Sustainable Emotional Design Based on Industry 4.0 of Industrial Nougat Packaging

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Article

Sustainable Emotional Design Based on Industry 4.0 of Industrial Nougat Packaging

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Abstract: Nowadays, digitalization present in all links of the product life cycle and within product design, packaging is a critical element, as it affects the customer's purchase intention, and therefore, it is one of the most important spaces where to include techniques and methods based on Industry 4.0 that obtain results from the user and bring them closer to the process. The relationship between packaging and the expected quality and emotions of users is a topic that is addressed in the social axis of sustainability and involves an effort to strengthen the relationship with the user. This article studies the expected quality of nougat packaging in terms of shape and colour using ANOVA analysis. For this purpose, a survey was carried out among 122 participants in Spain and Mexico. The main conclusion is that a packaging with the combination of three shapes (rectangle, square and triangle) and colours (yellow, orange and red) enhances consumers' emotions of admiration, satisfaction, pleasant surprise, attraction, fascination and joy.

Keywords: product design; social sustainability; Industry 4.0; emotion detection; ANOVA; nougat packaging

1. Introduction

Industry 4.0 is changing production systems, companies and value chains [1]. In addition, digital technologies enable new ways of delivering goods, services and customer solutions, generating new sources of revenue and new forms of competition and collaboration. [2,3]. There are many studies exploring the technical issues of Industry 4.0 and theoretical debates on business [4–7].

However, approaches that focus on the practical implications of digitalisation for business are comparatively scarce. These issues are central to strategy and sustainability [8–10]. Therefore, case studies investigating the use of digital technologies in enterprises and their outcomes are of interest. Since the performance of routine operations can be improved by smart decisions and smart decisions need the support of routine operations to collect relevant data, there is a growing research effort in merging Industry 4.0 and data analytics [11].

This paper deals with data analysis (as an application of Industry 4.0 technologies) in the early stages of product design. It is a research in Design Engineering, applied to the food industry. The use of machine learning techniques makes it possible to link the perceived quality of products to the factors on which they depend. Therefore, products can be designed for numerous applications, such as presenting the desired emotion, creating user profiles and recommending products that optimise user satisfaction. Nougat is a typical Spanish sweet, which can be purchased in souvenir shops and also at international airports in Spain. The packaging of this product is a very important element that influences the purchase intention of the product. The relationship between the properties of this product and the perceived quality/perception/emotions of users in the food sector are the subject of ongoing research. This paper presents the optimisation of perceived quality in nougat packaging

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using current machine learning techniques. Clustering , classification and product recommendation techniques [12,13] are used.

The confectionery sector in Spain was shown in 2019 to be growing stronger, retaining 46.4 % of the food and beverage industry which draws attention to its importance in this industry [14].

In 2020, nougats and marzipans increased their sales in Spain by 3.7% in value and 4.8% in volume. Supermarkets continue to be the prominent distributor, and sales of 91% in 2020, while small businesses and specialised stores barely account for 5% of total sales. Nougat and marzipan still play a leading role over Christmas with 87% of sales, since they are an intrinsic feature of Spanish Christmas fare [15].

It is worth noting that food and consumption is a complex behaviour since it involves a decision-making process, and is affected by various factors, including cultural, social, psychological, and sensory acceptance aspects [16,17]. Food choice also creates aggregate consumer demand in the food system for suppliers who produce, process, and distribute food [18]. In this aspect, the packaging is crucial and by taking into account that the interaction between shape and colour of packaging influences the way a product is expected [19,20], these two characteristics must be analysed. On the other hand, as noted, the inclusion of Industry 4.0 in production processes and, therefore, in all stages of product design and development, allows for greater visibility, connectivity and data analysis in the life cycle, which facilitates informed decision-making and improves product capability. Moreover, if these aspects are present in the early stages of design, it strengthens the outcome because, in that case, the user is present from the beginning and the final product will be better suited to his or her needs [21]. The research question for this work focuses on the design of products to improve perceived quality, from the point of view of optimising sustainability. In the state of the art there is a growing concern for sustainability, which has become a major global issue [22,23]. An example of the importance of environmental sustainability at this time is that sustainability is the backbone of the agenda of Sustainable Development Goals. Several of the SDGs are directly related to the concepts of environmental sustainability [24,25], although sustainability must go beyond the merely environmental.

Many of the interpretations of what sustainable development should in fact be coincide in that, in order to achieve such sustainable development, the policies and actions to attain economic growth must respect the environment and must also be socially equitable to procure economic growth: this is the Triple E model or "triple bottom line", an approach to sustainability that takes into account its environmental, social, and economic dimensions [26–28].

