



## **Do we all consider the same packaging elements as critical? Empirical findings from food product packaging**

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### **Abstract**

A cross-sectional survey was conducted from March to June 2019 of identifying and evaluating packaging elements of food products. A sample of 1,219 customers (657 women – 562 men) participated in the study. Based on a review of existing research, a pool of 43 packaging elements for food products was developed, aiming to examine the most important packaging elements that have a positive relationship on consumer behavior in buying food products. Hierarchical cluster analysis (HCA) and exploratory factor analysis (EFA) were conducted on a random split-half sample of the data to examine the factor structure of the 43 items in the general population. Confirmatory factor analysis (CFA) was conducted in the holdout sample. The HCA and EFA of the packaging items resulted in a seven-factor solution: (1) Informational content, (2) Content protection and recognition, (3) Smart functioning, (4) Geometry, (5) Environmental friendliness, (6) Endurance and (7) Coloration. CFA in the holdout sample supported this factor structure. It was found that sociodemographic factors

such as gender, place of residence and age are related to the customer's evaluation of a food item's packaging. The findings of the present study are enlightened by the consumers' attitudes and predispositions towards packaging, thus having possible managerial applications.

**Keywords:** Marketing, Package, Food Products, Consumer Behavior, Packaging Elements

## 1. Introduction

The food sector plays an essential role in all economies. In the US, it accounts for about 5% of gross domestic product, 10% of total employment, and 10% of consumers' disposable personal income (DPI) (Committee for Economic Development of The Conference Board, 2017). According to the European Commission, "*The food and drink industry is the EU's biggest manufacturing sector in terms of jobs and value added*". The EU food and drink industry employs 4.72 million people, generating a turnover of €1.2 trillion and €236 billion in value added, making it the largest manufacturing industry in the EU (Food Drink Europe, 2019). In Greece, it is also the largest employer of domestic processing, employing more than one third of all employees, while it is also among the most prominent sectors in manufacturing, with a production value reaching 24.7%, and gross value added at 24.3%, occupying second place in terms of turnover (Foundation for Economic & Industrial Research, 2018).

Packaging is one of the most crucial operations in the food industry. Almost all of the foods we trade or consume come in some sort of packaging in one form or another. The global food packaging market size was estimated at USD 303.26 billion in 2019, exhibiting a compound annual growth rate (CAGR) of 5.2% over the forecasted period (Grand View Research, 2020). In very simple terms, we can define the packaging of food products as all the materials, of any kind, used to protect, manage, deliver and present products, from raw materials to finished products, from the producer to the user or the end-consumer. Apart from the functional role of packaging, there is also the communicative role, quite simply because it becomes the voice and face of the producer's image and identity (Jönson, 2000). As Silayoi and Speece (2004) argue, the package becomes a critical factor in the consumer decision-making process because it communicates with the consumers at the very moment that they are actually making a decision in the store. A US study conducted by the Paper and Packaging Board and IPSOS

shows that 7 in 10 (72%) consumers agree that packaging design can influence their purchasing decision (IPSOS, 2018).

Many researchers have identified the multifunctional nature of packaging in the food industry. Rundh (2013) points out that: *“in today’s market, packaging consists of three functions which include logistics, commercial and environmental functions”*. Today more than ever, companies have come to realize that packaging can certainly affect consumers’ decision-making, as well as improve the performance of a business in terms of storage and transport, by standardizing their respective logistics activities, at the same time as minimizing their operational costs and giving the market a pro-environmental image with a high sense of social responsibility (Prendergast and Pitt, 1996; Bowersox and Closs, 1996; Lambert, Stock and Ellram, 1998; Marsh and Bugusu, 2007; Louw and Kimber, 2007; Silayoi and Speece, 2007).

From the analysis of the relevant literature, the authors of the present study appreciate the need for a research concerning the main elements of packaging in the food industry from a holistic point of view. This view encompasses the needs of marketing and logistics managers, food technologists and executives responsible for environmental issues, as well as the consumers of food products. By identifying the significance of all the above-mentioned factors against the various elements of the packaging of retail products, manufacturers can take into consideration the elements that are highly appreciated by both cohorts which is especially critical in Greece that (according to the literature) there is no a holistic point of view in the design of the packages in the food industry.

In order to achieve the above aim, for the purposes of this study, primary data were collected through a survey via questionnaires that were filled in by consumers of food products which is a very important and competitive sector in Greece. The main research questions of this study are as follows: *“What do consumers consider to be the most important elements of food packaging? Do their views differ in terms of their demographic characteristics?”*

The paper is organized as follows: The next section identifies the elements of the packaging of food products from the point of view of marketing, logistics, food technology and the environment. Based on these elements, primary research is applied in the food industry. The sample included responses from consumers of food products in Greece. The next section presents and discusses the findings, ending with discussions, conclusions and recommendations in the final section.

## 2. Elements of packaging

Packaging serves various significant roles and goals in the following functional business areas:

- Marketing, which aims to attract consumers to buy the product.
- Logistics and Supply Chain Management, which supports the physical protection of products during their handling and storage processes, against damage, shock, vibration, temperature, heat, moisture, etc., also including the unitization of foods, sorted from one type of packaging to a bigger load unit, in order to facilitate their movement within the food supply chain. Primary packages (items) are grouped into secondary packaging units (e.g. cartons) and these in turn are grouped into tertiary packages (transport packs), such as pallets, for example.
- Food technology, which aims to achieve consumer health protection against microbial and bacterial contamination/spoilage, taking into account the climatic hazards of the products, by keeping them healthy, clean, fresh, sterile and safe for their intended shelf life. Moreover, they provide information to consumers on topics concerning the use, consumption, storage, and recycling of packaged foods.
- The environment, which aims to reduce the impact of packaging on the environment or for the packaging to be produced by using reusable, recyclable and renewable resources.

The above-mentioned features of packaging are served by a variety of elements, which comprise elements that have been identified to serve the requirements of the four aforementioned functional areas. Nancarrow et al. (1998) use the term “attributes”. They argue that brands of food products use a range of packaging attributes, combining colors, designs, shapes, symbols and messages, which collectively make an impact on consumers’ buying behavior. As Silayoi and Speece (2004) point out, these attract and sustain attention, helping consumers identify with the images presented. Many researchers also identify a number of elements that increase the efficient and smooth flow of products across the supply chain (Johnsson, 1998; Bjarnemo, Jonson and Jönson, 2000) and support the traceability of the food products (Ahmed, A., Ahmed, N. and Salaman, 2005; Rundh, 2009). Furthermore, as Guillard et al. (2018) argue, an innovative sustainable form of packaging aims to address food waste and reduction of losses by preserving food quality as well as food safety issues, aiming to prevent food-borne diseases and chemical contamination.

Generally speaking, many researchers have tried to identify the key elements of the package (especially in the food industry) which have an impact in the four above disciplines involved in the packaging of food products. An indicative list of these can be found in Table 1.

