

PERCEPTION OF ZERO WASTE IN THE CONTEXT TO ENVIRONMENTAL INNOVATION IN SLOVAKIA

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Abstract: *At the present time, a great attention is paid to the ecological innovation, which represents innovation characterization to any ecological change with a positive impact on consumers. Such innovations increase the comfort for consumers and concurrently they represent more effective, more economic, ecological, healthier and safer solutions. Ecological innovation represents any innovation aimed at significant and visible progress towards the goal of sustainable development. This is done by reducing the impact on the environment or achieving a more efficient and responsible use of natural resources, including energy and Zero waste. The aim this paper is evaluation to the perception of Zero waste in the context of ecological innovations in Slovakia. The research is carried out using the Kano model. The results point to the importance of addressing the issue of ZeroWaste, encouraging friends to buy in non-packaging stores and creating a stimulation of advertising to buy products in a non-packaging store. Other attributes of the given issue are perceived by Slovak respondents in the opposite way or have no influence on them. Therefore, it is important to provide sufficient information on this issue and to educate the population in order to increase their interest in this issue and to start behaving responsibly towards waste management.*

Keywords: innovation, Zero-waste, ecological innovations, Slovakia, Kano model, consumer perception.

JEL Classification: O31, O32, Q53, Q59.

1. Introduction

Eco-innovation is the facts of today and the trends of tomorrow. In this context, we can understand the issue of eco-innovation and the related issues of waste-free management or Zero Waste management.

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At present, the model of market dependence, high level of technology and mechanization dominate, leading to a high level of production and thus high capital investments creating innovations in various areas. Currently part of every economic policy as well as the factor that significantly affects the long-term competitiveness of individual economies, not only growth market, but also environmental sustainability, removing and preventing negative impacts of economic activities. Concerns about the state of the environment is reflected in the content focus of science and technology and innovation policies, where eco-innovation are becoming position that is more important.

Eco-innovation as a theoretical concept is beginning to penetrate social science research at the beginning of the first decade of the 21st century. Arundel and Kemp (2009) define eco-innovation as the production, application or use of goods, services, production processes, organizational structures, management or business models that are new to businesses or consumers and whose results are aimed at reducing environmental risks as well as pollution, negative impacts of resource use compared to existing alternatives.

Degradation of the environment offers a constantly growing demand for products that are environmentally friendly. One way of saving the environment are stores that offer purchase without recourse to one-off, mostly plastic packaging This issue is also known as Zero Waste.

Zero Waste starts with the purchase and ends with the appropriate processing of the generated waste. This is a lifestyle whose proponents try to minimize the generation of waste that cannot be further processed (recycled or composted). It maximally reduces the use of disposable supplies (ZeroWaste CZ, 2019).

There are several ways to achieve or at least approach zero waste. One of them is non-packaging shops. The possibility of packing in one's own containers is gaining more awareness in Slovakia.

The reason why more people are becoming interested in Zero Waste is the constant increase in waste. We recycle and sort only 29% of the total amount, which puts us at the bottom of the EU. Up to 61% of municipal waste ends up in landfills, causing pollution of soil, groundwater, surface water and air (ZeroWaste SK, 2017). In Slovakia, the total volume of waste produced in Slovakia last year reached 14.28 mil. tons, figure 1.

The total of up to a third more waste was generated in Slovakia than in the previous year. The total production of municipal waste reached 2 140 000 tons, which represents 393 kilograms of municipal waste per capita. Compared to other EU countries, however, we still produce relatively little municipal waste in Slovakia. The Union average was close to 500 kg of municipal waste per capita. Only three countries reported less waste per capita - the Czech Republic, Poland and Romania. Nevertheless, waste is still rising in Slovakia and measures need to be implemented

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to minimize it through eco-innovation. Nevertheless, waste is still rising in Slovakia and measures need to be implemented to minimize it through eco-innovation, as waste accounts for a significant share of global pollution. Zero Waste can be an economical alternative to waste management, where new resources are constantly required to replace the raw materials used.

