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Capturing consumer loyalty through technological innovation and sustainability: The moderating effect of the grocery commercial format

Abstract

Purpose

The food sector is currently undergoing a process of transition as a result of the increased level of consumers' awareness towards issues related to sustainability. This work aims at analyzing the existence of links between technological innovation and sustainability, and its consequences on variables of paramount importance in the retail sector such as store image and loyalty towards the establishment. Moreover, we examine if the strength of these relations differs across store formats.

Design/methodology/approach

To achieve the objective of this work, a theoretical model based on the literature is proposed, contrasted through an empirical study carried out in a sample of 510 customers from three food retail formats: hypermarkets, supermarkets, and discount stores.

Findings

The results indicate that technological innovation strengthens sustainability. In addition, sustainability is postulated as a dynamic element of the store's image and loyalty. The intensity of these relationships may vary depending on the commercial format.

Practical implications

The implementation of innovative and sustainable practices such as reducing energy consumption, the use of recycled materials to manufacture products, and the participation of retail companies in collective social actions is considered to be of primary importance.

Originality

The study sheds light on the knowledge of the relations between customers' perceptions of technological innovation and sustainability in retailing, confirming their influence on store image and customer loyalty. Moreover, the findings reveal the importance of sustainability and innovation for the main types of retail food store format, although with some peculiarities that allow to draw relevant managerial implications for practitioners.

Keywords: technological innovation, sustainability, store image, store loyalty, food retailing

1. Introduction

The food sector is currently experiencing a continuous adaptation process as a consequence of changes in consumption patterns (Watanabe *et al.*, 2020). After years in which society and organisations have produced and consumed products without paying attention to their long-term environmental effects, the number of social movements defending a new pattern of more sustainable consumption is currently growing. In the same way that the number of organic consumers is growing, the demand for organic food products is also increasing (Watanabe *et al.*, 2020). These new consumers, driven by their attitudes, values, and beliefs favouring a safer and more sustainable form of consumption, add ecological, natural, and fair trade products to their shopping trolley (Simmonds and Spence, 2017).

Faced with this new scenario, the organic food market is growing exponentially, especially in countries like Spain, where the commercial sector is one of the main ones to generate added value in the economy. Despite positive data from the sector in regard to the economy, the COVID-19 pandemic has put thousands of traditional businesses to the test in that, after closing their doors to the public, they were forced to resort to new ways of attracting consumers and marketing their products, in order to remain operational and survive in the market (Gavrila and de Lucas, 2021). In this new economic and social context, retail companies find it necessary to incorporate more sophisticated and innovative tools into their businesses to remain competitive (Mahmoud *et al.*, 2020).

In this way, some research is paying greater attention to the impact that technological innovations and sustainability unleash on consumer purchasing behaviour (Donato *et al.*, 2021). From the consumer perspective, several studies identify product innovation as one of the main factors for the development of a more sustainable offer (Marín-García *et al.*, 2021a). Therefore, one of the main questions currently being raised, due to its contribution to the development of sustainable competitive advantages, consists of analysing the impact that technological innovation unleashes on the perception of actions related to sustainability in the retail stores (Franceschelli *et al.*, 2018). Moreover, some studies indicate that the implementation of measures related to sustainability can help to improve the image of establishments and increase consumer loyalty towards stores (Ibe-enwo *et al.*, 2019; Moisescu, 2018). However, the results obtained to date do not allow precise conclusions to be drawn in this line of research. Thus, further studies are required on how the retailers' efforts to introduce technological innovations and sustainable practices are perceived by consumers, and if these actions contribute to enhance store image and customer loyalty, which is one of the main objectives of companies.

In addition, there is evidence in the sense that the nature of the commercial format can determine the benefits obtained by retail companies as a result of the implementation of innovative and sustainable actions (Catuogno and Gutierres, 2015; Filipe *et al.*, 2017). Therefore, it may be explored if the effectiveness of these practices to patronize customers differs across retail store formats.

All in all, the marketing literature has recently called for further research on the new challenges and opportunities of innovation and sustainability in retailing, as well as for collaboration between academics, retailers and other supply chain members (Grewal *et al.*, 2021). Following the suggestions of Hunt (2020) for the re-institutionalization of the marketing discipline in Era V (2020-?), we focus on the study of consumer behavior. In particular, through this work, an investigation is proposed that makes it possible to achieve a series of objectives in the context of commercial food distribution. First, it is intended to examine the impact of technological innovations on sustainability. Second, it is intended to analyse the effect of sustainable practices on image and loyalty towards the store, also observing whether the relationship between sustainability and loyalty is direct or is moderated by image. Finally, it is intended to observe if the perception that the consumer has of the store influences their loyalty towards the establishment, taking into account the nature of the commercial format.

The usefulness of the present research is assumed to be relevant from a double perspective. Firstly, from an academic standpoint, it aims at expanding the knowledge on the effects of innovation and sustainability in retailing, assessing the mediating role of store image between sustainability and customer loyalty, already observed in other services companies. Secondly, from the practitioners perspective, the findings may help managers of retail establishments to gain a better understanding of their consumers and therefore assist them in the decision-making process. By analysing the consumer's perspective, this paper seeks, first and foremost, to facilitate decision-making by retail managers, taking into consideration the peculiarities of their store formats. Therefore, this research aims to generate greater knowledge of how consumers perceive the innovative and sustainable measures implemented by retailers so that managers of these companies can develop actions that improve the image of their establishments and, ultimately, facilitate customer retention.

2. Theoretical Framework

This section conceptually describes the main constructs on which this study is based. First, technological innovation in the context of retail will be described from the consumer's perspective. For the analysis of this construct, the line of research of those studies that propose that technological innovation from the consumer's perspective is based on changes made to a company's products and/or services will be followed (Lin, 2015; Marín-García *et al.*, 2021a).

Subsequently, the construct of sustainability will be studied in greater depth, in line with those works that indicate that its development is driven by innovation (Marcon *et al.*, 2017; Marín-García *et al.*, 2021b). For this, the proposal of Elkington (2004), in which he puts forward the need to address sustainability as a variable formed by economic, social, and environmental sustainability, will be upheld in this study. Finally, the constructs of store image and brand loyalty will be addressed, as they are considered strategic for the retail sector (Bloemer and Kasper, 1995; Moliner-Velázquez *et al.*, 2019) and it has been emphasised that they may be significantly linked to innovation and sustainability (Lavorata, 2014; Marín-García *et al.*, 2021b).

