even in near future (Larivière et al., 2017). However, there are no studies exploring the differences in the impact of various checkout options on the customers' overall evaluations of the retail stores.

2.4. Checkout methods – Quality, satisfaction and loyalty

Service quality is described as the degree to which the service received by customers matches their expectations and conceptualized accordingly as a global judgment or attitude based on customers' beliefs about the service (Parasuraman et al., 1985). However, most early studies explore the quality of service provided by the employees because self-service technologies were not very common at that time, particularly in retail stores. With growing popularity of self-service technologies in the last decade (Weijters et al., 2007), more recent studies have explored the customers' evaluation of self-service technologies in retail outlets (Kallweit et al., 2014; Wang, 2012), including self-service kiosks (Lee et al., 2013) and self-checkout machines (Fernandes and Pedroso, 2017; Lee et al., 2010; Orel and Kara, 2014).

According to Inman and Nikolova (2017) SSTs help the retailers attract new shoppers, increase share of spending by current shoppers and encourage shoppers to spend more. Shoppers' perceptions about fairness, value, satisfaction, trust, commitment and loyalty also mediate the effects of SSTs on their behavioral intentions, such as positive word-of-mouth (WOM) and future patronage as well as the retailers' revenues and profitability (Inman and Nikolova, 2017). Customer satisfaction is an overall evaluation based on the customer's purchase

and consumption experience with a good or service (Fornell, 1992) so also needs to incorporate their experiences with SSTs during the shopping experience. Typically, past research shows that customer satisfaction with the use of self-scanning devices in supermarkets has a positive impact on their overall opinion of the supermarket (Marzocchi and Zammit, 2006), thus indicating the overall relational implications of using such technologies. More recently, Inman and Nikolova (2017) show that retail shoppers' satisfaction mediates the effect of SST usage on their WOM and patronage intentions, implying that the check-out experience in particular can also play an important role in how retailers can build meaningful relationships with the customers.

2.5. Overall store quality, satisfaction and loyalty

Overall store quality is described as customers' overall perceptions about the quality of products and services provided by a retailer along with the store environment (Baker et al, 1994). Customers' overall satisfaction with a store is depicted as an overall evaluation of their shopping experience (Fernandes and Pedroso, 2017; Weijters et al., 2007). Customer loyalty to a store is described as the extent to which a consumer would patronize the retail store again and recommend the retail store to others (Lee, 2015). Past research shows that friendly, polite and helpful attitudes and behaviors of frontline service employees can have a positive influence on customers' perceived service quality, satisfaction and loyalty (Mittal and Lassar, 1996). Similar findings are reported by others about a positive impact of service quality on customer loyalty and behavioral intentions, particularly in the retail context (Lee and Yang, 2013).

There has been much research about SSTs in the retail industry (e.g., Marzocchi and Zammit, 2006; Weijters et al., 2007; Elliott et al., 2012; Jia et al., 2012; Wang et al., 2012; Wang et al., 2013; Orel and Kara, 2014; Fernandes and Pedroso, 2017). In contrast, staff-checkouts do not

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seem to be singled out from the rest of the services, and the staff as a whole tend to be evaluated as a part of store quality (Kitapci et al., 2013). Despite the importance of personal service or interaction with service staff in SSTs research (e.g., Lee and Yang, 2013; Lee, 2015), there is not much research on staff-checkouts except on the effect of a long queue at the checkout on store satisfaction (Van Riel et al., 2012).

Those customers who do not use self-service checkouts are dependent on the traditional staff-checkouts. Moreover, those customers who use self-service checkouts at supermarkets still use the staff-checkouts when there are many products and/or non-scannable items to buy (Wang et al., 2012). Thus, even with the advent of SSTs, frontline staff in retail stores may still play an important role in the check-out process. Nevertheless, past research seems to have paid insufficient attention to the role of staff-checkout and its impact on the overall perceived quality, satisfaction and loyalty towards the store. This paper aims to address this important research gap.

3. Theoretical background and hypotheses

3.1. Construal level theory (CLT)

Construal level theory suggests that the perceived psychological distance with objects influences individual's mental construal and subsequent predictions, evaluations, and behaviors towards those objects (Trope and Liberman, 2010; Trope et al., 2007). Moreover, people construe objects that are psychologically close to them using 'low-level, detailed, and contextual' features and those away from them using 'high-level, abstract, and stable' features (Trope et al., 2007). For example, an event which takes place in a faraway location or in distant future is represented with a high level of construal and people use its primary, essential, and abstract features as the basis of evaluation, providing more abstract and broad information (Trope and Liberman, 2010). In

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contrast, an event taking place nearby or at present is represented with a low level of construal and people use secondary, peripheral and concrete features as the basis of evaluation, providing more detailed information (Trope and Liberman, 2010). In services context, people with a high (low) level of construal rely more on intangible (tangible) attributes (Ding and Keh, 2017). Similarly, process (outcome) attributes have a stronger influence on service evaluations under low-level (high-level) construal (Tatavarthy et al., 2019).