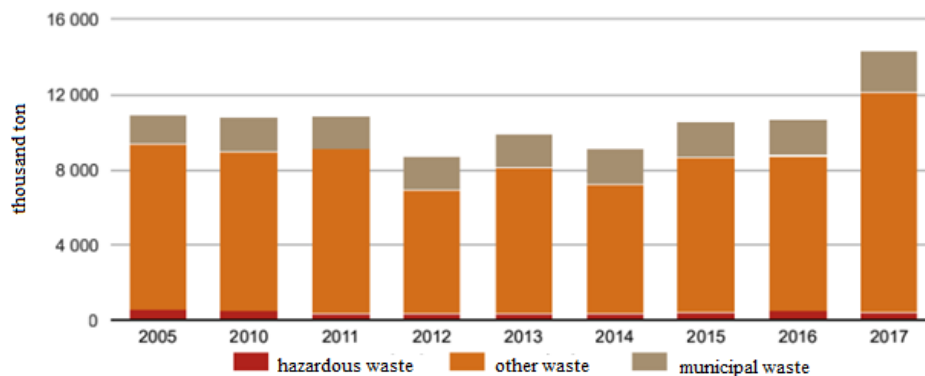


Figure 1 Waste in Slovakia
 Source: MŽP SR, ŠU SR, 2020

Such changes, innovation and creative thinking must become part of the innovation culture. Both businesses and consumers and society must live through innovation every day, otherwise their effect is minimal. However, this change is happening slowly, we cannot expect the society to accept innovation right away. It is about changing people's thinking and perception. Therefore, the aim of this paper is to evaluate the perception of the issue of ZeroWaste in the context of eco-innovation in Slovakia through the Kano model. This study examines whether Slovak respondents think ecologically and how well they know this issue. Because they have been actively hearing about the need to develop ecological activities for many years, while from an economic point of view we prefer solutions aimed at ensuring economic growth on the one hand and the sustainability and stability of the environment on the other.

2. Literature review

The connection of product innovation management within the entire innovation process and socially responsible business in the application of environmental protection, forms an environmental management system based on three pillars - environmental product performance, quality of innovation for the customer and added value of the product.

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The quality of the product, increasing the customer's standards by innovation, evaluates in particular the increasing customer comfort with use, safety and reliability of the innovated product. On the contrary, environmental impact assessments monitor the decreasing effects on climate change, efficient use of resources throughout the life cycle of an innovated product from research and development to its ecological disposal (Loučanová, 2016; Loučanová-Parobek, 2014; Straka, 2013; Štofková, 2013; Rudy, 2009).

All these innovation activities are a basic prerequisite for the commercial success of a business unit for the sustainable development of its business in a market economy, thus being connected with the commercial part of the innovation process, i. diffusion of eco-innovation into the market. Ecological innovations then represent an important dynamizing factor of every company and at the same time form a significant bridge between the present and the future of every company (Loučanová, 2016).

The economics of companies applying socially responsible business in the application of environmental protection is based on three principles of "3R" (Reduce - Reuse - Recycle), which are an economic code of conduct.

The principle of reduction is the orientation of the economy towards scientific and technological progress and innovation in order to make more efficient use of resources with the least possible use of raw materials and energy consumption. The principle of reuse means requiring the production of reusable products and packaging materials. Manufacturers and designers should give priority to designing products that are durable and reusable, thus extending their life cycle. The principle of recycling (Recycle) means at the end of the life of products and products to reuse them as available resources. The need to build and support the development of a recycling industry that returns waste and scrap (generated intermediates, raw materials and other materials) to the production process or other uses.

The concept of the "3R" model was subsequently extended to the "6R" model, which also takes into account the product's impact on the environment and sustainability (reduce, reuse, recycle, rethink, refuse, repair). According to (Alatervo, 2012), they are a superstructure of the original "3R" model to rethink and plan, reject and correct.

Think through (rethink) and plan the possibilities of development and solution of the given problem with the lowest possible consequences for the environment. Reject resp. not to accept activities (refuses) that are not the most suitable option for the environment, i. for example, considering the use of packaging that is not necessary.

Produce products (repair) that are easy to repair and thus prolong its life.