**Table 1. Elements of packaging**

<b>Authors/year</b>	<b>Title</b>	<b>Packaging elements (*)</b>
Sonsion (1990)	Packaging design: graphics, materials, technologies	Size impacts the visibility of the package and the information displayed
Bloch (1995)	Seeking the ideal form: product design and consumer response	The form or exterior appearance of a product is meant to communicate information to consumers
Meyers-Levy and Peracchio (1995)	Understanding the effects of colour: how the correspondence between available and required resources affects attitudes	Photographs and illustrations
Sauvage (1996)	The marketing aspect of packaging	Materials
Prendergast and Marr (1997)	Generic products: who buys them and how do they perform relative to each other?	Size, shape, colour, material, and aesthetic appeal
Nancarrow, Wright and Brace (1998)	Gaining Competitive Advantage from Packaging and Labeling in Marketing Communications	Image layout, colour combinations, typography, product photography, and the total presentation communicates an image
Underwood & Ozanne (1998)	Is your package an effective communicator? A normative framework for increasing the communicative competence of packaging	Pictures on the packaging
Raghubir and Krishna (1999)	Vital Dimensions in Volume Perception. Can the Eye Fool the Stomach?	Size and shape of the packaging
Grossman and Wisenblit (1999)	What we know about consumers' colour choices	Colours on the packaging
Mitchell and	Marketing causes and implications of	Layout

Papavassiliou (1999)	consumer confusion	
Madden, Hewett and Roth (2000)	Managing images in different cultures: A cross-national study of colour meanings and preferences	Packaging colours and logos
Rettie and Brewer (2000)	The Verbal and Visual Components of Package Design	Product photography, positioning, text font style, size, and colour
Coulson (2000)	An application of the stages of change model to consumer use of food labels	Food labeling
Silayoi and Speece (2004)	The importance of packaging attributes: a conjoint analysis approach	Package size, shape and elongation affects customer judgments and decisions.
Singh (2006)	Impact of colour on marketing	Packaging colours
Vila and Ampuero (2007)	The role of packaging in positioning an orange juice	Colour, typography, shape and image.
Rundh (2009)	Packaging design: creating competitive advantage with product packaging	Shape, size, colour, texture, photograph or illustration, other graphics, logo
Mutsikiwa and Marumbwa (2013)	The Impact of Aesthetics Package Design Elements on Consumer Purchase Decisions: A Case of Locally Produced Dairy Products in Southern Zimbabwe	Colour
Rundh (2013)	Linking Packaging to Marketing: how packaging is influencing the marketing strategy	Package size, shape, text, colour, material and graphics and its functional elements
Muhammad and Kamran (2014)	Visual Elements of Packaging of Packaged Milk on Consumer Buying Behaviour	Packaging colour, design, material, size and graphics
Vyas (2015)	Packaging Design Elements and Users Perception: A Context in Fashion Branding and Communication	Name of the brand, colour combination, font, picture on packaging, shape, size, product information and description, colour of brand name, graphics, visual information, logo and material
Davis, Bagozzi, and	User acceptance of computer technology: a comparison of two	Ease of use

Warshaw (1989)	theoretical models	
Holmes and Paswan (2012)	Consumer reaction to new package design	Ease of handling
Ahmed, Ahmed and Salaman (2005)	Critical issues in the packaged food business	Traceability
Rundh (2009)	Packaging design: creating competitive advantage with product packaging	Investigating elements of packaging that support (food) product safety
Molina-Besch, Wikström and Williams (2019)	The environmental impact of packaging in food supply chains – does life cycle assessment of food provide the full picture?	Reusable materials
Marsh and Bugusu (2007)	Food packaging: Roles, materials, and environmental issues	Green label
(*) Items falling within the current legislative, regulatory and institutional framework have been excluded, since they are mandatory.		

Ye, Morrin, and Kampfer (2020) provide an excellent overview of (visual elements in) packaging research by providing a summary of prior research on product packaging. They also examining the effect of glossy versus matte packaging in food products.

Based on the above studies, as well as the findings of Konstantoglou et al. (2016, 2017 and 2018) concerning research initiatives that have concentrated on the food industry, 43 elements were extracted, which were then classified into the following four categories: informational elements, operational elements, physical elements and visual elements.

[Inf.q1]	Provides nutrition information
[Inf.q2]	Reports production or reproduction techniques
[Inf.q3]	Includes quality standards marks
[Inf.q4]	Includes marks that show the compliance to environmental practices
[Inf.q5]	Includes data that support traceability
[Inf.q6]	Includes product identification coding schemes such as barcode, QR-code, etc.
[Inf.q7]	Includes marks for flammable / hazardous materials, storage conditions and brand elements
[Inf.q8]	Provides proposed ways of consumption
[Inf.q9]	Suggest recipes for this product
[Inf.q10]	Indicate country of origin and secondary materials
[Inf.q11]	Shows product temperature at any given time
[Inf.q12]	Designates protected origin name
[Oper.q1]	Protects the product from theft
[Oper.q2]	Protects the product from moisture
[Oper.q3]	Can easily be mounted on the shelf
[Oper.q4]	Does not expose the product to light
[Oper.q5]	Allows visual contact with part of the product
[Oper.q6]	Can easily be transported and handled
[Oper.q7]	Allows packaging in larger packages/logistics units (carton, pallet, etc.)
[Oper.q8]	Is ready to cook
[Oper.q9]	Increases product life
[Oper.q10]	Has a smart label
[Oper.q11]	The shape of the package describes the product content
[Oper.q12]	Does not expose light to solar radiation
[Phys.q1]	Has a marginally bigger size than the product size
[Phys.q2]	Has a marginally bigger volume than the product's volume
[Phys.q3]	Follows common/typical shapes (e.g. square, rectangle, triangle, circle)
[Phys.q4]	Is made of durable materials
[Phys.q5]	Is waterproof
[Phys.q6]	Withstands mechanical stress
[Phys.q7]	Withstands corrosion and wear
[Phys.q8]	Is light/has low weight
[Phys.q9]	Is produced by material/components (e.g. is made of durable materials that add prestige to the product)
[Phys.q10]	Is produced by materials that are environmentally friendly
[Phys.q11]	Is produced by materials that can be reused and materials that allow for elongation
[Phys.q12]	Is cheap (low price of production or recycling)
[Phys.q13]	Does not allow odors to leak
[Phys.q14]	Is made of recycled materials
[Vis.q1]	Has vivid / strong colors
[Vis.q2]	Has only one color (monochrome)
[Vis.q3]	Has only white color
[Vis.q4]	Has many blank parts (or has only white color as a background)
[Vis.q5]	Has a picture

**Figure 1. Categorisation of packaging elements for food products**

These elements will be applied to achieve the objectives of the present study, which is to evaluate the importance of packaging elements from the different points of view of consumers of food products.

### 3. Research methodology



In the present study, the following research questions are examined: *“What do consumers consider to be the most important elements of food packaging? Do their views differ in terms of their demographic characteristics?”*

1,219 consumers participated in the survey by filling out a questionnaire that initially outlined their demographic characteristics and purchasing behavior; they were then asked to assess the significance of the packaging elements using a five-point Likert scale (from 1: Not significant, to 5: Very significant). Before the questionnaires were administered, they were pilot-tested using the content validity method, and also checked for the appropriateness of the elements so as to have a clear understanding of the questions confirmed by the questionnaire samples.

