

Entrepreneurship and self-service technologies as a driver of customer loyalty to the retailer during the COVID-19 pandemic

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Abstract

Purpose – This research aims (i) to assess the level of customer satisfaction and loyalty to self-service technologies and Auchan Retail Portugal, (ii) to identify the determinants of customer satisfaction and loyalty to these technologies and also, (iii) to identify their influence on customer loyalty to this modern distribution retailer operating in Portugal.

Design/methodology/approach – A conceptual model was defined to meet the research objectives and to carry out the quantitative analysis applied to the random sample ($n = 483$) of customers. The data used were gathered via an online questionnaire survey, which covered all dimensions of the conceptual model, applied in 2021 in Portugal. To validate the hypotheses, Cronbach's alpha and multiple linear regression models were used.

Findings – The results reveal that customer satisfaction with self-service technologies has a direct and positive effect on customer loyalty to Auchan Retail Portugal. Furthermore, results reveal that the technology utility factors significantly influence the customer technology experience which has an impact on perceived service quality and perceived risk. The findings of this research provide data on how to improve customer adoption and satisfaction with self-service technology and highlight that these technologies should be part of firm's competitive strategy.

Originality/value – This study presents itself as a novelty for science, while granting important contributions to the retailer. It presents an innovative conceptual model that delivers to Auchan the basis for it to move toward smart retail technologies, aiming at the market trend of personalization. For future research, this study can be used as an instrument to evaluate the customer experience with self-service technology and to examine the determinants and effects of self-service technology separately.

Keywords Entrepreneurship, Self-service technologies, Mobile applications, Loyalty, Customer experience, Retail

Paper type Research paper



1. Introduction

The final impact of entrepreneurship, and the culture of entrepreneurship, is the creation of new companies or the development of new business opportunities in existing companies. For this reason, entrepreneurship has played a key role in national and regional economic policies. It contributes to the creation of an innovative business culture by promoting greater business dynamism and encouraging companies to seek to move up the value chain in a global economic environment that is competitive. Undoubtedly, the entrepreneurial spirit is considered an important mechanism of economic development through job creation, innovation and social well-being. According to [Schøtt *et al.* \(2015\)](#), entrepreneurs are entities that create new businesses, drive and shape innovation, accelerate structural changes, increase market competition and contribute to the fiscal health of the economy.

In this context, the retail industry has demonstrated the presence of a high entrepreneurial spirit, reflected in the systematic and rapid adaptation to environmental changes, relying on the development of new information and communication technologies to accompany and respond to the demanding expectations of the consumer. Also, the unexpected emergence of the pandemic, triggered by coronavirus disease 2019 (COVID-19), caused a vertiginous acceleration of technologies to respond quickly to new consumer demands.

This type of action seems to come close to what the literature refers to as human agency. [Parsell *et al.* \(2017, p. 239\)](#) and [Houston \(2010\)](#) define human agency as an individual's capacity to determine and make meaning from their environment through purposive consciousness and reflective and creative action.

According to [Huggins and Thompson \(2020\)](#), there are three forms of agency that may act as catalysts of transformation one of which is the entrepreneurial agency. This kind of agency operate across the personal-proxy-collective continuum.

Thus, entrepreneurs in the retail sector, attentive to current and future customer needs, use retail technologies to offer consumers convenience, more efficient and personalized services, always with easy access through various channels. Also, technology has drastically changed the way services are designed, developed and delivered to the customer. In particular, self-service technology provides new ways to deliver customer value, while making retailer operations more efficient. An example of these are the self-checkout technologies, as an automated alternative to the traditional checkout, which allow customers to produce a service without the direct involvement of a company element. The focus of these technologies is to optimize the customer's checkout, reorganizing its function, making the customer one of the creators of their shopping experience.

Therefore, it is not only entrepreneurs who implement new technologies in the retail sector but also the actions of their customers through the acceptance of these new technologies, which make this change possible.

This type of action seems to be explained in the light of human agency, as referred to by [Shanahan and Hood \(2000\)](#), [Bunnin and Yu \(2004\)](#), [Schlosser \(2015\)](#), and [Goller and Harteis \(2017\)](#).

In addition, retail entrepreneurs are also concerned with sustainability, implementing "green" measures, namely, waste management, minimization of plastic, reduction of food waste, energy saving, efficiency in water consumption, protection of biodiversity, transport efficiency, as well as complying with standards and obtaining certifications ([Grosu, 2023](#); [Bux and Amicarelli, 2022](#)).

The object of study of this work is the introduction of self-service technologies in Auchan Retail Portugal, and this study intends to contribute to the growing literature on the role of entrepreneurship in the development of new business opportunities fostered, in this case, with the application of self-service technologies in the retail sector, which play a critical role in the daily lives of most modern consumers. Thus, it is intended to understand what the influence of the customer experience with self-service technology on customer loyalty to these

technologies is and to Auchan, as well as to know the degree of satisfaction and loyalty to self-service technologies and to the retailer and, simultaneously, identify the antecedents of use, satisfaction and loyalty to these technologies and, therefore, to Auchan.

To proceed with the study, a conceptual model was developed from which 13 hypotheses were extracted. To validate the hypotheses, a questionnaire was created which allowed obtaining a database composed of 483 individuals who had used Auchan's self-service technologies for at least the last 3 months. Cronbach's alpha was applied to the collected data to validate the consistency of dimensions and subdimensions and, finally, multiple linear regression models.

The results allowed validating all hypotheses. The findings of this research provide data on how to improve customer adoption and satisfaction with self-service technology and highlight that these technologies should be part of the firm's competitive strategy.

The remainder of this paper is organized as follows. In [Section 2](#), we discuss the theoretical background. [Section 3](#) presents the conceptual model, hypotheses and objectives; it also describes data collection and the methodology used. [Section 4](#) perform the data analysis and presents the results. [Section 5](#) discusses and summarizes the main findings of our work and presents the limitations and future research.

2. Theoretical background

In the 21st century, the unit of time is the only one that technology has not been able to decipher, but efforts have been made to make the best possible use of time. This idea is reflected in the futuristic retail trend, whose main objective has been to increase customer convenience, to achieve full satisfaction with the shopping experience and the ultimate goal of loyalty. In this evolution, information systems and technologies play a crucial role, being recognized that they have transformed business processes over the last few years ([Meuter et al., 2005](#)).