In order to contextualise the proposal made in this work, it is necessary to summarise the three axes of the proposal: (1) tools and methods in the early stages of design to identify which product properties require improvements for an increase in user satisfaction; (2) use of techniques for data management and the relationship between perceived quality and factors; and (3) integrated perspective of sustainability, which includes social (perceived quality), economic, and environmental dimensions.

The combined influence of packaging shape and colour on consumer expectations of dairy desserts by using word association techniques and joint analysis results was studied in [29]. Hence, the authors suggest that different packaging colours give rise to different expectations of taste.

According to [30], *"Colour is perhaps the single most important element (or feature) as far as the design of multisensory product packaging is concerned. On the one hand, it plays a dominant role in terms of capturing the attention of the shopper in the aisle, or increasingly, online"*. This statement is supported by [31] in that colour motives between 62% and 90% of all consumer purchasing decisions, and is crucial in attracting customers and setting expectations (e.g. [32–34]). For example, it was shown that congruence of the product flavour and the packaging colour facilitated the visual search for a specific flavour of potato chips [35].

The ecological valence theory claims that colour preferences are an outcome of educational and cultural values and vary significantly across object contexts, particularly in terms of lightness and chroma [36]. Furthermore, colours evoke a variety of affective experiences [37].

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Regarding shape, according to [38], angular shapes are instinctively associated with conflict because they indicate a confrontation between the environment and the stimulus. In keeping with this, angular designs convey toughness, strength, and energy, whereas rounded shapes convey friendliness and harmony [39,40]. Furthermore, there is a propensity to choose rounded items over sharp, angular-shaped objects [40,41]. Due to the amygdala's fear response to angularly shaped items, people have a propensity to prefer rounder, semantically neutral objects [41,42].

Rectangular products and packages are viewed as "better" when compared to other shapes, which results in an upper demand for them in the market [43]. Although the shape allows differencing some products, for example, milk chocolate is related with rounder shapes, whereas dark chocolate is paired with angular [44].

According to [45], a package's shape on a milk-based dessert sets expectations for its textural properties and, hence, the square packaging was associated with thick sweets, whilst the rounded ones were associated with runny desserts. Another interesting study on the shape shows that angular packages of cookies are said to be healthier and taster better than spherical packaged cookies [46].

The pleasure of buying, owning, and using products evoke emotions [47], so as consumers choose foods that they like to eat, thereby creating positive experiences [48]. Emotion, motivation, and decision are connected, by means of learning, to predict future outcomes of specific scenarios [16]. A study carried out by [49] shows that visual appearances are relevant for describing emotional responses to (eating) food. In addition, in another studies by [48,50], categorise the strongest positive and negative emotions related to packaging and purchasing stages

A study carried out in [49] shows that visual appearances are relevant for describing emotional responses to (eating) food. In addition, in another studies by [48–50], the strongest positive and negative emotions related to packaging and purchasing stages (see Table 1).

Table 1. The strongest positive and negative emotions related to purchasing stages based on [48,50].

Positive emotion	Stage of purchase	Negative emotion	Stage of purchase
Admiration	Curious about taste and smell.	Contempt	Negative taste anticipation; too artificial.
Satisfaction	Looks good; fits my taste; product is distinct.	Dissatisfaction	Ugly packaging; not the best product.
Pleasant Surprise	Packaging looks fresh and distinctive.	Unpleasant Surprise	Does not look special.
Attraction	Curious about new product and about taste of instant product; lively picture.	Aversion	Packaging does not fit content; unattractive picture .
Fascination	Packaging feels different.	Boredom	Nothing special; not surprising; product looks boring.
Joy	Cheerful picture and graphics	Sadness	Makes me think of eating alone.

The variation of the shape and the colour of nougat packaging is studied in this paper in order to improve the expected quality by the consumer. This study is carried out through repeated measure analyses of variance (ANOVA).

The rest of the paper is structured as follows. Section 2 describes the materials and methods followed in the experimentation. Section 3 reveals the results obtained. Finally, the discussion, conclusions, limitations and future work are presented.

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2. Materials and methods

In order to carry out the experiment, a survey based on Survio Forms was designed in Spanish. The study was carried out in accordance with the World Medical Association (WMA, 2013) Helsinki Declaration. All participants provided informed consent prior to taking part in the study.

2.1. Procedure

At the start of their survey session, the participants were shown a webpage summarising the general purpose of this study. In the first block, the participants responded to several demographic questions (age, gender, country) and answered the main question. To next, four questions were inquired using different scales which can be seen in Table 2.

