

Recognition of sustainable packaging by consumers of household chemicals

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Abstract: The growing interest of companies in sustainability affects various areas of logistic activities, including packaging. There is a clear tendency among industrial companies to enhance the sustainability of packaging for their products. In doing so, companies contribute not only to the environmental behaviour of society but also to its overall well-being. However, for ultimate success in both business and society, it is important that consumers can recognise and appreciate these packaging efforts. The paper addresses the challenge of identifying sustainable packaging from the perspective of consumers, particularly in relation to the purchase of household chemicals such as detergents and cosmetics. Based on the literature review and focus group discussion, the paper reveals packaging indicators that enable consumers to identify sustainable packaging. A subsequent questionnaire survey involving 400 Czech consumers defines the relative importance of these indicators. Through exploratory factor analysis, the paper identifies six main factors in recognising sustainable packaging, namely graphic design, amount of material, type of material, brand, labelling, and reusability. Furthermore, the paper reveals differences in the perception of sustainable packaging based on the socio-demographic characteristics of consumers. Reusability, type of material, and labelling emerge as the most significant factors in packaging recognition within the Czech consumer market for household chemicals. While the impact of labelling and type of material factors varies depending on the education, age, and environmental inclination of consumers, the reusability factor equally influences all Czech consumers, regardless of gender, age, education, or lifestyle.

1 Introduction

Increasing environmental problems, such as global warming, have led to a growing awareness of the importance of sustainable development [1]. At present, sustainability has a significant impact on the direction of human society. It has become one of the main trends influencing corporate strategies in the last decade [2]. The principles of sustainability influence individual corporate strategies to varying degrees, and changes in these strategies also have a different impact on the sustainability of the company and society. One strategy with a significant effect on sustainability is the packaging strategy. Changes to this strategy concern the use of renewable materials, the reduction of materials [3], the rethinking of packaging structure [4], and the introduction of recyclable, returnable, and reusable packaging [5]. Each of these changes can significantly affect the amount and composition of municipal waste, a large part of which is packaging waste. In addition, appropriately designed packaging can make more efficient use of space during transport and storage or facilitate product handling. This can reduce waste during transport and reduce energy consumption and emissions [6]. For this reason, current packaging strategies focus specifically on the redesign of packaging to increase the

sustainability of product packaging [5] and contribute to higher business performance. Higher business performance is based on both resource savings and higher sales.

However, if higher sales are to be generated, consumers must have access to these innovations. They need to be able to identify what sustainable packaging is, differentiate it from conventional packaging, and consider its benefits when making purchasing decisions [1]. Therefore, it is crucial for businesses to understand what indicators consumers look for when recognising sustainable packaging. However, this is still insufficiently clarified on a theoretical level. Current knowledge in this area of research is limited because previous research worked with selected features of sustainable products [4,7,8] and did not examine the significance of the considered indicators of product sustainability from the perspective of customers through quantitative research, for the possibility of some generalization. The issue of different perceptions of these indicators has also not been sufficiently explored, although some studies point to a specific perception of sustainable packaging depending on environmental concerns [8], lifestyle [9], the country in which consumers live [1], or the maturity of this country [10].

The paper aimed to identify the main factors contributing to consumer recognition of sustainable packaging and to evaluate their significance when purchasing household chemicals. This aim was achieved using mixed-methods research (a combination of focus group discussion and questionnaire survey) on the Czech consumer market. Therefore, the paper has the potential to contribute to the development of knowledge both in the importance of sustainable packaging features and in different perceptions depending on several factors, namely demographic factors and attitudes towards environmental protection. At the same time, it contributes to the understanding of the different perceptions depending on the origin of respondents, as it adds the perspective of Czech consumers.

2 Literature review

Sustainable packaging helps protect the environment by reducing waste and societal healthcare costs while reducing environmental health risks [1]. The sustainability of the packaging, and as a result, the environmental friendliness of the packaging, matters to a large group of consumers. For example, Martinho et al. [11] stated that 44.1% of respondents consider environmentally friendly packaging to be very important or important, while 35.6% have a neutral attitude. Prakash and Pathak [12] concluded that up to two-thirds of consumers are interested in environmentally friendly packaging for products intended for daily consumption.

