Innovation in the Spanish retail sector: Analyzing customers' acceptance of a Scan&Go tool

Antonio Lorenzo-Espejo, María-Luisa Muñoz-Díaz, José Guadix, Jesús Muñuzuri

Abstract

Smart retail technologies are making their way into stores at a fast pace, as managers identify them as a great opportunity to save costs and attract clients into their shopping establishments. However, customers' acceptance of such innovations cannot be taken for granted. Precisely, managers' concerns about their clients' perception of in-store innovations are one of the main obstacles for the spread of smart retail technologies. In this article, the results of a survey completed by 2,010 customers concerning the introduction in the Spanish retail sector of a self-checkout system known as Scan&Go are analyzed. This tool allows customers to use their smartphones to scan the desired products, which are automatically added to their tab. In order to finish the purchase and leave the store, clients must simply show a code generated by the app to an employee. The paper analyzes and discusses the results of the survey, mainly the respondents' usage intention of the tool, focusing on aspects such as determining factors discussed in the literature, consumption habits and socio-economic background, and studying their influence on customer acceptance. Evidence of a positive response from customers to the introduction of the Scan&Go tool in Spanish retail establishments is found, as well as a target customer profile which can serve as a starting market segment for the deployment of the system.

Keywords

Smart retail technology; Scan&Go; self-checkout; retailing; customer acceptance.

1. Introduction and background

The technological development experienced in recent decades has led to the emergence of smart retail technology (SRT). These technologies integrate an interactive sales system that offers innovative services to customers through interconnected smart devices (Roy et al., 2018), drawing upon technological advancements such as mobile internet, radio frequency identification (RFID) tags, facial recognition, biometric sensors, artificial intelligence (AI) or the Internet of Things (IoT), which are drastically transforming the way people carry out their daily activities.

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The retail sector has not been oblivious to these developments. According to Wilson (2014), the retail sector investment in SRT was projected to exceed 190 billion euros by 2015. The interest of store managers in SRT is driven by the multiple benefits that their businesses can derive from these new technologies (Pantano & Naccarato, 2010).

For shopping establishments, the implementation of SRTs leads to considerable savings in staff costs and increased efficiency (Grewal, Levy, & Kumar, 2009; Roy et al., 2017). However, authors such as Verhoef et al. (2009) argue that it is necessary to take into account the impact of these new technologies on workers' morale and, therefore, on their productivity.

With respect to customers, SRTs are able to improve shopping experience noticeably through new services and features (Hoffman & Novak, 2015). According to Renko and Druzijanic (2014), this entails an improvement in the level of service offered to customers and an increase in sales. Along these lines, Kim and Kim (2008) have found evidence that customers who enjoy their shopping experience make more purchases.

The importance of customers' shopping experience should not be underestimated. Michelli (2006) argues that the success of companies like Starbucks comes from presenting customers with an attractive and differentiated shopping experience. A report by Badgett, Boyce, and Kleinberger (2007) identifies shopping experience as a key factor that companies must take care of in order to foster customer

loyalty towards their brands and services. Furthermore, offering customers the chance of using of mobile-based options for checkout and payment has been shown to lower the overall store price image (Falk et al., 2016).

Additionally, it must be noted that one of the elements on which firms that excel at innovation rely is embedding a social purpose in their corporate culture and channelling resources to the development of innovations that can help solve specific social problems (Pfitzer, Bockstette, & Stamp, 2013). Taking into account the events in recent months due to the COVID-19 pandemic, the modification of existing purchasing processes that derives from the use of Scan&Go would contribute value to the society providing a novel solution in Spain to improve social distancing. This new technology could become a "doing well by doing good" (DWDG) innovation. DWDG innovations refer to, amongst other things, the implementation of modifications of existing processes by firms that create value for society by providing novel and effective solutions to social problems, and value for the firms by enhancing their economic and social performance (Varadarajan & Kaul, 2018). In this sense, Amazon has recently announced its first in-store test of the Amazon Dash Cart (Amazon, 2020), a smart shopping trolley which can also help decrease social interaction at supermarkets.

However, many retailers remain hesitant to implement SRTs. This is mainly due to uncertainty about customer acceptance of new systems. In general, initial customer resistance to change can be expected, as is the case with most technological innovations (Laukkanen, 2016; Mani & Chouk, 2017).

Given the rapid pace of technological innovation at the present time, caution should be exercised in the search for applications of these advancements to the retail sector. Since the beginning of the 21st century, there has been a significant growth in the importance of the role played by consumer dissatisfaction in businesses (Pascual Nebreda, Díez Martín, & Blanco González, 2020). Pantano and Viassone (2014) warn that technological innovations in establishments only make sense if they respond to both consumer preferences and the needs of the businesses. Similarly, Mady (2011) suggests that research on technological innovations in retailing should be focused on whether consumers want to use the technologies in the first place. These findings oppose managers' assumption that all technological additions are a clear improvement for the retailing process from a customer standpoint.

Additionally, the implementation of undesired technologies in the retail context can lead to frustration amongst consumers, which, in turn, can give rise to unfair and unhelpful behaviours (Guchait & Namasivayam, 2012). Still, customer frustration provides managers with the opportunity to offer solutions to clients with maladaptive behaviour, leaving them with the positive feeling that their

problems have been fairly addressed by the retailer (Van Steenburg, Spears, & Fabrize, 2013).

In view of the reasons above, it is essential to understand customers and learn about their preferences and their concerns regarding technological innovations in the retail sector. Furthermore, learning how different types of customers value each aspect of their shopping experiences can help diversify the store clientele, increase the number of customers and retain current clients (Reynolds, Ganesh, & Luckett, 2002).

Gao and Bai (2014) and Inman and Nikolova (2017) highlight the lack of research in this area, while Claudy, Garcia, and O'Driscoll (2015) suggest that this lack of attention can lead to the continued development of new technologies without a proper understanding of the decision-making mechanisms that lead potential customers to accept or reject them.

