IPCA INSTITUTO POLITÉCNICO DO CÁVADO E DO AVE

CASHIERLESS STORES ON CUSTOMER ENGAGEMENT

Francisco Manuel Soares Viana

Orientadores

Professora Doutora Alexandra Malheiro

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Dissertação apresentada
ao Instituto Politécnico do Cávado e do Ave
para obtenção do Grau de Mestre em Marketing

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DECLARAÇÃO

Nome: Francisco Manuel Soares Viana
Endereço eletrónico: a16258@alunos.ipca.pt
Título da Dissertação: Cashierless stores on customer engagement
Orientador: Professora Doutora Alexandra Malheiro
Coorientador: Professor Doutor Marco Gouveia
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Assinatura: Francisco Manuel Soares Viana

CASHIERLESS STORES ON CUSTOMER ENGAGEMENT

Abstract

This study investigates how different store typologies influence attitudinal and experiential dimensions of the shopping experience. A field experiment was conducted across two store formats, involving 80 participants evenly distributed between groups. Cashierless stores were perceived as offering significantly greater time savings, confirming their advantage in terms of efficiency and speed at checkout. Traditional stores recorded significantly higher levels of social interaction, reflecting direct contact with cashiers and occasional staff interactions. No other variables showed significant differences. The findings suggest that retailers should adopt segmented strategies for each store typology, leveraging the strengths of each format. This study contributes to the limited literature comparing consumer responses to different store formats within the same context, providing empirical evidence from a real-world setting and practical implications for retail management.

Keywords: supermarkets, cashierless stores, customer engagement, attitude, experience.

Resumo

Este estudo analisa de que modo as distintas tipologias de loja influenciam as dimensões atitudinais e experienciais da experiência de compra. Foi conduzido um estudo de campo de natureza experimental, abrangendo dois formatos de loja, com a participação de 80 indivíduos distribuídos de forma equitativa entre os grupos. As lojas sem caixa foram percecionadas como mais eficientes, proporcionando uma poupança de tempo significativamente superior, o que reforça a sua vantagem em termos de celeridade no processo de pagamento. As lojas tradicionais registaram níveis significativamente superiores de interação social, refletindo o contacto direto com operadores de caixa e interações pontuais com colaboradores. As restantes variáveis não evidenciaram diferenças estatisticamente significativas. Os resultados sugerem que as empresas do setor do retalho deverão adotar estratégias diferenciadas e segmentadas em função de cada tipologia de loja, potenciando as especificidades e vantagens inerentes a cada formato. O presente estudo contribui para a escassa literatura que compara as respostas dos consumidores a diferentes formatos de loja no mesmo contexto, fornecendo evidência empírica em ambiente real e implicações práticas relevantes para a gestão do retalho.

Palavras-chave: supermercados, lojas sem caixa, envolvimento do cliente, atitude, experiência.

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1. Introduction

Customer demand for goods and services represents the fundamental cornerstone of industrial activity (Lemon & Verhoef, 2016). The development of products and services that deliver value to customers is critical for the success of retailers, as is the provision of a distinctive experience that enables companies to differentiate themselves in a competitive market (Marketing Science Institute, 2016). Both industry professionals and scholars acknowledge the significance of understanding and effectively managing engagement levels (Marketing Science Institute, 2016; Lemon & Verhoef, 2016).

The growing adoption of innovative retail technologies, particularly cashierless store models, has significantly transformed the shopping experience. These stores leverage advancements such as Artificial Intelligence (AI) to optimise retailers' operational efficiency and provide benefits to customers, including reduced queuing times and faster payments (Kumar, Ramachandrana & Kumar, 2021; Polacco & Backes, 2018). However, the high costs associated with implementing these technologies underscore the necessity of a comprehensive evaluation of customer reactions and their overall impact on the shopping experience (Polacco & Backes, 2018). For this reason, understanding customer attitudes towards these innovations becomes crucial, as it allows for an assessment of whether they enhance customer engagement or lead to unforeseen negative consequences.

In this context, AI plays a central role in the operation of cashierless stores, enabling a seamless and automated shopping experience (Cui, Esch & Jain, 2021). AI-driven technologies allow customers to enter, select their products, and leave without the need to interact with a checkout operator (Cui et al., 2021). A notable example is Amazon's Just Walk Out technology, used in Amazon Go stores, which enables customers to shop and exit without passing through traditional checkout counters, thereby making the process considerably faster (Nishihara, 2018).

Following the success of Amazon Go stores, retailers across different international markets have increasingly invested in similar cashierless technologies in order to remain competitive and respond to evolving consumer expectations (Nishihara, 2018). This trend reflects a broader shift towards automation and frictionless retail experiences, with several pilot stores and experimental formats being introduced across both European and global contexts (Savage, 2021; Wilson, 2022).

Despite the rapid proliferation of cashierless stores, significant gaps remain in the literature regarding their impact on customer attitudes and experiences. As a result, detailed analyses of perceived value, time-savings, satisfaction, loyalty, emotions, social interaction, and impulse purchases are still lacking.

This research aims to examine the influence of cashierless stores on customer engagement by analysing key dimensions and comparing the experiences of customers in traditional stores to those in cashierless environments. The study seeks to provide valuable insights into variations in engagement levels and shopping experiences, thereby enhancing the understanding of the broader implications of these innovations.

This research aims to provide an answer to the following research question:

RQ. Can cashierless stores improve customer engagement?

By highlighting key areas for improvement, this study aims to strengthen the understanding of the effectiveness of the cashierless concept and its potential to increase customer engagement. The following section presents relevant literature on cashierless stores and their key dimensions, also exploring attitudinal and experiential aspects that may influence customer involvement in this emerging retail format.

2. Literature Review

2.1. Cashierless Stores

Cashierless stores represent a disruptive approach that redefines the purchasing process by eliminating the need for traditional checkout counters (Ponte & Bonazzi, 2023). This concept aims to create a smoother and more satisfying shopping experience by significantly reducing time spent in queues and waiting, simplifying the process, and catering to individual customer preferences (Ponte & Bonazzi, 2023). Grounded in Industry 4.0 technologies, this model enables customers to enter the store, select their desired products, and complete their purchases entirely autonomously, removing the delays and inconveniences typical of conventional checkout systems (Gulson, Murphie & Witzenberger, 2021).