Table 2. Demographic: country, age and gender.

Country	Age			Gender		
	18 to 35	36 to 50	51 to 65	Male	Female	Total
Mexico	11	3	9	7	16	23
Spain	87	10	2	32	67	99
Total	98	13	11	39	83	122

In a second block, a total of 25 nougat packaging (see Figure 2) were shown to the participants in random order, one image at a time. Upon seeing each image, the participants rated the dimensions following on Table 1 in terms of expectations: Admiration-Contempt (E1), Pleasant surprise-Unpleasant surprise (E2), Attraction-Aversion (E3), Fascination-Boredom (E4), Joy-Sadness (E5), and Satisfaction-Dissatisfaction (E6). These dimensions were measured on 7 -point Osgood semantic differential scales.

2.2. Materials

The following figure shows the different stages into which the methodology is divided (see Figure 1).

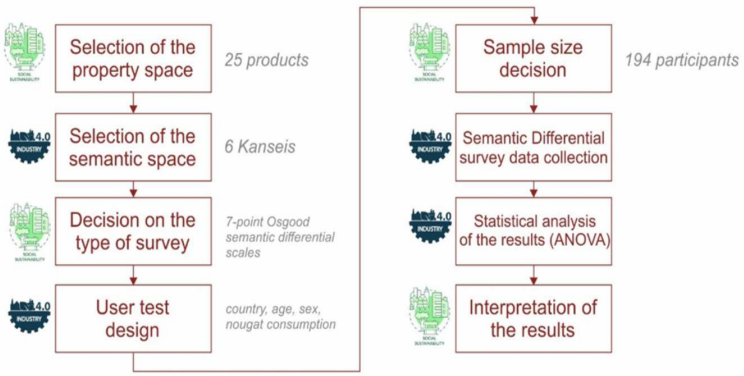

Figure 1. Methodoloty.

Given that the experiment was conducted online, the apparatus varied for each participant. Nevertheless, the experiment utilised 'full-screen mode' (i.e., utilising the entirety of the participant's monitor) and took place within a 1920 × 1920 pixel box in the centre of the screen.

The stimuli are Nougat packaging which has two features: colour and shape. Five colours (yellow, brown, orange, red and green) and the six shapes (circle, triangle, square, star, and rectangle) were used (see, Figure 2). Hence, there were a total of 25 (5 colours × 5 shapes) stimulus images of the packaging.

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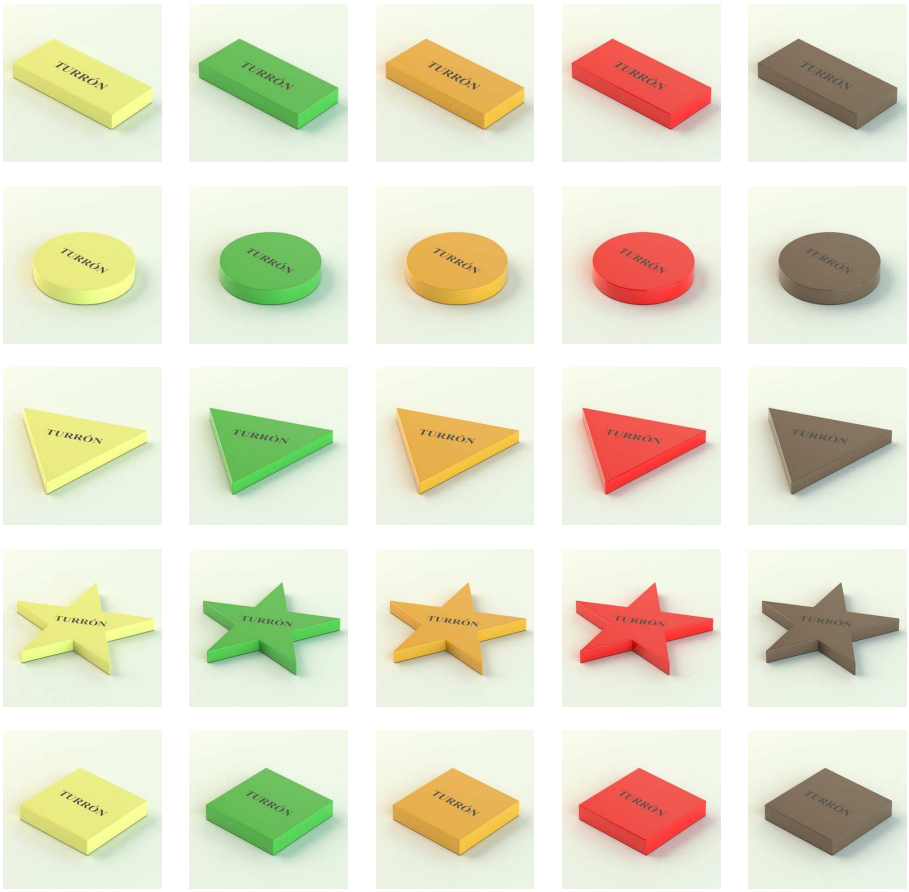

Figure 2. Colour and shapes of the Nougat products.

