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PREFACE

The objective of the conference is to further develop international scientific discussion, extending knowledge bases in the multidisciplinary field of design and research in business environment, including product design, service design, participative design, eco-design, product ecology, consumer perception of design, building company competitive advantage by design, perception of design in relation to culture, design and circular economy to respond to recent trends and challenges in business environment of European countries and sustainability. Ability to manage design brings competitive advantages for businesses and for countries and creates value for customers. Presented findings are partial results in the framework of the following research project:

•VEGA 1/0543/18 The Importance of Product Design in Consumer Decision-Making and Perspectives to Increase the Impact of Design on Creating Competitive Position of Companies Operating in the Slovak Republic

The papers correspond with the central themes:

- Design in Business Environment,
- Product Design and Service Design,
- Participative design
- Eco-design,
- Product Ecology,
- Consumer Perception of Design in different product categories,
- Design as company competitive advantage,
- Perception of Design in relation to culture
- Design and Circular Economy

TABLE OF CONTENTS

The state of the glass industry in Slovakia <i>Ivan Brezina –Alena Donovalová</i>	6
Designing selected flour parameters based on consumer requirements <i>Szymon Dziuba, Anna Cierniak-Emerych</i>	18
Attitudes to Eco-design in the Product Category of Home and Kitchen Accessories <i>Petra Garasová – Ľubica Knošková</i>	29
Impact of packaging design on the purchase of foods <i>Malgorzata A. Jarossová – Jana Gordanová</i>	39
Ekodizajn ako súčasť manažérstva environmentu <i>Marta Karkalíková</i>	46
The Service Design <i>Viera Kubičková</i>	54
Spotrebiteľský prístup k dizajnu a ekológii obalov potravinárskych výrobkov <i>Alica Lacková</i>	62
Strategic design as an integral part of early development of smart wearable devices <i>Michala Lipková</i>	70
The role of design in increasing a company's competitiveness <i>Smaranda Giușcă, Adina-Gabriela Croitoru, Rodica Pamfilie</i>	77
Protected Bulgarian Traditional Foods <i>Sabka Pashova</i>	84
Sustainable design in textile and apparel industries as an element of enterprise competitiveness versus sustainable consumption <i>Renata Salerno-Kochan, Klaudia Wach</i>	95
Evaluation of Eco-Innovations and Eco-Design in the Slovak Republic <i>Petra Garasová – Renáta Ševčíková</i>	107
Ecodesign in the Circular Economy: an Example of Packagings <i>Joanna Witczak</i>	116

The state of the glass industry in Slovakia ¹

Ivan Brezina –Alena Donovalová ²

Abstract

Four big automotive constructors are in the Slovakia, French company PSA Peugeot Citroen, German company Volkswagen AG, British company Jaguar Land Rover and Korean company Kia Motors. The localization of big automaker and their suppliers make a good assumption for growth of glass industry in the Slovakia. Glass industry in the Slovakia is still alive thanks to private tradesmen, where under their hands glass gets a new design and turns into a small work of art. Good design gives the product a clear identity and position in the market. The paper shows the existing glass industry overview in Slovakia. With help of implementation of multi - criteria decision making methods PROMETHEE II the economical perspective subject for investments state support are defined. The analysis shows the economic efficiency and the stability of leaders in glass industry in Slovakia too.

Key words

Glass industry in Slovakia, absolute range, design, PROMETHEE II

JEL Classification: L61

Introduction

Glass production is one of the most important discoveries in the cultural history of mankind. The glass industry is one of the oldest known types of crafts. (Kahan, J. et al., 2015). Slovakia is a country rich in traditions of glass production. Glass has its application in several industries, e.g. in the chemical, electrical, automotive or textile industry.

The current situation in the glass industry in Slovakia is mainly export-oriented, depending on foreign markets, especially Germany, France and the US market. The industry is mainly linked to the automotive and construction industries. Companies that want to compete in strong foreign competition must produce not only high quality, but also attractive design products.

The objective of this paper is to provide a comprehensive overview of the existing situation in the glass industry and to identify economically prospective subjects in the glass industry in Slovakia.

¹ This paper is output of research project VEGA 1/0543/18: The Importance of Product Design in Consumer Decision-Making and Perspectives to Increase the Impact of Design on Creating Competitive Position of Companies Operating in the Slovak Republic

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1 Methodology

For the goal fulfillment, we use the multicriteria decision making method. In this paper we apply one of the PROMETHEE methods. PROMETHEE methods are relatively young methods created by J. P. Brans (Tomić & all, 2011). The biggest advantage of this methods use is its objectivity and the possibility to build the final ranking of alternatives, which consider more criterions. The PROMETHEE methods are not the only one, which can be used by multiple decision making. It is known relatively big amount of the methods, which can be used for solving of the multiple decision-making problem. The example of this methods is STEM (Step-method), ELECTRE (Elimination and Choice Expressing Reality), WSA (Weighted Sum Approach), TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) (Furková & Reiff, 2014).

This paper focuses on the PROMETHEE method implementation, which is used by the comparison of the economical attractiveness of the most important companies in the Slovak glass industry. It exists more PROMETHEE methods, which can be used. The basic of its are the PROMETHEE I a PROMETHEE II. Both methods were built by Belgic economist J.P. Brans and were first time presented on the conference in Quebec in the year 1982 (Brans, 1982). For the Slovak glass industry companies comparison we use PROMETHEE II method, which make the absolute ranking of the alternatives. If we consider more time periods, it is possible to observe not only the final ranking of the Slovak glass industry companies, but the growth of this companies too. As every mathematical method it is necessary to know the purpose function, which is in PROMETHEE II follows:

$$\max(\min)\{y = (y_1, y_2, \dots, y_k) \mid y \in Y\} \quad (1)$$

y is dimension vector of the criterions and Y is the set of alternatives. For the PROMETHEE II method is very important the calculation of net flow ϕ , which shows the final absolute ranking. The base of the final absolute ranking of the alternatives is follows:

$$\begin{cases} y' P'' y'', \text{ ak } \phi(y') > \phi(y'') \\ y' I'' y'', \text{ ak } \phi(y') = \phi(y'') \end{cases} \quad (2)$$

For the net flow value determination is necessary to choose the preference intensity based on alternative comparison (in our paper is alternative the company in slovak glass industry) by condition, that i -th criterion is respected. It depend on chosen preference function type for the criterion. The type of preference function depend on the criterion character. The types of preferenc function in PROMETHEE II are presented in the Table 1.

Tab. 1 The types of preference function for PROMETHEE II

Typ	Definícia	Parametre
I.	$P(d) = \begin{cases} 0 & d \leq 0 \\ 1 & d > 0 \end{cases}$	-
II.	$P(d) = \begin{cases} 0 & d \leq q \\ 1 & d > q \end{cases}$	Q
III.	$P(d) = \begin{cases} 0 & d \leq 0 \\ \frac{d}{p} & 0 \leq d \leq p \\ 1 & d > p \end{cases}$	P
IV.	$P(d) = \begin{cases} 0 & d \leq q \\ \frac{1}{2} & q < d \leq p \\ 1 & d > p \end{cases}$	q, p
V.	$P(d) = \begin{cases} 0 & d \leq q \\ \frac{d-q}{p-q} & q < d \leq p \\ 1 & d > p \end{cases}$	q, p
VI.	$P(d) = \begin{cases} 0 & d \leq 0 \\ 1 - e^{-\frac{d^2}{2s^2}} & d > 0 \end{cases}$	S

Source: Mlynarovič, 1998

2 Results and Discussion

2.1 The glass industry in Slovakia

Glass production has a tradition dating back to the Bronze Age, where glass beads and home made necklaces come from. The first written mention of glassworks in our territory dates back to the 14th century. The first registered glassworks were founded in 1350 in Sklené Teplice. The glassworks were built near rivers in the mountains of mostly beech character. Beech hardwood provided enough energy to heat glass furnaces. There were also other raw materials for glass production - sand and quartz close to the river banks. The first custom-made glasses were temple windows and hollow glasses for the needs of miners and alchemists (Sklárstvo, 2019). During the 15th century the glass industry in Slovakia was influenced mainly by Italian art. In the 16th and 17th centuries glass production in Slovakia expanded.

After the First World War, the glass industry got into serious economic and technical problems due to growing competition in the world. After World War II, almost all the Slovak glassworks disappeared, and the remaining ones had a poor technical level and low production and economic efficiency. In the 1990s, renovation took place in several manufacturing plants, and companies as the Johns Manville Slovakia, Vetropack Nemšová, Izomat Nová Baňa and Ron Lednické Rovné (Kahan, J. et al., 2015) took the forefront.

The glass industry in Slovakia is despite the rich history economically descending. The declination was surprisingly not caused by economic crisis, which only highlighted the economic problems of the sector. An example is the Slovglass from Poltár, which suffered from very narrow product and regional focus and cheap competition products, imported especially from China. The crisis however brought positive effect - the market has cleared up and today there are five larges and several small businesses.

Glass industry is a brunch of industry focused on production of glass and glass products. According to the current classification SK-NACE Rev SK-NACE Rev.2, glassmaking fall under the branche 23.1 Manufacture of other non-metallic mineral products with the following sub-branches: Manufacture of flat glass, Shaping and processing of flat glass, Shaping and processing of flat glass, Manufacture of hollow glass, Manufacture of glass fibres, Manufacture and processing of other glass, including technical glassware. The classification of the glass industry is given in Table 2.

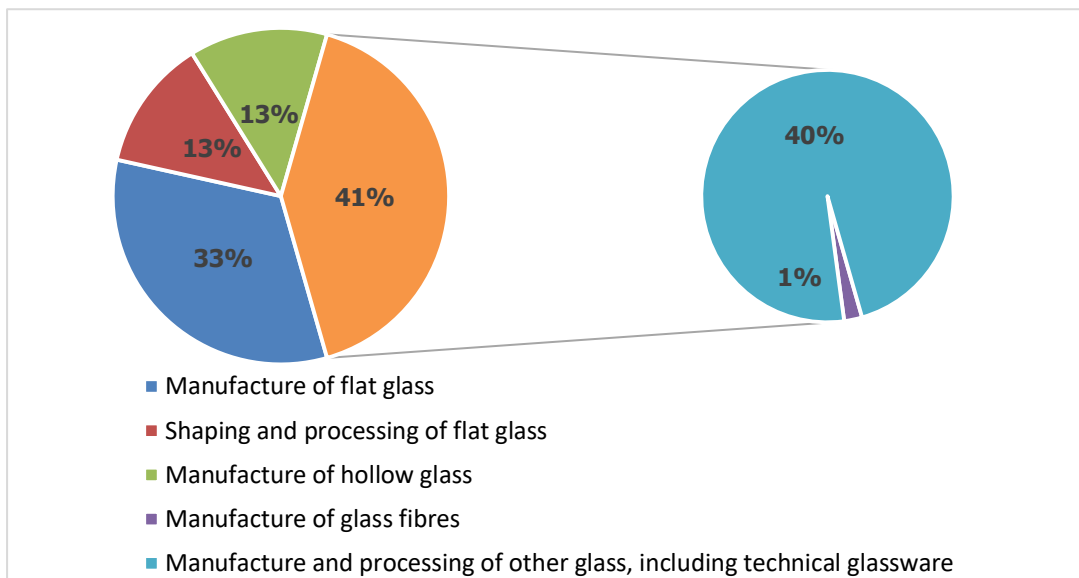
Tab. 2 The classification of the glass industry according to SK NACE Rev.2

Kód SK-NACE Rev.2	
23	Manufacture of other non-metallic mineral products
23.1	Manufacture of glass and glass products
23.11.0	Manufacture of flat glass
23.12.0	Shaping and processing of flat glass
23.13.0	Manufacture of hollow glass
23.14.0	Manufacture of glass fibres
23.19.0	Manufacture and processing of other glass, including technical

Source: Statistical classification of economic activities in the European Community

As of 31 December 2018, there were 316 subject's actives in the glass industry according to the Statistical Office of the Slovak Republic. The largest group of 40% of all entities are those engaged in the manufacture and processing of other glass, including technical glassware, such as automotive parts or glass products, used in construction. Less than 1% of subjects are involved in manufacture of glass fibers.

Graph 1 The structure of glass companies in Slovakia



Source: our processing according Statistical Office of the Slovak Republic

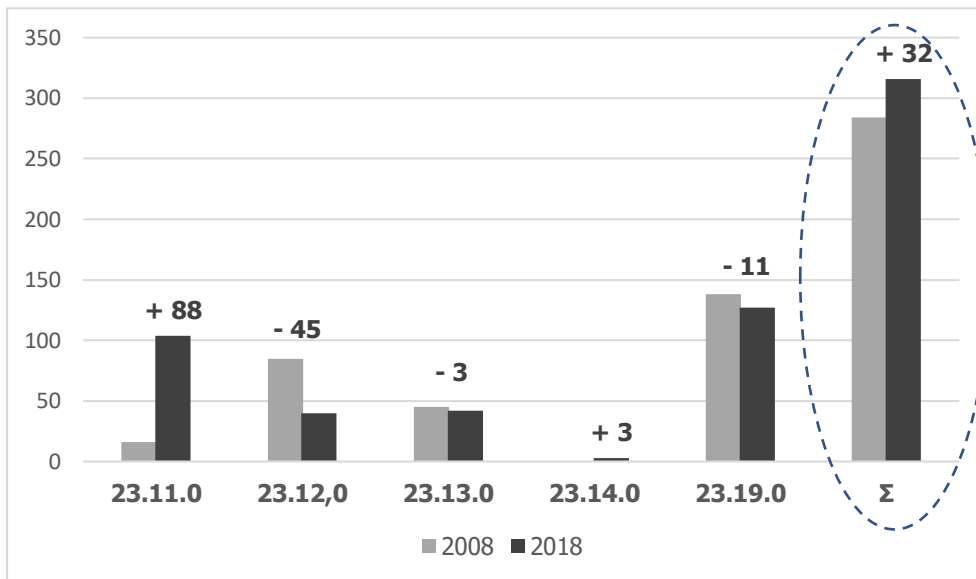
From legal form point of view dominate proprietary company limited by shares in a percentage of 55.4%, followed by tradesmen in a percentage of 42.1%. The other entities are joint – stock companies in a percentage of 2.5%.

In terms of number of employees according to Act of the National Council of the Slovak Republic on state aid, most usual are the microenterprises (in which the SMEs category consists of enterprises with less than 250 employees, the category of large enterprises consists of enterprises with more than 250 employees. Within the SMEs category there are microenterprises (0 -9 employees), small enterprises (10 -49 employees) and medium enterprises (50 –249employees)), reaching 90,2%. Up to 25,3% of these are entities with no employees. Small enterprises account for 5,4%, Medium enterprises have a share of 2,8% and large enterprises have a 1,6% market share. We have 5 large companies in the market. These are Johns Manville Slovakia, a.s., Medical Glass a.s., RF, spol. s ro, RONA, a.s., Vetropack Nemšová s.r.o.

In the glass industry in the years 2008 - 2018, there is an increase in the entities engaged in the production of flat glass by 88 entities, which represents an almost 650% increase in the number of entities in this sector, and increase of 3 entities, focused on fibers glass production. The decrease is recorded in other branches, in the sector of shaping and processing of flat glass by 45 subjects, in the production of hollow glass by 3 subjects and in the production and processing of other glass including technical glass by 11 subjects. Overall, there is an increase of 32 subjects in the glass industry, which represents 10,8%. This increase could be a result of increased demand for glass in the construction and automotive industries.

The Graph 2 below shows the development in the number of entities operating in individual sub-branches of the glass industry in Slovakia.

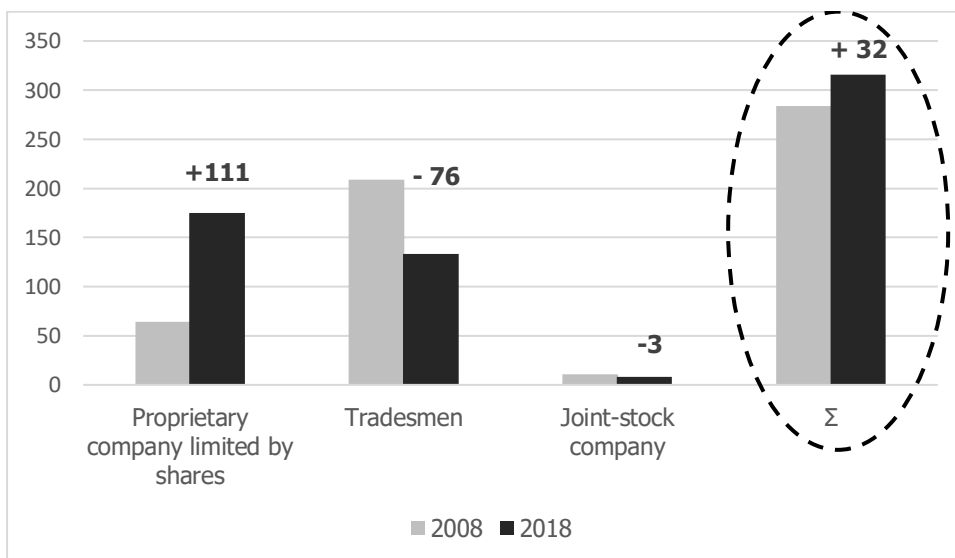
Graph 2 The development of number of subjects of individual glass industry subclasses in 2008 – 2018



Source: our processing according Statistical Office of the Slovak Republic

When monitoring the glass industry entities according to the legal form in the reporting period, we notice an increase in the number of proprietary company limited by shares by 111 entities. On the other hand, the decrease in the number of entities is recorded in natural persons by 76 entities and in joint stock companies by 3 entities.

Graph 3 The development of number of glass industry subjects by legal form in 2008 - 2018

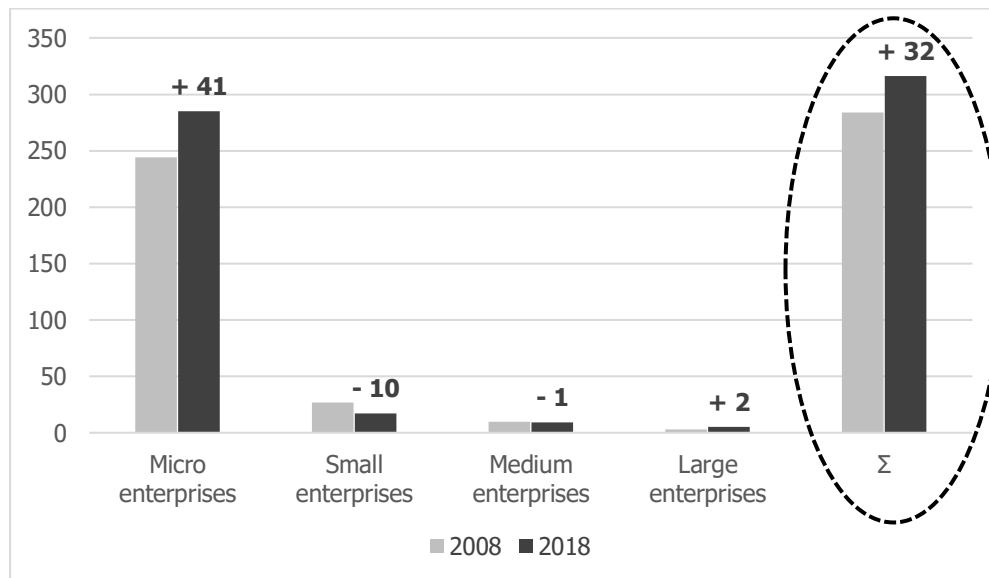


Source: our processing according Statistical Office of the Slovak Republic

When monitoring the development of the structure of entities by number of employees in the period under review, the number of micro-enterprises increased by 41 and large

enterprises by 2 entities. On the other hand, we see a decrease in small entities by 10 and medium entities by 1 entity.

Graph 4 Development of the number of enterprises by number of employees in the glass industry in 2008 - 2018



Source: v our processing according Statistical Office of the Slovak Republic

2.2 The characteristic of economic important glass industry companies in Slovakia

As already mentioned, the most important companies in the glass industry in Slovakia are RONA, a.s., Johns Manville Slovakia, a.s., Vetropack Nemšová s.r.o., Medical Glass a.s. and RF, spol. Ltd.

The glassworks was founded in 1892 by the entrepreneur Jozef Schreiber as the last and the largest glassworks of the Vienna company Schreiber und Neffen, which had the most modern technical equipment for its time. From the very beginning, the company **RONA a.s.** started to focus on the production of pressed glass and the production of hand-shaped glass. Especially in hand-shaped glass, the company has achieved and is achieving recognition and rewards. Products under the “Rona Crystal” brand are winning prizes around the world. The glassworks employs approximately 1,300 employees (RONA, 2019). 96% of production is exported and is available in more than 80 countries worldwide. The yearly production of the company exceeds 60 million pieces. The greatest demand for handmade production is in Germany, USA or Italy (Ištók, 2016).

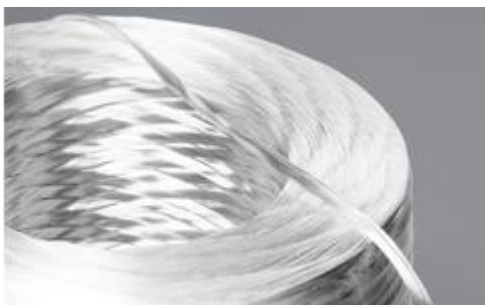
Fig. 1 Design handmade products



Source: <https://eshop.rona.glass/produkt/>

Johns Manville Slovakia, a.s. has been operating on the Slovak market since September 1995, when it acquired the company Skloplast. The plant in Trnava is one of the largest factories within Johns Manville. It employs more than 900 employees. The product portfolio is the production of glass fiber, the customers are mainly the automotive and construction industries (JM, 2019).

Fig. 2 Design new glass fiber



Source: <https://www.jm.com/>

The establishment of the glassworks in Nemšová is associated with the year 1902. Since 2002, the company **Vetropack Nemšová s.r.o.** is owned by Swiss corporate Vetropack Nemšová a. g. Currently, the company produces about 200 types of glass containers, its biggest customers are in domestic market, most of them are producers of spirits, wine, beer, soft drinks, vegetables and fruits. The design of the bottles is based on the innovative 3D design as shown below (Fig.3).

Experienced product designers work closely with our customers in our in-house design office. They develop custom glass bottles and jars from the initial product idea right through to the concrete product drawings and plans for the mould design. First decisions are made using detailed 3D blueprints. Even the lids and the label can be accurately depicted at this stage. After this, wood or acrylic models are made to refine the design. (Vetropack, 2019) The label is also agreed on. Finally, the overall design is fine-tuned in a sample production run. (Fig.4, Fig. 5).

Fig. 3 Glass bottle design in 3D



Source: <https://www.vetropack.sk/en/vetropack/news/>

Fig. 4 Modern packaging for sparkling wine



Source: <https://www.vetropack.sk/en/vetropack/news/>

Fig. 5 A drop-shaped water bottle



Source: <https://www.vetropack.sk/en/vetropack/news/>

With 380 employees, the company dominates the container glass market and is also trying to reach the first positions in European market (Vetropack, 2015).

Medical Glass, a.s. in Bratislava is one of the large companies with approximately 500 employees working in the manufacturing and processing of other glass, including technical glass. Its production focus is the glass packaging for the pharmaceutical industry, especially small bottles and ampoules (IRD Glass, 2019).

Fig. 6 New design of small bottles and ampoules



Source: <http://www.medicalglass.sk/>

The plant in Malacky was built by **RF, spol. s r.o.** in 2001. The company is a leader glass coating and glass encapsulation and in the production of sealing for the side, rear and roof windows of cars. The plant produces nearly 7 million windows per year for 33 car models. With 620 employees, it is specialized in shaping and processing of hollow glass (RF, 2019).

2.3 Economical analyses of important companies of the glass industry in Slovakia

The glass industry is important part of Slovak economy. In the analyses of this industry we use the multicriteria decision making method PROMETHEE II, which identify the success of the firm in glass industry. The success of the firm identified the high level of the product design. The design is important by product placement on the market. The analyses provides the complete view of the economic efficiency and the stability of the leaders in glass industry in Slovakia, which is useful for the protentional purchasers.

The result of the PROMETHEE II method implementation is absolute raking of the firms, which operate in glass industry of Slovakia. As the input of the PROMETHEE II method we consider four indicators: the profit growth, the sales growth, the profit and the return on asset. It is logical, that the higher profit growth is better for the firm. The same situation is by the sales growth. The indicator of the profit has the maximisation character too, because the profit is the main goal of the firm existence. I tis logical, that higher profit is the base of the stability of the firm, because this firm will have no problem with the future investments. The return on asset shows, how much EUR of nett profit earns the firm from one EUR of asset and it is calculated as the ratio of the nett profit and the total asset. This indicator we consider as maximizing, because higher return on asset is more positive.

For the analyses we use the data from final reports of the companies, which are place on internet wit free access. For the analyses is important to define the weights of the indicators too. These weights show the significance of the indicator by the analyses. For the most significant indicator we consider the sales growth in the firm, because the sales and the sales growth mean the growth of the whole company and so it means that the design of the products is right. The criterium of the sales growth have the weight 0,4. As the second important criterium we indicate the profit growth, which shows the effectivity of the company, because the profit includes not only the sales, but the costs of the company too.

The weight of this criterium is 0,3. In the analyses we indicate the weight of the profit on the level of 0,2 and the criterium of the return on asset has the weight 0,1. In the paper we focus on the last years 2010 to 2018.

Tab.3 The absolute ranking of important Slovak glass industry companies

Company	Absolute ranking of the company									Average ranking
	2010	2011	2012	2013	2014	2015	2016	2017	2018	
Johns Manville Slovakia, a.s.	1	1	5	2	1	1	1	5	4	2,33
MEDICAL GLASS, a.s.	2	3	3	4	4	2	3	4	3	3,11
RF, spol. r.o.	4	2	1	1	5	5	2	1	1	2,44
RONA, a.s.	5	4	4	3	2	4	4	3	2	3,44
VETROPACK NEMŠOVÁ s.r.o.	3	5	2	5	3	3	5	2	5	3,67

Source: own calculations

For the definition of the Slovak glass industry company success we use the arithmetic average of the rankings in the years 2010-2018. It is because the success of the company changed in these years and the average help us to identify the final success. The lower average ranking means, that the company is more successful. As we can observe in Table 3 the most successful company in the Slovak glass industry is Johns Manville Slovakia a.s. Based on the indicators we can define the RF, spol. s.r.o. as the health company. The least successful company in the Slovak glass industry is the Vetropack Nemšová s.r.o. In comparison to other companies it has no progress in the final output and can be describe like the least economic attractive company, which was analysed.

Conclusion

The glass industry in Slovakia has a long tradition. In Slovakia were more like hundred glassworks, but today produce only few of them. The glass industry in Slovakia is more oriented on export like on consumption in Slovak republic. The export is very sensitive on the situation on foreign markets, for all on the German and American market. The glass industry depends on the automobile industry and on the construction. The companies, which would like to be successful in international concurrence, must produce not only the products of high quality, but the product with good design too.

The made analyses shows, that the John Manville Slovakia, a.s. company is the leader of glass industry in Slovakia. It is very interesting, that in the last years of the observed period the company placed not on the front places in absolute ranking, what means that the company lose the leadership on the glass market in Slovakia. For the company is necessary to check the internal situation of the firm and market situation as the external factor of the firm success. This analysis shows the reasons why the firm lose the position on the glass market in Slovakia.

By the market situation analyses is the important the role of the product design. If the firm lose they position on the market, it means, that the design of the product is not sufficient. In observed period we can see this situation by Manville Slovakia, a.s.

Other situation is in the RF, s.r.o. company, which placed on the front places in the absolute ranking of glass industry companies in Slovakia, which is presented in this paper. We can assume, that the company estimate the market situation and the product design good. It means, that if the company hold the trend, it will be new leader on the glass market in Slovakia.

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Designing selected flour parameters based on consumer requirements

Szymon Dziuba – Anna Cierniak-Emerych¹

Abstract

In a free-market economy, high-quality products usually have a higher price. This statement takes on particular importance in food production. It must meet strict requirements set by Polish and European legislation. When paying for a food product, the customer must be sure of its quality and, above all, that it is of full value and safe for health. In order to meet these expectations of customers, grain millers also need to implement new technical and technological solutions that enable them to maintain their competitive advantage. It seems that the FAM-FMC (Fail Assessment Method - Flour Mixture Choosing) system guarantees low costs of flour production and repeatability of its quality. The aim of this study was to conduct empirical examinations of the quality of flour mixtures using the abovementioned system and to make a comparative analysis of the obtained results characterizing the standard flour and flour mixtures indicated by the system. In order to achieve the research goal, the methods were used as described in the ISO standards PN-EN ISO 13690, 2007, PN-ISO 5530-1:1999, PN-ISO 5530-2:1999.

Keywords

quality, food quality, flour production, flour parameters, flour production support systems

JEL Classification: M11, Q19, L660

Introduction

In order to meet the demands of growing competition, modern mills have to constantly adapt production to the changing customer expectations, while at the same time achieving high quality, high extraction rates for light flour at low production costs. This is possible if its equipment is increasingly automated, with long service life, minimal need for maintenance and minimal need for inspection (Hamrol, 2007; Dziuba, Szołtysek, Omar, 2006; Jankiewicz, 2007; Cacak- Pietrzak, 2008).

Flour is a basic raw material for many companies in the food industry. It is a product resulting from the crushing of purified grain and its internal part termed endosperm. It is a loose and fine-grained material, with its standard humidity of up to 15% of water. Flour is being typified in Poland and in some other countries by means of classification according to certain characteristics.

This common feature for different types of flour is the content of mineral salts called ash. Another characteristic of the flour is its colour. It depends on the type and quantity of pigments present in the grain, and on the flour extraction rate. The largest amount of pigments is accumulated in the grain husk. In contrast, the smell and taste of the flour are difficult to define.

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Flour is not a homogeneous material, but a mixture of different chemical compounds, both organic and inorganic. The content of these flour ingredients determines the quality of the flour and determines the suitability of the flour for food production (Gąsiorowski, 2004; Jakubczyk, Haber, 1983; Jankowski, 1981).

Therefore, the appropriate equipment of laboratories in mills determines the precise technological suitability of flour. This problem is particularly important in the production of special flour². The production of flour with the required parameters adjusted to individual customer needs has become a specific market niche. The variety of consumer preferences has forced the production of new non-standard types of flour. It is important that the flours produced to customer request have satisfactory quality characteristics. The final quality of the flour in the mill is the responsibility of the mixing division, which must be equipped with a system to support the control of the mixing process. This system should be adjusted to the production specificity in the enterprise. Its additional advantage is the possibility of graphical presentation of data and its simulation in order to produce flour according to more precise customer recipes (Gąsiorowski, 2004; Łásztity, Salgó, 2003).

There are grounds to believe that the abovementioned requirements are fulfilled by a system based on the Fail Assessment Method (FAM), which was modified for the grain-milling industry to develop the FAM-FMC – program (Fail Assessment Method - Flour Mixture Choosing). The program, by means of the adopted parameters and their numerical values, indicates the possibility of mixing the appropriate flours to obtain the flour expected by the customer. It indicates not only one suggestion for mixing different base flours but also many different variants to be chosen by the technologist. This is possible because of the coexistence, as mentioned earlier, of two methods in the program: multivariate and multicriteria analysis (Dziuba, Omar, 2015).

- The multivariate comparative analysis was used for comparison of objects (wheat flour in this study) defined by means of many diagnostic characteristics i.e. for the analysis of complex phenomena described by means of at least two or more variables. The diagnostic characteristics are considered as properties of the entities in the analysed set, considered from the standpoint of the phenomenon which represents the criterion for comparison of objects (Jankiewicz-Siwiek 1996). The method is used to transform a multidimensional space of diagnostic variables into a one-dimensional space of the synthetic variable that allows for organization of the entities depending on the level of the phenomenon. Grouping is also important here, which leads to the division of the set of objects into subsets, termed groups of objects which are most similar due to specific properties (thus homogeneous), and linear organization, which leads to hierarchization of objects due to the degree of intensity of the values that describe these objects of variables. This method also allows for the classification of the objects described in a multidimensional space of characteristics with respect for certain criteria of organization. Furthermore, Hellwig (1968) defined certain concepts, such as stimulants and destimulants and proposed two variants of the method: pattern and non-pattern organization. At a later stage, the concept of dominance was also

² **Special flour:** it is a flour with parameters defined by specific recipients or a flour intended for the production of certain secondary processing products, such as bakery and confectionery products.

introduced, which can be generally described as the most common features that occur in the statistical population studied (Borys, 1978).

- The multicriteria analysis allows for making decisions using an appropriate criterion used to assess and compare their effects. This criterion helps determine which of the decisions is the best. It should be noted that according to the multicriteria analysis, the evaluation consists in the reduction of the results of the evaluation using various partial criteria to the status of additivity³ of partial evaluations. Therefore, the evaluation is performed using more than one criterion. Achievement of the status of additivity is possible through determination of two states for each partial criterion: the least expected and the most expected status and then expressing each number that results from measurement by means of a specific partial criterion in the form of a percentage fraction of the route from the least expected to the most expected status. The total evaluation is obtained from the summation of the percentage values of routes covered in all partial criteria. However, the importance of each partial criterion should be first taken into consideration by multiplication by the weight of this criterion, i.e. by its importance. The weights should be chosen so that their sum is unity (Omar, Pilawski, 1994; Omar 2004).