According to Schögel & Lienhard (2021), three technological solutions are identified as the most promising for transforming the payment stage: i) mobile and augmented reality technologies such as Scan & Go, ii) Smart Carts, and iii) fully automated solutions based on artificial intelligence, exemplified by Just Walk Out technology.

The Scan & Go service, pioneered by Walmart, allows customers to scan the items they wish to purchase using a mobile app or specific in-store devices (Inman & Nikolova, 2017). Items are added to a virtual basket, and payment can be completed directly through the app, eliminating the need to pass through traditional checkouts (Inman & Nikolova, 2017). Although designed to provide a faster and more convenient experience, customer acceptance was limited, leading to the discontinuation of the service after initial trials (Koltun & Williams, 2018).

The Smart Cart solution enhances the shopping experience by integrating intelligent carts equipped with weight sensors, cameras, visual aids, and a display interface (Shwetha, Gowda, Sneba & Pooja, 2018). This technology automatically identifies products added to the cart, logging them into a virtual inventory that customers can track in real time. Once electronic payment is completed, customers can simply proceed to the exit without queuing for checkout. The recent introduction of Dash Carts by Amazon highlights the ongoing interest in technologies that offer innovative and efficient shopping experiences (Statt, 2020).

Just Walk Out technology, introduced by Amazon in its Amazon Go stores in 2018, represents a revolutionary innovation in the purchasing process (Wankhede, Wukkadada & Nadar, 2018). This solution combines cameras, sensors, facial recognition systems, and deep learning to monitor customer movements and automatically add products to a virtual basket (Polacco & Backes, 2018). Payment is also fully automated, with the total amount deducted from the customer's associated account, followed by a digital receipt sent via email (Polacco & Backes, 2018). This model eliminates the need for human interaction at the checkout, delivering an efficient and uninterrupted shopping experience (Polacco & Backes, 2018).

In sum, cashierless stores are being established worldwide in a variety of formats and across different industries, making use of the latest technological advancements to eliminate the traditional check-out process (Schögel & Lienhard, 2020). For each of the stages of the purchasing journey, the available technologies can be combined and applied in various ways (Schögel & Lienhard, 2020). The opportunities for stores range from cost reductions to increased convenience and the potential for a greater focus on the customer (Schögel

& Lienhard, 2020). Nevertheless, regardless of technological innovations, satisfying customer needs remains the primary objective (Schögel & Lienhard, 2020).

2.2. Cashierless stores on customer engagement

Perceived value

The concept of customer perceived value is a fundamental pillar of contemporary marketing, significantly influencing customer attitudes and playing a crucial role in shaping satisfaction, brand loyalty, and future purchase intentions (El-Adly, 2019). This concept is comprehensive, encompassing affective, cognitive, and sensory dimensions, which help identify the benefits customers derive from their experiences (El-Adly, 2019).

The importance of perceived value goes beyond the product itself, extending to the overall experience offered by the brand (El-Adly, 2019). This overall experience directly influences customer satisfaction and their predisposition for future interactions with the brand (Minvielle & Mars, 2010). In fact, the literature suggests that perceived value is a key precursor to repurchase intention, reflecting the customer´s evaluation of goods and services, and serving as an essential element in commercial transactions (Gligor & Bozkurt, 2022).

Customer perceived value can be understood as the difference between the total cost to the consumer (including price and sacrifice) and the benefits received, such as quality, advantages, and utility (Micu, Bouzaabia & Bouzaabia, 2019). When this difference is positive, it tends to promote repurchase intention, conversely, a negative view may discourage this intention (Micu et al., 2019). Thus, customer perception becomes crucial in commercial transactions, with the intrinsic value of the product being secondary to the overall consumer perception (Micu et al., 2019). It is important to note that this perception evolves over time, highlighting the importance of consistency in the quality of goods and services offered (Micu et al., 2019).

In both physical and digital retail environments, companies implement various promotional strategies and discounts to enhance customer perception and encourage positive purchasing behaviours (Micu et al., 2019). In the supermarket sector, particularly in cashierless stores, time-saving becomes a decisive factor (Gligor & Bozkurt, 2022). The elimination of traditional checkout systems and the implementation of faster purchasing processes not only reduce transaction times but also enhance the perceived value by customers, resulting in a more efficient and satisfying shopping experience (Gligor & Bozkurt, 2022).

The study by Slack, Singh, & Sharma (2020) adds that supermarkets generally focus on the functional value associated with cost-benefit, paying less attention to emotional and social aspects. Customer perception is primarily influenced by social value and cost-benefit relationship, while functional value related to performance and quality has a marginal impact on overall customer perception (Slack et al., 2020).

In summary, customer perceived value is a multifaceted and dynamic concept, encompassing both functional and emotional and social benefits (Thielemann, Ottenbacher & Harrington, 2018). Its effective management is crucial for customer satisfaction, brand loyalty, and repurchase intention, directly reflecting the success of companies' marketing strategies (Thielemann et al., 2018).

H.1.: Cashierless stores have a direct and favourable impact on perceived value.

Satisfaction

Customers´ choice of purchase location is influenced by a range of internal and external factors, such as perception, social and cultural context, and attitudes, all of which directly impact their satisfaction with a product or service (Khan, 2006). According to Wulanjani & Derriawan (2018), satisfaction corresponds to the sensation of pleasure, enthusiasm, delight, or disappointment experienced when comparing the perceived performance of a product with one's expectations. Furthermore, Singh (2006) defines satisfaction as either an attitude towards the provider or an emotional response to the discrepancy between what the customer expects and what they actually receive.

Customers may experience three levels of satisfaction: i) if the product's performance falls short of expectations, they feel disappointed; ii) if it meets expectations, they are satisfied; iii) if it exceeds expectations, they experience a high level of satisfaction (Wulanjani & Derriawan, 2018). Based on this perspective, it can be concluded that customer satisfaction results from a post-purchase evaluation, which is positive when the chosen alternative meets or surpasses expectations and negative when the obtained results fall short. This assessment is influenced by the customer´s own expectations (Efendi, 2020).

Customer satisfaction is, therefore, an essential metric for assessing the degree of contentment with the products and services offered (Catherine & Magesh, 2017). Maintaining customer satisfaction provides benefits for organisations, as it increases the likelihood of customer loyalty, higher consumption, and positive word-of-mouth recommendations (Catherine & Magesh, 2017). Enhancing customer satisfaction contributes to favourable business outcomes, reflected in increased sales and profitability (Mohan, 2013).

