



Examining the antecedents and consequences of perceived shopping value through smart retail technology



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ABSTRACT

This study examines the antecedents and consequences of perceived shopping value through smart retail technology. Specifically, we propose that perceived complexity, perceived advantage, perceived novelty and perceived risk of using smart retail technologies determine consumers' perceived shopping value, which, in turn, influences their store loyalty and intentions to adopt smart retail technology. Further, we propose that consumer innovativeness moderates these relationships. Survey responses from 338 actual shoppers with prior experience of smart retail technology were used to test the research model, while structural equation modelling was used to develop the proposed hypotheses. The present study offers a better understanding of consumer adoption of smart retail technology that may help managers to develop adoption strategies for successful implementation of smart retail technology in-store.

1. Introduction

The retail landscape is ever-changing, as systems, processes, information and communication technologies become more connected (Daunt and Harris, 2017; Dennis et al., 2014; Ferracuti et al., 2019). As a result, retail businesses are rapidly integrating technologies to remain profitable, relevant and customer-focused (Renko and Druzjanic, 2014). In response to an increasingly competitive environment, physical stores are complementing their existing business models with “smart retailing” to enhance the customer shopping experience (Roy et al., 2017; Roy et al., 2018). The concept of smart retailing emerged from the broader smart city phenomenon (Pantano and Timmermans, 2014). Essentially, the concept of “smartness” is linked to enhanced processes and efficiency from the retailers' side, and increased satisfaction and utility from the consumers' end. Over the past few years, traditional retail stores have incorporated several smart technology innovations into day-to-day practice. For example, self-service technologies (SSTs), radio frequency identification systems (RFIDs), interactive displays, touch screens, self-check-out functionality (Amazon Go), and informative touchpoints have been adopted to enhance customer engagement and experiences with retail stores (Pantano and

Timmermans, 2014; Roy et al., 2017, 2018). Smart retail technology (SRT) resonates with the smart use of technologies for retailing purposes and further creates a smart partnership between the retailer and consumer following its adoption and enhanced real-time interactivity (Gregory, 2015; Kim et al., 2016). It is forecasted investments in SRT are anticipated to grow by 20% annually to \$36 billion by 2020 (Research and Markets, 2015). Retailers, therefore, need to not only understand and identify suitable technology by way of critically examining the internal and external marketing environment but also introduce SRT at the most appropriate time. As such, retailers are constantly on the lookout for ways to employ SRT in order to offer superior shopping value to their consumers.

In parallel with this push by retailers to implement more SRT, consumers have become more technologically savvy and capable of using smart technology (Immonen and Sintonen, 2015). Hence, shoppers draw upon their perceptions of, and emotional responses to, a retailer's use of SRT, which potentially influences customer loyalty, drives purchase behaviour and creates a competitive advantage for the retailer. From the consumers' perspective, SRT in a traditional retail setting will enhance access to product and service information, offer convenience and foster better relationships with retailers, thus

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promoting consumer empowerment, engagement and experience (Yang, 2013). For retailers, SRT provides flexibility, customisation and reduced transaction costs within the retail environment. The introduction of SRT also provides important information to retailers on consumer characteristics, transactions, needs, preferences and their overall behaviour (Liao and Chen, 2004). However, SRT also elicits specific challenges, such as limiting the dynamic capabilities of organisations, the transfer of knowledge management strategies, relationship management practices, service access controllability and changes in consumption practices (Pantano, 2014; Pantano and Viassone, 2014). Nevertheless, the benefits offered by smart technology in a retail setting outweigh the identified challenges.

As discussed above, while the research emphasis to date has focused on the benefits of retail SRT, it has failed to examine the antecedents and consequences of customers' perceived shopping value through SRT, which some suggest to be an underexplored area in existing retail marketing literature (Priporas et al., 2017). Therefore, this current research investigates the antecedents to, and consequences of, consumers' perceived shopping value through SRT. Synthesising the literature on information systems (IS), consumer behaviour and relationship marketing, we determine the influence exerted by the characteristics of SRT (Jain et al., 2014) on consumers' perceived shopping value and the subsequent impact on consumers' store loyalty and intentions to use SRT. While prior research has been undertaken separately on SRT characteristics and intentions to use SRT (Compeau and Higgins, 1995; Forsythe and Shi, 2003; Moore and Benbasat, 1991; Teo, 2014), consumer innovativeness (Roehrich, 2004), shopping value (Chen and Dubinsky, 2003) and customer loyalty (Bloemer and Ruyter, 1998), this study is the first to test the inter-relationships between the constructs mentioned above using theories from IS, consumer behaviour and relationship marketing. The next section reviews the literature that guides the conceptual model.

2. Literature review

Change within the macro- and micro-level retail environment is occurring at a faster pace than anticipated, forcing retailers to actively defend their market position in a fiercely competitive environment (Pantano and Naccarato, 2010). In order to compete efficiently, retailers need to demonstrate their ability to adopt innovations and integrate new technologies into their operations (Pantano and Viassone, 2014). However, the adoption of new technologies by retailers may not necessarily translate into expected returns (Sethuraman and Parasuraman, 2005). While innovative technologies enhance customers' ability to access the services themselves (Pantano and Naccarato, 2010; Weijters et al., 2007), the adoption of these technologies may also motivate other consumers to develop unfavourable attitudes towards the retailer and the technology itself (Reinders et al., 2008); with research indicating shoppers concerns that the implementation of SSTs may lead to job losses, fewer staff and poor service outcomes (Bitner et al., 2000; Otekhile and Zeleny, 2016).

In the context of retailing, extant literature has focused on the acceptance of SRT (Clodfelter, 2010; Wang, 2012; Anderson and Bolton, 2015). Academic scholars have also elicited several characteristics relating to retail technology as perceived by consumers; for example, perceived usefulness, perceived enjoyment, attitudes about control and convenience, perceptions about personalisation and cost efficiency (Clodfelter, 2011; Wang, 2012; Walter et al., 2012). IS literature presents several models and theoretical frameworks for understanding consumers' propensity to adopt and continue to use new technology. For example, the theory of planned behaviour (TPB), the theory of reasoned action (TRA), the technology acceptance model (TAM) (and extensions), the unified theory of acceptance and use of technology (UTAUT), transaction costs perspectives and the perceived risk perspectives are closely associated with understanding consumer behaviour (Davis, 1989; Kim and Forsythe, 2009; Lin and Hsieh, 2006;

Venkatesh, 2000; Venkatesh and Bala, 2008). The majority of these models view consumer acceptance of technological innovations in a retail environment as a consequence of innovation characteristics such as relative advantage, compatibility, complexity, trialability or usefulness and result demonstrability from Rogers Diffusion of Innovation (DOI) framework (1982), but fail to incorporate the retail innovations' characteristics of risk and novelty.