Bearing these observations in mind, the FAM-FMC – system (Fail Assessment Method - Flour Mixture Choosing) can, therefore, be described with the following symbols (Dziuba, Omar, 2015):

$$S \begin{matrix} \xrightarrow{M_y} \\ \xleftarrow{M_z} \end{matrix} \Omega(M, R, E)^Q \quad (1)$$

where:

S – examination and evaluation system, M_z – theoretical mixtures of flour indicated by the program, M – set of 9 types of flour used in the experiment, M_y – target flour (flour required by the customer), R – set of relationships between parameters (characteristics) of flour, E – goals and economic consequences, Q – meeting the task i.e. optimal quality of the obtained mixture of flour, Ω – mapping symbol, i.e. properties of the system of evaluation and performing the task according to the algorithm suggested.

The system developed is based on the empirical experiences that are used for examination (construction) and evaluation of the components of objects (flours). It should be emphasized that in the system described by means of the symbols, both existing objects (M) and new elements of objects (M_z, M_L), selected during the research (Dziuba, Omar, 2015) are subject to empirical evaluation.

³ **Additivity, summation capacity** – a given quantity is additive if its value for the sum of its components is equal to the sum of the values for the individual components.

1 Methodology

The aim of this study was to conduct empirical examinations of the quality of flour mixtures using the abovementioned system and to make a comparative analysis of the results obtained for standard flour and flour mixtures indicated by the FAM-FMC – system (Fail Assessment Method - Flour Mixture Choosing), which are also flours.

In order to achieve the study aim, laboratory tests were carried out to determine such parameters as:

Gluten, which is a mixture of gliadin and glutelin proteins. It is responsible for giving the dough the necessary flexibility, resilience and gas retention capacity. Gluten is a viscous, elastic, light yellow to greyish-brown mass which may be elastic, pliant, compact or melting-away. Depending on these properties, gluten can be divided into 3 types: strong, normal and weak. Strong gluten is characterized by slow water absorption, compactness and low extensibility. The dough made of flour with this type of gluten is not very fluffy, hard and the breadcrumb is cohesive, dry and cracked (Gąsiorowski, 2004; Jakubczyk, Haber, 1983).

Gluten was determined by the mechanical method using the Glutomatic device. The use of the camera also gives the possibility to determine the gluten index parameter. The determinations were made according to the standard PN-A-74042-03:1993 (PN-A-74042-03, 1993).

The falling number, which determines the activity of amylolytic enzymes in the flour. These enzymes are a catalyst for the breakdown of starch to sugars essential for ethanol fermentation. Their activity substantially determines the fermentation power of flour and, consequently, bread rising. The falling number values can range from 60 to more than 420s. If the falling number is around 60, this means that the amylase activity is very high, which means that the flour was produced from overgrown cereals, which is an undesirable situation. The higher the value of this parameter, the lower the amylase activity (Gąsiorowski, 2004; Jakubczyk, Haber, 1983).

The determination of the parameter in question was carried out in accordance with PN-EN ISO 3093:2007 using the Hagberg-Perten apparatus (PN-EN ISO 3093, 2007).

In this study, the rheological evaluation was also performed i.e. the analysis determining the physical properties of the dough made of the flour discussed. For this purpose, the Brabender farinograph was used. It allows for the precise determination of dough consistency i.e. the quality of gluten in its composition. The results of the analysis are obtained in the form of a graph from which the following parameters can be read: dough development time, dough stability time, dough softening and water absorption, which for economic reasons was taken into account in the formulation of conclusions from the research. Flour water absorption means the volume of water needed to produce a dough with a maximum consistency of 500FU. Water absorption depends on the water content of the flour as well as on the quantity and quality of gluten, quality of starch, and in particular on the degree of starch damage. The greater the starch damage, the greater the water absorption and thus the greater the gain (Gąsiorowski, 2004). The parameter studied was determined according to the standard PN-ISO 5530-1:1999 (PN-ISO 5530-1, 1999). Water absorption is correlated with humidity, which was determined according to PN-EN ISO 712:2009 (PN-EN ISO 712, 2009).

Another device used in the tests was extensograph, which, like the farinograph, determines the physical properties of the dough. The device is closely related to the

farinograph, as the dough is prepared with the addition of common salt, which is further formed into a suitable shape in the extensograph. The extensograph can be used to determine the effect of fermentation on the extensibility and elasticity of the dough and the resistance to breakage. The following dough parameters are read from the diagram (Gąsiorowski, 2004):

R_m (EU) - maximum tensile strength in conventional extensographic units - i.e. maximum height of the extensographic curve.

E (mm) - extensibility: the distance covered by the registration paper from the moment the hook touches the dough chunk to the moment the roll breaks.

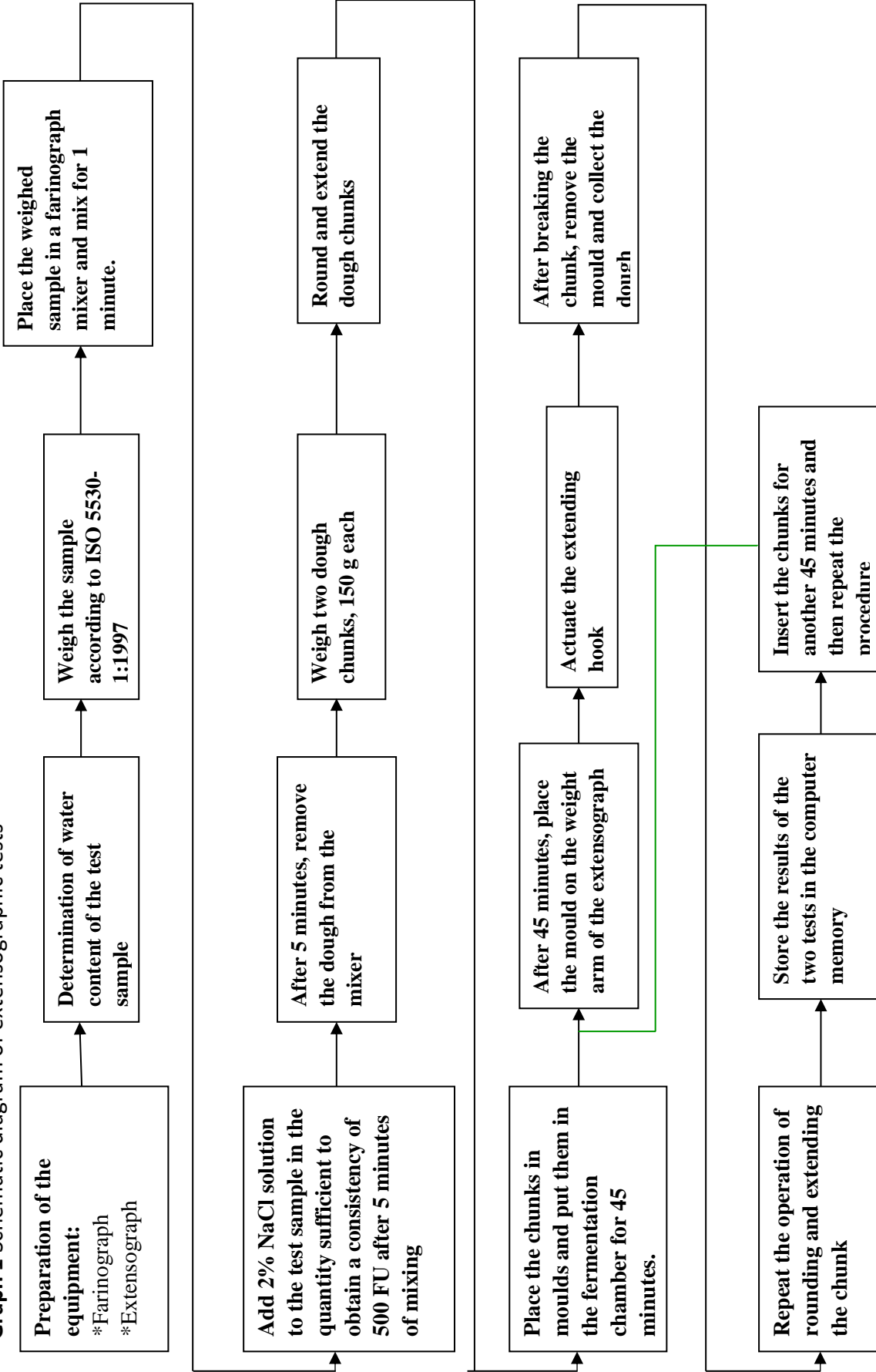
Dough energy (cm^2) - area under the plotted curve - work supplied during stretching of the test dough chunk; it indicates the capacity of the dough to increase its volume.

R_m/E - this is the ratio of maximum resistance and extensibility of the dough.

These parameters are analysed after 45 minutes, 90 minutes and 145 minutes of dough fermentation at 30°C on a piece of dough which is appropriately formed, i.e. rounded and then extended to form a roller. The tensile force is recorded in the form of graphs (extensograms). The determination of the discussed extensographic parameters was performed according to the PN-ISO 5530-2:2004 standard, with the analysis performed after 45 and 90 minutes.

The procedure of the tests is shown in Figure 1.

Graph 1 Schematic diagram of extensographic tests



Source: author's own elaboration

2 Results and Discussion

The results of analyses of base flours and the model flour are presented in Table 1. Parameters of these flours were input into the FAM-FMC – (Fail Assessment Method – Flour Mixture Choosing) system. Next, the system was given the task of indicating the most optimal mixtures which were parametrically similar to the model flour. The suggested mixtures generated by the system were empirically mixed (homogeneously) and then parametric determinations were made, as illustrated in Table 2.

Tables 1 and 2 show data on model flour, four base flours marked with letters A, B, C and D, and three mixtures of flours A+B (3:1), C+D+A (1:3:3), and C+D+A+B (1:1:3:1). Each base flour and each mixture was measured three times for 12 parameters. The true value of the parameter was estimated as the arithmetic mean of the three measurements. The quotient quantities R_{50}/E and R_M/E were estimated as means of three quotients obtained in individual measurements.

The standard deviation of three measurements of each parameter was calculated as a measure of the variation of measurements. It can be observed that the measurements of the base flour and the first mixture are varied to a similar degree, whereas the measurements of the last two mixtures are much more varied. This might mean that the mixtures are unstable.

Deviations of the parameter values from the desired values of the model flour were calculated as squares of the relative deviations for each parameter

$$d_i = \left(\frac{x_i - x_w}{x_w} \right)^2 \quad (2)$$

where x_i means the estimated value for the base flour or mixture, and x_w is the value of the model flour parameter.

A direct sum of deviations for all the parameters was assumed as a measure of the distance from the model flour.

$$S = \sum_{i=1}^{12} d_i \quad (3)$$

The value of the measure of the distance S was compared between the individual mixtures. The direct sum means that all parameters are equally important. The differentiated importance of the parameters and taking the weighted sum distance as a measure can be considered.

Tab. 1 Parameters of base and model flours

No.	Type of flour	Gluten content	Gluten index	Falling number	Water absorption capacity	Energy		Resistance at constant deformation (R_{50})		Extensibility (E)		Maximum resistance (R_M)		Coefficient (R_{50}/E)		Coefficient (R_M/E)	
						After 45 min	After 90 min	After 45 min	After 90 min	After 45 min	After 90 min	After 45 min	After 90 min	After 45 min	After 90 min	After 45 min	After 90 min
1.	Model flour	36.76	96.50	369	60.3	139	141	223	286	262	221	379	463	0.9	1.3	1.4	2.1
2.	Flour A	37.21	89.66	372	59.0	158	178	345	459	215	192	535	691	1.6	2.4	2.5	3.6
3.	Flour B	32.20	94.00	348	58.0	114	123	364	434	170	159	480	563	2.1	2.7	2.8	3.5
4.	Flour C	32.78	78.00	373	60.5	82	94	240	308	189	178	309	376	1.3	1.7	1.6	2.1
5.	Flour D	34.81	93.50	340	58.5	161	154	357	502	218	170	566	654	1.6	2.9	2.6	3.8

Source: author's own elaboration

Tab. 2 Parameters of model flour and

No.	Type of flour (suggestion)	Gluten content	Gluten index	Falling number	Water absorption capacity	Energy		Resistance at constant deformation (R_{50})		Extensibility (E)		Maximum resistance (R_M)		Coefficient (R_{50}/E)		Coefficient (R_M/E)	
						After 45 min	After 90 min	After 45 min	After 90 min	After 45 min	After 90 min	After 45 min	After 90 min	After 45 min	After 90 min	After 45 min	After 90 min
1.	Model flour	36.76	96.50	369	60.3	139	141	223	286	262	221	379	463	0.9	1.3	1.4	2.1
2.	Flour A+B (3:1)	35.25	92.2	390	59.4	154	162	274	378	244	202	475	594	1.1	1.9	2.0	2.9
3.	Flour C+D+A (1:3:3)	35.27	90.00	400	59.1	139	159	298	429	211	199	483	628	1.4	2.2	2.3	3.2
4.	Flour C+D+A+B (1:1:3:1)	34.88	89.00	394.3	58.8	143	148	316	406	210	180	498	613	1.5	2.3	2.4	3.4

Source: author's own elaboration

The expected values of parameters were also calculated as linear combinations of parameters of base flours. The greatest deviations from the proportionality were observed for the first mixture, but these deviations were in the direction of the model flour, which significantly improved the goodness of fit of this mixture with the model flour. For the last two mixtures, the estimated values of the parameters were much closer to the values obtained from the proportionality, but the deviation also occurred in the direction of the model flour, because the distance measure had lower values than expected from the proportionality.

Among the base flours, the best fit to the model flour was observed for flour C and therefore it should dominate in the mixtures closest to the model flour. Optimization with Solver add-in as an optimal mixture indicated A+C with proportions of ca. (1:9). However, the best-fitting mixture was the first mixture A+B (3:1) with a much lower value of the *S* measure value than that expected from proportionality. The last two mixtures, C+D+A (1:3:3) and C+D+A+B (1:1:3:1), have a fit similar to that of the base flour C, much better than the other base flours, especially B and D. This might mean that the response area in the plan of the mixture of base flours is non-linear. However, there are too few measurements for so many parameters to estimate it more precisely.

There are also many important strong linear correlations between parameters, which allow for predicting the values of one parameter from another. Some of them result from the fact that the same parameter is measured twice (after 45 minutes and 90 minutes), part from the formula for the R/E coefficient, while the most interesting may be the relationships between gluten content, gluten index, falling number, water absorption and energy with other variables.

Conclusions

Preliminary studies confirmed the existence of quantitative and qualitative dependencies in the process of mixing the initial flours and the final mixture. This justifies the use of the program that makes it possible to determine the nature of these dependencies and to choose the optimal variant that meets the preferences of producers and consumers. Milling technologists, guided by the level of inventories and the assortment of raw materials and by comparisons of analyses of the cheapest recipes while maintaining the full quality of mixtures, constantly correct production using the described system. The program also gives the possibility of final correction of flour defects, which were not eliminated at earlier stages of production, e.g. during the preparation of grain in the elevator. It is important to make conscious use of this system, with previous laboratory analyses being crucial. This allows for strict control and adjustment of the dosed proportions of base flours to ensure constant and repeatable baking properties of bakery and confectionery products.

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Attitudes to Eco-design in the Product Category of Home and Kitchen Accessories¹

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Abstract

Consumerism and throw away culture led to the emergence of eco-design, a production perspective that includes environmental protection criteria into every phase. The aim of the paper is to identify consumer perception of eco-design in Slovakia and consumer preferences of eco-design of home and kitchen accessories. We conducted a consumer survey using structured questionnaire. 100 respondents participated in the survey. The awareness of eco-design concept is not high. 46% of respondents are aware of the concept of eco-design. 63% of respondents are not interested in the disposal of the home and kitchen accessories after use but 67% of respondents reuse home and kitchen accessories for other purposes. Respondents perceive eco-design of kitchen and home accessories as expensive and with high quality. Women and men perceive eco-design of home and kitchen accessories almost the same way.

Key words

eco-design, consumer perception, home and kitchen accessories

JEL Classification: M20, Q50

Introduction

As the world population increases rapidly, the old "buy, use, throw away" paradigm of the linear economy is no longer applicable. Consumerism and throw away culture led to the emergence of eco-design, a production perspective that consists of integrating environmental protection criteria into every phase: from conception to development, from transport to recycling.

United Nations (UN) advocates a sustainable production model that makes optimal use of resources and energy, develops sustainable infrastructure, improves access to basic services, and creates high-quality green job opportunities. Eco-design is defined as "the integration of environmental aspects into product design and development with the aim of reducing adverse environmental impacts throughout the whole product's life cycle" (ISO, 2011). A key aim of eco-design is to reduce the overall environmental impact of a product or service to a minimum. Eco-design refers to innovative design solutions in both products and services that take into consideration the entire lifecycle. Minimisation of pollutants during the production period is just as important as it is during the product's lifetime. However, eco-design is an elastic and evolving concept that is better considered as an approach to design than as a label for eco-friendly products (EcoDesign Circle, 2018). Currently, global trend is to

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take into account the environmental aspects of products and packaging throughout the lifetime, from production to disposal, and finding a compromise between classic functions and environmental requirements (Dziuba, Ingaldi, 2015).

Concerning sustainable development, the goal is the quality of life for everyone, today and in the future. To ensure that design and product development progresses in the right direction, we need to include a holistic perspective that includes environment, people, economy and culture (Von Matern, 2018). Design change affects producer innovation activity across its whole spectrum (Kubičková, 2016, 2018).

A new model for sustainable production and consumption is represented by concept of circular economy. Circular economy incorporates product design, production process, and reprocessing, consumption, distribution, reparation and reuse, and recycling. It redefines the understanding of waste as the resource for tomorrow and leads to innovation and investment in goods and services associated with sustainability.

In 2015, the European Commission put forward a package to support the EU's transition to a circular economy. Three years after adoption, the Circular Economy Action Plan can be considered fully completed. According to the findings of the report, implementing the Circular Economy Action Plan has accelerated the transition towards a circular economy in Europe. In 2016, sectors relevant to the circular economy employed more than four million workers, a 6% increase compared to 2012. Circularity has also opened up new business opportunities, given rise to new business models and developed new markets, domestically and outside the EU. In 2016, circular activities such as repair, reuse or recycling generated almost €147 billion in value added while accounting for around €17.5 billion worth of investments. (Circular economy, EUROPA, 2019).

Smart design at the beginning of a product's lifecycle is essential for ensuring circularity. The transition towards a more circular economy requires an active engagement of citizens in changing consumption patterns. The Product Environmental Footprint (PEF) and Organization Environmental Footprint (OEF) methods can enable companies to make environmental claims that are trustworthy and comparable and consumers to make informed choices.

In 2018, EU implemented EU Strategy for Plastics in a Circular Economy as the first EU-wide policy framework adopting a material-specific lifecycle approach to integrate circular design, use, reuse and recycling activities into plastics value chains. Under the new plans, all plastic packaging on the EU market will be recyclable by 2030, the consumption of single-use plastics will be reduced and the intentional use of microplastics will be restricted (EC press release, Plastic Waste, 2018).

Recent studies in several countries or regions (including the EU territory) point to the fact that, in general, around 55-60% of the innovations include environmental benefits, that contribute to sustainability and sustainable growth. This implies that eco-innovation is already an integral part of design and innovation activities both within and outside businesses (SBA, 2018).

Previous research has found correlations between the provision of sustainability-related information and engendered emotions in consumers. Luchs, Brower, and Chitturi (2012) investigate the trade-off decision that consumers face when choosing between a product that is perceived to be more sustainable (i.e., more socially and environmentally responsible) and

another product that instead is perceived to offer superior functional performance. The results suggest that consumers presented with such a trade-off will tend to choose the product with superior functional performance over the product with superior sustainability characteristics, due to feelings of distress, until a minimum threshold of functional performance is achieved. The current research also shows that choice given this trade-off depends upon the degree to which consumers value sustainability that, in turn, is mediated by consumers' feelings of confidence and guilt. Further, based on an understanding of the emotions mediating choice in this context, the authors demonstrate how the effective use of product aesthetic design can improve the relative choice likelihood of sustainable products. Specifically, the authors demonstrate that superior aesthetic design has a disproportionately positive effect on the choice likelihood of sustainability-advantaged (versus performance-advantaged) products due to the effect that superior aesthetic design has on overcoming the potential lack of confidence in sustainable products. These findings highlight the specific value of aesthetic product design in the context of marketing sustainable products and suggest that it is especially important for firms interested in marketing sustainable products to also develop market-leading product aesthetic design capabilities.

Wang and Wu (2016) studied the impacts of four emotions, pride, guilt, respect, and anger, on consumers' intention of sustainable consumption choice of household appliances. Pride, guilt, and respect all have positive impacts on resisting non-energy conserving household appliances and purchasing energy conserving household appliances. This study confirms that the four emotions can take active roles in promoting sustainable consumption and extends current knowledge in this area by 1) showing that respect and anger can affect sustainable consumption choices significantly; 2) demonstrating that the impact of a specific positive emotion on the intention of sustainable consumption choices may not be stronger than a specific negative emotion; and 3) identifying the inner structure of sustainable consumption choices. Furthermore, this paper presents important implications for policy makers that pride appeal is a good option to promote energy conserving products.

Paparoidamis, Tran, Leonidou and Zeriti (2019) provide useful insights into the underlying mechanisms of how and why consumers respond to eco-innovative product designs across various high-tech product categories. Specifically, the results show (1) a positive effect of innovativeness degrees of eco-innovative attributes on consumers' perceptions of product eco-friendliness and on their adoption intentions as well as a significant moderating role of consumers' need for cognition; (2) a positive influence of eco-friendliness levels of eco-innovative attributes on consumer adoption intentions in the case of high-complexity products but not for low-complexity products, emphasizing the need to adopt different approaches when developing eco-innovations to ensure favorable consumer reactions; and (3) a significant impact of the detachability of eco-innovative attributes on consumers' perceptions of trade-offs between environmental benefits and product functionality and on their intentions to adopt eco-innovations. These findings add to existing theoretical knowledge, provide actionable managerial implications, and identify fruitful avenues for future research.

Maccioni, Borgianni, and Basso (2019) studied value perception of green products. Green products, for which participants required greater efforts in the search for relevant information, boost the value attributed to creative solutions still believed of high quality. This effect is significantly more evident for participants showing remarkable interest for

sustainability issues. Conversely, alternative products feature greater value perception because they are acknowledged to be functional and reliable.

In our research we want to shed more light on consumer perception of home and kitchen accessories which are in many cases produced from plastics and this way they considerably contribute to plastic waste. We focus mainly on women, and their attitude towards eco-design as they are most often the decision makers when shopping for home and kitchen accessories.

1 Methodology

The aim of the paper is to identify consumer perception of eco-design and consumer preferences of eco-design of home and kitchen accessories.

The required primary data is obtained from our consumer survey using standardised questionnaire sent to the respondents in Slovakia via the Internet. The obtained data was evaluated by simple analyses. Semantic differential was used to better understand consumer perception of eco-design. Cross-tables, p-value were used to test the dependence of evaluation of individual characteristics of eco-design.

For survey we chose product category: home and kitchen accessories. The reason of this choice is frequent use of plastics in home and kitchen accessories and foreseen future elimination of plastics in specific accessories due to environmental harm (e.g. plastic cotton sticks, cutlery, plates, plastic straws, mixers and balloon sticks).

Total of 100 respondents participated in the survey (Table 1).

Tab. 1 Respondents' demographic data

Gender	Age	Educational attainment	Employment	Income
Women 75 (75%)	15 – 20 7 (7%)	Still studying at Secondary school 3 (3%)	Student 9 (9%)	Low 17 (17%)
Men 25 (25%)	21 – 30 33 (33%)	Still studying at University 5 (5%)	On maternity or parental leave 17 (17%)	Medium 60 (60%)
	31 – 40 26 (26%)	Primary 2 (2%)	Employee 53 (53%)	High 12 (12%)
	41 – 50 17 (17%)	Secondary 41 (41%)	Businessman / entrepreneur 12 (12%)	No income 11 (11%)
	51 – 60 13 (13%)	University 49 (49%)	Retired 5 (5%)	
	61 and more 4 (4%)		Unemployed 4 (4%)	
Total respondents: 100				

Source: Own survey

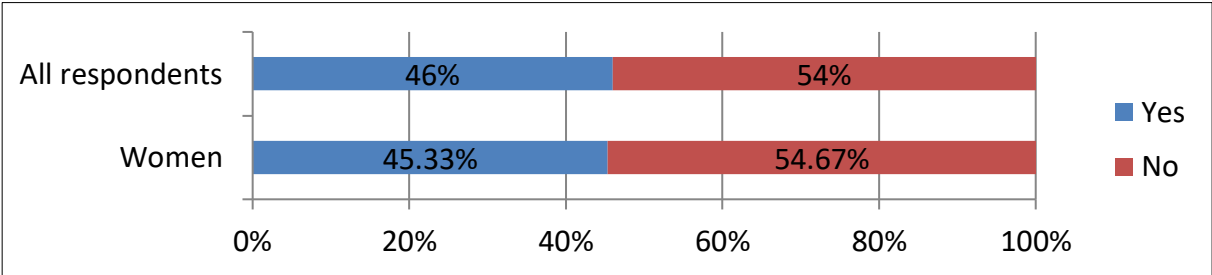
Of the total number of respondents, 75 (75%) were women and 25 (25%) were men. The largest number of respondents was in the age group 21 – 30 years, 33 (33%) of respondents, followed by age groups 31 – 40 with the number of respondents 26 (26%) and then age groups 41 – 50 with the number of respondents 17 (17%). In the survey, respondents with a higher education prevailed, 49 (49%) respondents with university degree. The most frequent employment situation of respondents was employee in 53 (53%) cases. The largest number of respondents has the medium income, 60 (60%) of respondents.

2 Results and Discussion

2.1 Results of the Survey

Through the survey, we wanted to find out the respondents' awareness of eco-design (Graph 1). We found that 46 (46%) of respondents were aware of the concept of eco-design, and 54 (54%) of respondents did not know this concept. Eco-design is quite a new term which can cause lower awareness. 34 (45.33%) of women were aware of the concept of eco-design, and 41 (54.67%) of women did not know this concept.

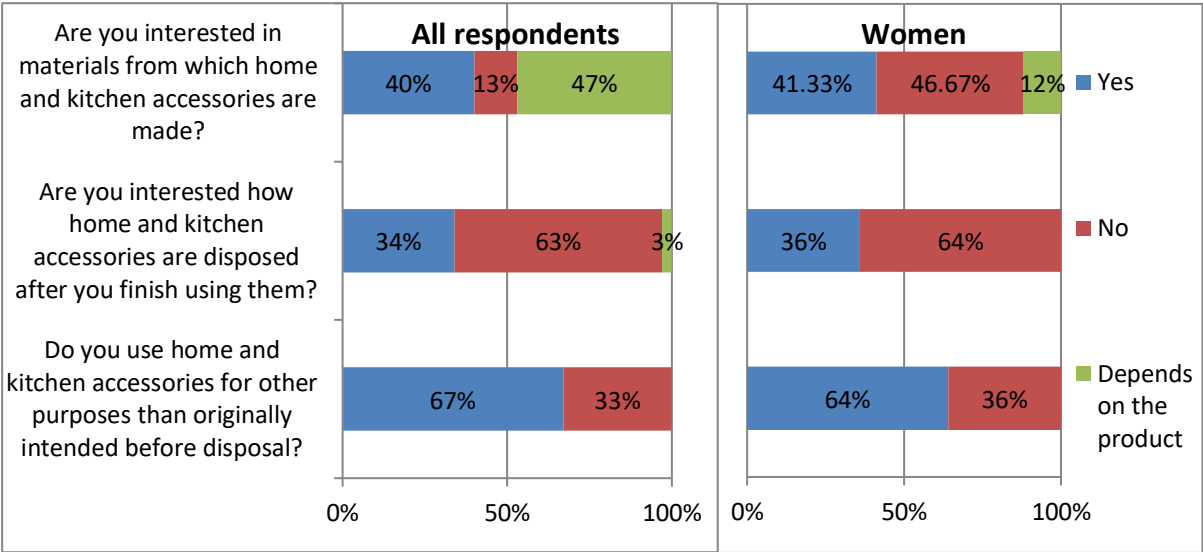
Graph 1 Awareness of eco-design by respondents



Source: Own survey

The material from which home and kitchen accessories are made is important for 40 (40%) of respondents, for 47 (47%) of respondents material choice depends on the product. 31 (46.67%) of women are not interested in material from which home and kitchen accessories are made. The largest number of respondents, 63 (63%), and 48 (64%) of women are not interested how the home and kitchen accessories are disposed after use. Of the total number of respondents, 67 (67%) respondents, and 48 (64%) of women use home and kitchen accessories before disposal for other purposes than they were originally intended for (Graph 2).

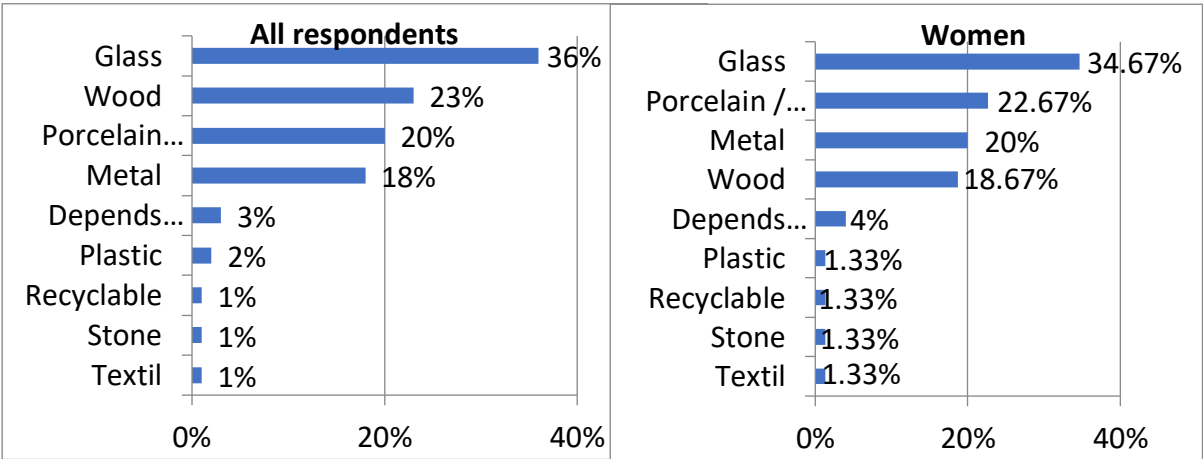
Graph 2 Selection of home and kitchen accessories



Source: Own survey

The most preferred material of home and kitchen accessories is glass, for 36 (36%) of respondents, and for 26 (34.67%) of women. Wood is preferred by 23 (23%) of respondents, and 14 (18.67%) of women, porcelain/pottery preferred by 20 (20%) of respondents, and 17 (22.67%) of women, and metal by 18 (18%) of respondents, and 15 (20%) of women. Plastic as a material for home and kitchen accessories preferred only by 2 (2%) of respondents, and by 1 (1.33%) of women. (Graph 3).

Graph 3 Preferred material of home and kitchen accessories

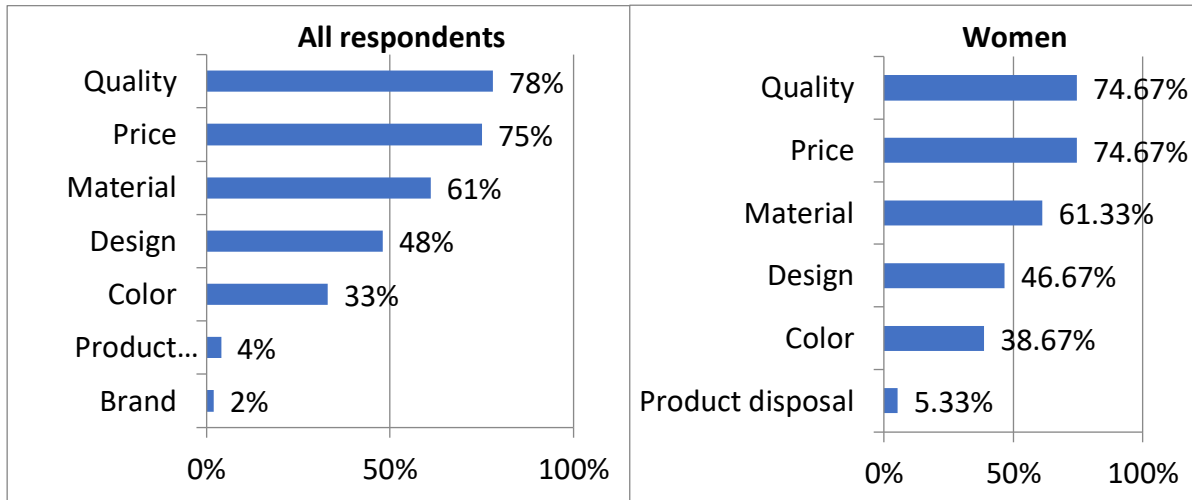


Source: Own survey

Quality is the most important product selection criterion for the 78 (78%) respondents. Second criterion is price, for 75 (75%) respondents. The third criterion is material, for 61 (61%) respondents, and then the design as product selection criterion is important for 48 (48%) of respondents (Graph 4).

The most important criteria for 56 (74.67%) women are quality and price. The material as product selection criterion is important for 46 (61.33%) of women, design is important for 35 (46.67%) of women and color is important for 29 (38.67%) of women. The brand as product selection criterion is not important for women at all.