There are four dimensions of psychological distance: spatial, social, temporal and hypothetical distance. Holmqvist et al. (2015, p.1432) defined these four dimensions of psychological distance with regard to a service interaction as, "the interaction takes place in a physical setting (spatial distance), through interactions with the service providers (social distance) concerning services offered either now or in the future (temporal distance) that either have a high or low certainty of outcome and so seem more or less real (hypothetical distance)". Due to technological advancement, a service interaction between customers and service providers can take place without any fact-to-face interaction (Grönroos et al., 2000). Shifting from physical interactions to electronic interactions increases psychological distance, which has a negative impact on the customer's perceived credibility of the service provider (Giovanis and Athanasopoulou, 2018). Therefore, both spatial and social distance are likely to have an unfavorable impact on how customers interpret the service provider (Holmqvist et al., 2015).

3.2. Carry-over effects of checkout methods

Recent studies also show that the use of SSTs in retail context may have a positive impact on the overall perceived quality of the store because it gives the customers more control and making it more convenient for them (Collier and Kimes, 2013). Similar findings are reported by Orel and

Kara (2014), who measure the quality of self-checkout method in terms of functionality, enjoyment, assurance, design, and convenience as well as Fernandes and Pedroso (2017), who focus on the speed, ease of use, control, reliability and enjoyment of self-checkout method. Notwithstanding the above, the attitudes and behaviors of frontline staff such as being friendly, polite, and helpful may affects customers' perceptions about service quality as well as overall store quality (Martinelli and Balboni, 2012), which is not the case for self-checkout because in this case the customers may not have a chance to interact with the service employees and have to complete most of the activities by themselves.

According to CLT, customers may rely on their evaluations of the different checkout methods, to form their perceptions and judgments about the overall store quality, satisfaction and loyalty, based on their psychological distance with the service providers. Moreover, customers tend to rely more on process (tangible) attributes such as interactions with service employees when evaluating their service experience under low-level construal and on outcome (intangible) attributes such as perceptions of overall service quality or satisfaction under high-level construal (Tatavarthy et al., 2019). In the retail checkout context, self-checkout would be an example of higher psychological distance because it involves limited or no face-to-face interactions between the customers and store employees; whereas staff-checkout may represent low psychological distance because it involves a close interpersonal interaction between the customers and checkout staff. Hence, shoppers who use staff-checkouts are likely to evaluate the service interaction more favorably compared to those who use self-checkout method because of their greater focus on the tangible elements of the service encounter, namely the checkout staff. In contrast, shoppers who use the self-checkout method are more likely to focus on the intangible elements of the service encounter when evaluating their checkout experience.

Many empirical studies demonstrate that service quality affects customer satisfaction because customers can only be (dis)satisfied with a service only after they have perceived the service (e.g., Baier and Rese, 2020; Zeithaml et al., 1996). When customers are satisfied with a service provider, they tend to repurchase from the same service provider as well as to recommend the service provider to their friends and family (Zeithaml et al., 1996). As argued earlier, perceived quality, satisfaction and loyalty for the staff-checkout method are likely to have stronger effects than those for the self-checkout methods, on the overall store quality, satisfaction and loyalty. Moreover, a similar difference could be expected in the effect of perceived service quality with the different checkout methods on the customers' overall satisfaction and loyalty for the retail store. Hence, the authors hypothesize as follows:

> *H1*. Perceived service quality of the staff-checkout method has a stronger positive effect than the perceived service quality of the self-checkout method, on the overall a) perceived quality, b) customer satisfaction, and c) customer loyalty for the retail store.

Early research on SST usage in retail context found that satisfied SST users are also likely to be satisfied with the supermarket (Marzocchi and Zammit, 2006), however others find that satisfactory past SST experience may not always lead to positive attitudes toward the SST service provider (Reinders et al., 2015) or it may vary by the nature of SST used (Djelassi et al., 2018). This could be a major problem for retailers as despite the introduction of SSTs over a decade ago, many customers still continue to be dissatisfied with their experience (Alhathal et al., 2019; Larson, 2019). As services tend to be relatively more intangible, buyers tend to look for evidence or signs of service quality from employees so that the function of service providers is crucial in maximizing customer satisfaction (Zeithaml et al., 1996). Moreover, the separation between the customers and frontline service employees created by SSTs also makes service

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encounters more impersonal and devoid of social interaction that is appreciated and craved by many customers (Alhathal et al., 2019). Hence, the authors hypothesize that customers are likely to be influenced by their satisfaction with the staff-checkout to a greater extent than the quality of self-checkout method in forming their overall satisfaction with the store, as follows:

> *H2*. Customer satisfaction with the staff-checkout method has a stronger positive effect than customer satisfaction with the self-checkout method, on the overall a) customer satisfaction, and b) customer loyalty for the retail store.

