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Labeling and consumer purchases

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Abstract

Labeling information and its presentation are intended to guide consumers at a store toward a choice of food that is healthier than they might otherwise buy. Consumer reactions to labeling are examined in this study through the Nutri-Score (food) label, the efficacy and utility of which is still under debate. The aim is to analyze the degree of approval of Nutri-Score through the Technology Acceptance Model, applying structural equation modeling to data gathered from a questionnaire administered to a sample of 478 Spanish consumers. All the hypotheses of the theoretical model were validated. The results of the proposed Nutri-Score Acceptance Model affirmed that perceived usefulness is a direct predictor of consumer attitude and purchasing behavior, when consumers are evaluating the contents of the Nutri-Score label. In turn, perceived ease of use had an indirect influence on the two previous variables. In this study, it is confirmed that Nutri-Score is an effective system for guiding consumer purchase decisions on packaged food. The usefulness of the label generates positive attitudes toward intention of use among consumers.

KEYWORDS

consumer-behavior, food, labeling, Nutri-Score, Technology Acceptance Model (TAM)

1 | INTRODUCTION

Food labels together with routines and other physiological and external signs are among the factors that influence the purchase of foods (Horne, 2009; Medina-Molina & Pérez-González, 2021). Labeling information and its presentation influence purchasing decisions (Bahuer & Reisch, 2019; Calderon-Monge et al., 2021). On the one hand, labeling information is intended to guide consumers at the store toward choosing healthier foods than they might otherwise choose (Wright et al., 2020). In the same way as climate information on food products is conveyed through the carbon label, food labeling information can help consumers identify and choose environmentally-friendly foods (Edenbrandt et al., 2021). As much nutritional information as can be clearly presented on a food label will help facilitate the choice of healthier food options among consumers. Likewise, the way in which information is presented on the food label is related to consumer perceptions and choices, as has been demonstrated with the green identity label (Lin & Nayga, 2022).

Packaged food labeling is a universal concern present in the national legislations of most countries. European regulations can be found on the nutritional information that is considered necessary to facilitate the choice of a food product. Regulation (EU) num. 1169/2011 on the provision of food information to consumers offers an option to firms, of a voluntary nature: the use of Front-of-Pack Labeling (FoPL). Although no substitution for the obligatory nutritional information, it can be used as complementary information, at all times following the above-mentioned Regulation: information that is not misleading for the consumer, nor ambiguous, nor confusing, and that is based on relevant scientific data. The World Health Organization is also calling for consumer-friendly labeling, introducing FoPL that

facilitates an understanding of nutritional information on food products (Bahuer & Reisch, 2019).

FoPL includes classification symbols and systems that summarize the key nutritional information of a product in a more understandable format (Hercberg et al., 2021; Ikonen et al., 2019; Newman et al., 2018; Nohlen et al., 2022) than a mere list of ingredients. It is divided into non-interpretative and interpretative labeling. The former presents a basic amount of nutritional information, providing poor interpretation and poor analysis of the information, significantly reducing the quantity and the complexity of the information (Ikonen et al., 2019; Newman et al., 2018). The latter, interpretative labeling, provides a general evaluation of product healthiness, serving as an interpretative summary of the information that can be of direct help to the consumer when evaluating the nutritional quality of food products (Hercberg et al., 2021). Depending on the level of detail provided, interpretative systems can be categorized into two main types: (1) nutrient-specific labels (i.e., the UK MTL label) and (2) summary indicator labels (i.e., Nutri- Score) (Nohlen et al., 2022).

Nutri-Score is an interpretative label with summary indicator systems that presents specific information on the overall nutritional quality of the product. It integrates various criteria to determine the global nutritional quality of food products and to provide a viewpoint or suggestion based on particular information. Nutri-Score is presented as a color-coded label with five colored letters that range from grade A (green color) to grade E (red color) included on the FoPL. The Nutri-Score grades quantify the nutritional value (A is the healthier and E, the least healthy option). The calculation of Nutri-Score is based on a system of nutrient profiles from the UK Food Standards Agency (FSA score) (Julia & Hercberg, 2017). The letters are deliberately added to improve the legibility of Nutri-Score (de Edelenyi et al., 2019; Julia & Hercberg, 2017).

The objective of implementing Nutri-Score is to help consumers purchase products with better nutritional properties. However, it must be taken into account that the efficacy of Nutri-Score and its usefulness are still under debate (Folkvord et al., 2021). In addition, on the one hand, other labels, such as nutrient-specific labels, compensate and even surpass the effects of Nutri-Score (Medina-Molina & Pérez-González, 2021) and, on the other hand, certain consumers are willing to pay extra for unnecessary food labels that provide no additional information to discerning consumers (Wilson & Lusk, 2020).

In accordance with the above, the objective of this work is to analyze the degree of acceptance of the Nutri-Score label through an adaptation of the Technology Acceptance Model (TAM). To do so, a conceptual model was proposed and several hypotheses were tested through structural equation modeling with AMOS software. Attitudes toward the labeling system were positive, but their effects on intention to use were not as intense as Perceived Use and Perceived Ease of Use.

A review of the scientific literature (Paul & Bhukya, 2021; Priya & Alur, 2023) highlights the limited research within the field of consumer behavior that relates to the influence of nutritional labels, among which Nutri-Score, on the purchase intention of food products, compared to the abundant research conducted in other disciplines, that is, medicine, public health, nutrition, and food (Temple, 2020). Considering that, the 21st-century consumer values healthy eating more than ever before, a research gap in the purchase decision-making process emerges that needs to be addressed.