The survey focused on four cities: Athens (the capital of Greece), Thessaloniki (the second largest city in the country), Larissa and Katerini (both large urban centres). The aim was to collect a number of completed questionnaires in proportion to the population of each city. In total, a convenience sample of 1,219 questionnaires were collected, from 582 (47.74%), 310 (25.43%), 181 (14.85) and 146 (11.98%) consumers in each city, respectively. The sampling locations were the stores of large retail chains and the research period was between March and June 2019.

Of the 1219 consumers who responded by filling in the questionnaire, 562 (46.1%) were men and 657 (53.9%) were women. The majority of the respondents ( $N = 892$ , 73.2%) lived in a large city while the remaining lived in a smaller town ( $N = 327$ , 26.8%). 45.5% of the respondents were graduates of tertiary institutes ( $N = 554$ ), while 22.6% ( $N = 275$ ) had postgraduate or doctoral degrees. There was no significant difference between gender and place of residence ( $\chi^2(1) = 2,325$ ,  $p = 0.127$ ), nor between gender and educational level ( $\chi^2(2) = 0.353$ ,  $p = 0.838$ ). About 2 in 3 respondents (804, 66%) reported buying packaged foods one or more times per week. 905 consumers (74.2%) stated that they consciously use food packaging to make a purchase decision, while about 1 in 3 (449, 36.8%) stated that they are highly influenced by the packaging in their decision to purchase the product.

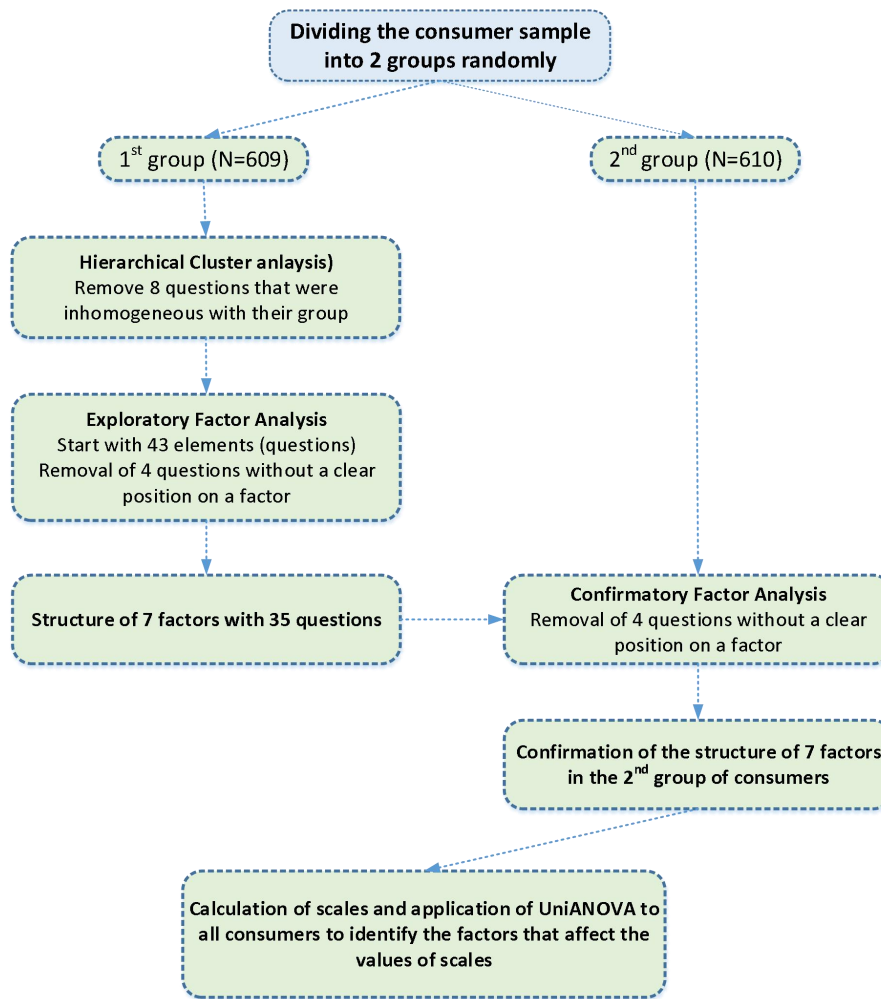
The large number of observations among consumers ( $N = 1219$ ) allowed the separation of observations into two subgroups with similar numbers, for which the structural analysis was performed in the first subgroup ( $N = 609$ ), and the confirmation of the structure of the model that emerged during the investigation for the second subgroup ( $N = 610$ ). The consumer sample was divided into two groups with the help of the SPSS random number generator. After the separation, each respondent group was statistically independent by gender ( $\chi^2(1)=1,532$ ,  $p=0.216$ ), age group category ( $\chi^2(4)=5,780$ ,  $p=0.216$ ), place of residence ( $\chi^2$

(1)=3,450,  $p=0.063$ ) and educational level ( $\chi^2$  (2)=2,462,  $p=0.292$ ). The group was also statistically independent by frequency of purchase of packaged food ( $\chi^2$  (4)=3,729,  $p=0.444$ ), information found on the food packaging ( $\chi^2$  (1)=2,418,  $p=0.120$ ) and the magnitude of the influence of the packaging in the purchase of the product ( $\chi^2$  (4)=1,983,  $p=0.739$ ).

Initially, exploratory factor analysis was used to identify the appropriate grouping of questions into factors in order to optimize the model's adaptation to the respective data. The results of the exploratory analysis were used in conjunction with the hierarchical classification of the questions in order to remove certain questions and/or to merge various elements. In the last step, confirmatory factor analysis was applied to the second part of the sample. Since the questions were distinct, the case for multivariate regression was not supported; therefore the Maximum Likelihood (ML) method could not provide reliable calculations of the model's coefficients or the adjustment indicators. For this reason, the corresponding indicators were calculated with the corresponding robust process of maximum probability, while the DWLS (diagonally weighted least squares) method was also used to control the model; this model adaptation method is more suitable for the case of ordinal variables as in the case of the present research (Mindril, 2010; DiStefano and Morgan, 2014).

Following this step, the individual scores were calculated using the sum for the corresponding questions, and univariate analysis of variance (UniANOVA) was carried out to identify the socio-demographic factors that affect the values of the scales. Tukey's test was used to identify homogeneous groups between factor levels, while in the case of covariance analysis (ANCOVA), multiple t-tests were applied with a corresponding adjustment to the rejection level according to Bonferroni's correction.