When recognising sustainable packaging, consumers often look for simple ways to do it [1]. They often identify sustainable packaging by the feeling of environmental friendliness [4]. Herbes et al. [1] identified four main groups of indicators, namely:

- structural indicators (material, size, and shape of the packaging),
- visual indicators (colour, branding, and images)
- information provided (text and figures), and
- sensory indicators (texture and smell).

For a certain group of consumers, packaging material is the primary indicator of the degree of environmental friendliness [13]. Up to 83% of consumers consider it important for packaging to be made from recyclable materials [14]. Materials that are routinely sorted and recycled have received an incredibly positive response. Typical environmentally friendly materials include paper [1,15], glass [4,15] and cardboard [1]. According to research by Orzan et al. [16], paper was identified as a suitable material by 74.2% of respondents; in research by Lindh et al. [17], paper was spontaneously identified as the least environmentally negative packaging material by 79% of respondents. Glass was identified as an environmentally friendly material in a study by Orzan et al. [16] by 51.1% of respondents. In addition to recyclable materials,

consumers are also interested in biodegradable or compostable packaging [18].

When assessing sustainability, it is not only about the type of packaging material but also about its quantity [1]. Sustainable packaging should be reasonably large, have a smart shape, and have a small footprint compared to the packaged product (optimisation of the free space in the packaging should be conducted). Inappropriately chosen shapes and sizes of the packaging may make consumers feel that the packaging is not sufficiently filled with the product [19]. Similarly, the optimisation of the one-off quantity of a product should be conducted in relation to the needs of consumers [7] to avoid product waste. However, the size and shape of the packaging (which also, for example, facilitates storage and transport) are not decisive when assessing the sustainability of the packaging [1,20]. A probable reason for this is that consumers do not sufficiently perceive the link between waste and packaging size, as suggested by studies by Boesen et al. [18].

The colour of the packaging [1] also helps consumers assess sustainability. This is one of the most distinctive features of packaging that drives purchasing decisions for organic products [21]. It attracts attention and can also signal naturalness and sustainability [22]. Earth-coloured packaging (e.g., brown, cream, or green) is a common indicator of sustainable products. Transparent packaging or packaging in colours that are associated with the naturalness of the product are also considered more sustainable options [22]. Lindh et al. [17] report that unbleached paper is often perceived by customers as an ideal form of packaging. However, consumers perceive sustainable packaging as less appealing because it tends to be simple and not as colourful [15].

Other indicators of the sustainability of packaging are brands, images, and other information in the form of numbers and text. Scott and Vigar-Ellis [10] report that 44% of respondents read the label on the packaging when evaluating the environmental friendliness of a product, and 30% of respondents rate the same based on an image or (e.g., recycle) logo on the packaging. According to a study by Herbes et al. [1], around 80% of consumers assess the sustainability of packaging based on labelling. Eco-labels provide consumers with information on the environmental performance of the product and packaging, which should facilitate the choice of sustainable products [23]. However, the current way of eco-labelling products on consumer markets is burdened by the fact that manufacturers use many eco-labels. Each of them is based on different evaluation criteria and often provides diametrically opposed information, which can be confusing for consumers [24]. According to Navas et al. [25], the impact of eco-labels on consumers is minimal.

Packaging information in various forms can also provide consumers with additional information regarding the sustainability of packaging. For example, recyclability of packaging (together with reusability) is one of the most frequently requested properties of sustainable packaging

[4,15,18]. Bech-Larsen [26] reports that 82% of consumers want them. These consumers need to be reassured of recyclability. According to Jerzyk [27], the information on the packaging about the possibility of recycling is one of the most important pieces of information for consumers. 83% of consumers believe that this information should be easy to find and 77% of consumers believe that it should be displayed directly on the packaging [14]. There may also be additional information on the packaging, such as a label or text describing the material or a number indicating the percentage of recycled material [1]. They also signal to customers the degree of sustainability of the packaging.

Consumers can also assess the sustainability of packaging based on other information, for example, information known or obtained from other sources, or only because of knowledge and trust in the manufacturer's brand. If consumers know and trust the manufacturer's brand, they are more likely to believe sustainability claims on packaging [28,29], which can influence their purchasing decisions.

Reusable or refillable packaging is particularly preferred by green consumers. In addition, they add a requirement to use one material type, namely glass or paper [22]. However, this requirement is not very widespread. According to Boesen et al. [18], only 9% of respondents say they consider it important that packaging is made of only one material. In any case, the reusability of packaging should be supported by packaging design, as according to Greenwood et al. [30], the consumer is willing to use the packaging more than once only if the packaging has a tasteful and timeless design.