Furthermore, this research gap is not addressed in this study using models such as the Theory of Planned Behavior (TPB), Value-belief-norm Theory, and the Value Identity Personal Norm Model (Priya & Alur, 2023), that are otherwise widely applied. Instead, the TAM model is chosen, which adds a degree of novelty to the article, as the model has scarcely been applied in non-technological fields.

The TAM model has been extensively applied in the field of technology. However, the literature also contains a significant amount of work in which the TAM model has been applied in other contexts (Marangunic & Granic, 2015). Thus, it can be observed that the TAM model has been applied in non-technological contexts such as apparel products (Ma et al., 2017), outsourcing decisions (Benamati & Rajkumar, 2008), acceptance of new policies (Pierce, 2014), and certification of nonprofit organizations (Slatten, 2012). On the same point, Benamati and Rajkumar (2002) considered the plausibility of applying the TAM model to consumer label acceptance. Hence, the main challenge of this study is to apply the TAM model to test the Nutri-Score label.

The article is structured as follows: after this introduction, the investigations within this field up until today are presented in Section 2 through a literature review, and then the working hypotheses are set out. In Section 3, an explanation is given of the materials that were employed and the application of the method is described. The results are described in Section 4. In Section 5, the results are discussed and the implications, limitations, and future research directions are described. Finally, the conclusions are detailed in Section 6.

2 | THEORETICAL FRAMEWORK AND DEVELOPMENT OF HYPOTHESES

The TAM was mainly developed on the basis of the Theory of Reasoned Action and Cost–Benefit Analysis Theory. It encompasses five dimensions: (1) Perceived Usefulness, and (2) Perceived Ease of Use, both of which encourage the internal variable of (3) Attitude toward Use and, in consequence, they generate (4) Intention to Use and (5) Real Use of the System (Davis, 1989). In general, theories of attitude based on psychological factors set out the attributes of cognitive systems and elucidate causal progression from the perception of attitudes and intention up to the final behaviors and user acceptance (Berbel-Pineda et al., 2018; Davis, 1989). Among those theories, the underlying assumption of cognitive consistency theory (Heider, 1946) posits that individuals are driven to pursue consistent attitudes, thoughts, beliefs, values, behaviors, and feelings. Likewise, the TAM is considered to be the most robust, parsimonious, and influential approach to modeling the behavior of innovation acceptance (Davis, 1989; Pavlou, 2003).

The TAM, whether enlarged or modified, has been extensively used in various contexts beyond technology (Marangunic &

Granic, 2015). Venkatesh (2000) affirmed that the parsimony of the TAM combined with its predictive power facilitates its application in different situations. In the case of food products, the TAM has been applied to the traceability of foods (Kim & Woo, 2016), online food purchases (Nguyen et al., 2019; Wu & Chen, 2005), and FoPL (Mazzù et al., 2021), and, in the fashion sector, to sustainable labels (Ma et al., 2017).

In a context where the consumers are informed, one part of their choice of food products takes place at the store (Sobal & Bisogni, 2009). Nutritional labeling impacts consumers while they are shopping, prompting them to consider the nutritional information before making a purchasing decision (Chen et al., 2023; Gomez et al., 2017). The purchase of foods can be considered a complex decision, due in part to the complexity of understanding nutritional labels that offer excessive information (Grunert & Wills, 2007). In addition, attitudes and purchase intention are influenced by additional factors, such as searching for a product, experience of the product, and its credibility (Caswell & Padberg, 1992; Singh et al., 2023). So, nutritional labels can play a significant role in completing the prepurchase process, helping consumers to take the final decision. Nutritional labels such as Nutri-Score can therefore be seen as a system for supporting decision-making, so that consumers exercise discernment when buying packaged food. In accordance with Spragel (1980), a decision-making support system is defined as any system that helps to facilitate a decision.

No scientific literature has been found where theoretical models have been applied to the Nutri-Score label, to understand the role that it plays in consumer decision-making, as well as the antecedents that prompt consumers to accept information from Nutri-Score. Although there is scientific literature that has highlighted the limitations of the Nutri-Score algorithm (Ter Borg et al., 2021; van der Bend et al., 2022), there are also academic articles on the effectiveness of Nutri-Score in the presence of other interpretative labels of specific nutrients (Medina-Molina & Pérez-González, 2021), the impact of Nutri-Score on consumers (de Edelenyi et al., 2019; Julia, Hercberg & WHO, 2017), consumer attitudes (Folkvord et al., 2021), and purchase intention (de Edelenyi et al., 2019; Folkvord et al., 2021; Freedman & Connors, 2011; Gomez et al., 2017).

Consumers have better perceptions of FoPL and use it better than the nutritional labels on the back of the packet (Folkvord et al., 2021), due to visibility issues. As well as preferring FoPL, they also prefer labels with useful information, and formats with nutritional labels such as graphs and symbols. With the example of Nutri-Score, the processing of colors requires more automatic cognitive processes, in such a way that the colors may be more rapidly perceived and understood than the printed text of other nutritional labels (Gabor et al., 2020). Egnell et al. (2018) in an experimental study on consumer perceptions of five FoPL in 12 countries, discovered that Nutri-Score yielded the best scores for understanding the nutritional quality of a product. However, as Nutri-Score requires less visual attention than other FoPL, consumers tended to overestimate the nutritional quality of the foods, including less healthy foods, in comparison with the experts (Egnell et al., 2018). It would therefore be meaningful to examine the role of perceived ease of use within the context of behaviors toward Nutri-Score use, setting out the following hypotheses:

Hypothesis H1a. The perceived ease of use of Nutri-Score will positively influence its perceived usefulness.