The main challenge for researchers in the field of technological innovation is to understand the driving forces behind customer acceptance of new technological systems, according to Venkatesh and Davis (2000). One of the tools that provide better results in this regard are technology acceptance models (TAM), which can explain and predict to a large extent the attitude of consumers towards new technologies (Venkatesh, 1999).

In the academic literature, a large number of studies using TAM models can be found concerning the acceptance of new technologies. The analysis of this literature helps identify a series of factors that, according to researchers, influence significantly the attitude of individuals towards technological innovations. Some of the determining factors considered by researchers are the perception of ease of use and perception of usefulness (Davis, 1989; Davis, Bagozzi, & Warshaw, 1989); the perceived enjoyment (Gao & Bai, 2014); and the perception of risk (Roy et al., 2018).

Nonetheless, several other factors can influence the attitude of customers towards SRTs. In particular, regarding self-service technology, Collier et al. (2015) find that situational variables such as the order size, the tolerance for wait-times, the convenience of the location and the presence of employees have a significant influence on the customers' usage intention. Additionally, Mukherjee, Smith, and Turri (2018) detect that the positive effect of RFID-based smart fitting rooms on purchase intention and customer satisfaction is conditioned by the quality reputation of the brand.

This paper seeks to gain a better understanding of customer perception of SRTs in the retail sector through the case of a Scan&Go tool developed by a Spanish company, Comerzzia. The company is trying to implement this self-checkout system in several supermarket chains and small shops nationwide. A self-checkout system can be defined as a set of

integrated digital technologies that try to eliminate the need for customers to go through a traditional till, operated by a worker, when making purchases in a store.

In order to analyze the response of potential clients to the developed system, we use the results of a questionnaire administered to 10,000 individuals during the month of May of 2019, obtaining 2,010 valid responses. This broad sample allows us to draw conclusions about the purchasing habits of Spanish customers, their acquaintance with new technologies in shopping establishments, the factors that influence their acceptance of innovations, their intention to use the proposed tool and their assessment of its functionalities.

Therefore, in this article we attempt to give a response to the following research questions:

Research question no. 1: How do the main factors determining consumers' acceptance of technological innovations affect customers' acceptance of a self-checkout system?

RQ2: How do the demographic and economic features of customers affect their acceptance of a self-checkout system?

RQ3: How do the consumption habits and routines of customers affect their acceptance of a self-checkout system?

RQ4: How do customers rate the features available in self-checkout systems?

The remainder of the article is structured as follows. Section 2 provides a brief description of the Scan&Go system. Section 3 presents the methodology followed for the design and implementation of the questionnaire and for the analysis of the responses. In Section 4, the results of the questionnaire are gathered and interpreted. Section 5 summarizes the conclusions drawn from the analysis and presents the limitations of the study and future lines of research. Finally, the references used in the preparation of this work are provided.

2. Description of the Scan&Go tool

Scan&Go is a self-checkout system that seeks to improve customers' shopping experience in establishments through innovative features. The Scan&Go system developed is based on an app that allows customers to scan the products available in the store using their mobile phone cameras.

This way, the selected items are added to the tab and it is not necessary to scan them at the exit of the store, thus saving the waiting time in queues for customers. In order to carry out the checkout, customers must simply show a code generated by the app to one of the employees in the shopping establishment.

Outside Spain, big retailers like Walmart or Tesco have tested the Scan&Go system in their stores. According to Inman and Nikolova (2017), Walmart implemented Scan&Go in 200 of its stores, drawing from this experiment that customers found difficulties in learning to use their app. Nevertheless, this test was carried out between 2013 and 2014, and an increase in mobile phone use skills can be expected from most customers since that time. Additionally, mobile technologies have improved drastically in recent years, increasing the agility and ease of use of the system.

The Spanish retail sector is not foreign to self-checkout systems. Multiple supermarket chains and department stores use self-payment tills in their different variants (with barcode or RFID tag reading). However, the experience with Scan&Go systems is very limited is Spain. Carrefour, a French retailer with a strong market presence in Spain, installed Scan&Go systems in a small number of stores in the early 2010s, but the initiative has not spread to other establishments since then.

The aim is to develop a mobile-based app that can be used in different supermarket chains and small establishments with a relatively low investment. This would allow customers who wish to use the application to accelerate their purchases, avoiding waiting times in queues. These waiting times can lead to frustration amongst customers, causing them to postpone the purchase or, at worst, decide to switch to another store.

Moreover, the Scan&Go tool seeks to improve the shopping experience and foster customer loyalty by offering various functionalities before, during and after the purchasing process.

3. Methodology

As mentioned above, an online questionnaire has been used in an attempt to obtain data from potential customers regarding Scan&Go and new technologies in shopping establishments. To this end, a survey has been designed, containing 60 questions that have been divided into 3 segments and 16 sections as shown in Figure 1.

Figure 1 Survey structure.
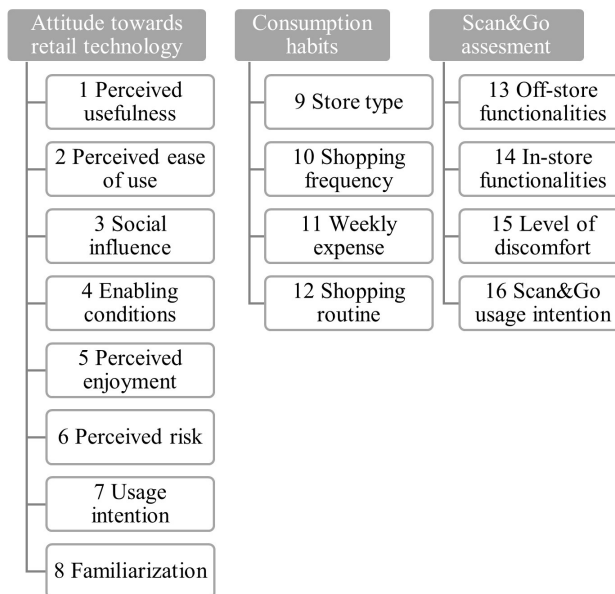
Additionally, various demographic and social characteristics of those surveyed have been collected, such as gender, age, level of educational attainment, employment status and monthly income in the household.