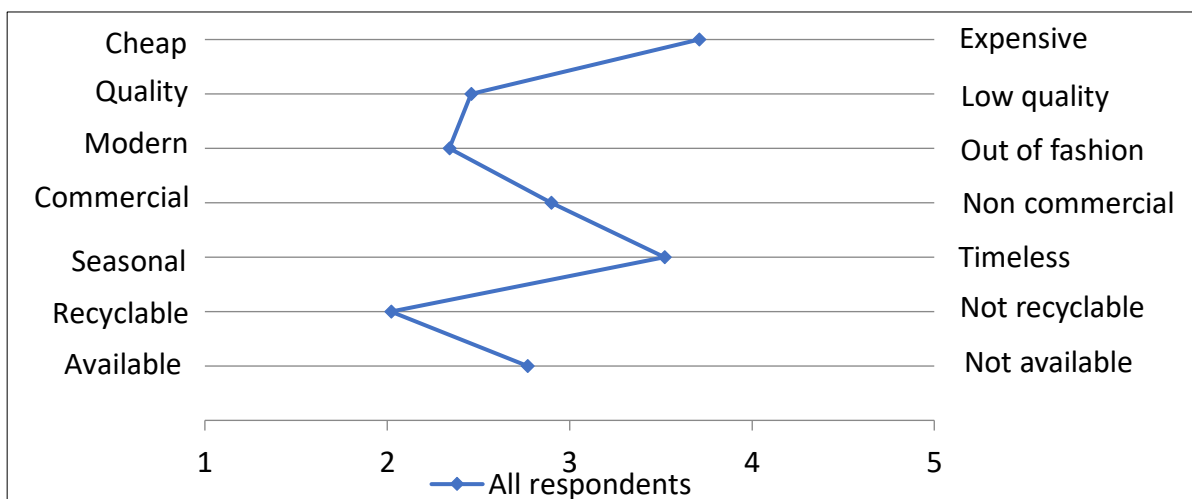
Graph 4 Product selection criteria of home and kitchen accessories



Source: Own survey

Respondents perceive eco-design of kitchen and home accessories as expensive but also as quality and recyclable. Despite of the perception of eco-design of home and kitchen accessories as modern, respondents perceive it also as timeless (Graph 5). It means that consumer can use this product for long time and it does not lose its appeal.

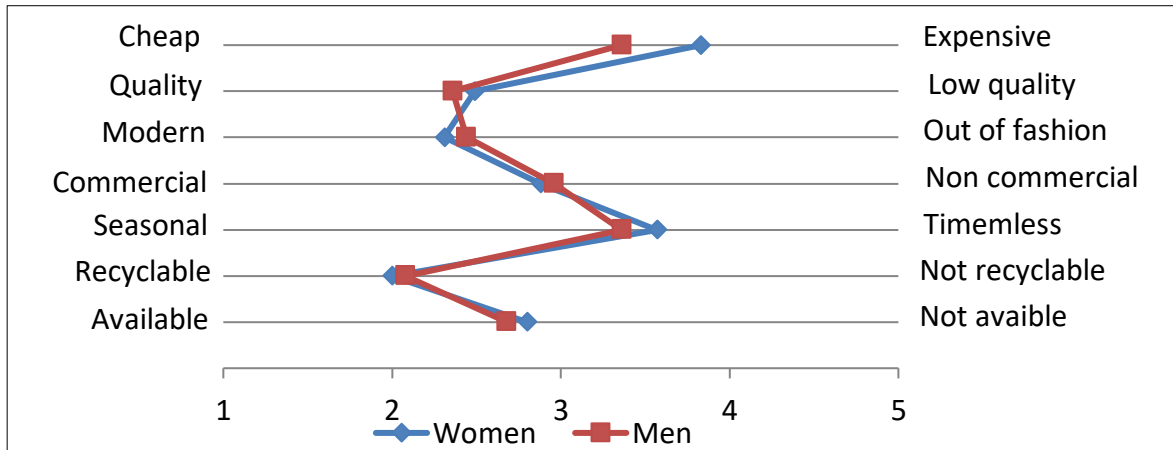
Graph 5 Consumer perception of eco-design of home and kitchen accessories



Source: Own survey

Women and men perceive eco-design of home and kitchen accessories almost the same way. We can see smaller differences in perception of following characteristics (Graph 6). Women think that home and kitchen accessories with eco-design are more expensive (average value 3.83) than men (average value 3.36). But on the other side men perceive these products as more seasonal (average value 3.36) than women (average value 3.57).

Graph 6 The perception of eco-design by women and men



Source: Own survey

Table 2 shows the average values and standard deviations in the characteristics of eco-design of home and kitchen accessories in three categories of respondents: all respondents, women and men. The most striking differences from the average value among all respondents were the perceptions of the characteristics: modern – out of fashion (1.15). Women had most diverse opinion in terms of what is modern – out of fashion (1.21). The most striking differences from the average value among men were the perceptions of characteristics: seasonal – timeless (1.04).

Tab. 2 Average values and standard deviation

Eco-design of home and kitchen accessories						
	Average value	Standard deviation	Average value	Standard deviation	Average value	Standard deviation
	All respondents		Women		Men	
Cheap – expensive	3.71	0.83	3.83	0.88	3.36	0.57
Quality – low quality	2.46	1.1	2.49	1.14	2.36	0.99
Modern – out of fashion	2.34	1.15	2.31	1.21	2.44	0.96
Commercial – non commercial	2.9	0.98	2.88	1.05	2.96	0.73
Seasonal – timeless	3.52	1.06	3.57	1.07	3.36	1.04
Recyclable – not recyclable	2.02	1.06	2	1.15	2.08	0.86
Available – Not available	2.77	1.01	2.8	1.08	2.68	0.8

Source: Own survey

Statistically relevant differences between genders were not found. Statistically relevant differences were found between age groups with p-value less than 0.05. Respondents in age group 21 – 30 and 31 – 40 have the tendency to evaluate terms cheap – expensive with middle value, p-value = 0, 0047. This same age groups evaluate terms seasonal – timeless also with middle value, p-value = 0,022.

Conclusion

The aim of the paper was to identify consumer perception of eco-design and consumer preferences of eco-design of home and kitchen accessories. For the survey we chose the product category of home and kitchen accessories. The reason of this choice is foreseen elimination of plastics in specific accessories due to environmental harm. Based on the primary survey using the standardize query method, we found out that 54 (54%) of respondents are not aware of the concept of eco-design. Women also have the low awareness of the concept eco-design, just 34 (45.33%) of women were aware of the concept of eco-design. The resulting low awareness of eco-design can be caused by insufficient information to consumers but also insufficient marketing support.

The material from which home and kitchen accessories are made is important for 40 (40%) of respondents and 31 (46.67%) of women are not interested in material from which home and kitchen accessories are made. The largest number of respondents, 63 (63%), are not interested in the disposal of the home and kitchen accessories after the use. It can be caused by the fact, that 67 (67%) of respondents reuse home and kitchen accessories for other purposes than they were originally intended for. For all respondents are the most preferred materials are: glass, wood, porcelain/pottery, metal. For women are the most preferred materials are: glass, porcelain/pottery, metal and wood. The reason for declared non-interest in product disposal as shopping criterion we can see partly in preferred materials for kitchen and home accessories which make less harm to the environment as plastic(e.g. glass can be recycled with high efficiency), and partly in low awareness of eco-design concept.

Respondents perceive eco-design of kitchen and home accessories as expensive but as quality. Despite of the perception of eco-design of home and kitchen accessories as modern, respondents perceive them also as timeless. Women and men perceive eco-design of home and kitchen accessories almost the same way. The smaller differences are in perception of terms cheap – expensive and seasonal – timeless.

It is worth pointing out that the issue of eco-design is important to pay attention to, because this topic is very current. In the paper we used the standardized query method and the semantic differential. Our survey is the basis for further exploration in area of consumer perception and preference of eco-design product solutions. It is also necessary to extend the survey to other product categories such as drugstore products for their high consumption and environmental impact.

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Impact of packaging design on the purchase of foods ¹

Malgorzata A. Jarossová² – Jana Gordanová³

Abstract

The article aimed to study the impact of packaging design on the purchase of foods. One hundred and ninety-three people from Slovakia took part in the research (women accounted for 71.5% and men 28.5% of respondents). The respondents were between 16 and 69 years old. The research took place in the form of an electronic questionnaire from 03/15/2019 to 03/22/2019. Up to 70.5% of respondents stated that price is the most important factor during food purchasing. Further factors were product quality, ingredients of the product, country of origin, product brand, packaging and advertisement. For only (7.8%) respondents, packaging design is very important and up to 70.6% of respondents packaging design is important, especially when they buy goods as a gift. Almost 50% of respondents replied that packaging that has a good design doesn't have to present higher product quality and (58.2%) said that they are not willing to pay a higher price for eye-catching packaging design.

Keywords

design, food packaging, consumer

JEL Classification: L66, Q19, Q10

Introduction

International Council of Industrial Design Companies defines design as a creative activity to create the multifaceted properties of objects, processes, services and their systems throughout their lifecycle. Design is a significant factor in innovative technology humanization and a decisive factor in cultural and economic exchange. We distinguish several types of design: product design, graphic design, packaging design, environmental design and others (Knošková, 2014). According to Design Act No. 444/2002, design means the external presentation of a product or part thereof consisting of features in particular lines, contours, colours, shape, texture, the material of the product itself or its decoration. Furthermore, the design may be a product or any material or industrial material, including packaging, alterations, graphic symbols, typographic characters, or parts for assembling a composite product, excluding computer programs.

Packaging design is graphic design using different colours, font styles, types of materials and surfaces, which is applied to the packaging in order to engage the customer in the supermarket to buy the product. Packaging design is created launching a new product,

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upgrading a product, or when a product is added to an existing product line. Packaging designers were once regarded as commercial artists. Now they act as marketing professionals, who do not just solve design issues, but also help in finding solutions for marketing problems and must know their craft. Packaging designers must be illustrators, control verbal and visual communication, and finally, yet importantly, they must know in their work adapt to the requirements of the manufacturer, trader, intermediary, consumer and regulatory authorities and restrictions (Kačeňák, 2011). Packaging design is an essential factor affecting the most successful new products that have been launched in the last two years, with the least attention among other marketing tools.

According to the latest Nielsen studies (2016), packaging design has emerged as a significant starting point in the decision-making process in a store, where up to 60% of purchase decisions are made at the store (www.nielsen.com, 2016).

Kačeňák (2011) describe the role of packaging design in marketing as follows: "The role of packaging design is to organize the functional, technical and visual communication parameters of the packaging. Design them to fulfil a rational economic and commercial intention with a high artistic standard, and to act effectively psychologically and aesthetically in the performance of sales and promotion functions in a market economy". Designers must also address functionality, hygiene, social responsibility and efficiency issues when designing product packaging. On the other hand, from the perspective of consumers, the concept of design narrows only to the visual-aesthetic design of the packaging surface and when buying, consider the graphic design of the packaging only as a whole. Packaging design includes colour of the packaging, font and text used on the label, drawing and photograph, shape of the packaging, and finally, packaging material (Kačeňák, 2011).

Colour of packaging. Colour is a powerful tool to directly affecting the human psyche by creating a mood. It attracts attention, promotes rememberability, and has aesthetic effects. Each colour has its symbolism or meaning, which influences consumers' perception of the product. We distinguish between warm, cold and neutral colours. While the warm colours (red, orange, yellow) evoke memories of the sun, fire - are the colour of happiness and encourages us to act. Cold colours (blue, green) have a calming effect. Therefore, it is recommended to combine colours or add some neutral colour, black or white, which tends to dampen more distinct colours (Knošková, 2014).

The importance of colours on packaging is increasing about foreign trade where, due to incorrect colour choices, goods can become unacceptable in a given country, even not for sale. In the Netherlands, for example, it is advisable to avoid German national colours, in Sweden do not like to combine their national colours (gold and blue), and in Latin America, purple means death (Kačeňák, 2011). **Fonts and text** on packaging fulfil two functions, namely the content and visual functions.

While the role of the content function is to provide some announcement or necessary product information, the visual function's role is to differentiate through a different font, font sizes and font colors Primary and secondary data that the customer does not act until the moment when he begins to pay particular attention to the product. Some data, such as quantity, manufacturer, shelf life, nutrition information, and others, have prescribed requirements. For the designer, it is also essential to know who the packaging is for and what the contents of the packaging are. If it is a male product, it is advisable to use austere, massive lettering with distinctive lines. If the product is intended for women, it is advisable to use a more elegant font style. On the other hand, a different font is required for the packaging of chocolate, spices, alcoholic beverages (Kačeňák, 2011).

Drawing and photography provide the fastest and most understandable form of communication between the product and the customer. Designers must follow general rules when creating packaging design, including the photo or drawing must be transparent. It must conform with the other elements of the packaging and should characterize the packaged goods or their use without misleading the customer (Kačeňák, 2011).

The shape of the packaging is another essential tool for the designer, but also the merchant. The unusual shape of the packaging can attract the attention of the customer, as well as its practical side, how it can be transported in the secondary packaging and thus can significantly reduce logistical costs in the supply chain (Rundh, 2016). Mainly consumers for whom the ergonomic properties of the packaging are essential to perceive its secure handling and open ability of the package as essential features. The possibility of reclosing, the possibility of using the package for direct consumption, or for the right heat treatment of food are only advantages of the package (Kačeňák, 2011). The overall appearance of the packaging is also important for customers (e.g. pattern, texture that is visually perceptible).

The last essential feature of packaging design is the material from which the packaging is made. Three criteria must be taken into account when selecting the packaging material. The first and most important is the protection function of the package in the whole of the life of the product. The secondary is the cost of packaging (the value of goods to the value of the packaging), and the tertiary criterion is the aesthetic aspect of the packaging material (Knošková, 2014).

Currently, global trend according to packaging is essential to take into account the environmental aspects of packaging throughout its lifetime, from production to disposal, and finding a compromise between classic packaging functions and environmental requirements (Dziuba, Ingaldi, 2016; Dziuba, Ingaldi, 2016a; Dziuba, Ingaldi, 2015). Packaging should minimize the negative impact on the environment, be made from biodegradable sources, and designed to be reusable.

1 Methodology

The article aimed to study the impact of packaging design on the purchase of foods. One hundred and ninety-three people from Slovakia took part in the research (women accounted for 71.5% and men 28.5% of respondents). The respondents were between 16 and 69 years old. The most frequent age groups were respondents aged 19 to 24 years (52.85%) and 25 to 34 years (25.91%). The group of respondents aged 45 to 54 represented 3.63% of all respondents. The least represented were the respondents under 18 (1.04%) and over 55 (2.06%) years. The largest group of respondents were from the Bratislava region (32.6%), the Prešov region (24.9%) and the Trnava region (15%). 6.7% of respondents stated that they came from the Žilina region, 6.2% of respondents were from the Trenčín region and 5.2% of respondents came from the Košice region. The least groups of respondents came from the Banská Bystrica and Nitra regions with the same percentage - 4.7% of all respondents. The research took place in the form of an electronic questionnaire from 03/15/2019 to 03/22/2019. The questionnaire was anonymous and contained 15 questions, of which four were socio-demographic. In this article, we analysed the respondents' answers from 4 questions, i.e.:

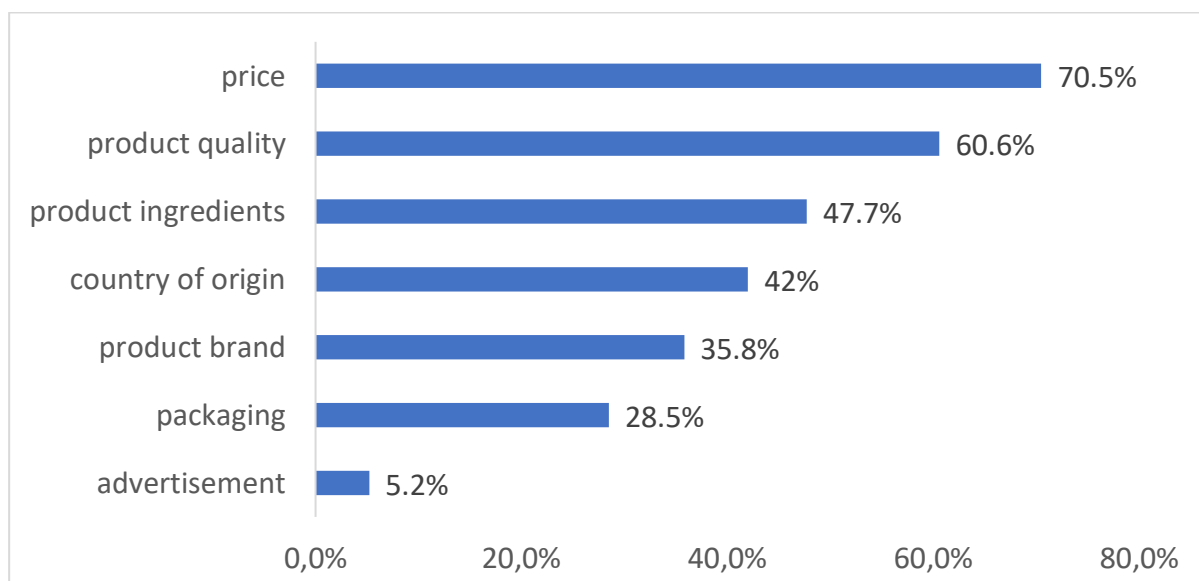
- 1) What factors influence you the most during food purchasing?
- 2) Is the packaging design important for you during food purchasing?

- 3) Do you agree with the statement that food packaging that has a good design represents a higher quality of the product?
- 4) Are you willing to pay a higher price for an eye-catching food packaging design?

2 Results and Discussion

In the first question we wanted to find out what factors most affected the respondents' food buying behaviour and what role packaging plays during their purchasing decisions. Respondents could mark more than one answer. Up to 70.5% of respondents stated that price is the most important factor during food purchasing (graph 1). Next, the respondents mentioned product quality (product properties confirmed by a special designation, e.g., Quality mark SK), ingredients of the product (47.7%), country of origin (42%), product brand (35.8%). The packaging was important for 28.5% of respondents. Only 5.2% of respondents answered that buying a product because of its advertisement. The answers to the first question are presented in graph 1.

Graph 1 Factors influencing the purchase of food by consumers



Source: Based on own research

The second question aimed to find out how packaging design is essential for customers during food-purchasing. According to the previous question, packaging affects shopping behaviour near 30% of respondents. Only for (7.8%) respondents, packaging design is very important (graph 2). Up to 70.6% of respondents said that packaging design is important for them, especially when they buy goods as a gift and for 21.6% of respondents packaging is not important factor during food shopping.

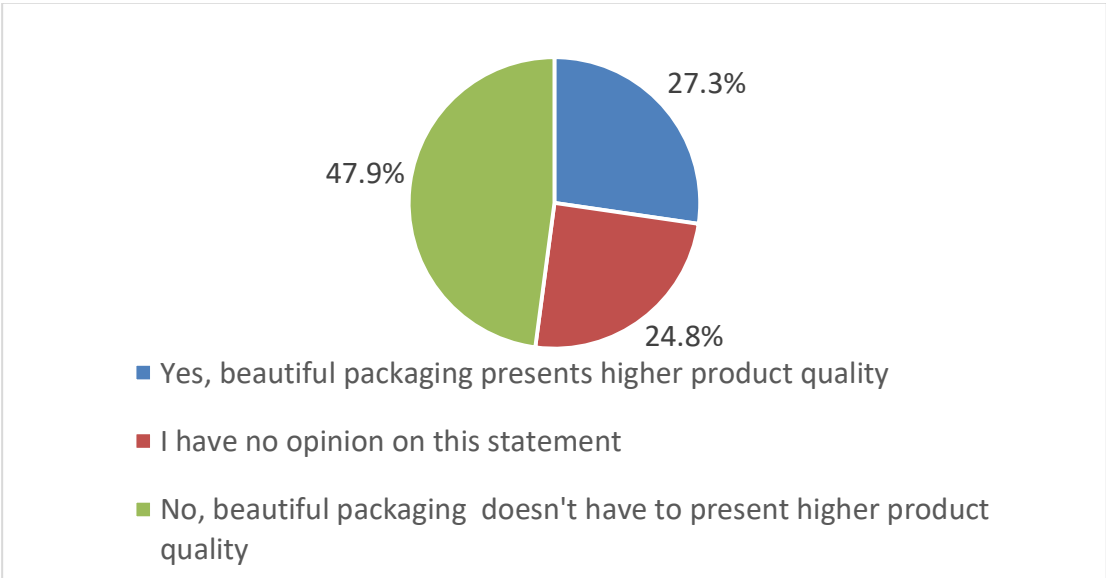
Graph 2 Importance of the packaging design during food shopping



Source: Based on own research

The next question answered only those respondents who, in the previous question, said that packaging design is important for them. The third question was to find out the respondents' attitude to the claim that the beautiful packaging presents higher product quality. Almost 50% of respondents replied that beautiful packaging doesn't have to present higher product quality. Every fifth examined person (24.8%) expressed that disagree nor agree with this statement (graph 3).

Graph 3 Respondents opinion to the claim that food packaging that has a good design presents higher product quality



Source: Based on own research

In the last question, we asked respondents if they were willing to pay a higher price for eye-catching packaging design. More than half of respondents (58.2%) said that they are not willing to pay a higher price for eye-catching packaging design. Nearly one in five respondents (41.8%) was willing to pay more for beautiful packaging design.

Conclusion

Creating a new product or refining an old one is essential to solve a consumer needs, in a new or better way. It needs to build credibility and showcase to consumers both the quality of the product and how it will be beneficial to them. In order to achieve this, is a need to leverage packaging as one of the key drivers. Currently, consumers will find a product or company credible if they see simplicity, transparency, and value, and these features should be reflected in the packaging. The article aimed to study the impact of food packaging design on the purchase of foods. In our survey the most of respondents stated that price is the most important factor during food purchasing. Further factors were product quality, ingredients of the product, country of origin, product brand, packaging and advertisement. Packaging design was important for more than half of respondents, but especially when they buy goods as a gift. Respondents replied that food packaging that has a good design doesn't have to present higher product quality and they were not willing to pay a higher price for eye-catching packaging design.

Nowadays consumers are visually influenced and experience-driven. Online shopping and social media have taken over, bringing the need for eye-catching packaging to an all-time high. The packaging is an effective way to promote brand image and differentiate the product from competitors. As it gives the first impression, it is important to identify what customers look for in packaging, which is the basic step in enabling to design effective packaging for products.

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Ekodizajn ako súčasť manažérstva environmentu ¹

Marta Karkalíková²

Abstract

Environmental management systems enable organizations systematically manage their level of environmental performance. It is a system designed to manage significant environmental aspects and to comply with legal requirements. Environmental management systems have brought several innovations, such as not only certification of environmental management systems, but also the use of energy labels, eco-labeling and, last but not least, ecodesign, which is already reflected in the product design process and must meet environmental requirements. The paper focuses on reasons for the implementation of environmental management systems, which are a decisive factor for organizations. To achieve this goal, the analysis was based on the current state of theoretical and practical knowledge of selected environmental management systems. The primary research was carried out in the form of a questionnaire, which obtained the reasons for the implementation of the system in organizations.

Key words

environmental policy, environmental management, implementation of management systems, environment

JEL Classification: Q50, Q56

Úvod

Európska únia, ako hospodárska a politická únia sa usiluje o vnútorný trh s bezpečnými a zároveň kvalitnými produktmi a službami, ktoré musia spĺňať právne záväzné legislatívne požiadavky uvedené v predpisoch a nariadeniach. Efektívnym nástrojom, zabezpečujúcim ich napĺňanie sú dobrovoľné normy systémov manažérstva, ktoré ISO - Medzinárodná organizácia pre normalizáciu vydáva a zvyšujú produktivitu, umožňujú zefektívňovanie procesov a zlepšujú štruktúru trhu s pozitívnymi ekonomickými dôsledkami. Organizácie, ktoré majú zavedené systémy manažérstva lepšie uspokojujú požiadavky zákazníkov, vyhýbajú sa chybám, motivujú a zapájajú zamestnancov do zvyšovania efektívnosti výkonu interných procesov, pričom kvalita, sa stáva základom ich podnikania (Albulescu, et al.,2016). Kvalita zabezpečuje, že systémy manažérstva spĺňajú požiadavky, očakávania zákazníkov a organizácia dodržiava bezpečnostné, environmentálne zákony, predpisy a normy, a to v oblasti výroby, označovania produktov a distribúcie (Chen, 2018). Zavádzanie systémov manažérstva v organizáciách podporuje konkurencieschopnosť v Európe.

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Na základe štúdií vykonaných vo vybratých krajinách možno konštatovať, že až jednu štvrtinu rastu produktivity v organizáciách v poslednom období možno pripísať zvyšovaniu implementácie noriem systémov manažérstva. To vedie nie len k úspešnej implementácii a certifikácii systémov manažérstva, ale aj k väčšej konkurencieschopnosti organizácie. Význam noriem systémov manažérstva je v tom, že ide o ich jednotnú uplatniteľnosť v organizáciách nie len na európskom ale i na celosvetovom trhu.

Organizácie sa čoraz viac zaoberajú environmentálnou problematikou a majú snahu preukázať, že riadia vplyvy svojich činností s ohľadom na životné prostredie. Dosahovanie rovnováhy medzi životným prostredím, spoločnosťou a ekonomikou sa považuje za dôležité pri uspokojovaní potrieb súčasnosti bez toho, aby bola ohrozená schopnosť budúcich generácií uspokojovať svoje potreby. Udržateľný rozvoj, transparentnosť a osobná zodpovednosť sa stávajú dôvodmi, že organizácie implementujú systémy manažérstva environmentu. Medzinárodná norma *ISO 14001:2015 Systémy manažérstva environmentu. Požiadavky s pokynmi na použitie* špecifikuje požiadavky na systém manažérstva environmentu, ktorý organizácia môže použiť na zlepšenie svojho environmentálneho správania. Cieľom normy je poskytnúť organizáciám rámec na ochranu životného prostredia a definovať požiadavky, ktoré im pomôžu dosahovať ciele, ktoré si stanovili. Je určená na použitie organizáciou, ktorá sa usiluje manažovať svoje environmentálne zodpovednosti systematickým spôsobom, ktorý prispieva k environmentálnemu pilieru udržateľnosti.

Implementáciu ISO 14001:2015 do organizácie možno považovať za významný krok k napĺňaniu zásad udržateľného rozvoja prostredníctvom riadenia ochrany životného prostredia. Cieľom systému manažérstva environmentu je zabezpečiť kvalitné životné prostredie (Pacana, 2017). Environmentálna zodpovednosť organizácie, zavádzanie a dodržiavanie environmentálne orientovaných systémov manažérstva predstavujú pre organizácie pozitívnu konkurenčnú výhodu v ich snahe o udržanie si stabilnej pozície na trhu a rozvoja podnikateľských aktivít. Rastúci dopyt a spotreba produktov, vývoj nových technologických procesov výroby, materiálov a produktov predstavujú zároveň rastúcu potenciálnu záťaž pre životné prostredie. Environmentálne zodpovedná organizácia môže eliminovať alebo zmierniť túto záťaž cieľavedomým zavádzaním opatrení zameraných na zmiernenie dopadu jeho podnikateľských aktivít na životné prostredie.

Snahou manažérstva environmentu je nájsť riešenie ako riadiť podnikové aktivity, tak, aby nespôsobovali degradáciu životného prostredia. Cieľavedomým zlepšovaním jednotlivých procesov a aktivít, môže organizácia prispievať nielen k lepšiemu životnému prostrediu, ale súčasne aj k zníženiu svojich podnikových nákladov (znižovaním množstva odpadov, spotrebou energií, vody a plynu alebo vypúšťaných emisií), čo sa pozitívne odrazí na jej zisku (Keivanpour, & Kadi, 2018).

Proaktívny prístup organizácií k zavádzaniu a udržiavaniu funkčných certifikovaných systémov manažérstva má pozitívny vplyv na podporu rozvoja environmentálnej zodpovednosti spoločnosti ako celku. Uvedený prístup organizácie k environmentálnej problematike spočíva v monitorovaní environmentálnych aspektov v každodennej činnosti, identifikovaní environmentálnych rizík a podľa možností im predchádzať. Tento prístup predstavuje komplexné systémové riešenie environmentálnych problémov.

Normy systému manažérstva environmentu priniesli niekoľko inovácií, medzi ktoré možno zaradiť nie len certifikáciu systémov manažérstva environmentu, ale aj využívanie energetických štítkov, environmentálne označovanie a v neposlednom rade ekodizajn.

V záujme trvalo udržateľného rozvoja je potrebné podporovať neustále zlepšovanie celkového dopadu produktov na životné prostredie, a preto už v procese ich návrhu musia byť splnené environmentálne požiadavky na daný produkt označované ako ekodizajn (Ceschin, & Gaziulusoy, 2019).

Ekodizajn sa zaoberá začlenením environmentálnych aspektov do navrhovania produktov a služieb, s cieľom zlepšiť environmentálne vlastnosti počas celého životného cyklu produktu (García-Sánchez, et al., 2019). Ekodizajn je súčasťou procesu vývoja produktu, identifikuje kľúčové environmentálne oblasti, ktoré majú počas celého životného cyklu produktu a služby dopad na životné prostredie. Skúma a vyhodnocuje všetky aktivity, materiály a látky, ktoré sú spojené so získavaním surovín, výrobou, distribúciou, používaním a konečnou likvidáciou produktov. Ekodizajn je nástrojom tvorby pro-ekologických dizajnerských riešení. Umožňuje dizajnérom prístup k informáciám o potrebách v oblasti ekologického dizajnu produktov a služieb.

Cieľom ekodizajnu je po identifikácii kľúčových environmentálnych oblastí navrhnúť ako znížiť, alebo úplne eliminovať jednotlivé negatívne environmentálne vplyvy produktu. Súčasnosťou procesu je aj navrhnutie potrebných organizačných zmien a spôsobu ako efektívne zlepšiť environmentálny profil produktu (Rodrigues, et al., 2019). Význam ekodizajnu je:

- vo zvyšovaní povedomia spotrebiteľov, aby produkty a služby spĺňali nie len požiadavky kvality, ale aj aby mali environmentálne vlastnosti,
- v sprísňujúcej európskej legislatíve v oblasti životného prostredia,
- v záujme investorov investovať do organizácií s vyhovujúcou environmentálnou a sociálnou politikou.

Ekodizajn je súčasťou environmentálnej politiky, ktorej cieľom je vstúpiť do výrobných a spotrebných rozhodnutí subjektov trhu produktov a služieb a dosiahnuť zmenu, ktorá predpokladá uplatnenie nástrojov a metód, ktoré zabezpečia vysokú environmentálnu účinnosť, redukciu environmentálnych škôd, pri dosahovaní požadovanej ekonomickej účinnosti (Jugend, et al., 2020). Systémy environmentálneho manažérstva sú jedným z účinných nástrojov pri riadení a znižovaní negatívnych vplyvov na životné prostredie a preto je dôležité, aby si členské štáty Európskej únie, ale aj jednotlivé organizácie uvedomili dôležitosť implementácie systémov manažérstva environmentu.

1 Metodika

Organizácie z dôvodu ekologických, zvýšenia výkonnosti a zníženia nákladov si implementujú systémy manažérstva environmentu, ktoré sú nástrojom pre dosiahnutie efektívnosti organizácie a sú založené na princípe neustáleho zlepšovania. Cieľom príspevku je identifikovať dôvody implementácie systémov manažérstva environmentu, ktoré sú rozhodujúcim faktorom pre organizácie. Použili sa viaceré metódy skúmania, pričom objektom skúmania boli organizácie, ktoré mali implementovaný systém manažérstva environmentu. Využili sa všeobecné postupy a metódy, na základe ktorých sa získali návrhy a odporúčania pre skúmaný subjekt. Riešenie problematiky vyžadovalo aplikáciu metódy analýzy, ktorá umožnila rozčleniť a následne detailnejšie preskúmať jednotlivé teoretické poznatky, získané prostredníctvom časopiseckých zdrojov.

Primárny prieskum bol realizovaný metódou dopytovania prostredníctvom štandardizovaného dotazníka, bol rozdelený do viacerých oblastí, ktoré boli rozdelené tak, aby sa dala čo najlepšie identifikovať efektívnosť systémov manažérstva environmentu v organizáciách a najmä ich dôvody implementácie. Dotazník bol rozposlaný elektronickou formou, pričom celkovo sa vrátilo 94 odpovedí z celkového počtu 380, čo predstavuje 24,7 % návratnosť a z toho 47 organizácií malo zavedený systém manažérstva environmentu.

Na spracovanie výsledkov sa využila metóda komparácie, kde sa najskôr analyzovali jednotlivé odpovede respondentov a následne sa porovnali a vyhodnocovali. Na zistenie postojov k jednotlivým dôvodom zavádzania systémov manažérstva environmentu sa použila hodnotiaci stupnica, ktorá vyjadrovala žiadny, slabý, priemerný, silný, najsilnejší dôvod implementácie. Na základe výsledkov sa identifikovalo, či je implementácia pre organizácie efektívna. Z odpovedí respondentov sa vypočítali aritmetické priemery hodnotení pre jednoduchšie pochopenie a interpretáciu. Na základe priemerov sa zostavilo poradie dôležitosti jednotlivých dôvodov implementácie systémov manažérstva environmentu. Využitím matematicko-štatistických metód sa analyzovali dáta, pomocou ktorých bolo možné jednotlivé výstupy zosumarizovať do grafickej podoby.

2 Výsledky a diskusia

Implementáciou systémov manažérstva environmentu sa eliminuje environmentálne riziko a preventívne sa riešia environmentálne problémy. *Norma ISO 14001:2015 Systémy manažérstva environmentu. Požiadavky s pokynmi na použitie* vyžaduje, aby si organizácia definovala svoje environmentálne aspekty, environmentálnu politiku, vymedzili krátkodobé a strednodobé environmentálne ciele. Tento systém zahŕňa organizačnú štruktúru, plánovanie činností, zodpovednosti, procesy, postupy, zdroje na prípravu, uplatňovanie, preskúmanie a udržiavanie environmentálnej politiky organizácie. Umožňuje dosiahnutie a systematické riadenie úrovne environmentálneho správania.