Further, the majority of IS models are skewed towards encapsulating cognitive beliefs, thus discounting the effects of affective and emotional components (Bagozzi, 2007). Moreover, the existing IS models incorporate several augmentations over the core TAM model, repeatedly focusing on the constructs of perceived ease of use and perceived usefulness. Given these gaps in the existing theoretical models and the literature, and the calls put forward by academic scholars (Benbasat and Barki, 2007; Brown et al., 2004; S. A. Brown and Venkatesh, 2005; Wells et al., 2010), there is a need to integrate affective and emotional beliefs with cognitive components and progress beyond the TAM extensions by encompassing the dynamic nature of emerging technological and smart innovations (Wells et al., 2010). We argue that customers develop favourable and/or unfavourable experiences from their direct interaction with smart technologies and the associated cognitive, affective and behavioural elements (Van Noort et al., 2012); therefore, the characteristics of SRT are important for understanding the development of consumers' intentions towards SRT.

Consumers' intentions to use SRT align with the expectation-confirmation theory (ECT) that is well posited in the consumer behaviour literature to understand consumers' intentions to adopt, actual adoption, continuance and repeat purchase decisions (Bhattacharjee, 2001). The consumers' intention to adopt SRT refers to the pre-purchase behaviour, actual adoption of SRT aligns with consumers' actual purchase behaviour and continued use of SRT and repeat purchase decisions relate to consumers' post-purchase behaviour (Pokryshevskaya and Antipov, 2012). If SRT performance matches consumers' expectations leading to satisfaction, consumers will readily intend to adopt SRT and further use SRT. Therefore, the value orientations that consumers develop towards SRT will determine behavioural intentions (Hong et al., 2017). Consumers' perceptions about the usefulness, ease of use, relative advantage and enjoyment influence the adoption and usage of technological innovations. Consumers' perceptions about complexity and risk associated with the technological innovations under consideration may lead to dissatisfaction and steer consumers away from adopting and using technological innovations. In this current research, the decision-making stages are condensed to the pre-purchase, purchase and post-purchase stages. Consumers' intentions to use SRT are therefore identified as a dependent variable and we depict specific SRT-related activities by combining scale items associated with pre-purchase, purchase and post-purchase stages.

3. Hypotheses development

3.1. Perceived complexity of SRT

The internet and mobile technology have provided opportunities for retailers to retain their existing customers and acquire new ones through personalised offers, in-store push-notifications and the opening of online retail channels (Li et al., 2015). Recent empirical evidence suggests that SRTs are simpler and easy to use, are more engaging and provide more meaningful customer experiences (Kallweit et al., 2014; Meuter et al., 2003; Roy et al., 2018; Weijters et al., 2007). In an attempt to reduce operational costs and increase revenue, retailers now encourage their customers to adopt SRT. However, there is a possibility that customers may react negatively to a new SRT if it is seen to be complex. For instance, a customer may perceive SSTs as being complex because they require a high level of customer involvement compared to their limited involvement in the full-service option. Likewise, customers may find it difficult to learn how to use and manage mobile apps for

different retailers (Inman and Nikolova, 2017). Perceived complexity refers to the degree to which consumers perceive the SRT to be more complicated, difficult to use and needing more effort to integrate it into day-to-day shopping activities (Moore and Benbasat, 1991).

Customers' perceived complexity of the new technology can be driven by their personality characteristics, such as inertia, or the desire for human interaction (White et al., 2012). Customers' inertia prevents consumers from performing less-familiar tasks because of the perceived complexity of alternative methods. Customers with a high desire for human interaction are less likely to adopt SRT compared to those who desire independence in the service experience (Meuter et al., 2000). Technology adoption literature also suggests that technology features affect the level of adoption. For example, although online stores provide greater product information and assortments, customers may perceive the information overload as complex (Iyengar and Lepper, 2000). We therefore propose the following hypothesis:

H1. Perceived complexity associated with SRT negatively influences consumers' perceived shopping value through SRT.

3.2. Perceived advantage of SRT

Perceived advantage refers to the degree to which smart technology in a retail environment is perceived by consumers to be superior to the existing retail technologies (Lu et al., 2015). For example, the perceived advantage captures the dimensions of convenience, cost-effectiveness, interactivity, quality and even functionality associated with smart technology in a retail setting (Gao and Bai, 2014). Extant literature posits the positive association between perceived advantage and utilitarian shopping value orientations developed by consumers within the context of technological innovations (Overby and Lee, 2006) due to associated benefits, such as convenience, efficiency and task accomplishment.

We draw upon an equity theory (Adams, 1963) perspective of SRT adoption. The tenet of this theory proffers that people's motivation to adopt a new technology depends on their gain/effort ratio. Customers will be more likely to have a favourable opinion of the technology if their gains from the use of the technology are higher than their efforts, and vice versa (Evanschitzky et al., 2015). In the context of SRT, shoppers will react negatively to a situation in which benefits of a new technology accrue to retailers at shoppers' expense (Inman and Nikolova, 2017). For instance, customers may consider SSTs as being less useful because they offload the labour to shoppers. In contrast, some customers may prefer self-checkouts because of the perceived speed of the transaction (Zhu et al., 2013). Perceived advantages in time-saving and convenience are cited as being the two most important drivers of smartphone shopping in various customer surveys (Wang et al., 2015). We therefore propose the following hypothesis:

H2. Perceived advantages associated with SRT positively influence consumers' perceived shopping value through SRT.