Five colours are considered since colour perception is categorical and people appear to get by with no more than a dozen colour names [51]. It is worth noting that while brown is familiar colour in nougats, yellows, green, orange and red, are less common.

2.3. Participants and Sample

The following problem is to fix the sample size. To this end, the following formula is used [52](1):

$$n \geq \frac{\frac{z^2 \times p(1-p)}{\epsilon^2}}{1 + (\frac{z^2 \times p(1-p)}{\epsilon^2 N})} \tag{1}$$

where N is the population size, e is the margin of error (percentage expressed as decimal places), and z is a standardised value. The z-score is the number of standard deviations that a given proportion deviates from the mean. The z-score is standardised and can be obtained from tables.

In this study, the profile of users who purchase nougat were taken as the population of Spain between 18 and 65 years of age. According to INE (Spain) [53] Spain has a population of men and women between 19 and 65 years of age of 29.971.679 people and 73.910.282 people in Mexico [54]For this user profile in 2021 contained 103.881.961 people.

A confidence level of 95% was assumed (z=1.96) and an error of 10%. Given these assumptions, the required sample size was calculated to be 97 respondents. The survey was administered using Survio software packaging (https://www.survio.com/). following the same criteria established in the previous section. A total of 122 respondents were obtained (99 participants from Spain, 23 participants and from Mexico from the University of Seville (Spain) and UP-AEP (Mexico)), in excess of the minimum number required for the expected level of confidence and error. The distributed

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questionnaire conformed to the ethical principles of the Helsinki declaration. Each participant received a brief introduction and signed an informed consent [55].

3. Experimental Results

A total of 122 participants took part in this study online: 99 participants from Spain and 23 participants from Mexico. In Tables 2 and 3 can be seen the answers of the participants.

Table 3. Result of questions of nougat consumption

Question	Answer				
How often do you eat nougat?	Never 14	Once year 78	Once month 28	Once week 2	Few days 0
Where do you buy nougat?	Supermarket 104	Souvenir 3	Pastry 9	Local 6	
Why do you buy nougat for?	Consumption 34	Gift 8	Souvenir 4	Share 75	
What time of year do you consume nougat?	Spring 1	Summer 2	Autumn 2	Winter 109	Never 8

The main results provided by the analysis of the variance (ANOVA) for each emotion can be seen in Tables 4–6. In these tables, the main effects of shapes, colour, and the interaction between shape and colour nougat packaging can be observed.

Table 4. The main effects of the shape and colour of nougat packaging and of the interaction between shape and colour, by using Repeated Measure ANOVAs.

Emo-	Shape			Colour			Shape * colour		
tion	F	p	$\eta 2$	F	p	$\eta 2$	F	p	$\eta 2$
E1	5.143	**0.002**	0.041	0.110	0.968	0.001	2.777	**0.012**	0.022
E2	2.956	**0.033**	0.024	1.413	0.235	0.012	1.988	0.071	0.016
E3	3.904	**0.009**	0.031	2.446	0.054	0.020	2.639	**0.010**	0.021
E4	8.477	**≤.001**	0.065	6.308	**≤.001**	0.050	5.004	**≤.001**	0.040
E5	5.597	**0.002**	0.044	13.825	**≤.001**	0.103	7.294	**≤.001**	0.057
E6	2.479	0.058	0.020	2.573	**0.044**	0.021	2.276	**0.032**	0.018

Table 5. The differences between packaging shapes as a function of colour.