Prostredníctvom implementovaného systému manažérstva environmentu sa sledujú a dodržiavajú legislatívne požiadavky v oblasti ochrany životného prostredia, riadia environmentálne aspekty, ekodizajn, zvyšuje environmentálne povedomie zamestnancov, monitorujú a merajú činnosti pri realizácii produktov a služieb, ktoré môžu významne ovplyvňovať životné prostredie, znižovať produkciu odpadov, hľadať možnosti recyklácie a znižovať spotrebu energie. Dôvody implementácie systému manažérstva environmentu sú:

- ekonomické - zníženie spotreby energie, zníženie nákladov z hľadiska eliminácie pokút, možnosť vstupu na nové trhy,
- technické - technologické inovácie,
- organizačné - proaktívny prístup k riešeniu environmentálnych problémov, dodržiavanie environmentálnej legislatívy, eliminácia environmentálnych rizík.

Zavedený systém manažérstva environmentu umožňuje organizácii vyhodnocovať a zlepšovať jednotlivé činnosti, ktoré sa realizujú v rámci environmentálnej politiky, ktorá určuje základnú orientáciu organizácie, rámcové ciele a princípy správania vo vzťahu k životnému prostrediu. Environmentálna politika je definovaná vrcholovým manažmentom a obsahuje záväzky týkajúce sa dodržiavania požiadaviek pre zlepšovanie ochrany životného prostredia. Environmentálna politika sa považuje za veľmi dôležitý dokument, ktorý je

prístupný všetkým zamestnancom, ktorí sú povinní dodržiavať pravidlá na dosiahnutie jej cieľov.

Ďalším veľmi významným prínosom je, že implementácia pomáha identifikovať, monitorovať a dodržiavať rozličné environmentálne požiadavky, čo sa v konečnom dôsledku odrazí aj na znížení nákladov. Náklady sa však znižujú aj tým, že organizácie pracujú na šetrení energie, znižujú odpady z výroby a vstupné materiály (Hammar, 2018).

Okrem cieľov súvisiacich s riadením procesov, môžu byť strategickými cieľmi v rámci systémov manažérstva environmentu aj zlepšovanie manažmentu ľudských zdrojov, komunikácie so zákazníkmi a uspokojovania ich potrieb, minimalizácia environmentálnych rizík, zlepšovanie krízového manažmentu, atď.

Prieskum bol zameraný na zistenie praktických skúseností s implementáciou systémov manažérstva environmentu v podnikateľských subjektoch pôsobiacich na Slovensku. Skúmali sa okrem iných faktorov, ktoré ovplyvňujú implementáciu systémov manažérstva aj dôvody jeho implementácie, ktoré sú rozhodujúcim faktorom pre organizácie. Dotazník bol rozposielaný elektronickou formou, pričom celkovo nám odpovedalo 94 respondentov, ktorí mali zavedené systémy manažérstva a z toho 47 organizácií malo implementovaný systém manažérstva environmentu.

Hodnoty získané spracovaním odpovedí na otázku aké sú dôvody, pre ktoré sa organizácia rozhoduje pre zavedenie systému manažérstva environmentu ukazujú, že všetky dôvody uvedené ako možné odpovede majú v organizáciách skôr priemerný a silný vplyv na ich rozhodovanie. Dôvody pre zavádzanie systémov manažérstva environmentu sú uvedené v tab.1 a znázornené v grafe 1. Respondenti mali označiť odpoveď pre každý ukazovateľ, pričom percentuálny podiel odpovedí je vypočítaný vzhľadom na celkový počet 47 respondentov.

Tab. 1 Dôvody pre implemetáciu systémov manažérstva environmentu

Dôvody pre zavedenie systémov manažérstva environmentu	hodnotenie									
	žiadny		slabý		priemerný		silný		najsilnejší	
	abs.	rel.	abs.	rel.	abs.	rel.	abs.	rel.	abs.	rel.
legislatívna povinnosť	2	4,3%	10	21,3%	20	42,6%	10	21,3%	5	10,6%
zvýšenie efektívnosti organizácie	2	4,3%	2	4,3%	18	38,3%	20	42,6%	5	10,6%
zníženie nákladov	1	2,1%	5	10,6%	10	21,3%	20	42,6%	11	23,4%
zvýšenie konkurencieschopnosti	0	0,0%	5	10,6%	15	31,9%	15	31,9%	12	25,5%
spoločenská	3	6,4%	6	12,8%	19	40,4%	16	34,0%	3	6,4%
environmentálna zodpovednosť	2	4,3%	7	14,9%	14	29,8%	16	34,0%	8	17,0%
spokojnosť	1	2,1%	4	8,5%	15	31,9%	21	44,7%	6	12,8%

Vysvetlivky: abs. – absolútna hodnota, rel. – relatívna hodnota

Zdroj: vlastné spracovanie

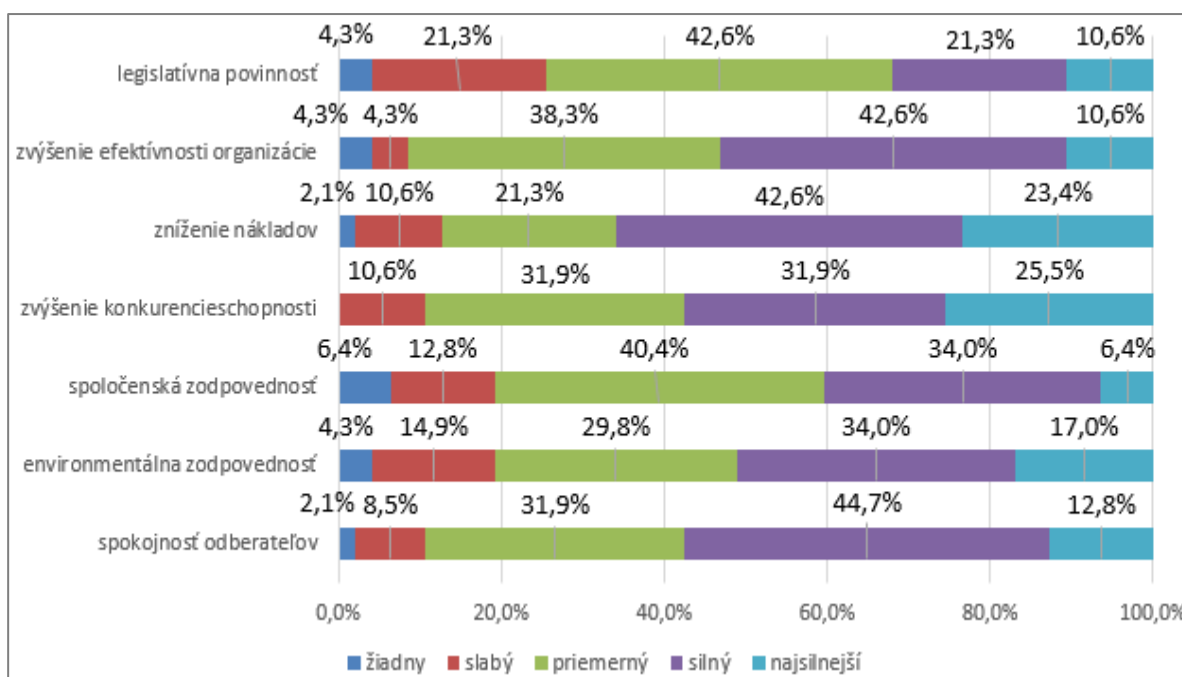
Najvyšší percentuálny podiel 44,7% uviedli respondenti ako silný vplyv (21 organizácií) na dôvod implementácie systémov manažérstva spokojnosť odberateľov v rámci dodávateľsko-odberateľského vzťahu. S rovnakým percentuálnym podielom 42,6% uviedli silný vplyv z dvoch dôvodoch, a to zvýšenie efektívnosti organizácie a zníženie nákladov (20 organizácií).

S implementáciou systémov manažérstva environmentu súvisia aj rôzne investície, ktoré sú nevyhnutné. Tieto investície vo forme nákladov budú v budúcnosti kompenzované rôznymi výhodami zo zavedenia systému manažérstva. Preto majú tieto náklady potenciál produkovať zisk pre organizáciu a nemali by sa podceňovať. Na druhej strane sa však na základe zavedenia systémov manažérstva environmentu organizáciám náklady znižujú. Môže to nastať v dôsledku skvalitnenia procesov a produktov, čím sa znižuje počet nepodarkov, reklamácií, chybovostí, recykluje sa zvyšný odpad a mnoho ďalšieho, na základe čoho sa organizácii znižujú celkové náklady. Každá organizácia pociťuje vplyv implementácie na náklady inak, a to pre ich veľkosť či oblasť podnikania.

Rovnaký percentuálny podiel 42,6% dosiahlo hodnotenie priemerný vplyv z dôvodu legislatívnych povinností (20 organizácií). Menej respondentov hodnotilo význam spoločenskej zodpovednosti, ktorú označilo viac ako 40,4% organizácií a následne za ňou silný vplyv environmentálnej zodpovednosti 34,0% respondentov.

Najmenšie percentuálne rozdiely pre určenie významu dôvodu zavedenia systémov manažérstva malo hodnotenie zvýšenie konkurencieschopnosti, kde sa hodnotenie pohybovalo od viac ako 25,5% respondentov pre najsilnejší význam, až po takmer 31,9% respondentov pre silný a pre priemerný význam tohto dôvodu.

Graph 1 Dôvody pre implemetáciu systémov manažérstva environmentu



Zdroj: vlastné spracovanie

Výsledky získané prieskumom potvrdzujú teoretické poznatky, že organizácie sa nerozhodujú pre zavedenie systémov manažérstva environmentu len kvôli legislatívnej povinnosti, ale preto, že sú sami proaktívne a uvedomujú si, že zavedenie týchto systémov manažérstva im umožňuje posilniť ich imidž environmentálne zodpovednej organizácie, zlepšiť spokojnosť odberateľov v rámci dodávateľsko-odberateľského reťazca a získať tak dôležitú konkurenčnú výhodu.

Proaktívny prístup organizácií k zavádzaniu a udržiavaniu funkčných certifikovaných systémov manažérstva má pozitívny vplyv na podporu rozvoja environmentálnej zodpovednosti organizácie ako celku. Systémy manažérstva environmentu sú komplexným, systematickým a účinným nástrojom, ktoré umožňujú organizáciám zakomponovať environmentálnu politiku do strategických plánov. Môžu systematicky pracovať na ich napĺňaní v súčinnosti s ostatnými strategickými cieľmi, a využívať ich na zlepšovanie potenciálu v snahe o zvýšenie konkurencieschopnosti, o zlepšenie environmentálnej zodpovednosti organizácie, či dlhodobej udržateľnosti podnikania.

V dôsledku globalizácie sa trhy stávajú silne konkurenčnými a organizácie sa snažia dosiahnuť svoj maximálny trhový podiel. Na jeho dosiahnutie sa snažia získať rôzne konkurenčné výhody, ako je kvalita produktov a služieb, či ochrana životného prostredia a z toho profitujú.

Záver

Organizácie majú viacero dôvodov, prečo sa rozhodnú implementovať systémy manažérstva environmentu. Tieto motívy môžu byť interné, kedy vychádzajú z vnútra organizácie alebo externé, ktoré sa prejavujú smerom navonok. Najčastejším motívom zavádzania systémov manažérstva pre organizácie sú požiadavky zákazníkov a environmentálne. Po implementácii a následnej certifikácii systémov manažérstva environmentu, môže organizácia využiť výhodu certifikácie v marketingových stratégiách, zlepšiť svoj imidž, zaujať a získať nových zákazníkov.

Dôvody implementácie systémov manažérstva sú kľúčovým a rozhodujúcim faktorom pre organizácie. Medzi tri najčastejšie uvádzané dôvody patria: zvýšenie efektívnosti organizácie, zníženie nákladov a spokojnosť odberateľov. Dôvody pre implementáciu systémov manažérstva environmentu, podľa normy ISO 14001:2015 sú prínosom, zvyšujú ich efektívnosť tým, že sa znižujú prevádzkové náklady. Implementácia je na dobrovoľnej báze na úrovni malých aj stredných podnikov. Na základe environmentálne orientovaného riadenia v organizácii je nevyhnutné realizovať aktivity, ktorými by sa prekonával nesúlads medzi spoločnosťou, trhom a životným prostredím.

Efektívnosť systémov manažérstva má dôležitý vplyv na riadenie organizácie. Systémy manažérstva environmentu zlepšujú efektívnosť organizácie, pretože sú založené na princípe neustáleho zlepšovania. Aby implementované systémy manažérstva v organizáciách boli efektívne, je potrebné analyzovať všetky procesy v organizácii, ako aj ekodizajn, ktorý je ich súčasťou. Proces implementácie systémov manažérstva je finančne náročný, pretože udržiavanie systémov manažérstva si vyžaduje od organizácií trvalé zlepšovanie.

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The Service Design¹

Viera Kubičková²

Abstract

Strengthening the service economy is a major challenge for developing service design issues. The theory of industrial economy has dealt with product design to a large extent. Technological and societal changes make quantitative and qualitative changes in service demand. Service development opportunities make challenges for service design. The purpose of the study is to identify the main reasons for the implementation of new approaches in service design and new trends in service design. The method of analysis, synthesis, comparison and statistical method made it possible to identify arguments for changes in service design. Growth of the service economy, social and technological changes and co-production of services are key drivers of using of service design. Service design based on customer's experience, co-creation design, service design based on customer's expectations and smart technology and web-based design are new forms of service design. Implementing new approaches in service design also brings economic benefit, labour productivity is higher in services that use smart design.

Key words

service design, technological changes, social changes, client expectations, smart technologies

JEL Classification: O14, O33

Introduction

Service design is an issue that develops in line with the strengthening of the service economy. Production processes are increasingly based on the use of automated systems and robots. Manufacturing is more efficient, more accurate and minimize human work. Production requires quality service inputs, while social change requires a new quality of service for society. The new needs of industry and society are a challenge for service design.

The article explains service design, provides arguments to support changes in service design, and identifies new trends in service design.

1 Methodology

The purpose of the study is to identify the main reasons for the implementation of new approaches in service design. There were used methods of analysis of theoretical inputs into the issue as well as synthesis of theoretical approaches to the issue. The statistical method and method of comparison were used for the purpose of identifying the position of services

¹ VEGA 1/0543/18: The Importance of Product Design in Consumer Decision-Making and Perspectives to Increase the Impact of Design on Creating Competitive Position of Companies Operating in the Slovak Republic

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in the Slovak economy and for the purpose of identifying the economic benefits of smart services in EU countries.

2 Results and Discussion

„Service design is the activity of planning and organising people, infrastructure, communication, and material components of a service in order to improve its quality and the interaction between service providers and customers. It is a creative, viable and user-centred design process that is used by organisations to create value for their customers or users and serves as a competitive advantage for the service provider“ (European Commission, 2014a).

The socio-economic relevance of service design as a means to advance business models is directly related to the role of the service sector in the European Union. This sector has been a key engine of economic and job growth. Over two-thirds of those employed in Europe now work in the service sector and between 60 and 70% of the annual gross value added figure achieved by the majority of European states can be attributed to services. However, although the value of the service sector continues to grow and customers' expectations of value for money in the service industry keep rising, good services are still the exception rather than the rule. It becomes clear that further economic progress and increased quality of life will be determined by the quality of services (European Commission, 2014).

The importance of service design is related to changing sophistication of clients. This is based on the availability, speed and quality of information. Companies that focus on economic performance and client loyalty introduce customization their services.

2.1 Drivers for using service design

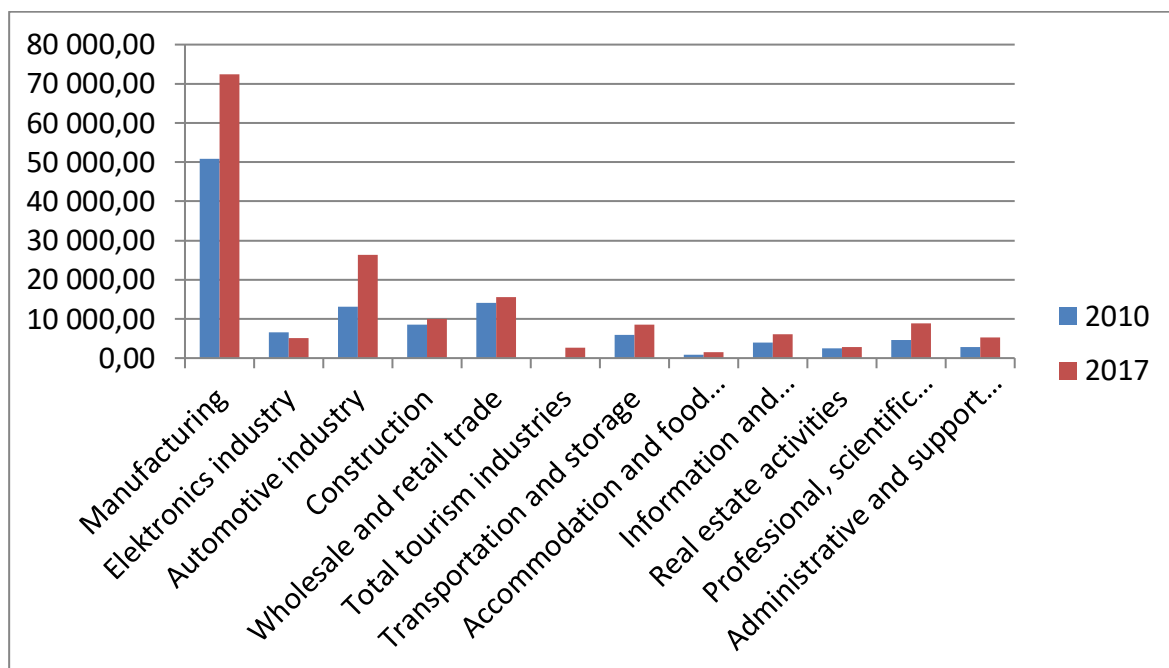
Growth of the service economy

The services sector contributes 70–80% of national value added and employment in developed countries, and its share is increasing also in the developing countries. The traditional division of economic sectors, especially the borderline between manufacturing and services has become blurred: business services contribute an important input to the manufacturing operations, while manufacturing companies themselves also produce services along their value chains and offer services to their customers. Well-developed knowledge-intensive business services (KIBS) are recognized important for the success of the manufacturing industry in internationally distributed production (De Backer et al. 2015).

The economic basis of Western industrial nations has changed dramatically in the last three decades from manufacturing to services. Services now typically represent between sixty and seventy percent of the gross domestic product of developed nations and almost all new companies being founded and jobs created are in this so-called tertiary sector. New challenges have emerged as this once minor sector has expanded rapidly (Mager, 2008).

The structure and changes of production value in the Slovak economy is recorded in the following graph. A key element of the Slovak economy is industry, with a clear priority of automotive industry. The services recorded an increase in production over the reporting period. Commercial services account for more than 40% of the total added value in Slovak economy. The strength of industry is a factor in the development of business services in Slovakia.

Graph 1 Production value in Slovakia, special aggregates of activities (NACE Rev. 2), million euro



Source: own processing according to Eurostat database, <https://ec.europa.eu/eurostat/data/>

Social and technological change

New social and technological trends cause changes in service design, products have new quality characteristics and meet new client expectations. Thus, qualitative changes are evident in all service sectors, not only in relation to the effects of social change, but also in terms of technology. The most frequently cited social changes are aging populations, migration, globalization and global warming. The present period is characterized by digital transformation and it means digitization, cloud, Big Data, IoT, 3 D printing and Industry 4.0 (Biahmou et al., 2016). Technological changes make it possible to strengthen web-based design services offered through the web. The socio-economic impact of web-based design is significant and positively influences future economic growth. As web-based design companies grow and flourish, they generate high-quality jobs in design, technology and sales (European Commission, 2014c).

Co-production of services

The production of services is carried out in cooperation between producer and client. The client is thus in the position of prosumer. Extent of participation of the client and its entry into the production depends on the level of standardization of services. The client defines the quality of service. The producer adapts production processes to the client's needs. The existence of a prosumer position activates a change in the design of services in the production of many service providers. There is a client's need and expectation in the definition of product attributes. This applies especially to personalized services. Standardized services enable producers to apply their own service design to a greater extent.

2.2 New trends in service design

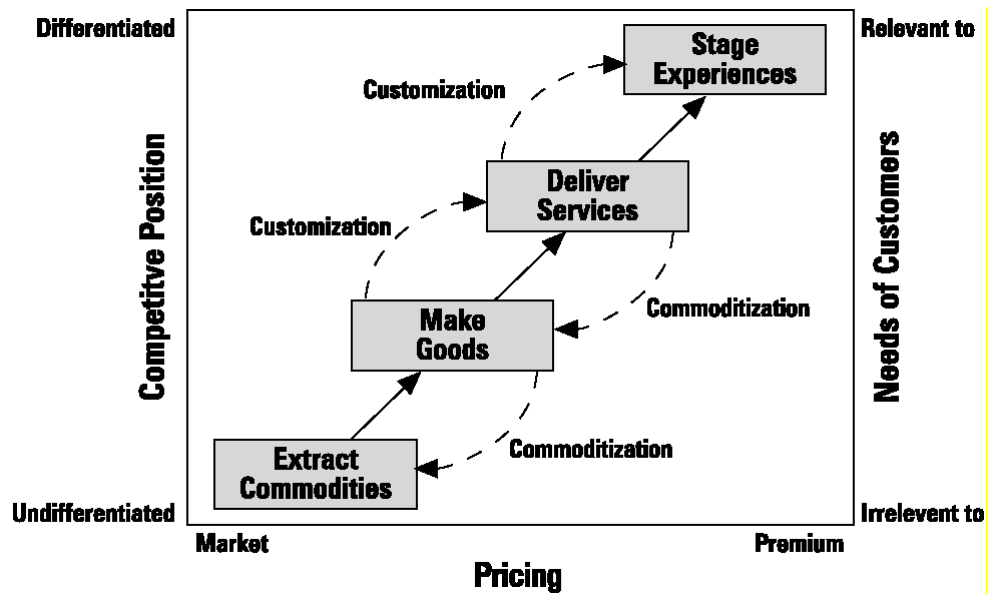
Changes in service design are related to new challenges and market demands. Also social and technological changes mean opportunities for a new design of services. Industry 4.0 is a phenomenon that changes production processes and opens economic space for service production. This creates opportunities for new ways of producing services as well as for the emergence of new services.

Service design based on customer's experience

Pine and Gilmore (1999) have placed the experience economy as the successor of the service economy, which followed after the industrial and agrarian economy. In Figure 1 the progression of the economic value is being presented which basically summarizes the importance of staging experiences in the business.

Service organizations are increasingly managing customer experiences to promote differentiation and customer loyalty (Zomerdijk, Voss 2009). Customer experience has become increasingly important for service organizations that see it as a source of sustainable competitive advantage, and for service designers, who consider it fundamental to any service design project ([Teixeira et al.](#) 2012).

Fig. 1 The progression of economic value



Source: Pine, B.J., Gilmore, J.H. (1999). *The Experience Economy*

Co-creation design

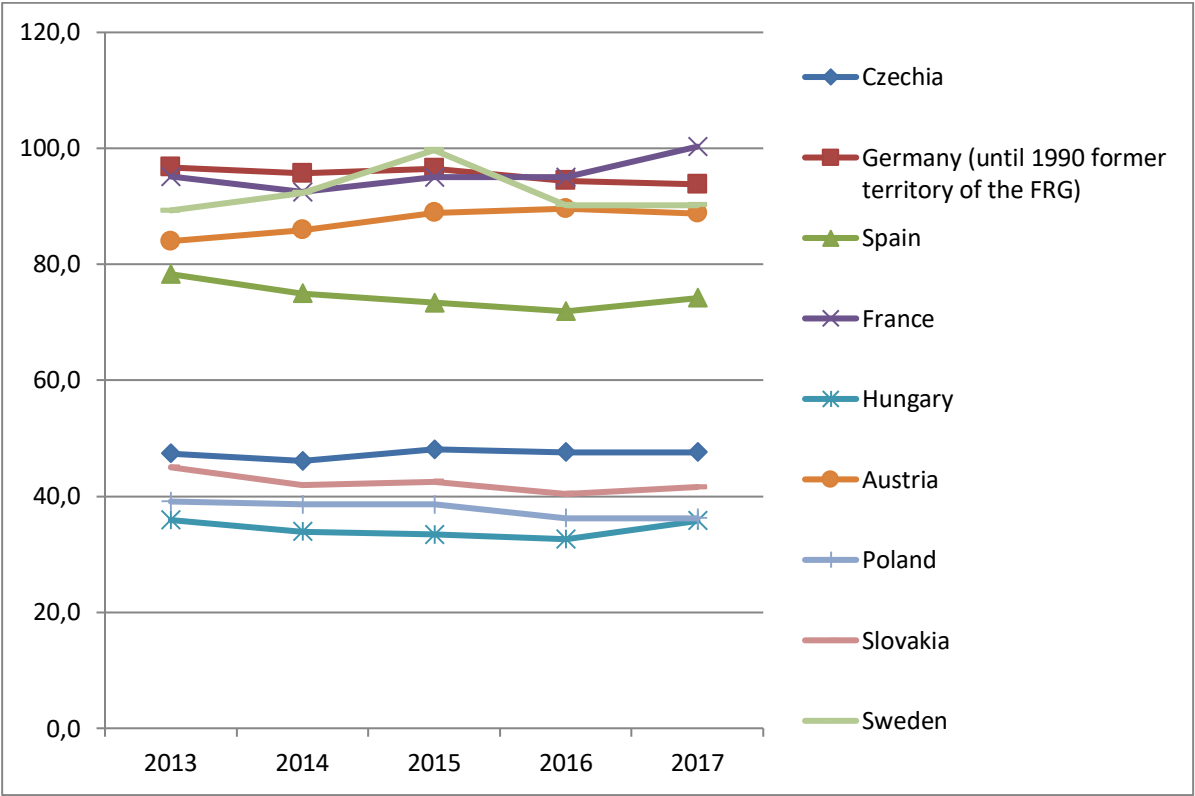
Co-creation design is based on co-production in services. It is a logical consequence of cooperation between the client and the producer. At the same time, other actors are also involved in design creation. They are network and cluster partners. But they can also be suppliers, government and educational and research institutions. This collaboration requires new management approaches based on open innovation. Crowdsourcing can be considered a form of co-creation in which everyone (the crowd) is invited to participate in the co-creation process. „Co-creation design is a revolutionary design approach where a multitude of stakeholders is actively involved in the design process. It goes beyond partnering with other companies, assembling multidisciplinary teams, or conventional user-designer relationships that might for instance apply to architects and their clients. Co-creation is about joint creation of value by the company and its customers. It allows the customer to co-construct the service experience to suit his or her context“ (European Commission, 2014b).

Service design based on customer’s expectations and smart technology

Hermann (2016) defined smart service as service adapted to specific customers using data and their smart processing. Therefore, for the design and development of smart service, it is essential to understand the customer, to have smart data and platforms for integration, data processing and changing business models. Smart services require high agility during development and they are also often produced in collaboration between businesses and the external environment. Client identification, co-production and cooperation are the key factor of smart service production.

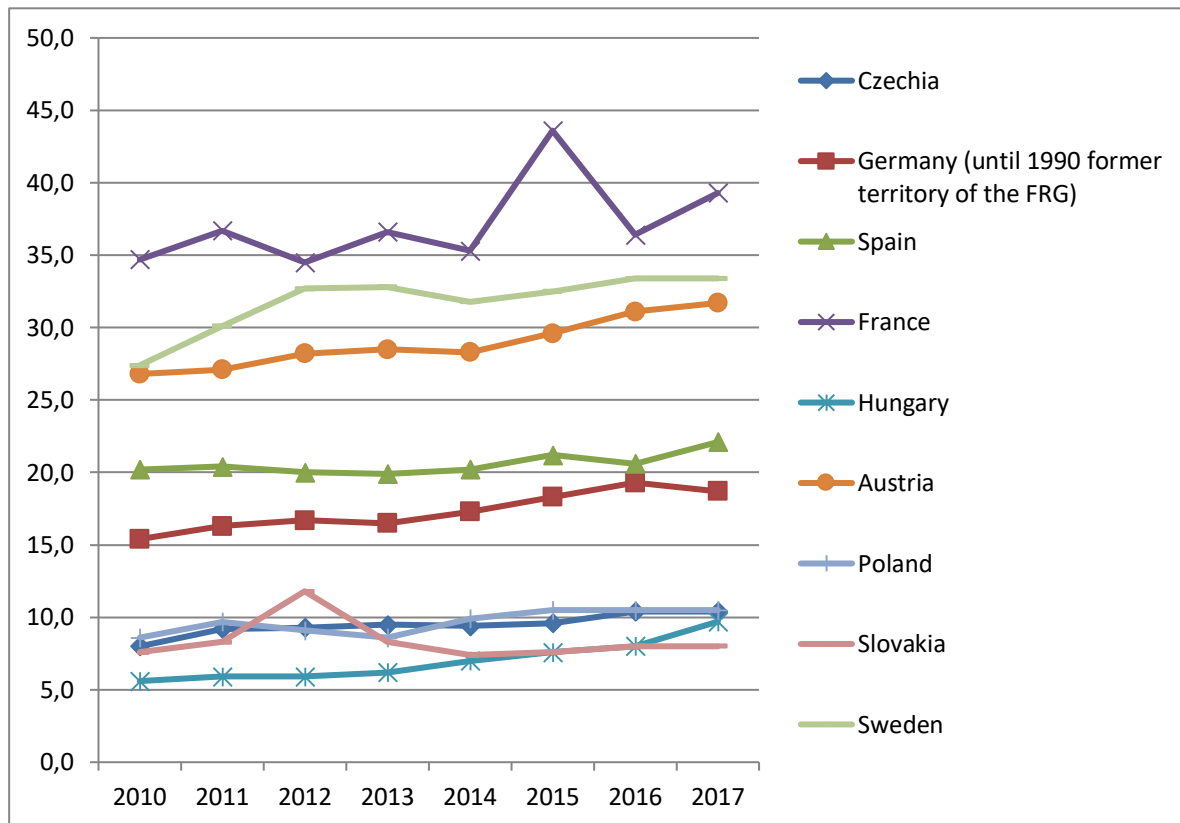
Labour productivity is higher in services that use smart technologies and approaches to a greater extent (graph 2, graph 3). Knowledge-intensive services are the creators as well as the biggest users of smart technologies. But the level of personalization services is a factor for smart technologies implementation. Therefore, tourism can be identified as a sector with a strong demand for smart solutions.

Graph 2 Apparent labour productivity (Gross value added per person employed) - thousand euro, Information and communication services



Source: own processing according to Eurostat database, <https://ec.europa.eu/eurostat/data/>

Graph 3 Apparent labour productivity (Gross value added per person employed) - thousand euro, Accommodation and food service activities



Source: own processing according to Eurostat database, <https://ec.europa.eu/eurostat/data/>

Conclusion

Growth of the service economy, social and technological change and co-production of services are key drivers of using of service design. The socio-economic relevance of service design as a means to advance business models is directly related to the role of the service sector in the European Union. The importance of service design is related to changing sophistication of clients. This is based on the availability, speed and quality of information. Companies that focus on economic performance and client loyalty introduce customization their services.

Service design based on customer's experience, co-creation design, service design based on customer's expectations and smart technology and web-based design are new forms of service design.

Implementing new approaches in service design also brings economic benefits. It reflects the concentration of companies on the client's needs and his loyalty. Labour productivity is higher in services that use smart technologies and approaches to a greater extent.

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Spotrebiteľský prístup k dizajnu a ekológii obalov potravinárskych výrobkov¹

Alica Lacková²

Consumer Approach to Food Packaging Design and Ecology

Abstract

The paper focuses on identifying and analyzing consumer approach to food packaging, focusing in particular on design and environmental aspects. As is clear from the results of the survey, the packaging of the food product is a classic example of the immediate correlation between quality and design. When evaluating food, consumers base their evaluation not only on their experience with the product and its taste, but they are also influenced to a large extent by the aesthetic and increasingly by ecological aspect of the packaging. The current trend is for packaging not only to be safe, but also to be recyclable or made from biodegradable materials. Several scientific methods were used to process the problem - the method of abstraction, analysis, synthesis, induction, deduction and scientific argumentation.

Key words

Packaging design, ecological aspects of packaging, recycling, biodegradable packaging

JEL Classification: JEL M31, Q13

Úvod

V súčasnej dobe je obal jednou z najdôležitejších zložiek podieľajúcich sa na tvorbe výrobkov. Prioritnou úlohou obalu je chrániť výrobok, resp. tovar, pri preprave, skladovaní či manipulácii. Taktiež, najmä pri potravinách, je dôležitý i z hygienického hľadiska a zabezpečuje dlhšiu trvanlivosť. V neposlednom rade slúži aj ako marketingový nástroj, jeho dizajn a imidž vo veľkej miere ovplyvňujú spotrebiteľské správanie.

V dnešnom konkurenčnom prostredí je obal neodmysliteľnou súčasťou marketingovej komunikácie. Kvalitný obal môže presvedčiť zákazníkov o kvalite výrobku, vzbudzuje pozornosť a motivuje ich ku kúpe. Spotrebiteľia sa stávajú informovanejšími, náročnejšími a sofistikovanejšími. Výrobcovia musia rozpoznať týchto spotrebiteľov, identifikovať ich potreby a nadviazať s nimi efektívnu komunikáciu. Efektívnym nástrojom marketingovej komunikácie, ktorý môže komunikovať so spotrebiteľom je práve obal.