Therefore, the survey contains all the questions and respondent data required to answer the research questions posited in this article. It should be noted that most of the questions in the survey are of stated preference and have been formulated on a Likert scale ranging from 1 to 7, where scores indicate the degree of agreement or disagreement with a statement. On the other hand, it is necessary to point out that, despite not having been able to personally experience the shopping process with Scan&Go, the respondents had to watch a video before completing the questionnaire. This video included an explanation of the tool and a demonstration of the improvements to the purchasing process derived from its use.

During the month of May of 2019, the questionnaire was distributed online to a panel of 10,000 respondents selected according to the specifications in terms of region of origin, age and gender set by the developers of the tool, seeking a faithful representation of the Spanish customer market to which Scan&Go is directed. 2,010 valid responses were obtained, which is equivalent to 20.1% of the total number of questionnaires administered. This sample presents a sampling error of +/-2.2%, considering random sampling, with a confidence level of 95% (Z=1.96) and in the case of maximum variability (p=q=0.5).

4. Results and discussion

In this section a summary of the results of the survey is presented, as well as the main findings obtained from the analysis of the responses.

4.1. Influencing factors

Given the importance of perceived ease of use, perceived usefulness, perceived enjoyment and perceived risk in the shaping of customers' attitudes towards technological innovations and SRT, according to a large number of authors (Davis, 1989; Davis, Bagozzi, & Warshaw, 1989; Gao & Bai, 2014; Roy et al., 2018), it is appropriate to ask respondents about each of these aspects. This will shed light on the actual impact of these factors in the case of a self-checkout system implementation, answering RQ1.

Thirteen questions have been included in the questionnaire to obtain information about specific aspects of the four factors mentioned above. To determine their influence on usage intention, Pearson correlation coefficients have been calculated for the relations between the results obtained for these questions and the Scan&Go usage intention question. This parameter allows us to characterize the relationship between two variables quantitatively.

For each calculated coefficient, its significance is calculated using a bilateral probability test and a confidence level of 99%. Using these parameters, all of the coefficients turned out statistically significant. Table 1 shows Pearson correlation coefficients, which quantify the relationship between the results of usage intention and each potentially determining factor according to the relevant literature.

Table 1 Pearson correlation coefficients of factors and usage intention.

Factor	Question	Pearson correlation coefficient (ρ)
Perceived usefulness	Scan&Go would be useful in your everyday life.	0.692
	Using Scan&Go could enhance your shopping experience.	0.708
	Using Scan&Go would allow you to shop faster.	0.661
	Using Scan&Go would make it easier for you to purchase typical consumer goods.	0.718
Perceived ease of use	Learning how to use Scan&Go seems easy to you.	0.421
	Interacting with Scan&Go seems clear and understandable to you.	0.453
	Using Scan&Go seems easy to you.	0.480
Perceived enjoyment	Using Scan&Go seems entertaining in itself.	0.675
	Using Scan&Go seems enjoyable.	0.707
	You would have fun using Scan&Go.	0.696
Perceived risk	You would feel safe shopping with Scan&Go.	0.658
	You are not bothered by the security measures (security cameras and verification of the weight of the purchase) implemented along Scan&Go technology in order to protect the establishment from theft.	0.536
	You feel safe disclosing your credit card information in order to use Scan&Go.	0.574

Firstly, it should be noted that the Pearson correlation coefficients of the results of the usage intention question with the results of the questions referring to the perceived usefulness and perceived enjoyment factors are greater than 0.65. This implies that there is statistical evidence of a strong correlation between these factors and the usage intention of the technology. In other words, it can be deduced from the observed data that respondents who think Scan&Go is useful and would enjoy using it indicate a greater intention to use the tool.

However, there is no evidence of a strong correlation between the results of the usage intention question and those of the questions relating to the factors of perceived risk and perceived ease of use. Notably, in the case of the three questions that reflect the perceived ease of use of those surveyed, the coefficients have been lower than 0.5.

Therefore, RQ1 is answered through this analysis: perceived usefulness and perceived enjoyment have a greater impact on the acceptance of self-checkout systems, such as Scan&Go, than perceived risk and perceived ease of use. These results could prove very useful for the design of new tools in the retail sector, motivating developers to enhance features that affect in a positive way the factors of perceived usefulness and perceived enjoyment, which, in light of the results, have the greatest influence on the usage intention of potential customers.

4.2. Scan&Go usage intention

Consecutively, the acceptance of the tool by potential customers must be analyzed. In order to obtain this data, respondents have been asked to indicate their degree of agreement with the statement "If Scan&Go were available in stores, I would use it", by means of the Likert scale. This way, we are able to obtain a measure of the respondents' usage intention towards the Scan&Go tool. The percentage of respondents who selected each option in this question is shown in Figure 2:

Figure 2 Scan&Go usage intention.
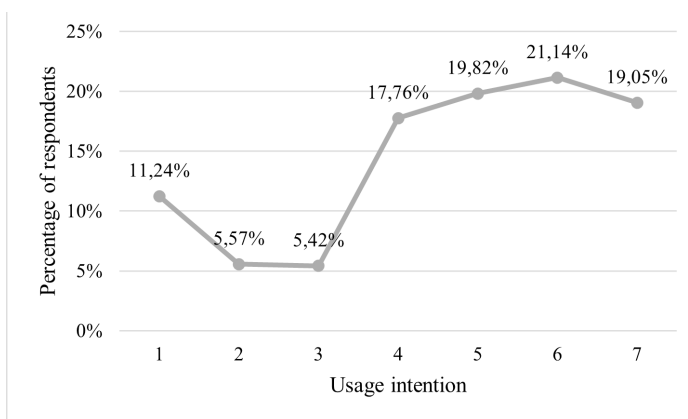
If we add up the percentages of potential customers who have indicated a degree of agreement of 5, 6 and 7, we can state that the acceptance degree of Scan&Go by those surveyed is 60.1%.

