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TECHNOLOGICAL ADVANCEMENTS IN THE RETAIL INDUSTRY: THE METHODOLOGY BEHIND THE ANALYSIS

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Abstract

Self-Service Technologies (SSTs) have emerged as a strategy for retailers to improve customer experience. This research determines Portuguese consumers' supermarket brand perceptions, to understand what players occupy an advantageous mental space for the implementation of these technologies: Perceptual Mapping. Findings reveal that the relationship between consumers and supermarkets is predominantly transactional, therefore perceptions of individual hedonic values are incomputable. Moreover, a Conjoint Analysis was employed to analyze preferences in checkout methods. While consumers under 45 are very interested in checkout-free technology, they exhibit a low willingness to pay for these technologies. Current market players can improve their checkout-free store models.

Keywords: Marketing Research, Self-Service Technologies (SSTs), Checkout Methods, Checkout-free Technology, Mystery Shopping, Perceptual Mapping, Brand Perceptions, Conjoint Analysis.

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List of Abbreviations

SST: Self-Service Technology

SCO: Self-Checkout

TAM: Technology Acceptance Model

RFID: Radio Frequency Identification

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1. Introduction

As consumer activity continues to shift from offline to online, the retail industry has undergone dramatic changes in the last decade. The Covid-19 pandemic boosted many technological trends, leaving retailers looking for new strategies to improve the customer experience and drive traffic back to the store (McKinsey & Company, 2022).

While a healthy tech foundation can give retailers the competencies to improve overall performance, most companies have not made sufficient progress and are missing opportunities as a result. In fact, suggestive evidence has shown that, between 2016 and 2020, digital leaders in the retail industry generated 3.3 times the total returns to shareholders of digital laggards (McKinsey & Company, 2021).

Retailers have been adapting a customer journey approach, in order to identify and address the most relevant consumer pain points. Accordingly, checkout-free technology in retail has emerged as the key to the creation of a frictionless customer experience. This process has often been dubbed "cashier-less checkout" but is more accurately described in the industry by "checkout-free technology", given that the entire checkout process is eliminated. "*Checkout-free/unmanned store is a new retailing concept where customers check in with mobile apps, choose their goods, and leave the store without help from cashiers or machines. In an ideal setting, it would be a complete automatic shopping experience for the time-scarce consumers, and an effective way to save manpower costs for retailers*" (Qi, 2019). This concept first caught the attention of Amazon, who announced their Just Walk Out technology in 2016: "*it allows consumers to shop as they normally would but save time and effort by eliminating the checkout—meaning no lines, no scanning products, and no fuss*" (AWS, 2022). To process transactions,

invoices, and billing, checkout-free technology makes use of QR codes, smart shopping carts, RFID (radio-frequency identification) tags, and machine vision (AI Multiple, 2022).

Such technologies combine convenience with experience. By allowing consumers to simply walk out of a store, retailers are directly eliminating the largest consumer pain point. In fact, "*25% of consumers are likely to avoid entering stores with long wait times, which may cause retailers to lose up to $100 billion annually"* (Qudini, 2020). Moreover, these technologies add value to retailers in additional ways, by implementing a new medium to understand customer behaviors and deliver more personalized messaging, improving inventory management, and replacing the traditional brick-and-mortar model with a modern experience. (A&M, 2022). Nonetheless, widespread adoption by consumers is still a relevant obstacle.

Checkout-free technology falls under the definition of self-service technology (SST). SSTs can be defined as "*technological interfaces that enable customers to produce a service independent of direct service employee involvement*" (Meuter et al., 2000). SSTs began being adopted in the 1990s, in the United States, but have since exponentially become the norm (Rinta-Kahila et al., 2021). These technologies have ultimately changed the expectations of customers since the role of the store employee has been replaced by technology (Hilton et al., 2013). Among the many different SSTs available, self-checkout (SCO) lanes have become an extremely popular choice for supermarkets around the world. Interestingly, a 2022 study found that SCOs currently comprise nearly 40% of lanes in US supermarkets. (Catalina, 2022). In 2019, the SST market size was valued at USD 28.3 billion, and is predicted to register a compound annual growth rate (CAGR) of 6.7% from 2020 to 2027 (GVR, 2020).

According to a financial literacy study conducted in 2016, 39% of Portuguese consumers claim to use the SSTs available in commercial spaces (Sapo, 2016). In recent years, Portugal has

pioneered innovation within the supermarket retail sector through the opening of two stores implementing checkout-free technology. In 2019, Portuguese retail group Jerónimo Martins launched the Pingo Doce & Go Lab Store, located at the Nova SBE campus. The pilot store addresses the specific needs of university students, "*offering a quick and convenient shopping experience*" (ESM, 2019). In 2021, Portuguese retailer Sonae partnered with Sensei, the leading European provider of autonomous stores, to launch Continente Labs. Because of the more advanced technology of Continente Labs, this store was the first in Europe to challenge Amazon's dominance in the market space (Charged, 2021).

Before the Covid-19 pandemic, Portugal was enjoying an overall positive economic climate. The country was considered one of Europe's most promising food markets, with projections indicating a compound annual growth rate (CAGR) of 2.2% from 2019 through 2022 (Dunnhumby 2021). As of 2021, trends in consumer behavior reported that Portuguese customers have been "*increasingly seeking promotions and discounts*" and limiting their "*food expenditures in response to COVID-19"* (GAIN, 2021). In fact, the discount distribution chain Lidl was one of the only food retail brands to gain market share in terms of value in 2020 (DN, 2020). Nonetheless, the expansion of the discounter model that has been registered throughout Europe is hampered by Portugal's unique retail industry. Unlike most European countries, the market "*is dominated by a small number of large retailers that specialize in traditional offerings*" (Dunnhumby, 2021). In terms of market share, the sector has been historically led by two national players: Sonae, with Continente (26.8%), and Jerónimo Martins, with Pingo Doce (22.9%) – accounting approximately for 50% of the retail market (GAIN, 2021). The present Work Project will focus on the top five supermarket brands based on their most recent turnover values, in Portugal. Therefore, alongside Continente and Pingo Doce, the following brands will

be the target of analysis: LIDL, with an 11.3% market share value; Auchan, with 5.6%; Mini-preço, with 3.9% (GAIN, 2021).

This dissertation narrows the object of study to the supermarket retail sector in Portugal, with two main purposes. First, the goal is to understand the perceptions of Portuguese consumers regarding supermarket brands operating in the national market, and how the mental space that a brand occupies in Portuguese consumers' minds can impact its chances of success when investing in checkout-free technology. These findings will be of value to industry players evaluating the possibility of implementing this process in their stores, given the lack of literature on the matter. Secondly, the focus will shift to what attributes of checkout methods, mainly checkout-free technology, are most valued by Portuguese consumers, alongside their willingness to pay for these services. Accordingly, the following research questions are proposed: **RQ1)** How do Portuguese consumers perceive supermarket brands operating in the national market? **RQ2)** What are the attributes that Portuguese consumers value the most in supermarket checkout methods?

Furthermore, the growing competition between supermarket brands increases the need for a deeper understanding of what criteria influence consumers' brand choices. Dongdae Lee & Michael Hyman (2008) found that consumers' choice of a product or store is driven by both hedonic and functional considerations. Thus, to determine what factors predominantly lead consumers to visit supermarket stores, a third research question is proposed, complementing the first one: **RQ3**) What are the drivers influencing what supermarket stores consumers choose to visit?

In addition, it is important to address the two opposing tendencies at play in the Portuguese market. Although SSTs are evidently growing in popularity, their success is highly influenced by "*customer's engagement, knowledge, behavior, and skills to complete the transactions*"

(Kara & Orel, 2014). Simultaneously, in 2021, the elderly population (65 and older) represented 23,4% of the total population in Portugal (INE, 2021). Customer age is a factor of particular importance that affects the interest in SSTs, due to the positive correlation between older age groups and technological illiteracy and anxiety. In other words, older people are more apprehensive to use SSTs because of the expected difficulties of learning new tasks (Simon & Usunier, 2007). Therefore, a fourth research question is proposed to complement the second one: **RQ4)** How does the age factor impact Portuguese consumers' interest in checkout-free technology?

In order to answer these questions, a literature review guided the research and served as background for the consumer and expert interviews conducted, as well as for the mystery shopping experience organized and built around the Technology Acceptance Model (Davis & Warshaw, 1989). These steps provided crucial insights for the careful development of a methodology based on two analyses: the construction of a Perceptual Map, based on the Brand Personality Construct (Aaker, 1997); and the development of a Conjoint Analysis. Data was collected, analyzed, and discussed. Finally, a conclusion summarized the major findings, together with highlighting some limitations and recommendations for future studies on the topic.

2. Major Findings

This section of the dissertation explores the major research findings provided by all qualitative, quantitative, and mixed methods applied, which will later be analyzed in detail. The development of a perceptual map aimed at examining how Portuguese consumers perceive supermarket brands, accessing RQ1. Contrary to what was expected, even though supermarket brands are

perceived quite distinctively from one another, consumers do not perceive brands multidimensionally through individual hedonic values. Brands are perceived by means of a unidimensional construct of perceived quality. Moreover, the way in which consumers perceive brand quality is directly affected by how often they visit a supermarket brand. This leads to the conclusion that the relationship between supermarket brands and Portuguese consumers is transitional, rather than hedonic, answering RQ3. When analyzing Portuguese consumers' most valued checkout methods and their respective attributes - RQ2 -, willingness to pay was revealed to be a decisive factor. Portuguese consumers are extremely price-sensitive to potential checkout services' prices, however, willingness to pay does increase proportionally with technology level. Age was revealed to be a key factor in SSTs adoption, addressing RQ4. Checkout-free technology stands out as the favorite checkout method for consumers under 45, and cashier lanes are the preferred method for consumers over 45. As expected, younger consumers tend to have an easier time operating with these technologies and assign them more value. Simulations revealed no significant differences in preference between the store models of Continente Labs and Pingo Doce & Go Nova but addressed potential model adaptation to maximize preference share.

3. Work Project Design

The current dissertation was organized into four stages, as seen in Figure 1.

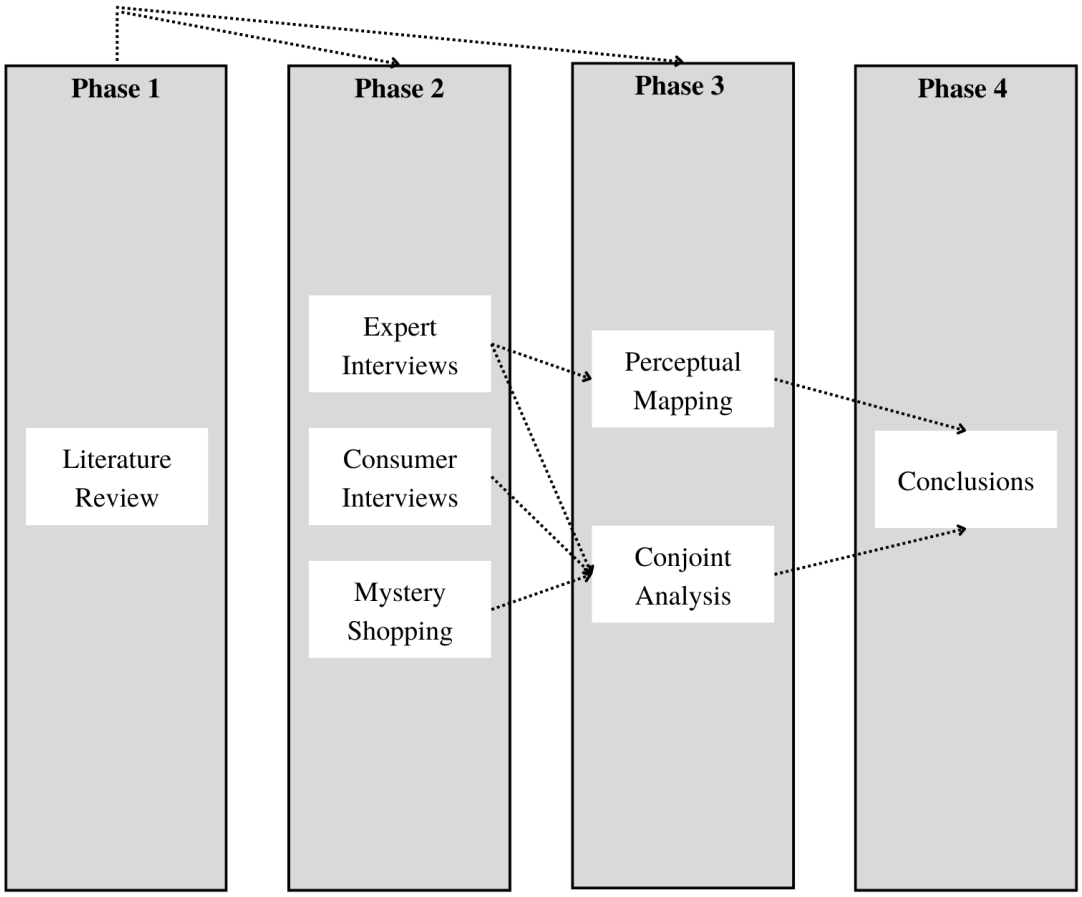


Figure 1: Work Project Design Diagram

Phase 1, the Literature Review, consisted of the study of the existent literature on the topic of SSTs, largely centered on the concept of checkout-free technology, and on the planned analyses (Perceptual Mapping and Conjoint Analysis). Subsequently, **Phase 2** involved qualitative and quantitative methods of research, through contact with consumers (interviews and mystery shopping experience) and industry experts (interviews). Findings from the Literature Review supported this stage of the project, by offering clear insights for the development of interview scripts, as well as briefs for the mystery shoppers. **Phase 3** comprised the two principal analyses

of the Work Project: perceptual mapping and conjoint analysis. The Literature Review conducted on these methods of analysis - mainly the existing studies applied to the topic of SSTs -, offered clear guidelines for their design, construction, and application. Findings from Phase 2 were used for the development of these analyses: expert interviews supported both the perceptual mapping and the conjoint analysis, while consumers (interviewees and mystery shoppers) only offered insights for the latter. Finally, **Phase 4** consisted of the extraction of the main conclusions of the analyses (Phase 3), a statement of project limitations, and the development of recommendations for future studies on the topic.

4. Literature Review

Technology Acceptance Model

a. Technology Avoidance

Whilst organizations continue to introduce new technologies, the challenge of widespread consumer adoption remains relevant. In fact, "*for as long as technology has existed, people have resisted it*" (Dziak, 2020). The reasons why certain consumers actively avoid new technologies vary, however, the main thought trends and attitudes that hamper the acceptance of technology are the following: (i) technology creates higher unemployment; (ii) technology dehumanizes goods and services, by reducing personal touch; (iii) it is difficult to learn how to use new technologies (Dziak, 2020). These ideas are strongly present in the discourse about automation technology in retail, as is the case of cashier-free supermarket stores, which seriously threatens the success of the implementation of this technology. Consequently, for the purpose of this dissertation, it is crucial to assess if Portuguese consumers are unwilling or uncertain about this concept.

b. The Model

With the development of technology and its growing importance in consumers' lives, the understanding of what influences technology acceptance and avoidance has grown more relevant over the years. Although self-service shopping has significantly improved, consumers continue to face relevant pain points that are unaddressed by regular cashier lanes and SCOs. This fact generates opportunities for grocery retailers to move past self-checkout machines. However, understanding consumers' willingness to embrace more autonomous technology is key to its implementation. Therefore, to address consumers' attitudes towards smart technologies in supermarket retail, and their intentions to adopt it, it is crucial to acknowledge the Technology Acceptance Model (TAM) (Thomas-Francois & Somogyi, 2022).

The research community's growing interest in addressing this topic has resulted in the development of several theories and models of technology acceptance and its successful adoption. In 1985, Fred Davis introduced the field's current dominant model, the Technology Acceptance Model (TAM). Davis attempted to create an equation capable of predicting the level of acceptance of technological systems.

The model – Annex 1, Figure 1 - takes into consideration five main dimensions: *"(1) Perceived usefulness; (ii) Perceived ease of use; (iii) Attitude toward using technology; (iv) Behavioral intention to use; (v) Actual technology use"* (Baumassepe, 2021).

The TAM "*presumes a mediating role of two variables called perceived ease of use and perceived usefulness in a complex relationship between system characteristics (external variables) and potential system usage*." (Marangunić & Granić, 2015). Perceived usefulness is the "*subjective judgment of the potential user's utility*" of a new technology, whilst perceived ease of

use is the "*cognitive effort expended by a potential user*" when learning how to use a new technology. (Yand et al., 2021). Both constructs come together to measure the consumer's motivation - attitude toward use. Davis believed that "*the attitude of a user toward the system was a major determinant of whether the user will actually use or reject the system*." (Marangunić & Granić, 2015).

A 2021 study for the Global Business & Finance Review Journal applied the TAM to investigate consumers' intention to use SSTs in China. Results proved that perceived usefulness and perceived ease of use "*had positive effects on customers' attitude and behavioral intention in the context of using SSTs*" (Yand et al., 2021).

Mystery Shopping

Mystery shopping is a "*tool used by companies to measure the quality of service (...) and the overall experience of the everyday customer*" which dates to the 1940s when it was primarily used to assess employee integrity (PamInCa, 2009). Currently, the primary goal of this instrument is to "*monitor the quality of processes and procedures used in the delivery of a service, rather than the outcomes of a service encounter*" (Wilson, 1998). It is a very powerful tool for organizations looking to improve their service quality, as it provides in-depth insights into consumers' experiences and perceptions.

Mystery shoppers are "*common people who visit a variety of business locations and (...) make observations based on the particular requests of each client*" (PamInCa, 2009).

Consumer Psychology

a. Theory of Consumption Values

The Theory of Consumption Values (TCV) was introduced by Sheth, Newman and Gross, in 1991. It illustrates the buying behavior of consumers concerning their consumption values. The theory aims to answer the question of why consumers decide for or against the purchase of a certain item, a series of products, or a brand (Tanrikulu, 2021). To address this question, the TVC encompasses the following five consumption values: (i) functional value; (ii) social value; (iii) emotional/hedonic value; (iv) conditional value; (v) and epistemic value - see Appendix 1, Figure 2 (Sheth, et al., 1991).

The degree to which a consumer's need is satisfied is known as consumption value. It is based on the individual's overall evaluation of a product's net utility or level of satisfaction after purchase (Tanrikulu, 2021).

According to the authors, this theory's application studies consumer choice behavior for many types of products, including durable and nondurable goods and services. For the purpose of the present dissertation, this theory will serve as basis for the analysis of Portuguese consumers' perceptions of supermarket brands.

Previous studies on the field indicate that two of the five dimensions of the TCV are relevant in the current research's context – functional value, the "*perceived utility of a product or service to attain utilitarian or physical performances*" (Sheth, et al., 1991); and hedonic value, the "*perceived utility acquired from an alternative's capacity to arouse feelings or affective states*" (Sheth, et al., 1991). Whilst the relative importance of each value will be assessed to understand the relationship between Portuguese consumers and supermarket brands, the latter were used for perceptual mapping, in the context of the brand personality construct.

b. Brand Personality Construct

Personality is a concept attributable to humans. It can, however, be used to illustrate the characteristics of non-human beings, such as brands. The "*transmission of human characteristics to non-human things and events*" (Guthrie, 1997) is referred to as anthropomorphism. Through this process, consumers tend to attribute positive characteristics to products and brands to maximize feelings of comfort and familiarity when using them (Haigood, 1999), whilst allowing for self-expression, facilitating relationships, and simplifying the process of brand choice (Freling & Forbes., 2005). Consequently, different brands may hold very recognizable personality traits (Plummer, 2003).

The brand personality concept is especially relevant in the domain of retail outlets because of the existence of multi-level relationships between customers and stores (Lockshin, 1997). Consumers can develop strong personal relationships with store brands and names, with store employees, and with the stores themselves.

Jennifer Aaker (1997) defines a brand's personality as "*the set of human characteristics associated with a brand*". To understand how the relationship between brand and human personality may drive preference, the author developed a five-dimension brand personality scale (Aaker, 1997). Through Aaker's model, the following five personality dimensions associated with brands were identified: Sincerity, Excitement, Competence, Sophistication, and Ruggedness.

However, the replication of the framework in multiple geographies has proven that the scale is not stable in different cultural contexts (Ferrandi, 2000) and that some dimensions have no real equivalents in terms of human personality. As the viability of brand personality scales is often questioned by critics, "*consumer behavior researchers must develop their*

definitions and design their own instruments to measure the personality variables that go into the purchase decision" (Kassarjian, 1971). Consequently, this paper will follow an ad-hoc approach to the brand personality scale. In other words, an adapted brand personality scale was developed, considering the specific service category being studied: supermarkets using advanced SSTs.

c. Brand Personality Scale: Ad Hoc Approach

A company's success is dependent on how consumers recognize innovativeness at the brand level, rather than the actual product or service attributes of the innovation (Einhorn & Arndt, 2010). In other words, it is likely that consumers equate brand names with perceived innovativeness, rather than actual product innovations. Furthermore, previous studies aiming to examine brand innovativeness have found that "*innovative brands are related with several interesting core and secondary associations that have not been adequately addressed in previous research*" (Shams et al., 2015). Innovativeness has been described by consumers across two dimensions: novelty – understood as the relative difference between current and past offerings (Garcia & Calantone, 2002); and meaningfulness – understood as the degree to which a brand's offerings are perceived as valuable and useful (Rubera et al., 2011).

Therefore, for the specific purposes of this research, the following three dimensions were added to Aaker's original framework: Innovation, Novelty, and Meaningfulness. The adapted brand personality scale includes eight brand personality dimensions, described in Appendix 1, Table 1, and will serve as grounds for the construction of this dissertation's perceptual map.

Marketing Frameworks

a. Positioning, Branding, and Perception in Marketing

Perception is "*the process by which an individual selects, organizes, and interprets information inputs to create a meaningful picture of the world*" (Kotler & Keller, 2015). This process is dictated by the individual's values, beliefs, needs, experiences, and environment (Chadha & Kapoor, 2008). In any market, consumers´ perceptions are crucial to the success of companies, because consumers will associate a brand's name with specific attributes, particular benefits, features, and characteristics. These associations will result in the unique placement of brands in the mind of target customers – positioning. Building a strong brand is crucial in any competitive business, therefore, positioning is a key managerial activity responsible for shifting consumers' perceptions and guaranteeing a sustainable position in the market (Gigauri, 2019).

Perceptions strongly influence buying behavior, which explains how positioning leads to competitive advantage. Positioning service brands is more difficult than positioning a product, because of the need to communicate vague and intangible benefits (Assael, 1985). In the study of service marketing, retailers such as supermarkets are classified as service providers. In general, supermarkets provide the following services: presentation of products to allow for easy and convenient purchases; additional services such as parking and delivery; enjoyable shopping experiences through the design of the stores; and SSTs - the focus of this dissertation. Consequently, these grocery retailers depend on shoppers' usage of a service, increasing the necessity of understanding customers' perceptions (Gigauri, 2019). Brands must put effort into finding a place in individual consumers' perceptual space. Consequently, battles of perception are currently witnessed over battles of products.

b. Perceptual Mapping

The visual representation of consumer perceptions through perceptual maps allows for successful positioning strategies and confident decision-making regarding marketing efforts to exert influence on customers' minds. Perceptual mapping has been historically considered as one of the most valuable analytical tools in marketing (Green & Srinivasan, 1990), and can be defined as the graphical technique for visually representing potential customers' perceptions (Gigauri, 2019). The technique is used to portray a brand's image, by describing the consumer's perceptions of brands on one or a series of spatial maps, allowing for the visual study of relationships between the brands (Chadha & Kapoor, 2008). The distances between the brands will demonstrate their differences or similarities and are quantified by the variables (Gigauri, 2019).

The variables can be a "*set of attributes or rank-orderings, evaluated by the consumers based on their perceptions of the brands*" (Dallakyan, 2014). Acknowledging consumers' perceptions and associations is the first step to collecting insights regarding brand preferences. By illustrating how the target consumers view competitive alternatives in the market space, "*perceptual mapping offers a unique ability to understand market structure, analyzing the complex relationships among marketplace competitors and the criteria used by buyers in making purchase decisions and recommendations*" (Nigam & Kaushik, 2011). It facilitates a clear definition of the target segment and the development of a unique positioning strategy, as well as reviewing the performance of previous positioning strategies.

For the purpose of this dissertation's perceptual mapping efforts, data collected about consumers' perceptions using the eight dimensions mentioned above (see Brand Personality Construct) will be studied through a common factor analysis (CoFA) in SPSS.