Extant research on the impact of SST usage on the customers' evaluations and behavioral intentions focus on the perceived quality of self-checkout machines (Fernandes and Pedroso, 2017; Lee et al., 2010; Lee et al., 2013; Orel and Kara, 2014) but ignore the role of customer satisfaction with the different checkout methods and their loyalty towards these methods, represented by their past usage, commitment, preference, and future intentions to use these methods. Interestingly, Robertson et al. (2016) show that the service quality and satisfaction for SSTs has positive effects on the customers' behavioral intentions but they also ignore the impact of customer loyalty towards different SSTs on their overall store loyalty. In this context, Adapa et al. (2020) show that the perceived advantage, complexity, novelty, and risk of using SSTs influence customers' perceived shopping value that in turn affects their loyalty towards the SSTs and overall store loyalty. However, Alhathal et al. (2019) show that the separation between customers and frontline service employees created by SSTs may weaken the impact of social benefits, relational trust and affective commitment on customer loyalty and overall customer relationships. Therefore, the authors use CLT to argue that the lower psychological distance between the customers and the checkout staff than with the self-checkout machines would lead to a stronger effect of customer loyalty to the staff-checkout on the overall store loyalty, as follows:

H3. Customer loyalty to the staff-checkout method has a stronger positive effect than

customer loyalty to the self-checkout method, on the overall customer loyalty towards the

retail store.

Figure 1 shows the conceptual model with all the hypotheses.

< Insert figure 1 about here >

4. Study 1 (Field survey – UK)

4.1. Sample and procedure

The authors used a mall-intercept approach to recruit retail shoppers in UK as the participants for

a field survey (N=313) to test and refine their questionnaire and for a preliminary assessment of

their conceptual model and hypotheses. UK was chosen as the setting for this study because

although a mature retail market, it is still relatively new to SSTs such as self-checkout machines

(Hamacher, 2017). Although the self-checkout machines were introduced in USA in 1984, the

supermarkets in UK only started using these in early 2000s (New Atlas, 2015). In fact, a survey

of 1,107 UK consumers in 2014 found that ten percent had never used self-checkout machines

and nearly 50% needed help when using them (Kiosk Marketplace, 2014). Hence, shoppers in

UK are still getting used to the self-checkout machines with no clear preference for this new SST

checkout method. This co-existence of different checkout methods allows the study of the

differences in their effects on the overall store quality, satisfaction and loyalty. Table 1 shows the

demographic (age, gender, education and occupation) and behavioral (loyalty membership,

shopping frequency and average weekly grocery bill) profile of the sample in both studies.

< Insert table 1 about here >

About half (54.7%) the participants are 50 years old or below and the sample has more females (71.9%) than males. About half the participants are educated up to high school (46.0%) and are employed (46.6%). About three-fifth of the participants are members of a retail loyalty program (61.7%) and shop regularly (60.4%) between one and four times a week, and about half (51.4%) the participants spend on an average £50 or less on their groceries every week.

4.2. Questionnaire design

The authors used a structured questionnaire to operationalize all the constructs included in their conceptual model, by adapting well-established three-item scales for store service quality and satisfaction (Sharma and Zhan, 2015) with five-point semantic differential formats and a four-item scale for store loyalty (Zeithaml et al., 1996) with a five-point Likert format. Single item scales were used for the perceived service quality and satisfaction with each checkout method in order as this study focuses on the impact of these variables on the customers' overall store quality, satisfaction and loyalty rather than studying the underlying dimensions. Moreover, using single item scales for these constructs helped minimize respondent fatigue in line with prior research (e.g., Cristobal et al. 2007; Parasuraman et al., 1988; Sivadas and Baker-Prewitt, 2000; Szymanski and Hise, 2000). Similarly, loyalty for each checkout method was measured with three questions related to the duration and frequency of past usage and likelihood of future usage, which relate to the conative and action dimensions of customer loyalty proposed by Oliver (1999). The questionnaire was pretested with a sample (N=240) of participants similar in profile to those in the main study to ensure that all the items were easy to understand and answer. Table 2 shows all the final scale items and their descriptive properties.

< Insert table 2 about here >

4.3. Data analysis

Confirmatory factor analysis using structural equation modelling with AMOS 26.0 shows a close fit for the measurement model (χ^2 = 511.26; *df* = 215; χ^2/df = 2.38; NFI = 0.90; CFI = 0.95; RMSEA = 0.048; SRMR = 0.056) with all the fit indices better than their recommended cut-off values (Hu and Bentler, 1999). All the scales show good psychometric properties with high factor loadings (.70 - .85). All the scales also show high composite reliabilities (.77 - .90) and average variance extracted (.53 - .72) showing high convergent validity (Fornell and Larcker, 1981). Moreover, the average variance extracted for each factor is greater than its squared correlations with all the other factors, showing discriminant validity (Fornell and Larcker, 1981). Table 3 shows the descriptives and bivariate correlations for all the constructs.

< Insert table 3 about here >

Next, a path model using AMOS 26.0 with all the hypothesized relationships and the seven control variables also shows a close fit (χ^2 = 229.42; *df* = 92; χ^2/df = 2.49; NFI = 0.90; CFI = 0.95; RMSEA = 0.052; SRMR = 0.058) with all the fit indices better than their cut-off values (Hu and Bentler, 1999). To compare the effects of hypothesized relationships between staff and self-checkout methods, the authors constrained each link and compared the fit ($\Delta\chi^2$, df = 1) between this constrained path model and the unconstrained path model. A significantly poorer fit for the constrained model confirms significant difference between the two hypothesized paths.