2.1. Technological innovation

Innovation in the context of retail is a concept that began to emerge in the 1990s, achieving greater relevance in recent years, thanks, in part, to the evolution and development of recent technologies (Franceschelli *et al.,* 2018; Gavrila and de Lucas, 2021). Recent studies indicate that technological advances are partly responsible for increasing competitiveness in organizations and in the way consumers buy and consume. These investigations stand out as technological innovations those developed from augmented reality and virtual reality (Moorhouse *et al.,* 2018). However, at present, it is also from other perspectives, giving greater prominence to the evolution of the product, the brand, the pricing models, with the consumer at the centre of this evolution and, differentiating between two large groups of innovations: technological and non-technological (Marín-García *et al.,* 2021b).

Focusing our attention on technological innovation, the perspective from which innovation is approached in this work, the fragmentation of demand and the increasing speed of technological change is presented as a key variable to face both national and international competition (Moorhouse *et al.,* 2018). This idea is based on the premise that the companies that manage to access the market more quickly and efficiently than their competitors, by offering products that meet the needs and expectations of their target market, will significantly improve their competitive position (Mahmoud *et al.,* 2020).

In relation to technological innovation, there are different ways to retain this variable, some associated with the implementation of tools closely linked to Artificial Intelligence, “machine learning”, or Big Data (Rana et al., 2021). However, from the consumer's point of view, in the retail context, the main or “most visible” variable of technological innovation identified as key to the development of organisations is product innovation (Lin, 2015; Marín-García *et al.,* 2021a). In general, it is argued that businesses innovate when they introduce new products or there are improvements or variations in existing products capable of satisfying the needs of consumers (Lin, 2015; Marín-García *et al.,* 2021a). There are many definitions proposed for product innovation. The traditional way of classifying this concept has focused on the degree or level of innovation developed, differentiating between radical innovations and incremental innovations (Lin, 2015). These types of innovations differ from each other by the degree of changes or modifications made to the products.

2.2.Sustainability

In 1987, the Brundtland Commission defined sustainable development as “*the development that meets the needs of the present without compromising the ability of future generations to meet their own needs*” (Brundtland, 1987, p. 40), which became the watershed moment that fuelled growing interest in the study of this concept. However, even today there are discrepancies when defining the nature of this variable. Its multidimensional nature has been one of the most relevant topics, widely covered by academic literature. One of the most referenced proposals when addressing the dimensionality of sustainability has been formulated by Elkington (2004). The author proposes the theoretical model called “Triple Bottom Line” (TBL), in which environmental sustainability, social sustainability, and economic sustainability are postulated as fundamental pillars for the success of companies. Firstly, the environmental dimension has been explained as the actions that companies take to create products and services without causing damage to the environment. Secondly, the social dimension is associated with the ability of companies to manage their businesses by improving quality of life and reinforcing the relationships that organisations have with the different stakeholders in their environment. Finally, the economic dimension is fundamental since it is considered a key requirement for the survival of companies.

More recently, Elkington (2018) has expressed his concern on the TBL being considered as an accounting system, since the author envisioned it as *"a genetic code, a triple helix of change for tomorrow's capitalism"* (p.3). A new wave of TBL innovation and deployment is required for system change towards more sustainable models, according to Elkington (2018). Nevertheless, the definition of Brundtland (1987) or the TBL (Elkington, 2004) are considered as too broad, whereas other conceptualizations only based on environmental aspects are considered as too limited.

Sustainability is one of the concepts that has stimulated the greatest interest among researchers and academics in the field of marketing in recent years (Donato *et al.*, 2021; Lavorata, 2014; Marcon *et al.*, 2017; Marín-García *et al.*, 2021a; Ruiz-Real *et al.*, 2018). In addition, sustainability is also a source of attraction for consumers, who demand greater commitment to the environment and to society (Lavorata, 2014; Marcon *et al.*, 2017; Marín-García *et al.*, 2021a; Ruiz-Real *et al.*, 2018).

To successfully design and implement a sustainability strategy, Lunde (2018) defines sustainable marketing as "*the strategic creation, communication, delivery, and exchange of offerings that produce value through consumption behaviors, business practices, and the marketplace, while lowering harm to the environment and ethically and equitably increasing the quality of life (QOL) and well-being of consumers and global stakeholders, presently and for future generations*" (p.94). This conceptualization, as well as the GREEN framework proposed by Lunde (2018) from this definition, encompasses elements that can be addressed both from the perspective of companies and consumers, integrating, in addition to the traditional economic, social and environmental dimensions of sustainability, also the ethical dimension.

Despite the fact that academics' interest in sustainability in retail is relatively recent, it is already considered a factor with immense potential due to the different areas of knowledge from which it can be approached due to its versatile and multidisciplinary nature. Ruiz-Real *et al.* (2018) identify the analysis of the conditions that must be met for sustainable practices to generate satisfactory results as preferential study areas of sustainability. In this sense, correct communication of the sustainable practices implemented will enable an improvement in the perception that consumers develop about the sustainable practices implemented by retail stores (Ruiz-Real *et al.*, 2018). In this vein, sustainability emerges as a key element for retailers, who have seen that sustainable development can become an important source of competitive advantage (Ruiz-Real *et al.*, 2018). In addition, these differences with respect to its competitors will be more intense if the triple dimensionality of sustainability is assumed (social, economic and environmental sustainability).

In short and following the TBL theory formulated by Elkington (2004), we postulate in this work that sustainability in retail commercial distribution is built through actions that involve economic sustainability, environmental sustainability, and social sustainability.

In particular, this work examines consumer perceptions of these sustainable practices, in order to analyse the impact that they may have on other variables, such as store image, in line with Tascioglu *et al.* (2019).

2.3.Store image

Image has been defined as "*the sum of beliefs, attitudes, stereotypes, ideas, relevant behaviours or impressions that a person holds with respect to an object, person or organisation*" (Belanger *et al.*, 2002, p.218). More recently, the image of the retail store is considered to be determined by various aspects, expressed by price, marketing, store environment, customer service, etc. (Graciola *et al.*, 2020). Depending on whether these associations are perceived positively or negatively by the consumer, the image of the store will be reinforced to a greater or lesser extent.