It is therefore clear that consumers can recognise sustainable packaging based on several indicators or characteristics. The question is how deep their knowledge is to rigorously evaluate these characteristics and indicators. According to Otto et al. [22], consumers evaluate packaging primarily through their feelings. They most often associate sustainability with the recyclability or reusability of packaging, and their knowledge of other aspects of sustainable packaging is limited. For example, they do not perceive the facts that condition the recyclability of packaging, or these facts are not important to them. As a result, consumer behaviour may be much less sustainable than they anticipate [3].

According to El Oraiba and Kiygi-Calli [31], packaging design preferences are not influenced by demographic factors such as gender, age, education, income, and married life. According to Popovic et al. [9], consumer attitudes towards environmentally friendly packaging are influenced by two main factors, namely lifestyle and the ability to apply knowledge in the field of environmentally friendly packaging in their daily lives. Lifestyle can also be characterised by an inclination towards environmental protection.

Regarding the intensity of the inclination towards environmental protection, two main groups of consumers can be distinguished, namely consumers with an initiative-

taking approach to the environment (eco-consumers) and traditional consumers (conventional consumers). Eco-consumers are people who try to reduce their environmental impact [32]. Over traditional products, they prefer products whose production saves energy, saves water, reduces water pollution, or generates their own contribution to improving the state of the environment [33]. Conventional consumers are highly influenced by consumerism. The main priority for them is to satisfy themselves through many products, often without regard for the waste that burdens the environment [34].

The perception of the sustainability of packaging can also be influenced by the country of origin of the consumers. For example, Herbes et al. [1] found that French consumers often rely on colour or perceived material. They rely on it more often than consumers in the United States and Germany, but they are much less inclined to search for more information, for example, on the Internet. For consumers from Germany and France, the quantity or size of packaging is a much more important indicator of sustainability than for US consumers.

3 Methodology

A mixed-methods approach that combines qualitative and quantitative research methods in a single research study was proposed to achieve the aim of the paper. The qualitative research aimed to reveal how consumers recognise sustainable packaging and then define potential indicators of sustainable packaging. The follow-up quantitative research aimed to measure the significance of these indicators when purchasing household chemicals in the population of Czech consumers and to identify the key factors in recognising sustainable packaging in consumer markets through subsequent analysis of the data obtained. At the same time, the validity of four research hypotheses was verified, which result from the literature review and verify the differences in the recognition of sustainable packaging depending on the socio-demographic characteristics of consumers. The hypotheses were formulated as follows:

H1: The way of recognising sustainable packaging depends on the gender of consumers.

H2: The way of recognising sustainable packaging depends on the age of consumers.

H3: The way of recognising sustainable packaging depends on the education of consumers.

H4: The way of recognising sustainable packaging depends on the lifestyle of consumers.

3.1 Data collection

The qualitative research was conducted using the focus group discussion, which included six Czech consumers of different genders (three men and three women) and ages (25-65 years). All participants in the discussion were united by their inclination towards a sustainable lifestyle and their preference for purchasing goods in sustainable

packaging. An audio-visual recording of the discussion was made, which was transcribed into written form and subjected to content analysis. The content analysis made it possible to define eighteen potential indicators of sustainable packaging, which were used in the creation of a questionnaire for follow-up quantitative research.

The quantitative research was conducted in the form of a questionnaire survey among 400 Czech consumers aged 18+ in the period from January to February 2023. The sample of respondents was compiled by quota sampling with bound quotas for gender and age according to data from the Czech Statistical Office [35]. The data were collected using personal questioning and a structured questionnaire. In the first part of the questionnaire, respondents assessed the extent to which they were able to recognise sustainable packaging when purchasing household chemicals according to eighteen pre-specified indicators. A four-point rating scale was used to measure the significance of the indicators (where 1 = no; 2 = rather no; 3 = rather yes; 4 = yes). During the interview, the basic

demographic characteristics of the respondents (gender, age, and education) and their attitudes towards a sustainable lifestyle (willingness to adapt to trends in sustainable development, interest in information related to sustainable development, frequency of purchase of sustainable products, and waste sorting in the household) were also identified. A five-point frequency scale was used to measure respondents' attitudes towards a sustainable lifestyle (where 1 = never; 2 = sometimes; 3 = often; 4 = very often; 5 = always). Based on these attitudes, the sample of respondents was divided into two segments (eco-consumers and conventional consumers) using the two-step cluster analysis method.