Technology is drastically changing the way services are designed, developed and delivered ([Meuter et al., 2005](#)), transforming the retail industry and the customer shopping experience ([Roy et al., 2018](#)).

With the aim of meeting consumer demands and expectations and, with the ultimate aim of increasing consumer satisfaction, retail technology tools are used by entrepreneurs in the retail sector to offer consumers better, more efficient and personalized services ([Bitner et al., 2002](#)) and with easy access through multiple channels ([Lee and Yang, 2013](#)). In this way, the traditional models of the various retail services have been replaced or expanded by technology, with customers increasingly providing their own services, that is, through "self-service technologies, customers carry out the complete service on their own account, without the direct assistance of an employee" ([Bitner et al., 2002](#), p. 96).

Nowadays, technology is not only present in the back-office processes but also in the front office, in the interaction with the customer, through self-service technologies, breaking the tradition of close personal contact between customers and employees ([Meuter et al., 2005](#)). Also, several studies ([Alaimo et al., 2022](#); [Beshley et al., 2023](#); [Shahzad et al., 2023](#)) have demonstrated the influence of technologies on customer satisfaction, experience and loyalty as well as the importance of its introduction in the service industry.

2.1 Self-service technology

Self-service technologies provide retailers with new ways to engage and serve customers while saving costs ([Roy et al., 2018](#)) and making their operations more efficient ([Morimura and Nishioka, 2016](#)).

These technologies allow customers to produce a service without the physical presence or direct involvement of an employee ([Meuter et al., 2000](#); [Meuter et al., 2005](#)). There are various

forms of self-service technologies that serve different purposes and act in different areas. For example, ATMs (Automated Teller Machines), automatic hotel checkouts, automatic payment pumps, online purchases, interactive and informative kiosks, among many other options (Meuter *et al.*, 2000). Another example of self-service technology is the self-checkout technology which, in this study, refers to an automated alternative to the traditional checkout (Lee and Yang, 2013) of a commercial establishment. For example, consumers, in the supermarket, have two alternatives: pay for items by interacting with the employee at the traditional cashiers, or establish an interaction with a self-checkout system (Lee and Yang, 2013).

Self-checkout technology intends to optimize the process, offering a fast checkout with a reorganization of the customer's function (Meuter *et al.*, 2000). The customer participates in the creation of the technology-based service and must be willing to assume responsibility, even partial, for the quality of the service itself (Marzocchi and Zammit, 2006). It is important that customers have a propensity for using self-service technology, feeling technology as a means to achieve their goals more easily and not as an obstacle (Marzocchi and Zammit, 2006). To improve the efficiency of checkout operations and minimize customers' waiting time in the checkout line, which negatively influences their satisfaction and their shopping experience, various forms of self-checkout have emerged (Morimura and Nishioka, 2016), explained below:

Self-checkout machines are a computerized system that allows customers to register their products and pay for their purchases autonomously. The customer interacts with a computer interface that guides him through the product registration process and indicates where to place them. By reading the article's barcode, the computer receives information about the item, showing its price to the customer and checking the weight of the article when placed on the scale (Inman and Nikolova, 2017). Thus, self-checkout machines allow the customer to register the products and pay for their purchases without resorting to a traditional cashier.

Self-scanning portable terminals are devices that allow us to read the barcode of products and their packaging on the fly, showing the customer the information on the price and quantity of the registered product. The customer can track the expenses of his purchase while making it and ends with payment in a designated area, without having to put the purchases in a cash register (Marzocchi and Zammit, 2006);

Mobile Apps vary from retailer to retailer, with some apps lacking a self-checkout option, with only basic functionality such as a store locator and the ability to view brochures or download coupons, while other retailers deliver to the customer a mobile application that offers an omnichannel experience, with the possibility of online and in-store purchases (Inman and Nikolova, 2017). In-store purchases, with the same logic as self-scanning portable terminals, work by registering products with the mobile application installed on the customer's smartphone. As the purchase is made, the customer registers and monitors the total purchase amount, ending up in the checkout area for this purpose, where he makes the payment without removing the products from the cart/basket (Inman and Nikolova, 2017). This technology allows for greater customer satisfaction due to the convenience and reduction of waiting time, combined with labor savings for the retailer (Inman and Nikolova, 2017).

Recently, alternatives to traditional checkout have also emerged through artificial intelligence, NFC (Near Field Communication) technology, RFID (Radio Frequency Identification), among others (Sharma *et al.*, 2021). Although the use of self-checkout methods brings significant benefits to retailers and customers (Lee *et al.*, 2013), the transition from the traditional service delivery method to the self-checkout method is not always easy seen as attractive by all customers, and it is essential that the company demonstrates the advantages of new services (Choi and Park, 2014; Elliott *et al.*, 2012).

Self-service technology combined with retail has been improved over time (Inman and Nikolova, 2017) and, although in recent years, studies on the use of self-service technologies have increased, still little is known about satisfaction and consumer loyalty to the technological checkout solution when using the traditional cashier as an alternative (Sharma *et al.*, 2021). Understanding the determinants that lead to consumer satisfaction is central to the success of self-service technologies in the retail context (Wang, 2012), as this is increasingly a critical service channel for interaction between customer and retailer (Meuter *et al.*, 2000).

2.2 Satisfaction

According to Roy *et al.* (2017), “satisfaction in smart retail results from the evaluation and impression of the performance of smart retail technologies by the customer” (p. 260). It is the accumulation of experiences with self-checkout technology that lead to the formation of customer satisfaction (Meyer and Schwager, 2007). When customer expectations and the perceived value of their user experience are balanced, satisfaction with the service arises (Meyer and Schwager, 2007). Thus, satisfaction is the measurement of customer expectations and perceived value. When perceived value equals expectations, the customer has achieved satisfaction; if the perceived value is lower than expectations, the customer is not fully satisfied; if the perceived value exceeds expectations, the customer is satisfied, and the product/service has exceeded their expectations.

Several studies (such as Iyer *et al.*, 2018; McLean *et al.*, 2018) have identified that the use of mobile applications by retailers influences consumer satisfaction.