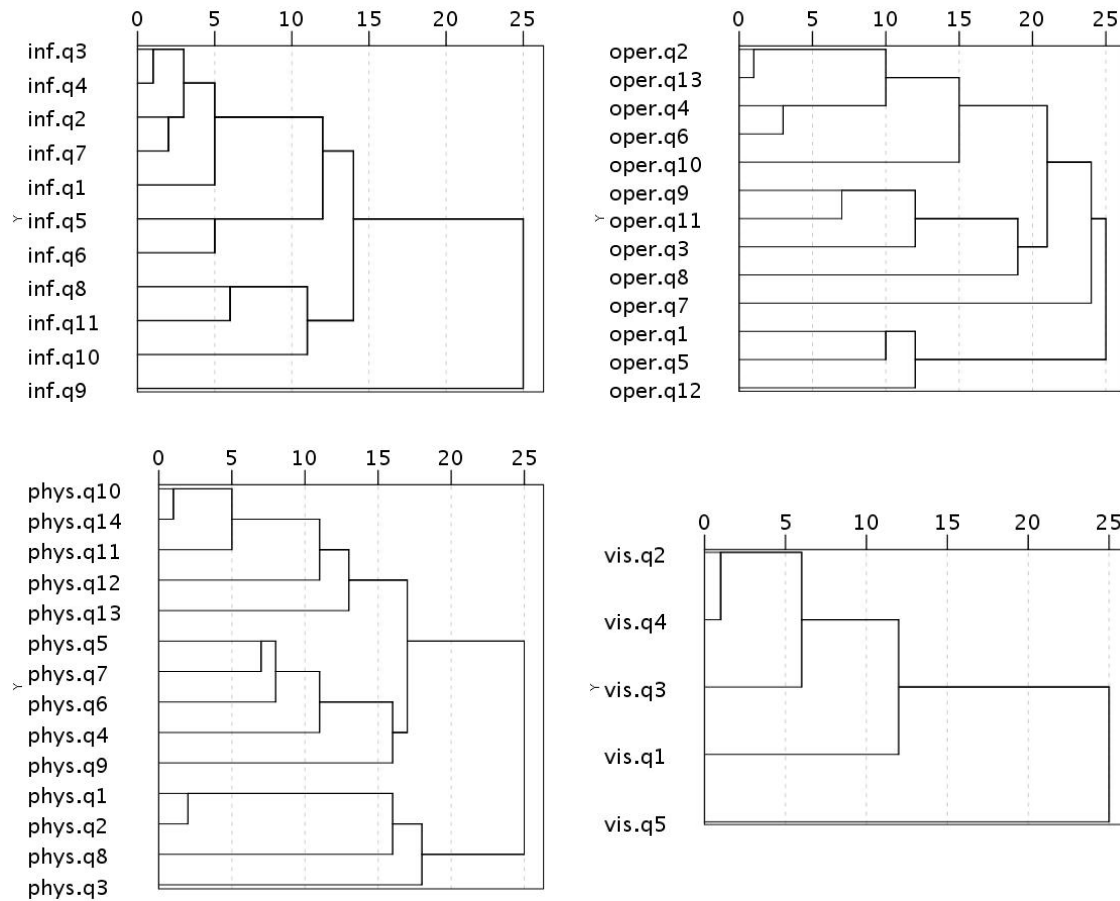
The steps involved in the statistical analysis are described in Figure 2. The statistical analysis was performed with the SPSS program (v.23) while the exploratory (EFA) and confirmatory factor analysis (CFA) were performed using the statistical programming language R equipped with the psych (Revelle, 2019) and lavaan packages (Rosseel, 2012).



**Figure 2. Research methodology steps**

## 4. Findings

Figure 3 visualizes the suggested grouping for each one of the four categories according to hierarchical cluster analysis on the first part of the sample (N=609). The hierarchical diagrams suggested that eight questions: one informational (inf.q9), three operational (oper.q1, oper.q6, oper.q7), three physical (phys.q4, phys.q9, phys.q12) and one visual (vis.q5), are significantly dissimilar from the other items or very similar to another item of the same group. Thus, it was decided that they would be removed from the subsequent analysis.



**Figure 3: Hierarchical analysis: suggested grouping**

Parallel exploratory factor analysis was applied in the set for the remaining 35 items, in order to find the number of factors explaining the common variability better than via a random sample of the same size (Horn, 1965). The results of the method suggested that 10 factors are the maximum number that can explain the common variability of the 35 items better than a random sample of the same size. Ordinary least squares minimization of the residuals was applied followed by oblimin rotation, a choice reflecting the assumption that the suggested factors are not orthogonal.

Four items having small loadings (less than 0,2) or significant conceptual differences from the remaining items of the same factors were removed and internal reliability of the factors was computed. Then, factors of the same category having two items and/or internal reliability less than 0,6 were combined, from which emerged the suggested seven-factor grouping.

The final seven-factor model of the 31 remaining items was as follows:

- Informational (INF) (Cronbach's  $\alpha = 0,839$ )

$$\text{INF} = \text{inf.q1} + \text{inf.q2} + \text{inf.q3} + \text{inf.q4} + \text{inf.q5} + \text{inf.q6} + \text{inf.q7} + \text{inf.q8} + \text{inf.q10} + \text{inf.q11}$$

- Content protection and recognition (OPE1) (Cronbach's  $\alpha = 0,757$ )

$$\text{OPE1} = \text{oper.q2} + \text{oper.q8} + \text{oper.q10} + \text{oper.q13} + \text{oper.q5} + \text{oper.q12}$$

- “Smart” functionality (OPE2) (Cronbach's  $\alpha = 0,622$ )

$$\text{OPE2} = \text{oper.q11} + \text{oper.q9}$$

- Geometric characteristics (PHY1) (Cronbach's  $\alpha = 0,689$ )

$$\text{PHY1} = \text{phys.q1} + \text{phys.q2} + \text{phys.q3}$$

- Environmental friendliness (PHY2) (Cronbach's  $\alpha = 0,772$ )

$$\text{PHY2} = \text{phys.q10} + \text{phys.q11} + \text{phys.q14}$$

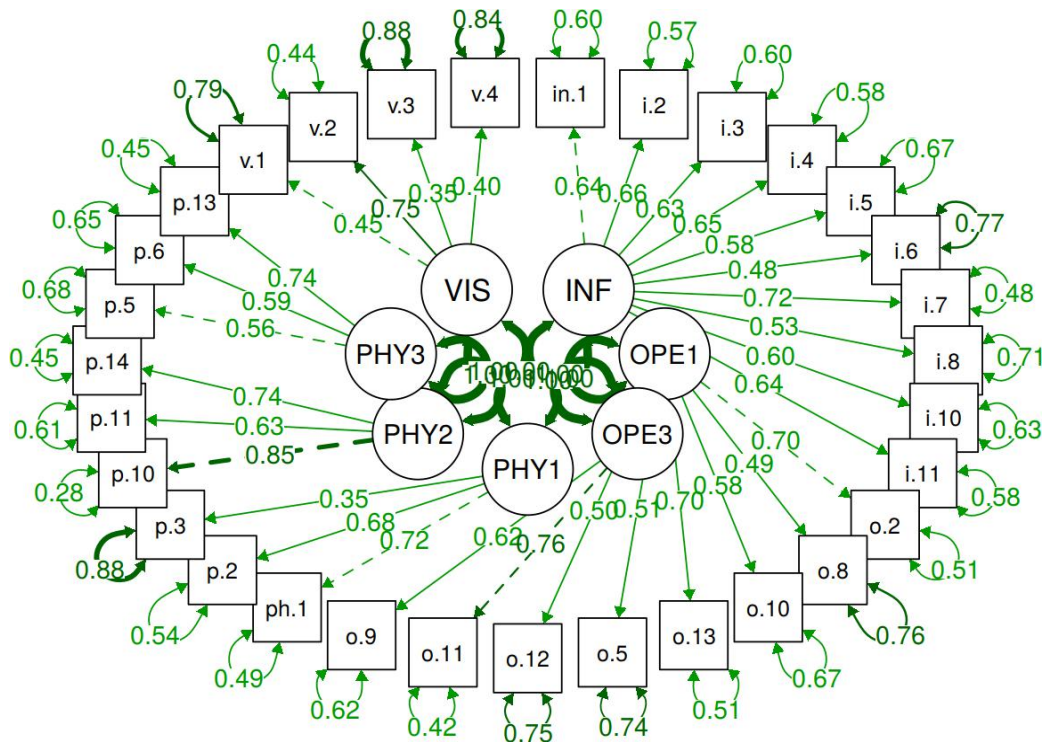
- Durability (PHY3) (Cronbach's  $\alpha = 0,650$ )