The results show that perceived quality of staff-checkout has a stronger positive effect on overall store quality compared to the quality of self-checkout (staff: β = .45, p < .001; self: β = .24, p < .001; $\Delta\chi^2$ = 9.05, df = 1, p < .01), thus H1a is supported. Next, staff-checkout quality has a stronger positive effect on overall store satisfaction compared to the quality of self-checkout

(staff: $\beta = .33$, $p < .001$; self: $\beta = .10$, $p > .35$; $\Delta\chi^2 = 6.83$, df = 1; $p < .01$), showing support for

H1b. Similarly, staff-checkout quality also has a stronger positive effect on overall store loyalty

compared to the quality of self-checkout (staff: $\beta = .24$, $p < .01$; self: $\beta = .05$, $p > .71$; $\Delta\chi^2 = 4.63$,

df = 1, $p < .05$), thus H1c is also supported.

Next, satisfaction with staff-checkout has a stronger effect on overall store satisfaction

compared to satisfaction with self-checkout (staff: $\beta = .29$, $p < .001$; self: $\beta = .11$, $p > .32$; $\Delta\chi^2 =$

3.98, df = 1, $p < .05$). Thus, H2a is supported. Similarly, satisfaction with staff-checkout has a

stronger effect on overall store loyalty compared to satisfaction with self-checkout (staff: $\beta = .21$,

$p < .01$; self: $\beta = .05$, $p > .45$; $\Delta\chi^2 = 7.26$, df = 1, $p < .01$), thus H2b also finds support. Finally,

loyalty to staff-checkout also has a stronger positive effect on overall store loyalty compared to

the loyalty towards self-checkout (staff: $\beta = .28$, $p < .001$; self: $\beta = .12$, $p > .30$; $\Delta\chi^2 = 3.89$, df =

1, $p < .05$); thus H3 is also supported. None of the control variables have any significant effect,

hence these are not discussed anymore. Table 4 summarizes all these results for study one.

< Insert table 4 about here >

4.4. Discussion

Study one provides support to all the hypothesized relationships in the conceptual model

(Figure 1), showing a stronger effect of quality, satisfaction and loyalty toward staff-checkout

method on the overall store quality, satisfaction and loyalty, compared to those for the self-

checkout method. One reason for these results about the carry-over effects of customer

experience with both the check-out methods could be the choice of UK as a research setting for

this study. As explained earlier, UK is a relatively new and less-developed market for the use of

SST applications in retail stores; hence, the retail shoppers in UK may not have formed

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sufficiently strong attitudes or preferences towards self-checkout method, which is possibly being reflected in the relatively stronger effects of the staff-checkout on the customers' overall store evaluations compared to self-checkout. Therefore, in order to replicate and validate these results in a market that has experienced SST usage in retail sector for a longer period, the authors conducted a second study using an online survey methodology with the members of a consumer panel in Australia, which is a relatively more developed market for the use of SST applications in the retail stores. Hence, study two helps test the generalizability of the study one results by using a different research setting (Australia) and a different methodology (Online survey).

5. Study 2 – Australia (Online survey)

5.1. Sample and procedure

The authors used a consumer panel to recruit supermarket shoppers in Australia to participate in an online survey (N=474) to replicate their findings from study one. Australia was chosen as the setting for this study because similar to UK, it is also a mature retail market but it is relatively more experienced with the use of SSTs in retail stores, such as self-checkout machines (Wang et al., 2012, 2013). In fact, self-service checkout machines are now available in almost all the 800 Coles supermarkets in Australia compared to just 60 in 2009, and almost 50 per cent of their customers use these machines (Powell, 2020). Hence, most shoppers in Australia are now used to the self-checkout machines (Holden, 2020; Wang et al., 2017) and have clear preferences for a particular checkout method (staff or self), which allows an object assessment of the differences in the impact of these checkout methods on the customers' overall store evaluations. Both UK and Australia are also high-income English-speaking countries, which allows a valid comparison of the results across the two studies.

As shown in table 1, this sample is slightly younger that the one in study one and has an even distribution across the different age-groups. Even this sample has more females (63.3%) than males but their proportion is lower than in study one. This sample is also slightly better educated than the one in UK with more than three-fifth (61.8%) educated above high school and about half the participants are employed (47.3%). Interestingly, this sample has relatively higher proportion of retail loyalty program members (76.8% vs. 61.7%) and regular shoppers between one and four times a week (77.5% vs. 60.4%), and about two-third (64.2%) of the participants spend on an average more than A$50 on their groceries every week.

This study used an online version of the same structured questionnaire as in study one in this study. A link to this online questionnaire was emailed by the consumer panel company to their members who participated in this study in return for a small monetary incentive (worth about A$2 each). All the members of this consumer panel are identified and verified by the panel company, which ensures the correctness of their profile information and greater accuracy in their responses. Table 2 shows all the scale items and their factor loadings.