Regarding the frequency of use, 56.8% of those surveyed showed to be in favor of using the tool frequently. In fact, 46.3% of respondents indicate that they are willing to use Scan&Go for all their purchases.

From the results obtained regarding the usage intention, it can be deduced that the proposed Scan&Go system could be successfully introduced in Spanish stores. However, it is necessary to delve deeper into the position of potential customers with respect to the tool and the various alternatives for its implementation.

4.3. Target customer profile

One of the main objectives of this study is to find the profile of social and demographic characteristics of potential customers with a high degree of acceptance of Scan&Go. Determining a target customer profile is essential for the implementation of the system in stores, a process that must be carried out gradually in an attempt to minimize the possible initial impact on the retailer's market share.

Such customers could be used as pilot users with two objectives in mind: simplifying the implementation of the system by offering the product first to users with a higher degree of acceptance of the technology and helping to promote the system amongst other customers, who may initially be more reluctant to use Scan&Go.

In order to find the defining characteristics of this target customer profile, RQ2 must be answered. Thereupon, an analysis has been made of the relationship between the different socio-demographic aspects asked about in the questionnaire and the usage intention of Scan&Go.

Figure 3 and Figure 4 show the average usage intention indicated by respondents according to their sex and work status, respectively. The results do not indicate that there are significant differences in the acceptance of Scan&Go according to these aspects. A very small difference can be identified depending on the employment status. Regarding the respondents' sex, only a slight variation can be identified between the usage intention of men and women, of less than 2 percentage points in the acceptance degree. This coincides with the study by Davis, Lang, and San Diego (2014), which shows that, while two different male and female shopping behaviours can be found, these are not determined solely by the customers' biological sex.

Figure 3 Usage intention depending on the respondents' sex.
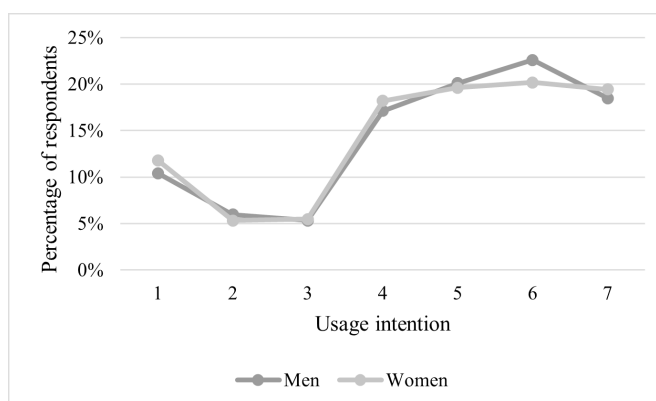
Figure 4 Usage intention depending on the respondents' work status.
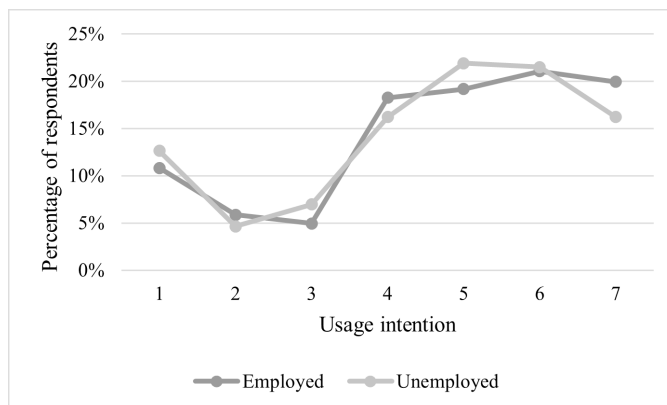
Greater differences can be found depending on the respondents' age ranges. Participants were classified into three age groups: 18-30, 31-45 and 46-60. Figure 5 shows the average usage intention for the respondents in each of these age segments.

Figure 5 Usage intention depending on the respondents' age ranges.
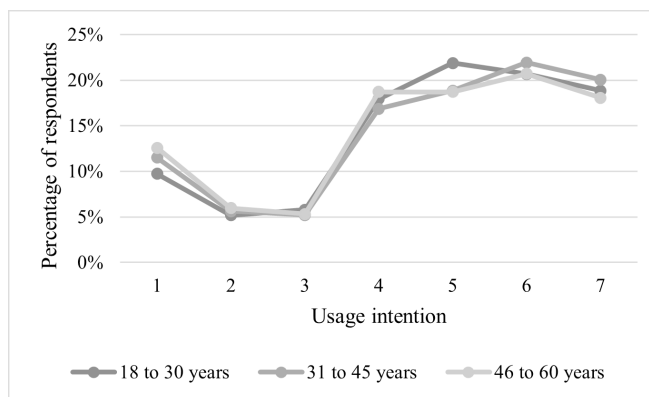
The acceptance degree of Scan&Go is 61.4% for respondents between 18 and 30 years of age, 60.83% for respondents between 31 and 45 years of age and 57.45% for respondents between 46 and 60 years of age. Therefore, a difference of almost 4 percentage points can be observed in the degree of acceptance between the younger and older groups. However, in principle one would expect even greater variation between these groups, as the Scan&Go system is based on a smartphone application, a tool more frequently used amongst the younger demographic.