$$\text{PHY3} = \text{phys.q5} + \text{phys.q6} + \text{phys.q13}$$

- Coloring (VIS) (Cronbach's  $\alpha = 0,566$ )

$$\text{VIS} = \text{vis.q1} + \text{vis.q2} + \text{vis.q3} + \text{vis.q4}$$

Confirmatory factor analysis was applied for the suggested seven-factor structure on the second part of the data ( $N = 610$ ). The diagonally weighted least squares (DWLS) method was chosen in order to compute the model's coefficients, a method appropriate to confirm an assumed factor structure for ordinal items where multivariate normality cannot be assumed (Míndril, 2010, DiStefano & Morgan, 2014).



**Figure 4: Standardized model coefficients ( $N = 610$ )**

**Note:** i.x, in.x: inf.x, o.x: ope.x, ph.x, p.x: phy.x, v.x: vis.x

The model converged after 72 repetitions, and a very good fit to the data was indicated ( $\chi^2(413)=1070,5$ ,  $p<0.001$ ). The Tucker Lewis Index (TLI) 0.960, normed fit index (NFI) 0.944, comparative fit index (CFI) 0.965, goodness-of-fit index (GFI) 0.970, adjusted goodness-of-fit index (AGFI) 0.964, standardized root mean square residual (SRMR) 0.063, and root mean square error of approximation (RMSEA) 0.051 (95% C.I. 0.047 – 0.055) suggested that the model was nicely fitted to the second part of the consumers' sample. All the model's coefficients were statistically significant at the 0,05 level of significance. The standardized regression coefficients are visualized in Figure 4.

Since the results of the confirmatory analysis indicated the validity of the seven-factor structure, the respective scale scores were calculated as the sums of the corresponding items.

The descriptive statistics for the total sample ( $N=1.219$ ) as well as the correlation among the seven factors are provided in Table 2. The informational, operational and physical factors were positively correlated with each other, indicating that the consumers' perceptions about product packaging are homogeneous. An exception was the visual factor, exhibiting non-significant or small correlations with the other factors.

**Table 2: Description of the seven factors describing the customers' perceptions**

	M(SD)	INF	OPE1	OPE2	PHY1	PHY2	PHY3
INF	3,5 (0,8)						
OPE1	3,4 (0,8)	,600**					
OPE2	3,1 (1,0)	,451**	,550**				
PHY1	2,9 (0,9)	,390**	,437**	,289**			
PHY2	3,5 (1,1)	,653**	,478**	,496**	,299**		
PHY3	3,4 (1,0)	,594**	,571**	,445**	,313**	,494**	
VIS	2,5 (0,8)	-,099**	-,001	,000	,211**	-,117**	-,083**

\*\* Statistically significant correlation at the 0.01 level

#### **4.2 Factors influencing consumer attitudes on packaging**

The analysis of variance method (ANOVA) was used to detect the factors that affect consumers' perspectives in terms of food packaging. Independent variables were defined as the respondents' gender, age group, place of residence, educational level, frequency of

purchase of packaged foods, if they consult the product packaging (Advice) and their perception of how much the packaging affects the purchase of the product (Effect). The results are shown in Table 3.

**Table 3. Factors influencing consumer attitudes about packaging**

<b>Informational content</b>	
<i>Results</i>	<i>Key findings</i>
<p>Gender (<math>p=0.501</math>) and Age (<math>p=0.056</math>) were shown to be statistically insignificant (it is however worth noting the rising trend in values with increasing age).</p> <p>In contrast, Place of residence (<math>F(1, 1201)=23,994, p&lt;0.001, \eta^2_p=0.020</math>), Educational Level (<math>F(2, 1201)=13,194, p&lt;0.001, \eta^2_p=0.021</math>), Frequency of purchase (<math>F(4, 1201)=10.41, p&lt;0.001, \eta^2_p=0.034</math>), Advice (<math>F(1, 1201)=48,175, p&lt;0.001, \eta^2_p=0.039</math>) and Effect (<math>F(4, 1201)=11,645, p&lt;0.001, \eta^2_p=0.037</math>) were shown to be factors with a statistically significant influence.</p>	<ul style="list-style-type: none"> <li>• Large city dwellers recorded a significantly higher average score than people living in small towns (3.6 versus 3.3).</li> <li>• Secondary school graduates had a lower average score in this factor than others.</li> <li>• The higher the frequency of purchasing packaged food, the higher the average value was for this factor.</li> <li>• Those who responded that they were not affected at all by the packaging in the purchase of the product recorded a significantly lower average value than others.</li> </ul>
<b>Protection and recognition of the product</b>	
<i>Results</i>	<i>Key findings</i>
<p>Place of residence was not statistically significant (<math>p=0.304</math>).</p> <p>In contrast, Gender (<math>F(1, 1201)=6,401, p=0.012, \eta^2_p=0.005</math>), Age (<math>F(4, 1201)=3,285, p=0.011, \eta^2_p=0.011</math>), Educational level (<math>F(2, 1201)=4,267, p=0.014, \eta^2_p=0.007</math>), Frequency of purchase (<math>F(4, 1201)=4,582, p=0.001, \eta^2_p=0.015</math>), Advice (<math>F(1, 1201)=9,379, p=0.002, \eta^2_p=0.008</math>), and Effect (<math>F(4, 1201)=3,251, p=0.012, \eta^2_p=0.011</math>) were demonstrated as factors with statistically significant influence.</p>	<ul style="list-style-type: none"> <li>• Women had significantly higher mean values than men (3.4 versus 3.3).</li> <li>• Older consumers recorded a higher average score than younger ones.</li> <li>• Secondary school graduates had a lower average score in this factor than others.</li> <li>• The higher the frequency of purchasing packaged food, the higher the average value in this factor.</li> <li>• Those who responded that they get advice from the packaging of a product had a significantly higher average value in this factor (3.4 vs. 3.2).</li> </ul>