Emo-	Yellow			Green			Orange			Red			Brown		
tion	F	p	$\eta 2$	F	p	$\eta 2$	F	p	$\eta 2$	F	p	$\eta 2$	F	p	$\eta 2$
E1	4.645	**0.003**	0.037	2.905	**0.024**	0.023	2.445	0.070	0.020	6.807	**≤.001**	0.053	0.279	0.867	0.002
E2	1.899	0.128	0.015	2.46	0.053	0.020	1.091	0.352	0.009	4.482	**0.003**	0.036	1.397	0.242	0.011
E3	1.131	0.339	0.009	6.061	**≤.001**	0.048	0.596	0.623	0.005	5.189	**0.001**	0.041	2.66	**0.041**	0.014
E4	2.167	0.086	0.018	11.951	**≤.001**	0.090	1.014	0.390	0.008	8.931	**≤.001**	0.069	3.654	**0.008**	0.029
E5	1.521	0.208	0.012	16.488	**≤.001**	0.120	1.929	0.124	0.016	10.091	**≤.001**	0.077	3.316	**0.016**	0.027
E6	2.349	0.068	0.019	2.929	**0.024**	0.024	2.416	0.065	0.020	3.862	**0.009**	0.031	0.066	0.980	0.001

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Table 6. The differences between colours as a function of nougat packaging shape.

Emo-tion	Rectangle F	Rectangle p	Rectangle $\eta 2$	Circle F	Circle p	Circle $\eta 2$	Triangle F	Triangle p	Triangle $\eta 2$	Star F	Star p	Star $\eta 2$	Square F	Square p	Square $\eta 2$
E1	1.437	0.221	0.021	2.65	0.052	0.021	3.422	0.099	0.028	1.363	0.246	0.011	3.165	**0.023**	0.025
E2	2.114	0.092	0.017	2.705	**0.049**	0.022	2.842	0.051	0.023	513	0.598	0.004	1.479	0.216	0.012
E3	1.52	0.204	0.012	3.414	**0.015**	0.027	2.533	0.061	0.021	0.751	0.493	0.006	5.281	**0.001**	0.042
E4	5.78	**≤0,001**	0.046	6.989	**≤0,001**	0.055	3.348	**0.021**	0.027	0.658	0.544	0.005	9.684	**≤.001**	0.074
E5	2.469	0.056	0.020	15.353	**≤0,001**	0.113	5.687	**0.001**	0.045	2.497	0.074	0.02	17.312	**≤.001**	0.125
E6	1.839	0.138	0.015	2.159	0.090	0.018	1.77	0.163	0.014	1.504	0.224	0.012	4.789	**0.002**	0.038

To next, the emotions are analysed one to one.

3.1. Admiration-Contempt (E1)

In terms of the main effect of packaging shape (see Figure 3), the participants expected there to be less Admiration for the circle nougat packaging than for the rectangle and square (both $p \leq .011$).

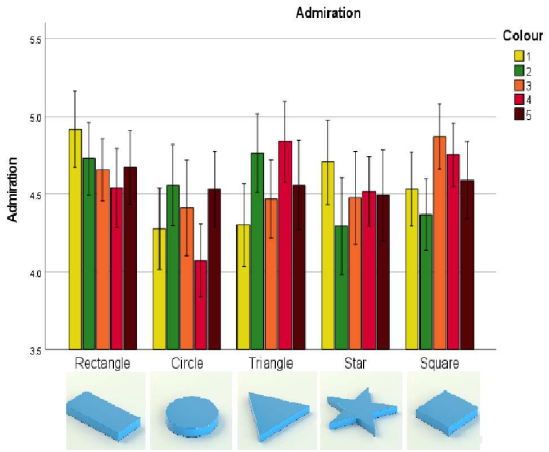

Figure 3. Mean rating of Admiration as a function of colour and shape of the nougat packaging. The error bars represent a 95% confidence interval.

In terms of the interaction of colour and shape, the participants expected there to be more Admiration for the yellow nougat packaging rectangular in shape than for the circle and triangle (both $p \leq .008$). Furthermore, the participants expected there to be more Admiration for the yellow nougat packaging star in shape than for the circle and triangle (both $p \leq .009$). Regarding the colour red, the participants expected there to be less Admiration for the red nougat packaging circle in shape than for the triangle, star, and rectangle (all $p \leq .043$).

In terms of the interaction of shape and colour, the participants expected there to be more Admiration for the triangle nougat packaging in red than for the yellow triangle and orange triangle (both $p \leq .039$). Moreover, the participants expected there to be more Admiration for the square nougat packaging in orange than for the green square ($p = .004$).

3.2. Pleasant surprise-Unpleasant surprise (E2)

In terms of the main effect of the packaging shape of the nougat packaging (see Figure 4), the participants expected there to be a less Pleasant surprise for the circular nougat packaging than for the star and triangle (all $p \leq .027$).