Retail establishments combine tangible and intangible elements that influence customer satisfaction (Catherine & Magesh, 2017). These include products and their packaging, the visual environment of the store (colours, product layout, and ease of circulation), sensory stimuli (scents, music, and lighting), operational processes (checkout systems and waiting times), staff interaction, and product offerings, encompassing variety, quality, and pricing policies. Additionally, factors such as employees' knowledge and behaviour, service efficiency, and complaint management also play a significant role in the customer experience (Morschett, Swoboda & Foscht, 2005; Theodoridis & Chatzipanagiotou, 2009; Ushantha, Wijeratne, Achchuthan & Lanka, 2014). Factors such as a predisposition towards customer relationships, a positive perception of service, and store image are crucial determinants of customer satisfaction (Bloemer & Odekerken-Schröder, 2002). The overall brand image influences both satisfaction and customer loyalty (Neupane, 2015). Furthermore, a pleasant store environment enhances the shopping experience and increases customer satisfaction (Babin & Darden, 1996).

Other relevant factors influencing supermarket satisfaction include the balance between product and price, service quality, personal interaction, convenience, and the store's physical appearance, as well as staff competence, reliability, after-sales service, and product innovation (Thương, 2016; Kumar, 2017).

H.2.: Cashierless stores have a direct and favourable impact on satisfaction.

Loyalty

In the current competitive and omnichannel environment, where switching costs are low and customers can easily compare offers and prices from retailers, customer loyalty is increasingly difficult to attain (Grewal, Roggeveen & Nordfält, 2017). Nevertheless, building a strong base of loyal customers is often considered one of the key outcomes of an effective relationship management programme (YouGov, 2017; Natasoiu & Vandenbosch, 2019).

Customer loyalty is a critical factor for the success of any organisation, reflecting the tendency of consumers to repeatedly choose a particular brand or company over its competitors (Villas-Boas, 2004). Establishing a long-lasting relationship is essential for securing a stable and reliable source of revenue, as loyal customers are more likely to make repeat purchases and spend more than new customers, resulting in higher profits and greater financial stability (Villas-Boas, 2004).

Furthermore, loyal customers are more likely to recommend the company to friends and family, which aids in customer acquisition and amplifies brand recognition (Anwar, Min & Dastagir, 2019). This type of loyalty also facilitates the collection of valuable feedback and insights, which can be used to improve products and services, thereby enhancing the shopping experience (Anwar et al., 2019).

A lasting relationship with customers plays a crucial role throughout the entire purchasing cycle, from the first contact with the brand to post-purchase satisfaction (Watson, Beck, Henderson & Palmatier, 2015). In particular, a positive payment experience, as part of that relationship, has a direct impact on customer satisfaction, thereby strengthening their loyalty to the brand (Hasan & Mishra, 2015).

By ensuring a positive payment experience and effectively managing customer expectations, businesses can cultivate a long-term relationship, which not only contributes to repeat purchases but also promotes recommendations and strengthens the competitive advantage in a sustainable manner (Watson et al., 2015).

In this context, it is important to deepen the understanding of how the choice between conventional and cashierless payment systems can affect customer loyalty (Nusrat & Huang, 2024). Understanding this dynamic is essential for retailers to optimise their payment systems and provide a more enjoyable and efficient shopping experience (Nusrat & Huang, 2024). However, it is important to consider that, despite the convenience offered by cashierless systems, they can sometimes negatively impact loyalty due to the phenomenon of entitlement perception, where customers expect special treatment (Reczek, Haws & Summers, 2014).

H.3.: Cashierless stores have a direct and favourable impact on loyalty.

Emotions

The concept of emotion is multifaceted and complex, encompassing neural circuits, response systems, and affective states that have the potential to influence and guide cognition and behaviour, in addition to involving antecedent cognitive evaluations (Izard, 2010). Furthermore, emotions can be regarded as both antecedents and consequences of the cognitive perception of the customer experience (Escadas, Jalali & Farhangmehr, 2020).

The role of emotions is crucial in human perception, impacting individuals' reactions even in similar situations due to their subjective nature, which allows for different emotional responses, shaped by the complexity and individuality of each person (Kuuru, Litovuo, Aarikka-Stenroos & Helander, 2020). Customers' feelings are influenced by how they evaluate situations that evoke various emotions, with any type of stimulus having the potential to become the focus of consideration and trigger emotional responses (Kuppens & Tong, 2010).

The emotional connection between the customer and the business is fundamental to the purchasing journey, as a positive impression during acquisition can create lasting memories influenced by the emotions experienced, both online and in physical stores, emphasising the importance for businesses to foster a bond as a significant differentiator (Terblanche, 2018). Rychalski & Hudson (2017) state that positive emotions have a stronger impact on satisfaction compared to negative emotions, highlighting the importance of evoking favourable feelings during the purchase journey for the retailer's long-term success.

Within this dynamic, the payment process plays a crucial role, as it is essential in shaping customers' positive emotional states throughout the purchasing cycle (Lyu, Lim & Choi, 2019). A positive phase in the payment process contributes significantly to customer satisfaction and fosters brand loyalty, generating a sense of esteem for the purchasing process (Lyu et al., 2019). Consequently, the implementation of innovative technologies, such as cashierless stores, has the potential to evoke positive emotions and foster memorable interactions with customers (Lyu et al., 2019).

According to the research by Kousi & Naselli (2022), the cashierless payment system evokes positive reactions of empowerment and excitement, without triggering prominent negative emotions (such as loneliness and discomfort), due to its novelty and technological complexity, providing an exciting and futuristic shopping moment. However, it is important to note that technologies can generate negative emotions if they present practical challenges (Kousi & Naselli, 2022).

H.4.: Cashierless stores have a direct and favourable effect on emotions.

Impulsive buying

Spontaneous acquisition can be defined as the sudden purchase of products without prior planning, typically associated with specific product categories or different stages of the purchasing process (Kwan, 2016). This impulse does not arise from a deliberate and rational decision-making process, but from a significant stimulus that compels the customer to act immediately and spontaneously (Iyer, Blut, Xiao & Grewal, 2020). Unplanned acquisition arises from the recognition of a stimulus that may be linked to situational, individual, or social factors (Chopdar et al., 2022).