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The green design of eco-innovation, which includes a number of eco-based design departments conducive to sustainable development, is also derived from these aspects. The result of environmentally friendly materials and production processes - such as non-toxic alternative production - is the solution of the entire product life cycle from design to end of life, recycling, reuse or disposal without negative impact on the environment supporting the waste chain, which we also know as Zero Waste.

Zero Waste is a philosophy that allows resources to be redesigned so that all products are reusable. No waste is sent to landfills and incinerators. This recommended process is similar to that in nature.

The internationally recognized definition of Zero Waste adopted by the International Zero Waste Alliance reads as follows: "Zero Waste is an ethical, economic, visionary goal that leads people to change their lifestyles and practices to mimic sustainable natural cycles where all discarded materials are a source of other uses. Zero Waste means designing products and processes to systematically eliminate the toxicity of waste and materials and to preserve and restore all resources instead of being burned or buried in the soil. Using Zero Waste eliminates all leaks into soil, water or air that endanger the planet, humanity, animals and the health of the planet.

Zero Waste concerns the management and planning of approaches, which, unlike conventional waste disposal, emphasizes the prevention of waste generation. It is a systems approach that aims at a massive change in the way materials pass through society. The result is zero waste. Zero Waste involves more than just eliminating waste through recycling and reuse. It will focus on reorganizing the production and distribution system. Zero Waste is more than just a difficult goal or ideal, but it also has instructions on how to proceed with continuous work on waste elimination.

Zero waste will not be possible without considerable effort from these components. The industry has control over the product and packaging design, the main production process and the choice of material. Governments can then shape policy and provide subsidies to those who start more productive production and adopt a comprehensive waste management strategy. They can thus eliminate waste and not just sort it (Krása, 2016, Ipate et al., 2015; Madudová et al., 2018).

Zero Waste can be an economical alternative to waste management, where new resources are constantly required to replace the raw materials used. They can thus become an alternative to consumption, as they generate a significant part of the world's pollution.

The results of the research in this paper represent an insert from the point of view of a general overview and provision of information for the general and professional public in the field of waste-free chain in the context of eco-innovation in Slovakia.

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The results will clarify the perception of the innovative status and the size of the impact of ZeroWaste on the Slovak population.

3. Methodology and empirical data

The primary method of perceiving the issue of ZeroWaste chain in the context of eco-innovation in Slovakia was the Kano model. The methodology consisted of several steps: compiling questionnaire, questionnaire measures for gathering specifiable information, evaluation, processing the results in a matrix of a typology of perception for the issue of ZeroWaste in the context of eco-innovation in Slovakia by respondents and subsequent interpretation.

As the first step, it was necessary to compile questionnaire, which provided concrete questions–statements. The questionnaire consisted of pairs of positively and negatively conceived questions and statements. According to the methodological approach of the model, respondents had an opportunity to respond every question (statement to attributes) on a scale from 1 to 5 representing a strong agreement to strong disagreement with that question (statement to attributes) based on the draft. The statements to attributes examined were knowledge of Zero Waste, efforts to sort and recycle waste, efforts to give preference to organic products over non-organic ones, perception of shops without packaging as shops where customers shop without packaging, bring their own containers and thus save the environment, shopping behavior in non-packaging stores, information on non-packaging stores and their benefits is not widely available, availability of non-packaging stores today, attractiveness of packaging-free products, encouraging friends to buy in non-packaging stores, availability non-packaging stores in your area, perception without a packaging store, as stores with a higher price product and stimulation of advertising to buy products in a non-packaging store.

Subsequently, according to the set questionnaire measures, a survey was carried out. The sample of respondents was determined at a confidence level of 95%, the allowable margin of error +/- 5% with a standard deviation of 0.5 which represents 384.16 respondents, i. 385 respondents. 1128 respondents took part in the research, which fulfilled the sample of respondents and the results at the given level of significance, standard deviation and allowable range of errors are relevant.

Subsequently, the inquiry was made in person interviewed through the Kano questionnaire. The selection was targeted – we were interviewed 564 women and 564 men and 282 respondents in each age category.