Hypothesis H1b. The perceived ease of use of Nutri-Score will positively influence consumer attitudes.

The purpose of using Nutri-Score is to highlight the affirmation that manufacturers are preparing healthy products. In addition, if consumers tend to use labeling whenever it helps them to take better decisions (de Boer, 2003), then they will lend attention to Nutri-Score when they perceive a benefit that is associated with its use. Consequently, the following hypotheses are proposed:

Hypothesis H2a. The perceived usefulness of Nutri-Score will positively influence consumer attitudes.

Hypothesis H2b. The perceived usefulness of Nutri-Score will positively influence consumer intentions toward its use.

The attitudes of a person, which are constructed upon the basis of past experience, concerns, information, and social pressures will influence the behavior of that person (Fishbein & Ajzen, 1975). Some divergent opinions can be found over the influence of nutritional labeling upon consumer attitudes. Shepherd et al. (1995) stated that beliefs regarding nutritional quality and health effects can be more important than the effects of real nutritional quality when deciding upon personal dietary options. However, Folkvord et al. (2021) affirmed that consumers who are more exposed to somewhat unhealthy food products have those products present in their minds more than the healthy alternatives, and the information of a nutritional label such as Nutri-Score will not change their attitudes. Other studies, notably Davis (1989) and Mazzù et al. (2021), have suggested that the positive attitudes of an individual toward certain products will to a great extent influence their intention to make a purchase (behavior). In the present study, the question of whether the content of Nutri-Score has a positive influence on purchase intention toward Nutri-Score-labeled products was analyzed, leading to the following hypothesis:

Hypothesis H3. The attitude toward Nutri-Score will positively influence the intention to use it.

Nutritional labels affect consumer purchase intentions (Berry et al., 2017; Huang & Lu, 2016). In the case of Nutri-Score, there is greater evidence that the Nutri-Score label influences food purchase intentions (de Edelenyi et al., 2019; de Temmerman et al., 2021; Freedman & Connors, 2011; Gomez et al., 2017) than there is evidence to the contrary (Folkvord et al., 2021). A consensus is therefore

emerging in the literature on the impact of the Nutri-Score label to stimulate consumer purchase intention. For example, de Temmerman et al. (2021) concluded that the Nutri-Score label had an effect on both perceived health and consumer purchase intention in an EU consumer study. In turn, in a study with Belgian consumers, De Bauw et al. (2021) concluded that the Nutri-Score label was associated with the consumption of healthier and more sustainable diets.

However, in addition to purchase intention, some studies have also shown the effect of the Nutri-Score label on increased product consumption levels. For example, a study in a university cafeteria in Colombia concluded that the inclusion of the Nutri-Score label on specific products led to an increase in the consumption of those products, showing an important effect of logo upon product consumption (Mora-García et al., 2019). A field study with Dutch consumers also concluded that the Nutri-Score label encouraged the selection of healthier cereal options (van den Akker et al., 2022). Likewise, another study in France concluded that Nutri-Score increased the purchase of high nutrition foods, but had no effect on medium, low, or unlabeled nutrition foods (Dubois et al., 2021).

In turn, mixed results were found in a study conducted in sports and non-sports shops. In the sports shops, the sales of healthy products were higher than the sales of less healthy products. In contrast, the results followed no defined standard in the non-sports shops. According to Ahn and Lee (2022), it may be due to the scarcity of people looking for healthy food in non-sports shops.

However, no relationship between the Nutri-Score label and purchase intention has been shown in some studies. For example, an experimental study to examine the impacts of the Nutri-Score label on three snacks concluded that the label had no effect on purchase intention, unlike some other studies. That finding may be because the experimental study was applied to unhealthy food products (Folkvord et al., 2021). Unlike the Nutri-Score label, shelf labeling has little influence on consumer behavior (Vandedvijvere & Berger, 2021).

All in all, conflicting results can be found in the literature, suggesting that further research is needed to analyze the impact of the Nutri-Score label on its usefulness, consumer attitudes, and purchase intention.

3 | METHOD

Consistent with the methodological approach developed by Davis (1989), the objective of the initial phase was to describe the items that formed the appropriate scales (see Table 1), to evaluate the reliability of the items, and to verify the scales.

3.1 | Measurement

In the TAM theoretical framework, *Perceived Usefulness* (PU) is defined as the extent to which an individual (consumer) perceives that using a specific system could improve performance at work (purchase decision) (Davis, 1989).

TABLE 1 Sociodemographic characteristics.

Sex		Employment	
Male	11.5%	Unemployed	14.0%
Female	88.5%	Employed	69.2%
		Self-employed	7.5%
		Student	5.6%
		Other	3.7%
Age (years)		Income (€/month)	
18–34	23.9%	<950	2.9%
35–44	45.2%	950–1500	20.9%
45–54	21.8%	1501–3000	51.5%
55+	9.1%	3001–4500	19.9%
		>4500	4.8%
Educational level			
Primary school	6.5%		
Secondary school	37.0%		
High school/university	56.5%		

The construct Perceived Ease of Use (PEOU) was described by Davis (1989) as the extent to which an individual (consumer) perceives that using a specific system (Nutri-Score label) would involve minimal physical and mental exertion. In other words, the extent to which the consumer perceives that the effort needed to understand and to use Nutri-Score will be minimal.