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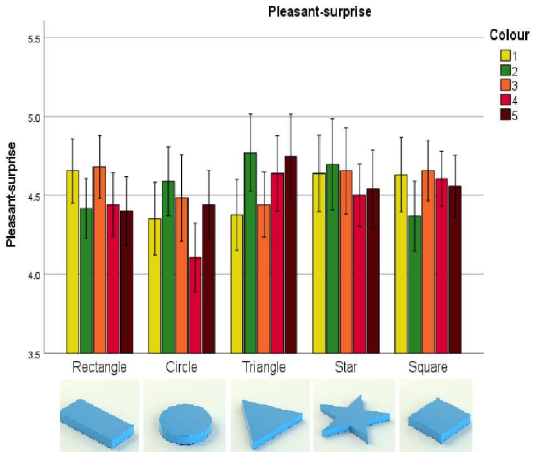

Figure 4. Mean rating of Pleasant surprise as a function of colour and shape of the nougat packaging. The error bars represent a 95% confidence interval.

In terms of the interaction of colour and shape, the participants expected there to be a less Pleasant surprise for the red nougat packaging circular in shape than for the triangle and square (both $p \leq .024$).

In terms of the interaction of shape and colour, the participants expected there to be less Pleasant surprise for the circle nougat packaging in red than in green and orange (both $p \leq .049$).

3.3. Attraction-Aversion (E3)

In terms of the main effect of the shape of nougat packaging (see Figure 5), the participants expected there to be less Attraction towards the circle nougat packaging than towards the triangle and star (both $p \leq .010$).

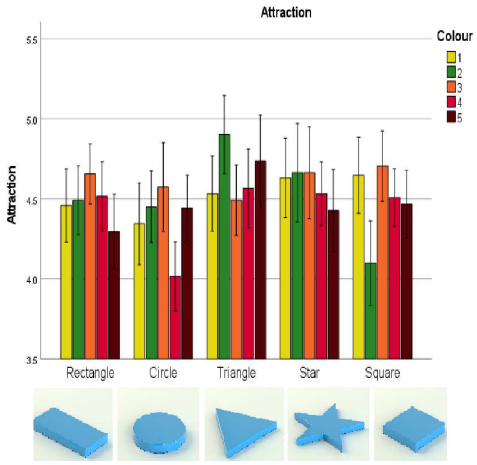

Figure 5. Mean rating of Attraction-Aversion as a function of colour and shape of the nougat packaging. The error bars represent a 95% confidence interval.

Regarding the interaction of colour and shape, the participants expected there to be less Attraction towards the red nougat packaging as a circle than towards the triangle, rectangle, star and square (all $p \leq .025$). Furthermore, the participants expected there to be less Attraction towards the green nougat packaging as a square than towards the triangle and star (both $p \leq .013$)

In terms of the interaction of shape and colour, the participants expected there to be more Attraction towards the circle nougat packaging in orange than towards the red circle ($p \leq .002$). In addition, the participants expected there to be less Attraction towards the square nougat packaging in green than towards the orange and yellow squares (both $p \leq .001$).

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3.4. Fascination-Boredom (E4)

In terms of the main effect of shape packaging (see Figure 6), the participants expected there to be less Fascination for the circular nougat than for the triangle and star (both $p \leq .013$). Furthermore, the participants expected there to be more Fascination for the triangle than for the circle and square (both $p \leq .036$).

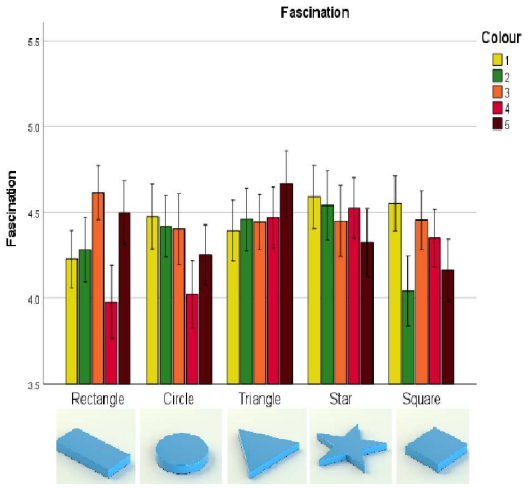

Figure 6. Mean rating of Fascination-Boredom as a function of colour and shape of the nougat packaging. The error bars represent a 95% confidence interval.

In terms of the main effect of colour, the participants expected there to be more Fascination for the yellow nougat packaging than for the red ($p \leq .006$). In addition, the participants expected there to be more Fascination for the orange nougat packaging than for the red and green (both $p \leq .033$).