The study of store image has received special attention, as it is considered a key tool for making strategic decisions by companies due to the support that it lends in the development of competitive advantages (Belanger *et al.*, 2002). In the context of retail trade, Bloemer and De Ruyter (1998, p.501) define this construct as "*the complex of a consumer's perceptions of a store on different (salient) attributes*". That is, the set of perceptions and beliefs of tangible and intangible elements that consumers associate with the establishment are the factors that contribute to the identity or personality of the store (Moliner-Velázquez *et al.*, 2019).

2.4.Loyalty to the store

The marketing literature states that loyalty should be understood as a process in which it is essential to consider purchasing and repurchasing behaviour and attitudes (Torres *et al.*, 2008). Traditionally, the construct has been explained in terms of two types of loyalty: spurious, or inertia, loyalty (Bloemer and Kasper, 1995) and true loyalty. The former, spurious loyalty, implies a behaviour with a high probability of repurchase, but with low commitment (Dick and Basu, 1994). The latter, true loyalty, in addition to repeat purchasing, manifests a behaviour of decision and choice on the part of the consumer based on preferences (Bowen and Shoemaker, 1998) and intentions (Mellens *et al.*, 1996), where the consumer considers different alternatives for evaluation.

Subsequently, the literature has described a more comprehensive model of loyalty. In this sense, the construct is conceived as a biased behavioural response, the consequence of a decision between one or more alternatives within a group of establishments. This phenomenon is expressed over time, due to a psychological decision and evaluation process, as the result of a commitment to the store (Bustamante and Rubio, 2017).

3. Formulation of hypotheses and proposal of the conceptual model

3.1. Relationship between technological innovation and sustainability

In recent years, retailers have had to face a set of factors that directly impact their business models. One of these factors is closely linked to consumers, who are changing their way of consuming (Watanabe *et al.*, 2020). As a basis for these changes, a greater awareness of issues related to sustainability seems to be the cornerstone when deciding which products to consume and where to buy them (Watanabe *et al.*, 2020). In this sense, retail establishments find in innovation a key ally to be able to develop a product assortment that meets the demands of consumers. That is, an important segment of the literature argues that innovation can become a driver for the sustainable development of products and/or services (Donato *et al.,* 2021).

Some studies point out the importance of acting within the main dimensions of innovation as essential elements to achieve the development of sustainable business models (Marcon *et al.,* 2017; Marín-García *et al.,* 2021b). Innovative business models for sustainability are defined as innovations that can generate a significant negative or positive impact and/or reductions for the environment and/or society. In this sense, Marcon *et al.* (2017) empirically contrast how some multinational companies have managed to adopt more sustainable practices in their businesses by implementing innovations in the products sold, and in the processes carried out to develop those products. In this way, Marcon *et al.* (2017) describe how product innovations contribute to facilitating changes towards more sustainable business models, taking the environmental dimension as a perspective.

Taking into account each of the dimensions of innovation and examining its impact on the development of sustainable actions, product innovation can have positive effects on the environment, by making use of less harmful materials, as a consequence of knowledge and technology applied to developed products (Marcon *et al.,* 2017).

In this way, given the existing evidence on the relationship between innovation and sustainability, and the positive effect that it can generate on consumers' perceptions of companies, we propose the first hypothesis of this research:

H1: *Customer perceptions about the retailer's degree of technological innovation have a positive and significant effect on the customer's perception of sustainable actions in the store.*

3.2.Relationship between sustainability and store image

The study of the consequences of the relationship between sustainability and store image from the consumer's perspective is acquiring huge interest due to the impact that these two variables have on the economic development of companies. In this way, some research begins to point to the positive effect that sustainable practices have on the development of the store's image from the consumer's perspective (Ahn and Seo, 2015; Lavorata, 2014; Marín-García *et al.,* 2021b).

Ahn and Seo (2015) analyse the influence that sustainable actions have on consumer behaviour, especially in the perception they develop towards the image of the food retail establishment. In their study, the authors obtain empirical, positive, and significant evidence of this relationship, highlighting the key role that the three dimensions of sustainability (economic, social, and environmental) have in the image that the consumer develops towards the store.

Along the same lines as the previous authors, Marín-García *et al.* (2021b) point out that the implementation and communication of actions directly linked to economic, social, and environmental sustainability may imply changes in the image that consumers develop towards the retail store.

Therefore, considering all the evidence described above, we put forward the following hypothesis:

H2: *Customer perceptions about the retailer's sustainable practices have a positive and significant effect on the image that the customer has of the store.*

3.3.Relationship between sustainability and loyalty towards the establishment

The effects of sustainable actions on consumer loyalty towards the store is a topic of preferential interest among academics and researchers due to the benefits that this relationship can imply for companies (Kumar, 2014; Lavorata, 2014; Moisescu, 2018). Although this relationship has traditionally been linked to the loyalty that the consumer develops towards the retailer's product, recent advances indicate that consumer loyalty also develops as a consequence of the additional services that the establishment offers its customers (Tian and Kamran, 2021). In this sense, it is important to point out that the strength of the sustainability-loyalty relationship cannot be understood solely as the behavior that the consumer generates from the supply of sustainable products offered by a retailer.

Kumar (2014) suggests some proposals related to sustainability that can be implemented by retail companies in order to improve their brand image and raise levels of consumer loyalty. Therefore, a correct labelling of products highlighting their organic and ecological nature through keywords or symbols, collaboration with social groups, or the participation of consumers in the development of eco-friendly products, are some of the most common commercial practices implemented in retail trade. These actions are key to increasing consumer loyalty towards establishments.

On the other hand, Moisescu (2018) examines the impact of sustainability on consumer loyalty in four different markets linked to the retail sector. The study carried out identifies that the TBL sustainability dimensions positively and significantly influence consumer loyalty to the store. The author states that retail companies have to make significant efforts within their marketing communication to transmit sustainable actions in order to increase customer loyalty.