By analyzing the usage intention of Scan&Go in relation to the respondents' educational attainment, it is also possible to identify clear variations. In particular, a different trend is observed between respondents with basic studies and those with medium or higher studies, as can be seen in Figure 6.

Figure 6 Usage intention depending on the respondents' levels of educational attainment.
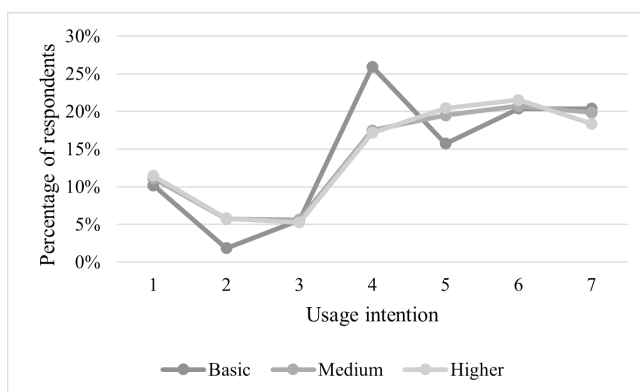

Table 2 shows the acceptance degrees for respondents according to their level of educational attainment. It can be seen that the degree of acceptance for respondents with a medium or higher level is almost 4 percentage points higher than that of respondents with basic educational attainment.

Table 2 Acceptance degree depending on the respondents' levels of educational attainment.

Usage intention	Level of educational attainment		
	Basic	Medium	Higher
Negative	17.59%	22.47%	22.52%
Indifferent	25.93%	17.48%	17.17%
Positive	**56.48**%	**60.05**%	**60.31**%

It is also possible to find substantial differences in the acceptance degree of Scan&Go depending on the average weekly household expenses of the respondents. This information is very relevant, as many medium and large-sized stores keep records of their clients' spending. Therefore, average spending should be one of the characteristics that define the target customer profile. Figure 7 shows the usage intention depending on the average weekly household expense on food, beverages, cleaning products, etc. of the respondents.

Figure 7 Usage intention depending on the respondents' weekly household expenses.
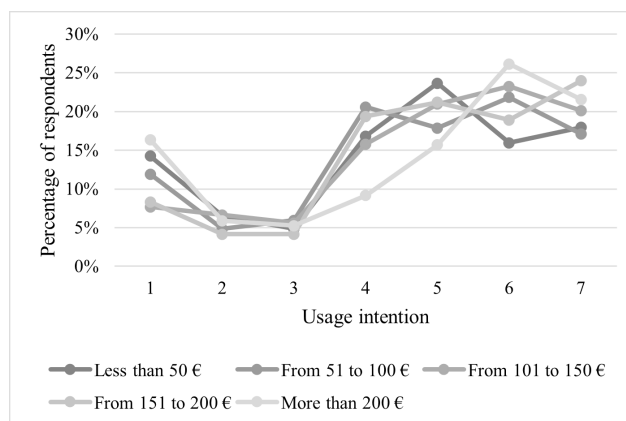
Significantly different trends can be seen from one range of weekly spending to another. By looking at Table 3, it can be concluded that respondents with a weekly expense of more than 100 euros show a significantly higher acceptance of the Scan&Go tool than those with an expense of less than 100 euros. This difference reaches 7.5 percentage points if we compare the acceptance degrees for the respondents who spend from 51 to 100 euros per week and those who spend from 101 to 150 euros per week.

Table 3 Acceptance degree depending on the respondents' weekly household expenses.

Usage intention	Weekly household expenses				
	Less than 50 €	From 51 to 100 €	From 101 to 150 €	From 151 to 200 €	More than 200 €
Negative	25.64%	22.68%	19.92%	16.59%	27.45%
Indifferent	16.81%	20.57%	15.76%	19.35%	9.15%
Positive	**57.55%**	**56.75%**	**64.32%**	**64.06%**	**63.40%**

The respondents' usage intention is then assessed according to the monthly income level in their households, as shown in Figure 8.

Figure 8 Usage intention depending on the respondents' monthly household income.
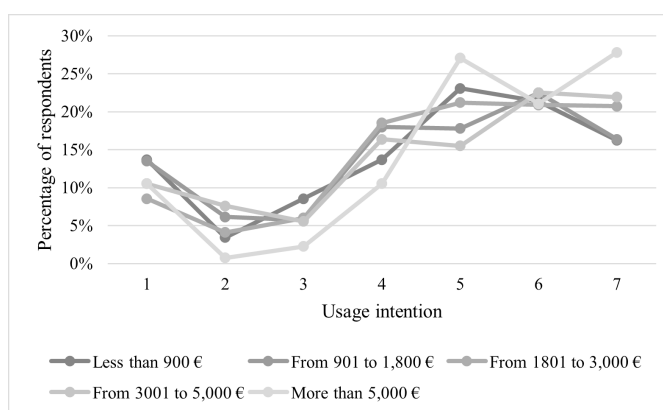

Figure 8 shows a large disparity between the usage intention of one category and another, which can be verified by obtaining the acceptance level for each income range, as reflected in Table 4.

Table 4 Acceptance degree depending on the respondents' monthly household income.

| Usage intention	Monthly household income				
	Less than 900 €	From 901 to 1,800 €	From 1801 to 3,000 €	From 3001 to 5,000 €	More than 5,000 €
Negative	25.64%	25.36%	18.67%	23.68%	13.53%
Indifferent	13.68%	17.99%	18.51%	16.37%	10.53%
Positive	**60.68%**	**56.65%**	**62.82%**	**59.95%**	**75.94%**

Thus, it can be seen that there is a big difference between the acceptance degree of Scan&Go for respondents with a monthly household income of more than 5,000 € and the rest of the respondents. This difference ranges from 13.2 percentage points when compared to the acceptance in the 1,801-3,000 € income segment, to 19.3 percentage points when compared to the acceptance in the 901-1,800 € income segment.