3.3. Perceived novelty of SRT

SRT is a more advanced technology in the retail sector and offers high-quality retail services (Roy et al., 2017). Perceived novelty refers to the degree to which consumers perceive and identify the SRT to be unique and novel in helping them to achieve shopping tasks in a more enjoyable manner than existing retail technologies. As per the diffusion of innovation (DOI) theory, customers' perceived novelty of technology influences their attitude towards its successful adoption (Rogers, 2004). Shoppers are more likely to be receptive to new technology if they perceive it to contain superior features and functions. In contrast, they resist the acceptance of new technology if it is perceived as not offering superior functions and benefits (Roy et al., 2018). Perceived novelty is related to the hedonic motivations of individuals by relating the use of

SRT as fun or enjoyment derived from technological advancements in retailing (S. Brown and Venkatesh, 2005). Existing literature highlights the positive influence exerted by perceived novelty in the adoption of mobile banking use (Kim et al., 2007) and the use of online services (Escobar-Rodriguez and Carvajal-Trujillo, 2014). Based on the above discussion, we propose that:

H3. Perceived novelty associated with SRT positively influences consumers' perceived shopping value through SRT.

3.4. Perceived risk of using SRT

The benefits offered by SRT are not without potential risks, uncertainties and adverse consequences. Perceived risk refers to consumers' exhibited uncertainty about using a specific product/service due to the potential negative consequences that are expected to emerge from its adoption or use (Featherman and Pavlou, 2003). Falk et al. (2007) identify five types of risks that can inhibit SRT adoption: (i) time risk, (ii) psychological risk, (iii) financial risk, (iv) performance risk and (v) social risk. For example, shoppers may be hesitant to spend too much time learning a new retail technology (i.e., time risk), or be anxious about the SRT (i.e., psychological risk) or have concerns about fraud when using SRT (i.e., financial risk) (Bulmer et al., 2018; Cunningham et al., 2005; Featherman and Pavlou, 2003; Meuter et al., 2003). Thus, perceived risk orientations may hinder consumers' intentions to adopt a specific technological innovation.

Recent instances of data breaches in different countries have eroded shoppers' trust in SRT. For instance, hackers were able to access the personal information of David Jones' and Kmart's online customers in Australia in 2015 (Inside Retail, 2015). Similarly, data breaches at Target, Home Depot, Neiman Marcus and Sally Beauty affected millions of customers in the United States and had huge cost implications for retailers (Roberts, 2017). Given such instances of privacy breaches, customers may display a preference for maintaining their bias towards the conventional way of shopping instead of taking the risk of adopting SRT, as per status quo bias theory (Evanschitzky et al., 2015; Falk et al., 2007). We therefore propose the following hypothesis:

H4. Perceived risk of using SRT negatively influences consumers' perceived shopping value through SRT.

3.5. The moderating role of consumer innovativeness

Consumer innovativeness refers to a consumer's predisposition to search, evaluate and try novel products and services (Ailawadi et al., 2001; Roehrich, 2004). Our definition of consumer innovativeness, which aligns with the concept of "innate innovativeness" advanced by Im et al. (2003, 2007), is not domain- or product-specific. Consumer innovativeness is different from the variety-seeking tendency that is defined as a consumer's propensity to switch to different products or services to try something different (Koschate-Fischer et al., 2018). Although the variety-seeking tendency could include innovative brands, it more typically involves the tendency to switch among familiar products or services and may exhibit the opposite of the tendency to stay with the same innovative product or service.

Rogers (1982) proposed DOI theory is the seminal theory that states individuals in a particular society fall into any one of the five adopter categories such as innovators, early adopters, early majority, late majority and laggards on the basis of their rates of adoption of a specific type of innovation (Agarwal and Prasad, 1998). The concept of consumer innovativeness closely aligns with the DOI theory and the relatively dynamic nature of technological innovations, whereby an individual naturally tends to adopt new innovations. From the consumer perspective, the many benefits associated with the SRT itself and relative advantages over traditional retailing will allow the consumer not only to readily adopt SRT but also to develop the intention to use SRT

on a continuing basis.

Innate innovativeness aligns closely with personality traits, thus reflecting a tendency to seek out unique and novel information, stimuli and experiences (Hirschman, 1980). Extant literature acknowledges that all members of society possess a greater or lesser degree of innovativeness (Midgley and Dowling, 1978). In the present study, consumer innovativeness is identified as the moderator variable that moderates the relationship between consumers' perceived value orientations, such as complexity, novelty, advantage and risk, towards using SRT and consumers' perceived shopping value developed through using SRT. It is anticipated that consumers scoring high on levels of innovativeness will more readily embrace technological innovations. Therefore, if consumers with high innovativeness perceive SRT to be less complicated, it will increase the likelihood that they will derive shopping value from their purchase, primarily due to ease of use and perceived usefulness. However, consumers with low levels of innovativeness are likely to perceive SRT to be more complex, which may give rise to the fear of being unable to complete the transaction successfully. The perceived fear and anticipated regret and guilt for being unsuccessful have adverse effects on deriving shopping value from using SRT. Based on the logic presented above, we can present our fifth hypothesis:

H5. Consumer innovativeness positively moderates the relationship between the perceived complexity of SRT and perceived shopping value through SRT.

The extant literature has identified many benefits associated with shopping: pleasure (Babin et al., 1994), product/service performance (Swinyard, 1997), convenience (Keeney, 1999), information and price efficiency, and quality (Zeithaml, 1988). However, in the case of the smart retail environment, evidence suggests that both utilitarian and hedonic benefits drive consumers towards shopping activities. For example, the benefits associated with price and promotional aspects encourage consumers to purchase groceries in an online shopping environment (Garretson and Burton, 2003). Consumers derive shopping pleasure while enjoying low prices and a relaxing shopping atmosphere, thus combining both utilitarian and hedonic value orientations (Cox et al., 2005). Therefore, in the present study, perceived shopping value is identified as a dependent variable that encompasses both utilitarian and hedonic value resulting from consumers' perceptions of SRT characteristics.