However, not all papers defend the positive and significant relationship of the sustainability-loyalty relationship. In this way, Lavorata (2014) does not find empirical support for the relationship between these variables, showing that other factors (proximity, assortment, price, quality, or service) exert greater influence than the sustainability of the retailer in consumer decisions when continuously making repeat purchases in the same establishment.

Taking into account the considerations made along these lines, and observing the relationships that link sustainability with loyalty, we propose the following hypothesis:

H3: *Customer perceptions about the retailer's sustainable practices have a positive and significant effect on the customer's loyalty towards the store.*

3.4.Relationship between store image and loyalty towards the establishment

In the literature, it has been pointed out that the variables traditionally linked to brand equity are interrelated (Buil *et al.,* 2013; Yoo *et al.,* 2000). While some researchers analyse brand equity as a multidimensional construct formed by several factors (Pappu *et al.,* 2006; Yoo *et al.,* 2000), other studies postulate causal relationships between these elements (Buil *et al.,* 2013; Marín-García *et al.,* 2021b).

Starting from the theory of reasoned action (Ajzen and Fishbein 1975), some works propose causal relationships between the variables traditionally linked to brand equity. Under this approach, it has been argued that the creation of brand value is conceived as a consumer learning process; brand awareness by consumers leads to attitudes (e.g., perceived quality and brand image/associations), which in turn influence attitudinal brand loyalty (Gordon *et al.,* 1993). In particular, Martenson (2007) argues that a favourable brand image promotes consumer loyalty and positive word of mouth. However, Bloemer and de Ruyter (1998) could not find a direct effect of store image on store loyalty. More recently, in the context of supermarkets in Spain, Beristain and Zorrilla (2011) argue the existence of a positive relationship between store image and brand loyalty.

In regard to the above, we propose the following hypothesis:

H4: *The brand image of the store has a positive and significant effect on the customer's loyalty towards the store.*

3.5.The moderating effect of the commercial format

The analysis of the moderating effect of the commercial format on consumer perceptions regarding the innovative and sustainable practices implemented is one of the least explored aspects so far in the context of retail. However, there are some studies that analyse the moderating effect of the commercial format in constructs such as the image of the store, considered as key elements in the advancement of this type of establishments (Filipe *et al.,* 2017).

Works such as that of Filipe *et al.* (2017) manage to empirically contrast the moderating effect of the commercial format on store loyalty. Specifically, this study supports the existence of differences in the way consumers perceive the retail establishment, differentiating between large and small stores. In this way, the authors confirm that the actions carried out by small businesses with the aim of attracting consumers have a positive impact on the loyalty that the consumer develops towards these types of establishments. Customers perceive that this type of business treats them in a more intimate and personalised manner than large stores. These results are shared by Catuogno and Gutierres (2015), who state that small businesses elicit affection from consumers.

Regarding the moderating effect of the commercial format on consumers' perceptions of the sustainable and innovative practices implemented by retail trade, the results seem to indicate that they are not influenced by the type of store (Marín-García *et al.,* 2021a). However, the existence of other studies that contrast these links is unknown, so it is essential to continue investigations in this regard.

Taking into account all the previous considerations about the moderating effect of the commercial format on consumer perceptions, we propose the following group of hypotheses:

H5a: *The relationship between technological innovation and sustainability in retail is moderated by the commercial format.*

H5b: *The relationship between sustainability and store image in retail is moderated by the commercial format.*

H5c: *The relationship between sustainability and loyalty in retail is moderated by the commercial format.*

H5d: *The relationship between image and loyalty in retail is moderated by the commercial format.*

3.6. The mediating effect of store image

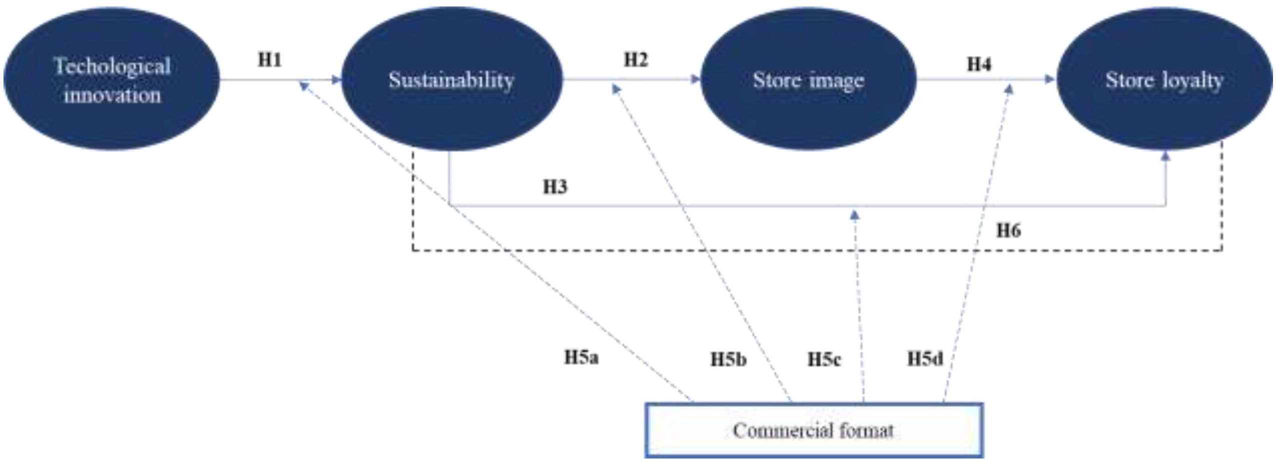
Despite the importance that the study of sustainability is acquiring, in the retail context, there are still many aspects to analyse. This gap is even greater if we seek to examine the mediating effect of store image from the consumer's perspective. Some studies try to shed light on this phenomenon by analysing whether the construction of loyalty depends directly on sustainability, or if, instead, it may be mediated by other factors. In this sense, in the context of retail banking services, Igbudu *et al.* (2018) analyse the mediating effect of image in the sustainability-loyalty relationship. In their work, the authors conclude that sustainable practices have a direct effect on consumer loyalty and that, furthermore, this relationship is also mediated by image. In the same setting, Ibe-enwo *et al.* (2019) obtain positive results for this relationship, arguing that sustainability drives consumer loyalty directly, and also indirectly through image.