Having analyzed the relationship between the demographic, social and economic characteristics of the respondents and their usage intention of Scan&Go as a response to RQ2, a target customer profile can be elaborated. The following characteristics shape this profile:

1. Medium or higher level of educational attainment.

2. Monthly household income greater than 5,000 €.

3. Weekly household expense on food, beverages, cleaning products, etc. greater than 100€.

As is the case in the study by Sajdakowska et al. (2018), well-educated and high-income consumers are amongst the most accepting of innovations. Respondents with these three characteristics were found to show an average acceptance rate of 79.27%, an increase of almost 20 percentage points compared to the global sample. Figure 9 shows the usage intention for respondents who meet the target customer profile characteristics and for the global sample of respondents.

Figure 9 Comparison of the usage intention indicated by all the respondents and by the respondents who fit the target customer profile.
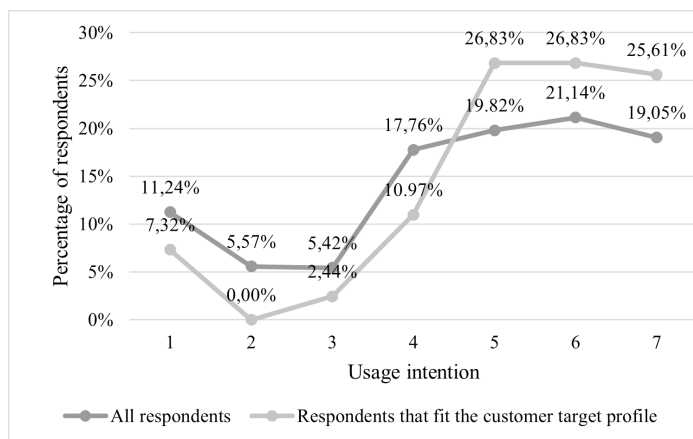
Given these results, offering Scan&Go to the targeted customers first could prove to be an effective market penetration strategy.

4.4. Relationship between customers' shopping habits and Scan&Go usage intention

In the previous section of the analysis, we investigate the relationship between customers' demographic, social and economic traits and their acceptance of Scan&Go. Consequently, we proceed to study the correlation between current shopping habits and routines on the usage intention of the tool in an attempt to answer RQ3.

Firstly, Pearson correlation coefficients are calculated for the respondents' usage intention and the results of each question related to shopping habits and routines. Table 5 shows these coefficients, along with their significance, computed using a bilateral probability test.

Table 5 Pearson correlation coefficients of factors with usage intention

| Shopping habits and routines	Pearson correlation coefficient (ρ)	Significance
Shopping frequency	0.030	0.174
Loyalty card usage	0.120	0
Mobile shopping apps usage	0.320	0
Self-payment tills usage	0.389	0
Online food products purchase	0.272	0
Postponement of the purchase due to long queuing times	0.185	0
Change of store due to long queuing times	0.185	0

As seen in the table, all but one of the correlations turned out statistically significant using a confidence level of 99%. In particular, the Pearson coefficient for the correlation between shopping frequency and usage intention cannot be considered statistically significant.

Table 5 shows a moderate correlation between Scan&Go usage intention and the use of self-payment tills on shopping establishments (p=0.389), the use of mobile shopping apps (p=0.320) and the use of internet for purchasing food products (p=0.272).

Figure 10 displays the percentages of respondents that have shown a positive, indifferent or negative Scan&Go usage intention for each frequency of self-payment tills usage. The graph clearly shows that the percentage of respondents with a positive usage intention increases as the self-payment tills usage frequency grows, while the percentage of respondents with a negative usage intention decreases.

Figure 10 Usage intention depending on the respondents' self-payment tills usage.
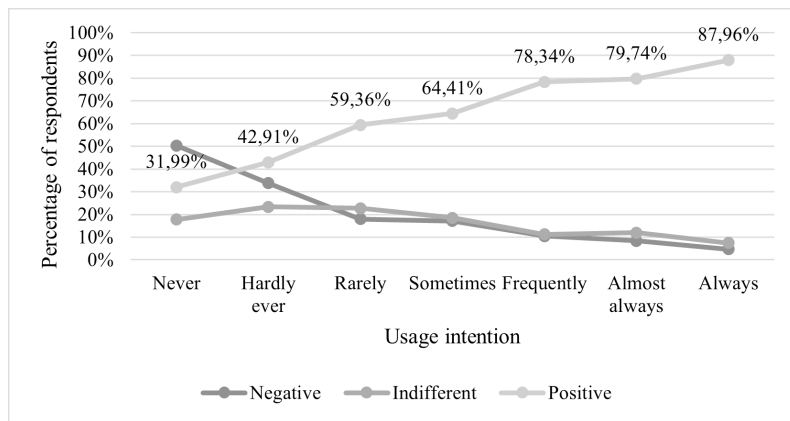
A similar trend, although not as steep as in the previous case, can be observed in the increase of the percentage of respondents with a positive Scan&Go usage intention with respect to their mobile shopping apps usage frequency. This is shown in Figure 11.

Figure 11 Usage intention depending on the respondents' mobile shopping apps usage.
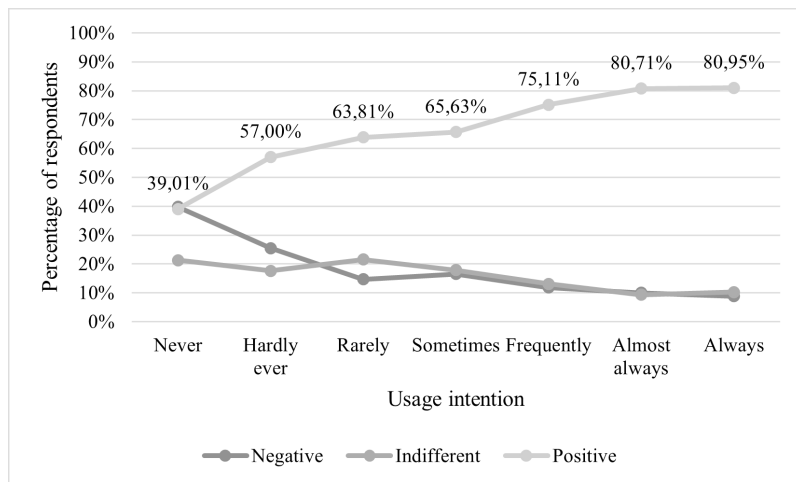
Moreover, Figure 12 depicts how the percentage of respondents that show a positive usage intention grows as the frequency with which they use the internet for food purchases increases. However, the trend seems to be more irregular than in the previous cases.