The construct *Attitude Toward Use* (ATT) was defined as the evaluative affect that an individual (consumer) associates with the use of the objective system (Nutri-Score label) in their daily activity (purchase decision) (Davis, 1989).

The constructs were measured through different items (see Table 1) using a 7-point Likert-type scale, based on the study of Dawes (2008), who found no significant differences in variance, asymmetry, and kurtosis using scales of 5, 7, and 10 points. The scales were used to show the level of agreement/disagreement with the statements of the different questions administered to the interviewees.

3.2 | Data collection

The questionnaire in use had previously been administered to 10 participants in a test run and, as a result, some minor changes were introduced in the wording of the questions on the scale. Data were collected through an online survey distributed through different online channels (WhatsApp, Facebook, Instagram, private messages, emails) in November 2021. This method was chosen because the online surveys provided access to larger populations that could be more difficult to access through conventional survey administration techniques (Lefever et al., 2007).

A snowball sampling technique was used to distribute the survey, so as to avoid any bias among the researchers toward the selection of the participants and to improve the geographical diversity. After

having verified invalid, absent, and atypical values, the final valid sample consisted of 478 Spanish purchasers. Spain together with other European Union states, such as France, Belgium, Germany, Luxembourg, the Netherlands, and Switzerland are among the first countries to have implemented the Nutri-Score on a voluntary basis for packaged foods. Nevertheless, while Spanish consumers demand simple, nontechnical labels on foods (Medina-Molina & Pérez-González, 2021), only 30% of consumers consider that the labels are of any use. Galan et al. (2020) demonstrated the superiority of Nutri-Score in comparison with other FoPL in the Spanish market, to encourage consumers to comprehend the nutritional quality of food products. According to these authors, the superiority of Nutri-Score is due to the use of color-coding systems and to the fact that it provides information on global nutritional quality, instead of specific nutrient-related information. Finally, it must be taken into account that no information campaigns to familiarize consumers with the use of Nutri-Score have taken place in Spain.

The sample size was acceptable to obtain reliable results for the estimation of the model. First, the sample is a good representation of a strictly defined population, in other words, the person who purchases the packaged food products. Second, the sample was in line with the standard guideline on the number of cases that should be at least five times greater than the number of indicators (Hair et al., 2010).

Finally, this article has as its objective to enhance the current body of literature through the introduction of the Nutri-Score Acceptance Model (NAM), a new theoretical model extrapolated from the TAM and applied to decisions to purchase healthy foods. To do so, structural equation modeling was performed using the AMOS statistical package and SPSS software.

4 | RESULTS

An analysis of the sample (see Table 1) indicates that the majority of interviewees were women (88.5%) in this study, which might suggest some gender bias. However, it may also be mentioned that the survey was administered to the person who "usually does the shopping for the family unit," who is very often a woman in Spain. In relation with age, the majority of the individuals within the sample were aged between 35 and 44 years old (45.2%), and then between 45 and 54 years old (21.8%) and between 15 and 34 years old (17.6%). With regard to educational level, the majority of respondents (56.5%) possessed higher education/university degrees, while most of the others (37.0%) had completed either secondary school studies, or sixth-form studies, or vocational studies, and a minority (6.5%) had only completed basic or primary school studies. With regard to employment levels, the majority of the respondents were employees (69.2%), unemployed (14.0%), and self-employed (7.5%). The family units of most respondents were formed of 4 (36.8%), 3 (25.1%), or 2 (15.9%) people. Finally, the family units of the majority of respondents had monthly incomes of between 1501 and 3000 Euros (51.5%).

4.1 | Measurement model

Prior to the structural equation-modeling phase, data normality was verified. The coefficients of asymmetry and kurtosis of each observable variable were then analyzed for the study of univariant normality. Hair et al. (2010) and Byrne (2010) suggested that kurtosis and asymmetry values between −7 and 7, and between −2 and 2, respectively, were indicators of the presence of normality in the data. All the coefficients of asymmetry and kurtosis were within the established limits, with which the univariant normality of the data may be affirmed (see Table 2). The Mardia test to verify multivariant normality was applied. If the value of the Mardia statistic is less than $p(p+2)$ where p is the number of observable variables, then according to the criteria of Bollen (1989), the multivariant normality of the data is verified. As observed in Table 2, the value of the Mardia statistic was 378.211, which was less than $27{\cdot}29 = 783$, sufficient to confirm the multivariant normality of the data.

Having verified the multivariant normality, a maximum likelihood model was estimated. Before the parameter estimation process, the evaluation of the model was analyzed, following a two-step methodological approach (Bollen, 1989; Ramírez-Hurtado et al., 2022; Rindskopf & Rose, 1988). First, the reliability and the validity of the measurement model were analyzed and then, the validity of the structural model.