Therefore, taking into account the studies showing the existence of a correlation between store image and consumer behavior (e.g., Peter and Olson, 2009), we put forward the final hypothesis of this study:

H6: *The effect of sustainability on consumer loyalty to the store is mediated by store image.*

Next, through Figure 1, we present the causal model proposed in this work:

Figure 1. Proposed research model



4. Methodology

To achieve the proposed objective, quantitative research is proposed using an ad-hoc structured questionnaire (see Appendix). The respondents had to answer a series of closed questions indicating their degree of agreement or disagreement. Specifically, the questionnaire collected information on the perception of sustainability in food retailers.

To do this, respondents had to assess sustainable actions in retail establishments at three levels: economic sustainability, social sustainability, and environmental sustainability. Similarly, information was collected on consumers' perception of store image and their loyalty to the commercial brand.

The scales used to measure the variables studied in this research have been extracted and adapted from numerous studies carried out in the field of marketing. All of them have a verified content validity. Specifically, the items used to measure technological innovation were adapted from Lin's (2015) scale. Regarding the measurement of sustainability in stores, the items have been extracted from the sustainability scale of Lavorata (2014). The measurement of the image that the consumer has towards the establishment was carried out using the scale developed by Yoo *et al.* (2000). Finally, the evaluation of loyalty towards the establishment was also carried out through the scale designed by Yoo *et al.* (2000), which has also been used in the context of retailing. In all cases, the items were evaluated using a 7-point Likert scale. Finally, in order to be able to segment the sample obtained, some classification questions were included (i.e. gender, age, level of education and employment status). A pretest was carried out on a group of 10 consumers, which allowed us to introduce improvements in the questionnaire.

Data were collected with a personal survey carried out between April and May 2017 in the province of Valencia (Spain), through a non-probability quota sampling method in terms of customer gender and age in order to guarantee the representativeness of the population of consumers in terms of the main sociodemographic variables. In order to achieve the sample of the study the interception technique at the exit of the establishments was used. The main requirements to be part of the population under study were being patrons of that establishment and older than 18. This information was obtained through a filter question. The establishments were selected based on their assortment and their positioning in the Spanish market, within the food sector. The selected commercial formats are grouped into hypermarkets, supermarkets, and discount stores. In total, 510 valid questionnaires were finally obtained (170, hypermarkets; 170, supermarkets; 170, discount stores).

For the analysis of the data obtained, we proceeded in two phases. Firstly, the measurement instrument was validated; and, secondly, the structural model was estimated. Both analyses were performed using the partial least squares (PLS) regression technique and the software used was SmartPLS (version 3.0). It is a technique that in recent years has been very well received by academics and researchers (Hänseler *et al.*, 2017).

5. Results

5.1. Measurement instrument validation

Before examining the validity and reliability of the measurement instrument, we performed an Exploratory Factor Analysis. In this way, through a Principal Component Analysis with Varimax rotation, we were able to observe the grouping of the items used to measure the different variables in factors, which allowed us to define the set of observed variables. The results of this analysis show sustainability as a construct made up of three dimensions, namely: economic sustainability, social sustainability, and environmental sustainability, as Lavorata (2014) had concluded, in line with the TBL.

The grouping of the three sustainability factors explains 72.91% of the total variance. Next, we use the PLS-SEM technique, calculating a PLS algorithm with a parameter of 300 maximum interactions and a path weighting scheme. Through this procedure, we obtained the information about the factor loadings, Cronbach's alpha, the composite reliability index (CRI) and the average variance extracted (AVE) for each of the factors that make up the causal model of this investigation and which are presented in Table I. During the process of analysing the results, it was decided to eliminate the items IM3, IM4, and IM5, as their loadings were lower than 0.7.

Table I. Measurement instrument of the structural model: Reliability and convergent validity.

Factor	Item	Loading	t	Cronbach α	CR	AVE
Technological innovation	IN1	0.857***	45.128	0.860	0.899	0.642
	IN2	0.708***	17.359			
	IN3	0.821***	33.199			
	IN4	0.794***	35.341			
	IN5	0.817***	36.458			
Economic Sustainability	SN1	0.799***	26.694	0.871	0.912	0.723
	SN2	0.888***	70.745			
	SN3	0.866***	60.894			
	SN4	0.843***	44.358			
Social Sustainability	SN5	0.743***	30.417	0.883	0.914	0.682
	SN6	0.886***	97.978			
	SN7	0.795***	29.168			
	SN8	0.815***	32.564			
	SN9	0.872***	67.039			
Environmental Sustainability	SN10	0.818***	32.109	0.871	0.888	0.727
	SN11	0.875***	50.773			
	SN12	0.864***	45.127			
Store image	IM1	0.752***	30.929	0.865	0.902	0.648
	IM2	0.797***	37.325			
	IM6	0.827***	49.083			
	IM7	0.813***	42.253			
	IM8	0.834***	72.306			
Store loyalty	LO1	0.921***	116.921	0.929	0.949	0.823
	LO2	0.913***	92.282			
	LO3	0.919***	121.161			
	LO4	0.874***	60.250			

Statistically significant at ***$p<0.01$.

The results obtained confirm the reliability and convergent validity of the measurement instrument. On the one hand, the Cronbach α values presented in Table I far exceed the reference value 0.7 (Churchill, 1979; Nunnally and Bernstein, 1994). Specifically, the results obtained show values that range between 0.8 and 0.9, identified as recommended values for advanced stages of research (Nunnally and Bernstein, 1994). On the other hand, the composite reliability presents satisfactory values that exceed 0.7, the minimum required index (Chin, 1998). Furthermore, in relation to the mean variance extracted, the results obtained are greater than 0.5, which means that each construct explains at least 50% of the variance of the established indicators (Fornell and Larcker, 1981). Finally, to confirm the discriminant validity of the variables that make up the structural model of this study, the Fornell and Larcker (1981) criterion was used. The results of this analysis show that the square root of the AVE is greater than the estimated correlation between the factors for all cases (Table II).

Table II. Measurement instrument: Discriminant validity (Fornell-Larcker criterion).