2.3 Customer loyalty to self-service technology and to retailer

A retailer has two main goals: to improve the customer’s shopping experience and to develop their loyalty to the store (Lee, 2015). The concept of customer loyalty can be defined as the “commitment of a customer to buy at a particular store” (Kelly, 1967, p. 15). In this study, two dimensions of loyalty were contemplated: to the retailer and to self-service technology. Retailer loyalty is achieved when the customer buys frequently at the same commercial establishment and recommends the retailer to their peers (Lee, 2015). Similarly, loyalty to self-service technology is achieved when the customer is loyal to the use of technology in their purchases and when they intend to practice word-of-mouth communication with the people around them about the technology.

Oliver (1997) describes that loyalty to a brand has four stages and that consumers go through these stages and become “more loyal.” Applying this knowledge to loyalty self-service technologies, the customer, in the first phase, cognitive loyalty, believes that this technology is preferable to their checkout alternatives. This recognition is based on prior knowledge or information based on experience. This state is superficial in nature, and if satisfaction is not processed, loyalty does not go deeper than technology performance. However, once there is satisfaction, loyalty begins “to take on affective tones” (Oliver, 1999, p. 35). In the second phase, affective loyalty, the customer develops a taste or attitude toward the self-service technology, based on successive satisfactory uses. Then, the third stage of loyalty places customers with a deeper level of commitment. Called volitional loyalty, this phase represents behavioral intention, commitment to technology and willingness to use it again. It is in the last phase, the loyalty of action, that the behavioral intention motivated in the previous state of loyalty is transformed into action, even if this implies overcoming the obstacles that appear.

According to Oliver (1999), satisfaction is the seed from which loyalty is born and which needs to be “cared for”/worked on to grow. Inman and Nikolova (2017) demonstrated that customer satisfaction with the use of self-service technology impacts word-of-mouth

communication and the intention to return to the store, thus verifying that the checkout experience plays a role important for developing relationships between retailer and customers.

2.4 Customer-level outcomes of the self-service technology

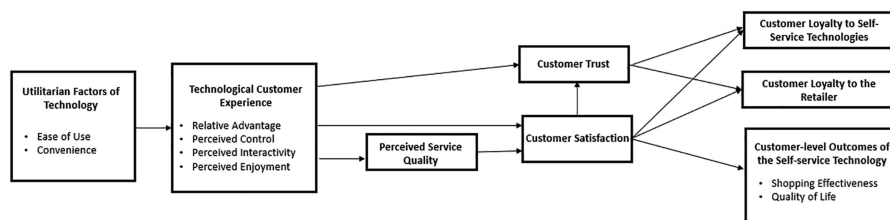
The results of self-service technology at the customer level are divided between purchasing efficiency and quality of life.

For customers, purchasing efficiency exists when the transaction is carried out with greater speed, control or convenience (Collier *et al.*, 2015). According to Roy *et al.* (2017), purchasing efficiency can be affected by situational factors and customer characteristics/traits. For example, in the study by Collier *et al.* (2015), the impact of situational factors on customers' decisions to use self-service technology was analyzed, and the model also examined the relationship between situational variables and customers' assessment of purchasing efficiency. Thus, the convenient location of the self-service technology had a strong and significant influence on the customers' purchasing efficiency. Likewise, customers' tolerance for waiting positively impacted perceptions of purchasing efficiency through a self-service technology, i.e., "if customers are more tolerant of waiting for their turn in a self-service technology, they may believe that this channel option gives them the best chance of increasing their purchasing efficiency" (Collier *et al.*, 2015, p. 708). Finally, the variable "basket size" had a strong relationship with the efficiency of the purchase, given that as the number of articles increased, the less perceived efficiency of the purchase by the customers was (Collier *et al.*, 2015).

The quality-of-life concept can be defined as a subjective perception that an individual has about their current life circumstances, encompassing various factors such as health, consumption, work, relationships/family and leisure (Dagger and Sweeney, 2006). Quality of life reflects well-being, happiness and satisfaction with life. It is a subjective, individual and empirical concept (Dagger and Sweeney, 2006). Increasingly, quality of life is linked to the effect of a service, which is a central concept in the investigation of this topic. But quality of life as a result of a service is a long-term measure of service quality compared to the traditional assessment of service satisfaction (Roy *et al.*, 2017).

2.5 Concept model and hypothesis

Thus, to respond to the research objective a conceptual model of relationship between the variables was developed, based on the theoretical foundation, and adapted to the situation and context of Auchan, the dimensions of the model were based on and adapted from the studies by McLean *et al.* (2018), Rose *et al.* (2012), Molinillo *et al.* (2020), Roy *et al.* (2017) and Lee and Yang (2013). Figure 1 shows the research model that intends to measure the impact of (1) Utilitarian Factors of Technology on the Customer's Technological Experience, (2) Customer



Source(s): Figure created by the author

Figure 1.
Proposed
Research model

Technological Experience on Perceived Quality of Service, (3) Technological Customer Experience and Perceived Quality in Customer Satisfaction, (4) Technological Customer Experience and Customer Satisfaction in Customer Trust, (5) Customer Trust and Satisfaction in Customer Loyalty to Self-service Technology and the Retailer (Auchan) and (6) Customer Satisfaction in Customer Self-Service Technology Outcomes, namely in the efficiency of shopping and in the customer quality of life.

Based on the conceptual model and the literature review, 11 research hypotheses were formulated, relating the study variables as follows:

According to McLean *et al.* (2018), supported by the studies of Davis (1989) and Bhattacharjee (2001), the utilitarian factors of technology drive the perception that the customer has of their shopping experience. For these authors, these factors “drive the level of customer satisfaction when using a retailer’s mobile application” (McLean *et al.*, 2018, p. 332). Ease of use and convenience are the determinants that lead the customer to try the technology, in this way, the following hypothesis is formulated:

- H1. Utilitarian factors of technology affects positively technological customer experience and is statistically significantly.

Several authors claim that perceived service quality has a direct and positive influence on customer satisfaction and loyalty, both with the store (retailer) and with the self-service technology. Veloso *et al.* (2018) states that service quality is an indispensable requirement for customer satisfaction, just as Lang (2011) noted service quality as an important determinant of customer satisfaction and their intention for word-of-mouth communication. According to Nadiri and Hussain (2005), service quality increases customer satisfaction, stimulates repurchase intention and motivates recommendation intention.