Regarding the interaction of colour and shape, regarding the colour red, the participants expected there to be less Fascination for the red nougat packaging rectangular and circle in shape than for the triangle, star and square (all $p \leq .034$). As for the colour brown, the participants expected there to be more Fascination for the brown nougat packaging triangle in shape than for rectangle and square ($bothp \leq .014$). Finally, for the colour green, the participants expected there to be less Fascination for the green nougat packaging square in shape than for the triangle, star and circle (all $p \leq .001$).

In terms of interactions of shape and colour, the participants expected there to be more Fascination for the rectangle packaging in orange than for the green, yellow, and red rectangles (all $p \leq .042$). Furthermore, the participants expected there to be less Fascination for the circular nougat packaging in red than for the orange, green, yellow, and brown circles (all $p \leq .007$). Moreover, the participants expected there to be less Fascination for the square nougat packaging in green than for the yellow, red, orange, and brown squares (both $p \leq .017$).

3.5. Joy-Sadness (E5)

In terms of the main effect of shape packaging (see Figure 7), the participants expected there to be more joy for the triangle and star nougat than for the rectangle, square and circle (both $p \leq .016$). In terms of the main effect of the nougat packing colour, the participants expected there to be less Joy from the red nougat packaging than from the colours orange, yellow, and brown (all $p \leq .029$).

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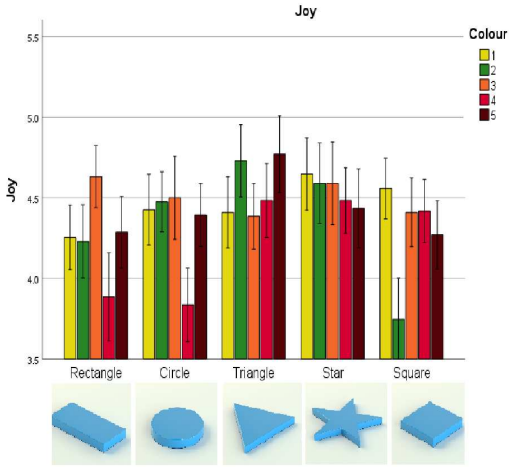

Figure 7. Mean rating of Joy-Sadness as a function of colour and shape of the nougat packaging. The error bars represent a 95% confidence interval.

In terms of the interaction of colour and shape, the participants expected there to be less Joy from the red nougat packaging circle in shape than from the square, star, triangle and rectangle (all $p \leq .003$). As for the colour brown, the participants expected there to be less Joy from the brown nougat packaging square in shape than from the star ($p \leq .015$). Finally, the participants expected there to be less Joy from the green nougat packaging square in shape than from the triangle, circle, star, and rectangle (all $p \leq .039$). Moreover, the participants expected there to be more Joy from the green nougat packaging triangular in shape than from the square, rectangle and star (all $p \leq .001$).

In terms of the interaction of shape and colour, the participants expected there to be more Joy from the rectangular nougat packaging in orange than from the green ($p \leq .026$). Regarding the circular shape, the participants expected there to be less Joy from the circular nougat packaging in red than in orange, yellow, green, and brown circles (all $p \leq .001$). As for the triangular shape, the participants expected there to be more Joy from the triangular nougat packaging in green than from the red and orange triangle ($p \leq .049$). Regarding the square shape, the participants expected there to be more Joy from the square nougat packaging in yellow than from the green square ($p \leq .001$). Moreover, the participants expected there to be less Joy from the square nougat packaging in green than from orange, yellow, red, and brown squares (all $p \leq .001$).

3.6. Satisfaction-Dissatisfaction (E6)

In terms of the main effect of the shape of nougat packaging (see Figure 8), the participants expected there to be less Satisfaction from the circular nougat packaging than from the square (both $p \leq .029$).

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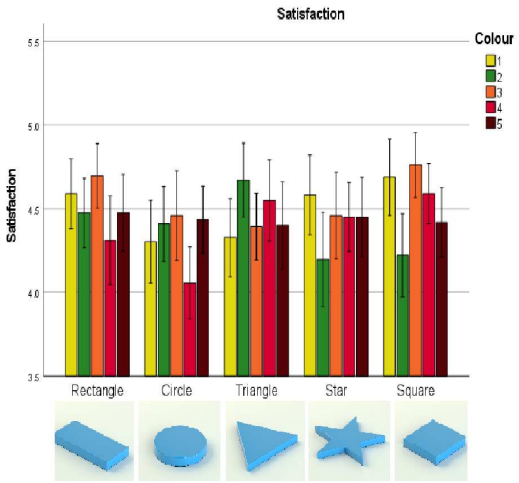

Figure 8. Mean rating of Satisfaction-Dissatisfaction as a function of colour and shape of the nougat packaging. The error bars represent a 95% confidence interval.