	1	2	3	4	5	6
1-Technological innovation	**0.801**	0.340	0.383	0.291	0.584	0.296
2-Economic sustainability	0.314	**0.850**	0.647	0.611	0.411	0.528
3- Social sustainability	0.367	0.575	**0.824**	0.713	0.394	0.504
4- Environmental sustainability	0.256	0.513	0.615	**0.853**	0.424	0.487
5-Image	0.500	0.364	0.366	0.375	**0.805**	0.524
6-Loyalty	0.278	0.475	0.464	0.440	0.499	**0.907**

Additionally, when considering sustainability as a second-order formative-formative construct, the weights of the factors were examined. Following the criteria established by Diamantopoulos and Winklhofer (2001), the absence of collinearity was verified through the variance inflation factor (VIF). The result obtained from this analysis corroborates the absence of collinearity, since the VIF values for each of the sustainability dimensions were below the critical level of 5 (Table III). Therefore, the psychometric properties of the measurement model were verified and the causal model could be estimated.

Table III. Parameter estimates of the formative second-order constructs.

1st Level Factor	2nd Level Factor	Weights	VIF
Sustainability	Economic sustainability	0.400	1.594
	Social sustainability	0.411	1.885
	Environmental sustainability	0.374	1.714

5.2.Estimation of the causal model

From the results presented in Table IV, it is observed that all the dependent constructs of the structural model show R^2 values above 0.1, the minimum threshold established by Falk and Miller (1992). Regarding the results of the Q^2 test, all the values are greater than zero, which confirms the predictive validity of the model. Therefore, the results obtained for R^2 and Q^2 allow us to confirm the explanatory power and the predictive relevance of the model, which in turn allows us to continue examining the significance of the proposed structural relationships. Table IV shows the results obtained for the path coefficients for the total sample as well as for each retail format, and the decisions on the proposed hypotheses.

Table IV. Causal relationships estimation.

			Total sample		Hypermarket	Supermarket	Discount store
	Relationship	Hypothesis	Standardised parameter	t	Standardised parameter	Standardised parameter	Standardised parameter
H1	Technological innovation → Sustainability	Supported	0.364***	11.784	0.336***	0.346***	0.398***
H2	Sustainability → Store image	Supported	0.417***	11.784	-0.017ns	0.651***	0.080ns
H3	Sustainability → Store loyalty	Supported	0.396***	9.961	0.578***	0.174***	0.454***
H4	Store image → Store loyalty	Supported	0.355***	11.450	0.623***	0.704***	0.325***

Sustainability: R^2=0.139, Q^2=0.092; Store image: R^2= 0.190, Q^2=0.113; Store loyalty: R^2=0.381, Q^2=0.290. * Statistically significant at ***p<0.01; ns=statistically non-significant

The results obtained through the PLS-SEM analysis allow us to support the first four hypotheses proposed for the causal model. Firstly, the positive and significant effect of technological innovation on sustainability is confirmed for the total sample as well as for each store format, thereby substantiating the dynamizing effect of the first construct on the second (β1 = 0.364, p<0.01, H1). These results are in line with those works pointing out that the implementation of sustainable practices in retail establishments can be more successful if innovative actions are implemented (Marcon *et al.*, 2017; Marín-García *et al.*, 2021b). An example of this could be the introduction of products that were not previously offered in the establishment (innovative practice) such as fair trade products (sustainable practice).

Regarding the hypotheses between sustainability and its consequences, first and foremost, there is support for the positive relationship with store image (β2 = 0.417, p <0.01, H2). Likewise, the positive and significant effect of sustainability on loyalty to the retail establishment has been supported by the results of the estimation of the causal model (β3 = 0.396, p<0.01, H3). Both Hypotheses 2 and 3 confirm the conclusions of previous studies (e.g., Marín-García *et al.*, 2021b; Moisescu, 2018), which show that acting on elements related to sustainability can modify the perception that consumers develop towards the retail establishment. This effect is especially strong in the sustainability-store image link.

Furthermore, we find support for the hypothesis that links brand image with loyalty towards the store, since a significant and positive path coefficient is obtained (β4 = 0.355, p<0.01, H4), as pointed out by Buil *et al.* (2013). However, its impact is relatively weaker in comparison to the rest of the relationships proposed.

All in all, structural equations modelling allows to assess the intensity of the causal relationships, so that, in our case, although customers might be loyal to the establishment for reasons other than sustainable practices, the existence of a significant relationship between sustainability and loyalty means that the former is also relevant to explain the latter.

5.3.Analysis of the moderating effect of the commercial format

Progressing in the study of the relationships raised in this work, a multi-group analysis was carried out using the PLS-MGA approach in order to contrast the group of hypotheses that make up H5. Table V confirm that the commercial format moderates some of these links. Specifically, the moderating effect of the commercial format can be confirmed in the relationship between sustainability and store loyalty in the three groups of consumers (hypermarkets, supermarkets, and discount stores). However, the link between sustainability and store image is moderate in the hypermarket and supermarket consumer group and in the supermarket and discount store consumer group, but not in the hypermarket and discount store consumer segment. On the other hand, regarding the relationship between store image and loyalty towards the establishment, the moderating effect of the commercial format is observed, as significant results were obtained in two of the groups: hypermarkets-discount stores and supermarkets-discount stores. These results are aligned with those works that indicate that the size of the store can influence the perception that consumers have in regard to variables such as image or loyalty to the establishment (Graciola *et al.*, 2020). Finally, it is possible to affirm that in food retail the relationship between technological innovation and sustainability is not moderated by the commercial format, since the differences in the intensity of the impact of technological innovation on sustainability across store formats are not significant. This result is aligned with those of previous research, arguing that the store format does not play a moderating role in the relationship between innovation and sustainability (Marín-García *et al.*, 2021a).