Given that there is a link between perceived quality and satisfaction and loyalty to self-service technologies and to the retailer (Lee and Yang, 2013; Sharma *et al.*, 2021) and Lee (2015) found that the quality of service of self-service technology-service positively affects customer loyalty to the retailer, it is proposed that there is a direct and positive relationship between customer technological experience and perceived service quality.

Based on the above concepts, the following hypothesis is advanced:

- H2. The technological customer experience affects positively the perceived service quality and is statistically significantly.

Lee and Yang (2013) state that the service quality of self-service technology has a positive impact on customer loyalty and on their behavioral intentions, in the retail context. Lee (2015) found that the service quality of self-service technology positively affects customer loyalty to the retailer. Since loyalty is a behavioral response to customer satisfaction (Sharma *et al.*, 2021), it is believed that service quality has a positive impact on satisfaction. A customer can only be dissatisfied or satisfied with a service after realizing it, thus being clear, for Sharma *et al.* (2021), that service quality affects customer satisfaction. In the study by Caruana (2002), the results proved that service quality and customer satisfaction are correlated. Also, Veloso *et al.* (2018) note that service quality is an indispensable requirement for customer satisfaction, just as Lang (2011) and Nadiri and Hussain (2005) state that service quality is an important determinant of customer satisfaction.

Based on the studies by Brakus *et al.* (2009) and Robertson *et al.* (2016), the authors Roy *et al.* (2017) proved that the customer’s smart technology experience directly increases satisfaction with smart retail technology.

Based on the previous discussion, the following hypothesis was advanced:

- H3. The technological customer experience and the perceived service quality affects positively the customer satisfaction and are statistically significantly.

The result of the study by [Rose et al. \(2012\)](#), demonstrated that trust is “mediated by the level of satisfaction with the online shopping experience” (p. 315). Yet [Rose et al. \(2012\)](#) found that satisfaction has a great impact on trust, and the higher the level of satisfaction with online purchases, the greater the level of trust.

In this way, the existence of a positive impact of customer satisfaction and technological experience on customer trust will be tested, in the context of self-service technologies, proposing the following hypothesis:

- H4.* The technological customer experience and customer satisfaction affects positively their Trust and are statistically significantly.

For [Marzocchi and Zammit \(2006\)](#), satisfaction directly influences customer loyalty to self-service technology and to the retailer. In this study, customers who are satisfied with the self-scanning technology are equally satisfied with the supermarket and stated that they will shop more often than if the technology option were not available. In the study by [Martin et al. \(2015\)](#), the effect of satisfaction on customer loyalty was significant in the context of online shopping, as in the study by [Rose et al. \(2012\)](#). For [Wang \(2012\)](#), consumer satisfaction is considered a determinant of the intention to continue using self-service technology in the context of retail. In the context of a study on the impact on loyalty of the experience with a retailer's mobile application, [Molinillo et al. \(2020\)](#) found that “a more satisfied customer (...) will be more willing to repurchase at the same point of sale, recommend it to others and even resist competitors' promotions” (p. 4). [Iyer et al. \(2018\)](#) also concluded that customer satisfaction with retailers' mobile applications can increase customer repurchase intention.

Customer satisfaction is, according to [Roy et al. \(2017\)](#), driver of behavioral intentions and word-of-mouth communication in relation to smart retail technology. [Roy et al. \(2017\)](#) found that “a positive experience with smart retail technology can increase customer satisfaction” (p. 267). This experience leads to positive responses in terms of behavioral intentions and word-of-mouth communication toward smart retail technology. And finally, all these variables lead to retail store loyalty ([Roy et al., 2017](#)).

In this way, the following hypotheses were formulated:

- H5.* Customer trust and satisfaction affects positively customer loyalty to self-service technologies and are statistically significantly.
- H6.* Customer trust and satisfaction affects positively customer loyalty to the retailer and are statistically significantly.

When customers are satisfied with the use of self-service technology, they are more likely to perceive their shopping experience as efficient and attribute a positive experience to the technology ([Meuter et al., 2000](#)). In the model proposed by [Sirgy et al. \(2007\)](#) the assumption is that “quality of life can be predicted through the degree of consumer satisfaction” with their retail experiences ([Roy et al., 2017](#), p. 262). Thus, satisfaction has a positive impact on the consumer's quality of life, in the context of the use of smart retail technologies ([Roy et al., 2017](#)). In summary, a positive experience with smart retail technology can increase customer satisfaction, which leads to positive responses in terms of shopping efficiency and consumer well-being ([Roy et al., 2017](#)).

Based on the aforementioned discussion, the following hypothesis is advanced:

- H7.* Customer satisfaction affects positively customer self-service technology outcomes and is statistically significantly.

3. Methodology

3.1 Measuring instrument

To respond to the research objectives and collect data, a questionnaire was applied, covering all the dimensions included in the conceptual model. From the literature review presented in [section 2](#) of this paper, the questionnaire was constructed, whose questions were adapted from the review of the literature on the subject, namely, [McLean *et al.* \(2018\)](#) and [Rose *et al.* \(2012\)](#) to assess customers' perception of the utilitarian factors of technology; by [Roy *et al.* \(2017\)](#) and [McLean \(2018\)](#) to analyze customers' perception of the customer's technological experience; by [Lee and Yang \(2013\)](#) to assess customers' perception of service quality; by [Molinillo *et al.* \(2020\)](#) to record customer perceptions of the trust they feel with the use of self-service technology; by [Roy *et al.* \(2017\)](#) to analyze customer perceptions of satisfaction and results at the customer level resulting from the use of Auchan's self-checkout solution; and, finally, adapted from [Roy *et al.* \(2017\)](#) and [Molinillo *et al.* \(2020\)](#) to assess the behavioral and recommendation intentions of Auchan's self-service technology and the repurchase and recommendation intentions of this retailer.

The sample subjects were recruited by invitation among Auchan customers. Thus, the questionnaire was carried out in an online format and distributed personally through a flyer at the Auchan store in Matosinhos and also through digital means, such as social networks and e-mail. The duration of the data collection period was two months (April and May 2021), a convenience sample was obtained consisting of a total of 483 validated responses, 485 were originally collected, but 2 were excluded because respondents claimed not to have experience with self-service technology (validity rate is 99.6%).