This behaviour is characterised by three main aspects: the absence of prior planning, the response to a specific stimulus, and the spontaneous and immediate decision-making process (Iyer et al., 2019). Impulsivity manifests without prior reflection, often influenced by the emotional state of the moment (Chopdar, Paul, Korfiatis & Lytras, 2022). According to Yi & Jai (2020), customers seek immediate pleasure, whether through physical or online purchases, which can trigger spontaneous and unplanned decisions, often driven by temporary affective states.

According to Sohn & Lee (2017), positive sensations can stimulate both cognitive and affective impulsive buying, while negative emotions tend to primarily intensify affective unplanned acquisition. Broadly speaking, both favourable and unfavourable emotional states exert a significant impact on this behaviour (Yi & Jai, 2020).

Favourable emotional states encourage the search for immediate pleasure, leading to quicker and less rational purchasing decisions (Hidiani & Rahayu, 2021). Conversely, during moments of stress or fatigue, impulse buying can serve as an emotional relief mechanism, providing temporary satisfaction (Xu, Wu & Li, 2020).

Nevertheless, some research suggests that while positive emotions do not always play a clear mediating role in impulsive buying, there is evidence that negative affect has a considerable influence on impulsive behaviours (Verplanken & Sato, 2011; Pradiatiningtyas, 2019).

This effect becomes even more evident in certain shopping environments, where multiple stimuli encourage spontaneous decisions, such as supermarkets, which represent one of the contexts where impulsive buying is most prevalent, potentially accounting for up to 62% of sales and 80% in specific product categories (Reisch & Zhao, 2017). To encourage this behaviour, supermarkets adopt various strategies, such as attractive packaging, store design, product displays, and promotions (Basu, Paul & Singh, 2022). Furthermore, technological advances in cashierless payment systems facilitate transactions, further encouraging this behavioural pattern (Basu et al., 2022).

Aligned with emotional and contextual factors, strategic approaches demonstrate how the retail environment directly impacts impulsive purchasing behaviour (Chopdar et al., 2022). Therefore, a deep understanding of emotional factors and marketing strategies in retail environments is essential for the effective management of impulsive buying (Chopdar et al., 2022).

H.5.: Cashierless stores have a direct and favourable impact on impulsive buying.

Time-saving

Prolonged waiting times in queues can be extremely frustrating for customers who are already overwhelmed with a multitude of daily tasks (Handel & Borrmann, 2016). This frustration often leads customers to seek more efficient alternatives, such as switching to other establishments or shifting to online shopping (Low & Lee, 2021). Conversely, retailers face substantial challenges, including excess inventory and compressed profit margins, which drive them to adopt stock liquidation strategies (Grubor, Milićević & Djokic, 2016). To alleviate the negative financial impact, these entities are frequently forced to hold sales under significantly more favorable conditions, with the aim of reducing surplus and alleviating economic losses (Grubor, Milićević & Djokic, 2016).

Time-saving potential is a critical factor for customers, and this is particularly relevant in automated stores equipped with artificial intelligence systems (Yale & Venkatesh, 1986; Low & Lee, 2021). Self-checkout systems, which reduce wait times at payment counters, can significantly enhance the shopping experience by addressing one of the key issues in large stores (Low & Lee, 2021). The direct influence of time saved on customer loyalty is evident from the fact that the shorter the time required for travel and waiting, the greater the customer's loyalty to the establishment (Gahinet & Cliquet, 2018; Polacco & Backes, 2018). Additionally,

the time spent on shopping is assessed primarily by the ability to save time, with particular emphasis on access proximity and waiting times at checkout (Gahinet & Cliquet, 2018).

Analysis of the shopping experience indicates that what effectively motivates customers to choose cashierless solutions is the expectation of superior performance, combined with the perception that such solutions offer greater speed, ease, and comfort during the payment process (Ponte & Bonnazi, 2023). Indeed, it is undeniable that the payment phase is often perceived as the most frustrating and primary source of dissatisfaction in physical supermarket shopping, with research findings in this area proving notably promising, thus encouraging investment in innovative solutions (Ponte & Bonnazi, 2023).

In conclusion, the integration of artificial intelligence in the retail sector presents a transformative opportunity for supermarkets to enhance their competitiveness on a global scale. By addressing one of the key sources of customer dissatisfaction (extended waiting times) cashierless stores can significantly improve customer satisfaction and loyalty, making this area a compelling target for both investment and further research (Polacco & Backes, 2018).

H.6.: Cashierless stores have a direct and favourable impact on time-saving.

Social Interaction

Human beings are intrinsically emotional and rely on interaction to satisfy their social needs (Polacco & Backes, 2023). In the retail context, the interaction between customers and employees directly impacts the shopping experience within supermarkets (Brown & Lam, 2008). In particular, the interaction between the customer and the cashier plays a central role in social interactions during the purchasing process (Ponte & Bonnazi, 2023). For retailers, the quality of these interactions is often used as a measure of relational proximity with customers (Marinković, Đorđević & Kalinić, 2020).

Customer satisfaction is frequently linked to the quality of interpersonal contact with team members (Ponte & Bonnazi, 2023). Relationships founded on empathy and the responsiveness of employees tend to elevate satisfaction levels (Menon et al., 2000). Furthermore, a well-informed team can positively influence customer emotions (Polacco & Backes, 2023). According to Pan and Zinkhan (2006), employee likability and competence are key determinants of future store loyalty. Personalised attention and swift service significantly contribute to more satisfying shopping experiences (Polacco & Backes, 2023). Assistance provided by the team remains the second most important aspect in evaluating customer satisfaction in relation to the store's environmental stimuli (Marques, Cardoso & Palma, 2013).

The desire for personalised shopping experiences emphasises the importance of dynamic and unique human interactions, which cannot be fully replicated without human contact (Polacco & Backes, 2023). Davis (2016) highlights that 77% of customers prefer to resolve issues through direct communication rather than automated alternatives. In this regard, one of the primary concerns surrounding cashierless stores is the potential reduction in such human contact (Polacco & Backes, 2023).

Additionally, it has been observed that customers value proximity to other customers, particularly when they identify commonalities, such as sharing the same geographical space or having similar interests (Marinković et al., 2020).

H.7.: Cashierless stores have a direct and favourable impact on social interaction.

2.3. Theoretical Synthesis and Conceptual Framework

The literature reviewed demonstrates that store format exerts a multifaceted influence on consumers' attitudes and experiences. The emergence of cashierless stores, supported by artificial intelligence technologies, has redefined the purchasing process by offering greater speed and convenience (Ponte & Bonazzi, 2023; Polacco & Backes, 2018). These characteristics support the assumption that the cashierless format has a positive impact on perceived value (H1), as efficiency and ease of use are commonly associated with a more favourable evaluation of service quality (El-Adly, 2019; Gligor & Bozkurt, 2022).