	Those who responded that they were not affected at all or only slightly affected by the packaging in the purchase of a product had a significantly lower average value than others.
<b>“Smart” functionality</b>	
<i>Results</i>	<i>Key findings</i>
<p>Age (<math>p=0.865</math>), Place of residence (<math>p=0.929</math>) and Educational level (<math>p = 0.13</math>) were shown to be statistically insignificant.</p> <p>In contrast, Gender (<math>F (1, 1201)=4,138</math>, <math>p=0.042</math>, <math>\eta^2_p=0.003</math>), Frequency of purchase (<math>F (4, 1201)=3,909</math>, <math>p=0.004</math>, <math>\eta^2_p=0.013</math>), Advice (<math>F (1, 1201)=4.11</math>, <math>p=0.043</math>, <math>\eta^2_p=0.003</math>), and Effect (<math>F (4, 1201)=7.103</math>, <math>p&lt;0.001</math>, <math>\eta^2_p=0.023</math>) were shown to be statistically significant.</p>	<ul style="list-style-type: none"> <li>• Women recorded a significantly higher average score than men (3.2 versus 3.0).</li> <li>• The higher the frequency of the purchase of packaged food, the higher the average value of this factor.</li> <li>• Those who responded that they were consulting the product packaging had a significantly higher average value in this factor.</li> <li>• Those who responded that they were not affected at all by the packaging in the purchase of the product had a significantly lower average value than others in this factor.</li> </ul>
<b>Geometric characteristics</b>	
<i>Results</i>	<i>Key findings</i>
<p>Place of residence (<math>p=0.84</math>), Frequency of purchase (<math>p=0.238</math>), and Advice (<math>p=0.257</math>) were shown to be statistically insignificant.</p> <p>In contrast, Gender (<math>F (1, 1201)=6,933</math>, <math>p=0.009</math>, <math>\eta^2_p=0.006</math>), Age (<math>F (4, 1201)=2,446</math>, <math>p=0.045</math>, <math>\eta^2_p=0.008</math>), Educational level (<math>F (2, 1201)=3,322</math>, <math>p=0.036</math>, <math>\eta^2_p=0.006</math>) and Effect (<math>F (4, 1201)=7,538</math>, <math>p&lt;0.001</math>, <math>\eta^2_p=0.024</math>) were shown to be statistically significant.</p>	<ul style="list-style-type: none"> <li>• Women recorded a significantly higher average score than men (3.0 versus 2.8)</li> <li>• Younger consumers had a higher average score, but this difference wasnt so large that it differs significantly from other age groups</li> <li>• Secondary school graduates had a lower average score in this factor than others</li> <li>• The higher the frequency of purchase of packaged food, the higher the average value in this factor, but this difference was not large enough to differentiate the categories</li> <li>• Those who responded that they consulted the product packaging for advice had a significantly higher</li> </ul>



	<p>average value in this factor (3.0 versus 2.8).</p> <ul style="list-style-type: none"> <li>Those who responded that they were not affected at all by the packaging for the purchase of the product had a significantly lower average value than others in this factor.</li> </ul>
<b>Environmentally friendly</b>	
<i>Results</i>	<i>Key findings</i>
<p>Gender (<math>p=0.072</math>) and Age (<math>p=0.572</math>) were shown to be statistically insignificant.</p> <p>In contrast, Place of residence (<math>F(1, 1201)=36,648</math>, <math>p=0.001</math>, <math>\eta^2_p=0.030</math>), Educational level (<math>F(2, 1201)=9,213</math>, <math>p&lt;0.001</math>, <math>\eta^2_p=0.015</math>), Frequency of purchase (<math>F(4, 1201)=9.64</math>, <math>p&lt;0.001</math>, <math>\eta^2_p=0.031</math>), Advice (<math>F(1, 1201)=11,051</math>, <math>p=0.001</math>, <math>\eta^2_p=0.009</math>) and Effect (<math>F(4, 1201)=6,035</math>, <math>p&lt;0.001</math>, <math>\eta^2_p=0.020</math>) were shown to be statistically significant.</p>	<ul style="list-style-type: none"> <li>Large city dwellers recorded a significantly higher average value than residents of small towns (3.7 vs. 3.1).</li> <li>Secondary school graduates had a lower average score in this factor than others.</li> <li>The higher the frequency of purchase of packaged food, the higher the average value for this factor.</li> <li>Those who responded that they were consulting the information on the product packaging for advice recorded a significantly higher average value in this factor (3.6 vs. 3.2).</li> <li>Those who responded that they were not affected at all by the packaging for the purchase of the product had a significantly lower average value than others in this factor.</li> </ul>
<b>Durability</b>	
<i>Results</i>	<i>Key findings</i>
<p>Gender (<math>p=0.154</math>), Place of residence (<math>p=0.067</math>), and Advice (<math>p=0.079</math>) were shown to be statistically insignificant.</p> <p>In contrast, Age (<math>F(4, 1201)=6,241</math>, <math>p&lt;0.001</math>, <math>\eta^2_p=0.020</math>), Educational level (<math>F(2, 1201)=4,848</math>, <math>p=0.008</math>, <math>\eta^2_p=0.008</math>), Frequency of purchase (<math>F(4, 1201)=8,891</math>, <math>p&lt;0.001</math>, <math>\eta^2_p=0.029</math>) and Effect (<math>F(4, 1201)=21,312</math>,</p>	<ul style="list-style-type: none"> <li>Older consumers had a higher average value than other respondents.</li> <li>Tertiary education graduates had a higher average score on this factor than the others.</li> <li>The higher the frequency of purchase of packaged food, the higher the average value for this factor.</li> <li>Those who responded that they were not affected at all</li> </ul>

p<0,001, $\eta^2_p=0,066$ ) were shown to be statistically significant.	or were only slightly affected by the packaging for the purchase of the product had a significantly lower average score than others in this factor.
<b>Visualization/Colorization</b>	
<i>Results</i>	<i>Key findings</i>
<p>Educational level (<math>p=0.551</math>) and Advice (<math>p=0.574</math>) proved to be statistically insignificant.</p> <p>In contrast, Gender (<math>F(1, 1201)=7.2, p=0.007, \eta^2_p=0.006</math>), Age (<math>F(4, 1201)=8,936, p&lt;0.001, \eta^2_p=0.029</math>), Place of residence (<math>F(1, 1201)=10,179, p=0.001, \eta^2_p=0.008</math>), Frequency of purchase (<math>F(4, 1201)=10,668, p&lt;0.001, \eta^2_p=0.034</math>) and Effect (<math>F(4, 1201)=10,121, p&lt;0.001, \eta^2_p=0.033</math>) were shown to be statistically significant.</p>	<ul style="list-style-type: none"> <li>• Women had a significantly higher mean value than men (2.5 versus 2.4).</li> <li>• Residents of small towns had a higher average value than residents of large cities (2.6 vs. 2.4).</li> <li>• The higher the frequency of purchase of packaged food, the lower the average value for this factor.</li> <li>• Those who responded that they were greatly affected by the packaging for the purchase of the product had a significantly higher average score than others.</li> </ul>

## 5. Conclusions

The large size of the consumer sample permitted both its division into two groups and the independent exploratory and confirmatory structure analysis of the questionnaire. The two random groups were statistically independent with the following demographic characteristics: gender ( $p=0.216$ ), age group ( $p=0.216$ ), place of residence ( $p=0.063$ ) and educational level ( $p=0.292$ ). Moreover, the group was also statistically independent in terms of the frequency of the purchase of packaged food ( $p=0.444$ ), information on the food packaging (advice) ( $p=0.120$ ) and the degree of the influence of the packaging on the product purchase (effect) ( $p=0.739$ ).