The questionnaire is divided into three parts, the first of which serves as a "screening" of customers, ensuring that respondents only advance in the survey if they have used at least one of Auchan's self-service technologies in the last 3 months, and that this was used in stores, thus ensuring greater reliability of the data. Thus, the questionnaire was submitted by 736 respondents in total, but 483 responses were validated for the study ($n = 483$). After questioning the customer about the Auchan store where they usually shop, they are directed to the second part of the questionnaire in which, through 35 questions, their opinion is asked about the various phrases linked to the study variables. To measure each dimension, the Likert scale was used with five possible answers, where 1 meant I totally disagree and 5 meant I totally agree. The third and final part aimed to characterize the clients sociodemographically. Still in this part, it was intended to know the purchasing process and the use of technology by the customer. In this last part, closed questions were used in the form of multiple choice (See [Table 1](#)).

3.2 Data analysis

To proceed with the characterization of the data (sociodemographic, of the purchase process and of the use of technology), tables of relative and absolute frequencies were created. The internal consistency of the dimensions and subdimensions of the research model was performed using Cronbach's alpha. Linear regression is an important and commonly used type of predictive analysis (to examine if: does a set of predictor variables do a good job in predicting an outcome (dependent) variable? And which variables in particular are significant predictors of the outcome variable, and in what way do they – indicated by the magnitude and sign of the beta estimates – impact the outcome variable? The nonparametric correlation measure, Spearman, was used to measure the intensity of the correlation between the variables. To validate the research hypotheses and identify the determinants of the behavior of the analysis variables, the multiple linear regression model was used. A significance level of 5% was assumed.

Dimension	Subdimension	Items
Customer technology experience	Relative advantage	Using the Auchan App and/or Express Boxes allows me to have a better shopping experience Using the Auchan App and/or Express Boxes is more convenient than using traditional boxes Using the Auchan App and/or Express Boxes allows me to make purchases more quickly When using the App and/or Express Boxes, shopping is easier
	Perceived control	When I use the Auchan App and/or Express Boxes I feel in control When using the Auchan App and/or Express Boxes, my attention is completely focused on its use
	Perceived interactivity	The quality of interaction offered by the Auchan App and/or Express Boxes is excellent to satisfy my shopping tasks While using the Auchan App and/or Express Boxes, my actions influence my user experience
	Perceived enjoyment	I have fun using the Auchan App and/or Express Boxes of this hypermarket The Auchan App and/or Express Boxes trigger pleasant emotions and feelings
Customer trust		Think that the Auchan App and/or Express Boxes will keep the promises and commitments they make I would rate the Auchan App and/or Express Boxes as reliable and honest Overall, I trust the Auchan App and/or Express Boxes
Perceived service quality		Overall, I am satisfied with the Auchan App and/or Express Boxes present on Auchan The Auchan App and/or Express Boxes exceed my expectations The Auchan App and/or Express Boxes correspond to my ideal of retail technology
Customer loyalty to self-service technology		I intend to continue using the Auchan App and/or Express Boxes I intend to use the Auchan App and/or Express Boxes very often in the future I would recommend the Auchan App and/or Express Boxes to people around me I would say positive things about the Auchan App and/or Express Boxes to others
Customer loyalty to the retailer		I intend to continue to shop at Auchan in the future I recommend Auchan to people around me
Customer-level outcomes of the self-service technology	Shopping effectiveness	Using the Auchan App and/or Express Boxes allows me to have a more efficient shopping experience Using the Auchan App and/or Express Boxes improves the productivity and efficiency of my shopping experience Using the Auchan App and/or Express Boxes allows me to easily make my purchase
	Quality of life	The Auchan App and/or Express Boxes play an important role in improving the quality of life of its users The Auchan App and/or Express Boxes play a very important role in my well-being

(continued)

Table 1.
Items of the survey

Table 1.

Dimension	Subdimension	Items
Utilitarian factors of technology	Shopping effectiveness	Using the Auchan App and/or Express Boxes is a convenient way to manage my time The Auchan App and/or Express Boxes make my life easier and better manage my shopping time
	Ease of use	The Auchan App and/or Express Boxes allow me to easily buy what I want on Auchan It is easy to use the Auchan App and/or Express Boxes

Source(s): Table created by the author

4. Findings

4.1 Demographic profile

The study sample comprises 483 individuals of whom 69.2% (334) are females and 30.8% (149) are males. The age bracket that stands out in the sample is 36–45 years (34.8% – 168 individuals), followed by 26–35 years (21.7% – 105 respondents) and 18–25 years (20.7% – 100 individuals). Regarding academic qualifications, it should be highlighted the high percentage of the sample with secondary education (54.7% – 264 respondents) and with a degree (30.2% – 146 individuals). Most respondents were married or living with a partner (50.3% – 243 individuals) and 42.9% (207) stated that they were single. As for the size of the household, 31.5% (152) belong to a household composed by 3 elements, inclusive, and 27.1% (131) belong to a household with 4 elements, inclusive. Regarding the average monthly net income of the household, it can be observed that 23.6% (114) of the respondents' households earned between EUR 750 and EUR 1250, 21.1% (102) earned between EUR 1251 and EUR 1750. It should be noted that 15.9% (77) of the respondents said they did not know or preferred not to answer. In terms of professional occupation, 81.6% (394) of the individuals are employed, followed by 6.8% (33) of the respondents who are students (see [Table 2](#)).

4.2 Purchase process and technology utilization

Matosinhos, was the shop most frequented by those polled, with 42.7% (206) of the sample habitually shopping in this Auchan hypermarket. About 19.3% (93) of the interviewees normally shop at the Maia shop, 13.7% (66) at the Gondomar shop, 12.8% (62) at the Vila Nova de Gaia shop and 4.6% (22) at the Canidelo shop. Thus, Auchan's Greater Porto Life Zone is the most representative of this sample. As regards the seniority of the clients at Auchan, 76.6% (370) of those polled have been shopping at Auchan for 5 or more years, and only 4.3% (21) of the sample have been using Auchan for their purchases for less than 1 year. Regarding the frequency of shopping at Auchan, 39.1% (189) of the individuals shop two or more times a week, 25.1% (121) shop at least once a month and 20.7% (100) shop once a week. Regarding the average amount spent on purchases at Auchan each month, up to EUR 50 represents 21.1% (102) of those polled, between EUR 101 and EUR 150 (83) represents 17.2% of the sample and between EUR 51 and EUR 100 (81) corresponds to 16.7% of the individuals.