Figure 12 Usage intention depending on the respondents' mobile shopping apps usage.
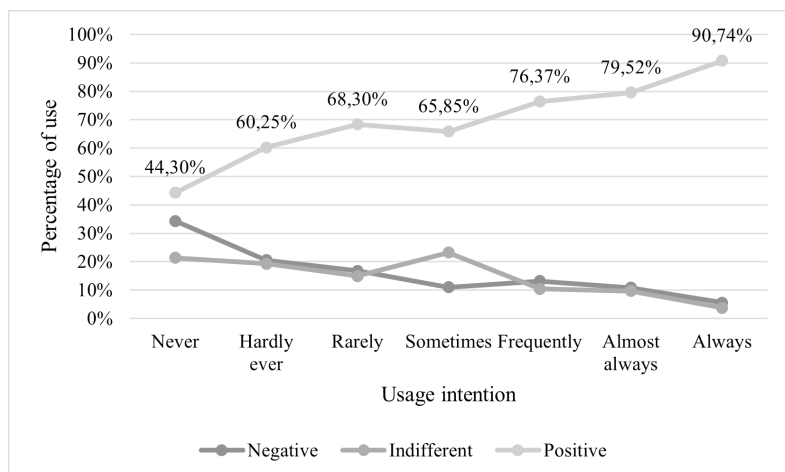
These trends, along with the Pearson coefficients calculated previously, indicate a direct correlation between the three shopping habits and the usage intention of Scan&Go. This seems to be a realistic assessment, as customers with some experience in using technology for their purchases and not refusing to perform the checkout by themselves would certainly be expected to approve of a tool like Scan&Go.

As previously shown in Table 5, there are three other shopping habits or routines for which statistically significant Pearson correlation coefficients have been calculated. These variables are the frequency of loyalty card usage, the frequency of postponement of the purchase due to long queueing times and the frequency of store change due to long queueing times. However, the coefficients computed for these three habits are lower than in the previous cases, which indicates a weaker degree of correlation with the Scan&Go usage intention.

This analysis provides an insight in the behaviour of customers towards new technological innovations in the retail sector depending on their shopping routines and acquaintance with other systems currently found in stores worldwide. On average, respondents have been found to show a significantly better usage intention of the proposed Scan&Go systems if they currently use self-payment tills for checkouts, shop using their cellphones or buy food products on the internet. These results answer RQ3 and could help store managers to narrow down the group of clients to whom offer new self-checkout systems.

4.5. Scan&Go functionalities assessment

The assessment that respondents make of the functionalities included in the Scan&Go tool is described in this section of the study in order to answer RQ4. In addition to analyzing the ratings given by the entire sample, it may also be of interest to study the evaluations given by customers who show a positive usage intention of the tool. Table 6 shows the functionalities of Scan&Go arranged according to the average rating given by the respondents. In addition, the right-hand column indicates the position in the ranking that each Scan&Go functionality would have if only the ratings of the clients that show a positive usage intention of the tool were taken into account.

Table 6 Ranking of the Scan&Go functionalities according to the assessments given by all the respondents and by those with a positive usage intention.

Ranking according to all respondents	Scan&Go functionalities	Ranking according to the respondents with a positive usage intention
1	Cancel a product from your basket	4
2	Find out the price of products by scanning them	1
3	Know the price of your basket at all times	2
4	Have your loyalty card and its advantages embedded in the application	5
5	Locate products in the store	6
6	Pay without having to queue up	3
7	Have access to special offers	10
8	Book products on sale	7
9	Verify that you have selected every item in your shopping list	8
10	Check receipts from previous purchases	12
11	Create a shopping list	9
12	View your expenses	13
13	Have your payment card integrated into the application	11
14	Obtain nutritional information about the products	15
15	Receive special offers or notifications on your mobile phone	16
16	Receive reminders of products you should acquire according to shopping frequency	14
17	Receive suggestions for products related to the items in your basket	17
18	Receive tips on using products or recipes	18
19	Receive suggestions or opinions from other users	19
20	Receive a shopping list proposal based on your previous purchases	20

It should be noted that the first six functionalities in the ranking according to all the respondents match the first six in the ranking according to the respondents with positive usage intention, although they are not in the same order.

4.6. Analysis according to store type

The analysis of the data obtained through the survey has been particularized for each type of establishment, in order to find out in which stores it would be more advisable to implement Scan&Go and how to do so. Respondents had to indicate if they are regular customers of these five main types of stores: traditional markets, small shops, local supermarkets, national supermarkets and hypermarkets.