Medzi základné úlohy balenia patrí tiež predĺženie trvanlivosti a uchovanie kvality. Zvlášť to platí pri potravinárskych výrobkoch. Obal zaisťuje ochranu výrobkov pred mechanickým poškodením a pred vonkajšími vplyvmi, a to počas celej distribúcie. Svojimi vlastnosťami pomáha preklenúť časový, priestorový a obsahový nesúlad medzi výrobou a spotrebou tovaru.

¹ Príspevok vznikol v rámci riešenia grantového projektu VEGA č.1/0543/18 „ Význam dizajnu produktov pri spotrebiteľskom rozhodovaní a perspektívy zvyšovania vplyvu dizajnu na tvorbu konkurenčného postavenia firiem pôsobiacich v Slovenskej republike“

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Požiadavky na obaly a obalové materiály závisia od toho, aký charakter má daný výrobok. Voľba vhodného obalu obmedzuje pôsobenie škodlivých vplyvov externého prostredia na vlastnosti výrobkov. Preto pri rozhodovaní o vhodnosti typu obalu treba brať do úvahy hlavne vlastnosti výrobku, ale aj vplyvy prostredia, spôsob dopravy, manipulácie a skladovania a v neposlednom rade aj obchodné hľadiska (Zhu, Guillemat & Vitrac,2019). Čo sa týka obchodu, odbytu a spotreby obal musí spotrebiteľovi poskytovať nielen potrebné informácie o obsahu zabaleného výrobku, ale musí upútať pozornosť zákazníka, vzbudiť jeho dôveru a vyvolať v ňom dobrý dojem. Práve preto nadobúda dizajn obalu veľký význam.

S narastajúcim počtom výrobkov sa čoraz častejšie stretávame aj s pojmom odpad. Neustále zvyšovanie produkcie rôznych druhov odpadu, vrátane komunálneho odpadu, predstavuje problémy ekologického, ekonomického i spoločenského charakteru (Nemat, et al.,2019). Nevyhnutné znižovanie množstva odpadu ukladaného na skládky a ich redukovanie je možné dosiahnuť hlavne dôsledným triedením a následným recyklovaním odpadu.

1 Metódy a metodika práce

Cieľom príspevku bolo identifikovať a analyzovať prístup spotrebiteľov k dizajnu a environmentálnym aspektom obalov na trhu potravinárskych výrobkov. Pri spracovaní problematiky sme využili viaceré vedecké metódy – metódu abstrakcie, analýzy, syntézy, indukcie, dedukcie a vedeckej argumentácie.

Prvým krokom bolo získavanie a analyzovanie relevantných informácií o danej téme zo sekundárnych zdrojov. Vychádzali sme z dostupných informácií publikovaných v dielach slovenských a zahraničných autorov. Informácie sme získavali z knižných, časopiseckých a internetových zdrojov. Vzhľadom na to, že spracovaná téma úzko súvisí aj s legislatívou, pracovali sme aj s platnými zákonmi a smernicami z oblasti balenia výrobkov.

Realizovali sme tiež vlastný spotrebiteľský prieskum, ktorého účelom bolo prostredníctvom dopytovania zistiť postoje spotrebiteľov k obalom potravinárskych výrobkov, so zameraním najmä na ich dizajn a ekologické aspekty. Prieskum bol realizovaný formou štandardizovaného dotazníka, pričom dotazníky boli distribuované prostredníctvom elektronickej pošty a sociálnej siete Facebook v časovom intervale marec – apríl 2019. Z celkového počtu 160 dotazníkov sa v priebehu stanoveného obdobia vrátilo spolu 112 dotazníkov, čo predstavuje 70 %-nú návratnosť. Získané údaje sme štatisticky spracovali a vyhodnotili prostredníctvom programov Survio.com a Microsoft Office Excel.

2 Výsledky a diskusia

2.1 Dizajn obalu

V dnešnej dobe je v obchodoch široký sortiment potravinárskych výrobkov a o kúpe niektorého z nich rozhoduje práve obal. Tento sa stal v súčasnosti takmer neoddeliteľnou súčasťou úžitkovej hodnoty výrobku. Podľa obalu sa posudzuje i kvalita výrobku. Mimoriadne intenzívne sa to prejavuje najmä pri potravinách. Možno povedať, že práve obal potravinárskeho výrobku sa považuje za klasický príklad bezprostredného súvisu kvality a dizajnu (Kačeňák,2011). Vyplýva to aj zo základných funkcií obalu, kde je okrem ochranej a

racionalizačnej zahrnutá aj funkcia komunikačná. V nich sa potom v rôzne intenzívnej forme podľa druhu obalu – prepravný, skupinový, spotrebiteľský – premietajú všeobecné, konkrétne i špecifické požiadavky dizajnu.

Pod dizajnom obalu rozumieme vonkajšiu úpravu celku alebo časti obalu, ktorá vyplýva zo znakov, najmä línií, obrysov, farieb, tvaru, alebo materiálov samotného obalu a jeho zdobenia. Na jednej strane dizajn rieši celkový vzhľad daného obalu, na druhej strane musí brať do úvahy aj to, s akou účinnosťou bude plniť funkčné vlastnosti. Prvotným cieľom dizajnu nemôže byť len vytvorenie atraktívneho obalu, ale spolu s výrobkom musí posilniť úžitkové a funkčné vlastnosti tak, aby vytvorený výrobok bol prínosom pre spotrebiteľa i pre spoločnosť. Tento celospoločenský význam dizajnu je pomerne často potlačovaný snahou niektorých výrobcov po okamžitom ekonomickom účinku, ktorý môže niekedy vyvolať zdanlivo efektné a povrchne pôsobivé riešenie.

Rastom významu samoobslužného predaja je tovar nútený ponúkať sa a predávať sám. Práve preto má obal mimoriadne dôležitú úlohu, aby prinútil zákazníka ku kúpe daného tovaru. Obal musí spĺňať nasledujúce predpoklady:

- *upútanie pozornosti* – obal vystupuje ako propagačný prostriedok, ktorý musí upútať pozornosť zákazníka,
- *vyvolanie želania* – v okamihu, keď už obal získal pozornosť, sa začne zákazník zaoberať so psychologickou stránkou obalu. Zákazník sa snaží identifikovať obsah obalu, vznikajú asociácie o kvalite, zaujíma ich výrobca, cena a použiteľnosť,
- *zapamätateľnosť* – keď mal zákazník dobré skúsenosti s nakúpeným výrobkom, je veľká pravdepodobnosť, že sa vracia pri ďalšej potrebe k tomu istému výrobku. Preto je dôležité, aby bol obal dobre zapamätateľný, aby dovedol zákazníka k hľadanému výrobku.

Obalový dizajn je špecifické odvetvie dizajnu, ktoré vždy rieši komplexnú problematiku marketingu, priemyselného a grafického dizajnu, technologické, logistické a ekonomické obmedzenia. Dizajn obalu v prvom rade zvýši estetickú hodnotu výrobku, zlepší jeho vlastnosti a zabezpečí vyššiu funkčnosť. Komerčnú účinnosť a estetickú hodnotu obalu môžeme posúdiť podľa grafickej úpravy, pričom sa jedná o tieto zložky (Kačeňák, 2011):

- *farebnosť* – prvé, čo spotrebiteľa upúta pri hľadaní tovaru, je práve farba obalu. Preto je dôležité, aby obal mal príjemnú farebnú kombináciu. Už mnohé experimenty poukázali na to, že napr. červené, oranžové alebo žlté farby sú optimistické vyvolávajúce pohyb a akciu. Naopak, modré a zelené farby majú ukludňujúce účinky a symbolizujú prírodu;
- *písmo a text* – plnia dôležitú úlohu na obale, jednak sprostredkujú informácie a majú tiež vizuálnu a grafickú funkciu. Dôležité sú typ a veľkosť písma, jeho umiestnenie, farebnosť. Text musí byť prehľadný a čitateľný, slogany a reklama nemôžu prekryvať dôležité informácie;
- *kresba a fotografia* – častokrát si spotrebiteľia všímajú len „obrázky“, preto je dôležité, aby tieto kresby vystihovali balený tovar, a aby boli v súlade s ostatnými prvkami grafickej úpravy;
- *tvar obalu* – je dôležitý aj z praktického hľadiska, rôzne úchytky a samotný tvar uľahčujú manipuláciu a spotrebu baleného tovaru;
- *obalový materiál* – je dôležitý aj z estetického hľadiska, ale prvotným kritériom pri výbere materiálu je jeho ochranná funkcia.

Obal určitý výrobok individualizuje, teda odlišuje od ostatných, podáva potrebné informácie a v samoobsluže nahrádza predavača. V tomto spočíva aj mimoriadny význam dizajnu. Vhodná kombinácia grafických prvkov a ich kvalitná technická realizácia umožňuje zvyšovať viditeľnosť výrobkov, upútava pozornosť zákazníka a uľahčuje mu voľbu z veľkého množstva výrobkov.

Úspech nového výrobku na trhu závisí predovšetkým od toho, ako pôsobí na spotrebiteľa. Toto pôsobenie sa deje prostredníctvom obalu. V prípade kladného prijatia a dobrých skúseností s obsahom je jeho predajnosť zaručená. Prostredníctvom obalu možno účinne pôsobiť na spotrebiteľa, napr. na výchovu a usmerňovanie estetického cítenia, na propagáciu zdravej výživy, na zvyšovanie pocitu sebavedomia vo vzťahu k zahraničným výrobkom, atď.

V súčasnosti si treba uvedomiť, že náklady na grafickú a tvarovú úpravu obalu a overenie jej účinnosti na trhu sú jednorazovými nákladmi a najmä pri masovo vyrábaných výrobkoch sú takmer zanedbateľné. Pritom vlastné prevádzkové náklady na výrobu obalov sú prakticky rovnaké, či sa vyrába obal s vhodnou, alebo nevhodnou vonkajšou úpravou.

Z predchádzajúcich úvah vyplýva, že dizajn obalov sa stáva dynamizujúcim faktorom obchodu. Pri výrobkoch, ktoré sú už trvalou súčasťou trhu sa niekedy objavuje potreba modernizácie obalu tak, aby zodpovedal súčasným trendom. K takýmto zásahom dochádza najmä vtedy, keď začína stagnácia alebo pokles dopytu. Vhodná zmena obalu môže v mnohých prípadoch ovplyvniť oživenie trhu. Pri modernizácii obalu ide však o zodpovednú prácu, lebo nevhodným zásahom môžu byť prerušené dlhé roky budované tradície.

Všeobecne sa usudzuje, že dnešný dizajnér má stále ťažšiu úlohu pri navrhovaní obalov (Setiadi, 2018). Vo svete sa rozširuje báza použiteľných materiálov, skracuje sa plánovaná životnosť výrobkov, zavádzajú sa nové technológie, ťažisko nákladov sa presúva k predvýrobným etapám a v dôsledku nasycovania trhu a zostrovania konkurencie vzrastá riziko neúmerných strát v prípade chybného zhodnotenia týchto a ďalších faktorov (Chae, Ha & Seo, 2017). Takáto situácia má za následok, že sa vo svete výrazne presadzuje taký spôsob dizajnerskej práce, ktorý zohľadňuje predovšetkým výrobo-technologické a ekonomické činitele.

2.2 Ekologické aspekty balenia tovaru

V dôsledku globalizácie a industrializácie sa čoraz častejšie stretávame s pojmom odpad. Tento je definovaný ako hnutelná vec, ktorej sa jej držiteľ zbavuje, chce sa jej zbaviť alebo je povinný sa jej zbaviť (Zákon č.79/2015).

V súčasnosti je nevyhnutné riešiť nielen enormné množstvo odpadu, ale aj jeho negatívny dopad na životné prostredie. Príčinou zhoršovania životného prostredia môžu byť: rast ľudskej populácie, rastúce nároky na uspokojovanie ľudských potrieb alebo zvýšenie nárokov na prostredie. O ochranu životného prostredia je rastúci záujem. Významnou úlohou štátu (ale aj samotných ľudí) je chrániť a aktívne dotvárať životné prostredie v súlade so záujmami spoločnosti a potrebami trvalo udržateľného rozvoja.

Trvalo udržateľný rozvoj je definovaný ako rozvoj, ktorý uspokojuje potreby súčasnosti a pritom neohrozuje schopnosť budúcich generácií uspokojovať ich vlastné potreby. Princíp trvalo udržateľného rozvoja spočíva v efektívnom využívaní materiálovo-energetických tokov, vytváraní výrobných recyklácií, predlžovaní životných cyklov výrobkov, na substitúcii

surovinovo a energeticky náročných a zdraviu škodlivých materiálov, procesov a podpore efektívnych nástrojov ako aj technologických postupov.

Spotrebiteľia ochranný a úsporný význam obalov z hľadiska ekológie veľmi nedoceňujú, naproti tomu záťaž životného prostredia často preceňujú. Obalový priemysel, vystavený veľkému tlaku ekologických občianskych iniciatív a svetovej mienky, dospel do reakcie na jednotlivé čiastkové poznatky ku komplexným poznatkom a konkrétnym záverom: k zvažovaniu ekonomických a ekologických aspektov pri hodnotení každého druhu obalu počas celej doby jeho životnosti a hľadaniu kompromisu medzi klasickými funkciami obalu a požiadavkami na prostredie (Rezaei et al., 2019).

Najväčším dôvodom rozširovania spotrebiteľského balenia bolo zavedenie nových foriem distribúcie a najmä samoobslúh (Urblíková & Gajdoš, 2013). Ďalším dôvodom bola zmena životného štýlu, kde sa premietali aj nové poznatky o možnostiach predĺžovania trvanlivosti a hygienické požiadavky. Najväčšiu polemiku vyvolávajú nevratné obaly na tekuté potraviny (plechové, plastové, kartónové), ktoré svojim objemom spôsobili, že sa týmto začala zaoberať aj verejnosť.

Ďalšou oblasťou pôsobenia obalovej techniky na životné prostredie je vlastná výroba obalov. Tu sa obaly hodnotia z hľadiska spotreby energie, pretože jej výroba mimoriadne zaťažuje životné prostredie.

Názory na ekologický dopad jednotlivých druhov obalových materiálov sa často výrazne líšia, pričom nemožno zabudnúť na skutočnosť, že výsledky hodnotenia sú v súčasnosti často využívané aj na reklamné účely a stávajú sa tak účinným argumentom v konkurenčnom boji medzi výrobcami jednotlivých druhov obalového sortimentu.

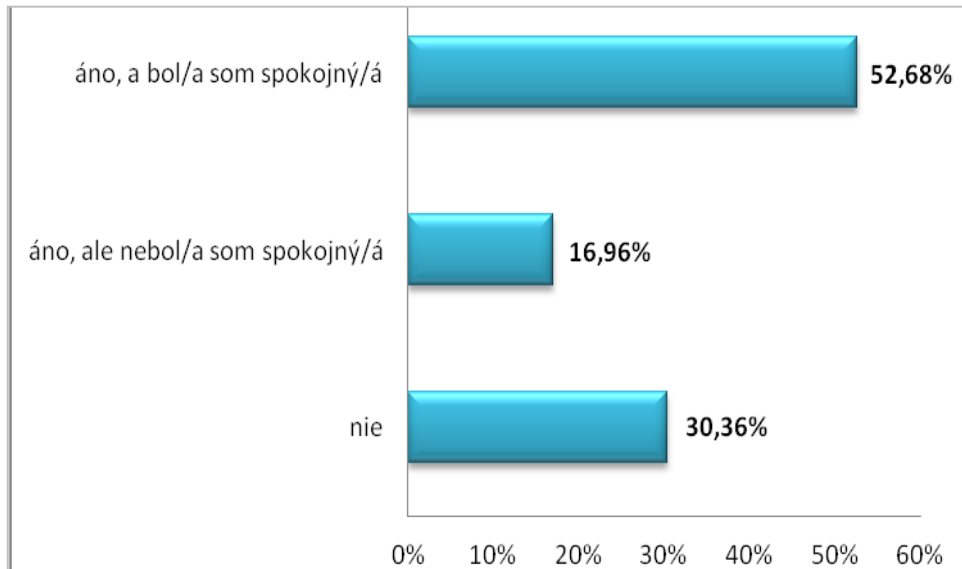
2.3 Vyhodnotenie spotrebiteľského prieskumu

Prieskum sme realizovali s cieľom zistiť postoje a preferencie spotrebiteľov k obalom a obalovým materiálom potravinárskych výrobkov vzhľadom na ich užívateľské a environmentálne aspekty. V príspevku sú uvedené iba čiastkové výsledky a vyhodnotenie iba tej časti prieskumu, ktorá bola zameraná na zisťovanie prístupu spotrebiteľov k dizajnu obalov a možnosti ich recyklácie.

Spotrebiteľského prieskumu sa zúčastnilo 112 respondentov, z toho 73,21% žien (82 respondentov) a 26,79% mužov (30 respondentov). Najväčší počet opýtaných patrilo do vekovej kategórie 18-29 rokov, t.j. 96 respondentov (85,71%). Ďalšiu kategóriu tvorili respondenti s vekom 30-49 rokov (28,93%) a najmenej respondentov bolo vo vekovej kategórii 50 a viac rokov (5,36%).

Ako vyplynulo z výsledkov prieskumu takmer 70% respondentov sa rozhodlo pre kúpu potravinárskych výrobkov len na základe dizajnu obalu, z toho 16,96% (19 respondentov) nebolo spokojných s daným výberom výrobku (Graf 1). Dôvodom nespokojnosti bol nekvalitný výrobok

Graf 1 Percentuálne vyjadrenie kúpy potravinárskych výrobkov na základe dizajnu obalu



Zdroj: Vlastné spracovanie

(kvalitnejší obal ako samotný výrobok), zavádzajúce, prípadne nekompletné informácie, manipulácia s dátumom spotreby, resp. dátumom minimálnej trvanlivosti. 30,36% opýtaných (30 respondentov) sa nikdy nerozhoduje pri kúpe potraviny len na základe dizajnu obalu.

Podľa prieskumu je pre respondentov dôležité (25%), aby obal bol recyklovateľný, a recykláciu vnímajú ako dôležitý proces opätovného zhodnocovania materiálov (Graf 2), ktoré už boli na nejaký účel použité a stal sa z nich odpad. Pre 44,64% opýtaných je síce dôležité, aby bol obal recyklovateľný, ale recykláciu nepovažujú za najefektívnejší spôsob riešenia v odpadovom hospodárstve. Dôvodom je, že pri recyklácii vzniká do určitej miery znečistenie životného prostredia, taktiež sa spotrebováva aj energia a recyklovaný výrobok nie je vždy taký kvalitný ako pôvodný.

Graf 2 Percentuálne vyjadrenie dôležitosti recyklácie obalov



Zdroj: Vlastné spracovanie

Recyklácia použitých obalov je podmienená výskytom obalových prostriedkov z jedného materiálu (Sand, 2019). V prípade racionálne zdôvodneného balenia je potrebné zohľadniť, ktoré z funkčne zodpovedajúcich obalových materiálov sú ekologicky prijateľnejšie. Ide o optimalizáciu obalov, vychádzajúcich zo všetkých jeho funkcií, kde by rozhodujúcim meradlom pri zhodnosti ostatných bola ekologická funkcia.

Záver

Tlak globalizácie a narastajúca konkurencia núti výrobcov neustále zlepšovať kvalitu výrobkov. Avšak výroba kvalitného výrobku s primeranou cenou nie je vždy postačujúca. Úspešní môžu byť len tí výrobcovia, ktorí zvládnu aj efektívnu marketingovú komunikáciu. Využívanie tradičných marketingových nástrojov ako sú reklama, podpora predaja alebo public relations môžu byť pre malé podniky pomerne nákladné. A práve v takýchto prípadoch narastá význam obalu ako efektívneho nástroja marketingovej komunikácie. Kvalitou samotného obalu a informáciami, ktoré poskytuje je obal dôležitým prostriedkom zabezpečenia ochrany spotrebiteľa. Kvalitný obal s originálnym dizajnom charakterizuje vlastnosti produktu, vzbudzuje pozornosť zákazníka a motivuje ho ku kúpe, čo potvrdili aj výsledky prieskumu. Z nich vyplynulo, že väčšinu spotrebiteľov pri kúpe potravín ovplyvňuje dizajn obalu. Na druhej strane, nevhodne zvolený obal môže spôsobovať odmietnutie výrobkov zo strany spotrebiteľov.

K modernej spoločnosti patrí aj zvýšený počet výrobkov, dôsledkom čoho narastá množstvo odpadov. Obaly sa po spotrebovaní alebo použití ich obsahu stávajú tiež odpadom., pričom rastúci objem odpadov má negatívny vplyv na životné prostredie. Na jednej strane životné prostredie je narušované priamo odpadmi samotnými, na druhej strane aj produktmi a emisiami, ktoré vznikajú pri ich zneškodňovaní. Základná otázka, ktorú treba čo najrýchlejšie riešiť, spočíva v znížení produkcie odpadov a v maximalizácii účinnosti recyklácie. Zhodnocovanie obalových odpadov recykláciou však predpokladá efektívne triedenie odpadu.

Záverom možno konštatovať, že výsledky prieskumu potvrdili význam dizajnu obalov ako aj možnosť ich recyklácie pre spotrebiteľov, avšak nepovažujú recykláciu v každom prípade za najefektívnejší spôsob nakladania s obalovým odpadom.

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Strategic design as an integral part of early development of smart wearable devices¹

Michala Lipková²

Abstract

The paper argues for the importance of holistic integration of design as a part of the product development process from the very beginning. The author uses example from the field of smart wearable electronics – use of design in the development of smart wearable camera for Slovak startup company Benjamin button in the years 2014-2017. The described project, in which the author participated as the lead designer and co-founder, serves as an example of complex integration of design as both a tool of formal execution (product design, visual communication, experience and service design) and an agile tool of multidisciplinary product development (design thinking, rapid prototyping, user testing, software development) in the pre-production stage, in this case discontinued after successful crowdfunding campaign. The paper describes the tools, methods and positive effects of strategic design approach, used/achieved during the smart wearable camera product development.

Key words

Integrated Design, Consumer Electronics, Smart Devices, Crowdfunding

JEL Classification: D02, D11, D26

Introduction

The idea of design-driven business strategy is not new. In the introduction to his manifest monograph, founder of frog – today worldwide proclaimed design consultancy - Hartmut Esslinger declares that the same idea has led him to start his consulting company in 1969. He states that design enables companies to invent projects that enhance human interactions and experiences and connect with consumers on an emotional level. Known for developing Apple's "Snow white" design language in 1980s, Esslinger calls design "*the means by which companies can apply creativity strategically to their business purpose*" (Esslinger, 2009).

The term "*strategic design*", frequently used in today's business world, refers to the professional field in which designers use their principles, tools and methods to influence strategic decision-making within an organization (Calabretta, 2016). Design can no longer be understood only as an isolated discipline neither as an end product. Design's aesthetic contribution (in the field of f.e. industrial design or visual communication) is definitely still needed, but the importance of intangible forms of design (experience design, service design) as well as the use and the transition of design methodologies to other disciplines have become equally (if not more) important.

¹ Project VEGA No. 1/0543/18: The Importance of Product Design in Consumer Decision-Making and Perspectives to Increase the Impact of Design on Creating Competitive Position of Companies Operating in the Slovak Republic

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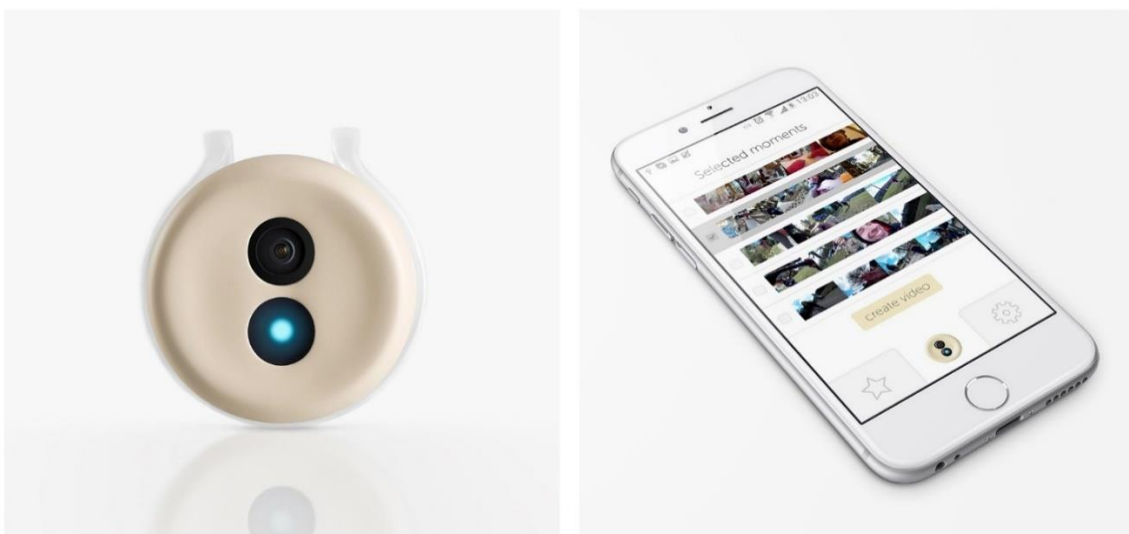
It is no secret that the first company, that started introducing first holistically designed products in the field of electronics, was Esslinger's early client - Apple. Creating synergy of software, hardware and online connectivity proved to be a valid strategy and became a standard of the (at that time only emerging) digital industry. To explain the universal value of this approach more closely, we could describe design as "*disciplined approach to searching, identifying and capturing value*" (Van der Pijl, 2016).

Rather than inviting the designer to the project at the very end to "make the project nice", as it used to be common in the linear product development cycle (prepare – execute), much greater value can be gained from the opposite: the cyclical and iterative approach provides the opportunity to create a products and businesses, that put the customer at the center and integrate design methods, tools and processes with other disciplines.

The concept of smart wearable camera Benjamin button was initiated and developed by Slovak serial entrepreneur Dominik Orfánus. The brand and the name of the project were inspired by short story by American writer F. Scott Fitzgerald. "*The Curious Case of Benjamin Button*" is an unusual story, in which the main character is born with the physical appearance of an 80-year-old man and undergoes a process of reverse aging.

The idea of "disrupting" aging from the short story became a metaphor for key values of the project - the return to the childhood and the authenticity of digital memories. Benjamin Button aimed to create an ecosystem around family memories. The solution consisted of two development parts: hardware (smart wearable camera) and software (intelligent video editing application). The product was supposed to (1) remove the smartphone from the parent – child interaction, allowing the user (the parent or the child) to wear the camera and to (2) avoid the hassle of video post-process. By automatically editing the video and suggesting best moments, the product was supposed to create seamless experience of reliving family moments.

Fig. 1 Benjamin button wearable camera prototype (left) and mobile app mockup (right)
(Design © Michala Lipková)



Source: Author's archive

What started as a standalone project later became official legal entity - limited liability company in Slovakia, supported by foreign investors. Among other partners, the project was accelerated by the German Tech Entrepreneurship Center (Berlin Startup Academy). During the Kickstarter campaign (June – July 2017) the project was supported by 148 backers and raised 208% of the campaign goal (Kickstarter, 2017). The project got awarded in national startup competition Startup Awards SK in 2015 and received substantial media attention internationally.

1 Methodology

There are two questions that currently rise when it comes to complex, innovative product development projects: Which role should a designer play? How can we evaluate the impact of good design? Both questions are impossible to answer universally. Both the role and the impact of design have drastically changed over last 20 years – and it keeps evolving every day.

Many refer to the launch of the first iPhone in 2007 as the turning point of digital design paradigm. Smartphone as the signature artifact of our age and mediator of our everyday (Greenfield, 2017) enabled the whole industry of digital products and services without which some of us can hardly imagine our daily routines and jobs. The digital shift brought new design directions, professions, methods and simultaneously - the need for new skillsets.

In his yearly reflection of design and technology trends, John Maeda suggests metaphor of successful integration of design into an organization, describing it as *“when design receives the Best Supporting Actor/Actress prize”* (Maeda, 2019). He distinguishes between “Classical Design”, “Design Thinking” and “Computational Design”. He sees “Computational Designer” as someone who understands computation, thinks critically about technology, uses all three kinds of design and actively learns AI and “the new”.

Benjamin button project serves as an interesting example from Slovak environment, mainly because of the honest attempt to apply design in strategic way across all parts of product development in a scale that is not usual in local enterprises of this size. Design decisions were successfully included in 3 key areas: (1) positioning of the product, (2) integrated product development and (3) creating trust towards a non-existing product in the pre-production stage.

One of the key aspects of the project was product’s unique market positioning. During the campaign and on the company website, the project promoted the product as “the world’s 1st smart camera for families”. At the time of the early development of the idea, there was no product on the existing market that would offer equivalent features in the niche of baby-friendly electronics.

The idea was competing with products that at the time offered hands free video recording (action video cameras and life logging cameras) or were targeted on parents (baby monitors and family cameras). The design opportunity was rising from the fact, that action video cameras and life logging cameras weren’t suitable for the use case – they were only designed for adults, and they were lacking easy to use software solutions that would enable automatic video editing or private instant sharing with family.

Similarly regular cameras (Canon, Samsung) - even if they were designed for children (Kidizoom), lacked the automation and user-friendly experience, which Benjamin button was

aiming for. The reason for including baby monitors in the research was the fact that this feature was for a long time considered as complementary to the key wearable camera function.

Based on the deep market research and analysis, the team has identified set of values and features that were considered unique among competition. These features were translated not only into the design of the device and software, but as well to the branding and communication strategy.

Fig. 2 Market positioning of Benjamin button camera



Source: Author’s archive

Branding is a good example of this approach: the original working title of the project was “MamaWatch.me”, referring to the original baby monitor idea. Since the market analysis helped to identify a niche, the team decided to continue with the name “Benjamin button”. The philosophy of the brand, represented by the name and the idea of disruption of the ordinary (“reverse aging” of Benjamin in the story) continued to be considered by all following design decisions.

Figure 3 illustrates the evolution of the models and prototypes created and tested during the product development process. The team iteratively used the methods of *rapid prototyping* in order to test the solutions often and early, which enabled altering the solution in favor of

the user. Since the final solution was a complex combination of hardware and software, design served as a necessary communication and testing tool between these two domains, and the project wouldn't be possible without integrated product development approach and co-creation principles.

We have repeatedly mentioned two outputs of the product development: *the hardware* (the wearable smart camera, developed to the stage of working prototype with working automatic video editing software demo) and *the software* (the mobile app, developed to the stage of the minimum viable product). This could evoke the idea that the physical product and the app were in the center of attention if the whole project - but in fact, none of the mentioned was the final destination. The ultimate goal of the project was to create and sell the *seamless customer experience* of capturing, sharing and reliving family memories.

To shape the hardware and the digital product in the way that they provide the desired experience, the team iteratively tested both with the target group, using different methodologies of *human centered design* (focus groups, in-depth interviews, observation, shadowing). Very often, non-designers took part in the testing and experienced the direct contact with the potential future customers. This experience enabled and simplified applying the *complete co-creation* approach, which is defined as a transparent process of value creation in ongoing productive collaboration with, and supported by all relevant parties (in our case marketing, sales, hardware and software development), with end-user playing the central role (Jansen – Pieters, 2017).

Fig. 3 Documentation of the prototypes (left) and testing with children (right)



Source: Author's archive

Photo on the left: (Photo © Michala Lipková)

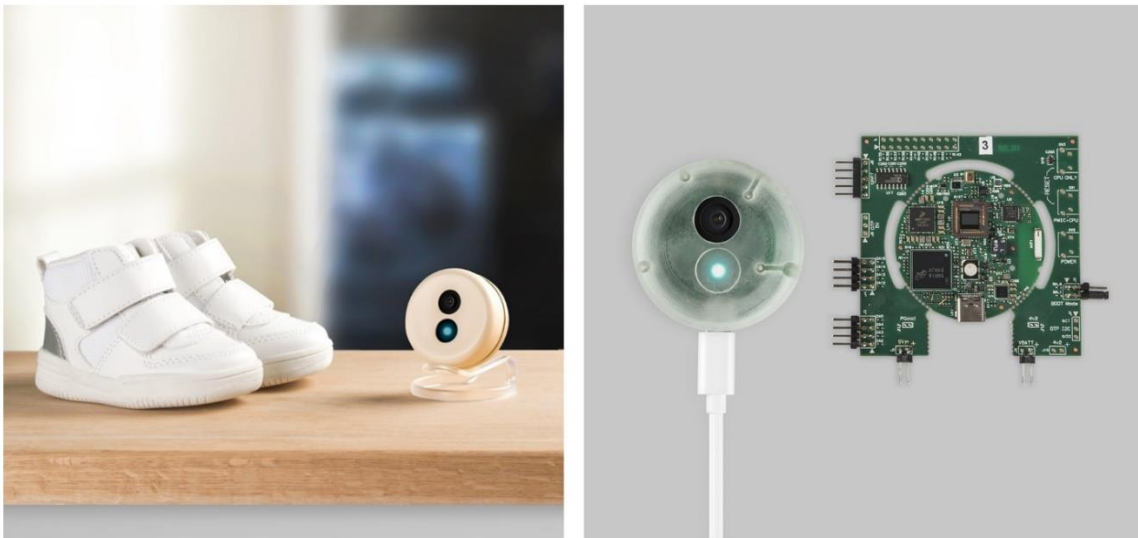
Photo on the right: (Photo © Zuzana Gavulová)

2 Results and Discussion

Most commonly, design is widely associated with the aesthetic and visual qualities that are brought by its authors. The emotional qualities and effects that design brings along were long overlooked. Especially in the context of our digital footprint and AI, designing trust and understanding becomes an important part of brand development. During the focus groups, respondents confirmed that the storytelling and visual communication of the brand, together with the consistency of the design of the product and the software highly contributed to their positive appreciation of this high tech solution.