The reliability of the items and the constructs of the measurement model had previously been studied. The reliability of the items was measured by confirming that their standardized factor loadings were over 0.707. The factor loadings exceeded that limit, except for those corresponding to the variables PEOU2 and PEOU7 (see Table 3). Nevertheless, the corresponding factor loadings were found to be close to the reference value. In addition, factor loadings slightly over 0.5 have been considered acceptable (Chau, 1997), for which reason the decision was taken not to overlook those items. It was therefore concluded that the reliability of the items had been verified.

Both the Cronbach's Alpha coefficient and the Composite Reliability were also studied to determine the reliability of the constructs. In the case of Cronbach's alpha, all the values exceeded the reference value of 0.7 (see Table 3). In turn, as may also be seen from Table 3, the coefficients of composite reliability also exceeded the value of 0.7 (Nunnally & Bernstein, 1994). It may therefore be affirmed that the reliability of the constructs was verified.

The next step was to analyze convergent validity and discriminant validity of the measurement model. The Average Variance Extracted (AVE) of each construct was applied, in order to analyze convergent validity. According to Hair et al. (2010), if values exceed 0.5, it indicates that a construct explains over half of the variability of its indicators. All the AVE coefficients exceeded that threshold (see Table 3), leading to the conclusion that the convergent validity of the constructs had been verified.

The evaluation of the measurement model was completed by analyzing the discriminant validity of the constructs. All the correlations between the constructs were below the square root of the AVE

TABLE 2 Concept, label, item, source, and descriptive results.

Concept	Label	Description of item	Min.	Max.	Skew	CR	Kurtosis	CR
Attitude (ATT) (Adapted from Chawia and Joshi (2019))	ATT1	Nutri-Score is good or bad.	1.0	7.000	−0.354	−3.160	−1.278	−5.703
	ATT2	Nutri-Score is relevant or irrelevant.	1.000	7.000	−0.316	−2.824	−1.314	−5.863
	ATT3	Nutri-Score is useful or useless.	1.000	7.000	−0.291	−2.594	−1.379	−6.154
	ATT4	Nutri-Score is valuable or worthless.	1.000	7.000	−0.274	−2.441	−1.397	−6.234
	ATT5	Nutri-Score is not beneficial or is beneficial.	1.000	7.000	−0.419	−3.738	−1.315	−5.871
	ATT6	Nutri-Score is interesting or without interest.	1.000	7.000	−0.450	−4.014	−1.311	−5.851
	ATT7	Nutri-Score is accessible or inaccessible.	1.000	7.000	−0.500	−4.466	−0.793	−3.539
Perceived Usefulness (PU) (Adapted from Davis (1989) and Bauerova and Kleper (2018))	PU1	Nutri-Score helps me to choose my packaged foods more quickly.	1.000	7.000	−0.145	−1.298	−1.425	−6.360
	PU2	Nutri-Score helps me to buy packaged foods.	1.000	7.000	−0.111	−0.992	−1.464	−6.533
	PU3	In general, I find Nutri-Score useful to choose packaged foods.	1.000	7.000	−0.151	−1.348	−1.500	−6.693
	PU4	Nutri-Score could improve the nutritional value of my diet.	1.000	7.000	−0.051	−0.456	−1.545	−6.897
Perceived Ease of Use (PEOU) (Adapted from Chawia and Joshi (2019))	PEOU1	Learning to use Nutri-Score labeling on packaged foods is easy for me.	1.000	7.000	−0.870	−7.761	−0.055	−0.245
	PEOU2	It is easy for me to use Nutri-Score to understand the nutritional value of packaged foods.	1.000	7.000	−0.471	−4.205	−1.015	−4.530
	PEOU3	Reading and decoding the Nutri-Score symbols require little mental effort.	1.000	7.000	−0.855	−7.629	−0.147	−0.657
	PEOU4	The Nutri-Score color-coded system facilitates its use.	1.000	7.000	−1.170	−10.445	0.376	1.677
	PEOU5	Nutri-Score instructions are easy to follow.	1.000	7.000	−1.032	−9.210	0.247	1.103
	PEOU6	In general, I think that Nutri-Score is easy to use.	1.000	7.000	−1.099	−9.805	0.314	1.400
	PEOU7	Nutri-Score is easily recognized on food packaging.	1.000	7.000	−1.220	−10.893	0.993	4.431
Behavioral Intention (BI) (Adapted from Chawia and Joshi (2019))	BI1	I am ready to choose my packaged foods using Nutri-Score.	1.000	7.000	−0.093	−0.834	−1.308	−5.837
	BI2	I intend to use Nutri-Score over coming months.	1.000	7.000	0.009	0.080	−1.429	−6.378
	BI3	Assuming that the foods I need have a Nutri-Score label, I will choose those foods rather than others with no Nutri-Score label.	1.000	7.000	−0.046	−0.409	−1.533	−6.841
	BI4	It is very likely that I will use Nutri-Score to choose my packaged foods in the future.	1.000	7.000	−0.163	−1.456	−1.510	−6.739
	BI5	I think that it is worth using Nutri-Score.	1.000	7.000	−0.147	−1.309	−1.542	−6.880
	BI6	I plan to make regular use of Nutri-Score in the future.	1.000	7.000	−0.033	−0.292	−1.518	−6.774
	BI7	I hope that the use that I make of Nutri-Score will continue in the future.	1.000	7.000	−0.192	−1.712	−1.516	−6.766
	BI8	I will enthusiastic-ally recommend Nutri-Score to others.	1.000	7.000	0.116	1.039	−1.522	−6.790
	BI9	Nutri-Score is crucial to satisfy my dietary needs.	1.000	7.000	0.398	3.554	−1.223	−5.457
		Multivariant.					378.211	104.477

Abbreviation: CR, critical ratio.