The Auchan's self-service technology most used by the respondents were the Express Checkouts, representing 44.5% (215) of those polled, where 41.4% (200) used both and 14.1% (68) only used the Express Scan – Auchan App (in-store). In the seniority with the use of Auchan's self-service technology, 32.3% (156) of the sample have been using it for 5 or more years, 18.8% (91) of the respondents have been using it for 2 years, 15.7% (76) of the sample for 3 years and 15.5% (75) of the individuals for less than 1 year. Regarding the frequency of use of Auchan's self-service technology, the results are similar to the frequency of shopping at

Auchan. Thus, 32.7% (158) of the individuals use the self-checkout solution in their shopping two or more times a week, 18.2% (88) use it at least once a month and 17.2% (83) use it once a week. It should be noted that 18.6% (90) of the sample only use self-service technology if they buy few products (Table 3).

Feature	Options	Absolute frequency – <i>n</i>	Relative frequency – %
Gender	Feminine	334	69.2
	Masculine	149	30.8
	Total	483	100
Age group	Less than 18 years	1	0.2
	18–25 years	100	20.7
	26–35 years	105	21.7
	36–45 years	168	34.8
	46–55 years	92	19.1
	56–65 years	11	2.3
	More than 65 years	6	1.2
	Total	483	100
Educational qualifications	Primary Education	12	2.5
	Secondary Education	264	54.7
	Bachelor's Degree	146	30.2
	Master's Degree	57	11.8
	PhD/Doctorate	4	0.8
	Without Formal Education	0	0
	Total	483	100
Marital status	Single	207	42.9
	Married or Common-law	243	50.3
	Marriage		
	Widowed	8	1.7
	Divorced	25	5.1
	Total	483	100
Household size	1 element	48	9.9
	2 elements	109	22.6
	3 elements	152	31.5
	4 elements	131	27.1
	5 elements	36	7.5
	6 or more elements	7	1.4
	Total	483	100
Household net monthly Income	Less than 750€	48	9.9
	Between 750 and 1250€	114	23.6
	Between 1251 and 1750€	102	21.1
	Between 1751 and 2250€	67	13.9
	Between 2251 and 3000€	52	10.8
	Between 3001 and 4000€	14	2.9
	More than 4000€	9	1.9
	Prefer not to answer	77	15.9
Professional occupation	Total	483	100
	Student	33	6.8
	Employee	394	81.6
	Self-employed	26	5.4
	Unemployed	8	1.7
	Retired	6	1.2
	Other	16	3.3
	Total	483	100

Table 2.
Demographic profile

(continued)

Feature	Options	Absolute frequency – <i>n</i>	Relative frequency – %
Residence district	Aveiro	12	2.5
	Braga	5	1.0
	Coimbra	3	0.6
	Faro	2	0.4
	Lisboa	9	1.9
	Porto	449	93.0
	Setúbal	1	0.2
	Viana do Castelo	1	0.2
	Vila Real	1	0.2
	Total	483	100
Auchan employee	Yes	281	58.2
	No	202	41.8
	Total	483	100

Table 2. Source(s): Table created by the author

Feature	Options	Absolute frequency – <i>n</i>	Relative frequency – %
Auchan’s self-service technology used	Scan Expresso – App	68	14.1
	Auchan		
	Express Checkouts	215	44.5
	Both	200	41.4
	Total	483	100
Auchan’s self-service technology usage seniority	Less than 1 year	75	15.5
	1 year	49	10.1
	2 years	91	18.8
	3 years	76	15.7
	4 years	36	7.6
	5 or more years	156	32.3
	Total	483	100
Frequency of Auchan’s self-service technology usage	Once a day	19	3.9
	Two or more times per week	158	32.7
	Once a week	83	17.2
	Twice a month	45	9.4
	At least once a month	88	18.2
	Only if buying a few products	90	18.6
	Total	483	100

Table 3. Technology utilization Source(s): Table created by the author

4.3 Construct reliability

The analysis of the internal consistency of the dimensions and subdimensions of the research model was performed using Cronbach’s alpha. The subdimension ease of use and the dimension cognitive experiential state, with a Cronbach’s alpha values of 0.782 and 0.724, respectively, show a reasonable internal consistency. The remaining dimensions and subdimensions had Cronbach’s alpha values between 0.80 and 0.90, which translates into a good internal consistency. The perceived service quality dimension and the convenience subdimension stand out as the dimension and subdimension with the best internal consistency (0.949 and 0.946, respectively).

4.4 Correlation between variables

Since the sample does not present a normal distribution and the variables are of the interval type, the nonparametric Spearman's correlation measure (ρ) will be used to measure the intensity of the correlation. Observing the Spearman's correlation coefficients obtained between the dimension technology utility factors and its subdimensions, ease of use and convenience (Table 4), it is concluded that they translate strong correlations and grow in the same direction.

In Table 5, it can be seen that Spearman's correlation between the customer technology experience dimension and its subdimensions reveal strong correlations and with the same direction.

Spearman's correlation coefficients between technology loyalty and its subdimensions, behavioral intention and intention to recommend technology, depict very strong and direct correlations, as verified in Table 6.

In Table 7, it is possible to observe Spearman's correlation between retailer loyalty and retailer repurchase intention and recommendation intention, which reveals a strong and increasing correlation in the same direction.

Finally, through the analysis of Spearman's correlation coefficients between customer-level results and its subdimensions, purchase efficiency and quality of life, it can be seen that the correlations are strong and direct, as shown in Table 8.

Table 9 shows the Spearman's correlation coefficients between all dimensions of the scale. In terms of direction, it can be observed that all dimensions grow in the same direction. When

Table 4.

Spearman's correlation between the dimension technology utility factors and its subdimensions (significance at 1%)

Subdimension	Utilitarian factors of technology
Ease of use	0.932
Convenience	0.934

Source(s): Table created by the author

Table 5.

Spearman's correlation between the customer technology experience dimension and its subdimensions (significance at 1%)

Subdimension	Customer technology experience
Relative advantage	0.794
Perceived control	0.764
Perceived interactivity	0.823
Perceived enjoyment	0.796

Source(s): Table created by the author

Table 6.