Consumers' perceptions of innovations being novel and new stimulate affective positive and negative reactions (Wells et al., 2010). These perceptions tend to generate positive affective reactions in the form of excitement and interest (Mukherjee and Hoyer, 2001), while negative reactions to novel innovations result from the uncertainty and fear associated with unprecedented combinations (Swanson and Ramiller, 1997). Perceived novelty is associated with positive outcomes, particularly in the technological innovations adoption context, due to the orientation towards newness and uniqueness (Fichman and Kemerer, 1993). Consumers scoring high on innovativeness tend to readily adopt the novel products and/or services under consideration (Yi et al., 2006). Therefore, consumers' perceptions about the novelty of SRT may potentially lead to positive perceptions of SRT-related shopping value orientations. Thus, we propose the following moderation hypothesis:

H6. Consumer innovativeness positively moderates the relationship between perceived novelty and perceived shopping value through SRT.

High and low levels of consumer innovativeness may have implications for consumers' perceived shopping value of using SRT. Consumers with high levels of innovativeness are more likely to receive new cues and stimuli in the form of SRT in the purchase environment and perceive the SRT as being an advantage for their shopping value (Agarwal and Prasad, 1998). This perception of having an advantage of using SRT may break habitual routines and make the consumer more

open to new options (Wood, 2010). In the situation of a "change" mindset, this innovativeness relates to considering, purchasing and consuming new and novel products and services and gaining a competitive advantage over other consumers. Consumers experiencing high levels of change from an advantage should, therefore, develop a stronger orientation toward innovativeness, which satisfies their need to relate to product or service innovativeness and, therefore, may improve the perceptions of shopping value in the purchase environment (Hopkins et al., 2014). Conversely, lower levels of consumer innovativeness do not change the mindset and are not likely to increase the consumer's innovativeness tendency. Previous research shows that consumer innovativeness is positively affected by the value of openness to change (Steenkamp et al., 1999). Thus, consumers who do not have a change mindset and lack a tendency towards innovativeness are likely to be less open to purchasing new and innovative products or services. Previous research supports this view and shows that consumer innovativeness and new product adoption are negatively related to loyalty but positively related to shopping value for innovative consumers (Lee et al., 2001; Mathur et al., 2008). Thus, we propose the following moderation hypothesis:

H7. Consumer innovativeness positively moderates the relationship between perceived advantage through SRT and perceived shopping value through SRT.

Extant research suggests a negative relationship between perceived risk of using SRT and shopping value through SRT (Koschate-Fischer et al., 2018). However, consumers with higher levels of innovativeness purchase innovative products and services, and risks are implied and inherent in their decision-making process (Koschate-Fischer et al., 2018). Conversely, consumers with lower levels of innovativeness are risk-averse and uncertain in their decisions about purchases. Sequential choice in psychology further supports this view, as it finds that motivations for action can change in opposite directions over the course of temporally contiguous risky situations (Inzlicht et al., 2014). However, this change in customers' decisions is based on their individual differences (e.g., higher or lower in risk-taking propensity). Consumers with higher levels of innovativeness will downplay the risk associated with the use of SRT to derive shopping value. However, this phenomenon can be the opposite for consumers with lower levels of innovativeness, as they can perceive the use of SRT as extremely risky. Based on the discussion as mentioned above, we present the next hypothesis:

H8. Consumer innovativeness moderates the relationship between perceived risk of SRT and perceived shopping value through SRT.

3.6. Perceived shopping value through SRT, loyalty and intentions to use SRT

Retail store loyalty refers to consumers' commitment to a particular retailer. Prior studies in marketing have shown that perceived value is an important determinant of approach or avoidance behaviours such as loyalty (Parasuraman and Grewal, 2000; Floh et al., 2014), and prior studies in the retail context also provide empirical support for this relationship (Chen and Quester, 2006). Therefore, we expect perceived shopping value through SRT to influence retail store loyalty, because consumers perceive that shopping using SRT is likely to accomplish their shopping task more efficiently and reflects worth from the shopping experience (Willems et al., 2017). Thus, consumers perceiving a higher level of value of using SRT are likely to have accomplished their shopping goals, which is likely to result in approach behaviours such as stronger repatronage intentions towards the retail store (Roy et al., 2017). Balaji and Roy (2017) demonstrated that perceived value co-created by shoppers using SRT leads to positive consumer behaviours. Similarly, Wunderlich et al. (2013) proposed that the value obtained from using technology-mediated interactions such as SRT may lead to positive attitudinal and behavioural responses. Therefore, given this

reasoning, we propose that:

H9. Perceived shopping value through SRT has a positive influence on retail store loyalty.

In the present study, behavioural intentions refer to consumers' actions in the future concerning SRT. We expect a positive relationship between perceived shopping value and behavioural intentions towards SRT. Unlike the traditional shopping experience, SRT offers personalised retail services, improved control of the shopping process, and increased convenience and enjoyment (Roy et al., 2018), which are likely to result in a positive attitude towards SRT and increased intentions to use it in the future. Furthermore, the TAM suggests that when consumers perceive a new retail technology as being more useful, they are likely to exhibit a higher intention to adopt the new technology (Müller-Seitz et al., 2009). Thus, a higher utility derived from using SRT in shopping results in a higher overall positive assessment of SRTs (Inman and Nikolova, 2017). Therefore, we propose that:

H10. Perceived shopping value through SRT has a positive influence on intentions to use SRT.

Retail store loyalty means that consumers have a favourable impression of a retail store with regard to its products, services and retail technologies such as SRT, and this favourable impression influences future patronage (Macintosh and Lockshin, 1997; Yoon and Park, 2018). Thus, it is reasonable to expect that if consumers have a positive attitude towards the store, they are more likely to engage in SRT for shopping in the future. Therefore, we propose that:

H11. Retail store loyalty has a positive influence on intentions to use SRT.

The study's research framework is presented in Fig. 1.