Subsequently, a database of data for their processing and analysis was processed from the obtained data. Interpretation of the results was carried out using the Kano model cross rule to identify perceived ecological innovations by Slovak respondents as mandatory, one-dimensional, attractive, non-influential, and ambiguous or exactly opposite requirements placed on them, table 1.

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“From the point how respondents perceive ZeroWaste, the findings were included in the following categories:

M – are obligatory requirements that customers consider as normal and are automatically expected. These requirements can be identified as primary or basic and therefore. They only deal with customers in the event of non-compliance.

O – are one-dimensional requirements that are represented by those product attributes that lead to fulfilment and satisfaction in the event of non-compliance to customers dissatisfaction.

A – are attractive requirements that have a clear impact on customers satisfaction because it is a requirement that customers did not expect.

R – are contradictory or reverse requirements in some literature (Loučanová, 2016).

I – are requirements which do not have any influence on customers. They are also called irrelevant requirements.

Q – are sceptical requirements (Grapentine, 2015, Loučanová et al. 2020)”.

Table 1 Kano model

Customer Requirements	↓ →	Dysfunctional (negative) question				
		1. like	2. must-be	3. neutral	4. live with	5. dislike
Functional (positive) question	1. like	Q	A	A	A	O
	2. must-be	R	I	I	I	M
	3. neutral	R	I	I	I	M
	4. live with	R	I	I	I	M
	5. dislike	R	R	R	R	Q

Requirement is...
 A: attractive
 M: must-be
 R: reverse
 O: one-dimensional
 Q: questionable
 I: Indifferent

Source: Szmigin, Reppel (2004)

“Based on the Kano analysis, a weight of requirements was assigned. Each identified request is a value of 1. This value is multiplied by the weight according to the identified category. In case: "M" mandatory requirements weight is 3, "A" attractive requirements have weight 2, "O" one-dimensional requirements have weight 1, "I" indifferent requirements or have no effect have weight 0, "R" conflicting requirements have weight - 1, "Q" sceptics have a weight of -2 in different age categories and their sum. The size of the factor represents the weighted arithmetic average of the relative share of the identified requirements and their weights of individual examined parameters. Based on the sum of the values, we are able to compare the results” (Loučanová et al., 2020).

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4. Empirical results

Based on previous results from the Kano model, we arrived at a final analysis, which we will create by compiling a typology matrix. Using this analysis, we will find out the innovation status and the size of the impact of the Zero Waste in the context of eco-innovation on the given age categories in Slovakia, see Table 2.

Table 2 Basic data for compiling a matrix of typology of Zero-waste issues in the context of eco-innovation in Slovakia

Attributes examined / Age categories	15-26		27-45		46-60		61 and more	
	M	3	M	3	M	3	R	-1
Knowledge of Zero Waste	M	3	M	3	M	3	R	-1
Efforts to sort and recycle waste	R	-1	R	-1	R	-1	R	-1
Efforts to give preference to organic products over non-organic ones	R	-1	R	-1	R	-1	Q	-2
Perception of shops without packaging as shops where customers shop without packaging, bring their own containers and thus save the environment	R	-1	R	-1	R	-1	Q	-2
Shopping behavior in non-packaging stores	I	0	I	0	I	0	M	3
Information on non-packaging stores and their benefits is not widely available	I	0	I	0	I	0	M	3
Availability of non-packaging stores today	I	0	I	0	I	0	M	3
Attractiveness of packaging-free products	R	-1	R	-1	R	-1	I	0
Encouraging friends to buy in non-packaging stores	M	3	M	3	Q	-2	M	3
Availability non-packaging stores in your area	R	-1	R	-1	R	-1	R	-1
Perception without a packaging store, as stores with a higher price product	I	0	I	0	I	0	Q	-2
Stimulation of advertising to buy products in a non-packaging store	M	3	M	3	I	0	M	3
Innovation status	4		4		-4		6	
Knowledge of Zero Waste	33	3	60	3	38	3	50	-1
Efforts to sort and recycle waste	93	-1	90	-1	83	-1	75	-1
Efforts to give preference to organic products over non-organic ones	57	-1	58	-1	71	-1	50	-2
Perception of shops without packaging as shops where customers shop without packaging, bring their own containers and thus save the environment	80	-1	69	-1	46	-1	75	-2
Shopping behavior in non-packaging stores	42	0	43	0	33	0	75	3
Information on non-packaging stores and their	39	0	42	0	46	0	75	3
Availability of non-packaging stores today	41	0	49	0	58	0	50	3
Attractiveness of packaging-free products	72	-1	76	-1	50	-1	50	0
Encouraging friends to buy in non-packaging stores	37	3	51	3	38	-2	50	3
Availability non-packaging stores in your area	72	-1	78	-1	84	-1	50	-1
Perception without a packaging store, as stores with a higher price product	46	0	48	0	42	0	50	-2
Stimulation of advertising to buy products in a non-packaging store	48	3	46	3	29	0	50	3
Impact size	7		2		31		40	