Spearman's correlation between the dimension loyalty to technology and its subdimensions (significance at 1%)

Subdimension	Customer loyalty to <i>Self-service</i> technologies
Behavioral intention	0.959
Technology recommendation intention	0.961

Source(s): Table created by the author

Table 7.

Spearman's correlation between the retailer loyalty dimension and its subdimensions (significance at 1%)

Subdimension	Customer loyalty to the retailer
Repurchase intention	0.932
Retailer recommendation intention	0.943

Source(s): Table created by the author

analyzing the intensity of the correlation, the dimension utility factors of technology and the dimension results at customer level show the highest degree of statistical dependence ($\rho = 0.821$), being the two most correlated variables. Next, technology loyalty shows a strong correlation with technology utility factors ($\rho = 0.779$) and with satisfaction ($\rho = 0.760$).

4.5 Regression analyses

To validate the research hypotheses and identify the determinants of the behavior of the analysis variables, the multiple linear regression model [1] was used (Table 10). In the first regression model the impact of technology utility factors on the customer technology experience is tested. The adjusted coefficient of determination shows that the model explains, on average, about 59.7% of the variation in the customer technology experience. At a 5% significance level, this model is statistically significant and, by applying the *t*-test, it is concluded that the technology utility factors ($\beta = 0.702$; $p < 0.001$) significantly determine the behavior of the customer technology experience. Thus, hypothesis H1 is validated.

The second model tests the influence of the technological customer experience on the variation of the perceived service quality. The model explains, on average, 42.1% of the variation in perceived service quality and is statistically significant at a 5% significance level. Applying the *t*-test, it is concluded that the technological customer experience ($\beta = 0.818$; $p < 0.001$) explains the variation in perceived service quality significantly. Thus, hypothesis H2 is validated.

The third model tests the impact of technological customer experience and perceived service quality on customer satisfaction. The adjusted coefficient of determination shows that the model explains, on average, about 64.3% of the variation in customer satisfaction. At a 5% significance level, this model is statistically significant and, by applying the *t*-test, it is concluded that the technological customer experience ($\beta = 0.535$; $p < 0.001$) and perceived service quality ($\beta = 0.445$; $p < 0.001$) significantly determine the behavior of customer satisfaction. Thus, hypothesis 3 was validated.

The fourth estimated model relates customer trust with the independent variables' technological customer experience and customer satisfaction. At a 5% significance level, the model is statistically significant and, applying the *t*-test it is observed that the technological customer experience ($\beta = 0.326$; $p < 0.001$) and customer satisfaction ($\beta = 0.374$; $p < 0.001$) significantly explain the variation of trust. The estimated model explains, on average, 47.1% of the customer trust behavior, thus validating hypothesis H4.

The fifth regression model tests the impact of customer trust and customer satisfaction on customer loyalty to self-service technology. The adjusted coefficient of determination shows that the model explains, on average, about 66% of the variation in customer loyalty to self-service technology. At a 5% significance level, this model is statistically significant and, by applying the *t*-test, we conclude that customer trust ($\beta = 0.341$; $p < 0.001$) and customer satisfaction ($\beta = 0.521$; $p < 0.001$) significantly determine the behavior of customer loyalty to self-service technology. Thus, hypothesis H5 is validated.

In the sixth regression model the impact of customer trust and customer satisfaction on customer loyalty to retailers is tested. The adjusted determination coefficient shows that the model explains, on average, around 22.1% of the variation in customer loyalty to retailers.

Table 8.
Spearman's correlation
between the customer
outcomes dimension
and its subdimensions
(significance at 1%)

Subdimension	Customer-level outcomes of the <i>self-service</i> technology
Shopping effectiveness	0.906
Quality of life	0.929
Source(s): Table created by the author	

	Utilitarian factors of technology	Customer technology experience	Perceived service quality	Customer trust	Customer satisfaction	Customer loyalty to self-service technology	Customer loyalty to the retailer	Customer-level outcomes of the self-service technology
Utilitarian factors of technology	1.000	0.737	0.713	0.582	0.713	0.779	0.487	0.821
Customer technology experience		1.000	0.642	0.558	0.698	0.721	0.377	0.773
Perceived service quality			1.000	0.580	0.725	0.656	0.443	0.693
Customer trust				1.000	0.629	0.647	0.417	0.553
Customer satisfaction					1.000	0.760	0.489	0.737
Customer loyalty to self-service technology						1.000	0.557	0.756
Customer loyalty to the retailer							1.000	0.499
Customer-level outcomes of the self- service technology								1.000
Source(s): Table created by the author								

Table 9.
Spearman's correlation
between the study
dimensions
(significance at 1%)

Dependent variable	Independent variables	Adjusted R^2	F -value [p -value]	Standardized coefficients	Unstandardized B	T -value [p -value]
Customer technology experience	Constant	0.597	716.115 [0.000]	0.773	0.915***	8.521 [<0.001]
	Technology Utilitarian Factors				0.702***	26.76 [<0.001]
Perceived service quality	Constant	0.421	351.866 [0.000]	0.650	0.725***	4.371 [<0.001]
	Technological Customer Experience				0.818***	18.758 [<0.001]
Customer satisfaction	Constant	0.643	434.702 [0.000]	0.431	0.137	1.044 [0.297]
	Technological Customer Experience Perceived Service Quality				0.535***	12.045 [<0.001]
Customer trust	Constant	0.471	215.884 [0.000]	0.305	1.544***	11.354 [<0.001]
	Technological Customer Experience Customer Satisfaction				0.326***	6.339 [<0.001]
Customer loyalty to self-service technology	Constant	0.660	467.924 [0.000]	0.320	0.731***	5.965 [<0.001]
	Customer Trust Customer Satisfaction				0.341***	9.093 [<0.001]
Customer loyalty to the retailer	Constant	0.245	69.385 [0.000]	0.172	2.591***	15.837 [<0.001]
	Customer Trust Customer Satisfaction				0.162***	3.225 [0.001]
Customer-level outcomes of the self-service technology	Constant	0.572	644.2 [0.000]	0.757	1.112***	10.313 [<0.001]
	Customer Satisfaction				0.698***	25.381 [<0.001]

Table 10. Summary of regression models
Note(s): * - Significant at 5%; ** - significant at 1%; *** - significant at 0.1%
Source(s): Table created by the author

At a 5% significance level, this model is statistically significant and, by applying the t -test, we conclude that customer trust ($\beta = 0.162$; $p = 0.001$) and customer satisfaction ($\beta = 0.278$; $p < 0.001$) significantly determine the behavior of customer loyalty to retailers. Thus, hypothesis H6 is validated.