TABLE 3 Standardized estimations, reliability, and validity (measurement model).

	λ standardized	Cronbach's α	Composite reliability (CR)	Average variance extracted (AVE)
Perceived Usefulness (PU)		0.974	0.903	0.8982
PU1	0.943			
PU2	0.952			
PU3	0.978			
PU4	0.917			
Perceived Ease of Use (PEOU)		0.939	0.733	0.6983
PEOU1	0.756			
PEOU2	0.677			
PEOU3	0.864			
PEOU4	0.914			
PEOU5	0.938			
PEOU6	0.965			
PEOU7	0.682			
Behavioral Intention (BI)		0.983	0.874	0.8654
BI1	0.918			
BI2	0.918			
BI3	0.923			
BI4	0.970			
BI5	0.956			
BI6	0.971			
BI7	0.939			
BI8	0.919			
BI9	0.853			
Attitude (ATT)		0.976	0.891	0.8847
ATT1	0.951			
ATT2	0.937			
ATT3	0.971			
ATT4	0.962			
ATT5	0.954			
ATT6	0.941			
ATT7	0.864			

(see Table 4), which confirmed the discriminant validity of the measurement model.

4.2 | Structural equation modeling

The structural model of the measurement model was evaluated, specifically its nomological or predictive validity. To do so, two conditions have to be met. First, all the coefficients or paths must be significative. All the coefficients were significative at a significance level of 0.1% (see Table 5). Second, the squared correlation coefficient of the dependent or endogenous constructs had to be higher than 0.3 (Chin, 1998). The values of the squared correlation coefficient for the constructs PU, ATT, and BI were 0.311, 0.827, and 0.883, respectively (Figure 1). With these values, the nomological or predictive validity of the structural model may therefore be affirmed.

In the following, the relations between the latent constructs and their statistical significance are examined. Particularly, all the relations were found to be significative. According to Davis (1989), PEOU was found to be a significant predictor of PU and ATT toward the use of Nutri-Score. The influence of PU on ATT, and subsequently on the intention of use (BI), was significant. In addition, ATT moderated the relation between PU and intention in a significant way, pointing to a partial mediation, as the direct effect was greater than the indirect effect. All the above yielded a basic validated NAM that connected PU and PEOU with the formation of ATT and BI (Figure 1).

Finally, a variety of indices were used to measure goodness of fit. Wheaton et al. (1977) considered the coefficient χ^2/df to be a measure of the global fit of the model. Moreover, they affirmed that

TABLE 4 Discriminant validity.

	PEOU	PU	ATT	BI
PEOU	**0.836**			
PU	0.558	**0.948**		
ATT	0.563	0.907	**0.941**	
BI	0.538	0.928	0.904	**0.930**

Note: The values shown along the main diagonal correspond to the square roots of the Average Variance Extracted (AVE) of the variable, while the other values indicate the correlations between the constructs.

values lower than 5 indicated that the model showed a good fit with the data. In our case, the coefficient χ^2/df yielded a result of 2.45, which also indicated a well-fitted model. Except for the GFI coefficient, which was very close to 0.9, the rest of the measures were found within the required limits for a good fit of the data (GFI = 0.893; CFI = 0.979; RMSEA = 0.055; NFI = 0.965; NNFI = 0.976; PNFI = 0.855).

Regarding the overall standardized effects, PU had the greatest impact on intention to use Nutri-Score, with a total effect of 0.912, after which came PEOU with a total effect of 0.538 and, finally, ATT with a total effect of 0.353 (see Table 6).

The results showed that Spanish consumers expressed an intention to use Nutri-Score when deciding to purchase packaged food products, because of its perceived usefulness rather than because of its ease of use.

5 | DISCUSSION

All the hypotheses of the conceptual model were validated. On the basis of the proposed Nutri-Score Acceptance Model (NAM) results, it may be affirmed that perceived usefulness was a direct predictor of ATT and BI among consumers considering the Nutri-Score label. In turn, the answers of the respondents suggested that PEOU had an indirect influence on the two aforementioned variables. In this way, an alternative and complementary framework has been proposed to those currently in use (see Grunert & Wills, 2007).

The findings indicated that consumers perceived Nutri-Score as a useful label, because it helped them to discern healthier foods and, therefore, to make better purchase decisions: facilitating those decisions, saving time when making the decision, and leading to product choices of better nutritional value. Contrary to the findings of Baker (2002), it was found in this study that consumers had to make little mental effort to read and to interpret the meaning of the Nutri-Score symbols. However, and as Folkvord et al. (2021) and Gabor et al. (2020) noted, consumers might run the risk of overestimating the nutritional value of foods in comparison with an expert assessment when interpreting the meaning of Nutri-Score, because Nutri-Score is a summary label with no itemization of nutrients. The explanation is that, as a summary label, Nutri-Score acts as a heuristic mental short-cut that reduces complex tasks to simple judgments (Hertwing & Pachur, 2015). It therefore has greater visibility and requires less visual attention (effort). Finally, the influence of attitude toward the use of Nutri-Score on intention of use was the smallest of all. There was a more intense positive influence of the usefulness of the label than the attitudes toward intention to use Nutri-Score among consumers. One explanation might be that Nutri-Score is perceived as useful, due to its ease of use, because the instructions are easy to follow, the color-code system helps with its use, and reading and interpreting the meanings requires little or no mental effort.