5.2. Data analysis

Once again, confirmatory factor analysis using structural equation modelling with AMOS 26.0 shows a close fit for the measurement model (χ^2 = 522.01; *df* = 215; χ^2/*df* = 2.43; NFI = 0.90; CFI = 0.95; RMSEA = 0.052; SRMR = 0.058) with all the fit indices better than their suggested cut-off values (Hu and Bentler, 1999). All the scales show good psychometric properties with high factor loadings (.71 - .92) as well as high composite reliabilities (.83 - .92) and average variance extracted (.62 - .82), which show high convergent validity (Fornell and Larcker, 1981). Average variance extracted for each factor is also greater than its squared

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correlations with all the other factors, showing discriminant validity (Fornell and Larcker, 1981). Table 3 shows the descriptives and bivariate correlations for all the constructs.

Once again the path model using AMOS 26.0 with all the hypothesized relationships and the seven control variables shows a close fit (χ^2 = 217.99; *df* = 92; χ^2/*df* = 2.37; NFI = 0.91; CFI = 0.96; RMSEA = 0.048; SRMR = 0.052) with all the fit indices better than their recommended cut-off values (Hu and Bentler, 1999). Once again, similar to study one, the authors constrained each hypothesize path and compared the fit ($\Delta\chi^2$, df = 1) for the constrained and unconstrained path models, with a significantly poorer fit for the constrained model confirming a significant difference between the two hypothesized paths. The results show that staff-checkout quality has a stronger positive effect on overall store quality compared to self-checkout quality (staff: β = .52, p < .001; self: β = .21, p < .01; $\Delta\chi^2$ = 11.36, df = 1, p < .001), thus H1a finds support. Next, staff-checkout quality also has a stronger positive effect on overall store satisfaction compared to self-checkout quality (staff: β = .37, p < .001; self: β = .19, p < .05; $\Delta\chi^2$ = 6.86, df = 1, p < .01), hence H1b is also supported. Similarly, staff-checkout quality has a stronger effect on the overall store loyalty compared to self-checkout quality (staff: β = .44, p < .001; self: β = .21, p < .01; $\Delta\chi^2$ = 8.62, df = 1, p < .01), showing support for H1c.

Next, satisfaction with staff-checkout method has a stronger positive effect on overall store satisfaction compared to satisfaction with self-checkout (staff: β = .22, p < .01; self: β = .04, p > .65; $\Delta\chi^2$ = 6.78, df = 1, p < .01), thus H2a is supported. Satisfaction with staff-checkout also has a stronger positive effect on overall store loyalty compared to that for self-checkout (staff: β = .16, p < .05; self: β = .01, p > .85; $\Delta\chi^2$ = 5.24, df = 1, p < .05), thus H2b finds support. Finally, loyalty for staff-checkout method has a stronger positive effect on overall store loyalty compared to the loyalty for self-checkout (staff: β = .21, p < .01; self: β = .03, p > .75; $\Delta\chi^2$ = 7.32, df = 1, p

< .01), thus H3 is also supported. Similar to study one, none of the control variables have any significant effect. Table 4 summarizes all these results for study two.

5.3. Discussion

Study two provides further evidence about all the hypothesized relationships in the conceptual model (Figure 1), showing that the carry-over effects of customer experience with the staff-checkout is stronger than those for the self-checkout, similar to study one. As argued at the end of study one, a reasons for the differences in these carry-over effects could have been the choice of UK as a research setting for this study because it is a relatively new and less-developed market for the use of SST applications in retail stores. However, based on these results from Australia, the level of development for the use of SSTs in retail stores seems to have only a marginal effect on the overall evaluations of the retail stores and customer experience and frontline staff in supermarkets still seems to be more relevant in influencing overall store evaluations irrespective of the popularity and usage of SST in retail sector. Next, the authors discuss the theoretical contributions and managerial implications of these results.

6. General discussion

This paper extends the growing literature on the role of SSTs in the retail sector, especially in the frontline retail management services that play a critical role in the everyday lives of most modern consumers, by comparing the influence of customers' experience with different checkout methods in supermarkets. Using the concept of psychological distance under the construal level theory as the conceptual foundations, the authors hypothesized that the customers' perceived quality, satisfaction and loyalty towards the two checkout methods would potentially have significant effects on their evaluations of overall store quality, satisfaction and loyalty. They

tested these ideas with two empirical studies in markets at different stages of development for SST usage in retail stores, namely UK (less developed SST usage) and Australia (more developed SST usage), using a field survey with retail shoppers in UK and an online survey with a consumer panel in Australia respectively. However, both the studies show that customers' experience with the traditional staff-checkout process continues to have a significantly greater influence on their evaluations of overall store quality, satisfaction and loyalty, compared to the self-checkout machines, irrespective of the level of development of SST usage in retail sector.