Factor Analysis is "*an interdependence statistical technique that seeks to determine the number and nature of latent variables or factors that explain the variation and covariation in a set of observed measures*" (Brown, 2015). Some expectations exist regarding the structure of relationships between the dimensions being studied, mainly the prediction of a group of high correlations between sophistication, innovation, and novelty. Nonetheless, an explanatory factor analysis (EFA) will be computed, assuming that there will not be any specifications regarding the number of factors to be extracted. (Rogers, 2022)

SPSS uses the PCA as a tool for the extraction of underlying common factors due to its lower need for computation power. Whilst both PCA and EFA will seek to reduce the set of dimensions into fewer variables (or factors), these statistical techniques are not the same: "*EFA can be used for data reduction and for other purposes, but PCA can only be used for that purpose*" (Rogers, 2022). In sum, the application of the CoFA is expected to summarize the relationships between the dimensions in a limited number of factors. If two factors are extracted, for example, a two-dimensional perceptual map can be used to plot both the dimensions and brands of the study. In turn, this will allow for the extraction of valuable conclusions regarding RQ1.

Conjoint Analysis

a. The Method

Conjoint Analysis is a methodological approach to the study of consumer preferences, developed by Luce and Tukey in 1964. The methodology allows for the understanding of how "*the various characteristics of a product contribute to its overall attractiveness, or better yet to its overall profitability*", and was popularized as a research tool after its introduction in marketing by Green and Rao, in 1971 (Vriens, 1994).

The analysis can be defined as a "*major set of techniques for measuring buyers' tradeoffs among multiattributed products and services*" (Green & Srinivasan, 1990). By breaking up overall utility into preference parameters, such as partworths, the method is decompositional in its approach (Aggarwal & Vaidyanathan, 2003).

In order to gain insights into consumer preferences, the technique can be summarized and organized in the following steps (Vriens, 1994). Firstly, the definition of the product or service through a confined amount of key characteristics, commonly known as attributes. These descriptive features can be objective or subjective, and influence customer preference. Then, these attributes must be defined on a number of levels. Translating these concepts to the space of supermarket retail, if the attribute being studied is, for example, "*supermarket size*", potential levels are: "*large supermarket – 2500 sq. meters*", "*medium supermarket – 1440 sq. meters*", and *small supermarket – 790 sq. meters*" (Saridakis, 2009). The combination of attributes and their corresponding varying levels results in a set of full profiles, which must be evaluated by an appropriate sample of respondents. Through that, study participants are providing numbers linked to each level, which allows for the measurement and extraction of buyer's tradeoffs. "*The numbers attached to these levels are called partworth utilities. Summing the partworth utilities, which belong to a certain profile, yields the overall utility if the additive model is used. It should be noted that the levels of the different attributes are quantified on one common scale: the utility-scale*" (Vriens, 1994). Once partworth utilities have been estimated, an in-depth analysis of the results through a multitude of statistical tests can help solve the specific marketing problems at hand.

Regarding limitations, the method becomes increasingly difficult to execute as the number of attributes and levels rises (Green & Srinivasan, 1990). Therefore, it can be challenging for low-

resourced researchers. Furthermore, Witdnk and Cattin (1989) estimated that the large majority of conjoint analyses (77%) were applied to consumer and industrial goods. Most product-related studies concerned decisions of "*product modifications, optimal product design, the redesigning of product lines, and the development and evaluation of new product concepts*" (Vriens, 1994). Thus, the lack of application in the service sector is a relevant obstacle to this dissertation.

b. Prior research

In the past 15 years, a few research studies have focused on the application of conjoint analysis in supermarket retailing. Nonetheless, for the aim of this dissertation, the focus is on checkout methods in supermarket retail, mainly checkout-free technology. A 2013 study by Dwane H. Dean attempted to anticipate consumer reaction to RFID-enabled grocery checkout. Radio Frequency Identification (RFID) tags are an example of a technological innovation used in checkout-free technology. (AI Multiple, 2022). Through this study, Dwane emphasized that their research was exploratory, and should be developed in the future through the construction of a conjoint analysis. However, no relevant literature was found on the topic.

Still, a 2009 study for The International Review of Retail, Distribution and Consumer Research, by Charalabos Saridakis, focused on the application of a conjoint model for the identification of the UK supermarket choice determinants. The study is "*amongst the largest conjoint applications in the literature of retailing*" (Saridakis, 2009), and aimed to identify which attributes drive supermarket choice, and their relative importance. Regarding the first step of the conjoint methodology – definition of attributes -, the paper analyzed four attribute groups: (i) merchandise – including "*quality of fresh foods and vegetables*", "*presentation of products on the shelves*", "*variety of product categories*", "*level of prices*", "*store brands*", and "*assortment*";

(ii) layout – including "*supermarket size*"; (iii) clientele – including "*number of customers*", and "*location*"; (iv) convenience – including "*distance*", "*opening hours*", and "*parking facilities*". It was found that merchandise-related attributes are the most relevant facet, whilst "*distance*" is the most important attribute: "*it is obvious that UK consumers are not willing to travel*" (Saridakis, 2009).

Later, in 2011, the Journal of Promotion Marketing conducted "*a full profile approach of conjoint analysis (...) to assess the impact of attributes on grocery shopping preference*". The study was conducted in a mid-western college town in the United States and used the following eight attributes: *"(i) customer service from the grocery store staff, (ii) shopping time efficiency, (iii) price or monetary efficiency, (iv) store layout, (v) store accessibility, (vi) affiliated services, (vii) variety of goods carried, and (viii) quality of goods carried*" (Agrawal, D. et al., 2011). Results found that product quality, store accessibility, and product variety were, on average, the attributes of highest relevance for respondents. Therefore, the conclusions are on par with the previous paper.

Supermarket Checkout Methods

Grocery shopping has undergone revolutionary changes over the recent years. Technological innovations have substantially influenced how supermarket players deliver their services and stay competitive in the context of globalization. The growing popularity of Self-Service Technologies (SSTs) leads to constant innovation in this sector. Nowadays, advanced technologies offer consumers digitized operations and frictionless checkout experiences. The tendency to adopt SSTs requires consumers to have an active participation in the production process of the services enabling them to "*co-produce the service with a minimal or no involvement of service*

provider's employees" (Meuter et al., 2000). Cashier lane's popularity is now decreasing, opening a path of growth for SSTs, as both consumers and retailers can benefit from this change.

First and foremost, customers' in-store retail processes are enhanced, as overall convenience is increased through higher autonomy and by avoiding long queues or even entire the checkout process (Qikserve, 2018). Also, an interesting advantage is the fact that consumers are provided with consistent services, as this method does not depend on employees' personalities and moods (Elliott, Meng, & Hall 2008; Weijters et al. 2012).

As for the retailers, there is a possibility to cut costs by reducing the in-store staff (PwC, 2017), increasing service availability, achieving consistent and standardized service atmospheres, and optimizing floor space (Agnihothri et al. 2002; Collier & Kimes 2013; Weijters et al. 2007). Store operators are freed of the repetitive chore of cashing out, and instead, can focus on activities that have a bigger impact (Fernandes & Pedroso, 2016).

Even though SSTs are becoming progressively popular, there are still relevant inconveniences that must be addressed. The potential benefits of SSTs are attractive; however, customers need to be able to embrace and use these new technologies (Lin & Chang, 2011). The responses towards participating in this process are not always as positive as expected (Dong et al. 2015). Hostility to SSTs can bring supermarkets financial losses, compromising their return on investments (Walker et al. 2002). Unpleasant experiences when using these new service options can compromise general customer satisfaction, and intention to reuse and recommend, therefore affecting retailer´s profits (Falk et al. 2007).

Supermarket brands face the new challenge of understanding how consumers will behave when facing these technologies, especially in the Portuguese market, as there are still few studies on

the topic. Adding to that, retailers need to support an expensive manufacturing cost, and the security system of SSTs is unperfect, which raises questions of theft.

In the following section, the three supermarket checkout methods explored throughout this dissertation will be explained, in order to better understand their respective components and processes, as well as relevant differences between them.

a. Cashier Lane

Supermarket cashier lanes are the most frequent checkout method found in Portuguese retailers. In this method, the checkout process - scanning, payment, and placing the purchased items into shopping bags - is conducted with the total assistance of a cashier operator.

b. Self- Checkout

Self-Checkouts (SCOs) are one of the forms of SSTs (Rinta-Kahila et al., 2021). The first retail self-checkout system was developed in the 1990s by Dr. Howard Schneider. By 2003, self-checkouts were already widely used in retail establishments across the world. Nowadays, supermarket brands have been leveraging technological advancements to increase their productivity through the implementation of self-service technologies, especially in the form of self-checkout counters.

In this checkout method, the customer is responsible for checking out their purchases without direct assistance from in-store assistants, through a sequence of directions displayed in the self-checkout machine. Consumers must scan and bag their items and pay for them autonomously. Thus, shoppers' participation, knowledge, and skills to complete the transactions will influence the success of the service provided. Nevertheless, self-checkout areas are supervised by service employees to control and assist customers (Leng & Wee, 2017).

These employees ensure that the process runs smoothly, by assisting customers struggling with the technology, or in cases of technology failure (Demirci & Kara, 2014).

c. Self-Checkout Process

Once consumers have selected the products that they want to purchase, the checkout process is guided via the touchscreen of the checkout machine. Customers must scan the barcode of each item themselves. The software identifies each item and adds it to the bill, displaying it on the terminal. For products such as fruits or vegetables that need to be weighed, the machines are equipped with scales. The customer must identify the product being weighed in the system, which in turn will indicate the weight and the corresponding price. Although this is the most common process, some stores offer a more innovative method where "*RFID tags (...) replace the original barcodes on products*" (Jie & Kamsin, 2021): shoppers can directly place their shopping bag/basket on the counter and all products are scanned simultaneously by the machine (Demirci & Kara, 2014). Depending on the retailer, the customer can be offered several payment methods, such as card or cash, and, in some cases, a supermarket specific app.

d. Checkout-free Technology

The idea of rethinking the physical shopping experience by eliminating the cashier lane and SCO queues was originally conceptualized by three men working for Amazon, in 2012. In the following year, the retailer patented it's Just Walk Out technology, characterized as a system that combines several technologies able to track consumer movement and activity in-store, and automatically sync information to their mobile devices. The combination of technologies includes high-resolution cameras and a variety of sensors, as well as deep learning and artificial intelligence. For example, through radio-frequency identification (RFID), the technology is

able to identify when customers remove an item from the shelves. RFID can improve business operations by increasing the accuracy of product tracking and lead time via electromagnetic coupling in the radio-frequency portion (Rungruengkultorn & Boonsiri, 2022). In December 2016, Amazon announced the opening of the first Amazon Go store using the Just Walk Out system, in Seattle. Due to issues with the technology, the grand opening was often postponed, but finally took place on January 22nd, 2018 (Kastrenakes, 2017).

e. Checkout-free Technology Process

The shopping process using the checkout-free technology can be described in six steps (Purwantono et al., 2021). First, the customer must download a mobile phone application in order to enter the store. The process of setting up the app will usually require payment information for a more seamless experience when exiting the store. At the store's entrance, the customer must scan their in-app profile (by using QR or barcodes). As the customer collects products from the shelves, the system can either automatically add the items to the in-app shopping cart, or consumers may need to scan the item with their phone camera in the app. Similarly, in order to remove an item from the in-app shopping cart, the customer may have to simply place the item back on the shelf or remove it from the in-app shopping cart manually. These slight differences in the checkout-free shopping experience are determined by the technological level of the store's service. Once the customer exits the store, the total price of the added items will be automatically withdrawn from the application's added payment method (Purwantono et al., 2021).

f. Checkout Free Technology in Portugal

Currently, only two supermarket stores in Portugal offer the checkout-free technology service. The first one opened in 2019, when the Portuguese retail group Jerónimo Martins launched the

Pingo Doce & Go Lab Store, located at the Nova SBE campus, in Carcavelos. The group stated that their goal was to "*offer a convenient shopping experience in less than a minute*" (Pingo Doce & Go Lab Store, 2019). Later, in 2021, Portuguese retailer Sonae launched Continente Labs, located in Saldanha, Lisbon, stating that "*shopping can now be faster and more convenient than ever*" (Continente Labs, 2021).

Although both stores offer a similar shopping experience, by targeting the same consumer pain-points, relevant differences in their technology result in slightly distinct processes. These differences – summarized in Table 1 - will be further analyzed in this dissertation's methodology and analyses sections.

Table 1 – Pingo Doce & Go Nova vs. Continente Labs Checkout-free process

	Pingo Doce & Go Lab Store	**Continente Labs**
Entering the store	• Mobile app is required (installed and with profile created). • A QR code is generated to enter the store.	• Mobile app is required (installed and with profile created). • Approaching the barriers that open automatically.
Selecting the products	• Scanning the barcode of the product through your phone.	• Grabbing the desired item (no need to scan).
Removing the products	• Manually — by pressing the "minus" symbol on the quantity of the product — or by touching the mobile phone to the barcode again.	• Putting the item back on the shelf.
Payment	• Payment through the app (credit card associated). No receipt, the purchase is registered in the app.	• Payment through the app (credit card associated). No receipt, the purchase is registered in the app.
Leaving the Store	• The app automatically generates a QR code to present on departure.	• If the payment was done through the app, a QR code is automatically generated to present on departure.

5. Methodology

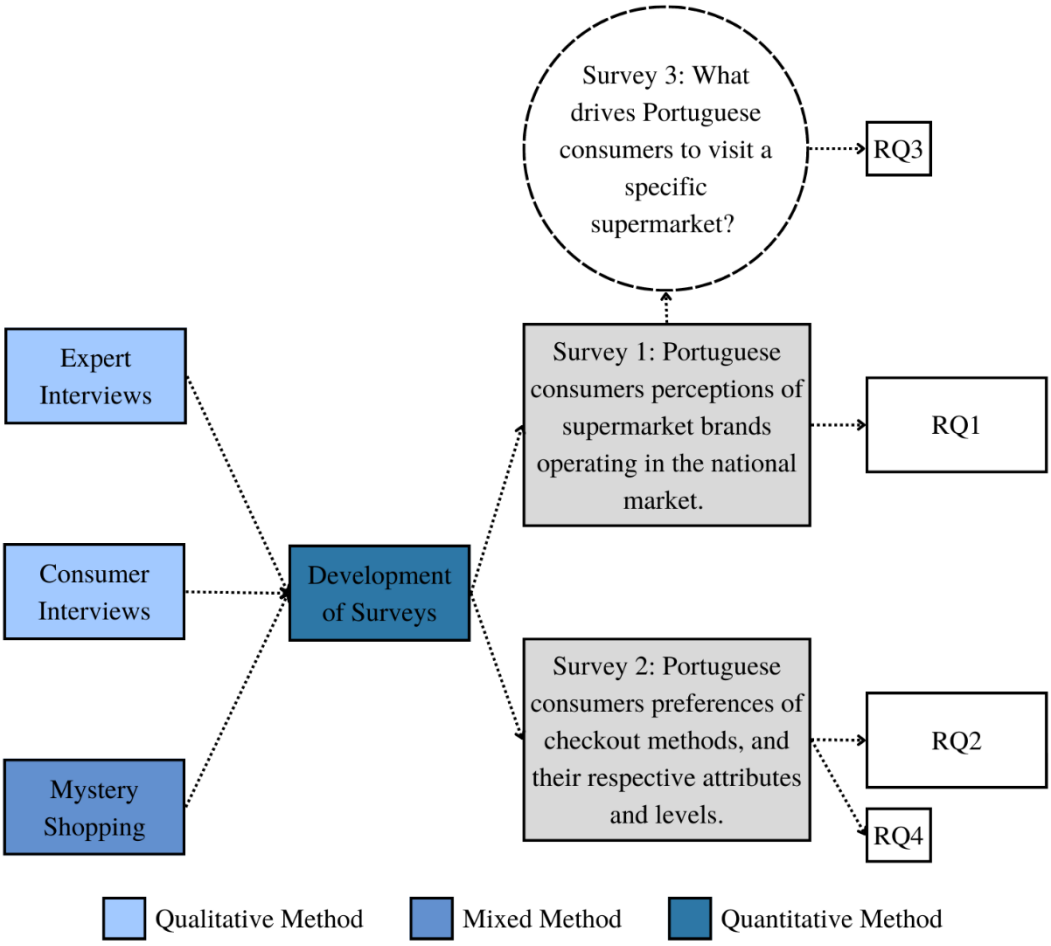


Figure 2: Methodology Diagram.

The present research resorts to qualitative, quantitative, and mixed research methods to find answers to the research questions previously proposed – Figure 2.

In a preliminary analysis, interviews were conducted with both consumers and professional experts in the field of checkout-free technology. These represent the qualitative research methods used to develop this dissertation. Subsequently, a mystery shopping experiment was conducted. This step represents a mixed method of research since it gathered qualitative conclusions - through interviews and qualitative questions in the mystery shopper assessment tool

(Appendix 3) – and quantitative insights – through the application of the Technology Acceptance Model (Davis, 1989). The information gathered in this preliminary analysis was used as the foundation for survey development.

Toward a deeper analysis of the questions defined, a quantitative approach is applied in the construction of three distinct surveys. Survey 1 gathered data for the Perceptual Mapping analysis, aiming to answer RQ1 (How do Portuguese consumers perceive supermarket brands operating in the national market?). The creation of a confirmatory Survey 3 was deemed necessary given the results of Survey 1 and aimed to answer RQ3 (What are the drivers influencing what supermarket stores consumers choose to visit?). Survey 2 collected data necessary for the development of the Conjoint Analysis, and aimed to answer RQ2 (What are the attributes that Portuguese consumers value the most in supermarket checkout methods?), and the complementary RQ4 (How does the age factor impact Portuguese consumers' interest in checkout-free technology?)

Qualitative Methods

a. Expert Interviews

For the purpose of this dissertation, two exploratory expert interviews were conducted with the purpose of gathering exclusive insights into expert knowledge about the concept of checkout-free technology in supermarkets, and how it impacts consumer behavior. The reliable and expert opinions of the interviewees also allowed for the identification of topics that deserve to be further developed, given the existing literature on checkout-free technology.

The first industry specialist interviewed – Expert 1 - is an assistant professor of Data Science and Business Analytics at Nova SBE, actively involved in the project of the pilot store Pingo

Doce & Go Nova, mainly responsible for the analysis of consumers' transaction data. The second industry specialist – Expert 2 - is the Head of Strategy & CEO at Sensei, the leading European provider of autonomous stores *"with an AI-powered solution to build efficient operations and deliver a seamless shopping experience*" (Sensei, 2022).

The interviews were guided by a descriptive script (Appendix 2, Table 1) divided into five sections: (i) *general questions*, mainly regarding the current benefits and drawbacks of implementing checkout-free technology in supermarket stores; (ii) *attributes*, to identify what characteristics of this technology appeal to consumers, and which ones drive away consumer activity; (iii) *perceptions*, to understand how the implementation of this checkout system can impact brand perceptions, and how current players are perceived by Portuguese consumers; (iv) *consumers*, in order to understand who is the target of this service, and how geographic, demographic, psychographic, and behavioral dimensions impact the usage and intention to use of the technology; (v) *future*, regarding trends that are shaping the future of the checkout process in supermarkets, and predictions about the major obstacles to introducing this concept in more stores through Portugal. Table 2 summarizes the expert opinions of both interviewees.

Table 2 – Expert Interviews Key Takeaways

	Expert 1	**Expert 2**
General Questions	• Benefits to consumers: enhanced shopping experience. • Benefits to market players: consumer transactions and behavior can be tracked at an individual level, allowing for personalized marketing. Checkout-free technology can engage with the consumer	• Benefits to consumers: enhanced shopping experience. • Benefits to market players: automated stores track inventory data in real-time which leads to an improvement in sales and operational efficiency. • Obstacles: this technology can increase theft.

	throughout the entire marketing funnel, influencing the entire decision-making process. • Obstacles: privacy concerns - consumers may fear the misusage of their data. Consumers may also exploit personalized pricing based on customer behavior.	• Continente Labs offers more advanced sensors and smart shopping cart technology, which means that consumers do not need to scan each item with their phones like in Pingo Doce & Go Nova.
Attributes	• Main selling point: convenience. Consumers will sacrifice their privacy for a faster and more seamless shopping experience. • Technology avoidance: checkout-free technology requires a certain level of technological literacy. Seniors, people from rural areas, and professionals with occupations with little to no technological involvement are examples of groups that are less likely of having the ability to understand, manage, and use this technology. • Store assistants are not necessary, because all needed information can be accessed via the app.	• Technology avoidance: past negative experiences with SSTs (for example, technology failure in self-checkout machines) can lessen consumers' intention to try out checkout-free stores. • Expert 2 identified store assistants as an improvement in the shopping experience because consumers often need help and instructions on how to use the technology.
Perceptions	• Currently, only transactional data is analyzed at Pingo Doce & Go Nova. The expert validated the hypothesis that studying consumers' perceptions will add value to the industry. • This technology will increase the perception of a brand as more innovative.	• Although Continente Labs is still in the test phase, the expert believes that brands should be perceived as reliable to successfully implement new technologies in supermarkets.

Consumers	• In Pingo Doce & Go Nova, an average visit to the store lasts around 3 minutes. According to the expert, consumers usually need 20 minutes to finish their shopping experience in regular supermarkets. • The current data collected at the store only categorizes consumers into Portuguese and non-Portuguese students. • The target: young college graduates interested in this technology that want to save time during their stressful university schedules.	• Consumers are tempted to make small purchases in terms of the number of items when using SSTs. • Timesaving is crucial. Therefore, it is important to offer grab-and-go items (prepared meals, snacks, or drinks). • Target: early adopters who are open to experimenting with innovation.
Future	• Trend: data collection. Information about consumer interaction with specific products, customer journeys, inventory data, and others, will change the future consumer supermarket shopping experience. • Obstacle to future widespread adoption: the technology will not be accepted by consumers if introduced in an area where most residents are technologically illiterate or uncomfortable with the concept.	• Trend: food waste innovations. For example, developing an alarm signal on the shelves that will trigger a dynamic pricing mechanism when products are reaching their expiration date. • Obstacle to future widespread adoption: upfront investments. If the technologies are not established, retailers may fear taking an investment in an automated store.

The industry expert interviews validated the hypothesis that studying consumers' perceptions (RQ1: How do Portuguese consumers perceive supermarket brands operating in the national market?) will add value to the industry, given the lack of literature on the matter, and taking

into consideration the fact that the current data being collected in both concept stores is solely transactional.

Furthermore, the conversations with the specialists highlighted multiple important characteristics of the checkout-free technology – Figure 3 –, which offers an explanation for the attributes chosen to be studied in the Conjoint Analysis developed later in the Work Project (RQ2: What are the attributes that Portuguese consumers most value in checkout-free technology supermarkets?).

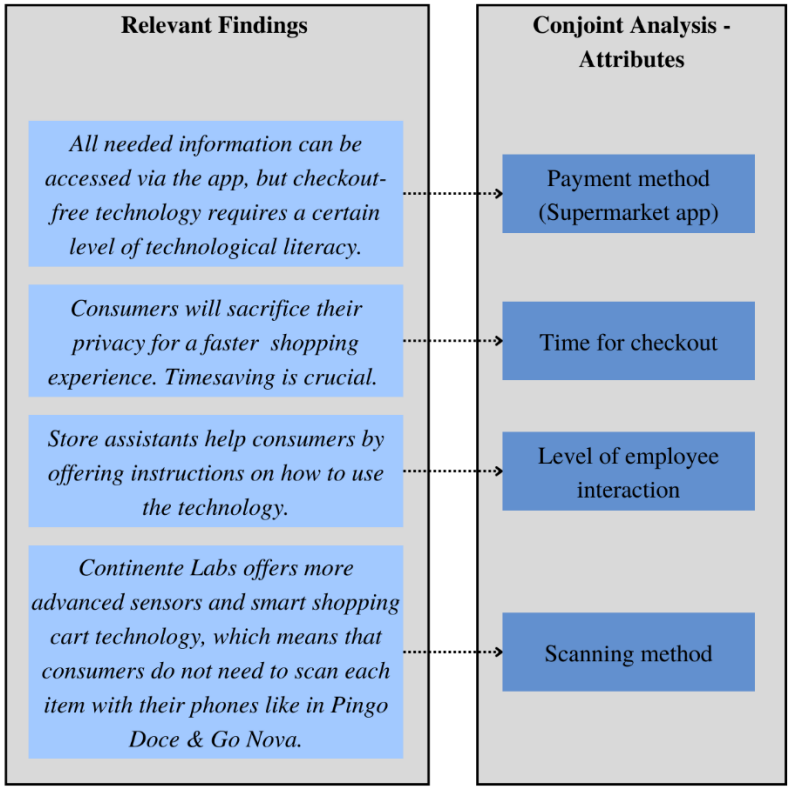


Figure 3: Expert Interviews – how the main insights sustain the Conjoint Analysis.