Exploratory structure analysis was implemented in two stages. The first step involved a hierarchical classification method which was used for all the questions of each group. At this stage, eight questions which were regarded as particularly inhomogeneous with the others in their group were removed, whereas the remaining 35 questions indicated an initial factor structure based on the similarity of the responses. An exploratory structure analysis was applied to these 35 questions, indicating the key components. A comparison of the main factors with those of the hierarchical classification and the utilisation of indicators such as the internal reliability factor led to the rejection of four more questions and the merging of certain

factors, resulting in a final model of seven factors containing 31 of the 43 initial questions. This model was tested with confirmatory structure analysis in the second part of the consumer sample and was satisfactorily adapted, which permitted the calculation of the corresponding figures and the extraction of the conclusions.

Large city dwellers were found to have a more mature consumer attitude towards the packaging of a product as they had a significantly higher average score than people living in small towns in terms of the information content found on the packaging, as well as for the environmental friendliness of the packaging, while they recorded lower scores for the factor concerning the coloring of the packaging than residents of small towns.

A similar difference was noted between tertiary education graduates who had higher average scores for the information content of the packaging compared to respondents who had completed secondary education, as well as for the factor concerning protection and recognition of the content, showing greater confidence in the packaging that protects the contents, while it also facilitates optical recognition of the contents. In addition, they exhibited higher values for the factor that described the geometric characteristics and the durability of the packaging, as well as for environmental friendliness. It turns out that products aimed at consumers with a high level of education and/or consumers in large cities should use packaging with rich information content, with a greater appreciation for durable packaging that allows for the recognition of the contents.

Women recorded significantly higher average scores for the factor concerning the protection and recognition of the content than men, showing greater confidence in packaging that protects the contents while facilitating visual contact with it, as well as higher scores for "smart" functionality and geometric features. In addition, they rated the coloring of the packaging more positively than men. Older consumers gave a higher rating for the protection and recognition of the content, and the durability of the packaging.

Concerning consumer attitudes the higher the frequency of purchase of packaged foods, the higher the average rating for the informational content on the packaging, as well as for the protection and recognition of the content, "smart" functionality, environmental friendliness and durability of the packaging. In contrast, an increase in the purchase frequency of packaged products corresponded to a reduced score in the coloring factor.

Furthermore, those who responded that they were not affected at all by the packaging in the purchase of the product recorded a significantly lower average value in the information factor,

protection and recognition of the content, "smart" functionality, geometric characteristics, environmental friendliness and durability of the packaging. Finally, those who responded that they consult the packaging of the products for advice had a significantly higher average value for the factors concerning "smart" functionality, protection and recognition of the content, geometric characteristics and environmental friendliness.

The analysis of individual elements posed to consumers showed additional differences in gender, place of residence and age. More specifically, women reported a higher degree of agreement than men for the question relating to protecting the product from theft. In the two questions for which place of residence proved to be a factor with significant influence ("Easy to transport" and "Made of durable materials"), residents of large cities reported a higher degree of agreement than residents of small towns, showing the greater difficulties in transportation and movement over long distances in large cities.

Regarding the age of the respondents, the older consumers surveyed differed from the rest for the statements concerning "Easily placed on the shelf", "Does not expose the product to light", "Easily transported", "Allows packaging of the product in larger units", "Withstands corrosion and wear", "Has a low weight", "Is cheap" and "Has a picture". In terms of educational level, secondary school graduates had a lower degree of agreement with the statement "Does not expose the product to light" while graduates of tertiary education were differentiated from the other two education categories by the statements "Allows packaging of the product in larger units" and "Is made of materials that give prestige to the product".

The higher the frequency of purchase of packaged food, the greater the agreement to the elements "Easy to place on the shelf", "Does not expose the product to light", "Easy to transport", "Is made of durable materials", "Withstands corrosion and wear" and "Is cheap". The positive response to the question "Do you consult food packaging?" was related with increased values to the factors "Suggests recipes for this product", "Protects the product from theft", "Does not expose the product to light", "Is easily transported", "Is made of durable materials" and "Withstands corrosion and wear."

Finally, the higher the value for the response to the question "How much does the packaging affect the purchase of the product?", the greater the agreement to the factors "Easily placed on the shelf", "Does not expose the product to light", "Easily transported", "Allows the packaging of the product in larger units", "Has a low weight", "Is made of materials that give prestige to the product", "Is cheap" and "Has a picture".

The present study proposes a new questionnaire that can detect a consumer's attitude towards the packaging of food products. The evaluation of the responses led to the identification of factors that predetermine the consumer's attitude and identify the characteristics of a packaging that will meet the consumer's expectations. This research can be expanded by examining if people who shopped at different types of stores (grocery, gas stations, drug stores, etc.) will report different priorities in terms of package design. The questionnaire developed in this survey can be used to detect differences in consumers' and managers' (in the food industry) perceptions of specific categories of food products in the market. The results herein will have direct applicability and usefulness to business practices, especially in relation to the targeted promotion of a product on the market.

## References

- [1] Ahmed, A., Ahmed, N. and Salaman, A. (2005), "Critical Issues in Packaged Food Business", *British Food Journal*, 107 (10), pp. 760-80.
- [2] Bjarnemo, R., Jonson, G. and Johnsson, M. (2000), "Packaging Logistics in New Product Development", in J. Singh, S. C. Lew and R. Gay (eds), *Proceedings of the 5th International Conference: Computer Integrated Manufacturing Technologies for New Millennium Manufacturing*, pp. 135-146.
- [3] Bloch, P. (1995), "Seeking the ideal form: product design and consumer response", *Journal of marketing*, vol. 59, pp.16-29.
- [4] Bowersox, D. and Closs, D. (1996), *Logistical Management: The Integrated Supply Chain Process*, McGraw-Hil.
- [5] Committee for Economic Development of The Conference Board (2017), *Economic Contribution of the Food and Beverage Industry, A Report by the Committee for Economic Development of The Conference Board*, [online], Available at [https://www.ced.org/pdf/Economic\\_Contribution\\_of\\_the\\_Food\\_and\\_Beverage\\_Industry.pdf](https://www.ced.org/pdf/Economic_Contribution_of_the_Food_and_Beverage_Industry.pdf).
- [6] Coulson, N.S. (2000), "An application of the stages of change model to consumer use of food labels", *British Food Journal*, Vol. 102 No. 9, pp. 661-8.
- [7] Davis, F. D. Bagozzi, R. P. and Warshaw, P. R. (1989), "User acceptance of computer technology: a comparison of two theoretical models", *Management Science*, vol. 35, no. 8.