4. Method

To test the conceptual model, we measured the constructs via a self-completion, online survey administered to a panel of respondents ($n = 338$) sourced from Amazon Mechanical Turk (MTurk). MTurk is a popular tool for the recruitment of respondents for research (Buhrmester et al., 2011) and there has been increase in the use of crowdsourcing platform for research (Hulland and Miller, 2018). For example, a review of work published in the Journal of Consumer

Research over four years indicated that 27% of the data presented in the journal articles in the form of surveys and experiments is collected using MTurk (Goodman et al., 2013; Goodman and Paolacci, 2017). Similarly, Chandler and Paolacci (2017) reported that over 40% of papers published in the Journal of Personality and Social Psychology and more than 20% of the articles published in Psychological Science used data sourced from MTurk. A survey method was preferred as the research required us to capture opinions from customers after they interacted with SRT. In total, 338 completed surveys were returned. There were 190 males (56%) and 148 females (44%) in the sample population. With regard to education, 31% (105) of the customers had a high school or primary school education, and 69% (233) had a university education. The sample showed that 51.5% (174) of the sample population had an income equal to or less than \$35,000, 30.7% (104) of customers had an income between \$35,000 and \$65,000, 8.6% (29) had an income between \$65,001 and \$80,000, and 9.2% (29) had an income higher than \$80,000. Customers' age categories were 18–24 (5%), 20–39 (60.4%), 40–54 (27.3%) and 55 or over (7.4%). Most customers (94%) shopped at least once a month at their preferred retail store, and 80% of the customers used self-service checkouts at least once per week. More than 85.5% of the sample had been using the internet for more than 5 years.

Respondents were screened to ensure they had used an SRT. Multiple item scales were pooled from the literature to measure the focal constructs. Previously validated scales were used to measure the *perceived complexity of SRT* (Moore and Benbasat, 1991), *perceived novelty of SRT* (Wells et al., 2010), *perceived advantage of SRT* (Moore and Benbasat, 1991), *perceived risk of using SRT* (Forsythe and Shi, 2003), *consumer innovativeness* (Roehrich, 2004), *perceived shopping value through SRT* (Z. Chen and Dubinsky, 2003), *retail store loyalty* (Bloemer and Ruyter, 1998) and, finally, *intentions to use SRT* (Compeau and Higgins, 1995; Teo, 2014). All items were adapted to suit the context and measured using a 7-point Likert scale. Respondents were also asked to report demographic information. The scale items retained in the current study are summarised in Table 1.

The IP-Address and location data were inspected to check for duplicates. Precautions to avoid duplicate responses were taken, which included a Qualtrics command to prevent ballot box stuffing. Efforts to reduce systematic measurement error (i.e. bias) were incorporated into the survey. Scale items were both positively and negatively worded to minimise acquiescence bias. Post-hoc, a Harman (1967) one-factor test

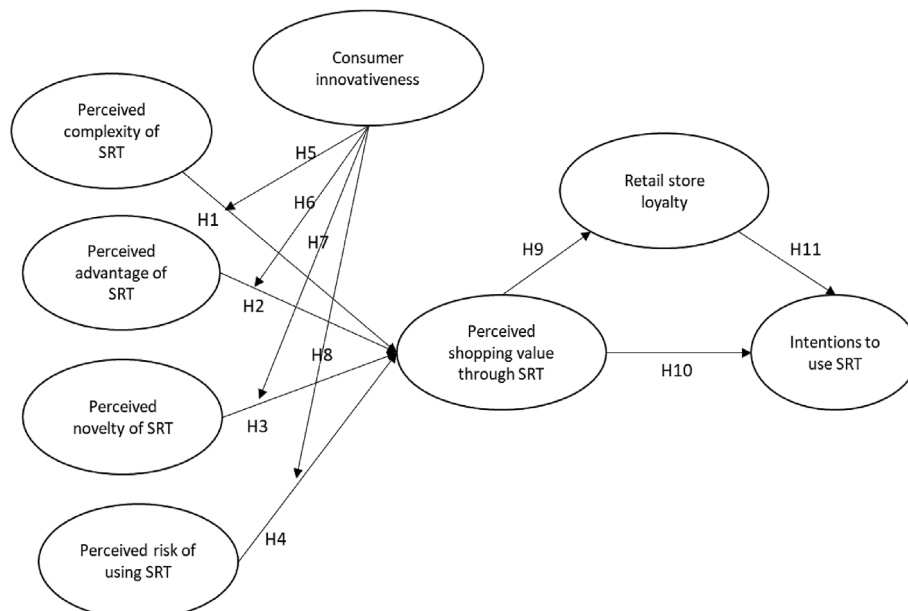


Fig. 1. Research framework.

Table 1
Item loading, scale sources and adapted items used in the study.

Constructs	Factor loading	Sources	Adapted items used in the study
Perceived complexity of SRT1	.89	Moore and Benbasat (1991)	SRT is complicated.
2	.69		SRT takes a lot of effort.
3	.86		SRT is confusing.
Perceived novelty 1	.57	Wells et al. (2010)	The concept of SRT is new.
2	.86		The concept of SRT is unique.
3	.80		The concept of SRT is original.
Perceived advantage of SRT1	.79	Moore and Benbasat (1991)	Using SRT enables me to accomplish my shopping tasks more quickly.
2	.84		Using SRT improves the quality of shopping I do.
3	.85		Overall, I find using SRT to be advantageous in performing my shopping.
Perceived risk of using SRT1	.71	Forsythe and Shi (2003)	I feel uncertain about how to effectively use the SRT.
2	.79		I am not fully capable of using the SRT.
3	.86		Using the SRT is not within the scope of my abilities.
Consumer innovativeness 1	.86	Roehrich (2004)	I am always seeking new ideas and experiences.
2	.91		I prefer a routine way of life to an unpredictable one full of change.
3	.90		I do not like meeting people who have new ideas. ^R
Perceived shopping value 1	.83	Chen and Dubinsky (2003)	The products in this retail store are reasonably priced.
2	.85		This retail store offers value for money.
3	.78		This retail store has good products for the prices set.
Retail store loyalty 1	.85	Bloemer and Ruyter (1998)	I consider this retail store as my first choice.
2	.58		I will shop more at this retail store in the next few months.
3	.78		I consider myself to be loyal to this retail store.
Intentions to use SRT1	.86	Teo (2014)	Given a chance, I intend to use SRT in the future.
2	.91		I will frequently use SRT in the future.
3	.90		I intend to use SRT in my next shopping trip.

N = 338, all item loadings are significant at $p < .01$.

was conducted. The first factor in the data accounted for less than 30% of the variance, suggesting common method bias is not an issue in the data (Harman, 1967). Mattila and Enz (2002) suggest that the techniques employed to minimise acquiescence bias (i.e. wording questions positively and negatively) and Harman's one-factor test provide support for the absence of these general method biases in the findings.