In short, in the context of food labeling, the validity and the solidity of the model was confirmed, in the same way as it had been in both France and Italy (Mazzù et al., 2021). It can likewise be applied to other Mediterranean countries, that is, Spain and Greece where it has been noted in different studies that the Nutri-Score calculation algorithm is consistent with the dietary model characteristic of the Mediterranean region (Gómez-Donoso et al., 2021; Itsiopoulos et al., 2022). This finding is important in the case of Spain, because the implementation of Nutri-Score in firms is a voluntary decision. The evidence suggests positive intention of use toward Nutri-Score that consumers have demonstrated when the label is perceived as both useful and easy to use.

5.1 | Policy implications

This study is the first application of the original TAM to Nutri-Score with favorable results. It opens the door to further progress, enlarging and modifying the TAM that is presented in the literature, in order to contribute to the adoption of Nutri-Score as a label that helps consumers to take healthier purchasing decisions and in a way that helps firms to incorporate Nutri-Score in their FoPL.

With regard to its *managerial contributions*, the importance of Nutri-Score among consumers has led the firms within the food sector to the conclusion that nutritional labeling is a key aspect in the decision-making process for food product selection. In addition, the consumer focuses on those labels that are easy to interpret and can be rapidly understood, because on most occasions, the choice of healthy foods is affected by the scant nutritional knowledge of the population, lack of time when shopping, and complex ways of presenting nutritional information.

Manufacturing firms should therefore concentrate on including FoPL in their food product packaging, such as Nutri-Score that has high evaluations, if they wish to be chosen over and above their competitors. In addition, firms should facilitate information to consumers, so that they choose healthier foods when making their purchasing decisions, thereby generating higher sales of such foods. One consequence of improved dietary patterns among consumers would be less governmental intervention to improve existing dietary patterns within a country and less social expenditure on illnesses, linked to over consumption of poor-quality foods.

5.2 | Theoretical implications

Existing knowledge has been reinforced and new knowledge contributed in this research. Among the most novel aspects, the Technology

TABLE 5 Structural model validity and estimations.

Hypotheses	Unstandardized β	Standardized β	*SE*	CR	*p*-valor	Supported
PU ← PEOU	0.866	0.558	0.071	12.265	***	Yes
ATT ← PU	0.867	0.861	0.031	27.887	***	Yes
ATT ← PEOU	0.129	0.082	0.039	3.337	***	Yes
BI ← PU	0.555	0.607	0.044	12.508	***	Yes
BI ← ATT	0.321	0.353	0.043	7.532	***	Yes

Abbreviations: CR, critical ratio; *SE*, standard error.
***Significance level <0.001.

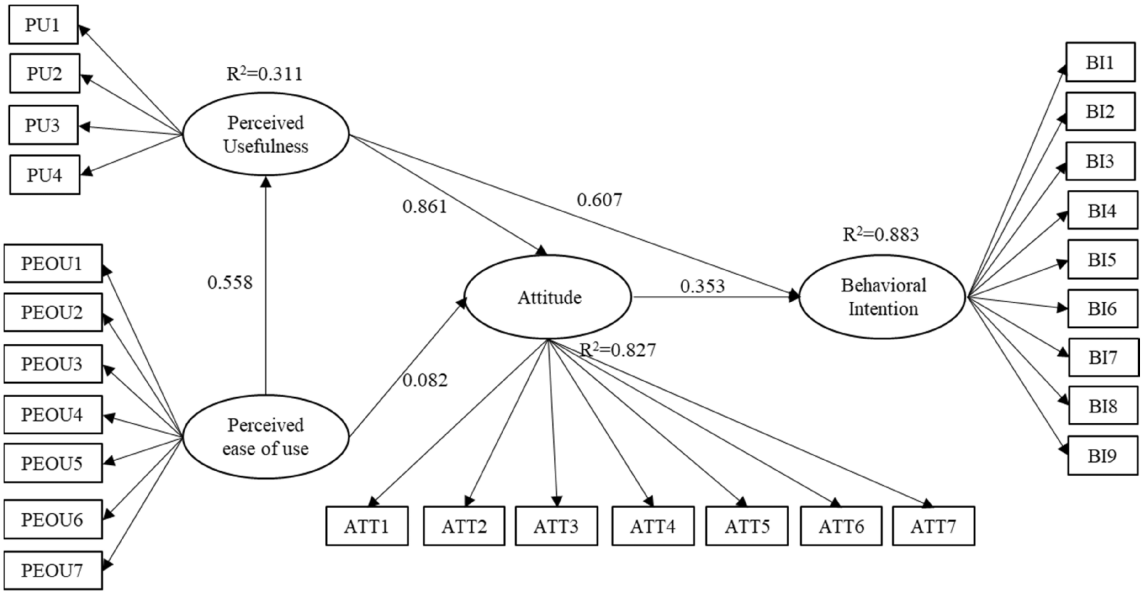

FIGURE 1 Estimate of structural equation model.

TABLE 6 Standardized total effects.