Similarly, several studies indicate that customer satisfaction tends to increase when the shopping experience is simplified and frictionless (Wulanjani & Derriawan, 2018), providing a basis for H2, which proposes a direct and positive effect of cashierless stores on satisfaction. Satisfaction, in turn, constitutes a key antecedent of loyalty (H3), as more satisfied customers are likely to repeat their purchase experience and recommend the retailer to others (Villas-Boas, 2004; Anwar et al., 2019).

Beyond attitudinal dimensions, the literature highlights the importance of emotional factors. Technological innovation can elicit positive emotions associated with novelty and efficiency (Kousi & Naselli, 2022), supporting H4. However, the reduced human interaction characteristic of automated formats may limit the emotional richness of the experience, potentially moderating the strength of this relationship.

Impulse buying (H5) may also be affected by store format, as automated environments and simplified payment systems tend to lower cognitive barriers and promote spontaneous decisions (Basu, Paul & Singh, 2022; Chopdar et al., 2022). Likewise, time saving (H6) represents one of the most salient functional benefits of cashierless stores, widely recognised as a determinant of convenience and satisfaction (Low & Lee, 2021; Gahinet & Cliquet, 2018).

Conversely, research in physical retail settings emphasises that social interaction plays a fundamental role in shaping emotional bonds with the brand (Brown & Lam, 2008; Marinković et al., 2020). While cashierless formats minimise direct human contact, the presence of other customers within the store environment can still provide a sense of social connection, particularly when familiar individuals are observed during the shopping experience. However, the absence of interpersonal communication with staff may weaken the depth of such interactions, reinforcing the need to assess how automation affects the social dimension of engagement. Therefore, H7 explores whether cashierless stores exert a direct and favourable impact on social interaction, or whether efficiency comes at the expense of social connectedness.

In summary, the reviewed studies suggest that store format influences both functional and experiential dimensions, underscoring the need for an integrated conceptual model. Customer engagement is conceptualised in this study as a higher-order construct reflected through impulsive buying and social interaction, while time saving is treated as a functional outcome of the store format. Furthermore, customer engagement is understood as an intermediate state emerging from emotional, social, and behavioural responses to stimuli, indirectly contributing to the formation of loyalty. Despite store format being the central concept in this study, the variable is operationalised as "Supermarket" to reflect the empirical context in which the data were collected. Specifically, the study was conducted in a single retail setting that integrates

two distinct areas: a cashierless area and a traditional area with staffed checkouts and human interaction. Therefore, the term "Supermarket" is used to represent the store format within this hybrid environment. Accordingly, the conceptual model proposed in this study represents the theoretical relationships between store format and the key dimensions of customer engagement.

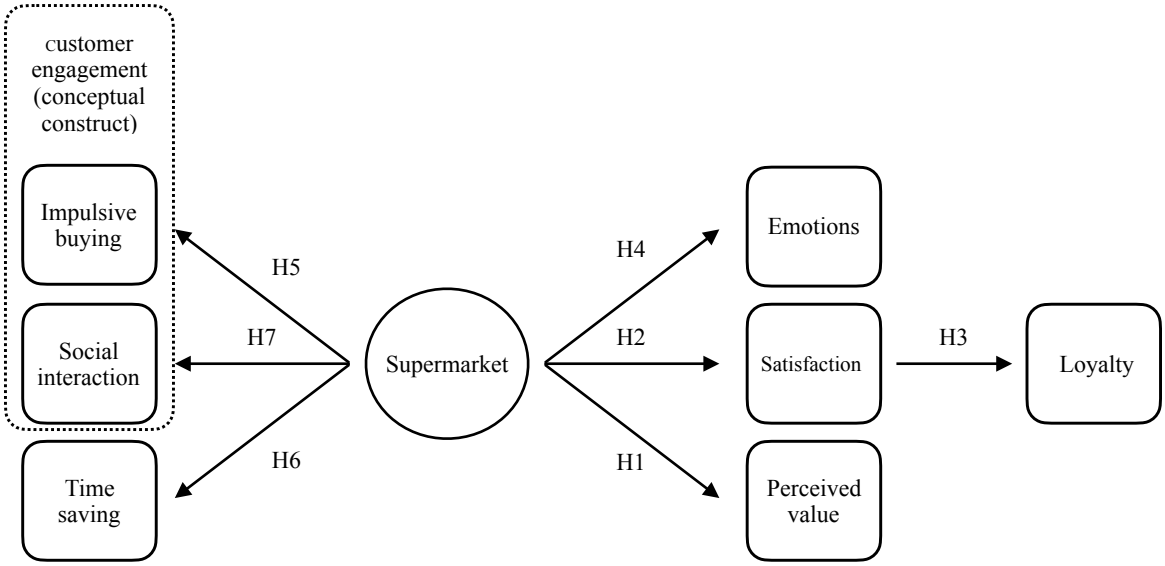


Fig 1
Conceptual model.

3. Methodology

3.1. Sample and procedure

This study was conducted in Portugal in collaboration with a large retail organisation operating in the food sector. Data were collected in a supermarket that integrates both cashierless and traditional checkout formats within the same physical environment. The store is organised into two distinct areas: one allowing customers to complete their purchases autonomously using cashierless technologies, and another operating with traditional staffed checkout systems.

Conducting the study in this real-world and technologically advanced context made it possible to observe consumers in their natural shopping behaviour, thereby enhancing the external validity of the results and enabling a direct comparison between the two store formats under consistent conditions.

The study adopted a quantitative monomethod research design, using an online self-administered questionnaire. This approach was selected because it allows for systematic and standardised data collection from a relatively large number of participants, ensuring objectivity, reliability, and the possibility of statistical analysis. It also facilitates the direct comparison of consumer perceptions across the two store formats while maintaining consistency in the measurement of attitudinal and experiential dimensions.

A non-probability sampling approach was adopted, specifically convenience sampling, whereby participants were recruited based on their accessibility within the retail context. This method is characterised by the inclusion of individuals according to their availability and ease of access, and is widely considered appropriate in real-world research settings where probabilistic sampling procedures are not feasible (Elfil & Negida, 2017).