5. Analysis

5.1. Measurement model results

Preliminary analysis and confirmatory factor analysis (CFA) using AMOS 25 revealed that the measures used in this research displayed adequate psychometric properties and appeared to be free of systematic bias (Hair, 2006; Hair et al., 2011) (see Table 2). The fit of the CFA for the research conducted is acceptable, with $\chi^2/df = 1.967$, ($p < .01$); comparative fit index (CFI) = 0.958; root mean square error of approximation (RMSEA) = 0.054; standard root mean square residual (SRMR) = 0.059; and normed fit index (NFI) = 0.951. These results suggest a good fit of the model to the data, and the nine-factor model is well-supported by the analysis.

5.2. Reliability and validity

The average variance extracted (AVE) of each construct is above

Table 2
Average variance extracted, composite reliability, maximum shared squared variance and inter-factor correlation.

Constructs	CR	AVE	MSV	1	2	3	4	5	6	7	8
1- Perceived complexity of SRT	.86	.67	.20	.82							
2- Perceived novelty of SRT	.80	.58	.34	-.00	.76						
3- Perceived advantage of SRT	.87	.69	.67	-.16	.58	.83					
4- Perceived risk of using SRT	.83	.63	.31	-.45	.34	.49	.79				
5- Customer innovativeness	.92	.80	.45	.16	.33	.44	.56	.89			
6- Perceived shopping value	.86	.67	.45	.33	.51	.60	.16	.67	.82		
7- Retail store loyalty	.79	.56	.38	-.05	.52	.57	.43	.41	.45	.75	
8- Intentions to use SRT	.90	.75	.67	-.22	.55	.82	.56	.52	.51	.61	.86

Correlations: all values are significant at $p < .05$, N = 338. Where CR = composite reliability; AVE = average variance extracted, MSV = maximum shared squared variance.

0.50, supporting convergent validity (Gerbing and Anderson, 1988). All standardized factor loadings are greater than 0.70 and significant ($P < .01$) (except for perceived complexity 2, perceived novelty 1, and retailer loyalty 2) providing further support for convergent validity. These items were retained as other reliability and validity measures of all the instruments were satisfactory. Inspections of the correlation matrix (see Table 2) revealed low correlations between different pairs of constructs. The square root of the AVE of each construct was greater than its inter-factor correlation, suggesting that each construct discriminates from others. Further, the average AVE of each construct was also greater than the maximum shared squared variance (MSV), confirming the discriminant validity between each pair of constructs. The outcomes of these tests demonstrate that the constructs achieved discriminant validity. Preliminary reliability analyses (see Table 2) revealed that the internal consistency of all scales was above the minimum threshold (Cronbach $\alpha > 0.70$). The Cronbach's alpha values stated as good (0.71–0.91), satisfactory (0.58–0.97) and acceptable (0.45–0.96) due to lack of clear hierarchy within the suggested ranges seems to be arbitrary. Taber (2018) suggested that the threshold values of Cronbach's alpha seem not to suggest that the lower loadings implying an unsatisfactory value.

5.3. Hypotheses testing

The results of the structural equation modelling provide support for

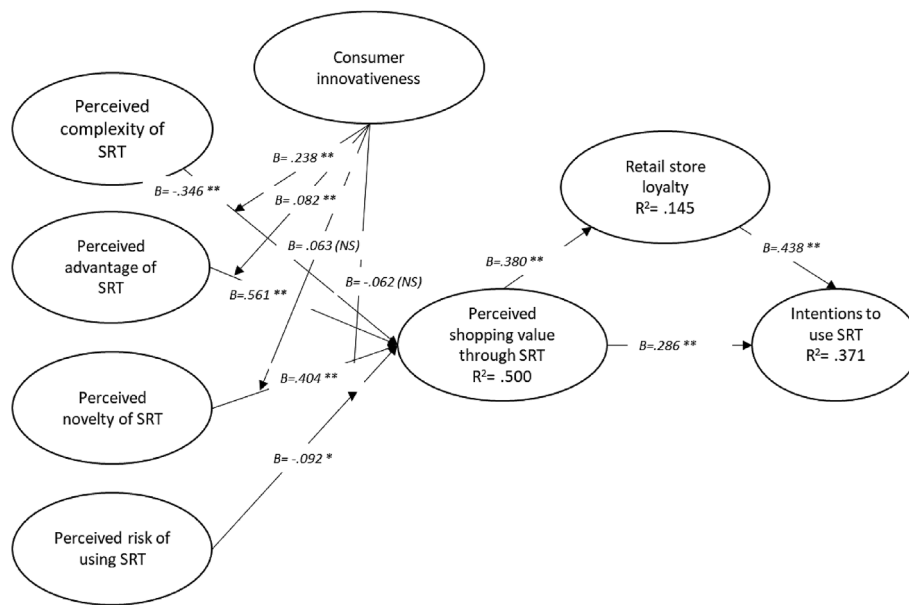


Fig. 2. Structural equation modelling results.

Table 3
Results summary.

Hypothesis	Estimate	SE	t	LCI	UCI	Hypothesis Support
H ₁ : Perceived complexity of SRT → Perceived shopping value	-.34**	.051	-6.77	-.25	-.44	Accepted
H ₂ : Perceived advantages → Perceived shopping value	.40**	.049	8.11	.31	.50	Accepted
H ₃ : Perceived novelty of SRT → Perceived shopping value	.56**	.045	12.44	.47	.65	Accepted
H ₄ : Perceived risk of using SRT → Perceived shopping value	-.09*	.045	-2.02	-.18	-.01	Accepted
H ₅ : Consumer innovativeness moderates the relationship between Perceived complexity of SRT → Perceived shopping value	.23**	.032	7.42	.18	.30	Accepted
H ₆ : Consumer innovativeness moderates the relationship between Perceived novelty of SRT → Perceived shopping value	.06(NS)	.045	1.40	-.03	.15	Rejected
H ₇ : Consumer innovativeness moderates the relationship between Perceived advantage of SRT → Perceived shopping value	.08**	.036	2.24	.01	.15	Accepted
H ₈ : Consumer innovativeness moderates the relationship between Perceived risk of SRT → Perceived shopping value	-.06 (NS)	.038	-1.60	-.14	.01	Rejected
H ₉ : Perceived shopping value of using SRT → Retail store loyalty	.38	.050	7.55	.28	.48	Accepted
H ₁₀ : Perceived shopping value of using SRT → Intentions to use SRT	.28	.046	6.12	.19	.38	Accepted
H ₁₁ : Retail store loyalty → Intentions to use SRT	.43	.046	9.36	.35	.53	Accepted
Variance change in perceived shopping value (%)	50.0					
Variance change in retail store loyalty (%)	14.5					
Variance change intentions to use SRT (%)	37.1					