Regarding the interaction of colour and shape, the participants expected there to be less Satisfaction from the red nougat packaging circle in shape than from the square and triangle ($p \leq .049$). Regarding the colour green, the participants expected there to be more Satisfaction from the green nougat packaging triangle in shape than from star, and square (both $p \leq .029$).

In terms of the interaction of shape and colour, participants expected there to be more Satisfaction from the circle-shape nougat packaging in orange than in red ($p \leq .026$). Regarding square shape, the participants expected there to be less Satisfaction from the square nougat packaging in green than from the orange and red squares (both $p \leq .009$).

4. Discussion, conclusions, limitations and future work

4.1. Managerial and theoretical implications

The general results of the experiment correspond with the colour-context theory of [56] which means the colour, depending on the circumstances is assigned a specific meaning, in this case with nougat packaging (such as the association nougat with your own colour yellow or brown). It can be concluded from the experiment that the participants associate colour with nougat packaging.

Furthermore, according to [57], the congruence between colour and flavour constitutes an important factor to consider while searching for flavour information. Participants were able to find packaging flavour labels faster when the colour of the container was consistent with the flavour label (e.g., red/tomato or green/cucumber) than when the colour was incongruent (e.g., yellow/tomato).

In our results, the green colour was associated with less Attraction, Satisfaction and Fascination in certain shapes because it is unusual in the marketplace to see a nougat in green packaging. The colour brown was associated with more Admiration but less Joy and Attraction, such as, in [29], where the adjectives Interesting, Premium, and Unpleasant were all employed to describe black containers for yoghurts; however contradictory terms do exist.

In packaging, the product colour is highly relevant and the shape of the packaging takes a second place. However, our results show that the form is indeed relevant, since it may add additional information and value; this is the case in the packaging of nougat, where the most preferred shapes are angular. The main shapes are triangles, stars, and squares for the whole emotion, except the star which evokes more Fascination than others. Hence, concerning the shape, the preference for participants with angular packaging could be explained by [58–60], where people prefer the angular shape for chocolate products, which have similar packaging to that of nougat, rather than the round shape that works for nougat packaging. According to [40] these research results, product shape and colour caps

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cannot be viewed as secondary features of the product line. The use of colour and shape in design can significantly alter consumer preferences, perceptions of quality, and feelings [40].

The emotions of Satisfaction, Joy, and Fascination are influenced by colour and shape, and hence that designers should take these factors to design nougat packaging that can provoke the emotion that the designer wants in a consumer. Moreover, it can be observed that colours and shapes play a major role when nougat packaging is designed.

Certain shapes are predominant in nougat packaging, such as rectangle, squares, and triangles. On the other hand, the main colours that could positively influence emotions are yellow, orange, and brown. Therefore, we suggest that the nougat industry make packaging with the combination of the three shapes (triangle, star and square) and colours (orange, yellow and brown) mentioned above to provoke greater feelings of Admiration, Satisfaction, Pleasant surprise, Attraction, Fascination and Joy.

The use of the adjective Satisfaction implies the inclusion of the social axis of sustainability throughout the study, which helps to strengthen this triple vision by connecting it with the purely economic aspects (attraction-sale of the product) and the environmental ones (use of less raw materials by creating products more focused on the user and his needs and therefore fewer product options that are less required).

In another hand, the nougat packaging with triangular shape combined with green and brown colours. And finally, the nougat packaging with circular shapes combined with green and orange colours. Therefore, our results showed that the colour and shape of the package are two important factors that influence purchase intention. In addition, the new nougat product could get a novelty shape (circular or triangular) package and colour that does not correspond with their product colour such as green.

The expectations a product generates are critical in the purchase stage since they influence the purchase intention. A product that generates increasingly positive emotion can generate a purchase intention, although these expectations must be consistent with the product sold in order to prevent any inconsistencies. The nougat industry also has to meet the expectations of the product since when these expectations are met, customers experience greater satisfaction, thereby generating a renewed intention to purchase the product .

4.2. Limitations and Future Work

The present research does not come without limitations. For example, the colours and nougat packaging selected were only a subset of the possible alternatives found in the market, and as such, future research may be expanded by studying additional colour variations (not only hue). Furthermore, no evaluation of the experience of the participants has yet been carried out. It would be interesting to evaluate how these variables influence experience, given specific expectations, and use different analysis techniques for the data in future research.

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