The seventh regression model tests the impact of customer satisfaction on customer self-service technology outcomes. The adjusted coefficient of determination shows that the model explains, on average, about 57.2% of the variation in customer self-service technology outcomes. At a 5% significance level, this model is statistically significant and, by applying the t -test, we conclude that customer satisfaction ($\beta = 0.698$; $p < 0.001$) significantly determines the behavior of customer self-service technology outcomes. Thus, hypothesis H7 is validated.

5. Discussion and conclusions

5.1 Theoretical implications

In the 21st century, in the food retail sector, competitors are not only differentiated by their product offer and price. The modern customer seeks convenience, ease and speed in their shopping, and retailers are differentiated by the services and shopping experience they offer to the customer, which is increasingly moving toward a unique and personalized experience, to attract and keep the customer. In this context, self-service technologies have been gaining the attention of retail entrepreneurs because they offer features at the shop checkout appreciated and sought after by the modern customer and because they increasingly allow personalization, that is, offering an individualized service to the customer. It should also be noted that the qualities of self-service technologies, typically sought after by the modern customer, were leveraged by the COVID-19 pandemic. With the increasing use of self-service technologies in the retail market, it becomes essential, to understand how customers' perceptions and evaluations of the self-service method influence their attitudes toward the technology and how they affect their loyalty to the retailer who provides it. In this perspective, this study had as a central objective to know the determinants of customer loyalty to self-service technology and to Auchan, as well as to evaluate the degree of customer satisfaction with Auchan's checkout technology solution and, consequently, to understand the impact of these technologies on customer loyalty to Auchan.

The research findings mainly proved the studies of [Rose et al. \(2012\)](#), [Roy et al. \(2017\)](#), [McLean et al. \(2018\)](#), [Molinillo et al. \(2020\)](#), and [Sharma et al. \(2021\)](#). Thus, they reveal that technology utility factors are direct antecedents of customer technology experience. thus, ease of use and convenience delineate a relationship, as proposed by [McLean et al. \(2018\)](#), that materializes in the creation of a utilitarian variable and crucial to the development of a favorable technological customer experience. Thus, it is recommended that Auchan maintains a technology that is easy to use and offers convenience to the customer, delivering a relative advantage over the use of traditional checkouts.

Additionally, it was observed that the customer's technological experience with self-service technologies directly and positively impacts perceived service quality, satisfaction and trust. Thus, we conclude that it is important for the customer to perceive a relative advantage when using the technology, to feel in control while using it and also to perceive an excellent interactivity that allows him/her to satisfy his/her shopping tasks.

As determinants of satisfaction, the model revealed the direct and positive impact of perceived service quality and the customer's technological experience. As determinants of trust, the study evidenced the direct and positive impact of technology customer experience and satisfaction.

The direct and positive determinants of customer loyalty to technology and retailer are satisfaction and trust. It should be noted that customer satisfaction with the self-service experience directly and positively influences customer loyalty to Auchan, thus responding to the main objective of the research. Finally, satisfaction has direct effects on the customer self-service technology outcomes, with respectively positive and negative impacts. These results indicate that respondents who use self-checkout technologies are loyal to Auchan, being the hypermarket chosen to do their shopping, visit the shop more often, thus phasing their shopping, throughout the week (2 or more times a week), and usually use self-checkout technology to check out.

5.2 Practical implications

The present study contributes to deepen the knowledge on self-service technologies, raises awareness on the topic and launches new knowledge that may be useful to other researchers and entrepreneurs in the retail sector. It also allows understanding the satisfaction and

expectations of customers who use these technologies and gives the managers of Auchan and other retail companies some recommendations and clues to develop future strategies that offer innovative and differentiating technological services, capable of attracting and retaining customers and, consequently, contribute to profitability and business sustainability.

The research points the direction and the bases for Auchan to walk, in large steps, toward intelligent retail technologies, integrating the personalization dimension in the self-service service offered to the customer, to respond to the market trend: personalization.

The use of self-checkout is an inevitable reality provided by the advance of technology, communication, and innovation, making available to retail new technologies and innovative ways of offering services to consumers. Auchan, which has always been at the forefront of technological advances to offer better services to the customer, making technological solutions available for shop checkout for over ten years, must continue to bet on the offer of services that meet the current demands of consumers. At the same time, it must offer convenience and ease in using self-checkout technologies, thus contributing to its competitive advantage, and to its path toward sustainability because the advantages that self-service technology offers are equivalent to the customers' demands. It is recommended that Auchan moves toward smart technologies, enabling anticipation of consumer needs and recommendation based on customer choices and purchase context and enabling cognitive customer experience by offering information based on location and customer interaction (Gretzel *et al.*, 2015; Roy *et al.*, 2017). In this way, Auchan not only improves the service delivered to customers and their satisfaction but also reduces its operational costs, adds value and strives for sustainability in an increasingly saturated and competitive market.

5.3 Limitations and future research

The main limitations of the study are the geographically restricted area from which the sample was drawn, particularly the northern area of Mainland Portugal, and the findings of the study cannot be generalized to all national and international Auchan shops. It should also be noted that, as the study was conducted in the context of the current pandemic situation (COVID-19), the results may have been influenced by the socio-economic constraints arising from the pandemic and the state of emergency we are experiencing at the time of sample collection.

For future research, it is proposed to understand the determinants of customer satisfaction and loyalty to self-service technologies and retailer through a more comprehensive sample, extended to national and international level, i.e., extended to all other life zones or even to Auchan shops. It would also be interesting to carry out the study involving the Auchan retail brand and other competing brands of modern distribution or specialized retail, establishing the comparison within the same sector or between sectors of the utilitarian factors of technology, the customer's technological experience and the antecedents of customer satisfaction and loyalty to self-service technologies and retailer. In addition, the study of possible indirect relationships between model variables can also be analyzed through the use of other models such as path analysis.

Note

1. All assumptions associated with multiple linear regression models were previously validated.

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