Discussions regarding the technology's target group also sustained the decision of what geographic, demographic, psychographic, and behavioral data needed to be collected through this

dissertation's main surveys. Mentions of age ("*young college graduates*") and technology illiteracy also validated the relevance of the Work Project's final research question (RQ4: How does the age factor impact Portuguese consumers' interest in checkout-free technology?).

While the expert interviews were especially relevant to both analyses of this Work Project, the following section – Consumer Interviews – gathered more specific insights regarding this paper's Conjoint Analysis.

b. Consumer Interviews

In total, five consumer interviews were conducted, either face-to-face or through an online meeting. Respondents were sampled from the group members' personal networks and connections. To gain insights into the perceptions and preferences of consumers of different ages, each interviewee belonged to a specific age bracket (18-24; 25-34; 35-44; 45-64; Over 65). Moreover, participants were purposefully selected so that the respondent sample also had some variation in terms of location, gender, and qualification. (Appendix 2, Table 3). Interviews lasted between 15 to 30 minutes and were guided by a script organized into eight sections (Appendix 2, Table 2). The language of the questions was accessible and easy to understand. They were also open-ended with the purpose of not constraining the participants' space and freedom to elaborate their answers, while maintaining a conversational and comfortable atmosphere.

First, demographic information regarding age, gender, location, and qualification was collected. Subsequently, consumers were if they have used SSTs in the past (self-checkout and checkout-free technology). If yes, the discussion shifted towards the following subjects: (i) frequency of usage; (ii) preference over cashier lanes; (iii) main attributes that make SSTs appealing; (iv) past bad experiences with SSTs; (v) points of potential improvement for SSTs. If not, different

topics were addressed, most related to technology avoidance and other motives that may keep consumers away from these checkout methods.

i. Results

Regarding self-checkout machines (SCO), Consumer 1 claims being very familiar with this method. Unless in circumstances where they must buy a large quantity of items, SCOs are always preferred over regular cashier lanes. Consumer 1 considers them to be "much faster", allowing them to "save a lot of time", and enjoys having several payment options. Consumer 2 stated that SCOs are always their first choice, once again highlighting how much faster this method is, especially when buying a small number of items. However, frequent encounters with technological errors were reported, as well as occasional difficulties to get in touch with staff. Consumer 3 recognizes that SCOs allow for more privacy when shopping, while simultaneously making the process quicker. Nonetheless, they prefer cashier lanes because of the human interaction. Similarly, Consumer 4 also prefers regular cashier lanes because of the interaction with employees. Finally, Consumer 5, the oldest, expressed feelings of technological anxiety and stated that they would not be able to do the process alone. Moreover, cashier operators can assist them with physical labor, such as bagging groceries or weighing fruits and vegetables.

Moving to checkout-free technology, Consumer 1 is a student at Nova SBE, therefore experiences this type of checkout regularly, in Ping Doce & Go Nova. The method's speed and the fact that "talking to people" can be avoided were highlighted as their most valued benefits. As for the bad experiences, poor internet connection and technical issues are pointed out. Consumer 2 states that they never encountered this type of method. Although not usually comfortable with trying new technologies, they showed some interest in the concept. Consumer 3 has experienced checkout-free technology only once, in Continente Labs. Even though they didn't

encounter any difficulties in the process, the method was characterized as too impersonal. Although the consumer seems interested in adopting this method, due the "avoidance of long queues", there are no stores near his living area. Consumer 5, in resemblance to their opinion of SCOs, expressed technology anxiety and lack of awareness.

Overall, the consumer sample seems interested and ready to shift from regular cashier lanes to SSTs, such as self-checkout or checkout-free technologies, with the exception of the oldest participant, who still prefers the traditional cashier lane. Consumers feel that there is a need for improvement, specifically regarding technical difficulties (failed internet connections, hard time scanning the products, etc.), problems with understanding the process, and difficulties when needing assistance. Nonetheless, the convenience and timesaving benefit of these technologies seems to weigh more in consumer's intention to use. The interviews showed the existence of a lack of awareness of these technologies in some consumers. This was expected, considering the fact that only two of these stores exist in Portugal, and both are located in Lisbon.

Later, consumer interview insights will serve as a foundation for the development of the conjoint analysis survey, by sustaining the decision of which attributes of SSTs better describe them: time for checkout, level of interaction with employees, available payment methods, and product scanning method.

Mixed Methods

a. Mystery Shopping Experience

i. Experience Design

A Mystery Shopping experience was conducted as the first analysis of this dissertation, with the following main purpose: to identify strengths and weaknesses in service delivery in check-out free Portuguese supermarket stores.

The experience was intentionally performed before the development of the later explored surveys, as it provided key inputs for the remaining analysis in this paper.

Mystery shoppers were asked to visit one of the two checkout free stores currently operating in the national market: Continente Labs or Pingo Doce & Go Nova. Only shoppers who had never visited these locations composed the participant sample. By gathering insights into both stores, the experience allowed for an assessment of the competitiveness of an organization's service provision when comparing it against other industry offers (Wilson, 1998). In other words, it was possible to compare the performance of the different technologies employed in these stores. Continente Labs uses more advanced sensors and smart shopping cart technology, which means that shoppers do not need to scan each item with their phones like in Pingo Doce & Go Nova.

Therefore, the first step of this experiment was the development of two distinct mystery shopping briefs, one for each store – Appendix 3 –, since the requested shopping tasks had to be adapted to the technology of the store visited.

After the visit, the mystery shoppers were asked to answer the following questions using a 5-point Likert scale (1 – "Extremely unlikely"; 2 – "Quite unlikely"; 3 – "Neither"; 4 – "Quite likely"; 5 – "Extremely likely"):

Most especially, age drastically impacts the observed utility values. The average partworth utility for checkout-free technology of 42.01% drops sharply to -42.66%. To balance this, the average for the cashier lane of -43.14% jumps to 57.34%. For self-checkout, the average of 1.12% falls to -14.68%. As expected, technology avoidance is a pertinent concept that heavily impacts the preferences of consumers in the older age segments of the sample (above 45). These findings are on par with the expected results. As previously mentioned in the Expert Interviews segment, the target group for these technologies in Portugal is currently "*young college graduates*". Conclusions from the Customer Interview segment are also aligned with these values: the oldest interviewee emphasized technology illiteracy and fear of embarrassment from struggling to use these technologies as crucial factors that stop them from being willing to try SSTs. In order to address this finding in more detail and find an answer to this dissertation's fourth research question (RQ4: How does the age factor impact Portuguese consumers' interest in checkout-free technology?), the following section of the analysis will focus solely on checkout-free technology.

a. Checkout Free Technology – Entire Sample

Checkout-free technology is catching the attention of most consumers, as seen by the previous results. In addition, the lack of studies of intelligent automation applied to the check-out process in the supermarket retail industry magnifies the relevance of this section of the Work Project.

First, in order to understand what pair of attributes represents the largest trade-off in the mind of Portuguese consumers, all attributes were the object of a Pearson correlation test (pairwise). Appendix 7, Table 12 highlights the significant pairings, considering a 95% confidence interval.

The most relevant correlation of statistical significance identified is a negative correlation between the cost of service and time for checkout (-0.557). This means that when the importance of the cost of the service decreases, the importance of time for checkout increases, and vice versa. In other words, most of the price value of this technology is correlated to its benefit of timesaving over other methods of checkout. This should also mean that a consumer's willingness to pay is mostly affected by the time saved by using the checkout-free technology – this hypothesis will be tested further ahead in the Willingness to Pay section of the dissertation. Nonetheless, given the fact that the cost of service (68.27%) is approximately 6 times more important to Portuguese consumers than the time for checkout (11.17%), this indicates that consumers are willing to tolerate longer queuing and checkout times for lower prices. "*With inflation at all-time highs, customers are prioritizing saving money. Even the most advanced self-checkout technology won't revert this trend in the short term*." (Heubel, 2022). Therefore, the implementation of a membership program or any additional fees that would put a price tag on checkout-free stores would ultimately hinder their success.

Although relevant, the current analysis of the complete sample fails to provide imperative conclusions regarding the target consumers of this technology. Therefore, the following section of the dissertation will look at individual segments in the sample, in order to understand which geographic, demographic, and behavioral dimensions most influence the interest in checkout-free supermarkets, and why.

b. Checkout Free Technology – Segmented Sample

Partworth utilities were, once again, computed a total of 21 times (Appendix 7, Table 13), representing all possible segments of the sample, but this time solely focusing on checkout-free technology. A Descriptive Statistics analysis in SPSS, with a confidence interval for mean of

95%, led to the identification of 2 outlier values – highlighted in Table 7. Both outliers are present in the segment of consumers above the age of 45. As expected, age stands out as a variable of added importance.

Table 7 - *Partworth* Utilities - Sample Segmentation. Checkout-free Technology. SPSS Input.

			RELATIVE IMPORTANCE				
		n	PAYMENT METHOD	SCAN-NING	EMPLOYEE INTERAC-TION	COST OF SERVICE	TIME FOR CHECK OUT
SEGMENT	**Gender: F**	55	9.40%	3.60%	7.50%	68.40%	11%
	Gender: M	47	9%	3.90%	7.30%	68.40%	11.40%
	Item per trip (<=10)	45	8.30%	3.40%	7.90%	70.20%	10.10%
	Item per trip (>10)	58	10%	3.90%	7.30%	66.70%	12%
	Age (<=44)	73	7.30%	3.40%	7.80%	69.40%	12%
	Age (>44)	30	14.40%	4.40%	6.90%	65.30%	8.90%
	Income (until 19.999€)	65	8.90%	3.50%	7.10%	69.50%	11%
	Income (above 20.000€)	33	10.30%	4%	8.30%	66%	11.40%
	Supermarket trips per month (<5)	40	9.50%	4.10%	7.50%	68.50%	10.40%
	Supermarket trips per month (>=5)	63	9.10%	3.50%	7.60%	68.10%	11.60%
	Professional status: student	36	6.10%	3.20%	7.50%	70.50%	12.60%
	Professional status: employed	58	10%	3.90%	8%	67.40%	10.70%
	Qualifications: BSc and above	89	8.30%	3.60%	7.60%	69%	11.50%
	Region: Lisbon and Center	76	8.80%	3.70%	7.80%	68.80%	10.80%

In order to further understand the impact of age on consumers' preferences, it is necessary to test if the importance of the attributes of checkout-free technology is, or is not, independent of age.

Thus, multiple Analyses of Variance (ANOVA) were run – one for each attribute. The null hypothesis being tested states that there is no difference between the group's means, where younger represents ages below 44 (n=73), and older represents ages above 45 (n=30).

$$H0: \bar{x}_{younger} = \bar{x}_{older}$$

$$H1: \bar{x}_{younger} \neq \bar{x}_{older}$$

The results (Appendix 7, Table 15) show that, when considering a confidence interval of 95%, the differences in the means are significant for three attributes: payment method; cost of service; and time for check-out. For these, the p-value is always below the significance level of 0.05, meaning that there is enough statistical evidence to reject H0. On the other hand, the importance of employee interaction and scanning method seems to be independent of the age variable.

Stronger conclusions can be extracted from these results when looking at the individual level partworths for the segment of age above 45 – Appendix 7, Table 16. Payment method emerges as the second most important attribute for these consumers, replacing time for checkout. This explains both outlier values mentioned above. In fact, this group registers a strong preference for not having to use a supermarket phone app (-7.15%). This finding does not come as a surprise. In the Mystery Shopping experiment conducted, the older participant (59 years) claimed to struggle with the installation of the app and had to enter the store without it, by asking for the help of a staff member. This is an important conclusion, especially because the current automated stores operating in Portugal (PD&GO Nova and Continente Labs) require consumers to use an app. When looking at Cost of Service, the older segment seems to be slightly more willing to pay (with a level partworth of 1.15% for the 2.29€ option, against an average of -0.96%). This

finding is sensible, given that most people earn more money at older than at younger ages. Regarding Time for Checkout, the older segment seems to be more willing to wait longer times (with a level partworth of -0.18% for 4-7 minutes option, against an average of -4.42%).

Based on these findings, it becomes possible to answer this dissertation's fourth and final research question (How does the age factor impact Portuguese consumers' interest in checkout-free technology?). In essence, consumers above the age of 45 are not interested in the concept of checkout-free supermarket stores. This segment is specially not keen on installing a phone app to take advantage of this technology. However, the app is what currently offers retailers the ability to track shoppers at an individual level. Furthermore, based on their in-store behavior, the app can deliver personalized messaging to shoppers, influencing consumer behavior throughout their entire visit, and boosting sales. Thus, it would not be in the interests of retailers to remove the app as a necessary requirement to visit their checkout-free stores. Moreover, the group of consumers above the age of 45 seems to place less value on this technology's inherent and central benefit of timesaving.

The fact that Pingo Doce & Go Nova is located at the Nova SBE Campus and that Continente Labs is near Lisbon's university city is no coincidence. Current market players are actively targeting younger consumer groups. At this point in time, widespread adoption of checkout-free technology in Portugal is unrealistic, given that, in 2021, the elderly population (65 and older) represented 23,4% of the total population in Portugal (INE, 2021). In fact, one of the industry specialists - Expert Interviews section - stated that seniors will not accept this store concept and that the digital divide will be stronger in the era of AI, because of automation illiteracy.

Despite the fact that it has been roughly established that, given the current economic climate, the introduction of a membership program or any additional fees will inhibit the success of check-out-free stores, the following section of the Work Project should confirm this finding through an analysis of Portuguese consumers' Willingness to Pay.

c. Willingness to Pay

When looking at the percentage of times that a price option was chosen, per check-out method (Figure 16), it is possible to understand that Portuguese consumers are more willing to pay for the most technological method.

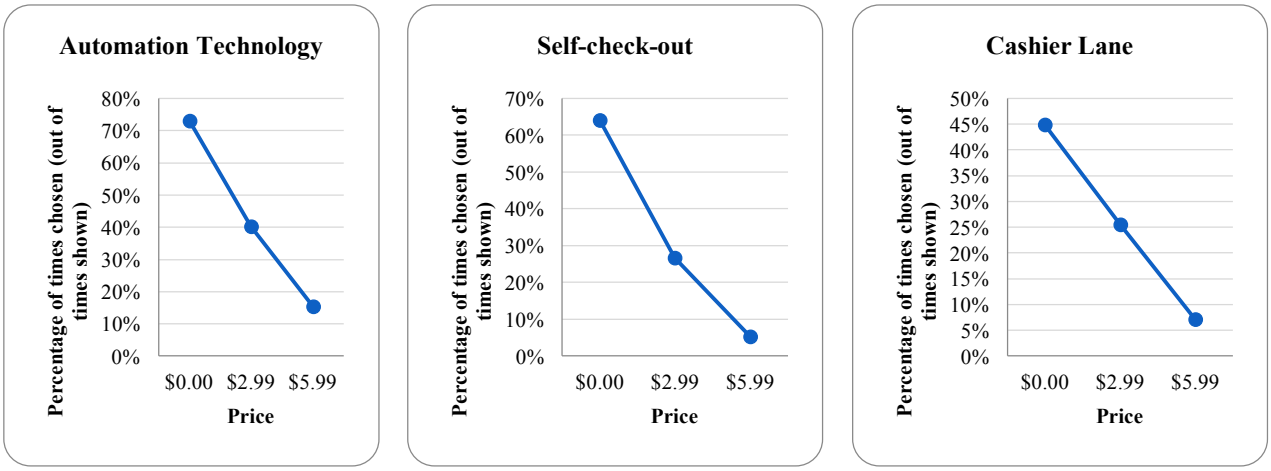


Figure 16: WTP Preliminary Analysis

The percentage of times chosen increases, for both price levels, as technology increases. For cashier lanes and self-checkout, the percentages were very similar, averaging 26.1% and 6.25%, for the price of 2.99€ and 5.99€, respectively. For checkout-free technology, these numbers increase to 40.3% and 15.4%, respectively.

In order to compute WTP, it is necessary to look at the level partworths for the cost of service amongst the check-out methods – Appendix 7, Table 17. By looking at the average utility scores,

it is possible to understand that when the price falls from 5.99€ to 0.00€, consumers are registering a utility gain of 12.69. Therefore, 1 utile is worth approximately 0.47€ (the result of 5.99€/12.69).

Looking back at the Partworth Utilities for the Brand Attribute, for the entire sample – Appendix 7, Table 18 - it is possible to estimate the WTP for each check-out method. Hence, it is estimated that Portuguese consumers are willing to pay 60 cents to use checkout-free technology, in a scenario where the other option is only cashier lanes. If the scenario changes and self-checkout machines are available, consumers are only willing to pay 30 cents to use checkout-free technology.

a. Checkout Free Technology WTP

Going back to checkout-free technology, and following the same rationale as prior, it is possible to estimate WTP for the different attribute levels. Since a price fall from 5.99€ to 0.00€ corresponds to an average utility gain of 12.60, 1 utile is worth approximately 0.48€.

Appendix 7, Table 19 summarizes how much Portuguese consumers are willing to pay for their preferred attribute levels. In sum, Portuguese consumers are willing to pay 0.48€ to not use a supermarket app; 0.11€ to scan their own items; 0.17€ for employee interaction; and 0.65€ for the fastest check-out times.

It becomes evident that the maximum prices that Portuguese consumers are willing to pay for modern check-out technologies is quite low. As expected, timesaving is the factor with the highest WTP (0.65€). This finding is in accordance with the Perason Correlation developed previously, where the tradeoff between time and cost of service was discussed in detail.

Finally, in order to complement the analysis developed thus far, the following section of the Work Project – Simulations - will allow for a comparison between Pingo Doce & Go Nova and

Continente Labs based on their current models (combination of attributes). Furthermore, some scenarios presupposing model adaptations and the entrance of new players will be analyzed.

d. Simulations

The Conjointly platform enables the creation of preference share simulations. For the purpose of this dissertation, multiple simulations were run in order to answer relevant questions related to concept testing, new market player entries, and pricing research.

i. The current market: Pingo Doce & Go Nova versus Continente Labs

In order to compute preference shares for the current national market players employing check-out-free technology – Pingo Doce & Go Nova and Continente Labs -, their respective service offerings were described in the language of the attributes and levels included in the study – Table 8. These descriptions were mostly based on the results of the mystery shopping experience.

Table 8 - Attribute levels of Pingo Doce & Go Nova and Continente Labs

	Payment Method	**Scanning Method**	**Employee Interaction**	**Cost of Service**	**Time for Check-out**
Pingo Doce & Go Nova	Supermarket App	Scan your own products	Low to none	Free	Less than 3 minutes
Continente Labs	Supermarket App	No scanning necessary	Medium	Free	Less than 3 minutes

Results – Figure 17 - demonstrate that there is a slight difference in preference shares between Pingo Doce & Go Nova (47.6%) and Continente Labs (52.4%). This is on par with the suggestive conclusions of the mystery shopping experience, where the TAM score for Continente (78%) was higher than Pingo Doce's (63%). Nonetheless, the preference shares are very similar, which means that no specific player is a clear winner in terms of current service model.

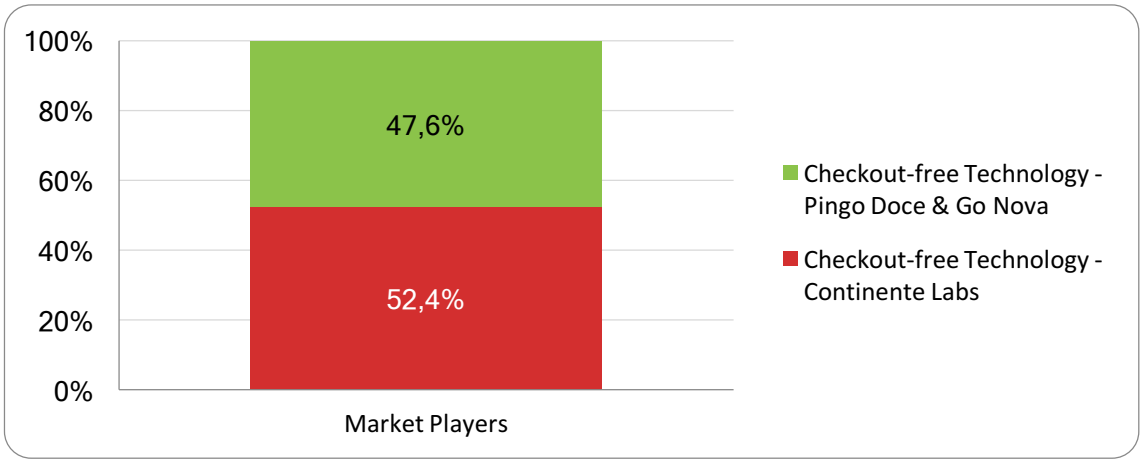


Figure 17: Preference shares - Pingo Doce & Go Nova versus Continente Labs

Moreover, both concept stores were compared to cashier lanes, and self-service machines – Figure 18. This process demanded an assumption related to time for checkout: as the technological level of the checkout method increases, the time for checkout will decrease. In other words, checkout-free technology assumes a time for checkout level of less than 3 minutes, self-service machines are 4 to 7 minutes, and cashier lanes are 8 to 11 minutes. This assumption translates the essential timesaving benefit of SSTs.

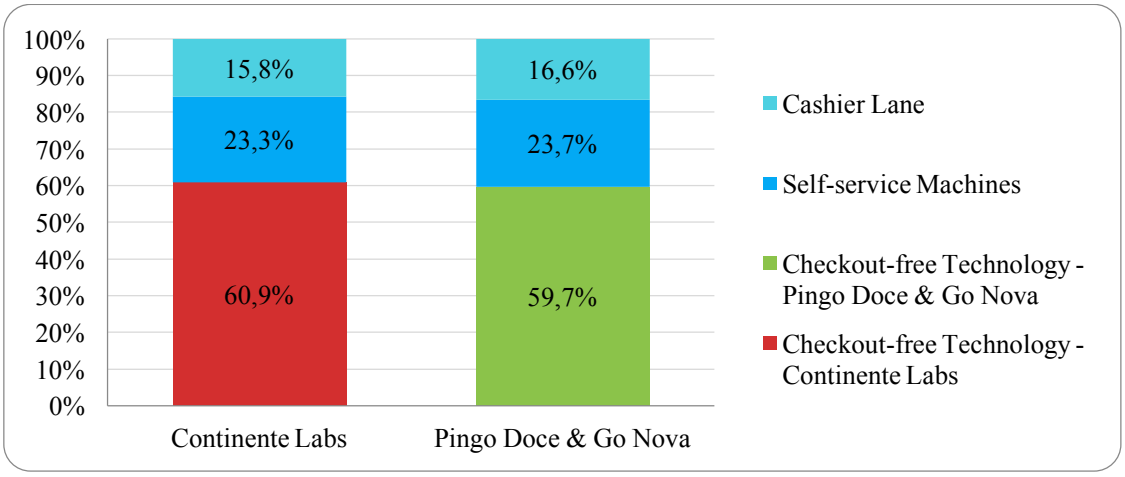


Figure 18: Preference shares – the three checkout methods

Checkout-free technologies own approximately 3/5 of consumers' preference share. As highlighted in previous sections, Portuguese consumers seem interested in the concept of checkout-free technologies, over the remaining checkout methods. However, the outcomes of the previous analyses conducted in this paper have offered significant evidence that this is not the case for consumers of all demographics, principally for older age ranges. Thus, new simulations were run, drawing a distinction between consumers in terms of age, ceteris paribus: a segment of consumers above the age of 45, and a segment below the age of 45 – Figure 19. In fact, checkout-free technology is the least preferred method for the older consumers, with a preference share 2.7 times smaller than the younger group.