Data were collected at the physical point of sale during a single day of fieldwork. Participants were invited to take part in the study following their shopping experience and were assigned to the appropriate version of the questionnaire according to the store format used by the participant. The store format was identified based on the checkout area in which the transaction was completed, as the retail setting integrates distinct cashierless and traditional sections. The questionnaire was self-administered and accessed either through a QR code or via a device provided within the store environment. A total of 80 valid responses were obtained, 40 from customers of traditional stores and 40 from customers of cashierless stores, with efforts made to maintain a balanced number of responses between genders; however, this proved challenging with regard to age, due to differences in consumer profiles between the two store formats. To minimise potential response biases, such as social desirability bias or acquiescence bias, the questionnaire emphasised that there were no right or wrong answers, and that all information collected would remain anonymous and be treated confidentially (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003).

Table 1

Survey response distribution.

Category		Traditional Stores N = 40 (%)	Cashierless stores N = 40 (%)
Age			
18-24		15	30
25-34		17.5	32.5
35-44		22.5	15
45-54		27.5	15
55-64		15	7.5
≥65		2.5	0
	Total	100	100
Gender			
Male		55	57.5
Female		45	42.5
	Total	100	100
Education			
Basic education		17.5	10
Secondary education		40	45
University		42.5	45
	Total	100	100

3.2. Measurement

The study utilised two distinct questionnaires, each applied to different customer groups. The first was directed at users of traditional stores, while the second targeted customers of cashierless stores. Both questionnaires followed the same structure, organised into four main sections.

The first section introduced the general objectives of the research, ensuring anonymity and data confidentiality, confirming that all participants were over 18 years old, and obtaining informed consent. The second section included general questions to characterise the customer profile and their behaviours related to the use of traditional or cashierless stores. The questions were organised in a “funnelling” format, beginning broadly and gradually narrowing to more specific topics regarding shopping experience and attitudes. This process was crucial, as these aspects were used as control variables, given that past behaviours can influence future related behaviours (Biscaia, Trail, Ross & Yoshida, 2017). The third section measured the main constructs of the model proposed for the study, using adapted items that reflected the shopping experience and attitudes of each group. The final section collected demographic information about the participants, which was also used as control variables, considering that individual characteristics may influence how

customers respond to different types of stores (Yim & Byon, 2020). The questionnaire items (Table 2) were assessed on a 5-point Likert scale, with the endpoints ranging from "strongly disagree" to "strongly agree".

The items evaluating impulsive buying were adapted from Rook & Fisher (1995), aiming to analyse whether cashierless stores influence an increase in impulsive purchases. Items related to social interaction were based on Dabholkar (1996), intending to understand how interactions with other individuals in the store environment may impact customers' shopping experience. Time saving was measured using items adapted from Dunkley, Helling & Sawicki (2004), evaluating customers' perceptions of time savings when shopping in cashierless stores. Emotions were measured using items adapted from the Carreira, Patrício, Jorge, Magee & Hommes (2013) and Rodgers (2013), aiming to understand the emotions experienced by customers throughout the different stages of the shopping process. Perceived value was assessed using the SERV-PERVAL scale, adapted from Petrick (2002), analysing customers' overall perception of the value of the shopping experience.

Finally, satisfaction and loyalty were measured using items adapted from Orel & Kara (2014) to evaluate satisfaction with the shopping experience, intentions to continue the relationship with the brand, and willingness to recommend the experience to others.

To assess the internal consistency of the constructs, the reliability of the measures was tested (Table 2). All constructs presented Cronbach's alpha coefficients above the recommended threshold of 0.70, indicating high internal consistency and supporting the reliability of the measures (Nunnally & Bernstein, 1994).

Table 2

Measurement model and scale reliability.

	Cronbach alpha (α)	
Item description	Traditional	Cashierless
Perceived value	0.969	0.892
I like shopping at this supermarket.		
I feel relaxed when shopping at this supermarket.		
I feel good when shopping at this supermarket.		
Shopping at this supermarket gives me pleasure.		
This supermarket offers good products for the price.		
Satisfaction	0.970	0.904
I am satisfied with my experience.		
The experience is beyond my expectations.		
I am happy to shop at this supermarket.		
I am satisfied with the quality of service and customer care at this supermarket.		
Loyalty	0.950	0.935
I will shop at this supermarket again.		
I recommend this supermarket.		

If I need to shop, I will return to this supermarket.		
I speak well of this supermarket to friends and family.		
This is my favorite supermarket.		
Impulsive Buying	0.928	0.866
I buy products I don't need.		
I buy products I wouldn't normally buy.		
I buy products and then don't know why I bought them.		
I buy products I didn't have in mind.		
Social Interaction	0.926	0.823
I can interact with other people.		
The environment of this store helps me interact with others.		
I receive help when I need it.		
I feel comfortable interacting with other people.		
Time-Saving	0.943	0.911
I don't need to wait to pay.		
I spend less time shopping.		
I choose my products quickly.		
I make the payment quickly.		
Emotions	0.839	0.835
My shopping experience at this store was…		
• Good		
• Comfortable		
• Fast		
• Pleasant		
• Safe		

4. Analysis and results

The use of parametric statistical techniques is supported by the Central Limit Theorem, according to which the sampling distribution of the mean tends towards normality for sufficiently large samples, typically above thirty observations (Hair, Black, Babin, & Anderson, 2013). As each group in this study comprised 40 participants, this condition is satisfied, supporting the use of parametric tests such as the independent samples t-test.

The results of the t-test (Table 3) reveal statistically significant differences only in the variables social interaction and time saving. Social interaction recorded higher mean values in traditional stores (M = 3.95, SD = 1.01) compared to cashierless stores (M = 3.48, SD = 0.84), $t(78) = 2.294$, $p = 0.024$, with a moderate effect size ($d = 0.513$). Conversely, time saving showed higher values in cashierless stores (M = 4.07, SD = 1.07) compared to traditional stores (M = 3.16, SD = 1.14) with a large effect size ($d = -0.820$).

For the remaining variables, no statistically significant differences were observed (p = 0.678, 0.328, 0.414, 0.197, 0.071), and effect sizes were negligible to small ($|d| \leq 0.41$), suggesting that, in these dimensions, store typology does not exert a meaningful impact on consumers' reported perceptions.

Table 3
Mean and standard deviation in the traditional and cashierless stores.