Table V. Results of the multigroup analysis and mediating effect test

Hypothesis	Relationship	Hypermarket-Supermarket Stand.parameter	p-value	Hypermarket – Discount store Stand.parameter	p-value	Supermarket-Discount store Stand.parameter	p-value
H5a	Technological innovation → Sustainability	0.010ns	0.895	0.062ns	0.451	0.052ns	0.498
H5b	Sustainability → Store image	0.668***	0.000	0.097ns	0.762	0.571***	0.000
H5c	Sustainability → Store loyalty	0.404***	0.000	0.124*	0.051	0.280***	0.001
H5d	Store image → Store loyalty	0.081ns	0.247	0.298***	0.000	0.379***	0.000
Summary of mediating effect test							
	Relation	Total effect	Direct effect	Indirect effect	VAF		
H6	Sustainability → Store loyalty	0.547***	0.407***	0.140***	0.380		

* Statistically significant at *p<0.1; ***p<0.01; ns = statistically non-significant

5.4.Analysis of the mediating effect of store image

Finally, the analysis of the role of image as a mediating variable between sustainability and loyalty in retailing was carried out using the bootstrapping technique developed by Preacher and Hayes (2008). Table V shows that there is a significant direct and indirect effect between sustainability and store loyalty. For this reason, hypothesis H6 is supported, which postulates the mediating role of image in the Sustainability-Loyalty relationship in retailing. Additionally, we can confirm through the result of the Variance Accounted For (VAF), which determines the size of the indirect effect in relation to the total effect (Hair *et al.*, 2014), that store image has a partial mediating effect in this relationship (0.380), and therefore, it plays a key role in the link between the perceptions of consumers on the retailer's commitment to sustainability and customer loyalty.

Furthermore, in Table V we can observe the direct effect of sustainability on loyalty, and the indirect effect, mediated through store image. In this sense, it is observed that the relationship between sustainability and loyalty would be positive for those establishments that take into account in their decisions the actions that are directly related to the improvement of the image that consumers have of them. These results accompany the line of research proposed by Igbudu *et al.* (2018), who highlight the importance of variables linked to brand value through their mediating role.

6. Conclusions

The results obtained in this work allow us to obtain a more concrete vision of the effect of technological innovation and sustainability in food retailing. Specifically, the analyses carried out make it possible to respond to the main objective of the research, that is, to confirm the need to reconfigure the current commercial distribution system from a dual perspective of innovation and sustainability. Moreover, these findings support those contributions that show the importance of promoting sustainable actions with innovative practices, thus responding to the existing controversy in the literature about whether or not innovation stimulates sustainability. Furthermore, although some constructs such as image or loyalty have been extensively studied in Marketing, this research analyzes them in relation to innovation and sustainability. Taking into account the relevance of both concepts in the development of competitive advantages and the few contributions in this regard, we understand that the results obtained can provide additional value in this field of research. Consequently, it is possible to formulate a set of theoretical conclusions and practical implications that are presented below.

6.1.Theoretical implications

The study of the innovation construct in retail has been extensively addressed in the literature from the perspective of companies, neglecting the customers' perceptions. From those studies that have analysed this construct from the consumer's perspective, most of them have looked at innovation from a global perspective, that is, assuming that it is an element made up of factors associated with the product, marketing, and type of relationship between businesses and consumers (Lin, 2015). This work seeks to make advances in the knowledge of innovation from the client's perspective, where the results obtained suggest that, in the food retail trade, for consumers to perceive establishments as innovators, it is essential to work on the "product" variable. Our findings support the notion highlighted by Mahmoud *et al.* (2020), in the sense that those companies that manage to access the market quickly and efficiently and that also manage to satisfy the needs of consumers (in this case, introducing innovations that contribute to enhance consumers' perceptions of the retailer's sustainability), will achieve a differential advantage with respect to their competitors (through enhanced customer loyalty, according to our results).

Therefore, the development of a market penetration strategy by managers, i.e. including improvements in the design of products, whether that is in their packaging, labelling or format, can help to generate a greater perception of innovation in trade. Furthermore, the development of new products, which are more ecological and different from those of its competitors, can be a competitive advantage for this type of establishment.

Besides, it is found that, in retailing, sustainability must be analysed from a triple perspective - economic, social, and environmental - as proposed by Elkington (2004). Although the literature already demonstrates the importance of moving towards sustainable business, the results obtained to date could raise some doubts. Studies such as that of González-Lafaysse and Lapassouse-Madrid (2016) point out that the sustainable actions implemented by retail establishments can be perceived as commercially motivated, creating an image contrary to that desired by these businesses. On the other hand, works such as that of Lavorata (2014) obtain empirical results that indicate that the effect of sustainable initiatives in stores does not have a significant impact on consumer loyalty. In an attempt to shed light on these inconclusive findings, our study obtains positive results in terms of consumers' perception of the sustainable practices implemented in retail. This research achieves satisfactory results, on the one hand, in relation to the causes behind sustainable actions and, on the other hand, their impact on other variables of paramount importance in marketing, which are explained below.

Firstly, it is possible to affirm that, in the commercial food distribution sector, technological innovation boosts sustainability. These results are in line with those works that indicate that sustainable and innovative businesses can achieve competitive advantages, thus differentiating themselves from their main competitors (Marcon *et al.*, 2017). Thus, from the results obtained, it is observed that it is not possible to understand the progress of food stores without considering both technological innovation and sustainability, and this link is significantly strong regardless the store format.

Secondly, empirical evidence is obtained of the positive and direct effect of sustainability on store image (Kumar, 2014) and consumer loyalty towards the establishment (Moisescu, 2018). Likewise, it is also observed that the image of the establishment exerts a mediating effect between sustainability and loyalty, confirming the importance of this construct in the commercial distribution sector (Donato *et al.*, 2021; Ibe-enwo *et al.*, 2019).

In addition, it is confirmed that store image also drives loyalty. That is, positive perceptions held by the consumer towards the establishment will encourage them to repeat their purchases in the same store, as indicated by Yoo *et al.* (2000).

Finally, this work advances the analysis of the commercial format as a moderating variable in the proposed relationships. Some studies have differentiated between two types of commercial formats, small and large (Filipe *et al.*, 2017; Graciola *et al.*, 2020). One of the main conclusions observed in the research presented is that the link between technological innovation and sustainability is not moderated by the commercial format. The impact of the commercial format on the relationships between sustainability and image, and sustainability and loyalty, is particularly significant when comparing the group of consumers in supermarkets with that of hypermarkets and discount stores, which leads us to believe that the moderating effect of the commercial format is not associated with the size of the store, as the literature had suggested up to now. On the contrary, the relationships between image and loyalty to the establishment seem to be in line with those previously stated by Filipe *et al.* (2017) and Graciola *et al.* (2020).