** $p < .01$, * $p < .05$ $N = 338$, NS=Non-Significant.

all the hypotheses, with the exception of H₆ and H₈ (see Fig. 2). The moderating effect of customer innovativeness on the relationship between the perceived novelty of SRT → Perceived shopping value (H₆) and Perceived risk of SRT → Perceived shopping value (H₈) was found to be non-significant (Baron and Kenny, 1986). The variance change in dependent variables was 0.145, 0.371 and 0.50 for perceived shopping value, retail store loyalty and intentions to use SRT respectively. Table 3 presents a summary of the results.

5.4. Indirect effects

Based on the approach employed by Zhao et al. (2010), we tested the indirect effects using the Process Macro Tool (Model 4) (Preacher and Hayes, 2004). The results demonstrate that all indirect effects were significant (see Table 4), except the indirect effect of perceived risk of using SRT on intentions to use SRT.

5.5. Slope analysis

A simple slope analysis was conducted to confirm the moderating effect of consumer innovativeness (moderator). The simple plot analysis (see Fig. 3) reveals that consumer innovativeness dampens the negative

relationship between the perceived complexity of SRT and perceived shopping value. Fig. 4 reveals that consumer innovativeness strengthens the positive relationship between the perceived comparative advantage of SRT and perceived shopping value.

6. Discussion and implications

This research extends the scholarship on SRT, consumer behaviour and customer-retailer relationship-building strategies by considering the antecedents to perceived shopping value of using SRT. The development and testing of our conceptual model adopts a different approach to general IS models, including TRA, TPB, TAM and UTAUT. This study advances the scope of the most recent technological innovations in retailing and research in the consumer innovativeness literature through scrutinising its antecedents and outcomes in the retail setting. Our findings provide a more holistic perspective on how customer-perceived complexity, novelty, advantage and risk characteristics of SRT could contribute to the development of consumers' perceptions of shopping value of using SRT, leading to positive consumption experiences for consumers and retailers. Our results show that in a smart retailing context, customer evaluation of the novelty in features, attributes and functions performed by SRT plays a vital role in

Table 4
Indirect effects.

Indirect effects	Bootstrapping (5000 sample)			
	Effect size	SE	LCI	UCI
Perceived complexity of SRT → Perceived shopping value → Intentions to use SRT	.20**	.036	.13	.27
Perceived novelty of SRT → Perceived shopping value → Intentions to use SRT	.13**	.029	.07	.43
Perceived advantage of SRT → Perceived shopping value → Intentions to use SRT	.19**	.036	.12	.46
Perceived risk of using SRT → Perceived shopping value → Intentions to use SRT	.01	.024	-.03	.06
Perceived shopping value of SRT → retail store loyalty → Intentions to use SRT	.17**	.035	.10	.37

** $p < .01$, * $p < .05$, $N = 338$. SE = standard error LCI = lower confidence interval; UCI = upper confidence interval.

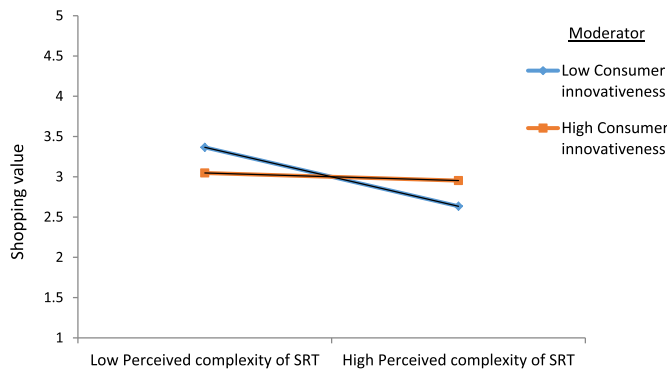


Fig. 3. Two-way interaction of perceived complexity of SRT and consumer innovativeness on customer-perceived shopping value.

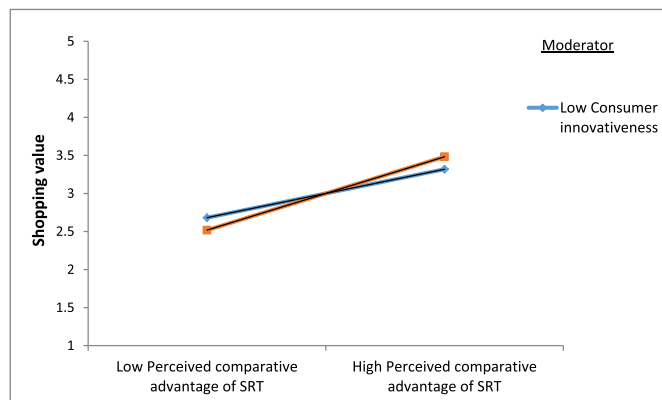


Fig. 4. Two-way interaction of perceived advantage of SRT and consumer innovativeness on customer-perceived shopping value.

developing positive shopping value perceptions.

Our findings indicate that perceptions about complexity and advantage, in conjunction with consumers' predisposition to search, evaluate and try novel products and services, can generate shopping value through SRT. Highly innovative consumers may engage in cognitive and emotional decision-making through central and peripheral paths respectively, which may facilitate a positive consumption experience of using SRT. However, while consumer innovativeness tends to strengthen the relationship between the effect of perceived complexity and advantage on customers' perceptions of shopping value of using SRT, the impact of perceived novelty and risk were not moderated by consumer innovativeness. Perhaps novelty-seeking attitude and risk-averseness are implied parts of innovativeness, and consumers with high levels of innovativeness are likely to see advancements in SRT as simply another service enhancement.