Construct	Traditional stores		Cashierless stores		T-test (Sig.)	*Cohen´s d*
	Mean	SD	Mean	SD		
Perceived Value	3.78	1.08	3.87	0.83	-0.416 (.678)	-.093
Satisfaction	3.51	1.14	3.73	0.89	-0.985 (.328)	-.220
Loyalty	3.64	1.06	3.82	0.96	-0.821 (.414)	-.184
Impulsive buying	2.87	1.06	2.56	1.05	1.302 (.197)	.291
Social interaction	3.95	1.01	3.48	0.84	2.294 (.024**)	.513
Time-saving	3.16	1.14	4.07	1.07	-3.666 (.000***)	-.820
Emotions	3.78	0.90	4.12	0.73	-1.833 (.071)	-.410

The correlation matrix (Table 4) shows that perceived value exhibits a strong positive correlation with satisfaction (r = 0.839) and loyalty (r = 0.787). Satisfaction is also strongly correlated with loyalty (r = 0.783). In addition, social Interaction presents a moderate positive correlation with perceived Value (r = 0.592), satisfaction (r = 0.512) and loyalty (r = 0.512). Time Saving is moderately correlated with perceived value (r = 0.551), satisfaction (r = 0.575) and loyalty (r = 0.562). Emotions display a positive correlation with perceived value (r = 0.694), satisfaction (r = 0.725) and loyalty (r = 0.702). Conversely, impulsive buying shows very low correlations with all variables ($r \leq 0.074$). None of the correlations exceed the critical value of 0.85, indicating no evidence of multicollinearity issues (Kline, 2023).

Table 4
Correlation matrix.

Construct			Correlation matrix						
	Mean	SD	1.	2.	3.	4.	5.	6.	7.
1. Pv	3.83	0.96	1.0						
2. Sat	3.62	1.02	0.839	1.0					
3. Loy	3.73	1.01	0.787	0.783	1.0				
4. Ib	2.72	1.06	0.056	0.065	0.074	1.0			
5. Si	3.71	0.95	0.592	0.512	0.512	0.022	1.0		
6. Ts	3.62	1.19	0.551	0.575	0.562	-0.163	0.301	1.0	
7. Emo	3.95	0.83	0.694	0.725	0.702	0.001	0.544	0.710	1.0

Note: Pv = perceived value; Sat = satisfaction; Loy = loyalty; Ib = impulsive buying; Si = social interaction; Ts = time-saving; Emo = emotions.

The analytical model was developed based on the proposed conceptual framework, establishing direct relationships between store typology and the attitudinal and experiential dimensions under analysis. In this framework, store typology is modelled as an exogenous variable influencing perceived value, satisfaction, loyalty, emotions, impulsive buying, time saving, and social interaction. Figure 1 illustrates these hypothesised relationships and the positioning of each construct within the model.

The model was estimated to test the seven proposed hypotheses (Table 5). The results indicate that only H6 was supported ($\beta = -0.383$, $p < 0.001$).

All other hypotheses were not supported, as their p-values exceeded the 0.05 significance threshold. Specifically, Social interaction (H7) showed a statistically significant coefficient ($\beta = 0.251$; $p = 0.024$), but it indicates higher scores for traditional stores. Impulsive buying (H5) showed a small positive effect ($\beta = 0.146$; $p = 0.197$) that was also non-significant. For the experiential dimensions, neither emotions (H4: $\beta = -0.203$; $p = 0.071$), satisfaction (H2: $\beta = -0.111$; $p = 0.328$) nor perceived value (H1: $\beta = -0.047$; $p = 0.678$) showed significant effects. Loyalty (H3), positioned as the final endogenous variable in the model, was also not significantly influenced ($\beta = -0.093$; $p = 0.414$).

Overall, the model results suggest that, with the exception of Time saving, store typology did not exert a meaningful direct impact on the attitudinal and experiential dimensions under analysis.

Table 5
Structural model comparing the Traditional and cashierless stores.

	Beta (β)	Hypotheses	P-value	Hypotheses testing
Sm → Pv	-0.047	H1	0.678	Not supported
Sm → Sat	-0.111	H2	0.328	Not supported
Sm → Loy	-0.093	H3	0.414	Not supported
Sm → Emo	-0.203	H4	0.071	Not supported
Sm → Ib	0.146	H5	0.197	Not supported
Sm → Ts	-0.383	H6	0.000***	Supported
Sm → Si	0.251	H7	0.024**	Not supported

Note: Sm=Supermarket; Pv=perceived value; Sat=satisfaction; Loy=loyalty; Emo=emotions; Ib=impulsive buying; Ts=time-saving. Si=social interaction.
***$p < 0.001$. ** $p < 0.05$.

5. Discussion and implications

The present study examined how store typology influences consumers' perceptions and behavioural intentions across attitudinal and experiential dimensions. Results revealed statistically significant differences only in two dimensions, suggesting that the direct impact of store format is more limited than expected. Cashierless stores were associated with higher perceptions of time saving (H6), while traditional stores scored higher in social interaction (H7). No significant differences were found for perceived value (H1), satisfaction (H2), loyalty (H3), emotions (H4), or impulsive buying (H5).

This outcome indicates that differences between store formats are not as pronounced across most psychological and behavioural constructs. Consumer perceptions appear to converge in most dimensions, with efficiency and social connectedness emerging as the only areas where store typology exerts influence. The absence of significant effects in variables central to relational and experiential marketing requires critical reflection, as it may reflect methodological limitations or shifts in the role these dimensions play in consumer behaviour.

The analysis of H6 showed that cashierless stores were perceived as offering greater time savings, consistent with research linking automated checkout to reduced waiting times and higher flow efficiency (Pantano et al., 2020). However, this benefit did not result in higher satisfaction or loyalty, which suggests that speed of payment, although acknowledged by consumers, is insufficient to generate relational or attitudinal value. According to Parasuraman et al. (1988), convenience should be regarded as a basic attribute: its absence creates dissatisfaction, but its presence alone does not provide differentiation.

Research on personal time management shows that freed minutes are often redirected to routine tasks with little gratification, which limits the potential of time saving to generate satisfaction or long-term loyalty (DeVoe & Pfeffer, 2011; Whillans, Weidman & Dunn, 2016). In line with Verhoef et al. (2009), the efficiency of cashierless models may also reduce opportunities for human interaction, constraining the creation of emotional bonds. Thus, while convenience is valued, it remains confined to the functional sphere without mechanisms to be converted into symbolic or emotional value.