One of the most challenging and repeatedly occurring issues during customer testing was the correct understanding of all product's features and benefits. Therefore the design of the campaign page became a subject of frequent testing and redesign. The quantitative questionnaire, realized after the Kickstarter campaign was canceled, confirmed that majority of campaign's supporters understood the key features of the device and the software. 78,6% of the respondents considered having free hands when recording as the key feature and 60,7% appreciated time saved by automatic video editing.

Fig. 4 Marketing photos of a model (left) and working prototype (right)



Source: Author's archive (Photo © Michala Lipková)

Conclusion

The solution that the company decided to bring to the market was a complex smart device, which combined software and hardware in a technically challenging way. Despite the successful crowdfunding campaign, considering the financial feasibility of the project, the team canceled all technical development activities and decided to pivot into a different field of the parenting market segment (Zařko, 2017), while keeping the design as the key strategic factor of the product development process.

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The role of design in increasing a company's competitiveness

Smaranda Giușcă – Adina-Gabriela Croitoru – Rodica Pamfilie¹

Abstract

Nowadays, in markets close to saturation, coming up with something new, a product, a service or just a new component or feature, that will secure a position in the consumer's mind and budget often feels like a very difficult task for many companies. And most times, in order to be successful, this product or service must exhibit a novelty factor that can only be obtained through the process of innovation. This paper discusses the design-innovation relationship and its influence in what concerns the success and competitiveness of companies. We analyzed whether the focus on design and innovation is present in the way the top most successful companies are describing themselves online. The research method consisted in searching for key words related to the field of design and innovation on the respective companies' web pages. The results matched our expectations and it consolidated the fact that the top companies by market capitalization are also the top most innovative companies.

Key words

design, innovation, competitiveness

JEL Classification: O30, M19

Introduction

In a globalized economy, a company's degree of competitiveness is the engine for maintaining and developing it, the alternative being only one – for the company to exit the market. It is only so long that a successful product will keep being the consumer's first choice and then, if nothing pushes the product further by improving it or diversifying its appeal, something else, something new from the competition will replace it.

Martin (2009) talks about how difficult it can be for companies to choose to innovate. He argues that there are two paths a company can go on: exploration, the one that includes innovation and expanding, and exploitation, the one that is safe and requires just an analytical approach of the business's already developed competencies. He argues that there are very few companies that can maintain an equilibrium between the two and the answer to that would be design thinking – as it could help the company rely on its strengths and advance on possible opportunities not yet present on the market.

To be the first on the market is a good start, but it is not a guarantee of success, as the CEO of Pentland Brands plc said: "There is intense competition, and anybody can design a decent product. They can't all design outstanding products. So, design is the differentiator." (in Warwick Business School & Design Council, 2014)

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Literature review

Nowadays, innovation is on everyone's business agenda. In the EU, companies reported doing different types of innovation: 27.3% reported organizational-type innovation activities, 23.9% product innovation, 22.8% marketing innovation and 21.6% process innovation (Eurostat, 2017).

Governments worldwide are also aware of the benefits brought on by innovations and, as such, developed programs that support companies in their efforts to become more innovative and more competitive. Two such examples are „Designing Demand“ in the UK (2010) and „Better by Design“ in New Zealand (2010).

When studying the approach towards design of successful global companies, an industry analysis of 12 such companies found that (Warwick Business School and Design Council, 2014):

- design is meant to solve problems and is first and foremost meant for satisfying the customer,
- design is most efficient when it is part of the company culture and all employees are aware of its importance
- design is universal in its value adding character, no matter the industry and the size.

This shows that design is a very powerful and multitasking tool. When design is used together with other business methods in order to innovate, the results can be very beneficial for the companies.

The UK based project Design Value studied 158 companies and came to several conclusions regarding the value of design in innovation. (Cooper et al, 2017) We found the following to be relevant to our paper:

- design was used in three ways within the companies: 1) to directly contribute to the development of innovative products, services and markets; 2) to help in accelerating and diminishing the risk of innovative activities; 3) to support the marketing of products and services and the construction of brands;
- companies that use design as a process or strategy consider it as important as their research and development activities, as both are very important for their competitiveness;
- design skills are ranked among the five most important sources of competitive advantage;
- companies perceived the value of using design based on the feedback from their customers and on the way their innovations are received by the market.

However, we must differentiate between product design and product innovation. Thus, product design is "the choice and configuration of elements, materials and components that give the product particular attributes of performance, appearance, ease of use, method of manufacture, etc." while product innovation is "the application of new concepts, inventions or technologies in the design of the whole product or key components". (Roy & Reidel, 1997) So, the simple use of design process does not equate innovation. Design changes in a product that are similar to routine updates or seasonal changes, meaning that neither the functional

features nor the expected uses of the product are modified significantly, do not turn products into innovative products. (Croitoru, 2019)

The use of design in the innovation process can be turned into a strategy for the companies that want to gain a competitive edge and be ahead of their competitors. (Verganti, 2013) Being more than just a surge in the creativity of the company's actions, design-led innovation surprises the consumer by creating a new need that arises from the existence of the new product or service. A situation like this where demand follows the offer is an example of "technology-push innovation" and is in opposition to the older, more static way of doing business where companies would react to consumer needs and wants in the form of "demand pull innovation" (Di Stefano et al., 2012)

The fact that design can help improve a company's performance on the market is sometimes seen from the very definition of design that often mentions its impact or role in helping companies perform better. In 1973 IBM chief executive, Thomas Watson Jr., said "good design is good business". (IBM, n.a.) Kotler and Rath (1984) considered that "design is the process of seeking to optimize consumer satisfaction and company profitability through the creative use of major design elements (performance, quality, durability, appearance, and cost) in connection with products, environments, information, and corporate identities".

We wish to underline that design has a dual advantageous nature, its use having benefits both for the consumer and the company. While the consumer may be satisfied by the product characteristics, usage or looks, the company's benefit derives from the savings arising from the cheaper manufacturing and the smarter technologies and actions involved in the manufacturing process.

In UK, it was calculated that for every £1 invested in design, a business might achieve as much as £20 in increased revenues, up to £4 increase in net operating profit and a return of £5 in increased exports. (Innovate UK, 2015)

McKinsey & Company tracked the design practices of 300 publicly listed companies over a five-year period in multiple countries and industries (medical technology, consumer goods, and retail banking) and came up with the McKinsey Design Index (MDI). Their analysis uncovered a strong correlation between high MDI scores and superior business performance: top-quartile MDI scorers increased their revenues by 32% and total returns to shareholders by 56% as compared to their industry counterparts over a five-year period. (Sheppard, et al., 2018)

Using design as a positioning and differentiating tool has been proven to have a positive influence on the marketing mix. Lawless and Fisher defined a framework with seven strategic components that influence decisions regarding competitive advantages: product shape, product function, intangible product elements, price, promotion, distribution, company characteristics. (Lawless and Fisher, 1990) We argue that each of these works with a certain component of the design process and each of them has the capacity to influence consumers' perceptions of the product.

1 Methodology

In 2003, a comparative study using data from the World Economic Forum's "Global Competitiveness Report 2002-2003" created a "Design Index" that took into consideration five

aspects: extent of branding; capacity for innovation; uniqueness of product designs; production process sophistication; and extent of marketing. (Gertler & Vinodrai, 2006) The study found a strong positive correlation between national hierarchies regarding the use of design and their overall level of competitiveness among 75 countries. When looking at the top 25 countries in the “Global Competitiveness Report 2002-2003” the study also found that those countries were also the highest ranking in the newly created Design Index.

If design and innovation work better when applied at all levels of the organization, from top-management to low-level employees, (Martin, 2009) we feel that this should also mean that design and innovation is something so important for those companies that they must include them in the way they portray their activities towards their customers from the very beginning of their interactions. Thus, the point of this analysis is to see whether the companies that are the most successful, as measured by their market capitalization, emphasize and communicate their focus on design or innovation on their web page. The companies included in this analysis are the top 15 companies by market capitalization in the year 2018 as resulted from the Pricewaterhouse Coopers’ “Global Top 100 Companies 2018 Report”.

The methodology consisted in searching for key words related to the field of design and innovation (“design”, “designed”, “designer” and “innovation”, “innovated”, “innovative”, “innovator”) on the respective companies’ web pages (in the About us section or similar) (Table 1).

Tab. 1 Key words related to design and innovation on the web pages of the top 10 companies by market capitalization

Rank	PwC Top companies by market capitalization	Quote about “design”	Quote about “innovation”
1	Apple	When products are designed to be accessible, more people can do what they love.	Truly innovative products leave their mark on the world instead of the planet.
2	Alphabet	no	Google itself is also making all sorts of new products, and I know Sundar will always be focused on innovation—continuing to stretch boundaries.
3	Microsoft	no	We believe technology can and should be a force for good and that meaningful innovation can and will contribute to a brighter world in big and small ways.
4	Amazon.com	Design to surprise and delight. Rethinking the role of sustainable packaging for online fulfillment.	Inventing for customers is in our DNA. Take a look at some of the innovations pioneered by Amazon.

Rank	PwC Top companies by market capitalization	Quote about “design”	Quote about “innovation”
5	Tencent	no	We invest heavily in talent and technological innovation, actively participating in the development of the Internet industry.
6	Berkshire Hathaway	no	no
7	Alibaba	no	Our success and rapid growth is built on the spirit of entrepreneurship, innovation, and an unwavering focus on meeting the needs of our customers
8	Facebook	Designing the Facebook Company Brand. A new brand system designed for clarity, inspired by people.	no
9	JPMorgan Chase	no	Innovate, test and learn – we know some ideas will fail, and that’s okay
10	Johnson & Johnson	There are few places where designers can truly have an impact on the world. This is one of them.	“I Have a Vision for Helping Advance Healthcare”: Meet 6 Leaders Working on Inspiring Innovations in 2020

Source: authors using “Top 10 companies by market capitalization” from Pricewaterhouse Coopers, 2018

2 Results and Discussion

As expected most companies do indeed underline the use of design and innovation in their main online statements. In them, associations with some other ideas or business trends can be analyzed, allowing for the following benefits of using design and innovation to be observed:

- *Consumer orientated advantages:* Design makes user-friendly products. Facebook underlines the improvements design can make in the interactions with users, Alibaba puts the consumer’s interest first, Amazon wants to “surprise and delight” and Apple makes products that are meant to be accessible for more people
- *Promoting sustainable development and ecology:* The way design and innovation are used by companies is appealing to the modern, Eco-conscious consumer. Johnson & Johnson views design as a tool to make products more Earth friendly, Apple sees innovation as a way to protect the planet, Microsoft uses innovation to “make the world better”, Amazon is making its packaging sustainable

- *Purely competitive advantages:* Innovating is the way to being one step ahead of the competition. JPMorgan Chase is aware of the risks involved in committing to innovations, Johnson & Johnson is promoting its innovations as “visionary”, Alphabet talks about stretching boundaries, Tencent sees its own innovations as “developing the Internet industry”.

While the latter category is the one that is most obviously about increasing the competitiveness of the company the first three categories of actions (financial, consumer orientated, sustainability promoting) are also part of what makes a company more successful.

We confront the companies included in our analysis with the list of the top 10 most innovative companies as resulted from a Boston Consulting Group analysis (Table 2).

Tab. 2 Top companies by market capitalization compared to most innovative companies

Rank	PwC Top companies by market	The Most Innovative Companies
1	Apple	Alphabet/Google
2	Alphabet	Amazon.com
3	Microsoft	Apple
4	Amazon.com	Microsoft
5	Tencent	Samsung Electronics
6	Berkshire Hathaway	Netflix
7	Alibaba	IBM
8	Facebook	Facebook
9	JPMorgan Chase	Tesla
10	Johnson & Johnson	Adidas

Source: Pricewaterhouse Coopers, 2018, Boston Consulting Group, 2019

As a confirmation of the value of design and innovation, companies that were the top 4 on the market capitalization list are indeed the top 4 most innovative companies, with places among them changing quarterly due to market adjustments and development. Facebook is also present on both lists and we note that, although not visible in table 2, Johnson & Johnson is also in the top most innovative companies on the 14th place.

Further research could look at the size of the companies’ R&D costs and correlate them with the above rankings.

Conclusion

Our paper reviewed the way design is seen as an important way to improve performance both at a macroeconomic and microeconomic level. Some companies already report that design is a key element for business success (67% of the exporters included in a New Zealand study by Gertler & Vinodrai, 2006) and even more are hopeful that it will add value to the business (80% of the companies).

Provided that governments will continue to develop programs that promote innovation through design, the benefits that design rich products and services bring to all of us will be present in everyday life.

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Protected Bulgarian Traditional Foods

Sabka Pashova¹

Abstract

The development of food science and technology in modern conditions is the reason for the wide variety of foods. Traditional Bulgarian foods have specific composition and properties for the area in which they are grown or produced. The purpose of this study is to present the achievements in this area (scientific publications and the existing legal framework) and to highlight the specific terms associated with the term “traditional” as well as to present the protected traditional Bulgarian meat products, their origin and properties. In order to achieve the research aim are studied and systematically analyzed scientific publications and the existing legal framework in the area. The protected traditional Bulgarian foods are subject to review in this research. In order to achieve the research aim are studied and systematically analyzed scientific publications and the existing legal framework in the area. It was found as a result of the study that the registered Bulgarian products are 8. Bulgaria has successfully registered as: Protected Geographical Indication two products - Gornoorjahovski Sudzhuk and Bulgarian Rose Oil; Traditional-Specialty Foods five meat products - “Fille Elena”, “Lukanka Panagurska”, “Rolle Trapesitsa”, “Kaizerovan Trakia neck” and “Cattle Pastarma”; Protected Designation Origin - one product Strandzhanski manov med (honey)/Manov med (honey)of Strandzha.

Key words

protected foods, traditional Bulgarian foods, properties

JEL Classification: L66, Q18

Introduction

The production of traditional Bulgarian foods dates back to ancient times, and has consistently evolved, expanded and enriched over the years. The traditions of the production of foods in the neighboring Balkan countries have been influenced the native producers.

In order to preserve our country-specific foods it is necessary to protect them. There is a specific procedure for entering a food as a protected designation and a protected geographical indication product in the European Commission's register. The protection of registered names includes prohibiting the misuse or imitation, translation or escort of the protected designation with expressions such as “style”, “type”, “method”, etc., as any other practice that could mislead the consumer as to the true origin of product is also subject to sanctions (Hristov, 2017). Foods of plant or animal origin have a specific composition that determines their properties and uses as intended (Ribarova, 2007, Danesi et al., 2013).

There are three European quality schemes: *a protected designation of origin* (all processes - production, processing, packaging - occur in the same region); *protected geographical indication* (one of the processes is carried out in the specified region); *traditionally-specific food* (protection of prescription and production for at least 30 years, it is

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linked to a tradition rather than to a geographic region). These are mechanisms to protect region-specific products or country-specific products, to bring added value to producers and to the regions. The registration is a way of accessing the market, providing additional employment for people and leading to the preservation of traditions (Hristov, 2017).

Walch et al. (2019) found in their research that the consumers preferred and believed that traditional foods were healthier than store-bought foods. Traditional food intake was low. That's why it is necessary to examine and to consider the effect of enhancing social networks and implementing policies that support traditional food intake.

The production of traditional-specific foods is subject to strict rules. The first is that they can only be produced by companies that are members of a specially created association. The second requirement is strict compliance with the formulation, technology and manufacturing conditions described in the relevant documentation requesting protection in Brussels.

The purpose of this study is to present the achievements in this area (scientific publications and the existing legal framework) and to highlight the specific terms associated with the term "traditional" as well as to present the protected traditional Bulgarian meat products, their origin and properties.

1 Methodology

The protected traditional Bulgarian foods are subject to review in this research. In order to achieve the research aim are studied and systematically analyzed scientific publications and the existing legal framework in the area.

2 Results and Discussion

2.1 Terms and definitions related to traditional food

Traditional raw materials: Traditional raw materials are the raw materials used in the past and presently alone or combined as components of identified geographical origin that have properties and composition that meet the requirements of the European Union (Alliance) and the national legislation (Ribarova, 2007). The ingredients in their composition must meet the requirements of quality, safety (chemical, microbiological and physical) and comply with the hygienic rates and rules of processing and production (Boyadzhiev, Markova, 1987).

Traditional recipe: The uniqueness of the traditional recipe is in the detailed description of the ingredients and the way they are processed, arranged in order of their use and passed down from generation to generation over the years (Ribarova et. al., 2005).

Method of production: The production and/or processing of products must fully correspond to those used in the past, without the inclusion of modern processing techniques. Legislation on traditional foods is dynamic, but needs to be adapted with appropriate modifications and additions, specific to the particular species. The preservation of national traditional plant species aims to protect them from imitations and this necessitates the creation of a system of registration at national and Union level (Hristov, 2017).

Traditional specific foods: There are the following three regulated categories of foods of a specific nature: Protected Designation of Origin (PDO); Protected Geographical Indications (PGI); Traditional Specialties Guaranteed (TSG) (Ribarova et. al., 2005, Irechek, 1974, Hristov, 2017). All of them are mechanisms to protect specific products for each region or country. A better interpretation and clarification of the terminology presented in line with the current regulatory framework is needed. In the European Commission's Traditional Food Register, very few products are classified under the name of TSG, and most of the food is registered under the PGI and PDO brand (Ribarova, 2007, Hristov, 2017).

Labeling rules make it easier for consumers to identify quality food produced by a particular technology. A comprehensive Quality Policy - Protected Designations including Protected Designations of Origin, Protected Geographical Indications and Traditional Specific Foods has been developed in the EU. EU quality policy aims at protecting the names of specific products to promote their unique characteristics, linked to their geographical origin as well as traditional know-how. Product names can be granted with a “geographical indication” (GI) if they have a specific link to the place where they are made. The GI recognition enables consumers to trust and distinguish quality products while also helping producers to market their products better. Other EU quality schemes emphasise the traditional production process or products made in difficult natural areas such as mountains or islands (European Commission, 2019). They are important tools that protect the names of regional foods, such as wines, cheeses, hams, sausages and olives, so that only foods that genuinely originate in a particular region are allowed to be identified as such (Guardia, Illueca, 2013, Pashova, 2019).

Fig. 1 Special EU logos, designations of the quality scheme



Source: COMMISSION IMPLEMENTING REGULATION (EU) No 668/2014 of 13 June 2014 laying down rules for the implementation of Regulation (EU) No 1151/2012 of the European Parliament and of the Council on agricultural product quality schemes. Published L OB. No. 179 of 19 June 2014.;

https://www.google.com/search?q=Special+EU+logos,+designations+of+the+quality+scheme&client=opera&hs=fpG&source=Inms&tbm=isch&sa=X&ved=0ahUKEwiS972owdLIAhW7QUEAHWT8CYMQ_AUIESgB&biw=1195&bih=590#imgsrc=09KTZQugOdNzxM

A special EU logos (Fig. 1) are used and printed to the packages of products of a given geographical origin: Protected Designation of Origin (PDO), Protected Geographical Indication (PGI), and those prepared or produced by traditional way: food with Traditional Specialty Guaranteed (TSG). Traditional Specific Food (TSG) describes a specific food that: (a) results from a method of production, processing or composition that conforms to traditional practice for that product or foodstuff, or (b) is manufactured from raw materials or ingredients which are traditionally used for it. Traditional specific foods have no connection with the geographical area. "Traditional" means proven use in the domestic market for a period that allows transmission from generation to generation. This period is at least 30 years. 'Specificity'

means the characteristic features of production which clearly distinguish that product from other similar products of the same category.

The optional quality term "*mountain product*" is used only to describe the products intended for human consumption listed in Annex I to the Treaty on the Functioning of the European Union (TFEU) for which: (a) both raw materials and feed for farmed animals originate mainly from mountain areas; (b) in the case of processed products, processing is also carried out in mountain areas. The horticultural product may be of animal origin, vegetable origin or beekeeping product. The EU Organic Farming logo can be placed on all pre-packaged organic food products produced in the EU, ensuring that they comply with EU organic production standards.

At the end of 2017, 1402 products were registered in the EU, such as PDO, PGI or TSG. It is found that the southern countries in the European Union (EC) produce the greatest number of products, certified at the Food European register as a quality products. Of these, Italy, France, Spain, Portugal and Greece account for 70% of these products. First place in the Union, in spite of the registered number of products took Italy - a total of 293, but only about 52 for local cheese, and 110 - for fruits and vegetables. After that is France with 242 certificates, Spain with 194, Portugal with 138 and Greece with 104 (Fig. 2).

Fig. 2 The top 5 countries at EU according to the registered number of products



Source: Euractiv, <https://money.bg/euromoney/ot-1402-zashtiteni-produkti-v-evropa-samo-7-sa-balgarski-koi-sa-te.html>

The registered Bulgarian products are 8. “Fille Elena”, “Lukanka Panagurska”, “Rolle Trapesitsa”, “Kaizerovan crop Trakia”, “Cattle Pastarma”, “Sudjuk Gornoorjahovski” are registered as a food with Traditional Specialty Guaranteed (TSG). Another Bulgarian protected product are the Bulgarian rose oil and the Strandzhanski manov med/Manov med of Strandzha. The Bulgarian rose oil had an EU logo for the PGI from the summer of 2014 and the Strandzhanski manov med had an EU logo for the PDO from the spring of 2019 (Stojcheva, 2017, DOOR database).

The European protection procedure is free of charge, but it takes about two years and can only be started by a producer association. The initiators apply first to the Bulgarian Ministry of Agriculture, enclosing relevant documents regarding the product's relationship with the region or evidence of traditional food composition or technology of its production. Following are inspections by experts from the Ministry of Agriculture and a deadline for objections by interested persons in the country. The request shall then be sent to the European Commission, published in the Official Journal of the Community and shall be given the opportunity of each Country Member to object. After six months, if no objection is raised, the product is entered in the relevant European register (Georgieva, 2018).

2.2 Protected Bulgarian meat traditional food

The protected traditional Bulgarian food, registered at the EU, such as TSG are some products from meat, such as “Fille Elena”, “Lukanka Panagyurska”, “Rolle Trapesitsa”, “Kaizerovan crop Trakia”, “Cattle Pastarma” and “Sudjuk Gornoorjahovski”. Some details connected with the region of their origin and technology of production are discussed and present below.

“Fille Elena”. Fille Elena is a specific raw-dried delicacy that comes from chilled pork (fish or bonfile)It is typical of the area of the town of Elena. The origin of the name comes from the town of Elena (a town at the foot of the Elena Balkan), and not by accident, since there are traditions in the production of this delicacy throughout the region. The name is specific in itself, and the geographical region has a significant impact on the properties and quality of the product (Fille Elena and Panagyurska Lukanka Become EU Trademarks, 2014).

The production technology is specific for the product and the region, and the properties of the finished product have a significant influence on the salting, drying and pressing. The separated fillets are cleaned of fat and placed in salting pans (dry salting method applies). The salted pieces are stored in refrigerated chambers with an air temperature of 0 to 4°C. After 5 days the pieces are rearranged (the places of the upper ones are replaced with the lower pieces) and a minimum of 5 more days are left under the same conditions. After the salting process is complete, a twine clip is placed on each fillet. The fillets thus prepared are hung (not allowed to touch each other). They are drained for up to 24 hours at an air temperature not exceeding 12°C. The drained fillets are placed in natural or air-conditioned dryers. The drying is carried out at an air temperature not higher than 17°C and a relative humidity of 70-85%. During drying the product is pressed with wooden boards. The fillet is pressed for 12-24 hours. On the first press the fillets are placed when the pieces are slightly dried and when a slight dry cover appear on the surface. The pressing is done several times until the product is well dried and the pieces are shaped properly. The presses also have to absorb the separated moisture, that`s why they are made of natural material - wood that can be repaired and dried. Pressing forms the final appearance of the product. After the last pressing, the fillets are rolled with a pre-homogenized mixture of ground black pepper and chubritsa (*Satureja*), according to the recipe. The drying process lasts at least 25 days, depending on the size of the pieces, until a firm, elastic texture characteristic of the product is reached. Fille Elena has a specific oval-cylindrical flattened elongated shape, without defined size (Official Journal of the European Union, C 70/6, 2014).

“Lukanka Panagyurska”. The name “Lukanka Panagyurska” is specific and comes etymologically from the name of the place where the product was first produced - the town of Panagyurishte. The product is a pressed raw-dried meat product of crushed fresh beef (which can be replaced with fresh buffalo) and fresh pork, auxiliary materials and natural spices filled in natural or artificial casings with diameter of 50 mm. Characteristic of the product is the moderate-salty taste with a pronounced aroma of spices. The surface of the product has a specific dry white coating of “*white noble mold*”, which is an indicator of properly matured technological processes of ripening and drying. The sliced surface of the product is brown-red to red in color, due to the combination of beef (or buffalo) and pork

meat, unlike the pink-red color of other similar products (Fille Elena and Panagyurska Lukanka Become EU Trademarks, 2014).

The production of "Lukanka Panagyurska" includes the following steps: cutting meat, grinding (during grinding must be added all spices and salting materials in quantities according to the recipe - salt, potassium or sodium nitrate, sugar, ascorbic acid, spices - black or white pepper natural, cumin natural, and starter cultures/yeasts) The obtained filling mass is machine-filled in thick beef gut (bovine chow), blind sheep gut or in artificial casings that are double-tied with twine or clipped. The product is suspended, dried and drain (for 2-3 days in an air temperature of 8 to 24°C and relative air humidity 65-90%). It was then air-dried in an air temperature of 12-17°C and a relative humidity of 70-85%. During drying and ripening, 2 to 3 presses are made. The duration of the presses is 12-24 hours. For the first pressing, the products are applied after it is found that the bottom edge and the surface are well dried and the pieces of bacon are slightly protruding under the sheath. As a result of mechanical pressure, the temperature of the product slightly increases, which, by condensing the moisture on the surface, creates the possibility of surface coating with white noble mold (Official Journal of the EU, C 89/57, 28.03.2014).

"Trapesitsa Role". The Trapesitsa Role originates etymologically on behalf of the historic Trapesitsa Hill in the old capital city of the Bulgarian Boyars of Veliko Tarnovo. The name is specific in its own right, because it is used and known on the territory of Bulgaria and has a long history and reputation. Under this name, the product is manufactured and is popular throughout the country up to this day. It is a specific meat product for Bulgaria, which has been produced in Bulgaria using traditional technology for more than 30 years. Trapesitsa Role is a pressed raw-dried meat product made from chilled pork and a mixture of salt and natural spices - black pepper, white pepper and garlic filled in natural gut or collagen and placed in a net, and shaped with a bandage of pack-thread (The Trapesitsa Role is protected as a typical BG product).

The product is made from pork fillet or pork neck. The formed pieces are placed in salting pots and then stacked tightly in maturing containers in a refrigerating facility with an air temperature of 0 to 4°C. After 4-5 days, they are rearranged (the places of the upper ones are replaced with the lower pieces) and in total stay at least 10-12 days under the same conditions until complete the salting process. After completion of the salting process, the meat is put in a cover, wrapped into a net, hung and drains for up to 24 hours at an air temperature not exceeding 12°C. After draining the products comes the drying at air temperature of 12-17°C and a relative humidity of 70-85%. The drying is continued from 3 to 5 days, after which the "Role" is pressed for 12-24 hours. On the first press, the Trapesitsa Role is placed when the pieces are slightly dried and when there is a slight dry cover on the surface. The individual pieces must be sorted by thickness before being pressed. Usually 2-3 presses are made. The drying process continues until a tightly elastic texture is achieved (The Trapesitsa Role – a food with a traditional specialty guaranteed (TSG)).

"Thracian Kaiser Neck". The product is a raw-dried delicacy made from non-shredded meat. It is prepared from fresh meat (pork neck), pressed several times during drying and smeared with a Kaiser mixture of natural spices and white wine. Fresh, well-ripened pork is

used for the production of this product. The shaped pork meat pieces are arranged in suitable salting vessels and are stacked tightly in the maturing vessels in refrigeration facilities at a temperature of 0 to 4°C. After 3-4 days, they are rearranged (the places of the upper ones are replaced by the lower pieces) and a minimum of 10 days remain under this conditions. A pick is placed on each salted piece of meat, they are suspended, and the pieces are not allowed to touch each other. They are drained for up to 24 hours at an air temperature not exceeding 12°C and then placed in natural or air-conditioned drying chambers. The drying is carried out at an air temperature of 12-17°C and a relative humidity of 70-85%. During drying and ripening, several pressings are performed. The compression time is 12-24 hours. The meat pieces are put on the first press when they are slightly dried and when there is on the surface a slight cover. The individual pieces must be sorted by thickness before being pressed. In general, the drying process continues until a tightly elastic consistency and water content reached not more than 40% of the total mass. After the last pressing, the pieces are smeared with a Kaiser mixture of spices, cymene, water and white wine according to the recipe. After that the mixture on the surface smoothed out to form a layer of 2-3 mm thickness and hung for drying. The drying process continues until the Kaiser mixture dries well and forms a crust (The EC registers Thracian Kaiser Neck as a product with a specific character - TSG).

"Beef Pastarma". Beef Pastarma is a raw-dried delicacy with the taste and aroma of ripe beef, with no side taste. It is a pressed meat product made from non-shredded fresh beef and auxiliary materials.

The traditional method of production of the product involves the processes of salting, maturing and drying, during which complex microbiological, physicochemical and biochemical processes in the meat raw material take place. These processes are the main reason for formation of good structure, pleasant aroma and taste of the product. The formed pieces of meat are salted with salt or salting mixture according to the recipe and stacked tightly in suitable maturing vessels. They are left in a refrigerated room with an air temperature of 0 to 4°C. After 3-4 days, they are rearranged (changing the places of the upper pieces with the lower pieces of meat) to salt evenly and stay for another 3-6 days under the same conditions. After salting, the product is immersed in clean cold water until it has a pleasantly salty taste. After completion of this process the pastarma is hung for draining for up to 24 hours at an air temperature not exceeding 12°C, and then placed in natural or air-conditioned drying chambers. The drying is carried out at an air temperature of 12-17°C and a relative humidity of 70-85%. During the drying, a complex physicochemical, biochemical and microbiological processes take place and from the raw meat is obtained a ready-to-eat product. During drying, the product is pressed several times in order to obtain a denser texture and a smoother surface. The individual pieces must be sorted by thickness before being pressed. The meat is placed on the first press when the pieces are slightly dried and when on the surface there is a slight dry cover. Usually 2-3 pressings are made, the first is after 3-4 days of draining. The process continued 12-24 hours. The drying process lasts for 25-30 days depending on the size of the pieces until a tightly elastic consistency of the product (Beef Pastarma Application Specification, 2015).

"Gornooryakhovski sudzhuk". Gornooryakhovski sudzhuk is a pressed, durable, crude dried product made from high quality beef meat (characterized by a high glycogen content,

when it broke down the product become juicy, have a characteristic taste and is colored from red to brown), filled in a natural shell. The spicy taste of Gornooryahovski sudzhuk is due to the traditional combination of herbs: black pepper, caraway and chubritsa, dosed according to a recipe that has remained unchanged over the time.

The traditions of product manufacturing date back to the 19th century, but the essential influence have the relatively constant climatic conditions and weak air currents in the area of Gorna Oryahovitsa, the propagation of a specific combination of noble molds (*Penicillium* and *Aspergillus*) on the surface of the product and the entrepreneurial nature of the local people to preserve the meat through salting, ripening and subsequent drying are a prerequisite for the emergence and development of the production of the product Gornooryahovski sudzhuk. After filling the intestines, the products are formed manually by special turning the intestine and compacting the filling mass by tightening with a twine. Of particular importance to the specific properties of the product is the ripening process which results in the meat mass maturing, becoming more tender, juicy and the products acquire a characteristic density, taste and color. The transformation of the color of the product to red-brown, the swelling and thickening of the meat mass and the specific odor indicate that the anaerobic processes must be discontinued in order to prevent the formation of substances that make the product unfit for consumption. With relatively constant drying conditions (temperature 15-18°C and humidity of about 75%), a noble mold develops in the premises, which prevents grease of the fats and forming a gray ring, contributes to even drying of the products and enhances the aroma of herbs. The compression of the pieces is of particular importance in order not to crack the intestines and at the same time to give the characteristic horseshoe shape and equal thickness of the pieces, by uniform distribution of weight and gradual tension of the press. The products become infected with mold from wooden boards during pressing, spores are spread in rooms by weak air currents, and their micelles covered the entire surface of the Sudzhuks. The characteristic climatic conditions (dry, cold air and low air currents) in the production area during the period from September to May and the specific microflora are a prerequisite for confirming the drying conditions in the production of Gornooryahovski sudzhuk. These conditions are achieved year-round through the use of ventilation systems that regulate and maintain constant values of temperature and humidity (Official Journal of the EU, C 75/9, 14.03.2014).

So far, Bulgaria has successfully registered as: Protected Geographical Indication only two products - Gornooryahovski Sudzhuk and Bulgarian Rose Oil. This signifies that the Sudzhuk can be produced only on the territory of the town Gopna Orjahovitsa and the Rose Oil can be produced only on the territory of Rose Valley, near the town of Kazanluk.; Traditional Specialty Guaranteed Foods are registered "Fille Elena", "Lukanka Panagurska", "Rolle Trapesitsa", "Kaizerovan Trakia neck", "Cattle Pastarma".; Protected Designation Origin only one product Strandzhanski manov med (honey)/Manov med (honey) of Strandzha. In the national procedure for registration as a traditional-specialty food are "Trojan Lukanka" and "Eastern Balkan Pig Meat", which apply for a protected designation of origin (PDO).

Due to the specificity of these foods, they are produced in smaller enterprises, in smaller quantities, using typical technologies. Therefore, it is difficult and impossible to be present in large quantities on foreign markets. But these foods can be used to promote the region and

the state, to attract tourists and to bring local communities closer. A major advantage for producer companies is the higher cost of the product as well as the opportunity to participate in EU-funded promotional programs.