The structure of the research sample is shown in Table 1. Based on the chi-square test, the research sample can be considered representative of gender ($\chi^2 = 0.002$; $p = 0.968$) and age of respondents ($\chi^2 = 0.002$; $p = 0.968$), but it is dominated by consumers with higher education ($\chi^2 = 150.248$; $p < 0.001$) compared to the structure of the Czech population.

Table 1 Structure of research sample

Characteristic	Segment	Frequency in the research (%)	Frequency in the population (%) ^a
Gender	Males	51.0	51.1
	Females	49.0	48.9
Age	18-34	23.3	23.2
	35-54	36.8	36.8
	55+	40.0	39.9
Education	Primary	17.3	44.9
	Secondary	41.8	34.0
	Tertiary	41.0	21.1
Lifestyle	Eco	32.3	.
	Conventional	67.8	.

a. Structure of the Czech population according to SLDB 2021 [35].

3.2 Statistical data processing and verification of research hypotheses

Methods of exploratory and inferential statistics were used in the IBM SPSS Statistics (version 24) software for processing quantitative data. To compare the significance of eighteen indicators, an average ranking on the measuring scale was determined for each indicator, and this ranking was subjected to the Friedman test at the 5% significance level. This made it possible to uncover the most important indicators of sustainable packaging.

To identify the main factors of sustainable packaging recognition and to verify the research hypotheses, exploratory factor analysis was used. The quality of the data for factor analysis was evaluated using the Bartlett test and the Kaiser-Meyer-Olkin criterion. The principal component method was used for the extraction of the factors, but the initial solution was orthogonally rotated by the Varimax method in order to improve the interpretation of the analysis results. The reliability of the analysis results was evaluated using *Cronbach's alpha*.

Based on the factor analysis model, each respondent was evaluated with a factor score, the value of which can be used to infer the degree of influence of factors in recognising sustainable packaging. Because the factor score has a standardised normal distribution of $N(0;1)$, positive score values point to a more significant effect of the factor, while negative score values point to a less significant effect. This fact was used to verify the validity of the $H1-H4$ research hypotheses. In each group of consumers (by gender, age, education, and lifestyle), the average values of factor scores were determined, and the differences between the averages were tested using the ANOVA test at a 5% significance level. This made it possible to decide on the validity of the research hypothesis and to evaluate how the way of recognising packaging differs between individual consumer segments.

4 Results and discussion

The first part of the analysis focused on revealing the indicators of sustainable packaging used by consumers

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when purchasing household chemicals. The content analysis of the focus group discussion made it possible to identify 18 indicators (see Table 2) that do not differ fundamentally from the indicators described in previous research [1,7,10,22]. However, three new indicators have been identified, namely the brand of the product or the name of the manufacturer, the type of sales network that

offers the product, and the placement of the product in the store. Conversely, the indicators we identify do not include sensory indicators of packaging sustainability, such as texture or smell, as reported by Herbes et al. [1]. However, it can be estimated that this difference is due to the nature of the products that were the subject of research.

Table 2 Relative importance of sustainable packaging indicators

Indicator	Response rate ^a (%)				Average ranking
	No	Rather no	Rather yes	Yes	
Returnability of packaging	2.3	12.5	48.3	37.0	12.76 ^b
Recyclability of packaging	1.0	12.8	53.3	33.0	12.66 ^b
Refillability of packaging	2.3	17.3	49.8	30.8	12.17 ^b
Use of recycled materials	2.5	21.0	53.0	23.5	11.30 ^b
Sustainability product certification label	3.0	21.0	51.5	24.5	11.29 ^b
Type of material used	2.0	24.0	59.0	15.0	10.53
Rate of filling the packaging with the product	6.8	28.5	42.0	22.8	10.45
The number of types of material used and their easy separability	5.0	27.8	51.3	16.0	9.97
Amount of material used	6.8	29.5	46.5	17.3	9.84
Sustainable/eco-friendly claims on packaging	4.8	32.3	51.3	11.8	9.59
Product brand or manufacturer's name	12.5	29.3	44.8	13.5	9.20
Number of layers of the packaging	9.0	35.5	40.0	15.5	9.08
The type of sales network in which the product is offered	13.0	37.5	43.8	5.8	8.08
Used images and natural motifs on the packaging	20.0	37.3	35.3	7.5	7.49
Placement of the product in the store (or e-shop)	15.0	44.3	33.8	7.0	7.44
Packaging colour	21.5	43.5	27.8	7.3	6.75
Minimalist graphic packaging design	21.3	44.5	30.3	4.0	6.47
Packaging shape	28.3	45.5	20.8	5.5	5.93