In a retailing context, goal congruence regarding positive shopping value is also important and could be attributed to the occurrence of favourable outcomes, such as loyalty and continuance of intentions to use SRT. Loyalty and intentions to use SRT can help consumers to attain

their goals (e.g., purchasing an iPad through SRT results in building social identity, eliminating the fear of being excluded from hi-tech social circles). In this situation, consumers can hope that their engagement with SRT positively affects their personal and social positioning. These positive outcomes are possible because the perceived benefit of purchasing through SRT outweighs the costs associated with maintaining the status quo.

The results of the indirect effects further show that perceived shopping value through SRT remains significant in explaining the relationship between customer-perceived complexity, novelty, advantage and intentions to use SRT. The results further highlight the effect of perceived shopping value on customers' intentions to use SRT, thus enhancing consumers' loyalty. These findings are notable because studies on customers' purchases of products and services through SRT have employed TRA, TPB, TAM and UTAUT, and emphasised the intentions to use SRT. However, our study is the first to position perceived shopping value of using SRT as the mechanism that creates the effects of perceived complexity, novelty, advantage and risk on intentions to use SRT. We also position store loyalty as an important mediator in helping consumers feel more confident about using SRT. We further show that innovative consumers are better able to attain shopping value through SRT and intend to make a repeat purchase of the same product and service using SRT.

Our findings further reveal that retailers should help their customers to experience SRT, which may assist customers in the process of attaining store loyalty. Managers can achieve this by implementing specific SRT marketing strategies that help customers set and reach collaborative goals, such as co-creation of value and customisation. Put simply, the more confidence a customer has that the SRT will provide value, the more loyal they will be to the SRT and the retailer. Accordingly, managers of multi-channel retailers and service firms should implement strategies to cultivate an environment that attracts innovative customers and increases the perceptions of novelty and advantage, and decreases the magnitude of complexity and risk associated with the usage of SRT. For instance, immersive and interactive training simulations would enhance the consumer experience with SRT, where customers could use all of their senses (sensory-based exploration of unknown environments) before purchasing through SRT (Stein and Ramaseshan, 2016). Such interactive experiences with SRT mitigate risk and improve confidence that the delivered product or service will resemble the displayed ones. These pathways may include using SRT to look for multi-channel retailers or service firms to provide operational efficiency and transactional excellence, like payment plans, price guarantees or easy return methods (Jeng, 2017).

Customers want to see how their purchases contribute to their personal wellbeing and social fit, and setting the right goals makes this connection explicit for them. Some retailers neglect to think about what value orientations a customer is personally trying to accomplish through SRT (e.g., positive shopping value and loyalty). To help align customers' engagement and involvement in the novel and advantageous brands with reduced complexity and risk, firms may need to incorporate customers' personal interests into their marketing mix and online marketing strategies to increase customers' loyalty with the

store, which will ultimately develop grounds for the continuance of their repurchase intentions through SRT. While promoting SRT to all customers is inevitable, a cohort of innovative customers would be strategic and valuable to any smart retailer. Retailers should also strive to examine the level of innovativeness during the early stages of their interaction with customers. Employees who provide support for the use of SRT, if adequately trained and equipped, can assess customers' purchase intentions by examining their levels of innovativeness. In short, managers should give their employees discretion to help customers in this way, especially with the immediacy of social media in an online purchasing environment. Luthans and Jensen (2002) have already emphasised the need to examine the role of innovativeness levels in positive organisational behaviours and human resource management strategies and practices by shedding light on how customers' innovativeness can be instrumental in converting prospects into satisfied, committed, involved and loyal customers. Finally, with the rapid growth of shopping through SRT, retailers are very keen to bring the frictionless customer experience of shopping in the store wherever they can. At the same time, retailers also want access to the rich data and high-performance analytics that SRT can generate with the integration of customer-relationship management to drive websites and mobile shopping trips.

The primary goal of this activity is to establish limitless control to design a customer experience and engagement and collect big data to improve predictability about how customers will derive value from shopping at the store. Retailers can gain a competitive advantage and implement a differentiation strategy by sensing, understanding and capitalising on SRT and integrating it into the Internet of Things data with analytics. To take advantage of this new promising area, with SRT integrated with and powered by automation, artificial intelligence, the Internet of Things and advanced analytics, retailers can now understand the context (the time and the place of the customer) to identify when a customer needs help or an incentive to purchase and respond proactively using smart transportation applications, demand-aware warehouse technologies and robotics. For instance, in a smart store, we will be able to use Wi-Fi foot-traffic monitoring to see if customers dwell over a product area.

7. Future research directions

This study has presented a systematic approach to understanding consumers' intentions to use SRT and, most importantly, the moderating and mediating effects of consumer innovativeness and loyalty variables. The study extends the popular IS technology adoption models and ECM. The results obtained affirm the moderating and mediating roles of consumer innovativeness and loyalty between identified independent and dependent variables. The study's findings emphasise the importance of perceived shopping value generated by consumers through SRT in a retail store environment, thus enhancing retail store loyalty and intentions to use SRT. Overall, the findings from this study enhance our understanding of SRT and consumers' intentions to use SRT.

The study has certain limitations. For example, the study's focus is to investigate consumers' intentions to use only one technological application, SRT, in one country. Therefore, the study area is discounted by not incorporating potential effects of cultural features and other new smart applications, thus preventing generalisations of the research findings to other contexts (Hofstede, 1983). Cultural features, for example national cultural contexts and the classification of countries as high or low on individualism versus collectivism, have showcased positive and/or negative effects on the levels of consumer innovativeness in the extant research (Khan et al., 2014; Mortimer et al., 2015). Future research directed towards exploring different cultural, country and technological contexts will strengthen our research model and the findings obtained in the present study. Similarly, the present study does not take into consideration a deep exploration of the demographic

variables to investigate the influence exerted by mediator and moderator variables on perceived shopping value and intentions to use SRT; for example, it does not explore in detail how the variations in age, level of income, level of education and ethnicity impact on intentions to use SRT. Future research could focus on investigating the demographic effects on consumers' intentions to use SRT. This study focuses on perceived shopping value as the predictor of retail store loyalty and intentions to use SRT. As other retailer factors such as trust, image, and brand equity might be affected by the SRT and influence store loyalty, future researchers should examine how SRT influences retailer trust and image in influencing their intentions to use SRT and retail store loyalty. Also, future research could study users' engagement of SRT on social media platforms and the features of SRT that attract user attention.

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