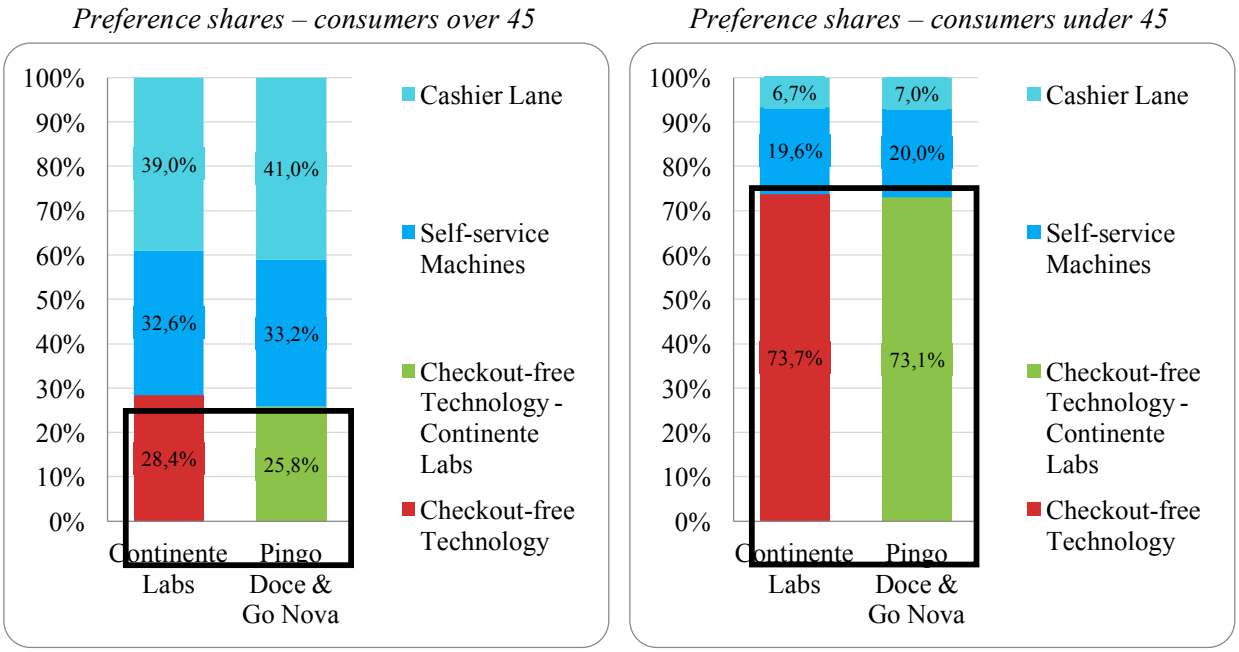


Figure 19: Preference shares – the impact of age segmentation

i. What if analysis: entrance of new market player

While the concept stores of Pingo Doce & Go Nova and Continente Labs are evidently appealing to the needs of younger consumers, earlier insights reveal that the service model of both stores does not match the ideal model profile. Partworth utilities determined that the following hypothetical combination of attribute levels is the most representative of consumer's preferences: less than 3 minutes for checkout; free of cost; medium interaction with employees; scanning your own products; paying with a card.

Against this background, a simulation was performed, assuming the scenario of the entry of a new market player (NMP) introducing checkout-free stores with an ideal profile service model – Figure 20. In this context, the NMP would register a preference share (72.3%) that is 12 percentage points higher than the average percentage share of the current market players (60.3%).

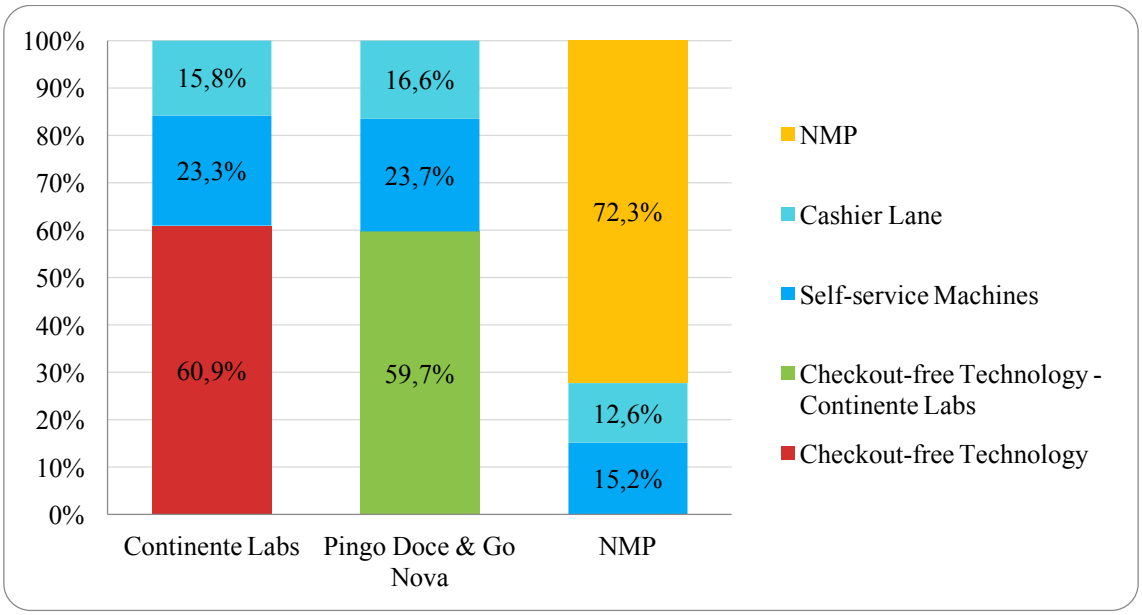


Figure 20: Preference shares – entry of new market player

These findings suggest that the two players in analysis should consider carrying out model adaptations, in order to achieve the best realizable performance in terms of preference share. Although the ideal profile determined that the preferred scanning method is the "scan your own products" approach, adaptations regarding the scanning method will not be considered, given its very low relative importance – Figure 14. Accordingly, the recommended adaptations are the following. First, Pingo Doce & Go should employ store assistants. The store's current concept model presumes that these are not necessary because all needed information can be accessed via the app (Expert Interviewee 1). However, analyses conducted earlier in the dissertation suggest that market players must employ store assistants in order to help consumers overcome expected feelings of technological anxiety when learning how to use checkout-free technology. Furthermore, in order to match the ideal combination of attribute levels, Pingo Doce & Go Nova and Continente Labs should remove the supermarket app as a necessary requirement to let shoppers visit their stores. In fact, partworth utilities have shown a drop in consumers' utility when forced to use a supermarket app. However, as previously discussed, the app is what currently offers retailers the ability to track shoppers at an individual level, so this would be against the essence of checkout-free stores and retailers' interests. In sum, the presence of store assistants at Pingo Doce & Go Nova is the only relevant recommended model adaptation.

ii. What if analysis: NMP with a membership fee of 2.99€

In order to withdraw conclusions related to the price sensitivity of consumers and potential added revenue sources for retailers, another simulation was performed. This test assumed that consumers could only visit the NMP under the condition of a monthly membership fee.

Figure 21 represents the preference share scenario of the NMP against the other methods of checkout. Earlier in this paper, results from the Willingness to Pay section revealed that Portuguese consumers are willing to pay up to 0.60€ to use checkout-free technology. In terms of levels, consumers are willing to pay 0.48€ to not use a supermarket app; 0.11€ to scan their own items; 0.17€ for employee interaction; and 0.65€ for the fastest check-out times. In total, this is 2.01€. Thus, the 14.1% preference share is foreseeable: it is understandable that a new market player could still compete with regular free of cost cashier lanes at the 2.99€ price point. However, a 5.99€ price point would not be financially feasible for retailers, given the preference share drop to 3.9% The price elasticity of demand between $2.99 and $5.99 is -2.1, meaning that demand is elastic: an increase in price by 1% leads to more than 1% drop in volume.

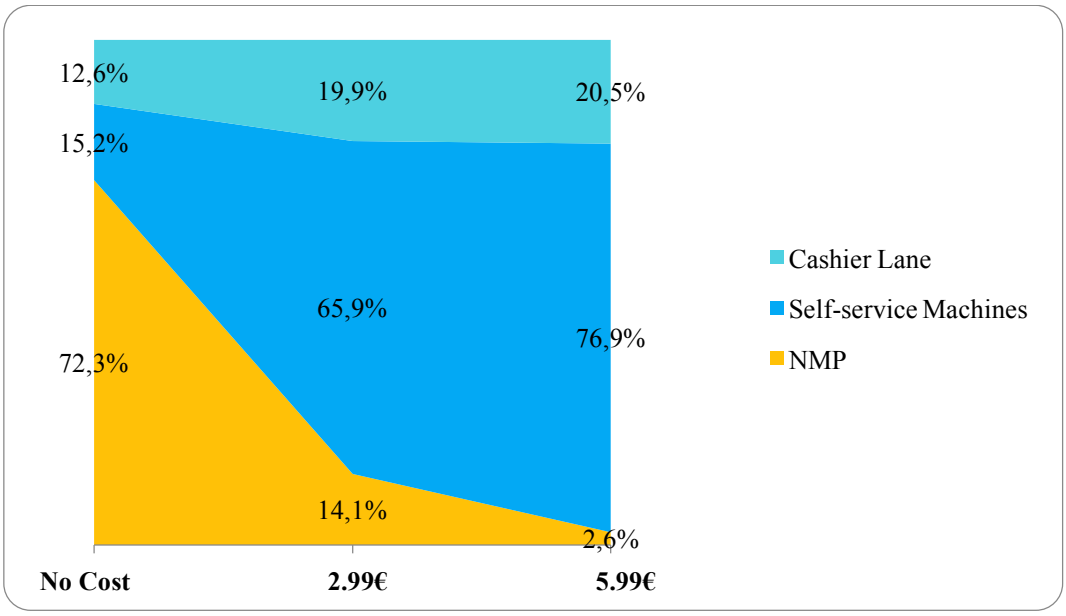


Figure 21: Price sensitivity simulation

Nonetheless, this simulation does not take into consideration the existing market players: Pingo Doce & Go Nova and Continente Labs. Therefore, lastly, a simulation was run comparing revenue projections for the hypothetical NMP against current players. This simulation is assuming a

pool of 1000 total shoppers, each spending 200€ in their checkout-free store of choice, by using the following formula:

Equation 3

$$Revenue\ Projection = share * membership\ price * 1000 + share * 1000 * 200€$$

The results in Figure 22 demonstrate that, in this scenario, the NMP would register a revenue of € 7.93K, which represents only 3.9% of the total revenue of the three players. Thus, although the 2.99€ price point seemed previously feasible, it would require all remaining players to adopt a similar monthly membership model.

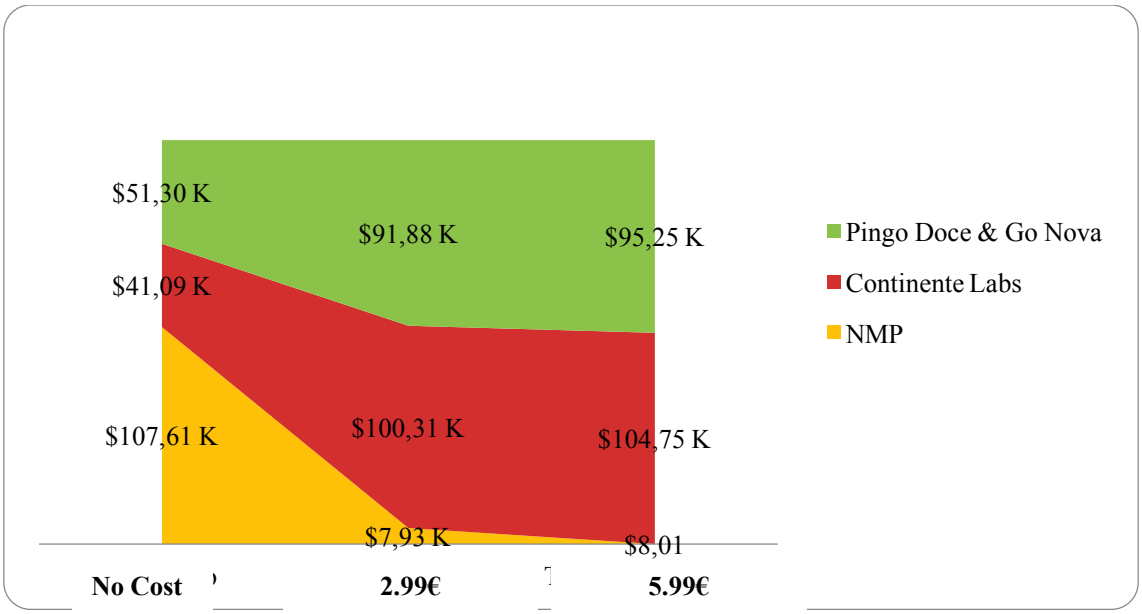


Figure 22: Revenue projection simulation

6. Conclusion

In today's world, everything happens faster and there is an unprecedented drive for efficiency. Processes are being optimized, and this trend is not only evident in the workplace but in all aspects of everyday life. Grocery shopping is no exception, as the focus is increasingly shifting toward a seamless consumer experience that can drive traffic back to retailers' physical stores. The supermarkets of the future "*will totally appeal to the five senses, with strong visual and olfactory components, and they will be thought of under two fundamental axes: technology and transparency with consumers"* (Indústria, 2018). New store concepts are emerging, and they can range from a self-checkout terminal to a completely automated supermarket. In order to better understand these trends, this Work Project evaluated how Portuguese consumers perceive the supermarket brands operating in the national market – Perceptual Mapping -, and which check-out methods they value the most – Conjoint Analysis.

First, the Perceptual Map analyses uncovered meaningful results. The top five market players, based on their most recent values of turnover, were studied through the lenses of the Brand Personality Construct. An ad-hoc approach to the model resulted in eight different brand personality dimensions: Sincerity, Excitement, Competence, Sophistication, Ruggedness (Aaker, 1997); Innovation (Su et al, 2015); Novelty, and Meaningfulness (Shams et al., 2015). The data collected was the target of a principal component analysis (PCA), where only one high-quality component (Eigenvalue > 1) was extracted. This component explained 96.851% of the variance in the dataset, and correlations between dimensions registered a minimum of 0.872. A second component was manually computed but registered an Eigenvalue very close to zero (0.205) and could only explain 2.566% of the variance in the model. The resulting component plot or perceptual map proved that brands are perceived quite distinctively from one another,but they are

compared in consumers' minds through one unidimensional construct – the unique factor originally extracted, which is argued to represent the perceived quality of the supermarket brand. Perceived quality can be described as a consumer's estimate of a product or service's cumulative excellence. Under this assumption, Continente is perceived as the highest quality brand, closely followed by LIDL and Pingo Doce. Auchan and Minipreço registered component 1 values below zero, meaning that they are perceived as the lower-quality brands in the group. Therefore, RQ1 (How do Portuguese consumers perceive supermarket brands operating in the national market?) is answered.

Against this background, an additional survey was constructed, in order to understand what are the drivers that mostly influence consumers' decision of what supermarket store to visit. It became evidently clear that Portuguese consumers are almost totally driven by functional values (89%) over hedonic ones (11%). Therefore, since brand-related drivers have low influential power, the relationship between Portuguese consumers and supermarkets can be described as transactional. This finding answers RQ3 (What are the drivers influencing what supermarket stores consumers shop at?). Moreover, statistical tests using this survey's data revealed that Portuguese consumers' perceptions of supermarket brand quality are not independent of the supermarkets that they most often visit. This means that a supermarket brand's perceived quality is influenced by functional values, such as store proximity.

One of the initial goals of this dissertation was to assess how a supermarket brand should position itself in the mental space of Portuguese consumers, in order to have the best chances at successfully implementing checkout-free technology in their stores. Thus, the link between the Perceptual Mapping and Conjoint Analyses was dependent on the successful extraction of, at least, two

factors for the principal component analysis (PCA). However, because consumers do not perceive supermarket brands multidimensionally, no conclusions can be extracted from independent brand personality dimensions, such as Innovation (Su et al, 2015); Novelty, and Meaningfulness (Shams et al., 2015). Consequently, a Multidimensional Perceptual Map addressing these dimensions was not realizable. Nonetheless, this is still a conclusion of value for players in the supermarket industry in Portugal. Retailers do not need to invest in repositioning themselves in the minds of Portuguese consumers to guarantee a successful introduction of checkout-free technology. On the other hand, the focus should be on transactional marketing objectives, connected to the functional values that drive consumer activity.

Given that the perceptions of Portuguese consumers have been established, the focus of the dissertation shifted toward their preferences: preferred checkout methods, and their respective attributes and levels. For the Conjoint Analysis, data was collected and exported through Conjointly, and then multiple analyses and statistical tests were performed. Results indicated that checkout-free technology is the preferred method for the general sample, with a partworth utility of approximately 50%. The cost of service is of very large importance for consumers (68.27%), followed by time for checkout (11.17%), payment method (11.17%), level interaction with employees (7.57%), and scanning method (3.70%). According to respondents' preferences, the ideal store profile is the following: less than 3 minutes for checkout; free of cost; medium interaction with employees; scanning your own products; paying with a card. In the remaining checkout methods, the results followed identical trends. Such insights offer a conclusion to RQ2 (What are the attributes that Portuguese consumers value the most in supermarket checkout methods?)

However, segmentation of the sample by age ranges drastically impacted the observed utility values. The previously mentioned partworth utility of approximately 50% for checkout-free technology drops to -42.66% when looking at Portuguese consumers above the age of 45. Thus, technology avoidance is a pertinent concept that influences the preferences of consumers in the older age segments. ANOVAs allowed for a better understanding of these results: this segment of consumers is specially not keen on installing a phone app to take advantage of this technology, and they place less value on the technology's inherent and central benefit of timesaving. Based on these findings, RQ4 is addressed (How does the age factor impact Portuguese consumers' interest in checkout-free technology?).

Nonetheless, two more analyses complemented the present dissertation: Willingness to Pay and Simulations. First, respondents registered a maximum willingness to pay of 2.01€. This means that, on average, Portuguese consumers would pay a membership fee of 2.01€ to shop at check-out-free supermarkets. However, the simulation analysis concluded that this could only be feasible if all players adopted a similar monthly membership model. If some remained free of charge, preference share, and consequently revenues, would transfer to the free stores. Simulations also revealed that, in order to maximize preference share, Pingo Doce & Go Nova should employ in-store assistants. Consumers indicate a preference for checkout-free stores without the requirement of a supermarket app. However, the app is what gives retailers the ability to track shoppers at an individual level, allowing for personalized marketing. Removing the app would be against the essence of checkout-free stores and retailers' interests, therefore, it is not a valid recommendation for model adaptation. This can strongly impact the external validity of the project's findings, because of the low representativity of the Portuguese population (Wild et al., 2022).

Limitations and Future Recommendations

First, it is important to consider that the number of total survey responses is quite low: 101 respondents in Survey 1, 103 in Survey 2, and 46 respondents in the complementary Survey 3. Furthermore, the over-sampling of university students resulted in a skewed sample, mainly in terms of respondents' age and qualification. This can impact the external validity of the work project's findings, because of the low representativity of the Portuguese population (Wild et al., 2022).

Regarding the Perceptual Mapping analysis, a relevant limitation is related to the fact that only a limited number of market players were studied. This means that, for certain survey participants, their favorite supermarket brand could have been left out of the player pool. Future research on the topic should expand this analysis to more brands.

Regarding the Conjoint Analysis, the main factor that limited the research was the complexity of the Conjointly platform. Its design fails to display accurately on smartphones, which led many participants to quit the survey. This explains the discrepancy between the registered 383 participants and 103 responses. The method also method becomes increasingly difficult to execute as the number of attributes and levels rises (Green & Srinivasan, 1990). Therefore, the 6 attributes and 19 levels in analysis can be challenging for low-resourced researchers.

Future studies on subjects similar to this Work Project's topic should address all limitations highlighted. As the industry steadily shifts towards more technological SSTs, new market conditions will continuously impact consumer behavior, perceptions, and preferences. Therefore, future research should build upon this dissertation's findings in order to further develop them and adapt them to upcoming market trends. The lack of literature on this subject also accentuates the need for adaptations of this research to new contexts, locations, and/or cultures.

7. Bibliography

A&M, 2022. *No Wallet? No Problem: How Just-Walk-Out Technology is Shaping the Future of Retail.* Accessed October 24, 2022. https://alvarezandmarsal-crg.com/wp-content/uploads/2022/08/Just-Walk-Out-Alvarez-and-Marsal-Consumer-Retail-Group.pdf

Aaker, David A. 1991. *"*Managing Brand Equity: Capitalizing on the Value of A Brand Name, The Free Press". *Journal of Business Research, 29(3): 247-248. https://www.semanticscholar.org/paper/Managing-brand-equity%3A-Capitalizing-on-the-value-of-Long-well/e04692fb98caf71988e029616e0a7e04c47235be*

Aaker, J. L. (1997). "Dimensions of Brand Personality". *Journal of Marketing Research, 34(3), 347–356. https://doi.org/10.1177/002224379703400304*

Aggarwal, P., & Vaidyanathan, R. 2003. "Eliciting Online Customers' Preferences: Conjoint vs Self-Explicated Attribute-Level Measurements". *Journal of Marketing Management, 19, 157 - 177. https://www.tandfonline.com/doi/abs/10.1080/0267257X.2003.9728205*

AI Multiple, 2022. *Checkout Free Systems in 2022: What is it & How does it work?* Accessed October 24, 2022. https://research.aimultiple.com/checkout-free/

Alan M. Wilson. 1998."The role of mystery shopping in the measurement of service performance". *Managing Service Quality: An International Journal, Vol. 8 Issue 6 pp. 414-420* https://www.emerald.com/insight/content/doi/10.1108/09604529810235123/full/html?skipTracking=true

Albors-Garrigos, J. (2020). Barriers and enablers for innovation in the retail sector: Co-innovating with the customer. A case study in grocery retailing. Journal of Retailing and Consumer Services, 55,102077.

Amazon Web Services (AWS), 2022. *Elevate your retail experience with Just Walk Out technology.* Accessed October 24, 2022. https://aws.amazon.com/pt/blogs/industries/elevate-your-retail-experience-with-just-walk-out-technology/#:~:text=Our%20answer%2C%20Just%20Walk%20Out,scanning%20products%2C%20and%20no%20fuss.

Ambroise, Laure & Jean Marc, Ferrandi & Merunka, Dwight & Valette-Florence, Pierre. 2004. "How well does brand personality predict brand choice?". *Asia Pacific Advances in Consumer Research.* https://www.researchgate.net/publication/47379079_How_well_does_brand_personality_predict_brand_choice

Amorim, M., Lago, A., Moscoso, P., & Prieto, E. (2016). Assisted vs. self-checkout in retail: An empirical analysis of the impact of operational process dimensions on customer satisfaction, recommendation and reuse. Journal of Service Science Research, 8(1), 1-39.

Assael, H. 1985. "Marketing Management: Strategy and Action". *Marketing News, 19(15), 18.* https://discovery.ebsco.com/c/7kzg2s/details/otl2scqlg5?q=Assael%2C%20H.%20%281985%29%2C%20Marketing%20Management

Brown, T. A. 2015. "Confirmatory factor analysis for applied research". *2nd ed. New York, NY: Guilford Publications. https://discovery.ebsco.com/c/7kzg2s/details/xxseqsayvb?q=Confirmatory%20Factor%20Analysis%20for%20Applied%20Research*

Carstens, A. (2019). The future of money and payments. Speech held in Dublin, 22.

Catalina, 2022. *As Self-Checkout Lanes Multiply at Retail Locations Across the Country, Catalina Study Assesses Impact on Shopper Behavior & Sales*. Accessed October 26, 2022. https://www.catalina.com/press-releases/self-checkout-manual-checkout-retail-experience#:~:text=The%20number%20of%20SCOs%20in,offer%20only%20SCOs%2C%20per%20CNN.

Cattin, P., & Wittink, D. R. 1982. "Commercial Use of Conjoint Analysis: A Survey". *Journal of Marketing, 46(3), 44–53. https://doi.org/10.1177/002224298204600308*

Chadha, S. K. & Kapoor, D. 2008. “An Attribute Based Perceptual Mapping Of The Selected Private Life Insurance Companies: An Empirical Study In Ludhiana.” *Vision, 12(3), 53–60. https://doi.org/10.1177/097226290801200305*

Charged, Retail Tech News, 2021. *Europes first cashierless autonomous store opens in latest challenge to Amazon Go.* Accessed October 27, 2022. https://www.chargedretail.co.uk/2021/05/26/europes-first-cashierless-autonomous-store-opens-in-latest-challenge-to-amazon-go/

Chung, J. E., Park, N., Wang, H., Fulk, J., & McLaughlin, M. (2010). Age differences in perceptions of online community participation among non-users: An extension of the Technology Acceptance Model. Computers in Human Behavior, 26(6), 1674-1684. https://www.sciencedirect.com/science/article/pii/S0747563210001883?casa_token=6Oq7Qib05RwAAAAA:W0N4Tzn4nmo146MBa38O5-yPR9xKekO72Epp3MLLO5K6uhwUibMZolp6KFV9q-wBmlaJN7PXSl4.