Conclusion

According to changes in the Law on Trademarks and Geographical Indications, the protection of Bulgarian food at the national level will be abolished, and the products must apply for entry in the European Database of Origin and Registration (Registers of protected designations of origin, Protected geographical indication or Traditional specialty guaranteed). The procedure is too long, takes 2 years and there is a risk that the food will remain "defenseless" between missing the local registration and receiving the European one.

The problem with the abolition of national protection has been present in Bulgaria since the beginning of 2007. This is a commitment made in the EU Accession Treaty. From January 1st, 2007 to January 1st, 2008, there was a transitional period during which the Bulgarian legislation had to be aligned with the European regulation. Under Regulation No 1151/2012 on agricultural and food quality schemes, EU Member States are not allowed to grant national protection for geographical indications of agricultural products and foodstuffs. The EC noted that applications from manufacturers of the concerned products should be submitted periodically under Regulation 1151/2012.

For consumers, protection of traditional Bulgarian foods means that traditional-specific foods are of good quality, with no additives and no authorized ingredients. This is guaranteed by the strict rules under which they are produced. *The first of these* states is that they can only be produced by companies that are members of a specially formed association that exercises internal control over manufacturers. *The second requirement* is strict adherence to the recipe, technology and manufacturing conditions described in the relevant documentation, with which is requesting protection in Brussels. Registration requires all companies to work according to established traditional methods, with the same recipes and with the same technological parameters. The primary control over whether companies comply with this is delegated to external certified organizations. In addition, producers of traditional foods in Bulgaria are subject to control by the Bulgarian Food Safety Agency.

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Sustainable design in textile and apparel industries as an element of enterprise competitiveness versus sustainable consumption¹

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Abstract

The decisions being made during the design stage are very important in enterprise competitiveness. They determine the company's future profits and development. They influence also the subsequent phases of a product life cycle, including those that determine consumer behaviour. One of the main obligations of contemporary companies is sustainable development, based on sustainable design, taking into account the environmental and social aspects of a product. The purpose of the article is to present examples of good practices regarding the sustainable design of textile and clothing products and to present the research results on Polish consumers attitudes to the sustainable consumption of these products, including their purchasing preferences and habits, as well as attitudes toward disposal manners of non-use products. The investigations on the Polish consumers' behaviours showed that they are characterized by rather a rational approach to clothing purchases, however, there is a need to increase consumers' knowledge and awareness about sustainable consumption, especially regarding raw materials choosing and disposal manners of non-used products.

Keywords

sustainable design, sustainable consumption, consumers' behaviour, apparel industry, textiles

JEL Classification: M11, L67, Q56

Introduction

The textile and apparel industries are characterized by high dynamics of development. Cultural and social transformations, as well as the continuous progress in manufacturing technologies, contribute many changes, both in consumers' behaviour on the marketplace as well as in manufacturers attitude to the design, production and distribution of clothing. These changes affected the increase in sales of these products, which was especially noticed in the 1980s and 1990s when the new business model, known as fast fashion, started to develop. In this model, the life cycle of a clothing product has been radically shortened. This can be seen above all in stores that can introduce new collections several times or even several times during the year and completely change the range. This means that the time between product design and its launch is shortened to a few weeks (Linden, 2016; Bick, Halsey, Ekenga, 2018) or even to one or two weeks, which in the fashion world is already called as ultrafast fashion (Kowalski, 2019). The upward trend in clothes consumption continues. Quoting S. Lu (2018), after Marketline, the value of the global apparel retail market, in 2017 totalled USD 1,414.1 billion (52.6% women's wear, 31.3% men wear and 16.1% children wear), and it is forecast to reach USD 1,834 billion in value in 2022, which means about 30% increase in only 5 years. It is

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worth noting that the fast fashion model has contributed to the increase in the number of low-quality products that are quickly destroyed during use and maintenance. What is worse, low price and lower quality mean that the value of clothing in the consumers' eyes is decreasing and getting rid of such clothing becomes easier for them (Butler, 2018). The result of that is a huge increase in textile wastes (by about 60% between 2015 and 2030, i.e. with 57 million tons of waste annually) that cause a big global problem (*Pulse of the Fashion Industry*, 2017).

The response for fast fashion is slow fashion model, initiated by Kate Fletcher from the Centre for Sustainable Fashion. Following the phenomena of the slow food initiative, she noticed the need to "slow down" also in the apparel industry (Hill, 2018). This idea takes into account the resources and processes necessary for the production of clothing and also respects the principles of sustainable development. A characteristic concept of this trend is sustainable design, which has become one of the main responsibilities of clothing companies at the stage of planning a new product, and sustainable consumption, which is a huge challenge for the modern consumer.

Taking into account this developing trend, the purpose of this article was to present examples of good practices regarding the sustainable design of textile and clothing products and to explore the Polish consumers' behaviours, considering their attitude to the sustainable consumption, in order to indicate directions for the sustainable design.

Preferred fibres and eco-certification as important trends in sustainable design

Decision being made during design stage, as for example choice of raw materials, through the use of environmentally friendly fibres, local high-quality raw materials or certified materials influence all the subsequent phases of a clothing life cycle, including those that determine consumer behaviour in relation to these products, such as purchasing decisions, maintenance or disposal methods.

As follows from the report published by The Fibre Year Report (2017), textile and apparel products are made primarily of synthetic fibres (64% - 68%), which significantly contribute environmental degradation due to large CO₂ emissions in manufacturing processes and a relatively high-water use. Cotton - the second raw material, in respect to production volume with estimated 22-24% market share, has also an adverse environmental impact (*Preferred Fiber & Materials... 2017*), wherein the overwhelming bulk of cotton comes from so called conventional cotton crops, i.e. cotton crops grown with the assistance of significant amounts of pesticides and herbicides that are harmful to humans and the environment.

This problem is increasingly recognized by textile and clothing companies, which declare to increase the use of certificated materials made following criteria defined by various standards, mainly Oeko-Tex Standard 100, which is the most popular eco-label for textiles and clothing, or from the so-called preferred fibres i.e. those selected for its more sustainable properties than those of conventional fibres and materials and manufactured environmentally, while respecting human rights, seeing them as a chance to increase their competitiveness.

As follows from Textile Exchange (*Preferred Fiber & Materials... 2018*) the most in demand among manufacturers is 100% Certified Organic Cotton. A large-scale preferred cotton

implementation is declared both by big multi sector companies such as C&A, H&M, Otto, Marks & Spencer or Tchibo GmbH, and smaller clothing manufactures, including sports and home textiles. According to analyses made by K. Brodde of Greenpeace, organic cotton shares in about 12% to 25 million tons of worldwide cotton production, thus contributing to reducing pesticide and water use (*Clothing and Greenery* 2017, p. 56). It is worth noting that a complete conversion to organic cotton production could reduce negative environmental effects by 46% (Venkatesan & Periyasamy, 2017). Companies producing sports clothing (e.g. Nike, The North Face, Decathlon) declare an increasing interest in synthetic fibres from recycling (especially polyester recovered from beverage bottled). Its production requires about 33-53% less energy and generates about 55% less carbon dioxide than the production of primary raw material (Leonas, 2016). The producers show also increasingly higher interest in preferred chemically treated cellulose fibres. A leader in developing manufacturing technology of such fibres is the company LenzingAG awarded by the European Commission with the "European Award for the Environment" for implementation of the most environmentally friendly manufacturing technology of Tencel™ fibres, characterized by a closed cycle with solvent and water recovery of 100% and highly efficient water and energy use (Crnoja-Cosic, 2018).

Sustainable technologies

Sustainable design should also be based on knowledge about the technology of producing materials from which clothes will be made, as well as the technology of constructing clothing, including patterns, connecting elements, etc.

To reduce the amounts of chemicals used and to minimise water and energy consumption the producers more and more often use innovative technologies to replace chemical processes harmful to the environment. Many interesting solutions provide biotechnology, which is used both in production of biopolymer fibres as well as in a number of chemical treatments of fibres and fabrics, thus enabling the use of environmentally hazardous chemicals to be reduced or even eliminated. It is worth to mention about increasing use of enzymatic processes in degreasing cotton and increasing its ability to absorb dyes, remove starch from cotton yarn, cotton fabric shrink to obtain a worn-effect jeans, while not reducing its mechanical properties, or modifying synthetic fibres by increasing its moisture transportability (Paul 2015; Silva, Cavaco-Paulo & Fu 2015). Important biotechnological products are also biomasses used for surface modification of textiles. As examples of such products can be biosurfactants (e.g. glycolipids, phospholipids, fatty acids, lipopeptides) produced by microorganisms (bacteria or fungi). They play a double role in the textile product manufacturing process as a surfactant and a bactericidal and biodegradable substance, and most importantly they are non-toxic to humans and the environment (Paul 2015). A number of sustainable solutions can be observed also in textile dyeing and printing processes. This applies both to process technology and dye selection. In the former case, this is connected with the use of technologies enabling thermal energy recovery by recovery of cooling water or discharge of steam condensate into boilers that may reduce the use of electricity and CO₂ emission even by 32.2%, and thermal energy use, in turn causing reduction of CO₂ emission by 41.7% (Bevilacqua et al. 2014). As regards to the use of dyes, these activities are oriented towards elimination of dyes harmful to humans and the environment, limitation of use these dyes in dyeing baths as well increase interest in natural dyes obtained, for example, from algae or plants (Vankar 2017), which if used on a large scale would significantly improve the safety

of the environment and consumers, while keeping aesthetic properties and durability of these products.

Considering new trends in technologies, worth underlining are the zero waste product manufacturing technologies that target at reducing waste volumes at the design stage (zero-waste design) and in the manufacturing process (e.g. computer-aided product shaping, laser cutting, sonic cutting and welding). An interesting example of this technology is a seamless knitting technique (Fig. 1), the use of which in the production of clothing is associated with a loss of materials of up to 30%. 3D technology allows minimizing the amount of waste by knitting all clothing without seams, in one process, in a three-dimensional design on a knitting machine (Lee, 2016). Other examples are the "Adidas's Primeknit" technology and "Flyknit" technology patented by Nike. There are methods of weaving items, which reduces waste even by 60% in comparison with cutting and sewing. Since this innovation eliminates waste, the use of this technology has reduced Nike's environmental footprint by 3.5 million pounds of waste (Kell 2016).

Fig. 1 The process of designing clothes in 3D knitting technology



Source: Lee K.E (2016) *Environmental Sustainability in the Textile Industry*, https://link.springer.com/chapter/10.1007/978-981-10-2639-3_3#Sec10

1 Methodology

Backgrounds of own research

One of the main objectives of the European Union, implemented in the field of consumer and environmental policy, is the development of the concept of sustainable consumption. It seeks to raise awareness and education for consumers, broaden the rights of obtaining information on products and manufacturers and introduces systems and regulations to ensure the safety of the products offered. Stimulators for the increase in sustainable consumption include, but are not limited to, state policy and the activities of NGOs, society and the market. Political and organizational action produces results in the form of legislation, various types of programs, like certification of products, and strategies that indicate the path of sustainable production and consumption. Society, through its actions, has an impact on consumer attitudes and also increases awareness and accountability among buyers. The market, in turn, offers access to sustainable products, as their availability and type of offer depend on companies.

Sustainable consumption in regard to textile and clothing products on the Polish marketplace

Sustainable consumption regarding textile and clothing products include such behaviours as [Koszewska, 2016; Salerno-Kochan & Kowalski, 2019]: buying less clothing, choosing high-quality and durable products, buying clothes only when needed; not applying temporary fashion; purchase of clothing based on information on raw material composition, place of production, paying attention on certificates; seeking information on companies' policies and practices and ceasing or limiting purchases of products of companies that use unethical and environmentally harmful activities, proper maintenance of products and their repair if possible, and finally a careful approach to waste management [Koszewska, 2018].

In terms of consumer role in the sustainable development of the textile and apparel market, worthy of notice are further stages of product use and disposal. It should be underlined that the impact of the utility and post-use phase has an equally important impact on the environment because they absorb huge amounts of energy or water. Some of consumer behaviours during use phase can already be shaped at the design stage by appropriate selection of raw materials (e.g. preferred fibers), designing products with timeless forms, using finishing technologies that increase the durability of products, or reduce the onerousness of maintenance processes (e.g. enabling washing in low temperatures, eliminating ironing) etc. Actions that consumers can take in this phase include, among others: making rational decisions regarding the frequency of washing/ironing/drying clothes; using eco-friendly detergents; using of energy-saving washing machines, limited using of dryers and irons; repairing and reworking damaged clothing; participating in clothes swapping, donating clothes to collection points or for charity.

The literature of the subject contains little research on textile and clothing products sustainable consumption, especially on the Polish marketplace. Therefore, the purpose of this study was to investigate the Polish consumers' behaviours in terms of their purchasing preferences and habits and attitudes towards disposal manners of non-use products.

Method description and characteristic of respondents

The data for this research were gathered through an online enquiry posted on Google Docs, performed between March and May 2019. A link to the address of the online questionnaire has been distributed through social networks. The questionnaire contained single and multiple-choice questions, as well as scaled questions. The survey questions concerned consumer attitudes during the lifecycle of clothing products, including purchasing habits and preferences, attitudes towards clothing maintenance and practices with disposal of unnecessary clothing and textiles. The survey was attended by 150 Polish respondents, 63% of whom were women and 37% were men. The age of respondents was divided into three compartments – 18-25 years; 26-35 years and over 36 years. The number of respondents by age and gender is set out in Table 1.

Tab. 1 Structure of respondents

	Female	% of respond.	Male	% of respond.	Sum	% of respond.
All	95	63	55	37	150	100
Age						
18-25	40	27	18	12	58	39
26-35	18	12	20	13	38	25
above 36	37	25	17	11	54	36
Education level						
Primary	1	0.3	2	0.7	3	2
Secondary	35	23	20	13	55	36.7
Bachelor and above	59	39	33	22	92	61.3
Economic status						
High	7	4.7	5	3.3	12	8
Good	55	36.7	29	19.3	83	56
Above average	16	10.7	15	10.7	32	21.3
Below average	15	10	6	4	21	14
Bad	2	2.7	0	0	2	2.7
Place of residence						
Village	32	21.3	9	6	41	27.3
Town < 50 thous. of	14	9.3	5	3.3	19	12.7
Town 50 - 100 thous. of	4	2.7	5	3.3	9	6.0
Town 100 – 500 thous.	3	2	7	4.7	10	6.7
City >500 thous. of	42	28	29	19.3	71	47.3

Source: own research

2 Results and discussion

As a result of the conducted research, it was found that the vast majority of respondents (71%) declare a rational approach to clothing purchases, of which 43% are women and 28% are men. 19% of respondents declare that they buy products after consulting another person (13% women and 6% men). About 9% of respondents, including 6% women, declare unthoughtful purchases made under the influence of emotions.

Respondents asked to rate their shopping behaviour on the 5-point scale, ranging from 'strongly disagree' = 1, to 'strongly agree' = 5 (Graph 1), rated the highest (3.71) as saying that "they most often buy mid-priced clothing, paying attention to the timelessness of style and quality". 32% of respondents strongly agreed with this statement, and almost half - rather agreed. "The preference for buying smaller quantities of clothing that is more expensive and of high quality" was also highly rated (3.57). It is worth noting that when assessing this type of consumer behaviour, the arithmetic average of men's responses exceeded the average of women's responses. The lowest score (1.59) was obtained by the statement regarding "seasonal change of wardrobe according to the latest fashion trends" (87% of responses). With regard to the sustainable development of the textile and clothing industry, and widespread consumerism, this is a positive result saying that many consumers do not follow fashion blindly and are able to rationally assess their purchasing needs.

Graph 1 Rating of consumers purchasing behaviours



Source: own research

Table 2 presents the average ratings of factors determining the choice of clothing products, taking into account the gender of respondents. Based on obtained data, it can be concluded that among estimated factors, those connected with sustainable consumption (as ecology of product, quality of material, fibre content, timeless of fashion, safety of product or certification) received quite different ranks, which demonstrates the ambiguous attitude of consumers to this trend. The greatest importance consumers attach to the aesthetic of a product, which is consistent with the results of other studies on this issue.

Tab. 2 Rating of factors determining clothes purchasing

Factor	Rating in 5-grade scale*		
	All	Women	Men
Aesthetic of product	3.96	4.09	3.73
Ecology of product	3.90	3.97	3.92
Quality of material	3.88	3.92	4.01
Price	3.85	3.93	3.71
Quality of workmanship	3.83	3.88	3.75
Sales / promotion	3.43	3.59	3.15
Fibre content	3.27	3.42	3.02
Timelessness of fashion and pattern with trends	2.80	2.92	2.60
Brand	2.77	2.54	3.16
Discounts for regular costumers	2.69	2.79	2.51
Safety of product	2.67	2.93	2.24
Certification e.g. FAIR TRADE, FAIR WEAR	2.08	2.25	1.89
Advertisement	1.90	1.99	1.75

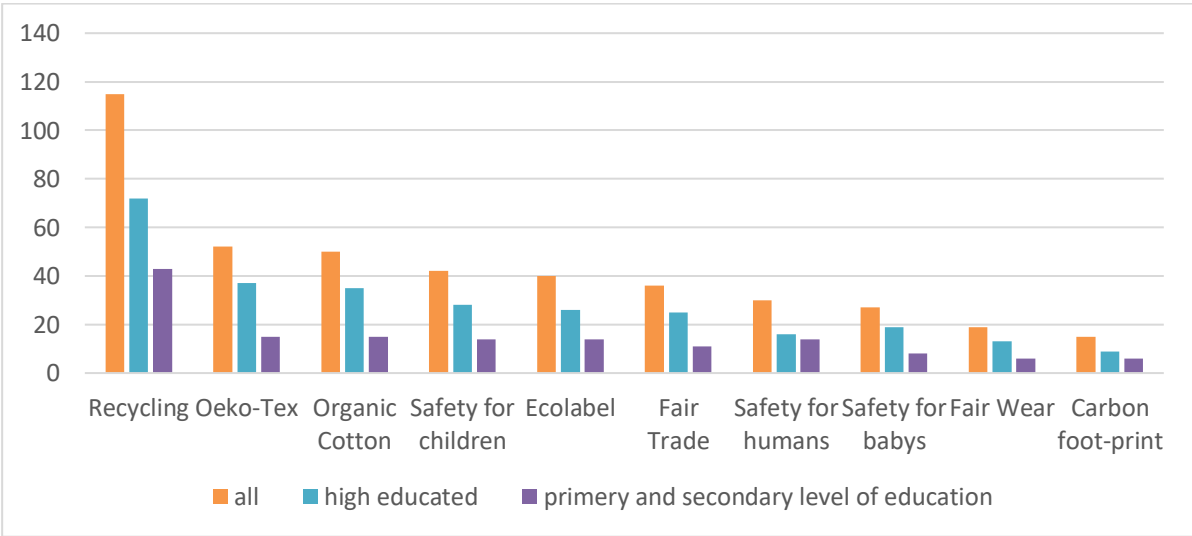
*5 – the most important factor, 1 – the least important factor

Source: own research

Considering factors indicating sustainable consumption, it is worth paying attention to quite high ranks for ecology, quality of material and workmanship. On the other hand, however, the presence of certification informing that product fulfil the principles of business social responsibility, as well as safety of a product, received quite low rates. Particularly surprising is the relatively low rating of the "product safety", compared to the "product ecology", which is often confirmed by certificates guaranteeing the safety of product use. These results may indicate a different understanding of these concepts by consumers. The fibre composition, as a determinant of the clothing purchase, ranks as a moderately significant factor with the assessment 3.27. Respondents, when asked, in the next question, about the preferences regarding the type of fibber (multiple-choice question), indicated natural fibres - 73% (including 49% women) or mixed compositions - 67% (including 44% women). Materials from ecological fibres declared only 12% of the surveyed, mainly women (9%).

In the next multiple-choice question, the knowledge of respondents on certification pictograms was tested (Graph 2). Based on the obtained results, it was found that respondents' knowledge on pictograms largely depends on the level of their education. The respondents with a higher level of education declared definitely better knowledge of pictograms than those with a secondary or primary level of education. The most known among the presented pictograms is the one informing that the product is made of recyclable materials (77% of responses). It should be noted that this is not a pictogram that is used on clothing, but rather on various types of packaging for food products. 72 people with higher education and 43 people with a lower level of education indicated knowledge of this pictogram. Other pictograms, including those used on clothing, are definitely less recognizable. The top certificates, most commonly known by respondents, and used for clothing and textile products, were: Oeko-Tex Standard 100 and 100% Certified Organic Cotton, and then: Safe for Children, Ecolabel and Fair Trade. It is worth noting that when asked about a pictogram that would encourage respondents to buy clothes, they most often pointed to the Oeko-Tex Standard 100 (70% of responses), 100% Certified Organic Cotton and Friendly to Humans (55% each).

Graph 2 Knowledge of pictograms, percentage of responses taking into account the level of education



Source: own research

Based on the data presented above, it can be concluded that respondents tend to make sustainable purchases rather low.

The last question in the questionnaire concerned the behaviour of respondents with regard to unused but still good clothing. In order to determine their habits, the respondents used a five-point scale, where 1 means "never" and 5 means "always". Table 3 presents arithmetic means for individual methods, taking into account the gender of respondents.

Tab. 3 Rating of respondents' behaviour in regard to unused but still good clothing

Type of behaviour	Rating in 5-grade scale* \bar{x}		
	all	women	men
For home use as clothes for housekeeping, cleaning materials etc.	3.06	3.20	2.82
Donating your friends / family	3.03	3.12	2.89
Donating to charity	2.91	3.28	2.27
Sorting and transferring to collection points	2.64	2.95	2.11
Gathering in a wardrobe	2.39	2.44	2.29
Garbage disposal	2.10	1.87	2.49
Processing into other products	1.54	1.61	1.42
Selling	1.36	1.41	1.27
Swapping	1.32	1.42	1.15

*5 – the most frequent behaviour, 1 – the least frequent behaviour

Source: own research

Studies have shown that consumers most often use unused but still good clothing for domestic purposes and give them to friends or family. Women more willingly than men donate unused clothing to charity or to clothing collection points. Manners of disposing of still good clothes that are the least used by respondents are: modifying clothing into other products, selling and swapping with others. Comparing the attitude of men and women to methods of handling unused clothing, it can be seen that men much more often throw clothes into the garbage than give them, for example, to charity, or segregate and give them to collection points.

Conclusions

Products design plays a very important role in the financial success of enterprises, determining the company's profits and competitiveness. In a few last years, it is considered as well, as a very important stage of a products life cycle that influence the environment and consumer behaviours. During this stage, designers may decide about the choice of raw materials, technologies, create product durability, usability, a manner of their maintenance and even disposal. Together with the expansion of the idea of sustainable development, a need for changing the approach to the textile products and clothing design was drawn. More and more companies attach more importance to the production of products that burden the environment to a lesser extent and do not violate human rights, which is still a big problem in

the textile and clothing industry. An example of such activities is the use by a growing number of companies of preferred fibres, especially organic cotton, recycled polyester fibres, and cellulose chemical fibres, such as Tencel. Designers also have the opportunity to choose less burdensome technologies, for the production and finishing of products. Biotechnology and zero waste technologies are particularly interesting. A good practice, more and more often considered by designers, is to create products that meet the requirements of various certificates, among which the most popular is the Oeko-Tex Standard 100.

The investigations on the Polish consumers' behaviours showed that respondents are characterized by rather a rational approach to clothing purchases. The vast majority declare that they go shopping only when they need to buy a specific product. They also prefer buying medium and high-quality products with a timeless style. Among the respondents are also those who buy a lot of clothes at low prices, have too much clothing and do not walk in the products purchased - however, their share is much smaller. Among factors affecting the purchase of clothing, the most important for them are aesthetics and ecology of the product, quality (both material and workmanship) and price. Most often they choose clothes made of natural fibres. Most consumers are able to pay more for clothes made from eco-friendly materials and respecting human rights. The vast majority of respondents who declare their willingness to pay an additional amount are women. The most commonly known certificates by respondents and used for clothing and textile products are: Oeko-Tex Standard 100 and 100% Certified Organic Cotton. It was found that higher educated consumers showed more knowledge of the presented pictograms. Certificates that encourage respondents to buy products are those on environmental and safety issues.

The results of the research on the methods of disposing of clothing that the condition allows for further use show that consumers are increasingly aware of their impact on the environment. They use unused but still good clothing for domestic purposes and give them to friends or family. Women more willingly than men donate unused clothing to charity or to clothing collection points.

Summing up the conducted research in the context of indicating directions for the sustainable design in relation to the stages of post-production life of the product it should be stated that designers should focus on creating products in a timeless style, of medium and higher quality and at a reasonable price, from natural fibres. Designing, taking into account the requirements of the Oeko-Tex certificate criteria, which is the most recognizable and expected by consumers, is also a good direction. Research also indicates the need to increase consumers' knowledge and awareness about sustainable consumption, especially regarding raw materials choosing and disposal manners of unused products.

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Evaluation of Eco-Innovations and Eco-Design in the Slovak Republic¹

Petra Garasová – Renáta Ševčíková²

Abstract

Eco-innovation initiative is gaining increasing attention both from business and policy makers and have become an emerging priority in the EU. The concept of eco-design aims at integrating environmental concerns at the product design stage and is more specific than eco-innovation. The aim of the paper is to identify the use of eco-innovations and eco-design in the Slovak Republic and to determine the relationship of selected variables and awarding the “Environmentally Friendly Product” brand. This label is awarded by the Ministry of the Environment of the Slovak Republic to products or services that meet specified conditions. The Eco-innovation performance of the Slovak Republic was compared with the European Union countries using the Eco-Innovation Index. The Slovak Republic with a total score of 68 ranked as the 23rd place and belongs to the group of catching-up countries. Using a simple linear regression, we found the moderate correlation between 2 variables (Human resources in science and technology and Patent applications to the European Patent Office) and the number of products awarded the “Environmentally Friendly Product” brand.

Key words

eco-innovation, eco-design, Slovak Republic

JEL Classification: M20, O30

Introduction

Environmental sustainability, the elimination and prevention of the negative impact of economic activities are becoming an essential part of any economic policy and a factor that significantly affects the long-term competitiveness of individual economies. Concerns about the future of the environment are also reflected in the content focus of innovation policies in which eco-innovation is beginning to play an important role (Jeck, 2012).

The concept of eco-innovations is relatively new and the first time it appears to the late 90s of the 20th century. The concept of eco-innovations has been introduced to ensure sustainable growth. From the economic point of view are preferred solutions aiming at ensuring economic growth on the one hand and environmental sustainability and stability on the other. We are talking about the so-called sustainable growth of the global economy, where the growth of one quantity is not realized at the expense of the other but in symbiosis with it (SBA, 2018).

On the one hand, eco-innovation initiatives are gaining increasing attention both from business and policy makers and have become an emerging priority in the EU. On the other

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hand, the concept of eco-design aims at integrating environmental concerns at the product design stage, thus at the earliest stage of new product development. Eco-design is more specific than eco-innovation, as it particularly focuses on the different mechanisms that lead to more sustainable products (Slimane et al., 2015).

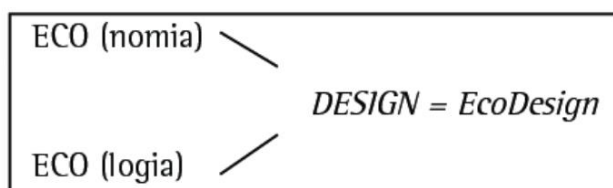
Eco-Design and Eco-innovation

Eco-design assumes that the environmental impact of a product should be considered already at the product design stage. The literature offers several definitions of the term (Dostatni et al., 2015):

- Eco-design is a new approach to product design and consists in the identification of the environmental impact associated with the product and considering it in the design process at an early stage of product development,
- Eco-design is also referred to as design for environment, environmental design, ecological design, sustainable product design and green design. It introduces an additional dimension to the traditional design: the design is evaluated for the environmental impact of the product throughout its life cycle,
- Eco-design – one of the systemic tools in environment management, which assumes that the product and services introduced on the market should have minimal environmental impact throughout their life cycle.

Karlsson & Luttrupp (2006) note that the ecological concept incorporates priorities related to sustainability in the global business scenario. The “eco” element, in the ecological conception, can refer both to the economy (reflecting a business orientation) and ecology (reflecting the importance of environmental aspects) (see Fig. 1).

Fig. 1 Origins of the word “Eco-design”



Source: Karlsson & Luttrupp (2006)

Use of eco-design principles not only satisfies legal requirements, it also benefits the environment, and consequently society as a whole. The use of eco-design brings other benefits to companies related to their social image, by announcing their concern for environmental questions. Furthermore, by reducing the use of materials and consumption of energy, it increases their operating profits. For all these reasons, eco-design can become a differential for companies, since today’s consumers increasingly want products and services

that minimize the negative impacts on the environment, and sustainable design is one way of satisfying these desires, by finding innovative solutions (Laruccia, Garcia, 2015).

Haned (2015) in the survey found that, for 45% of the responding companies, eco-design has a positive effect on the bottom line, in absolute terms, while the effect was neutral for 51 %. From a social standpoint, eco-design is a thus win-win solution, as it generates environmental benefits for all, without any negative impact on profitability. For a large portion of companies, the eco-design approach also has positive, non-financial impacts, like improved reputation and recognition.

Firms that implement ecological conception also can reduce costs, obtain competitive advantages, improve their corporate image and the quality of their products, and even reduce the legal requirements to which they are subject (Vercalsteren, 2001).

Concepts such as ecological design, cleaner production and development of sustainable products promote the use of environmentally friendly techniques in the conception, design and manufacture of products (Byggeth et al., 2007).

European Commission (2006) defines eco-innovation as any innovation resulting in significant progress towards the goal of sustainable development, by reducing the impacts of our production modes on the environment, enhancing nature's resilience to environmental pressures, or achieving a more efficient and responsible use of natural resources.

OECD (2010) defines eco-innovation as the implementation of new or significantly improved products (goods or services), processes, marketing methods, organizational structures or institutional arrangements that deliberately or as a side effect lead to environmental improvements.

Eco-innovation is the development and application of a business model that is shaped by a new business strategy that includes sustainability in all life-cycle business operations in partnership with partners across the value chain. It includes a coordinated set of modifications or new solutions to products (goods / services), processes, market access and an organizational structure that leads to greater company performance and competitiveness (O'Hare et al., 2014).

1 Methodology

The aim of the paper is to identify the use of eco-innovation and eco-design in the Slovak Republic and to determine the relationship of selected variables and awarding the "Environmentally Friendly Product" brand. The Eco-Innovation Scoreboard (Eco-IS) and the Eco-Innovation Index illustrate eco-innovation performance across the EU Member States. They aim at capturing the different aspects of eco-innovation by applying 16 indicators grouped into five dimensions. The Eco-Innovation Index shows how well individual Member States perform in different dimensions of eco-innovation compared to the EU average and presents their strengths and weaknesses. The Eco-IS and the Eco-Innovation Index complements other measurement approaches of innovativeness of EU countries and aims to promote a holistic view on economic, environmental and social performance (Europa, 2019).

Indicators of eco-innovation index include (Europa, 2019):

- Eco-innovation inputs comprise investments (financial or human resources) aiming to trigger eco-innovation activities. The indicators include: Governments environmental and energy R&D appropriations and outlays (% of GDP), Total R&D personnel and researchers (% of total employment), Total value of green early stage investments (USD/capita).
- Eco-innovation activities include indicators to monitor the scope and scale of eco-innovation activities undertaken by companies. The component focuses on efforts and activities rather than on actual results of innovation activity. The indicators include: Firms declaring to have implemented innovation activities aiming at a reduction of material input per unit output (% of total firms), Firms declaring to have implemented innovation activities aiming at a reduction of energy input per unit output (% of total firms), ISO 14001 registered organisations (per mln population).
- Eco-innovation outputs describe the immediate results of eco-innovation activities. Indicators in this component are used to monitor the extent to which knowledge outputs generated by businesses and researchers relate to eco-innovation. The indicators include eco-innovation related patents (per mln population), eco-innovation related academic publications (per mln population), eco-innovation related media coverage (per numbers of electronic media).
- Eco-innovation socio-economic outcomes – depict wider effects of eco-innovation activities for society and the economy. This includes changes in employment, turnover or exports that can be related to broadly understood eco-innovation activities. Indicator includes exports of products from eco-industries (% of total exports), employment in eco-industries and circular economy (% of total employment across all companies), revenue in eco-industries and circular economy (% of total revenue across all companies).
- Eco-innovation resource efficiency outcomes – relate to wider effects of eco-innovation on improved resource productivity. Eco-innovation can have a twofold positive impact on resource efficiency: it can increase the generated economic value, while at the same time decrease pressures on the natural environment. Indicator includes material productivity (GDP/Domestic Material Consumption), water productivity (GDP/Water Footprint), energy productivity (GDP/gross inland energy consumption), GHG emissions intensity (CO₂e/GDP).

Numerical data were processed by statistical-comparative analysis and to illustrate the results were used a graphical representation. We used linear regression to determine the impact of selected variables on the number of products awarded the “Environmentally Friendly Product” brand. Based on our knowledge from literature, we decided to analyse the impact of the following variables:

1. Governments environmental and energy R&D appropriations and outlays (million euro) - government budget allocations for research and development data measure government support for environmental and energy R&D activities in the Slovak Republic.
2. Governments environmental and energy R&D appropriations and outlays (euro per inhabitant) - government budget allocations for research and development

data measure government support for environmental and energy R&D activities in the Slovak Republic.

3. Human resources in science and technology (% of active population) in the Slovak Republic.

4. Patent applications to the European Patent Office – data for the Slovak Republic.

The data were obtained from Eurostat and OECD statistical databases.