These findings suggest that customers are probably unable or unwilling to transfer their quality perceptions, satisfaction judgments and loyalty intentions with self-checkout methods, to their overall perceptions, evaluations and intentions towards the retail store. In contrast, their perceived quality of staff-checkout seems to have a significant and strong positive impact on their evaluations of overall store quality, which self-checkout method seems to be catching up with. Although self-checkout method does not have the same impact as staff-checkout method, the support for the effects of self-checkout quality on store quality is probably a reflection that frontline staff are often present during this frontline experience. Indeed, a recent study by Kimes and Collier (2015) confirms this premise by indicating that customers often expect a frontline staff member to be present to help them out in case of a SST service failure. In considering their finding in conjunction with the results of this study, it is abundantly clear that for the time being retail managers need to continue to focus on the human aspect of frontline interactions between their customers and the service employees, even if these are restricted to dealing with simple queries or problem solving and not handling the manual checkout process.

Specifically, the results show that perceived quality, satisfaction and loyalty towards staff-checkout are still stronger drivers of overall store evaluations although self-checkout quality

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seems to be catching up as evident in its relatively smaller and yet significant positive impact on overall store quality in both studies. Hence, retail managers in both UK and Australia should continue to focus on recruiting, managing and training the frontline employees in their stores to ensure high levels of service quality and satisfaction, who can play an important role in helping build customer satisfaction and loyalty towards the store. However, retail managers also need to continuously improve the quality and satisfaction with the self-checkout method as these are likely to have an increasing impact on overall store evaluations in future. In this context, prior research shows that perceived complexity and risk of using SSTs in retail outlets may deter some customers from trying to use and adopt these (Adapa et al., 2020). Clearly, the retailers cannot afford to sit back and wait for customers to overcome these challenges by themselves and they need to help the customers experience SSTs because of their potential impact on store loyalty.

Specifically, retailers can develop and implement strategies to promote SST usage, such as providing incentives and personalized help to the customers to motivate them to try these SSTs and build their confidence over time. They may also use communication strategies, such as in-store advertising and promotions to highlight the innovative and personally beneficial elements of SST usage. Similarly, retailers may introduce price guarantees and easy return methods to reduce the negative perceptions about the complexity and risk associated with SST usage. Retailers can also use their customer databases to identify a group of innovative customers (e.g., early adopters of SSTs) to demonstrate their advantages to the other customers. Of course, retailers should also train their frontline employees to support the customers who need help in using SSTs to facilitate their initial experience that may build regular usage over time. Finally, retailers should also use the SSTs to collect data about customer usage patterns to gain insights about the profile of those customers who are quicker to adopt than the others, and use this

knowledge to develop suitable marketing activities targeting different customer segments.

None of the control variables show any significant influence on the three store-level outcome variables, hence the results for the proposed conceptual model seems quite stable and reliable. Specifically, none of the demographic (e.g., age, gender, education, occupation) or behavioral variables (e.g., loyalty membership, shopping frequency and average grocery shopping amount) have a direct effect on store quality, satisfaction or loyalty. Therefore, it seems that retailers who are moving towards increased usage of SSTs in their stores should dig deeper to understand the potential impact of SSTs on their diverse set of customers because many of them are unlikely to be impressed by what they may think of as an extra burden on them rather than something that would make their lives easier or more convenient. This finding also highlights the importance of customer awareness and education programs to help the customers overcome their resistance to adopting self-checkout machines as their preferred payment method.

7. Limitations and future research

This paper has some limitations that future research may address. First, the authors used one study in UK and another in Australia, with two different methods, to replicate and validate their findings as well as explore any differences between these two locations based on the disparity in the level of development in use of SSTs in retail stores. However, the two empirical studies show very similar results in these two locations. One reason for this could be that being developed and culturally similar markets, both UK and Australia may not be that different from each other in the use of SSTs in retail stores and cultural values. Therefore, future studies in less developed markets (e.g., China and India) may provide a stronger test for the conceptual model proposed in this paper and also help generalize the findings. Second, cultural differences may also influence

customer experience (Sharma et al., 2009), hence future research could test the proposed model in diverse cultural settings to help retails optimize customer experience at the organizational frontlines and develop stronger overall store loyalty (Singh et al., 2017).

Third, both the studies in this paper used supermarkets as their research setting, which may also explain the lack of differences in the findings between the UK and Australia samples, because supermarket consumers may behave in the same manner in markets with comparable income levels. Hence, future studies in other retail contexts such as department stores, clothing or footwear stores, fashion or jewelry retailers etc. may provide incremental insights. Fourth, this paper focuses on the role of checkout staff to explore their relevance in the face of growing use of SSTs in retail outlets. Hence, it does not measure the intangible aspects of checkout experience in the two studies, which is a limitation future research may address. Finally, the authors use single-item measures to assess the service quality and satisfaction for the two check-out methods to minimize respondent fatigue (e.g. Cristobal et al. 2007; Parasuraman et al., 1988; Sivadas and Baker-Prewitt, 2000; Szymanski and Hise, 2000) but these scales may not be able to capture the complete meanings of these constructs, which may limit the managerial implications of the results. Hence, future research may use multidimensional scales for these constructs to gauge their impact on the customers' overall perceptions about the store and provide more meaningful insights to help retailers improve overall customer experience.