Conjointly (2022). Retrieved 5 October 2022, from https://conjointly.com/guides/what-is-conjoint-analysis/.

Dahlberg, T., Mallat, N., Ondrus, J., & Zmijewska, A. (2008). Past, present and future of mobile payments research: A literature review. Electronic commerce research and applications, 7(2), 165-181.

Dallakyan, A. 2014. “Yogurt Market Analysis In Armenia Using Hedonic Price Model And Perceptual Mapping Method”. *American Economic Association (AEA) Annual Meeting. http://www.aea.am/files/papers/w1402.pdf*

De Vos, R. (2002). The use of conjoint analysis to determine consumer buying preferences: A literature review. Journal of Family Ecology and Consumer Sciences= Tydskrif vir GesinsekologieenVerbruikerswetenskappe, 30(1),32-39.https://journals.co.za/doi/epdf/10.10520/AJA03785254_63.

Dean, D. H. (2008). Shopper age and the use of self- service technologies. Managing Service Quality: An International Journal. https://www.emerald.com/insight/content/doi/10.1108/09604520810871856/full/pdf?title=shopper-age-and-the-use-of-self-service-technologies.

Dean, Dwane. 2013. "Anticipating Consumer Reaction to RFID-Enabled Grocery Checkout". *Services Marketing Quarterly. 34. https://www.researchgate.net/publication/262970275_Anticipating_Consumer_Reaction_to_RFID-Enabled_Grocery_Checkout*

Demirci Orel, F., & Kara, A. (2014). Supermarket self-checkout service quality, customer satisfaction, and loyalty: Empirical evidence from an emerging market. Journal Of Retailing and Consumer Services, 21(2), 118-129. https://doi.org/10.1016/j.jretconser.2013.07.002.

Diário de Notícias, 2020. *Todas as pessoas que trabalham para o Lidl recebem mais dinheiro no próximo ano.* Accessed 28 November. https://www.dn.pt/dinheiro/todas-as-pessoas-que-trabalham-para-o-lidl-recebem-mais-dinheiro-no-proximo-ano-13060231.html

Dunnhumby April 202. Retailer Preference Index - 2021 global learnings. https://www.dunnhumby.com/wp-content/uploads/2021/04/dunnhumby-global-RPI-2021-EMEA-Report.pdf

Dunnhumby, 2020. *Portugal Grocery Retailer Preference Index 2020.* Accessed 28 November. https://www.dunnhumby.com/resources/reports/price-value/en/portugal-grocery-retailer-preference-index-2020-second-edition/?asset=96458

Einhorn, B. and Arndt, M. 2010. *The 50 most innovative companies*. Accessed November 11, 2022. https://www.bloomberg.com/news/articles/2010-04-18/the-50-most-innovative-companies

Elliott, K., Meng, G., & Hall, M. (2012). The influence of technology readiness on the evaluation of self-service technology attributes and resulting attitude toward technology usage. Services Marketing Quarterly, 33(4), 311-329.

EMS (2019). Pingo Doce opens its first checkout-free supermarket in Lisbon.

European Supermarket Magazine (ESM), 2019. *Pingo Doce Opens Its First Checkout-Free Supermarket In Lisbon.* Accessed October 27, 2022. https://www.esmmagazine.com/technology/pingo-doce-tests-its-first-till-free-supermarket-in-lisbon-81017

F.D. Orel, A. Kara. 2014. "Supermarket self-checkout service quality, customer satisfaction, and loyalty: Empirical evidence from an emerging market." *Journal of Retailing and Consumer Services 21 (2014) 118–129.* https://reader.elsevier.com/reader/sd/pii/S0969698913000829?token=00F3395573766269C7957230A2E69677C481420E09468DBE7AA66EBD1036434B3C7679FC07F3EE993D1B324ED3D6B037&originRegion=eu-west-1&originCreation=20221212145456

Fernandes, T., & Pedroso, R. (2016). The effect of self-checkout quality on customer satisfaction and repatronage in a retail context. Service Business, 11(1), 69-92. https://doi.org/10.1007/s11628-016-0302-9.

Fox, E. J., Montgomery, A. L., & Lodish, L. M. (2004). Consumer shopping and spending across retail formats. The Journal of Business, 77(S2), S25-S60.

Françoise Simon, Jean-Claude Usunier. 2007. "Cognitive, demographic, and situational determinants of service customer preference for personnel-in-contact over self-service technology." *International Journal of Research in Marketing, Volume 24, Issue 2, Pages 163-173.* https://reader.elsevier.com/reader/sd/pii/S0969698913000829?token=00F3395573766269C7957230A2E69677C481420E09468DBE7AA66EBD1036434B3C7679FC07F3EE993D1B324ED3D6B037&originRegion=eu-west-1&originCreation=20221212145456

Freling, Traci & Forbes, Lukas. 2005. "An examination of brand personality through methodological triangulation." Journal of brand management, 13(2): 148-162. https://www.researchgate.net/publication/233651095_An_Examination_of_Brand_Personality_Through_Methodological_Triangulation

GAIN, 2021. *The Portuguese Food Retail Sector.* Accessed 28 November.

Garcia, R. and Calantone, R. 2002. "A critical look at technological innovation typology and innovativeness terminology: A literature review". *Journal of Product Innovation Management, Vol. 19, No. 2, pp. 110– 132.* https://www.sciencedirect.com/science/article/abs/pii/S0737678201001321

George, D., & Mallery, P. 2003. "SPSS for Windows step by step: A simple guide and reference". *11.0 update (4th ed.). Boston, MA: Allyn & Bacon. https://www.researchgate.net/publication/234827666_SPSS_for_Windows_Step-by-Step_A_Simple_Guide_and_Reference_140_update_7th_Edition*

Gigauri, Iza. 2019. "Applying Perceptual Mapping Method for Successful Positioning Strategy". *International Journal of Management and Business Sciences; Vol. 1, Issue. 1, 14-23. https://www.researchgate.net/publication/333185560_Applying_Perceptual_Mapping_Method_for_Successful_Positioning_Strategy*

Glovo (2022). Glovo prime: The benefits of the Glovo subscription service. Glovo Blog. Retrieved October 26, 2022, from https://blog.glovoapp.com/en/glovo-life/glovo-prime-subscription-service/.

Grand View Research, 2020. *"*Self-service Technology Market Size, Share & Trends Analysis Report By Product (ATM, Kiosks, Vending Machines), By Application (Retail, QSR, Banking, Healthcare), By Region, And Segment Forecasts, 2020 – 2027". *Market Analysis Report*. https://www.grandviewresearch.com/industry-analysis/self-service-technology-market

Green, P. E., & Carmone, F. J. 1969. "Multidimensional Scaling: An Introduction and Comparison of Nonmetric Unfolding Techniques". *Journal of Marketing Research (JMR), 6(3), 330–341*. https://doi.org/10.2307/3150139

Green, P. E., & Rao, V. R. (1971). Conjoint Measurement for Quantifying Judgmental Data. *Journal of Marketing Research*, 355-363

Green, P. E., & Srinivasan, V. (1978). Conjoint analysis in consumer research: Issues and outlook. *Journal of consumer research, 5*(2), 103-123.

Green, P. E., & Srinivasan, V. 1990. "Conjoint Analysis in Marketing: New Developments with Implications for Research and Practice". *Journal of Marketing, 54(4), 3–19. https://doi.org/10.1177/002224299005400402*

Gremler, D. D., Gwinner, K. P., & Brown, S. W. (2001). Generating positive word- of-mouth communication through customer- employee relationships. International Journal of Service Industry Management.

Gursoy, Dogan. Ming-Hsiang, Chen. Hyun, Jeong Kim. 2005. "The US airlines relative positioning based on attributes of service quality." *Tourism management, 26(1): 57-67. https://www.researchgate.net/publication/223379790_The_US_airlines_relative_positioning_based_on_attributes_of_service_quality*

Guthrie, S. E. 1997. "Anthropomorphism: a definition and a theory*". Anthropomorphism, Anecdotes, and Animals. pp. 50–58 https://psycnet.apa.org/record/1996-98870-004*

GWI. (n.d.). Connecting the dots - the consumer trends to know for 2023. Retrieved November 21, 2022, from https://www.gwi.com/connecting-the-dots?show_report=global&force_unlock=k1lbnTD05yMZCPW&submissionGuid=d2df710f-a5f8-4590-b189-b08cec038798.

Haigood, T.L. 1999. "The brand personality effect: an empirical investigation*". American Marketing Association. Conference Proceedings, Vol. 10, pp. 140-149. American Marketing Association. https://www.proquest.com/openview/0bd554354b16edf657ec0a57e33e5c91/1?pq-origsite=gscholar&cbl=35292*

Hilton, T., Hughes, T., Little, E. and Marandi, E. (2013), "Adopting self-service technology to do more with less", Journal of Services Marketing, Vol. 27 No. 1, pp. 3-12. https://doi.org/10.1108/08876041311296338.

Hirogaki, M. (2014). Service Quality Management in retailing: Theory and empirical analysis of customer satisfaction with Checkout Services [Abstract]. International Journal of Trade, Economics, and Finance, 5(3), 270-276. doi:10.7763/ijtef.2014.v5.383.

Hoeppner, B. B., Kelly, J. F., Urbanoski, K. A., & Slaymaker, V. 2011. "Comparative utility of a single-item versus multiple-item measure of self-efficacy in predicting relapse among young adults". *Journal of substance abuse treatment, 41(3), 305–312.* https://doi.org/10.1016/j.jsat.2011.04.005

IBM, 2022. *IBM SPSS Statistics.* Accessed November 18, 2022. *https://www.ibm.com/products/spss-statistics*

INE, 2021. *Censos 2021 – Divulgação Dos Resultados Provisórios.* Accessed November 4, 2022. https://www.ine.pt/ngt_server/attachfileu.jsp?look_parentBoui=535653930&att_display=n&att_download=y

INE, 2022. "Taxa de desemprego aumenta para 5,8% - 3.º Trimestre de 2022". Accessed November 18, 2022. https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_destaques&DESTAQUESdest_boui=540173819&DESTAQUESmodo=2

Indústria, 2018. "Comércio: O Futuro do Setor em Portugal". *Indústria. Revista de Empresários e Negócios.* http://cip.org.pt/wpcontent/uploads/2019/01/IND_NEW_118_LR.pdf

Islami, Muhammad & Asdar, Muhammad & Baumassepe, Andi. 2021. *Analysis of Perceived Usefulness and Perceived Ease of Use to the Actual System Usage through Attitude Using Online*. Accessed November 5, 2022. https://www.researchgate.net/publication/348913553_Analysis_of_Perceived_Usefulness_and_Perceived_Ease_of_Use_to_the_Actual_System_Usage_through_Attitude_Using_Online_Guidance_Application/citation/download

James R. Lewis. 2019. "Comparison of Four TAM Item Formats: Effect of Response Option Labels and Order". *Journal of Usability Studies. Vol. 14, Issue 4, pp. 224–236. https://uxpajournal.org/wp-content/uploads/sites/7/pdf/JUS_Lewis_August2019.pdf*

Kassarjian, H. H. 1971. “Personality and Consumer Behavior: A Review”. *Journal of Marketing Research, 8(4), 409–418.* https://doi.org/10.1177/002224377100800401

Kastrenakes, J. (2017). *Amazon's cashier-free store reportedly breaks if more than 20 people are in it*. Von The Verge: https://www.theverge.com/2017/3/27/15073468/amazon-go-shopper-tracking-store-opening-delay.

Kotler, Philip, and Kevin Keller. 2015. Marketing Management, Global Edition. *Pearson Education, Limited. ProQuest Ebook Central.* https://ebookcentral.proquest.com/lib/fel/detail.action?docID=5185776.

Kubiatko, M. (2013). The Comparison of Different Age Groups on the Attitudes toward and the Use of ICT. Educational Sciences: Theory and Practice, 13(2), 1263-1272. https://files.eric.ed.gov/fulltext/EJ1017271.pdf.

Lee, D., & Hyman, M. R. (2008). Hedonic/functional congruity between stores and private label brands. *Journal of Marketing Theory and Practice*, *16*(3), 219-232. https://www.tandfonline.com/doi/pdf/10.2753/MTP1069-6679160303?needAccess=true.

Leng, H. K., & Wee, K. N. L. (2017). An examination of users and non-users of self-checkout counters. The International Review of Retail, Distribution and Consumer Research, 27(1), 94-108. https://www.tandfonline.com/doi/full/10.1080/09593969.2016.1221842.

LUSA. (2021). *Portugal: Continente Labs opens first store with no check-out*. Von Macau Business News: https://www.macaubusiness.com/portugal-continente-labs-opens-first-store-with-no-check-out/.

Macintosh, Gerrard & Lockshin, Lawrence. 1997. “Retail relationships and store loyalty: A multi-level perspective.”. *International Journal of Research in Marketing. 14. 487-497. https://www.researchgate.net/publication/223058055_Retail_relationships_and_store_loyalty_A_multi-level_perspective*

Marangunić, N., & Granić, A. (2015). Technology acceptance model: a literature review from 1986 to 2013. Universal access in the information society, 14(1), 81-95. https://link.springer.com/article/10.1007/s10209-014-0348-1.

Mark Dziak. 2020. "Technology acceptance model (TAM)." *alem Press Encyclopedia of Science, 2020. 2p.* https://discovery.ebsco.com/c/7kzg2s/viewer/html/emllb62s6f

Marr, B. (2022). The best examples of subscription business models. Retrieved November 17, 2022, from https://bernardmarr.com/the-best-examples-of-subscription-business-models/.

McKinsey & Company, 2020. *Adapting to the next normal in retail: The customer experience imperative.* Accessed October 13, 2022. https://www.mckinsey.com/industries/retail/our-insights/adapting-to-the-next-normal-in-retail-the-customer-experience-imperative

McKinsey & Company, 2021. *Breaking the code: Unlocking digital and analytics at scale for consumer goods.* Accessed October 13, 2022. https://www.mckinsey.com/industries/retail/our-insights/breaking-the-code-unlocking-digital-and-analytics-at-scale-for-consumer-goods

McKinsey & Company, 2022. *The tech transformation imperative in retail.* Accessed October 13, 2022. https://www.mckinsey.com/industries/retail/our-insights/breaking-the-code-unlocking-digital-and-analytics-at-scale-for-consumer-goods

McLeod, S. A. 2019. "*Likert scale"*. Simply Psychology. www.simplypsychology.org/likert-scale.html

Meuter et al., 2000. "Self-Service Technologies: Understanding Customer Satisfaction with Technology-Based Service Encounters". *Journal of Marketing, 64 (3), pp. 50-64.* https://journals.sagepub.com/doi/10.1509/jmkg.64.3.50.18024

Morgan, K. (2022). Are people completing surveys on mobile devices? https://www.surveymonkey.com/curiosity/are-people-completing-surveys-on-mobile-devices/.

Morimura, F., & Nishioka, K. (2016). Waiting in Exit-Stage Operations: Expectation for Self-Checkout Systems and Overall Satisfaction. Journal of Marketing Channels, 23(4), 241–254. https://doi.org/10.1080/1046669X.2016.1224309.

Ng Xin Jie & Intan Farahana Binti Kamsin. 2021. "Self- Checkout Service with RFID Technology in Supermarket". *International Conference on Integrated Intelligent Computing Communication & Security https://www.atlantis-press.com/article/125960797.pdf*

Nigam, Ashutosh & Kaushik, Rajiv. 2011. "Attribute Based Perceptual Mapping of Prepaid Mobile Cellular Operators: An Empirical Investigation Among Management Graduates in Central Haryana". *International Journal of Computational Engineering and Management. 11. https://www.researchgate.net/publication/266873508_Attribute_Based_Perceptual_Mapping_of_Prepaid_Mobile_Cellular_Operators_An_Empirical_Investigation_Among_Management_Graduates_in_Central_Haryana*

Orel, F. D., & Kara, A. (2014). Supermarket self-checkout service quality, customer satisfaction, and loyalty: Empirical evidence from an emerging market. Journal of Retailing and Consumer services, 21(2), 118-129.https://www.sciencedirect.com/science/article/abs/pii/S0969698913000829.

PamInCa. 2009. "The Essential Guide to Mystery Shopping*". Chapter 1, Pages 3-5. https://discovery.ebsco.com/c/7kzg2s/details/zggbxz23bf?q=MYSTERY%20SHOPPING%20GUIDE*

Park, H. J., & Lee, H. S. (2014). Product smartness and use-diffusion of smart products: the mediating roles of consumption values. Asian Social Science, 10(3), 54 https://pdfs.semanticscholar.org/e607/652ff60973d77c63e239774c8b176f67de64.pdf.

Pezzini, G. (2020). How to reduce queues in your retail store and keep customers safe. Retrieved November 3, 2022, from https://www.lsretail.com/resources/how-to-reduce-queues-in-your-retail-store-and-keep-customers-safe.

Phillips, T. (2021). Continente opens cashierless supermarket in Portugal. NFCW. https://www.nfcw.com/whats-new-in-payments/continente-opens-cashierless-supermarket-in-portugal/.

*Plummer, Joseph. 2003. "*How Personality Makes a Difference". *Journal of Advertising Research. 40. https://www.researchgate.net/publication/4854435_How_Personality_Makes_a_Difference*

PORDATA, 2022. "Agregados familiares por escalões de rendimento: IRS Modelo 1+ 2". Accessed November 18, 2022. *https://www.pordata.pt/portugal/agregados+familiares+por+escaloes+de+rendimento+irs+modelo+1++2-79*

PORDATA, 2022. "Pensões da Segurança Social: total, de sobrevivência, de invalidez e de velhice". Accessed November 18, 2022. https://www.pordata.pt/portugal/pensoes+da+seguranca+social+total++de+sobrevivencia++de+invalidez+e+de+velhice-96

PORDATA, 2022. "População residente com idade entre 16 e 89 anos: total e por nível de escolaridade completo mais elevado". Accessed November 18, 2022. *https://www.pordata.pt/portugal/populacao+residente+com+idade+entre+16+e+89+anos+total+e+por+nivel+de+escolaridade+completo+mais+elevado-2101*

PORDATA, 2022. *Despesas médias de consumo final das famílias: total e por tipo de bens e serviços.* Accessed 28 November. https://www.pordata.pt/Portugal/Despesas+m%c3%a9dias+de+consumo+final+das+fam%c3%adlias+total+e+por+tipo+de+bens+e+servi%c3%a7os-768-247964

PortugalDigital (2020).Gov.pt.https://portugaldigital.gov.pt/wp-content/uploads/2022/01/Portugal_Action_Plan_for_Digital_Transition.pdf.

Purwantono, H. Y., Gunawan, A. A., Tolle, H., Attamimi, M., & Budiharto, W. (2021). A literature review: Feasability Study of technology to improve shopping experience. *Procedia Computer Science* (179), 468-479.

Pyramid (2022). Self-Checkout. https://pyramid-computer.com/de-de/self-checkout/.

Qi, Cong. 2019. "Is checkout-free store a flash in the pan? Factors influencing Hong Kong people's adoption intention of checkout-free stores". *ACIS 2019 Proceedings. 11*. https://aisel.aisnet.org/acis2019/11

Qin Zhang, Manish Gangwar, P.B. Seetharaman. 2017. "Polygamous Store Loyalties: An Empirical Investigation". *Journal of Retailing, Volume 93, Issue 4, Pages 477-492.* https://doi.org/10.1016/j.jretai.2017.09.001.

Qudini, 2020. *The Problem With Wait Lines in Retail.* Accessed October 24, 2022. https://www.qudini.com/the-problem-with-wait-lines-us-retail/

Quikserve (2018). The evolution of self-service technology. https://qikserve.com/self-service-tech-a-history/.

Rafaeli, A. (2017). When cashiers meet customers: An analysis of the role of supermarket cashiers. Academy of Management Journal, 32(2), 245–273. https://doi.org/10.5465/256362.

Raghavarao, D., Wiley, J. and Chitturi, P. (2011). Choice-based conjoint analysis. Boca Raton, FL: Chapman & Hall/CRC.

Rama, M. D., de Ridder, H., & Bouma, H. (2001). Technology generation and age in using layered user interfaces. Gerontechnology.. https://journal.gerontechnology.org/archives/22-25-1-PB.pdf.

Reinders, M. J., Dabholkar, P. A., & Frambach, R. T. (2008). Consequences of forcing consumers to use technology-based self-service. Journal of Service Research, 11(2), 107-123.

Retail Technology Innovation Hub (RTIH), 2022. *Amazon halts Just Walk Out tech powered checkout-free stores push.* Accessed November 18, 2022. https://retailtechinnovationhub.com/home/2022/8/22/amazon-halts-just-walk-out-tech-powered-checkout-free-stores-push

Rinta-Kahila, T., Penttinen, E., Kumar, A., & Janakiraman, R. (2021). Customer reactions to self-checkout discontinuance. Journal of Retailing and Consumer Services, 61, 102498.

Robert S. Yeh, Robert D. Plante & Deepak Agrawal. 2011. "Consumer Data Analysis and Its Managerial Application for the Grocery Industry". *Journal of Promotion Management, 17:1, 96-113. https://www.tandfonline.com/doi/full/10.1080/10496491.2011.553790?scroll=top&needAccess=true&role=tab*

Rogers, P. 2022. "Best Practices for Your Exploratory Factor Analysis: A Factor Tutorial". *RAC - Revista de Administração Contemporânea, 26(6), 1–17.* https://doi.org/10.1590/1982-7849rac2022210085.en

Rubera, G., Ordanini, A. and Griffith, D.A. 2011. "Incorporating cultural values for understanding the influence of perceived product creativity on intention to buy: An examination in Italy and the US". *Journal of International Business Studies, Vol. 42, No. 4, pp. 459–476.* https://link.springer.com/article/10.1057/jibs.2011.3

Rungruengkultorn, P., & Boonsiri, S. (2022). Warehouse Processes Improvement Using Lean Six Sigma and RFID Technology. *International Journal of Mathematics and Computer Science, 17*(3), 1175-1186.

Sapo, 2016. *Estas são as formas de pagamento preferidas dos portugueses*. Accessed October 26, 2022. https://sol.sapo.pt/artigo/509418/estas-sao-as-formas-de-pagamento-preferidas-dos-portugueses

Sapo, 2022. *Portugal é o terceiro país europeu onde a comida sobre mais que a inflação.* Accessed November 18, 2022. *https://eco.sapo.pt/2022/11/21/portugal-e-terceiro-pais-europeu-onde-comida-sobe-mais-que-a-inflacao/*

Saridakis, Charalabos. 2009. "A hybrid conjoint model for the identification of the UK supermarket choice determinants: An exploratory study". *The International Review of Retail, Distribution and Consumer Research. 19. 103-133. https://www.researchgate.net/publication/247514902_A_hybrid_conjoint_model_for_the_identification_of_the_UK_supermarket_choice_determinants_An_exploratory_study*

Sensei, 2022. Accessed November 7, 2022. *https://www.sensei.tech/*

Shams, Rahil & Alpert, Frank & Brown, Mark. 2015. "Consumer perceived brand innovativeness". *European Journal of Marketing. 49.* https://www.researchgate.net/publication/281488297_Consumer_perceived_brand_innovativeness

Sheth, J. N., Newman, B. I., & Gross, B. L. (1991). Why we buy what we buy: A theory of consumption values. Journal of Business Research, 22(2), 159-170. doi:10.1016/0148-2963(91)90050-8.

Statista (2022) - Population of Portugal, by gender 1864-2020 by Aaron O'Neill, Jun 21, 2022 https://www.statista.com/statistics/1017340/male-female-population-portugal-1864-2020/.

Statista (2022) - Reasons behind supermarket choice in the United Kingdom (UK) in 2017 by Emma Bedford, Jan 14, 2022 https://www.statista.com/statistics/690118/reasons-supermarket-choice-united-kingdom-uk/.

Statista, 2022. *What is the key reason for your choice?* Accessed November 20, 2022. https://www.statista.com/statistics/690118/reasons-supermarket-choice-united-kingdom-uk/

Tanrikulu, C. (2021). Theory of consumption values in consumer behavior research: A review and future research agenda. International Journal of Consumer Studies, 45(6), 1176-1197.

Thomas-Francois, K., & Somogyi, S. (2022). Self-Checkout behaviors at supermarkets: does the technological acceptance model (TAM) predict smart grocery shopping adoption? The International Review of Retail, Distribution and Consumer Research, 1-23. https://www.tandfonline.com/doi/full/10.1080/09593969.2022.2051195.