2 Results and Discussion

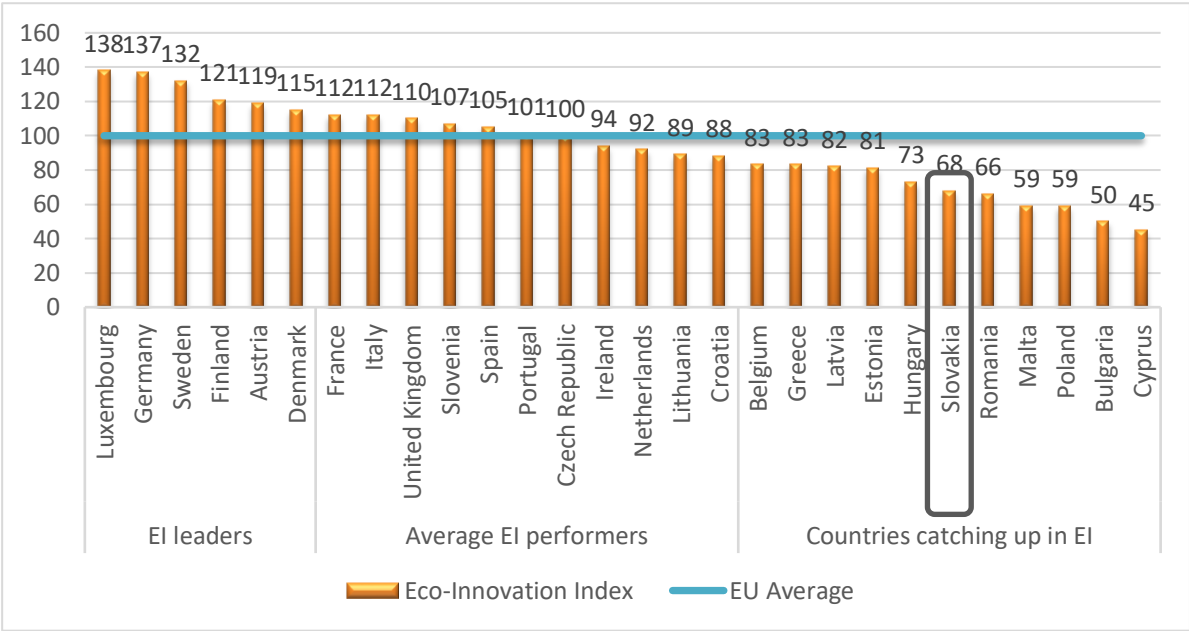
2.1. Eco-innovation in the European Union

According to Eco-Innovation Scoreboard countries were clustered into three groups (Graph 1):

- Eco-innovation (EI) leaders, scoring significantly higher than the EU average (i.e. a score of >114)
- Average eco-innovation (EI) performers with scores around the EU average (i.e. between 85 and 114)
- Countries catching up in eco-innovation (EI), with around 85% or less performance compared to the EU average (i.e. scores <85)

In the 2018 version of the Eco-Innovation Index, Luxembourg leads the ranking of all EU countries, with an aggregated score of 138. Germany (137) and Sweden (132) follow very closely. Also, Finland and Austria have been grouped to the eco-innovation leading countries. Eleven Member States obtained scores around the EU average of 100 and were therefore labelled as average eco-innovation performers. The aggregated eco-innovation scores in this group range from 112 (Italy and France) to 88 (Croatia). The last group is represented by the group of countries catching up in eco-innovation and their aggregated scores range from 83 (Belgium) to 45 (Cyprus). Except for Belgium, all countries in this last group are Member States that joined the European Union in or after 2005. Compared to the 2014-2017 editions of the Eco-Innovation Index, most countries remained in the respective country cluster. For example, the traditional top-performing countries such as Denmark, Germany, Finland, Luxembourg and Sweden since 2015 have also ranked highest in the index 2018. Like in previous years some changes in positions took place among the EI leaders. Luxembourg regained its 1st position that it had in 2014 and 2016. Austria has been improving its performance in last four years has joined the EI leaders' group in 2018 and positioned in 4th place. Also, in the other two groups of average EI performers and countries catching up in EI, generally minor changes in the group compositions can be observed. Most notably, Malta that after many years climbed up to average performers group in 2017, in the last ranking moved back into the catching up group, the Czech Republic considerably improved its position in comparison to previous several years. Cyprus, Bulgaria and Poland have been constantly on the bottom of the EI ranking (EU Eco-Innovation Index 2018).

Graph 1 Eco-Innovation Index 2018

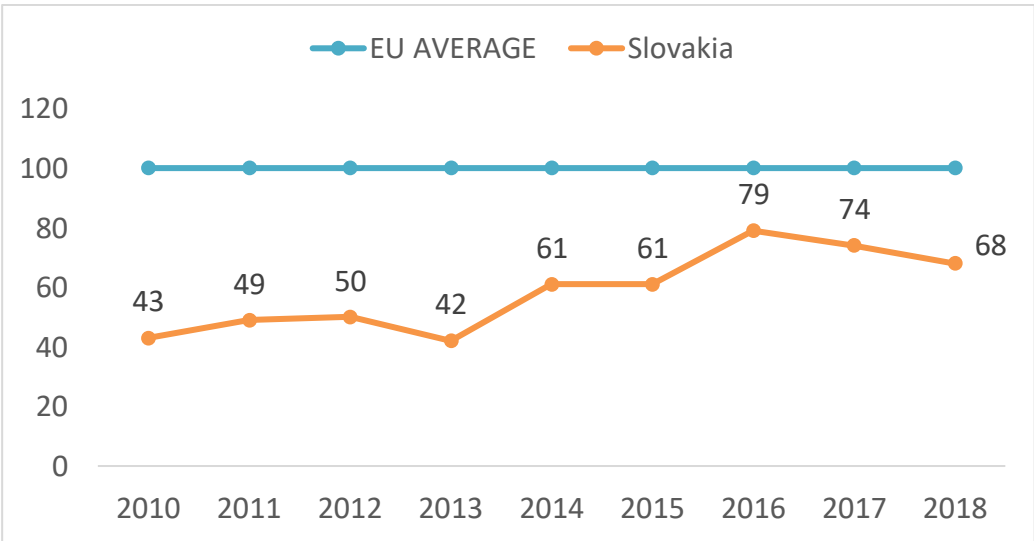


Source: own construction from EU Eco-Innovation Index, 2018

2.2 Eco-innovation and Eco-design in the Slovak Republic

The results (Graph 2) of the scoreboard show that overall eco-innovation performance of Slovakia for 2018 is falling, with an overall index score of 68, ranking Slovakia on 23rd place among EU-28 countries. The score of 68 means that Slovakia’s overall eco-innovation performance is 32% below the EU average. The largest eco-innovation performance was recorded in 2016 with the score of 79, since then the score has been decreasing. The only component in which Slovakia scores the EU average is resource-efficiency outcomes, while the other four components score below EU average.

Graph 2 Eco-Innovation index

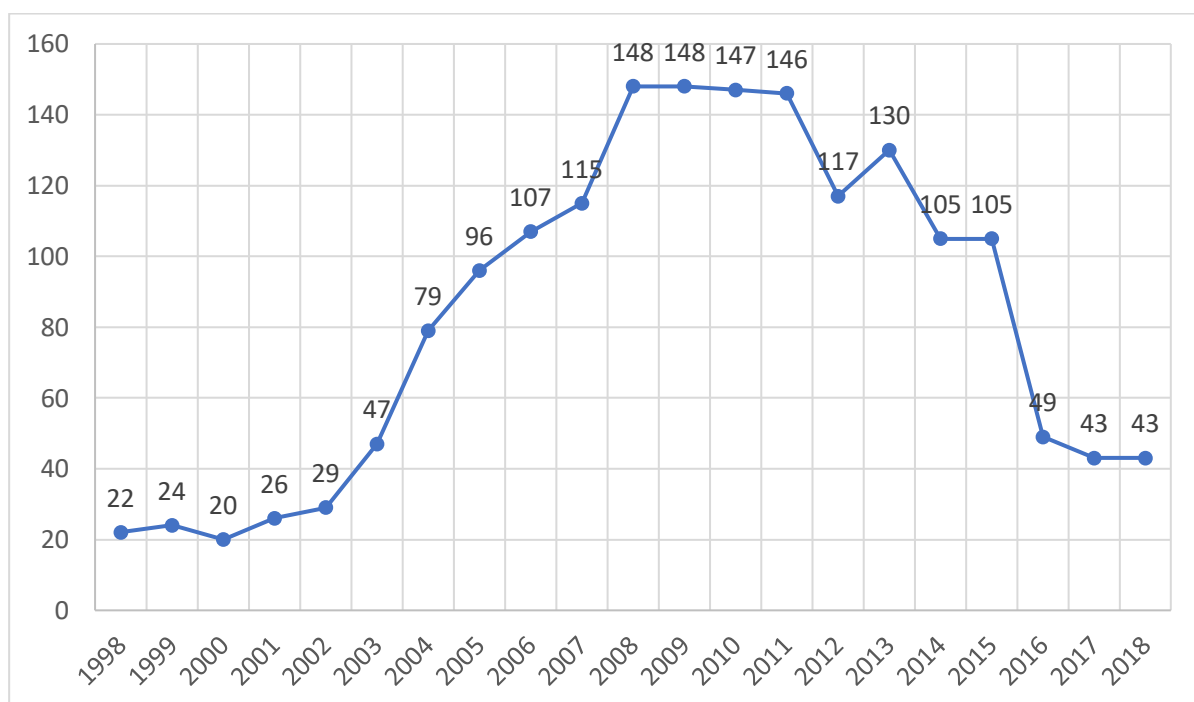


Source: own construction from European Eco-Innovation Scoreboard Interactive Tool

Eco-labelling supports the production and consumption of more environmentally friendly products and provides customers with information about the environmental impact of the products.

In Slovakia, through the “Environmentally Friendly Product” (“Ekologicky vhodný produkt” - EVP) brand, consumers receive information about environmentally friendly products. Since 1997, a total of 252 products have been assessed and awarded the “Environmentally Friendly Product” brand. The largest total number of products awarded the EVP brand - 148 products, was recorded in 2008 and 2009. Since 2011, the total number of EVP products has been decreasing (Graph 3).

Graph 3 Evolution of the Environmentally Friendly Product from 1998-2018



Source: own construction from Enviroportál – Information Portal of The Ministry of the Environment.

We used simple linear regression to describe the relationship between the selected variable and the value of the “Environmentally Friendly Product” brand. The dependent variable is the “Environmentally Friendly Product” brand and the independent variables are the individual selected variables that we defined in the methodology. We used basic statistical indicators to evaluate the relationship of variables – the correlation coefficient, the coefficient of determination and the p-value to determine the statistical significance of our results. Variable Governments environmental and energy R&D appropriations and outlays expressed in million euro and also in euro per inhabitant did not obtain the P-value of less than 0.05. In our model, we cannot confirm the correlation between this variable and the “Environmentally Friendly Product” brand. Other selected variables (Human resources in science and technology - % of active population and Patent applications to the European Patent Office) within the individual regression models obtained a P-value of less than 0.05, i.e. they are

statistically significant. We found a quite high correlation coefficient for both variables (0,66; 0,70), there is a moderate correlation between variables. The best values were obtained for the variable Patent applications to the European Patent Office and based on the coefficient of determination we can explain 49.70% of variability of variable “Environmentally Friendly Product” brand by this regression model. The remaining 50.30% is due to variables not included in the regression model and random effects.

Conclusion

The aim of the paper was to identify the use of eco-innovations and eco-design in the Slovak Republic and to determine the relationship of selected variables and awarding the “Environmentally Friendly Product” brand. We compared the eco-innovation performance of the Slovak Republic with the countries of the European Union using the eco-innovation index. According to the latest Eco-Innovation Scoreboard, Slovakia worsened its position, currently reaching 68% of the EU average and belongs to the group of Countries catching up in eco-innovation. Our weakest area in eco-innovation is part of the eco-innovation inputs. Eco-innovation inputs include investments (financial resources, human resources, technical resources) that provide an initiative for eco-innovation activities in companies, research organizations and other institutions, which includes investments aimed at launching eco-innovation activities. In the Slovak Republic, eco-labelling has been implemented since 1997 through a national scheme for awarding the national eco-label “Environmentally Friendly Product”. Its aim is to reduce the negative impact of consumption and production on the environment, health, climate and natural resources by promoting and favouring products and services with less negative impact on the environment. The performed analysis confirmed the moderate correlation between 2 variables (Human resources in science and technology and Patent applications to the European Patent Office) and the number of products awarded the “Environmentally Friendly Product” brand. In order to support eco-innovation and eco-design in Slovakia, it is necessary to create a comprehensive concept of systematic support with the active involvement of state and public administration. The focus should be on promoting exports of products from the green industry, employment in environmental sectors, research and development in the environment and energy sectors.

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Ecodesign in the Circular Economy: an Example of Packagings

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Abstract:

The article deals with the concept and meaning of eco-design in packagings within the context of the circular economy. Design for environment becomes more and more popular tool for improving environmental efficiency of products. The paper provides guidance on how to perceive and assess environmental aspects of packagings in the perspective of circular economy and support introducing the life cycle thinking development processes. On the basis of the existing literature on the subject, current legal regulations and data, the paper presents the idea and premises of the eco-design concept in question and points out their significance and possibilities of their practical introduction in the packaging industry. Implementation of the life cycle thinking in packaging management brings a wide range of benefits. The key elements which need special attention are the design and the role of designers. These elements are also a stage in the transformation process of packaging industry towards circular economy. The key principle is that at design level a packaging should be treated as waste. The result of treating packaging as a waste on the design stage is in its perfection as to optimizing environmental efficiency and reducing its negative impact on the environment. Thus, eco-design allows realization of premises and aims of the circular economy concept. It may soon become a determining competitive factor.

Keywords

eco-design, circular economy, packaging.

JEL Classification: Q01, Q02, Q5

Introduction

One of the priorities of the European Commission economic policy is circular economy. The idea of the concept is to maintain the value of products, materials or resources as long as possible so as to minimize the amount of product waste. Used products and materials are recycled, processed and used again. Thus, waste is treated as a raw material, which leads to more efficient and more sustainable use of resources. The problem of the necessity of changing the way of thinking about products and waste has been discussed in The European Commission briefing “Closing the loop: New circular economy package” (Communication from the Commission 2015, COM 614). According to its assumptions, all measures should support building a resource saving, low emission, sustainable and competitive economy.

The circular economy concept was created on the basis of thinking within all the product life cycle categories. In this way, it takes into consideration all its stages, starting from design, through production, consumption, waste collecting finishing at its management. Seeing the

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product through its all life cycle supports both waste reduction and increasing the level of its recycling. Each of the considered stages influences product's total influence on the environment. For instance, both design and production influence the process of raw material extraction, resource use and waste production in all the product life cycle. It should be stressed; however, the starting point of circular economy is the beginning of the product life cycle. It is the proper product design that can contribute to saving valuable resources. The key role, therefore, is played by product design. Its significance comes mainly from the fact that this stage shapes all the product life cycle. In fact, its planning allows reduction of negative influence on the environment. One can actually say that designing is not only an essential stage of circular economy but it is its basis. In this respect, the key element is monitoring of the impact on the environment during the whole product life cycle.

Eco-design is another name for Design for Environment. According to ISO/TR 14062 it means the above defined „inclusion of environmental aspects into product design and development” (ISO/TR 14062; Commission implementing decision of 17.12.2015) in all its life cycle. Apart from traditionally considered aspects of design such as safety, functionality, ergonomics, costs, durability and technical parameters, product evaluation includes two other elements and these are impact on the environment and the prospect of all the life cycle. One ought to stress here that each product can be designed in such a way that its influence on the environment will be the lowest possible and the friendliest. It is commonly thought that up to 80% of the influence is determined at the stage of design. It can be said that the role of the designer in considering environmental criteria in the cycle is crucial. The designer is provided with proper knowledge (product specification), different solutions and materials (material consumption, avoiding dangerous materials) and tools (specialist programmes) allowing development of a product which does not burden the environment during its production, exploitation (resource efficiency, possibility of repair, modernization or regeneration) as well as at the stage of becoming waste.

Durability and possibility of dismantling in order to retrieve individual materials and components or recycling possibility are key product qualities as far as circular economy is concerned. Environmental criteria should be considered at the stage of selection of raw materials and materials used for production, exploitation, final development as well as during production process itself (sustainable production).

Eco-design inclusion in economic practice complies with The Sustainable Development Agenda 2030 established by United Nations. It includes 17 Sustainable Development Goals, 13 of which refer to circular economy. With respect to packaging industry as to Eco-design, Goal 12 is particularly important because it concerns responsible consumption and production. It deals with promoting resource and energy efficiency, sustainable infrastructure and providing access to basic services, green and decent jobs and a better quality of life (<http://www.un.org.pl>). Benefits from sustainable consumption and production are achievement of overall development plans, reduction of future economic, environmental and social costs as well as strengthening economic competitiveness and poverty reduction. A lower level of consumption also contributes to reducing degradation and pollution, which results in increasing quality of life of all market users. Within the goal connected with reaching sustainable production and consumption a number of tasks has been set. They are as follows (<http://www.un.org.pl>):

- implementation of 10-year programs concerning sustainable consumption and production for all countries (developed countries should take the lead, considering the development and capabilities of developing countries);
- reaching the sustainable management and efficient use of natural resources (by 2030);
- halving per capita global food waste at the retail and consumer levels and reduction of food losses during production and supply, including post-harvest losses (by 2030);
- achieving the environmentally sound management of chemicals and all waste throughout their life cycle in accordance with agreed international frameworks (significant reduction of release of the substances into air, water and soil by 2020);
- substantial reduction of waste generation through prevention, reduction, recycling and reuse (by 2030);
- encouraging companies, especially large and transnational ones, to adopt sustainable practices and to integrate sustainability information into their reporting cycle;
- promotion of public procurement practices that are sustainable, in accordance with national policies and priorities;
- providing people everywhere with relevant information and raising their awareness of sustainable development and lifestyles in harmony with nature;
- supporting developing countries in strengthening their scientific and technological capacity to move towards more sustainable patterns of consumption and production;
- development and implementation of tools monitoring sustainable development impacts on sustainable tourism that creates jobs and promotes local culture and products;
- establishing more efficient fossil-fuel subsidies that encourage their sustainable use, which can remove market distortions, in accordance with national circumstances, tax restructuring and phasing out harmful subsidies, considering specific needs and conditions of developing countries as well as minimizing the possible adverse impacts on their development (protecting the poor and the affected communities).

In the context of the above-mentioned goals and tasks, the range of eco-design use is very wide. It can be used both in developing new products, services or processes and improving the existing ones. The aim of eco-design and measures taken within its framework is the reduction of negative impact on the environment at each stage of the life cycle. Hence, the concept is universal and may be applied in all branches.

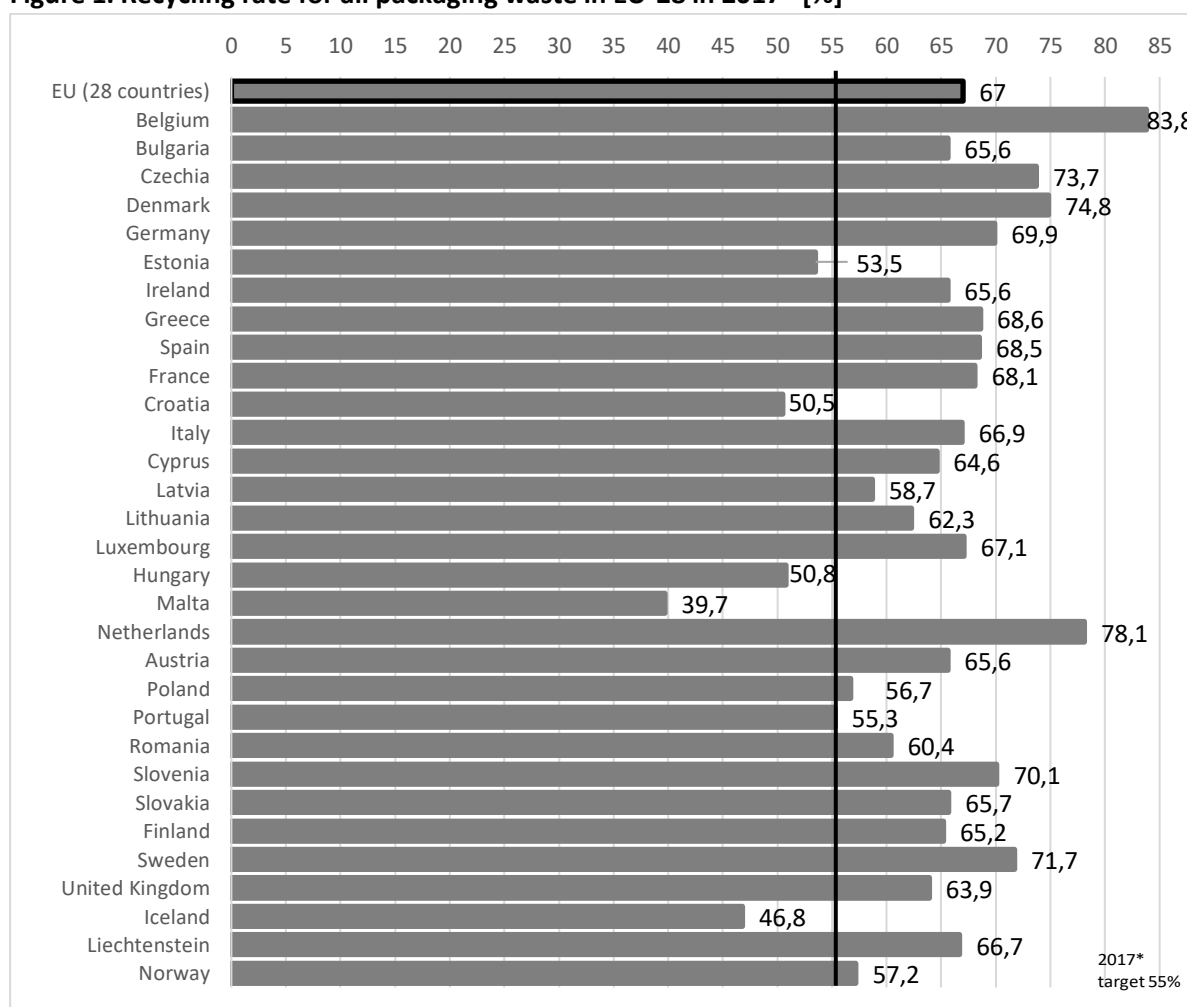
1 Methodology

The aim of the paper is to examine the effects and assess the impact of circular economy on eco-design in packaging industry. It presents the necessity of transformation in the way of thinking about packagings. The paper is based on the review on existing scientific literature and industry data as well as the current legal regulations in the field. The main issue of the paper is to present the idea and premises of the eco-design concept in question and points out their significance and possibilities of their practical introduction in the packaging industry. It underlines the role of designers and life cycle thinking in adopting to circular economy rules. The paper provides also guidelines and underlines actions necessary in each country to support implementation of recyclable packaging, which at the end of the life cycle can be easily recycled.

2 Results and Discussion

In the process of transformation of packaging industry towards circular economy, the key stage is designing and the role of designers. Packagings are regarded by the European Commission as one of priority waste streams, which will be subject to systematic reduction, as far as landfilling and intensification of preparation for reuse are concerned (Communication from the Commission 2015, COM 614; Commission implementing decision of 17.12.2015, Communication from the Commission 2018 COM 028; Directive (EU) 2018/850, Directive (EU) 2018/851, Directive (EU) 2018/852). Aims concerning the range of recycling and reduction of landfilling were stated in the Legislative Package concerning waste approved on 28 January 2018 by ENVI (Committee on the Environment, Public Health and Food Safety). In accordance with the legislation, the share of municipal waste to be recycled will gradually rise. By 2025 55% of municipal waste should be recycled and then respectively 60% by 2030 and 65% by 2035. Separate targets are set for specific packaging materials, such as paper and cardboard, plastics, glass and metal. Since 2022, member states should establish separate collection of dangerous waste from households and then respectively since 2023 – bio-waste and since 2025 - textiles. The latest available data show that in 2017 packaging waste recycling level in most European countries accounted to over 55%, which is presented in Figure 1.

Figure 1. Recycling rate for all packaging waste in EU-28 in 2017* [%]

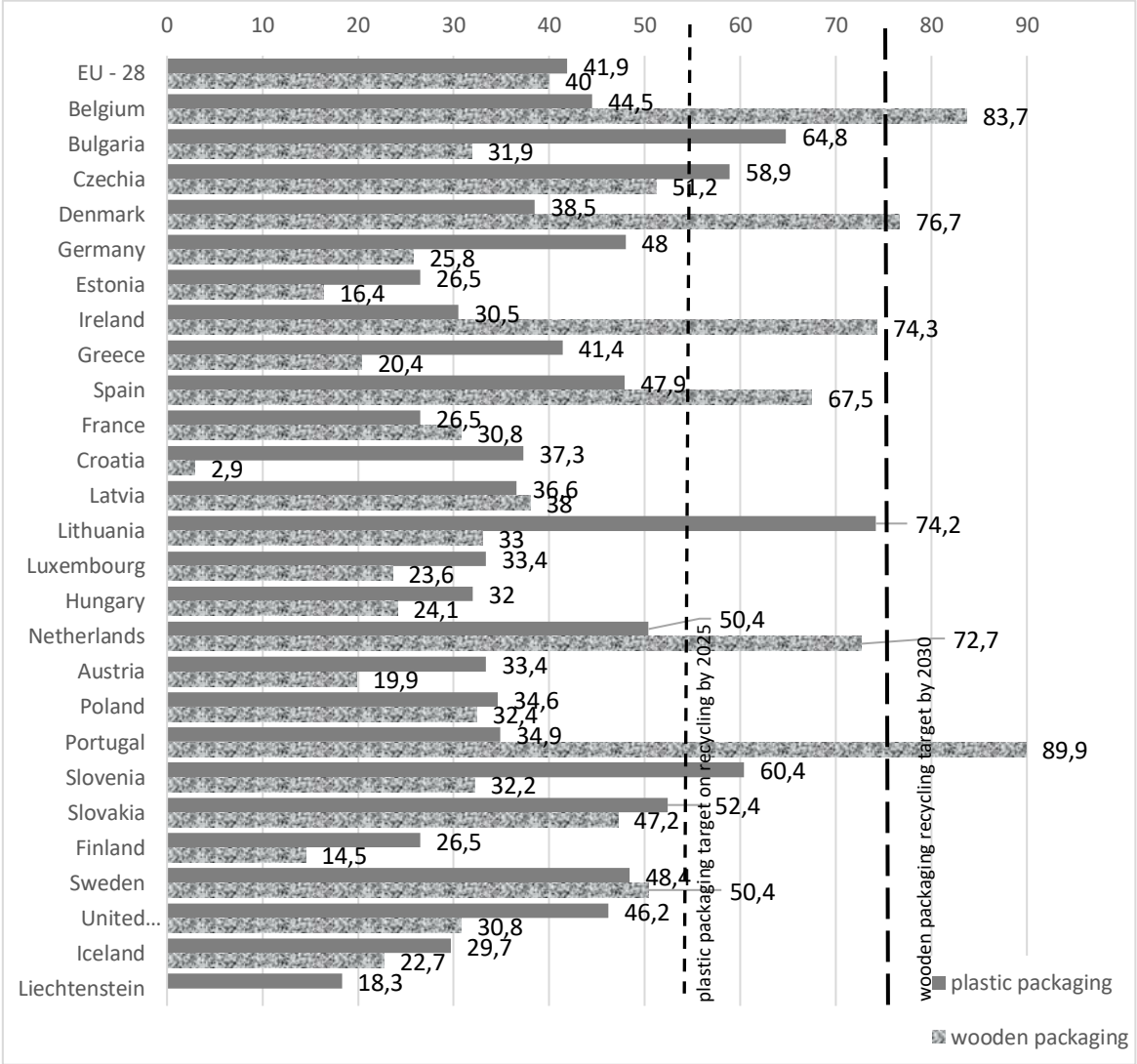


Source: Eurostat 2019.

*data of recycling rate in 2016 for Italy, Cyprus, Malta, Romania and Norway.

The European Union Action Plan for the Circular Economy also specify targets on recycling particular priority materials such as plastic and bio-based materials such as wood. Regarding plastic and wooden packaging, respectively the target of 55% on recycling by 2025 and the target of 75% on recycling by 2030 is set. Nowadays only a few countries reach the future target for wooden material. There are Belgium, Denmark and Portugal, which is presented in Figure 2.

Figure 2. Recycling rate for plastic and wooden packaging waste in EU-28 in 2017* [%]



Source: Eurostat 2019.

*data of recycling rate in 2017 is unavailable for Italy, Cyprus, Malta, Romania, Norway, Switzerland, Montenegro, North Macedonia, Albania, Serbia, Turkey; wooden packaging data for Lichtenstein is 0%.

Products, including packagings, should be designed in a way that will make them possible to be recycled and reused. This will make waste management easier and cheaper, on economic, environmental and social levels.

Eco-design of new packagings seems to be the simplest. When planning a product, from

the very beginning one can start thinking in the life cycle categories and deal with questions concerning impact on the environment (Witczak, 2018). It is also possible, however, to redesign already existing products. One of the possibilities of assessing packaging influence on the environment is using methodology of Life Cycle Assessment. One of the most frequently used techniques in eco-designing is Life Cycle Assessment (ISO/TR 14062; <https://www.teraz-srodowisko.pl/aktualnosci/Ekoprojektowanie-to-myslenie-kategoriamicyklu-zycia-2172.html>; Lewandowska, 2010; Navajas et al., 2017; Witczak, 2018). A very important aspect of proper design of a product and its packaging is considering material flow within all the value chain. It concerns mainly the supply chain (raw materials and semi-finished products) but also the stage of use and postproduction (recycling). Considering the material flow, one should also consider the environmental impact of all stages of the product life cycle. In advanced methods of LCA, apart from the product (e.g. packaging) and its influence on the environment at individual life cycle stages, one also considers an indirect impact, comparing it to alternative solutions (e.g. packaging allowing reduction of the packed product loss).

As early as at the stage of its designing it is important to perceive the packaging as waste, which it will become just after its use (Witczak, 2018). Issues concerning the way of recycling and if and how one will be able to use its components should be considered. Another crucial aspect is the raw material used for production and in case of multi-material packaging – a possibility of separating all its individual components and avoiding materials which are harmful to the environment or problematic in respect of recycling. Another important aspect of looking at the packaging is also resource intensity. Designing contour packaging, which plays its function in a way which allows for avoiding repackaging of products, may efficiently contribute to reducing the amount of waste produced after their use. The way and the goal of designing, in turn, influence durability and time of use of the product. Disposable products (e.g. plastic bags, non-returnable drink packagings) have a very short life cycle. The shorter it is, the greater impact the product generates on the environment. It is connected with material and resource intensity of production processes as well as with the costs of their management system. The design of the packaging should, therefore, allow for the post-use stage, thanks to which it would be possible to increase the number of reused products, their components and materials in the economic circle. As early as at the stage of the product design, producers should allow the possibility of packaging reuse and applying recyclable or recycled materials or removing problematic materials from the packaging (Bachorz, 2017). A good practice in packaging eco-design would increase the volume of both municipal and recycled packaging waste, which would lead to achieving the set target in this range and efficient implementation of the circular economy model in the branch.

The economic aspect of the above-mentioned issues is important as well. The height of charges put on the producers within the Extended Producer Responsibility (EPR) for the packaging of the products should depend on the cost of their management (Bachorz, 2017). For example, in Poland, the product charge is set on the basis of the criterion connected with the kind of material the packaging is made of (plastics, paper and cardboard, aluminium). However, we should remember that it is not the only property determining difficulties and costs connected with waste recycling. After all, in accordance with the concept of all the life cycle, issues concerning influence of packaging qualities on the possibility of its waste management, providing for packaging reuse, applying recycled or recyclable materials or removing problematic materials from the packagings (e.g. PVC labels on PET packagings) should be considered at the level of designing. It seems that using financial incentives

providing for the above-mentioned aspects could positively contribute to wider use of packaging eco-design by producers. One of the solutions could be development of an economic instrument promoting use of more environment friendly packagings and recycling of the packaging. It would also split the cost among the producers on the basis of their actual influence on the costs incurred in the process of waste management after a product is introduced on the market (Bachorz, 2017).

Introduction of individual solutions and supporting instruments will support implementation of recyclable packaging, which at the end of the life cycle can be easily recycled. In accordance with the Institute of Circular Economy guidelines (Bachorz, 2017) it is necessary to take actions also on the level of each country. Among them there are as follows:

- development of financial incentives motivating to application of more environment-friendly and more recyclable packaging;
- promotion of returnable packaging which can be reused after considering their impact on the environment in the whole life cycle;
- establishing the height of charges compliant with actual costs of product waste management;
- providing sufficient supervision of the waste management system by clearly defined set of responsibilities of the system participants and transparency of the cash flow.

Conclusion

Eco-design, which is the basis of the circular economy, can soon become a factor of competitive advantage. In the light of targets connected with packaging waste recycling, it is particularly relevant to use the concept of thinking in the life cycle categories while designing this type of product. Treating the packaging as waste leads to its proper design and may contribute to implementation of the circular economy strategy.

However, it is necessary for the producers to use the possibilities which eco-design offers more widely. A stimulus which could influence its wider use might be financial incentives and precise regulations connected with packaging waste management. Use of eco-design as a requirement when one applies for subsidy on innovative products within structural funds or as a criterion to offer discounts might influence promotion of the idea of thinking within the life cycle categories. This, in turn, might influence economic, environmental and social benefits and lead to wider promotion and implementation of the concept of circular economy.

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