a. Frequency of responses to the question of whether respondents are able to recognise that purchased goods are sustainably packaged according to the indicator.
 b. There was no statistically significant difference between the values of the average rank (post hoc Friedman tests with Bonferroni correction).

In the next phase of the analysis, the significance of eighteen indicators was compared based on the analysis of data obtained from the questionnaire survey. Table 2 presents the results of the data analysis, including the value of the average ranking of the indicator (the significance of the indicator increases as the ranking value increases). The result of the Friedman test ($\chi^2 = 1419$; $df = 17$; $p < 0.001$) shows that the examined indicators are not comparably important in recognising sustainable packaging. Czech consumers most often orient themselves according to the information provided on the possibilities of reusing packaging (returnability of packaging, refillability of packaging), recyclability of packaging, use of secondary materials, and eco-labels. The importance of indicators in the field of recyclability of packaging corresponds to the revealed importance of this characteristic of packaging for consumers in previous research [1,4,15,18,26]. However, the revealed significance of eco-labels contradicts Navaz et al.'s [25] claim that the impact of eco-labels on consumers is minimal.

Regarding the fact that several indicators were evaluated by respondents in an analogous way, the main

factors of packaging recognition using exploratory factor analysis were revealed in the subsequent step of the analysis. The adequacy of the use of factor analysis can be declared by the significant result of the Bartlett test ($\chi^2 = 2763$; $df = 153$; $p < 0.001$) and by the high value of the Kaiser-Meyer-Olkin criterion, which reached 0.851 in the research. The resulting solution of the rotated component matrix, presented in Table 3, explains 70.3% of the variability of the input data. All extracted factors achieve the required reliability (values of *Cronbach's alpha* are higher than 0.7).

Table 3 shows that six main factors influencing consumer recognition of sustainable packaging can be identified. These factors are as follows:

- graphic design,
- amount of material,
- type of material,
- brand
- labelling, and
- reusability.

Table 3 Results of exploratory factor analysis

Rotated component matrix	Factor loading ^a					
	Graphic design	Amount of material	Type of material	Brand	Labelling	Reusability
Minimalist graphic packaging design	0.821					
Packaging colour	0.809					
Packaging shape	0.721					
Used images and natural motifs on the packaging	0.686					
Number of layers of the packaging		0.865				
Amount of material used		0.820				
The number of types of material used and their easy separability		0.638	0.526			
Rate of filling the packaging with the product		0.632				
Use of recycled materials			0.766			
Type of material used			0.732			
Recyclability of packaging			0.711			
Product brand or manufacturer's name				0.791		
The type of sales network in which the product is offered				0.789		
Placement of the product in the store (or e-shop)				0.689		
Sustainable/eco-friendly claims on packaging					0.825	
Sustainability product certification label					0.767	
Returnability of packaging						0.808
Refillability of packaging						0.759
Cronbach's alpha	0.806	0.822	0.746	0.740	0.711	0.706

a. Factor loading values lower than 0.5 are hidden.

The above-mentioned finding expands on and refines already published conclusions, especially by Herbes et al. [1], who identified four groups of these indicators (structural, visual, sensory, and information). The difference was identified not only in the number of these groups but also in their structure and content. The graphic design factor identified by our research is closely related to the visual perception of packaging design. It therefore includes consumer reactions to the colours and motifs used, which evoke the sustainability of the packaging. The material aspects of packaging are recognised by consumers in two basic ways, namely the amount of material and the type of material factors. The amount of material factor represents the consumer's perception of the amount of material used and how it is used to package the product (including the division of products into batches and the use of excess packaging layers). On the other hand, the type of material factor is related to consumer perceptions of the type of material used and the possibility of its recycling. The brand factor is closely related to the purchasing orientation of consumers according to the sustainable image of the manufacturer, the brand of products, the placement in the store, or the specific classification of the product in the e-shop. The labelling factor involves consumer perceptions of the symbols, brands, and other claims on the packaging that are used to identify sustainable packaging. Finally, the reusability factor includes the consumer's perception of whether the

packaging can be reused (returnability of packaging and refillability of packaging).