	PEOU	PU	ATT	BI
PU	0.558	0.000	0.000	0.000
ATT	0.563	0.861	0.000	0.000
BI	0.538	0.912	0.353	0.000

Acceptance Model (TAM) has been applied to a scenario in which the products are not technological ones, although a degree of innovation for the decision-maker is necessary. In the case of the Nutri-Score label, the innovation relates to the traffic light system for conveying nutritional information to the consumer. This article has therefore added to the scarce research on applying the TAM model to nontechnological products.

In addition to the above, the results obtained in this article reinforce the functioning of the TAM model. The model serves to explain the intention to use the Nutri-Score label. In other words, consumers who perceive the ease of use and usefulness of a technological or innovative product will generate a positive attitude toward that product, favoring their intention to use it. The Nutri-Score label has been shown to be effective in informing consumers about the nutritional quality of food products and helping them make healthier choices at the point of purchase (de Temmerman et al., 2021; Hercberg et al., 2021; Julia & Hercberg, 2017). It is a useful easy-to-use label that generates an attitude toward purchasing behavior.

5.3 | Implications for consumers

The usefulness of the Nutri-Score label for consumers, because of its ease of use, has some implications. First, the Nutri-Score label facilitates food-product purchasing decisions among consumers. Faced with a decision between products that either have or do not have the Nutri-Score label, consumers would choose the former because those labels provide more information. In addition, products with the Nutri-Score ecolabel can be selected by looking at the lettering and the colors of the ecolabel, because the information that the consumer is looking for and that is needed to make the decision can be found on the label. In that way, the consumer saves time when choosing some rather than other products within the same range, based on nutritional information; understanding and comparing the information on one or another product with far less effort.

Second, from the point of view of health, the Nutri-Score labeling code helps the consumer choose the most nutritional health-related

products. Greater value is being attached to healthy eating nowadays among some segments of consumers. Nutri-Score labeled foods therefore provide information on the nutritional aspects of food products, facilitating consumer choice. For those consumers whose eating habits are unhealthy, Nutri-Score labelled products are an opportunity or a lure to change their habits, if they may wish or need to do so.

5.4 | Limitations and future research directions

The present study has limitations, which will be explored in future research, seeking to enlarge upon and to modify the TAM. Some of the limitations are: not having considered different external determinants of perceived usefulness—individual differences between consumers and social pressure, among others—, and of Perceived Ease of Use (PEOU), as well as the perception of external control. Consumer familiarity with food products displaying the Nutri-Score label and the external effects arising from earlier experience with other labels were also not taken into account. This limitation is also a future research direction for those researchers who might wish to extend the TAM model to other food nutritional labels.

Some directions for future research can be derived from this work, which are important within the field of consumer research (Paul & Bhukya, 2021). For instance, future lines of research related to an extension of the TAM model. First, perceived information (Kim & Woo, 2016) could be incorporated into the original TAM model to examine the PU of Nutri-Score to the consumer. If consumers refer to labeling because it helps them to make their product purchase decision, those consumers who wish to ascertain nutritional information, will perceive the useful of using Nutri-Score, because that label will facilitate the elimination of information asymmetries that might arise between the information they seek and the information that food product manufacturers choose to supply.

Second, some divergent opinions on the influence of nutritional labeling upon consumer attitudes, as previously discussed, suggest that trust in the information provided by Nutri-Score could be another important factor in the extended TAM model, influencing both consumer attitudes and purchase intention. Trust in Nutri-Score-related information will lead to positive attitudes toward Nutri-Score-labeled products and will positively influence purchasing intention among consumers.

Third, the pressure of subjective beliefs of family and friends, and subjective norms or pressure from others that influence consumer behavior may also influence intention to purchase Nutri-Score-labeled products.

Finally, some other variables such as health awareness and consumer purchasing habits should be taken into account. In the first case, health awareness might well deepen the influence that healthy and sustainable diets have on consumer' attitudes toward labels. Consumers whose health concerns are greater will have more positive attitudes toward Nutri-Score than consumers whose health concerns are less present in their minds. In terms of purchasing habits, the intention to purchase products will differ depending on habits consumer. Consumers who shop online may be less likely to buy Nutri-Score labeled products than those who shop offline.

This study has been conducted with data gathered Spain. Health perception, purchase intentions, nutritional knowledge, and dietary behavior vary between one country and another, whence the importance of replicating this study in other countries, to see whether the results might differ. Finally, the emotional impact caused by the perception and attractiveness of the Nutri-Score label logo could be analyzed through neuromarketing techniques, a highly topical and emergent line of research over recent years.

6 | CONCLUSION

The objective of this work has been to offer insights into the discussion surrounding the Nutri-Score nutritional label in Spain. The study has been focused on the acceptance of this labeling system among consumers, and its usefulness and ease of use, in order to orient decisions toward the purchase of healthier foods. The TAM, understood as a consumer decision-making support instrument at the store, has been applied to the Nutri-Score label, which is considered an effective consumer decision-making support system on packaged foods. In this study, the variables that contributed to generating positive attitudes within consumers who referred to Nutri-Score before making their packaged food purchasing decisions were, in order of importance, the usefulness of the label, followed by PEOU.

AUTHOR CONTRIBUTIONS

Esther Calderon-Monge and Inés Ramos Cuesta contributed the conception of the manuscript. José M. Ramírez-Hurtado performed the analysis and Esther Calderon-Monge helped to perform the analysis with constructive discussions. José M. Ramírez-Hurtado and Esther Calderon-Monge performed the data analyses and wrote the manuscript. All authors contributed to the article and approved the submitted version.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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