Time News. (2022, October 24). In Portugal, the crisis causes food thefts from supermarkets to soar. Retrieved November 25, 2022, from https://time.news/in-portugal-the-crisis-causes-food-thefts-from-supermarkets-to-soar/.

Turner III, D. W., & Hagstrom-Schmidt, N. (2022). Qualitative interview design. Howdy or Hello? Technical and Professional Communication.

Valencia, A., Mugge, R., Schoormans, J., & Schifferstein, H. (2015). The design of smart product-service systems (PSSs): An exploration of design characteristics. International Journal of Design, 9(1).

Van der Horst, F., & Matthijsen, E. (2013). The irrationality of payment behaviour. DNB Occasional Studies, 11(4).

Vriens, M. 1994. "Solving marketing problems with conjoint analysis". *Journal of Marketing Management. Volume 10, 1994 - Issue 1-3: Quantitative Methods in Marketing. Pp 37-55. https://www.tandfonline.com/doi/abs/10.1080/0267257X.1994.9964259*

Wells, J. (2017). Faster Front ends: How supermarkets are speeding up checkout. Retrieved November 3, 2022, from https://www.grocerydive.com/news/grocery--faster-front-ends-how-supermarkets-are-speeding-up-checkout/534852/.

Wilcox, J. B., Bellenger, D. N., & Rigdon, E. E. (1994). Assessing sample representativeness in industrial surveys. Journal of Business & Industrial Marketing. https://www.emerald.com/insight/content/doi/10.1108/08858629410059834/full/html.

Wilson, A. M. (1998). The role of mystery shopping in the measurement of service performance. Managing Service Quality: An International Journal. https://www.emerald.com/insight/content/doi/10.1108/09604529810235123/full/html?casa_token=eRb9gM_5TbkAAAAA:JPKk0pPEL2PDgF_mQWS1B6BOpJRKjbUvOvLK8IJeSz3pMBcZprRHZZd-XleIe0qE2p06K0jKeWm0XoL5X6j1HaBmOzf79DKNmAxfPRXpaW5KiYdmD2io.

Wittink, D.R., Vriens, M., & Burhenne, W. (1994). Commercial use of conjoint analysis in Europe: Results and critical reflections. International Journal of Research in Marketing, 11(1), 41-52.

WorldBank, 2022. "Population ages 65 and above (% of total population) – Portugal". Accessed November 18, 2022. https://data.worldbank.org/indicator/SP.POP.65UP.TO.ZS?locations=PT

Wübbenhorst, P. (2022). Definition: Conjoint-Analyse. [online] Gabler Wirtschaftslexikon. Available at: <https://wirtschaftslexikon.gabler.de/definition/conjoint-analyse-29085> [Accessed 27 September 2022].

Yang, Ke & Choi, Jeong-Gil & Chung, Jellna. 2021. "Extending the Technology Acceptance Model (TAM) to Explore Customer's Behavioral Intention to Use Self-Service Technologies (SSTs) in Chinese Budget Hotels*". Global Business Finance Review. 26. 79-94. https://www.researchgate.net/publication/350897946_Extending_the_Technology_Acceptance_Model_TAM_to_Explore_Customer's_Behavioral_Intention_to_Use_Self-Service_Technologies_SSTs_in_Chinese_Budget_Hotels/citation/download*

Zhu, Y., Dai, F., Yuan, Y., Yin, D., Zhang, T., Chen, Y., . . . He, Y. (2019). An anti-theft system based on the self-checkout - alife robotics. Retrieved November 27, 2022, from

https://www.alife-robotics.co.jp/mem-
bers2019/icarob/data/html/data/OS_pdf/OS11/OS11-9.pdf.

8. Appendices

Appendix 1 – Literature Review

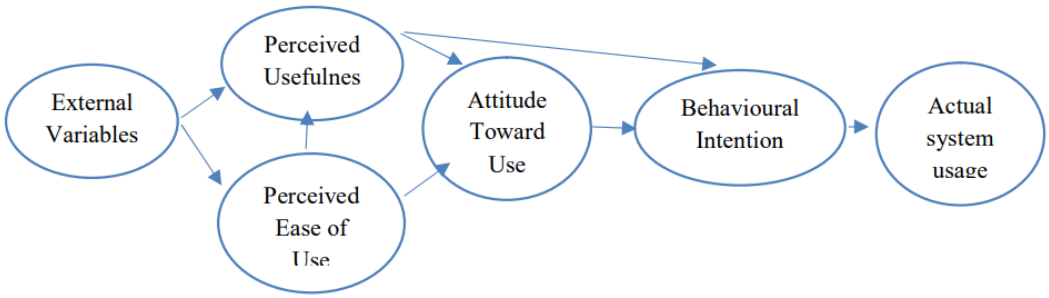


Figure 1: The Technology Acceptance Model (Fred, 1985).

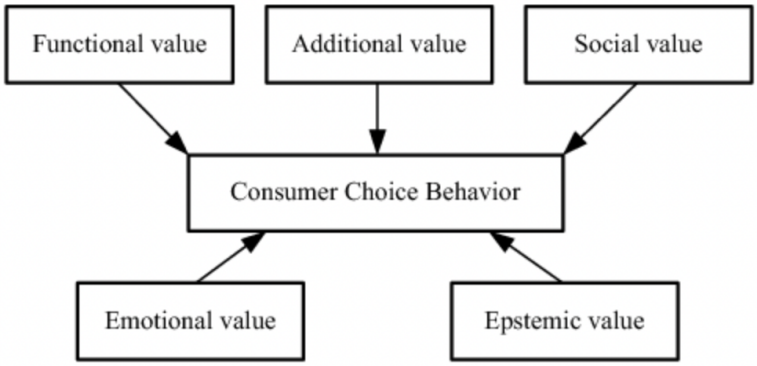


Figure 2: Conceptual framework of the Theory of Consumption Values (Sheth, Newman, and Gross 1991).

Brand Personality Dimension	**Brand Personality Traits**
Sincerity	Welcoming, genuine, cheerful, honest, down-to-earth.
Excitement	Up-do-date, spirited, daring, imaginative.
Competence	Reliable, successful, determined.
Sophistication	Charming, upper-class.
Ruggedness	Strong, rugged, vigorous, tough.
Innovation	Unique, original, modern, intelligent, innovative, open to change. (Su et al, 2015)
Novelty	Creative, different, trendsetter, surprising, forward-looking. (Shams et al., 2015).
Meaningfulness	Useful, valuable, advantageous. (Shams et al., 2015).

Table 1: Ad-hoc approach to the brand personality scale - the adapted model. Eight dimensions and their respective personality traits.

Appendix 2 – Experts and Consumers' Interviews

General Questions	**1.** How are you connected to the topic of checkout free technology in supermarkets?
	2. What do you think are the main benefits of implementing this technology in supermarkets?
	3. On the other hand, what are the main obstacles? For example, technology failure, theft, consumer uncertainty, etc.
	4. In previous years, some supermarket chains (Costco and CVS) have removed self-checkouts from some of their stores. Why do you think this has happened?
	5. Do you know what the main differences between PD & GoNova and Continente Labs are?
Attributes	**6.** In your opinion, what do you consider essential characteristics of this technology? In other words, what attributes of these technologies attract consumers?
	7. What do you think are the main reasons that would stop certain customers from trying these services? For example, fear of humiliation by not knowing how to work the technology.
Perceptions	**8.** Which perceptions about the different players in the market (Continente Labs and PD &Go Nova) do you think consumers have?
	9. How do you think a brand should be perceived by consumers to successfully implement this technology? For example, formal vs casual brands; serious vs funny brands.
Consumers	**10.** Do you notice any changes in buying behavior? For example, does it enhance consumers' experience? Does it increase consumer loyalty?
	11. The success of these services is influenced by the customer's engagement, knowledge, behavior, and skills to complete the transactions. Does this affect the type of consumers that use these services?
	12. How do you think (age, gender, education, income, sociodemographic factors) impact the usage/intention to use these technologies?
	13. How do you help instruct customers? Is there always a service assistant?
Future	**14.** What are the trends shaping the future of these technologies?
	15. What do you think would be the biggest obstacles, if trying to introduce this technology in stores all over Portugal?

Table 1: Expert Interview Script.

Demographics	Age
	Gender
	Qualifications
	Location
User Experience (SCO)	Have you ever used self-checkout in supermarkets?
Attributes (SCO)	If yes… • How often do you use it? • Do you prefer it over the regular check-out? • What are the main attributes that attract you to this technology? • Have you ever had a bad experience with this technology? What was it?
	If no… • What is stopping you from using it? • Is there anything that leads you to avoid these technologies?
User Experience (Checkout Free Technology)	Have you ever shopped at supermarkets with checkout free technology (PD&GONova or Continente Labs)?
Attributes (Checkout Free Technology)	If yes… • How often do you use it? • Do you prefer it over the regular check-out? • What are the main attributes that attract you to this technology? • Have you ever had a bad experience with this technology? What was it?
	If no… • What is stopping you from using it? • Is there anything that leads you to avoid these technologies?
Points to Improve	Is there any feature that you would like to be added to these technologies?

Table 2: Consumer Interview Script.

Participant	Age	Gender	Location	Qualification
Consumer 1	21 years old	Female	Suburbs of Lisbon	Master's degree
Consumer 2	26 years old	Female	Lisbon	Bachelor's degree
Consumer	52 years old	Male	Lisbon	Secondary School
Consumer 4	59 years old	Male	Torres Vedras (Lisbon)	Bachelor's degree
Consumer 5	81 years old	Female	Porto	Bachelor's degree

Table 3: Consumer Interviews - participant characteristics.

Appendix 3 – Mystery Shopping Briefs

Continente Labs Brief: Mystery Visit Experiment

You are a test buyer in a checkout free supermarket store in Lisbon, one of the first of its kind in Europe. By participating in this experience, you are contributing to the development of a study with the objective of understanding Portuguese consumers' perceived ease of use and perceived usefulness of these retail technologies.

*Please go to **Continente Labs** and fulfill the following tasks:*

1. **Download the mandatory App.**
2. **Enter the store.**
3. **Look for the following items and add them to your shopping cart:**
    a. **Croissant**
    b. **Milk**
    c. **Coca-Cola Zero**
    d. **Freshly brewed coffee**
4. **Remove the milk from your shopping cart.**
5. **Assume you cannot find Colgate Toothpaste. Try to get help from a store employee.**
6. **Pay for your groceries.**
7. **Exit the store.**

After you've successfully fulfilled all the tasks above, please fill out the assessment tool on the following page.
The money for your purchased items will be refunded once you submit yout assessment.

Thank you very much for participating in this mystery shopping experience! ☺

Pingo Doce & Go Nova Brief: Mystery Visit Experiment

You are a test buyer in a checkout free supermarket store in Lisbon, one of the first of its kind in Europe. By participating in this experience, you are contributing to the development of a study with the objective of understanding Portuguese consumers' perceived ease of use and perceived usefulness of these retail technologies.

*Please go to **Pingo Doce & Go Nova** and fulfill the following tasks:*

1. **Download the mandatory App.**
2. **Enter the store.**
3. **Scan the following items and add them in your shopping cart:**
    a. **Croissant**
    b. **Milk**
    c. **Coca-Cola Zero**
    d. **Freshly brewed coffee**
4. **Remove the milk from your shopping cart.**
5. **Assume you cannot find Colgate Toothpaste. Try to get help from a store employee.**
6. **Pay for your groceries.**
7. **Exit the store.**

After you've successfully fulfilled all the tasks above, please fill out the assessment tool on the following page.

The money for your purchased items will be refunded once you submit yout assessment.

Thank you very much for participating in this mystery shopping experience! ☺

Mystery Shopper Assessment Tool

Perceived Usefulness (PU)

Unlikely **Likely**

	Ex-tremely	Quite	Neither	Quite	Extremely
Using checkout free technol-ogy would make my grocery shopping quicker.					
Using checkout free technol-ogy would make my grocery shopping easier.					
I would find this technology useful in my daily life.					
I would prefer a checkout free store over a regular store.					
I would visit more checkout free stores in the future.					

Perceived Ease-of-Use (PEU)

Unlikely **Likely**

	Ex-tremely	Quite	Neither	Quite	Extremely
Learning to operate checkout free technology would be easy for me.					
I would find it easy to install and use the app needed for these services.					
My interaction with this technology would be easy and understandable.					
I would find it easy to add and remove items from my cart.					
I would find it easy to pay for my groceries with check-out free technology.					

Additional Questions (Yes/No)

- I enjoyed my experience in a checkout free store: _____
- I felt anxious before entering the store: _____
- I felt anxious during my visit: _____
- I missed the human interaction in the checkout process: _____
- I need help from a store employee: _____
- I felt good about my experience in the store: _____

Name of Participant: _____ Date: _____

Appendix 4: Mystery Shopping Results

Shop-per	**Store Visited**	**De-mographics**	**PU Perceived Useful-ness**	**PEU Perceived Ease-of-Use**	**TAM**	**Experience Highlights / Additional Comments**
A	Continente Labs	59-year-old male	72%	48%	60%	Struggled with the app installation. Managed to enter the store without the app/QR code, with the staff's help. Performed the checkout through a self-service machine. Experienced technical difficulties in payment.
B	Continente Labs	23-year-old fe-male	100%	92%	96%	Experienced technical difficulties with the app, namely with the app's link to a payment method, but was helped by the staff. Overall, very positive experience.
C	Pingo Doce & Go Nova	24-year-old male	76%	72%	74%	Installation of the app was characterized as easy. Experienced some difficulties when needing to remove an item from the app's shopping basket.
D	Pingo Doce & Go Nova	52-year-old fe-male	52%	52%	52%	Felt anxious before entering the store, because of the lack of confidence in operating with the technology, which resulted in an overall unpleasant experience.

Table1: Summarized results from Mystery Shopping Experience.

Appendix 5 - Perceptual Mapping:

Survey Design

Supermarket Brand	**Overall Turnovers (2021*)**	**Turnover in Portugal (2021*)**
Pingo Doce	$ 5.51 bn	$ 5.51 bn
LIDL	$ 75.10 bn	$ 2.10 bn
Auchan	$ 13.50 bn	$ 1.70 bn
Continente	$ 960 m	$ 960 m
Minipreço	$ 7.56 bn	$ 771 m
El Corte Inglés	$ 12.90 bn	$ 468 m
Aldi	$ 18.60 bn	$ 453 m
Mercadona	$ 28.50 bn	$ 416 m

*Table 1: Turnover per supermarket brand - overall versus Portugal values. Source: Orbis, 2022. *Certain values are representative of the fiscal year of 2020.*

Brand Personality Dimension	Brand Personality Traits
Sincerity	Welcoming, genuine, cheerful, honest, down-to-earth.
Excitement	Up-do-date, spirited, daring, imaginative.
Competence	Reliable, successful, determined.
Sophistication	Charming, upper-class.
Ruggedness	Strong, rugged, vigorous, tough.
Innovation	Unique, original, modern, intelligent, innovative, and open to change. (Su et al, 2015)
Novelty	Creative, different, trend-setter, surprising, forward-looking. (Shams et al., 2015).
Meaningfulness	Useful, valuable, advantageous. (Shams et al., 2015).

Table 2: Ad-hoc approach to the brand personality scale - the adapted model. Eight dimensions and their respective personality traits.

	Attribute	Description	Scale
Brand Personality A brand's personality is described and measured by the human personality traits that are relevant to the brand. It is the set of human characteristics attributed to brands, for example, affectionate, funny, serious, or trustworthy.	Sincerity	Sincerity includes the following personality traits: welcoming, genuine, cheerful, honest, down-to-earth.	1 – Lowest classification 4 – Highest classification 5 – "I do not know this brand"
	Excitement	Excitement includes the following personality traits: up-do-date, spirited, daring, imaginative.	1 – Lowest classification 4 – Highest classification 5 – "I do not know this brand"
	Competence	Competence includes the following personality traits: reliable, successful, determined.	1 – Lowest classification 4 – Highest classification 5 – "I do not know this brand"
	Sophistication	Sophistication includes the following personality traits: charming, upper-class.	1 – Lowest classification 4 – Highest classification 5 – "I do not know this brand"
	Ruggedness	Ruggedness includes the following personality traits: strong, rugged, vigorous, tough.	1 – Lowest classification 4 – Highest classification 5 – "I do not know this brand"
	Innovation	Innovation includes the following personality traits: unique, original, modern, intelligent, innovative, open to change. (Su et al, 2015)	1 – Lowest classification 4 – Highest classification 5 – "I do not know this brand"
	Novelty	Novelty includes the following personality traits: creative, different, trendsetter, surprising, forward-looking. (Shams et al., 2015).	1 – Lowest classification 4 – Highest classification 5 – "I do not know this brand"
	Meaningfulness	Meaningfulness includes the following personality traits: useful, valuable, advantageous. (Shams et al., 2015).	1 – Lowest classification 4 – Highest classification 5 – "I do not know this brand"

Table 3: Brand Personality Section: Attributes, descriptions, and scales.

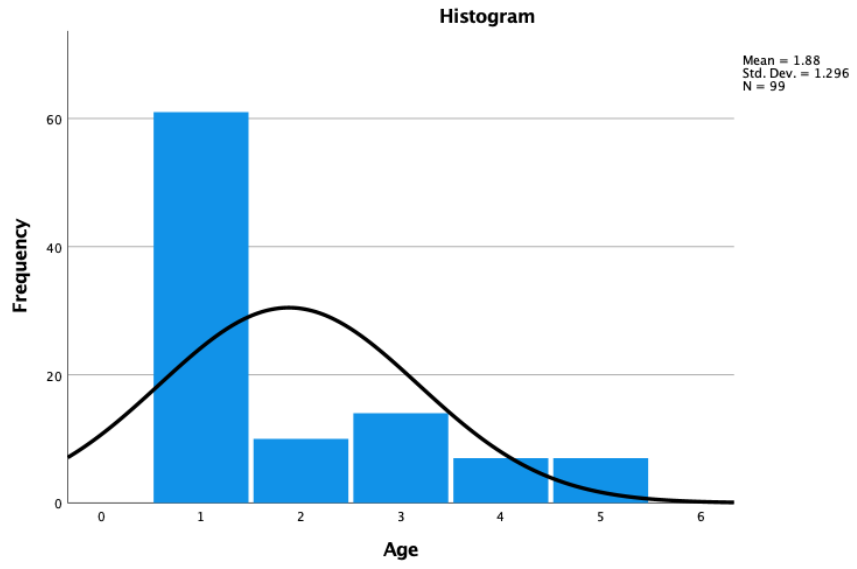
Sample Characteristics

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Other	2	2,0	2,0	2,0
	Portuguese	99	98,0	98,0	100,0
	Total	101	100,0	100,0	

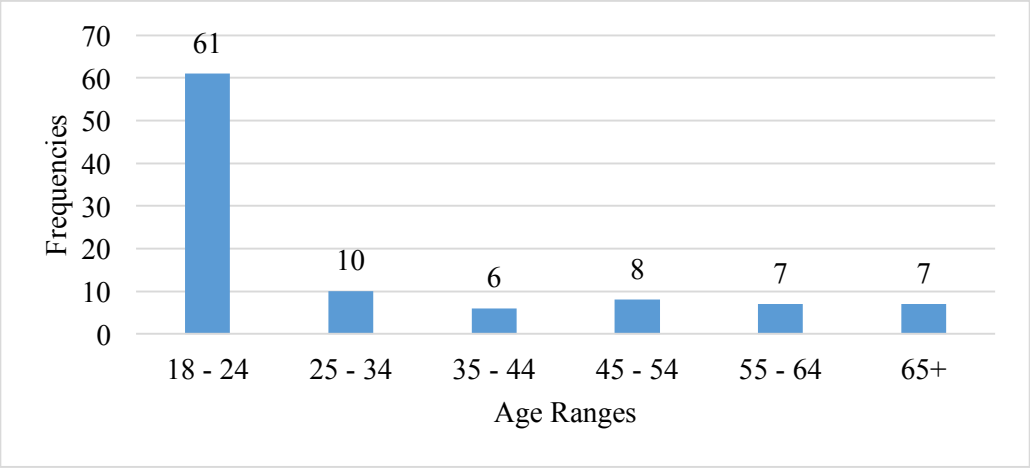
Table 4: Number of respondents, divided by Portuguese and Non-Portuguese (N=101).

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18 - 24	61	61,6	61,6	61,6
	25 - 34	10	10,1	10,1	71,7
	35 - 44	6	6,1	6,1	77,8
	45 - 54	8	8,1	8,1	85,9
	55 - 64	7	7,1	7,1	92,9
	65+	7	7,1	7,1	100,0
	Total	99	100,0	100,0	

Table 5: Age group percentage distribution (n=100).



Graphic 1: Histogram Age Group distribution.



Graphic 2: Age Group distribution.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	58	58,6	58,6	58,6
	Male	39	39,4	39,4	98,0
	Other	2	2,0	2,0	100,0
	Total	99	100,0	100,0	

Table 6: Gender percentage distribution (n=100).

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Center	8	8,1	8,1	8,1
	Algarve	3	3,0	3,0	11,1
	Azores	1	1,0	1,0	12,1
	Lisbon	29	29,3	29,3	41,4
	North	58	58,6	58,6	100,0
	Total	99	100,0	100,0	

Table 7: Portuguese region percentage distribution (n=100).

Annual Income Range*	PORDATA Results	Sample Results
Annual income of or below 10.999	30.9%	39%
Annual income between 11.000€ and 19.999€	30.9%	30.2%
Annual income between 20.000€ and 36.999€	23.6%	17.1%
Annual income between 37.000€ and 74.999€	5.5%	12.7%
Annual income above 75.000€	9.1%	0.9%

*Table 8: Comparison between sample results, from people who reported an annual income, and PORDATA's data. *The income ranges differ slightly between the two sources.*

Results and Discussion

	Sincerity	Competence	Excitement	Sophistication	Ruggedness	Innovation	Novelty	Meaningfulness
Pingo Doce	3.04	3.13	3.08	2.78	3.16	2.92	2.99	3.29
LIDL	3.33	3.29	3.40	2.81	3.29	3.33	3.45	3.45
Auchan	2.54	2.71	2.37	2.53	2.66	2.56	2.48	2.66
Continente	3.10	3.59	3.32	3.33	3.56	3.43	3.22	3.56
Minipreço	2.05	2.12	1.99	1.62	1.93	1.71	1.74	2.00

Table 9: Perceptual Survey results: average dimension rating per brand.

	Sin-cerity	Compe-tence	Excite-ment	Sophisti-cation	Rug-ged-ness	Inno-vation	Nov-elty	Meaning-fulness
Sincerity	1	0.935	0.984	0.872	0.951	0.963	0.996	0.975
Compe-tence	0.935	1	0.958	0.978	0.997	0.987	0.952	0.987
Excitement	0.984	0.958	1	0.882	0.962	0.964	0.981	0.983
Sophistica-tion	0.872	0.978	0.882	1	0.976	0.961	0.899	0.949
Rugged-ness	0.951	0.997	0.962	0.976	1	0.989	0.964	0.994
Innovation	0.963	0.987	0.964	0.961	0.989	1	0.982	0.986
Novelty	0.996	0.952	0.981	0.899	0.964	0.982	1	0.98
Meaning-fulness	0.975	0.987	0.983	0.949	0.994	0.986	0.98	1

Table 10: SPSS Output - Correlation Matrix.

Component	Extraction Sums of Squared Loadings		
	Total	% Of Variance	Cumulative %
1	7.748	96.851	96.851

Table 11: Summary of Principal Component Analysis in SPSS.

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.994	0.995	8

Table 12: SPSS Output - Reliability Analysis.

Segment	**Total Variance Explained by Component 1 (%)**
Gender: F	96.417
Gender: M	95.514
Age: 14 - 44	95.496
Age: 45 +	93.859
Occupation: Student	95.007
Occupation: Employed	95.807
Occupation: Unemployed	88.805
Occupation: Retired	86.71
Income: 0 - 19.999€	97.014
Income: 20.000€ +	93.047
Qualifications: until 9th grade	92.904
Qualifications: until 12th grade	97.082
Qualifications: BSc and above	95.71
Total Sample	96.851
Average	94.10553846

Table 13: SPSS Segmented Analysis.

Component	Extraction Sums of Squared Loadings		
	Total	% Of Variance	Cumulative %
1	7.748	96.851	96.851
2	0.205	2.566	99.418

Table 14: Summary of the Principal Component Analysis in SPSS, when forcing a second factor.

	Component	
	1	2
Meaningfulness	0.998	-0.01
Ruggedness	0.995	0.091
Innovation	0.995	0.034
Competence	0.99	0.122
Novelty	0.985	-0.15
Excitement	0.98	-0.164
Sincerity	0.975	-0.212
Sophistication	0.955	0.294

Table 15: Dimension coordinates.