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Figure 1 – Conceptual Model
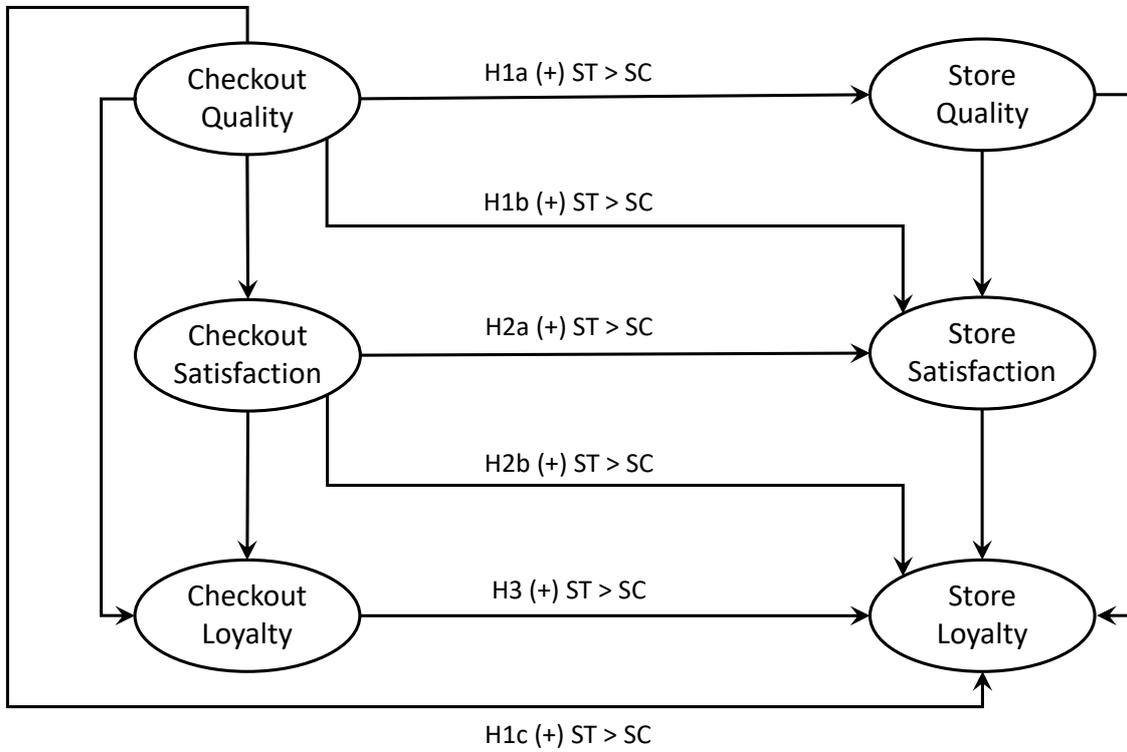
Legend: ST = Staff-checkout; SC = Self-checkout

Table 1 – Sample profiles

	Study 1 – UK (N1=313)		Study 2 – Australia (N2=474)	
	Frequency	Percent	Frequency	Percent
Age				
30 years and below	67	21.4%	98	20.7%
31-40 years	54	17.3%	106	22.4%
41-50 years	50	16.0%	90	19.0%
51-60 years	51	16.3%	84	17.7%
Above 60 years	91	29.1%	96	20.3%
Gender				
Male	88	28.1%	174	36.7%
Female	225	71.9%	300	63.3%
Education				
High School or below	144	46.0%	181	38.2%
Undergraduate	75	24.0%	163	34.4%
Postgraduate	41	13.1%	73	15.4%
Others	53	16.9%	57	12.0%
Occupation				
Student	15	4.8%	25	5.3%
Homemaker	38	12.1%	72	15.2%
Retired	77	24.6%	75	15.8%
Unemployed	14	4.5%	39	8.2%
Employed	146	46.6%	224	47.3%
Self-employed	23	7.3%	39	8.2%
Loyalty membership				
Non-member	120	38.3%	110	23.2%
Less than 2 years	27	8.6%	77	16.2%
2-5 years	62	19.8%	146	30.8%
More than 5 years	104	33.2%	141	29.7%
Shopping frequency				
Rarely (1-2 times a month)	11	3.5%	16	3.4%
Occasionally (3-4 times a month)	86	27.5%	59	12.4%
Regularly (1-2 times a week)	110	35.2%	279	58.9%
Frequently (3-4 times a week)	79	25.2%	88	18.6%
Very Frequently (more than 4 times a week)	27	8.6%	32	6.7%
Average weekly grocery bill (£ in UK and A$ in Australia)				
25 or below	38	12.1%	48	10.1%
26 - 50	123	39.3%	122	25.7%
51 - 75	82	26.2%	110	23.2%
76 - 100	50	16.0%	95	20.0%
Above 100	20	6.4%	99	20.9%