- [8] DiStefano, C. and Morgan, G. B. (2014) A Comparison of Diagonal Weighted Least Squares Robust Estimation Techniques for Ordinal Data, *Structural Equation Modeling: A Multidisciplinary Journal*, 21:3, 425-438, DOI: 10.1080/10705511.2014.915373
- [9] Foundation for Economic & Industrial Research (2018), Greek food and drink industry - Facts and figures [online], Available at [http://iobe.gr/docs/research/RES\\_05\\_B\\_05042019\\_REP\\_GR.pdf](http://iobe.gr/docs/research/RES_05_B_05042019_REP_GR.pdf).
- [10] Grand View Research (2020), Food Packaging Market Size, Share & Trends Analysis Report By Type (Rigid, Flexible), By Material (Paper, Plastic), By Application (Bakery and Confectionery, Dairy Products), By Region, And Segment Forecasts, 2020 - 2027 [online], Available at <https://www.grandviewresearch.com/industry-analysis/food-packaging-market>.
- [11] Grossman, R.P. and Wisenblit, J.Z. (1999), "What we know about consumers' colour choices", *Journal of Marketing Practice: Applied Marketing Science*, Vol. 5 No. 3, pp. 78-88.
- [12] Holmes G. R. and Paswan, A. (2012), "Consumer reaction to new package design", *Journal of Product & Brand Management*, vol. 21, no. 2, pp. 109-116.
- [13] Horn, J. (1965) A rationale and test for the number of factors in factor analysis. *Psychometrika*, 30, 179-185.
- [14] IPSOS (2018), Most Americans Say That the Design of a Product's Packaging Often Influences Their Purchase Decisions 2018, [online] Available at <https://www.ipsos.com/en-us/news-polls/Most-Americans-Say-That-the-Design-of-a-Products-Packaging-Often-Influences-Their-Purchase-Decisions>.
- [15] Johnson, M. (1998), Packaging logistics - a value added approach, PhD dissertation, Department of Engineering Logistics, Lund Institute of Technology, Lund University.
- [16] Jönson, G., (2000), Packaging Technology for the Logistician, 2nd Ed., Lund University.
- [17] Lambert, D. M., J. R. Stock, and Ellram, L. M. (1998), *Fundamentals of Logistics Management*, Irwin/McGraw-Hill, Boston, MA.
- [18] Louw, A. and Kimber, M. (2007), The Power of Packaging, The Customer Equity Company is a wholly owned subsidiary of TNS (UK), [online] Available at [www.tnsglobal.com/\\_assets/files/The\\_power\\_of\\_packaging.pdf](http://www.tnsglobal.com/_assets/files/The_power_of_packaging.pdf).
- [19] Madden, T. J., Hewett, K., and Roth, M. S. (2000), "Managing images in different cultures: A cross-national study of colour meanings and preferences", *Journal of International Marketing*, 8(4), 90-107.

- [20] Marsh, K. and Bugusu, B. (2007), “Food packaging? Roles, materials, and environmental issues”, *Journal Food Science*, 72 (3), pp. 39-55.
- [21] Meyers-Levy, J. and Peracchio, L. (1995), “Understanding the effects of colour: how the correspondence between available and required resources affects attitudes”, *Journal of consumer research*, 22(2), pp.121-139.
- [22] Mîndril, D. (2010). Maximum Likelihood (ML) and Diagonally Weighted Least Squares (DWLS) Estimation Procedures : A Comparison of Estimation Bias with Ordinal and Multivariate Non-Normal Data.
- [23] Mitchell, V.W. and Papavassiliou, V. (1999), “Marketing causes and implications of consumer confusion”, *Journal of Product & Brand Management*, Vol. 8 No. 4, pp. 319-39.
- [24] Molina-Besch, K., Wikström, F., and Williams, H. (2018), “The environmental impact of packaging in food supply chains-does life cycle assessment of food provide the full picture?”, *The International Journal of Life Cycle Assessment*. 10.1007/s11367-018-1500-6.
- [25] Muhammad, A. and Kamran, A. (2014), “Impact of Visual Elements of Packaging of Packaged Milk on Consumer Buying Behaviour”, *Interdisciplinary Journal of Contemporary Research in Business*, 5(11), pp.118-160.
- [26] Mutsikiwa, M. and Marumbwa, J. (2013), “The Impact of Aesthetics Package Design Elements on Consumer Purchase Decisions: A Case of Locally Produced Dairy Products in Southern Zimbabwe”, *IOSR-Journal of Business and Management*, 8(5), pp.64-71.
- [27] Nancarrow, C., Wright, T.L. and Brace, I. (1998), “Gaining competitive advantage from packaging and labeling in marketing communications”, *British Food Journal*, Vol. 100, No. 2, pp. 110-8.
- [28] Prendergast, G. and Pitt, L. (1996), “Packaging marketing logistics and the environment are there trade-offs?”, *International Journal of Physical Distribution and Logistics Management*, 26(6), 66-72.
- [29] Raghubir, R. and Krishna, A. (1999) Vital Dimensions in Volume Perception. Can the Eye Fool the Stomach?, *Journal of Marketing Research*, 36 (3), pp. 313-26.
- [30] Rettie, R. and Brewer, C. (2000), “The verbal and visual components of package design”, *Journal of Product & Brand Management*, Vol. 9 No. 1, 56-70.
- [31] Revelle, W. (2019). psych: Procedures for Psychological, Psychometric, and Personality Research. Northwestern University, Evanston, Illinois. R package version 1.9.12, <https://CRAN.R-project.org/package=psych>.

- [32] Rosseel. Y. (2012). lavaan: An R Package for Structural Equation Modeling. *Journal of Statistical Software*, Vol. 48, Iss. 2, pp. 1-36.
- [33] Rundh, B. (2009), "Packaging design: creating competitive advantage with product packaging", *British Food Journal*, 111 (9), pp. 988-1002.
- [34] Rundh, B., (2013), "Linking Packaging to Marketing: how packaging is influencing the marketing strategy", *British Food Journal*, 115(11), pp. 1547-63.
- [35] Silayoi, P. and Speece, M. (2004), "Packaging and purchase decisions: an exploratory study on the impact of involvement level and time pressure", *British Food Journal*, Vol.106, Iss.8, 607-628.
- [36] Silayoi, P. and Speece, M. (2007), "The importance of packaging attributes: a conjoint analysis approach", *European Journal of Marketing*, 41 (11/12), 1495-1517.
- [37] Singh, S. (2006), "Impact of colour on marketing", *Management decision*, 44.6 (2006): 783-789.
- [38] Sonsion, (1990), *Packaging design: graphics, materials, technologies*, Van Nostrand Reinhold, Technology & Engineering.
- [39] Underwood, R. L. and Ozanne, J. L. (1998), "Is your package an effective communicator? A normative framework for increasing the communicative competence of packaging", *Journal of Marketing Communications*, 4 (4), pp. 207-220.
- [40] Vila, N., and Ampuero, O. (2007), "The role of packaging in positioning an orange juice", *Journal of Food Products Marketing*, 13 (3), 21-48.
- [41] Vyas, H. (2015), "Packaging Design Elements and Users Perception: A Context in Fashion Branding and Communication", *Journal of Applied Packaging Research*, Vol. 7: No. 2, Article 5, pp. 95-107.