	Component	
	1	2
Pingo Doce	.34849	-.28527
LIDL	.74208	-1.37216
Auchan	-.45028	.77269
Continente	.88819	1.16603
Minipreço	-1.52848	-.28129

Table 16: Brand coordinates.

Supermarket Brand	Average Score of all Dimensions	Score in %
Continente	3.41	85%
Lidl	3.27	82%
Pingo Doce	3.03	76%
Auchan	2.57	64%
Minipreço	1.81	45%
Average	2.818	70%

Table 17: Average Score of all Dimensions per Brand.

Appendix 6: Additional Exploratory Survey - Drivers Influencing Supermarket Store Choice

Supermarket	**Average Ranking**
Continente	3,96
Lidl	3,72
Pingo Doce	3,43
Auchan	2,11
Minipreço	1,78

Table 1: Average ranking per brand.

Level of Significance (α)	**Critical Value**	**Q**	**Relationship**
0.01	32.00	33.86	Q > CV
0.05	26.30	33.86	Q > CV
0.10	23.54	33.86	Q > CV

Table 2: Summary of Contingency Analysis.

Factor	Count	Factor Type
Quality - Price Ratio	30	Functional
Product Diversity	25	Functional
Location	25	Functional
Product Quality	25	Functional
Price	15	Functional
Promotions	9	Functional
I like the store environment	8	Hedonic
I like the brand	6	Hedonic
I like the store employees	2	Hedonic

Table 3: Frequency Table and Factor Categorization.

Frequencies of Variables	Counts	% of Total
Functional	129	89%
Hedonic	16	11%
Total	145	100%

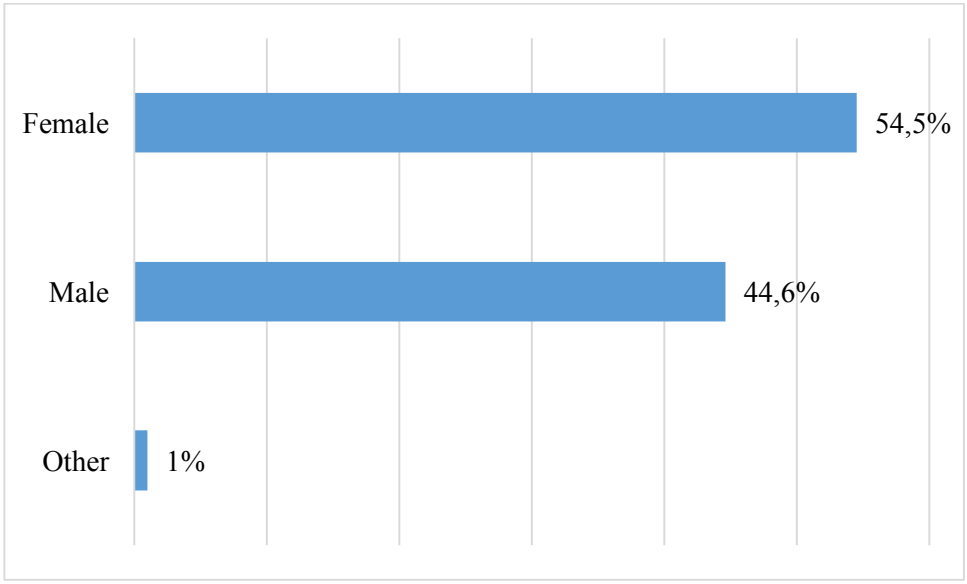
Table 4: Frequency of Variables: Hedonic vs Functional.

Appendix 7 – Conjoint Analysis

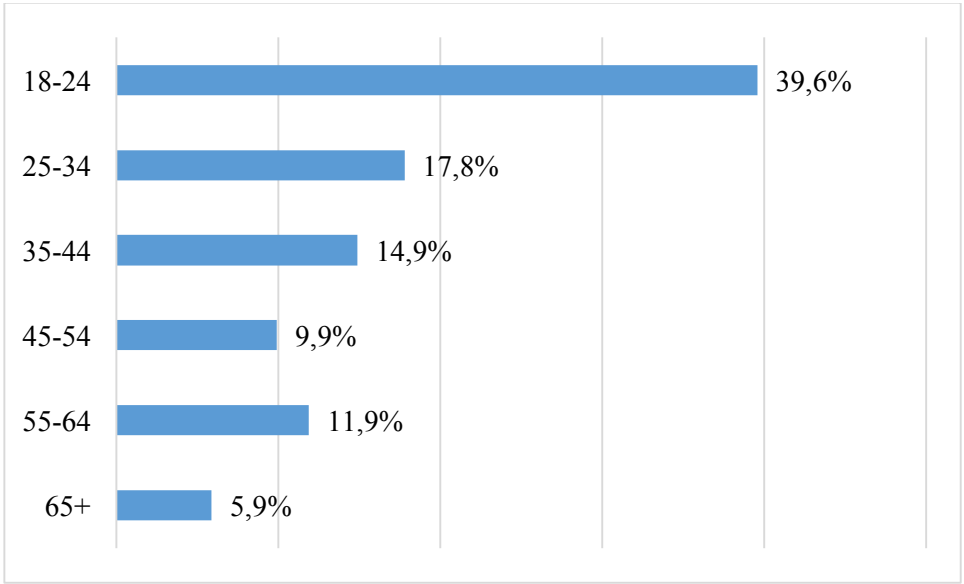
Attributes & Levels / Brands	Checkout Free Technology	Self-Checkout	Cashier Lane
Payment Method			
Card	✔	✔	✔
Cash & Card		✔	✔
Supermarket App	✔		
Scanning of the products			
No scanning	✔		
Self-scanning	✔	✔	
Cashier scanning			✔
Interaction with employees			
None to Low	✔	✔	
Medium	✔	✔	
High			✔
Cost of service			
No cost	✔	✔	✔
Monthly fee (2.99€)	✔	✔	✔
Monthly fee (5.99€)	✔	✔	✔
Time for Check-Out			
Less than 3 minutes	✔		
4-7 minutes		✔	
8-11 minutes		✔	✔
12+ minutes			✔

Table 1: Conjoint Analysis Construct: brands, attributes and levels

Sample Characteristcs



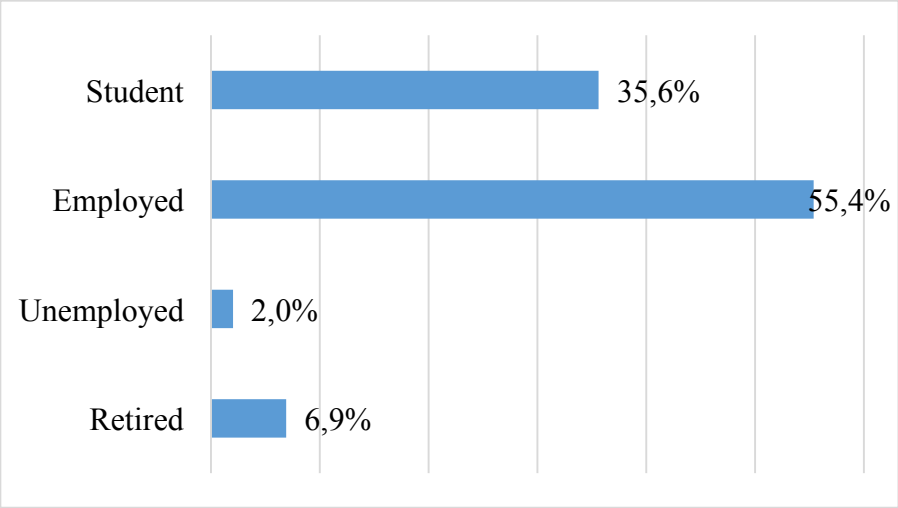
Graphic 1: Sample Characteristic: Gender



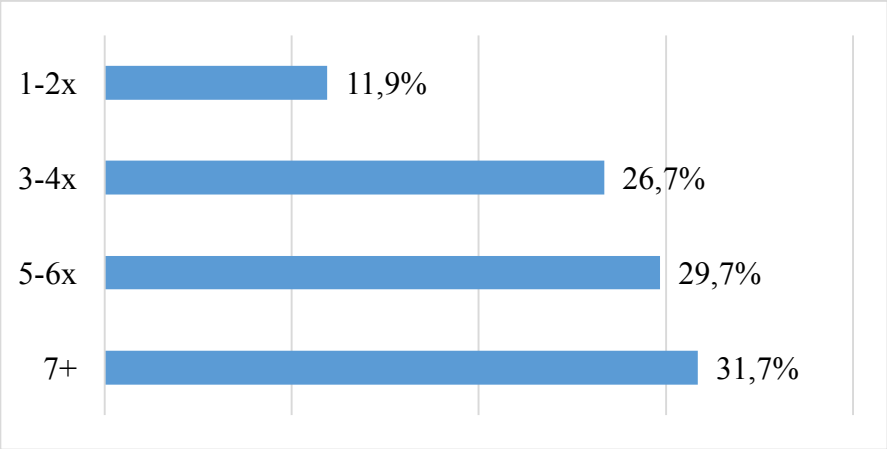
Graphic 2: Sample Characteristic: Age

Annual Income Range*	PORDATA Results	Sample Results
Annual income of or below 10.999	30.9%	9.9%
Annual income between 11.000€ and 19.999€	30.9%	28.7%
Annual income between 20.000€ and 36.999€	23.6%	11.9%
Annual income between 37.000€ and 74.999€	5.5%	14.9%
Annual income above 75.000€	9.1%	5.0%

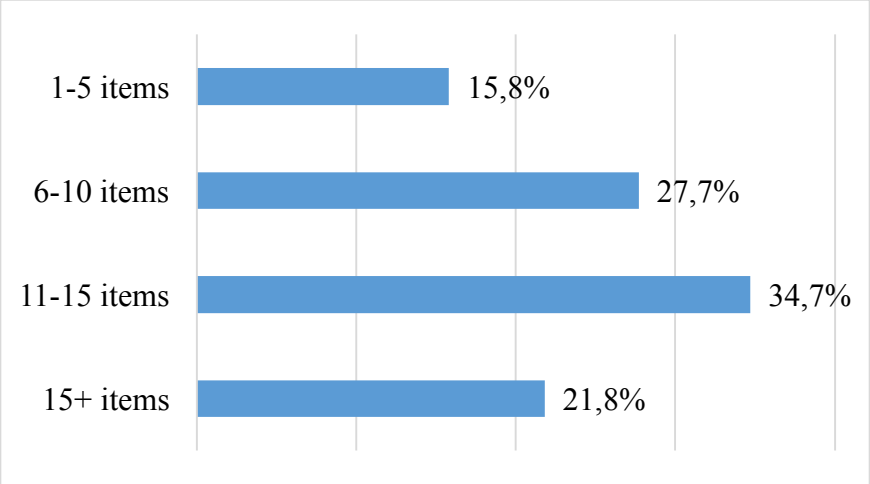
Table 2: Sample Characteristics: Annual Income



Graphic 3: Sample Characteristic: professional status



Graphic 4: Frequency of monthly supermarket visit

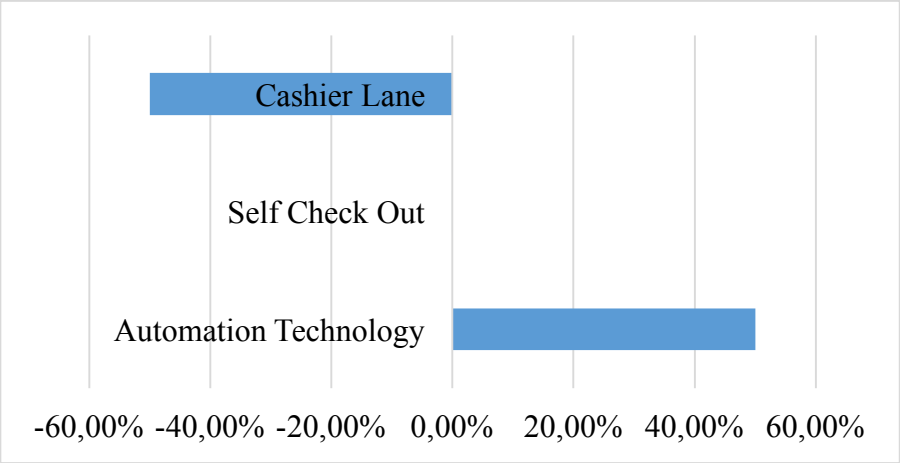


Graphic 5: Number of items per supermarket visit

Results and Discussion

	Partworth Utility	**Scaled Pathworth Utility**
Checkout free technology	0.64	50.04%
Self-checkout	-0.00	-0.08%
Cashier Lane	-0.64	-49.96%

Table 3: Partworth Utilities for the Brand Attribute, for the entire sample.



Graphic 6: Partworth Utilities for the Brand Attribute, for the entire sample.

								Partworth Utility			Scaling the Partworth Utility		
		n	Total n	Automation Technology	Self-Check Out	Cashier Lane	Max - Min	Automation Technology	Self-Check Out	Cashier Lane	Automation Technology	Self-Check Out	Cashier Lane
SEGMENT	Gender: F	55	103	0	-0,44	-1,31	1,31	0,58	0,14	-0,72	44.63%	10.73%	-55.37%
	Gender: M	47		0	-0,89	-1,23	1,23	0,71	-0,18	-0,52	57.43%	-14.86%	-42.57%
	Gender: Other	1		0	0,47	-1,38	1,86	0,30	0,78	-1,08	16.31%	41.85%	-58.15%
	Item per trip (<=10)	45	103	0	-0,73	-1,25	1,25	0,66	-0,07	-0,59	52.71%	-5.42%	-47.29%
	Item per trip (>10)	58		0	-0,57	-1,29	1,29	0,62	0,05	-0,67	48.04%	3.93%	-51.96%
	Age (<=44)	73	103	0	-1,04	-2,33	2,33	1,12	0,08	-1,20	48.29%	3.43%	-51.71%
	Age (>44)	30		0	0,40	1,41	1,41	-0,60	-0,21	0,81	-42.66%	-14.68%	57.34%
	Income: rather not say	5	103	0	-0,44	0,36	0,80	0,03	-0,41	0,39	3.22%	-51.61%	48.39%
	Income (until 19.999€)	65		0	-0,57	-1,41	1,41	0,66	0,09	-0,75	46.75%	6.50%	-53.25%
	Income (above 20.000€)	33		0	-0,81	-1,27	1,27	0,69	-0,12	-0,57	54.77%	-9.54%	-45.23%
	Supermarket trips per month (<5)	40	103	0	0,02	-0,29	0,31	0,09	0,11	-0,20	28.05%	35.97%	-64.03%
	Supermarket trips per month (>=5)	63		0	-1,06	-1,90	1,90	0,99	-0,07	-0,91	51.93%	-3.86%	-48.07%
	Professional status: student	36	103	0	-1,47	-2,80	2,80	1,42	-0,05	-1,37	50.88%	-1.75%	-49.12%
	Professional status: employed	58		0	-0,62	-1,21	1,21	0,61	-0,01	-0,60	50.55%	-1.10%	-49.45%
	Professional status: unemployed	2		0	2,57	-2,46	5,03	-0,04	2,53	-2,50	-0.74%	50.37%	-49.63%
	Professional status: retired	7		0	2,60	6,33	6,33	-2,97	-0,38	3,35	-47.02%	-5.96%	52.98%
	Qualifications: until 12th grade	14	103	0	1,13	1,94	1,94	-1,03	0,11	0,92	-52.73%	5.47%	47.27%
	Qualifications: BSc and above	89		0	-0,92	-1,78	1,78	0,90	-0,02	-0,88	50.50%	-1.01%	-49.50%
	Region: North	21	103	0	-1,14	-0,84	1,14	0,66	-0,48	-0,18	57.92%	-42.08%	-15.84%
	Region: Lisbon and Center	76		0	-0,62	-1,58	1,58	0,73	0,12	-0,85	46.31%	7.39%	-53.69%
	Region: South and Islands	6		0	0,83	1,12	1,12	-0,65	0,18	0,47	-57.99%	15.99%	42.01%

Table 4: Partworth Utilities: Sample Segmentation.

			Automation Technology	Self-Check Out	Cashier Lane
SEGMENT	**Gender: F**	55	44.63%	10.73%	-55.37%
	Gender: M	47	57.43%	-14.86%	-42.57%
	Item per trip (<=10)	45	52.71%	-5.42%	-47.29%
	Item per trip (>10)	58	48.04%	3.93%	-51.96%
	Age (<=44)	73	48.29%	3.43%	-51.71%
	Age (>44)	30	-42.66%	-14.68%	57.34%
	Income (until 19.999€)	65	46.75%	6.50%	-53.25%
	Income (above 20.000€)	33	54.77%	-9.54%	-45.23%
	Supermarket trips per month (<5)	40	28.05%	35.97%	-64.03%
	Supermarket trips per month (>=5)	63	51.93%	-3.86%	-48.07%
	Professional status: student	36	50.88%	-1.75%	-49.12%
	Professional status: employed	58	50.55%	-1.10%	-49.45%
	Qualifications: BSc and above	89	50.50%	-1.01%	-49.50%
	Region: Lisbon and Center	76	46.31%	7.39%	-53.69%

Table 5: SPSS Input for Descriptive Analysis.

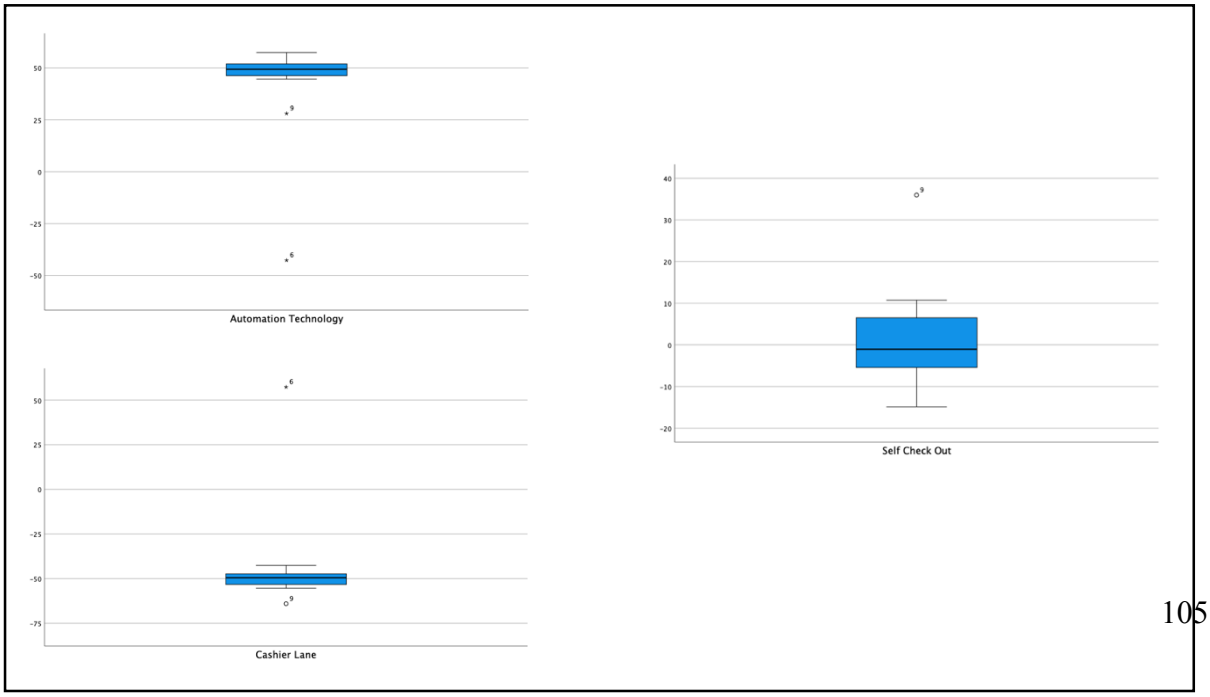
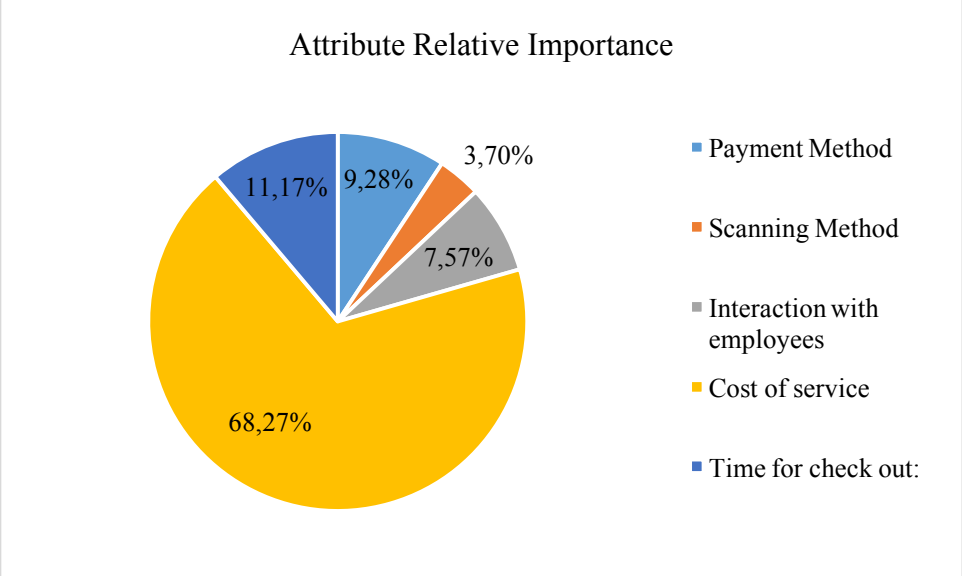


Figure 1: SPSS Ouput: Outliers.

	Attribute Relative Importance
Payment Method	9.28%
Scanning Method	3.70%
Interaction with employees	7.57%
Cost of service	68.27%
Time for check out:	11.17%

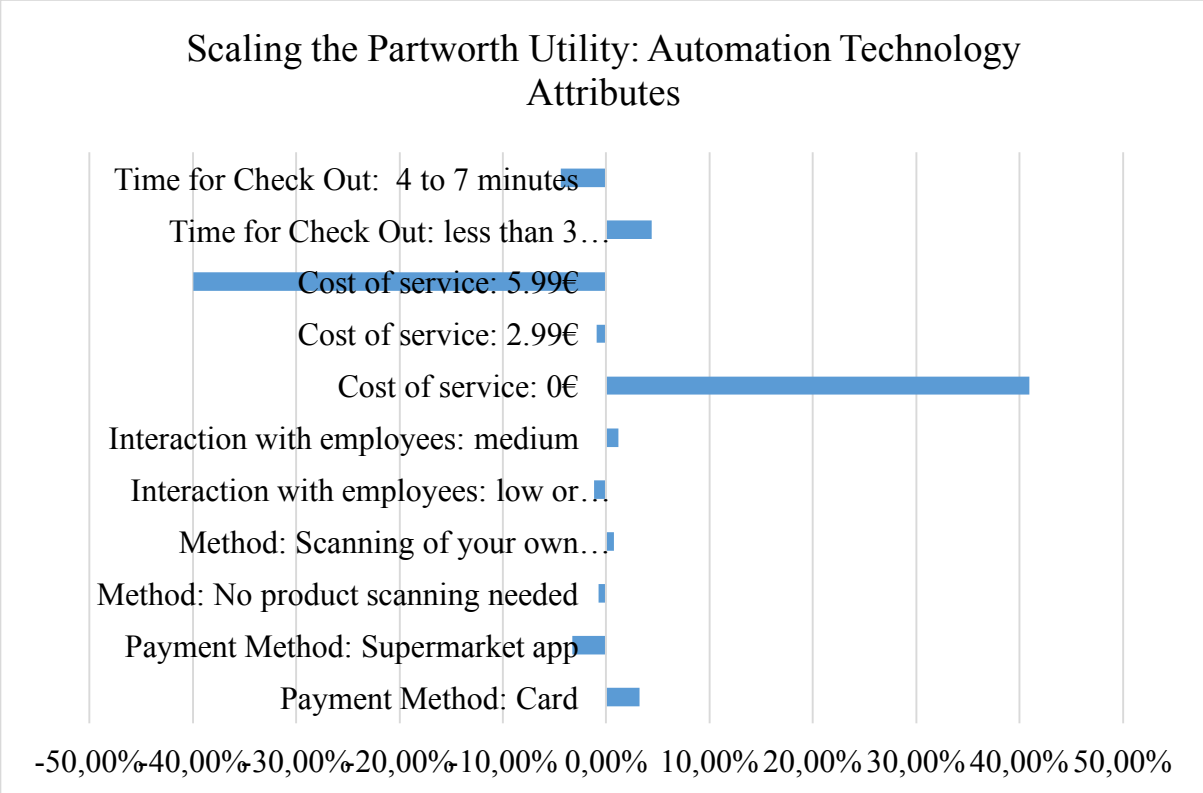
Table 6: Attribute Partworths for automation technology.