Table 7 shows the percentage of respondents who have indicated that they are users of each type of establishment.
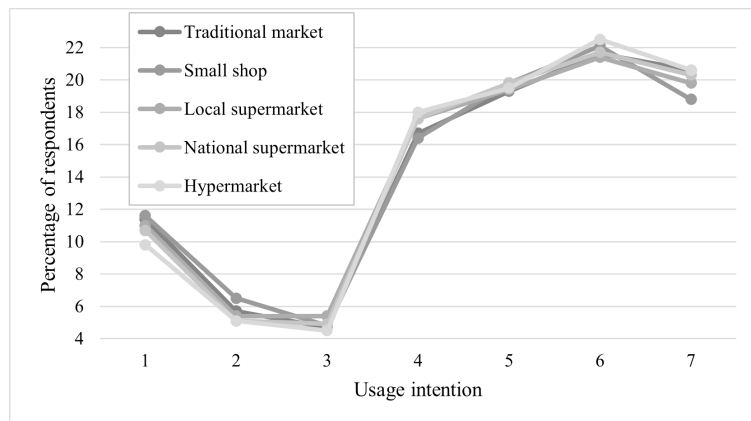
Table 7 Percentage of respondents that purchase at each type of store.

Store type	Traditional market	Small shop	Local supermarket	National supermarket	Hypermarket
Percentage of respondents (%)	47.26	46.17	71.69	89.15	82.49

Analyzing the results while differentiating between the users of each type of store, the variations in the usage intention of Scan&Go are not significant, as shown in Figure 13.

Figure 13 Usage intention depending on the respondents' type of store choice.

It should be noted that only the responses of hypermarket users stand out above those of other users. If we consider the responses indicating a value of 5, 6 or 7 as a positive usage intention towards Scan&Go, we can obtain the customer acceptance degrees for each type of store, which are shown in Table 8.

Table 8 Acceptance degree depending on the respondents' type of store choice.

Store type	Traditional market	Small shop	Local supermarket	National supermarket	Hypermarket
Acceptance degree (%)	61.47	60.67	60.65	61.77	62.61

These results suggest that the Scan&Go tool is more widely accepted by hypermarket users than by other customers. The acceptance degree for this type of store is almost 2 percentage points higher than that obtained for respondents who buy in small shops and for those who buy in local supermarkets. National supermarkets users also indicate a high acceptance degree, less than 1 percentage point below the acceptance degree given by hypermarkets users.

Therefore, according to these results, the most suitable stores to implement the Scan&Go system with the least possible impact on the business' market share are hypermarkets and national supermarkets.

5. Conclusions and future research

The research carried out in this article tries to achieve a better knowledge of the Spanish customers' perception of technological innovations in the retail sector and, specifically, of a self-checkout system, the Scan&Go tool.

The main conclusion drawn from this study is that the majority of the 2,010 respondents show a positive usage intention towards the tool, which endorses the implementation of Scan&Go in Spanish shops. However, much more information is needed in order to carry out this implementation successfully, hence the need for the rest of the analyses presented throughout the article.

The analysis of the influence of certain factors on the usage intention yields some very relevant results: the aspects of the tool that improve the perception of usefulness and the perception of enjoyment of the customers should be enhanced, since these factors largely determine usage intention amongst respondents.

Additionally, a series of demographic, social and economic factors have been found to influence the usage intention of the tool. Based on this information, we have identified three user features that make up a target customer profile: a medium or higher level of educational attainment; a monthly household income of more than 5,000€; and a weekly household expense on food, beverages, cleaning products and similar items greater than 100€. The tool could be offered in its first stages of implementation to clients fitting such profile, that show an average usage intention almost 20 percentage points higher than the global sample.

Customers' shopping routines have also been found to affect their acceptance of the presented tool. The analysis shows that respondents that frequently use self-payment tills, shop through mobile apps or buy food products online show a significantly higher usage intention of the Scan&Go system.

Consecutively, using the results of the survey, the assessment that potential clients make of the different functionalities of Scan&Go has been analyzed. This allows companies developing similar tools to consider eliminating the features that are poorly valued by respondents, such as receiving suggestions from other customers and from the system or obtaining nutritional information from products, with the ensuing economic savings in the development and implementation of the tool.

Finally, the analysis has been particularized for each type of store. This has allowed us to detect that hypermarket users and national supermarket users show a slightly higher usage intention than the rest of the respondents.

The different types of analyses performed in this article address the concerns of the Scan&Go developer about the design and implementation of the tool. However, we believe that the results can be extended to new technological developments implemented in the Spanish retail sector in years to come, as well as being applicable in similar markets globally.

An area of interest for both researchers and developers in the future are open-source retail technologies. For store managers, implementing free-software based systems could reduce significantly installation costs. Furthermore, it is reasonable to assume that customers would adopt innovations faster and more willingly if different chains of stores utilized solutions based on the same system. However, further research is needed in order to estimate the effects of such standardization on customer acceptance.

The conclusions drawn from this study are constrained by a series of limitations, which offer opportunities for future research. Firstly, the respondents have only had the chance of answering the questions included in the survey before using Scan&Go. A deeper understanding of the attitude of customers towards the tool could be achieved by administering the questionnaire to the same panel of respondents after they have been given the chance of using Scan&Go. Such information would allow developing a comparison between customers' initial perception of the tool and their feedback after extended usage, in the likes of the longitudinal study presented by McLean et al. (2020). Additionally, the current global health crisis has complicated the shopping process in physical stores. According to Szymkowiak et al. (2020) the perception of in-store COVID-19 contraction has influenced customers' behaviours. This gives way to a new line of future research: comparing consumers' attitude towards this kind of tools before and after the pandemic. Such a longitudinal study could detect a presumable increase in customers' acceptance of tools that minimize social contact, such as Scan&Go.

A further expansion of this study would be to delve deeper into the factors that influence customers into becoming loyal users of the system, rather than just occasional consumers. In this regard, Urueña-López, Pascual-Miguel and Iglesias-Pradas (2012) propose an integrative model for customer repurchase intention in business-to-consumer e-commerce environments. They find that customer satisfaction and purchasing habits are strong determinants of their repurchase intention. As in the cited study, also performed in Spain, the use of customer surveys and statistical analysis can help isolate the factors that influence customer fidelity to the Scan&Go tool and, as a further step following the market penetration of the SRT, determining a customer profile that characterizes loyal customers.

Acknowledgments

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