6.2.Practical implications

The results obtained in this work allow us to formulate some recommendations for managers of retail establishments, especially those that sell food products.

Firstly, in relation to technological innovations, it is recommended to develop existing or new products that incorporate new features in their design. For example, the managers of retail food establishments could incorporate products from Fair Trade, organic, and aimed at new market segments, such as vegan and vegetarian consumers, into their current offer. On the other hand, making changes to the products they already offer would also be an appropriate decision to attract new consumers and retain current ones. Therefore, the development of new product formats, changes in their packaging, or modifications to the typography of the text or logo are some measures that are recommended. Moreover, expanding their range of services, differentiation from the competition, such as the option to pay without the need to go through the checkout or the possibility of obtaining more information about the products by scanning QR codes, would add value to the current offer of stores. However, it is important not to forget that some of these decisions may have negative connotations for certain segments of consumers or workers. For example, older consumers may find it difficult to understand or use some of the innovations mentioned, such as the self-checkouts. In addition, these innovative actions can lead to the loss of jobs. In this sense, specialised personnel (cash staff) are required to help customers with these processes. On the other hand, there is the possibility that there are consumers who do not have devices to access the information provided by QR codes, so it is important that this information is also available in a conventional way.

Secondly, sustainability is a fundamental factor for today's consumer. In this sense, it seems necessary that, in order to improve the image that consumers have of establishments and increase loyalty towards them, it is important to implement sustainable actions. In addition to developing new products or novel designs of existing products, this must be done by considering three essential elements: economic sustainability, social sustainability, and environmental sustainability. The creation of products using material and energy resources in an efficient way and reducing their negative impact on the environment, can be a way to attract consumers. On the other hand, the collaboration of companies with social, sporting, or humanitarian movements, among others, can generate competitive advantages for organisations. However, today's consumers are more demanding and sometimes perceive that these decisions are commercially motivated on the part of the establishments (González-Lafaysse and Lapassouse-Madrid, 2016). Therefore, these measures will have a positive result if the company sends the right messages according to the communication channel it uses.

Finally, image is also postulated as an element that enhances loyalty towards the establishment. Therefore, if consumers demand more innovative and sustainable businesses, it seems clear that companies should modify some aspects of their establishments. Eliminating plastic bags, using furniture or items in colours associated with sustainability, such as green or brown, can help improve the image that the consumer has towards the store, and encourage them to make a repeat purchase in the establishment.

Although the main intention of this work is to provide guidelines for decision-makers in companies, it is important to point out that for some of the aforementioned actions to be implemented, the collaboration of public administrations is also necessary through grants and subsidies. Therefore, for retail to be able to adapt to consumer trends, influenced by a greater awareness of sustainability issues, business-government collaboration is vital.

6.3. Limitations and future lines of research

Finally, we gather together some limitations of this work that can lead to a set of opportunities for future research in marketing. Firstly, the results of this study are focused on a specific geographic region, therefore, we consider that its analysis could be extended to larger samples and to other geographic areas. In addition, it would also be convenient to include other commercial food formats not considered in this work to observe if the same behaviour occurs. In addition, in relation to the methodology of the study, the development of research that analyzes the dynamic nature of relationships between innovation, sustainability perceptions, store image and customer loyalty may be explored in further research.

On the other hand, we believe that it is important to broaden the concept of innovation, taking into account other facets of the construct that allow a better explanation of its effect on sustainability. This paper analyses the concept of technological innovation in response to the changes developed in the supply of products and services of retail companies.

However, we believe that the analysis of this construct must take a step forward and, therefore, it is vital to retain developments that are important today, but have not been addressed in the present research, such as Artificial Intelligence, as suggested by Rana *et al.* (2021). The evaluation by the consumer of tools linked to these new technologies such as "intelligent search", "independent recommendation windows", cashier-less (just-walk-out tech) or the use of "chatbots" can give us a better vision of the type of innovative business model that retail establishments are advancing towards. In addition, analysing the consequences of these tools on consumer satisfaction and loyalty can help companies make better decisions. In this sense, a more detailed analysis can help us identify which are the most innovative tools linked to Artificial Intelligence (Rana *et al.*, 2021) and, on the other hand, delve into the negative aspects that may impact stakeholders. Regarding the nature of sustainability, we understand that future research should consider the holistic definition of this construct suggested by Lunde (2018), which includes both from the perspective of the consumer and the company as well as the ethical dimension.

Examining the impact of sustainability on other variables related to store equity could be a challenge that now needs to be faced. Therefore, we propose a study of the effect of sustainability on the reputation of the establishment, perceived quality or satisfaction, examining how the purchasing behaviour of consumers varies. Finally, it is proposed to analyse other mediating variables not assessed in this work that can help to explain how the effects of technological innovation and sustainability are intensified in the generation of loyalty.

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Appendix. Measurement scales

Factor	Item
Technological innovation	IN1. STORE X offers many new products
	IN2. STORE X offers creative own designed products
	IN3. STORE X offers innovative private brand products
	IN4. STORE X offers more innovative products than other stores
	IN5. STORE X offers various products for selection
Economic Sustainability	SN1. STORE X pays producers a fair price
	SN2. STORE X pays its employees a decent wage
	SN3. STORE X pays its employees a minimum wage in developing countries
	SN4. STORE X monitors the working conditions of its employees
Social Sustainability	SN5. STORE X sells fair trade products
	SN6. STORE X sells organic products
	SN7. STORE X implements humanitarian actions
	SN8. STORE X engages in actions directed at schools
	SN9. STORE X sells share products (donations to charitable associations)
Environmental Sustainability	SN10. STORE X recycles their products and packaging
	SN11. STORE X cuts back their consumer of electricity
	SN12. STORE X pays attention to the environment
Store image	IM1. STORE X has friendly personnel
	IM2. STORE X has extensive assortment
	IM6. STORE X has attractive promotions in the store
	IM7. STORE X provides excellent customer service
	IM8. STORE X offers an attractive loyalty program
Store loyalty	LO1. I consider myself to be loyal to X stores
	LO2. When buying groceries X stores are my first choice
	LO3. I will not buy from other groceries retailers if I can buy the same item at X stores
	LO4. Even when items are available from other retailers, I tend to buy from X stores