Graphic 7: Attribute Partworths for automation technology.

	Partworth Utility	Scaling the Part-worth Utility	Ideal Profile
Payment Method: Card	0,507	3.25%	Card
Payment Method: Supermarket app	-0,507	-3.25%	
Method: No product scanning needed	-0,113	-0.72%	Scanning of your own prod-ucts
Method: Scanning of your own prod-ucts	0,113	0.72%	
Interaction with employees: low or none	-0,180	-1.16%	Medium
Interaction with employees: medium	0,180	1.16%	
Cost of service: 0€	6,379	40.93%	0€
Cost of service: 2.99€	-0,149	-0.96%	
Cost of service: 5.99€	-6,230	-39.97%	
Time for Check Out: less than 3 minutes	0,689	4.42%	Less than 3 minutes
Time for Check Out: 4 to 7 minutes	-0,689	-4.42%	

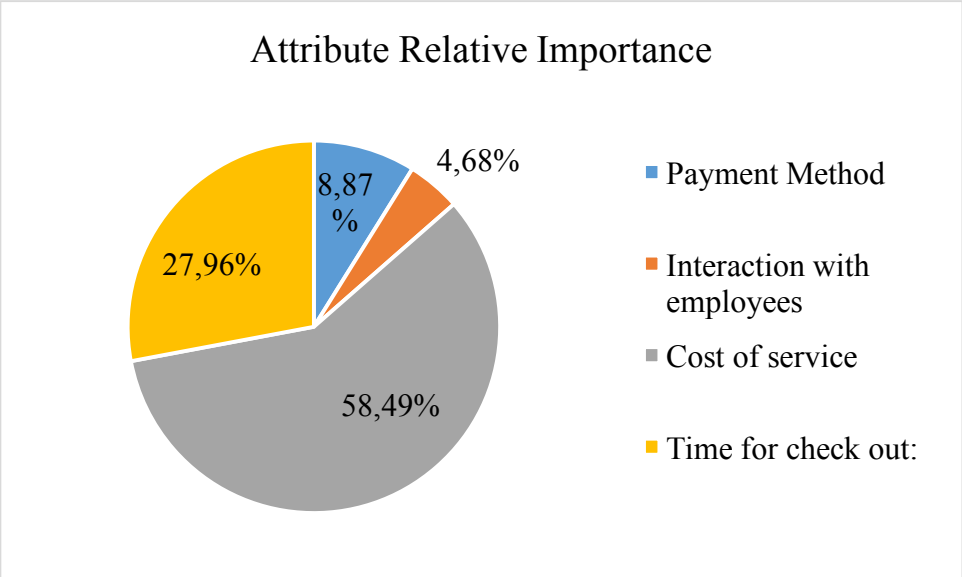
Table 7: Level Partworths for automation technology.



Graphic 8: Level Partworths for automation technology.

	Attribute Relative Importance
Payment Method	8.87%
Interaction with employees	4.68%
Cost of service	58.49%
Time for check out:	27.96%

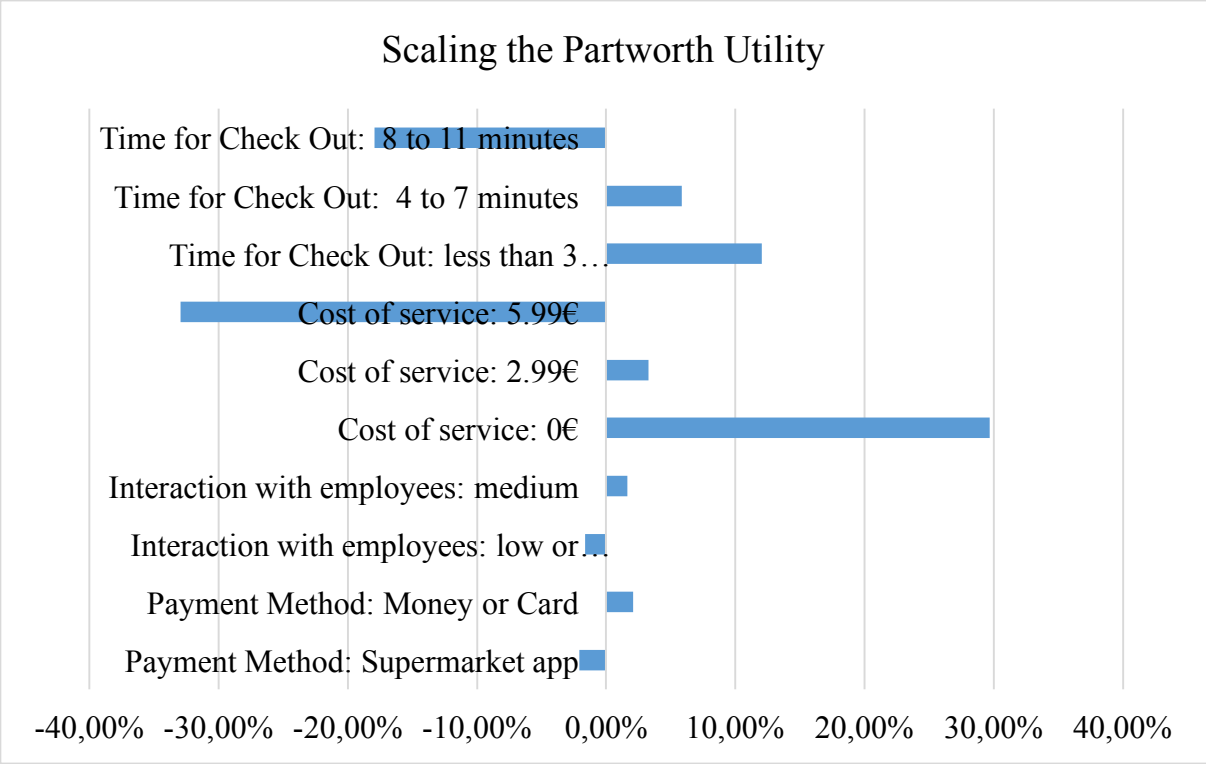
Table 8: Attribute Partworths for self-check-out.



Graphic 9: Attribute Partworths for self-check-out.

	Partworth Utility	Scaling the Partworth Utility	Ideal Profile
Payment Method: Supermarket app	-0,459	-2.10%	Money or Card
Payment Method: Money or Card	0,459	2.10%	
Interaction with employees: low or none	-0,355	-1.62%	Medium
Interaction with employees: medium	0,355	1.62%	
Cost of service: 0€	6,485	29.65%	0€
Cost of service: 2.99€	0,721	3.29%	
Cost of service: 5.99€	-7,206	-32.95%	
Time for Check Out: less than 3 minutes	2,634	12.04%	Less than 3 minutes
Time for Check Out: 4 to 7 minutes	1,284	5.87%	
Time for Check Out: 8 to 11 minutes	-3,918	-17.91%	

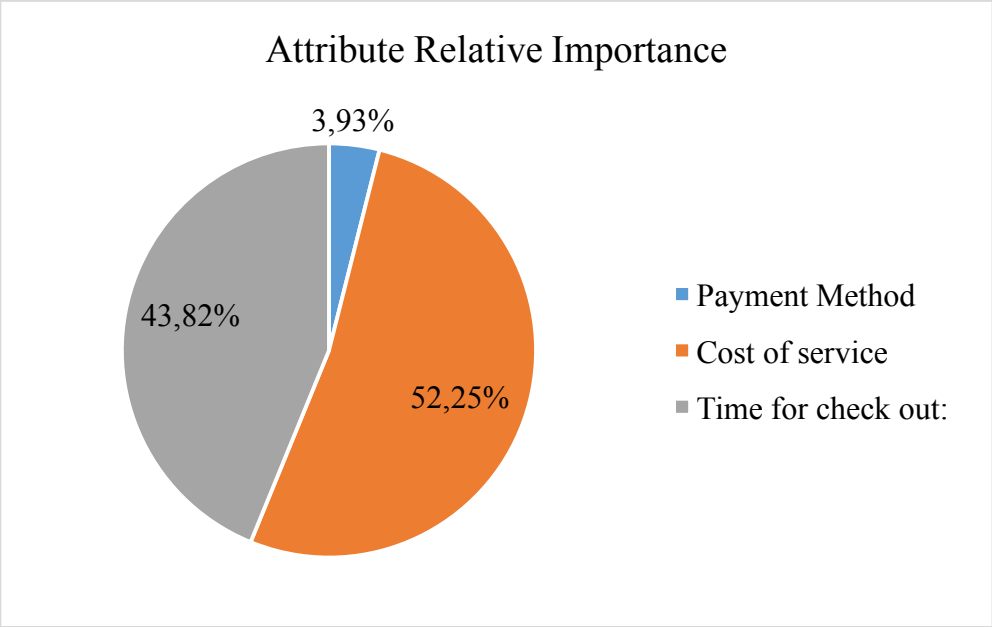
Table 9: Level Partworths for self-check-out.



Graphic 10: Level Partworths for self-check-out.

	Attribute Relative Importance
Payment Method	3.93%
Cost of service	52.25%
Time for check out:	43.82%

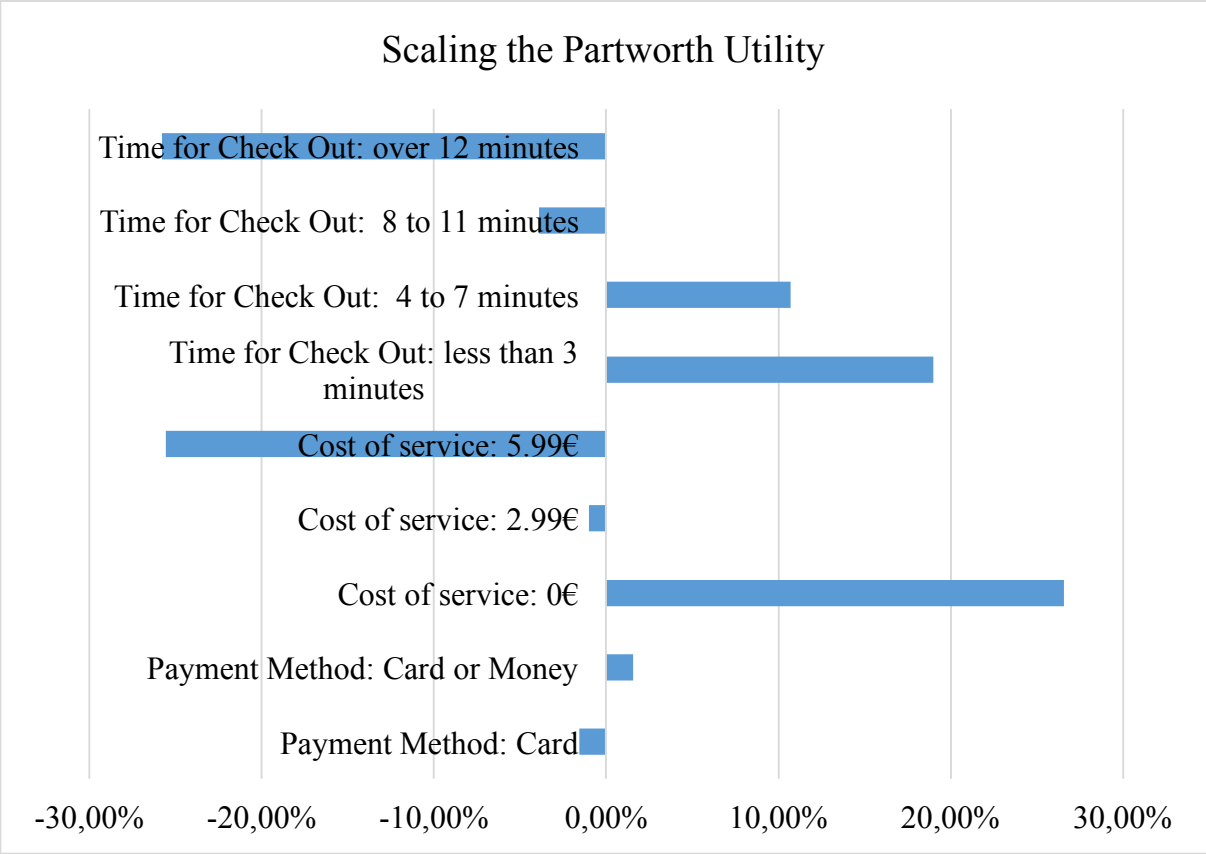
Table 10: Attribute Partworths for cashier lane.



Graphic 11: Attribute Partworths for cashier lane.

	Partworth Utilities	Scaling the Part-worth Utility	Ideal Profile
Payment Method: Card	-0,353	-1.56%	Card or Money
Payment Method: Card or Money	0,353	1.56%	
Cost of service: 0€	5,999	26.55%	0€
Cost of service: 2.99€	-0,227	-1.01%	
Cost of service: 5.99€	-5,772	-25.55%	
Time for Check Out: less than 3 minutes	4,291	18.99%	Less than 3 minutes
Time for Check Out: 4 to 7 minutes	2,416	10.69%	
Time for Check Out: 8 to 11 minutes	-0,880	-3.89%	
Time for Check Out: over 12 minutes	-5,827	-25.79%	

Table 11: Level Partworths for cashier lane.



Graphic 12: Level Partworths for cashier lane.

		PAYMENT METHOD	SCAN-NING	EMPLOYEE IN-TERACTION	COST OF SERVICE	TIME FOR CHECK OUT
PAYMENT METHOD	Pearson Correlation	1	-0.107	-.214*	-.377**	-.213*
	Sig. (2-tailed)		0.281	0.03	<.001	0.031
	N	103	103	103	103	103
SCANNING	Pearson Correlation	-0.107	1	0.186	-.328**	0.033
	Sig. (2-tailed)	0.281		0.06	<.001	0.737
	N	103	103	103	103	103
EMPLOYEE IN-TERACTION	Pearson Correlation	-.214*	0.186	1	-.474**	-0.004
	Sig. (2-tailed)	0.03	0.06		<.001	0.972
	N	103	103	103	103	103
COST OF SER-VICE	Pearson Correlation	-.377**	-.328**	-.474**	1	-.557**
	Sig. (2-tailed)	<.001	<.001	<.001		<.001
	N	103	103	103	103	103
TIME FOR CHECK OUT	Pearson Correlation	-.213*	0.033	-0.004	-.557**	1
	Sig. (2-tailed)	0.031	0.737	0.972	<.001	
	N	103	103	103	103	103

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

Table 12: SPSS Output - Pearson Correlation of Attributes

				RELATIVE IMPORTANCE (FOR AUTOMATION TECH)				
		n	Total n	PAYMENT METHOD	SCANNING	EMPLOYEE INTERACTION	COST OF SERVICE	TIME FOR CHECK OUT
SEGMENT	**Gender: F**	55	103	9.40%	3.60%	7.50%	68.40%	11%
	Gender: M	47		9%	3.90%	7.30%	68.40%	11.40%
	Gender: Other	1		14.80%	3.70%	21.10%	50.90%	9.50%
	Item per trip (<=10)	45	103	8.30%	3.40%	7.90%	70.20%	10.10%
	Item per trip (>10)	58		10%	3.90%	7.30%	66.70%	12%
	Age (<=44)	73	103	7.30%	3.40%	7.80%	69.40%	12%
	Age (>44)	30		14.40%	4.40%	6.90%	65.30%	8.90%
	Income: rather not say	5	103	7.30%	4%	8.80%	67.70%	12.10%
	Income (until 19.999€)	65		10.30%	4%	8.30%	66%	11.40%
	Income (above 20.000€)	33		11.00%	4.40%	8.30%	64.40%	11.80%
	Supermarket trips per month (<5)	40	103	9.50%	4.10%	7.50%	68.50%	10.40%
	Supermarket trips per month (>=5)	63		9.10%	3.50%	7.60%	68.10%	11.60%
	Professional status: student	36	103	6.10%	3.20%	7.50%	70.50%	12.60%
	Professional status: employed	58		10%	3.90%	8%	67.40%	10.70%
	Professional status: unemployed	2		13%	3.20%	5.90%	73.30%	4.60%
	Professional status: retired	7		18.40%	4.40%	4.60%	62.80%	9.80%
	Qualifications: until 12th grade	14	103	15.40%	4.30%	7.60%	63.50%	9.30%
	Qualifications: BSc and above	89		8.30%	3.60%	7.60%	69%	11.50%
	Region: North	21	103	10.30%	3.60%	6.70%	66.30%	13.20%
	Region: Lisbon and Center	76		8.80%	3.70%	7.80%	68.80%	10.80%
	Region: South and Islands	6		11.60%	3.60%	7.20%	69.10%	8.50%

Table 13: Partworth Utilities - Sample Segmentation. Automation Technology

			RELATIVE IMPORTANCE (FOR AUTOMATION TECH)				
		n	PAYMENT METHOD	SCAN-NING	EMPLOYEE IN-TERACTION	COST OF SERVICE	TIME FOR CHECK OUT
SEGMENT	**Gender: F**	55	9.40%	3.60%	7.50%	68.40%	11%
	Gender: M	47	9%	3.90%	7.30%	68.40%	11.40%
	Item per trip (<=10)	45	8.30%	3.40%	7.90%	70.20%	10.10%
	Item per trip (>10)	58	10%	3.90%	7.30%	66.70%	12%
	Age (<=44)	73	7.30%	3.40%	7.80%	69.40%	12%
	Age (>44)	30	14.40%	4.40%	6.90%	65.30%	8.90%
	Income (until 19.999€)	65	8.90%	3.50%	7.10%	69.50%	11%
	Income (above 20.000€)	33	10.30%	4%	8.30%	66%	11.40%
	Supermarket trips per month (<5)	40	9.50%	4.10%	7.50%	68.50%	10.40%
	Supermarket trips per month (>=5)	63	9.10%	3.50%	7.60%	68.10%	11.60%
	Professional status: student	36	6.10%	3.20%	7.50%	70.50%	12.60%
	Professional status: employed	58	10%	3.90%	8%	67.40%	10.70%
	Qualifications: BSc and above	89	8.30%	3.60%	7.60%	69%	11.50%
	Region: Lisbon and Center	76	8.80%	3.70%	7.80%	68.80%	10.80%

Table 14: Partworth Utilities - Sample Segmentation. Automation Technology. SPSS Input.

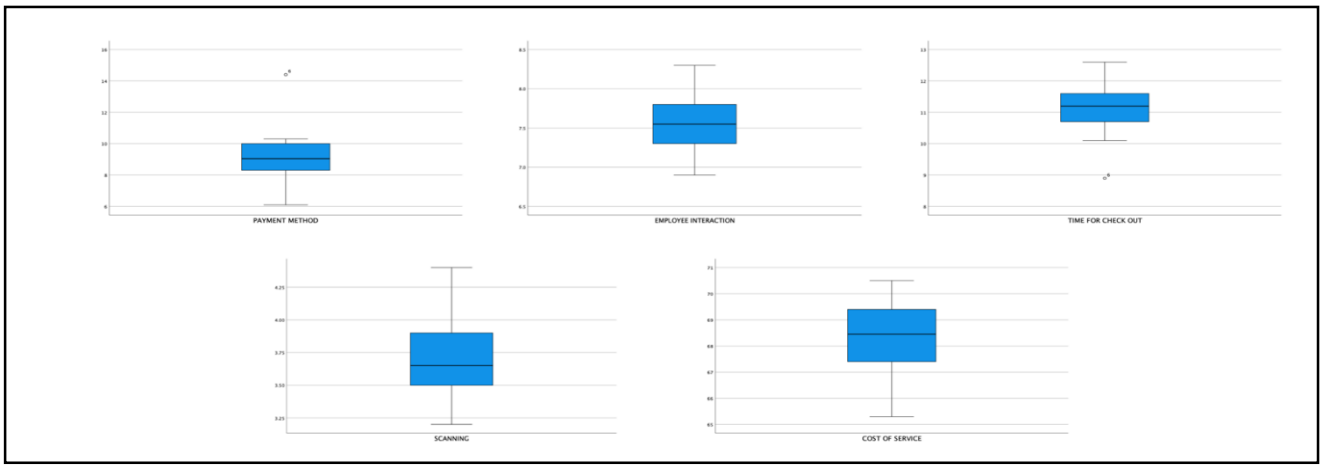


Figure 2: SPSS Output: Outliers for Automation Technology.

PAYMENT METHOD	*Source of Variation*	*Sum of Squares*	*df*	*Medium SS*	*F*	*CV*	*p-value*
	Age	0,133	1	0,133	54,508	F>CV	0,000
	Error	0,247	101	0,002			p-value < 0,05
	Total	0,380	102				H0 is rejected,
SCANNING	*Source of Variation*	*Sum of Squares*	*df*	*Medium SS*	*F*	*CV*	*p-value*
	Age	0,002	1	0,002	3,353	F<CV	0,070
	Error	0,074	101	0,001			p-value > 0,05
	Total	0,076	102				Failed to reject H0,
EMPLOYEE INTERACTION	*Source of Variation*	*Sum of Squares*	*df*	*Medium SS*	*F*	*CV*	*p-value*
	Age	0,002	1	0,002	0,695	F<CV	0,406
	Error	0,342	101	0,003			p-value > 0,05
	Total	0,345	102				Failed to reject H0,
COST OF SERVICE	*Source of Variation*	*Sum of Squares*	*df*	*Medium SS*	*F*	*CV*	*p-value*
	Age	0,043	1	0,043	4,444	F>CV	0,037
	Error	0,987	101	0,010			p-value < 0,05
	Total	1,031	102				H0 is rejected,
TIME FOR CHECK OUT	*Source of Variation*	*Sum of Squares*	*df*	*Medium SS*	*F*	*CV*	*p-value*
	Age	0,025	1	0,025	5,328	F>CV	0,023
	Error	0,469	101	0,005			p-value < 0,05
	Total	0,494	102				H0 is rejected,

Table 15: ANOVAs for Age.

	Payment Method: Card	Payment Method: Super-market App	Scanning: No scanning needed	Scanning: Scan your own prod-ucts	Interaction with Employees: none or low	Interaction with Employees: av-erage	Cost of Service: Free	Cost of Service: 2,99€	Cost of Service: 5,99€	Time for Check Out: less than 3 minutes	Time for Check Out: 4 to 7 minutes
Partworth Utility	1,22	-1,22	-0,34	0,34	-0,40	0,40	6,47	0,20	-6,67	0,03	-0,03
Scaling the Part-worth Utility	7.15 %	-7.15 %	-1.96 %	1.96 %	-2.34 %	2.34 %	37.80 %	1.15 %	-38.96 %	0.18 %	-0.18 %

Table 16: Level partworths for people over 45 - Automation Technology.

Attribute	Level	Self-Check Out	Automation Technology	Cashier Lane	Averge Partworth Utility
Cost of Service	No cost	0	0	0	0
	€2.99	-5,76	-6,53	-6,23	-6,17
	€5.99	-13,69	-12,61	-11,77	-12,69

Table 17: Level partworths for Cost of Service amongst the check-out methods.

	Partworth Utilities	WTP
Self-Check-Out	-0,64	€0.30
Cashier Lane	-1,27	€0.60
Automation Technology	0	-

Table 18: WTP per check-out method.

	Partworth Utility	Scaling the Partworth Utility	Mean Utility	WTP
Payment Method: Card	0,507	3.3%	0,000	
Payment Method: Super-market App	-0,507	-3.3%	-1,014	0.48 €
Scanning: No scanning needed	-0,113	-0.7%	0,000	
Scanning: Scan your own prod-ucts	0,113	0.7%	0,226	0.11 €
Interaction with Employees: none or low	-0,180	-1.2%	0,000	
Interaction with Employees: aver-age	0,180	1.2%	0,361	0.17 €
Cost of Service: Free	6,379	40.9%	0,000	
Cost of Service: 2.99€	-0,149	-1.0%	-6,529	
Cost of Service: 5.99€	-6,230	-40.0%	-12,609	0.48€.
Time for Check Out: less than 3 minutes	0,689	4.4%	0,000	
Time for Check Out: 4 to 7 minutes	-0,689	-4.4%	-1,377	0.65 €

Table 19: WTP for attribute levels in automation technology