From a managerial perspective, this limitation highlights the need to reframe time not only as efficiency but also as an emotional and existential resource, associated with higher-order human needs (Maslow, 1943). Communication strategies could emphasise the reinvestment of saved time in meaningful activities such as family engagement or self-care. Post-purchase reinforcement, for example through digital receipts or mobile applications that inform customers of their saved time, could tangibly strengthen perceptions of convenience and foster loyalty (Zeithaml, Bitner & Gremler, 2020).

In contrast, H7 showed that traditional stores obtained higher scores in social interaction. According to Schmitt (1999), human contact is a distinctive element of this format, which remains a symbolic marker of recognition and community. However, this interaction did not translate into higher satisfaction or loyalty, suggesting that brief exchanges at the point of payment are insufficient to create lasting relational value. In line with Verhoef et al. (2009), transactional contact risks becoming superficial if not accompanied by depth and meaning.

These findings call for a reconceptualisation of social interaction in retail. The checkout stage could be redesigned as a platform for micro-experiences, such as consultative interactions, personalised recommendations, tastings or moments of surprise. Both formats face risks: traditional stores of offering superficial human contact, and cashierless stores of restricting their value proposition to efficiency. In both cases, the challenge lies in converting dominant attributes, sociability or speed, into emotionally meaningful experiences capable of sustaining loyalty.

Regarding the remaining hypotheses, no significant differences were found between formats. In the Portuguese context, cashierless retail is still at an early stage, with limited availability. Many participants encountered the format for the first time, which restricted its potential to generate satisfaction and loyalty, dimensions that normally depend on repeated experiences. Brand communication also framed cashierless stores as identical to traditional ones but without queues, which may have shaped expectations and minimised perceived contrasts. A critical perspective would further suggest that a store promoted as "the largest cashierless in the world" but differentiated only by speed risks failing to create memorable experiences.

From a theoretical perspective, the findings both confirm and challenge existing frameworks. The centrality of efficiency reflects the service quality model (Parasuraman et al., 1988), while the persistence of social interaction supports experiential marketing (Schmitt, 1999). However, the absence of differences in satisfaction or loyalty suggests that traditional frameworks may not fully capture the dynamics of frictionless technologies, where value creation extends beyond the in-store journey. This highlights the need for updated models that integrate operational efficiency, digital ecosystems and symbolic meaning.

Managerial opportunities also arise from redesigning cashierless journeys. Elements of surprise or recognition at the exit, participation in digital communities, or educational content that helps consumers use saved time meaningfully could enrich the experience beyond convenience. Intelligent cross-selling powered by artificial intelligence may also reinforce perceived value.

In conclusion, if cashierless formats remain confined to a discourse of efficiency, they risk becoming easily replicable commodities. Their competitive advantage will depend on the ability to transform operational speed into emotional and symbolic value, making time not only a resource to be saved but also an asset that enriches the consumer's overall experience and quality of life.

6. Limitations and further research

This study presents certain limitations that should be acknowledged. First, data collection was geographically restricted to a specific region, which may limit the generalisability of the results to other contexts. The distance between the researcher's residence and the study area also constrained the scope and duration of fieldwork, potentially affecting the diversity of the sample. Second, the investigation was conducted in an early stage of implementation of the cashierless format, which may have influenced consumer perceptions. As adoption matures, both attitudes and behaviours may evolve, warranting longitudinal analyses to capture such changes.

From a methodological perspective, although the model allowed for the simultaneous testing of multiple relationships, its scope was confined to the constructs and pathways defined in the conceptual framework. Future research could expand this framework by including additional mediating or moderating variables, such as perceived trust, technological readiness, or shopping habits, in order to refine the understanding of consumer decision-making in different store formats.

Further studies should also consider broader and more diverse geographical samples, as well as longitudinal designs, to evaluate the persistence of the observed patterns over time. Moreover, qualitative approaches, such as in-depth interviews or ethnographic observations, could complement quantitative results by providing richer insights into the motivations and emotional drivers underlying consumer choices.

In sum, gaining a broader understanding of the interactions between store typology, perceptions, and behaviours will enable the development of more targeted and effective retail strategies that balance operational efficiency with the creation of emotional and relational value for different consumer profiles.

7. Conclusion

This study examined the impact of store format on consumer experience and attitudes by comparing traditional retail environments with cashierless stores. The findings indicate that the introduction of automation technologies modifies certain functional dimensions of the shopping experience, particularly the perception of time saving, yet does not significantly influence attitudinal factors such as perceived value, satisfaction, or loyalty. These results suggest that technological innovation in retail, while relevant, is not sufficient to redefine consumer engagement, which remains anchored in emotional and symbolic dimensions that technology alone cannot replace.

While prior research has conceptualised customer engagement as a multidimensional construct, this study contributes by operationalising it through distinct behavioural and social dimensions within the context of cashierless stores. In doing so, it offers a more nuanced perspective on how engagement manifests in technology-driven retail environments, particularly when automated checkout systems are considered alongside traditional service formats. This observation reinforces the need to reconsider theoretical models linking functional performance and emotional response, acknowledging that consumption experiences are hybrid phenomena that integrate both utility and meaning. Consequently, technological innovation should be understood not merely as an operational evolution but as a cultural process that reshapes modes of interaction and the criteria of value attributed to the shopping experience.

From a managerial perspective, the findings highlight the importance of embedding technology within strategies that preserve the human dimension of consumer experience. The implementation of automated systems should be accompanied by communication and personalisation mechanisms that convey proximity, reassurance, and recognition, ensuring that efficiency does not result in dehumanisation. At the same time, traditional retail formats may benefit from redefining social interaction, transforming human contact into a genuine differentiating factor and a competitive advantage in an increasingly automated marketplace.

While this study offers relevant theoretical and practical contributions, it recognises certain limitations, particularly the collection of data within a single geographical and temporal context. Future research could expand the scope to other sectors and countries, and explore the role of mediating variables such as trust in technology, digital readiness, or perceived control. Employing qualitative or mixed-method approaches could also provide a deeper understanding of the meanings consumers attach to technology and human interaction.

In sum, the study concludes that automation reshapes the shopping experience operationally, yet does not eliminate the centrality of the human dimension. The value of cashierless stores lies not merely in the speed they provide, but in how effectively they integrate technological efficiency with symbolic and relational elements that confer meaning to the experience. The future of retail will therefore depend on organisations' ability to balance the precision of algorithms with the depth of emotion, transforming innovation into experience and convenience into connection.

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