From the comparison of the results presented in Table 2 and Table 3, the key factors in recognising sustainable packaging among the population of Czech consumers are reusability, type of material, and labelling factors. When recognising sustainable packaging, consumers are therefore primarily guided by whether the packaging can be reused and recycled and whether the packaging is marked with appropriate symbols, claims, or eco-labels that declare the responsibility of producers for the sustainable management of packaging materials throughout the entire life cycle of the packaging.

The last part of the analysis verified the research hypotheses about differences in packaging recognition depending on the socio-demographic characteristics of the respondents. Tables 4-7 present the values of average factor scores (the degree of influence of sustainable packaging recognition factors) in respondent segments depending on their gender (Table 4), age (Table 5), education (Table 6) and lifestyle (Table 7). The tables also include the results of the analysis of variance (ANOVA) test, which verify the significance of the reported differences.

An analysis of differences in the recognition of sustainable packaging by gender of respondents revealed significant results only in the case of the brand factor ($F = 4.922$; $p = 0.027$). The values of the average factor scores in Table 4 show that women are more likely than men to

assess the sustainability of packaging by brand or manufacturer of the product, or the product distribution in consumer markets. The results support the H1 hypothesis

(the way of recognising sustainable packaging depends on the gender of consumers).

Table 4 Gender differences in factor scores

Factor	Average Factor Score		ANOVA Test	
	Men	Woman	F	p
Graphic design	-0.079	0.076	2.393	0.123
Amount of material	-0.043	0.042	0.719	0.397
Type of material	-0.077	0.074	2.274	0.132
Brand	-0.113	0.108	4.922	0.027
Labelling	-0.059	0.057	1.343	0.247
Reusability	-0.051	0.049	0.983	0.322

In the case of the analysis of differences by age of respondents, significant differences were confirmed only in the case of the labelling factor ($F = 3.516$; $p = 0.031$). The values of the average factor scores in Table 5 show that with increasing consumer age, respondents' sensitivity

to the symbols, brands, and claims used on packaging decreases in recognising their sustainability. The results support the H2 hypothesis (the way of recognising sustainable packaging depends on the age of consumers).

Table 5 Age differences in factor scores

Factor	Average Factor Score			ANOVA Test	
	18-34	35-54	55+	F	p
Graphic design	0.056	-0.070	0.031	0.581	0.560
Amount of material	0.020	0.123	-0.124	2.381	0.094
Type of material	0.159	-0.084	-0.015	1.718	0.181
Brand	-0.159	0.068	0.030	1.589	0.205
Labelling	0.221	-0.006	-0.123	3.516	0.031
Reusability	0.070	-0.021	-0.021	0.299	0.742

An analysis of the differences in recognising sustainable packaging according to respondents' education revealed significant results in the case of both factors, which are closely related to the material aspects of packaging. In the case of the amount of material factor ($F = 15.662$; $p < 0.001$), these differences are significantly more significant than in the case of the type of material factor ($F = 3.802$; $p = 0.023$). The values of the average

factor scores in Table 6 show that as consumers become more educated, their ability to judge the sustainability of packaging by the amount of material used in the packaging and the type of material from which the packaging is made increases. The results support the H3 hypothesis (the way of recognising sustainable packaging depends on the education of consumers).

Table 6 Education differences in factor scores

Factor	Average Factor Score			ANOVA Test	
	Primary	Secondary	Tertiary	F	p
Graphic design	0.151	0.004	-0.068	1.164	0.313
Amount of material	-0.440	-0.105	0.292	15.662	<0.001
Type of material	-0.103	-0.118	0.164	3.802	0.023
Brand	0.192	-0.010	-0.070	1.692	0.186
Labelling	-0.018	0.032	-0.025	0.144	0.866
Reusability	0.013	0.007	-0.013	0.024	0.976

The confirmation of the H1-H3 hypotheses points to differences in the recognition of sustainable packaging depending on the demographic characteristics of the respondents. If we compare this finding with the conclusions of El Oraiba and Kiygi-Calli [31] regarding packaging design preferences, we can conclude that recognition and perceived preference are two different

aspects of a consumer's perception. While there is an influence of demographic factors on recognition, the preference for sustainable packaging design may be independent of demographic factors.