Table 2 – Scale items

	Study 1 – UK (N1=313)		Study 2 – Australia (N2=474)	
	Staff	**Self**	**Staff**	**Self**
Checkout method				
Perceived quality				
How do your rate quality of this method?	0.76	0.84	0.85	0.90
Satisfaction				
How satisfied are you with this method?	0.74	0.85	0.86	0.91
Loyalty				
How long have you used this method?	0.77	0.83	0.75	0.82
How frequently do you use this method?	0.70	0.76	0.73	0.87
How likely are you to use this in future?	0.72	0.78	0.90	0.92
Overall store				
Perceived service quality				
Bad 1 2 3 4 5 6 7 Good	0.73		0.79	
Poor 1 2 3 4 5 6 7 Excellent	0.78		0.83	
Below 1 2 3 4 5 6 7 Above	0.73		0.75	
Expectation Expectation				
Satisfaction				
Dissatisfied 1 2 3 4 5 6 7 Satisfied	0.84		0.89	
Unhappy 1 2 3 4 5 6 7 Happy	0.85		0.90	
Displeased 1 2 3 4 5 6 7 Pleased	0.83		0.90	
Loyalty				
I will speak positively about this store.	0.81		0.86	
I will recommend this store to others.	0.79		0.84	
I will encourage others to use this store.	0.78		0.81	
I will continue to shop at this store.	0.74		0.71	

Table 3 – Correlations table

	M	SD	1	2	3	4	5	6	7	8	9
1. Staff-checkout quality	4.34	.76	**.76**								
2. Self-checkout quality	3.11	1.29	.14*	**.84**							
3. Staff-checkout satisfaction	4.46	.77	.62***	.13*	**.74**						
4. Self-checkout satisfaction	3.27	1.29	.07	.69***	.19*	**.85**					
5. Staff-checkout loyalty	3.97	.35	.10	-.42***	.08	-.42***	**.73**				
6. Self-checkout loyalty	2.79	1.10	-.06	.59***	-.01	.61***	-.52***	**.79**			
7. Store quality	4.03	.72	.49***	.37***	.41***	.26**	-.05	.05	**.75**		
8. Store satisfaction	4.30	.81	.44***	.18*	.45***	.13*	-.01	.01	.58***	**.84**	
9. Store loyalty	3.91	.97	.25**	.13*	.25**	.13*	.03	-.02	.54***	.52***	**.78**
Average variance extracted (AVE)	NA	NA	.58	.71	.55	.72	.53	.62	.56	.70	.61
Composite reliability (CR)	NA	NA	NA	NA	NA	NA	.77	.83	.84	.90	.84
1. Staff-checkout quality	5.84	1.14	**.85**								
2. Self-checkout quality	5.92	1.95	-.05	**.90**							
3. Staff-checkout satisfaction	4.63	1.16	.73***	-.06	**.86**						
4. Self-checkout satisfaction	4.07	2.05	-.03	.67***	-.03	**.91**					
5. Staff-checkout loyalty	4.50	.26	.71***	-.30**	.54***	-.30**	**.80**				
6. Self-checkout loyalty	3.43	.92	-.20*	.56***	-.22*	.66***	-.47***	**.87**			
7. Store quality	5.74	.98	.54***	.20*	.50***	.17*	.33**	.07	**.79**		
8. Store satisfaction	5.89	1.12	.45***	.18*	.45***	.16*	.27**	.07	.62***	**.90**	
9. Store loyalty	5.59	1.27	.49***	.17*	.46***	.15*	.28**	.06	.52***	.57***	**.81**
Average variance extracted (AVE)	NA	NA	.72	.81	.74	.82	.64	.76	.62	.80	.65
Composite reliability (CR)	NA	NA	NA	NA	NA	NA	.84	.90	.83	.92	.88

Note: Figures on the diagonal are the square roots of the AVE values. * $p < .05$; ** $p < .01$; *** $p < .001$

Table 4 – Structural models output

H#	Hypotheses	Study 1 (UK)	Study 2 (Australia)
H1a	Staff-checkout quality → store quality	.45***	.52***
	Self-checkout quality → store quality	.24**	.21**
H1b	Staff-checkout quality → store satisfaction	.33***	.37***
	Self-checkout quality → store satisfaction	.10	.19**
H1c	Staff-checkout quality → store loyalty	.24**	.44***
	Self-checkout quality → store loyalty	.05	.21**
H2a	Staff-checkout satisfaction → store satisfaction	.29***	.22**
	Self-checkout satisfaction → store satisfaction	.11**	.04
H2b	Staff-checkout satisfaction → store loyalty	.21**	.16*
	Self-checkout satisfaction → store loyalty	.05	.01
H3	Staff-checkout loyalty → store loyalty	.28**	.21**
	Self-checkout loyalty → store loyalty	.12	.03
	Control variables		
C1	Age → store loyalty	-.12	-.01
C2	Gender → store loyalty	.08	.01
C3	Education → store loyalty	.05	-.03
C4	Occupation → store loyalty	-.02	.02
C5	Loyalty membership → store loyalty	.03	.07
C6	Shopping frequency → store loyalty	-.03	.04
C7	Average grocery bill → store loyalty	.02	.03

$^{*} p < .05; ^{**} p < .01; ^{***} p < .001$