The most significant differences were revealed when analysing the differences according to the lifestyle of the respondents. Consumer recognition of sustainable

packaging differs for amount of material factor ($F = 10.449$; $p = 0.001$), type of material factor ($F = 10.329$; $p = 0.001$), and brand factor ($F = 9.632$; $p = 0.002$). The values of the average factor scores in Table 7 show that eco-consumers are more likely to orient themselves to all

material aspects of the packaging as well as the brand of the purchased product when recognising sustainable packaging. The results support the H4 hypothesis (*the way of recognising sustainable packaging depends on the lifestyle of consumers*).

Table 7 Lifestyle differences in factor scores

Factor	Average Factor Score		ANOVA Test	
	Eco	Conventional	F	p
Graphic design	0.135	-0.064	3.481	0.063
Amount of material	0.194	-0.092	7.300	0.007
Type of material	0.230	-0.109	10.279	0.001
Brand	0.253	-0.120	12.514	<0.001
Labelling	-0.067	0.032	0.862	0.354
Reusability	0.098	-0.047	1.833	0.177

The importance of the involvement of eco-consumers in the process of recognising sustainable packaging was expected in advance. Therefore, the surprising result of the research is the fact that graphic design, labelling, and reusability factors were not identified as more significant factors in the eco-consumer segment. At the same time, the results of the research showed that the factors of graphic design and reusability affect all consumers to the same extent, regardless of their gender, age, education, or lifestyle.

The conducted research also highlighted specificities depending on the country from which the research data originated. Comparing our results with those from Herbes et al. [1], it emerges that Czech consumers, like consumers from France, Germany, or the USA, base their orientation on the type of packaging material and the eco-labels used. However, unlike them, Czech consumers also place great emphasis on the reusability of packaging.

5 Conclusions

Our research focused on the area of recognising sustainable packaging. Based on the qualitative research, we have defined a wide portfolio of sustainable packaging indicators from the perspective of consumers buying consumer chemicals (detergents and cosmetics). This allowed us to expand the group of indicators described in the literature to include other indicators, namely the brand of the product or the name of the manufacturer, the type of sales network that offers the product, and the placement of the product in the store.

Based on the quantitative research, we have found that Czech consumers most often orient themselves according to the information provided on the possibilities of reusing packaging (returnability of packaging, refilling of packaging), recyclability of packaging, use of secondary materials, and eco-labels. Using factor analysis, we have grouped the individual indicators into six factors behind the recognition of sustainable packaging. These are graphic design, amount of material, type of material, brand, labelling, and reusability. This can be considered an

extension of current knowledge, as previous studies worked directly with individuals and often only selected indicators. This approach also allowed us to understand that the most significant factors in recognising sustainable packaging among the population of Czech consumers are reusability, type of material, and labelling.

The analysis of differences in the impact of factors on consumers revealed significant variations depending on the socio-demographic characteristics of consumers. The results suggest that:

- Women are more likely than men to judge the sustainability of packaging by the brand or manufacturer of the product or how the product is distributed to consumers.
- As consumers age, respondents' sensitivity to the symbols, brands, and claims used on packaging decreases when recognising their sustainability.
- As consumers become more educated, their ability to judge the sustainability of packaging by the amount of material used in the packaging and the type of material from which the packaging is made grows.
- Eco-consumers are more likely than conventional consumers to look at all material aspects of the packaging as well as the brand of the purchased product when recognising sustainable packaging.

The results of the study can be generalised to a certain extent regarding the structure of the research sample, which was representative only by age and gender. Therefore, the results may be partially distorted, for example, by the fact that the sample contained more educated consumers than there are in the population. Nevertheless, we are convinced that our research contributes to the development of knowledge in the field of sustainable packaging indicators.

The study suggests that there are also regional differences in recognising sustainable packaging. Therefore, we would recommend further investigation of these regional differences for follow-up research. It would

seem useful to us to examine not only the differences themselves but also the factors influencing or causing these differences. We assume that the reason for these differences may not only be the culture or maturity of individual countries but also different attitudes towards environmental problems and ways of solving them, and within this also the form and maturity of the waste management systems.

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