For a summary of the attitudes of respondents according to age, we used matrix typology perception Zero Waste in Slovakia, which is shown in figure 2.

The matrix of the typology of perception of the issue of ZeroWaste in the context of eco-innovation in Slovakia from the point of view of the age structure of

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respondents shows that the highest innovation status in the Zero Waste in the context of eco-innovation is 61 and over. The innovation status for this age group is 6 and the impact size is 40. Age categories 15 to 45 have an innovative status of 4 with low impact. The negative innovation status is shown by the age category 46 to 60, where we identified it as a value of -4 with a high size of influence 31. We can assume that this age group, like the older age category, is aware of the need to address this issue and its importance, but as they are of working age, they do not have enough space to perceive them as much as the older generation, which causes their negative innovation status to this issue.

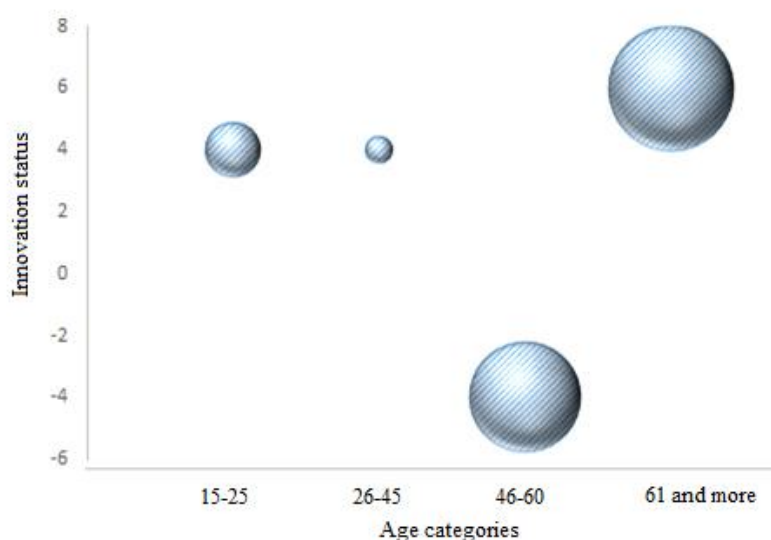


Figure 2 Matrix of typology of perception of Zero Waste issues in the context of eco-innovation in Slovakia

To a greater extent, we can state that Slovak respondents have the opposite attitude to this issue. However, they perceive knowledge of this issue and encouragement around to solve this issue as mandatory. It follows from the above that they are aware of the importance of this issue, but do not have enough information about it and therefore consider it a mandatory or necessary requirement to know this issue. They also perceive the availability of stores included in the Zero Waste chain in Slovakia as contradictory. In several cases, we have even identified ambiguous answers that suggest ignorance of the issue.

Based on the results, we can state that the innovation status, within the perception of the issue of Zero Waste in Slovakia, is relatively large, which mainly affects the knowledge of the issue. From the point of view of innovation status, Slovak

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respondents consider knowledge of the issue of Zero Waste, encouragement to buy in non-packaging stores and advertising incentives for such behavior to be mandatory requirements. This applies to age categories from 15 to 45 years. For the age group of 61 and over, they would welcome more information on this issue as a mandatory requirement. The least positive innovation status is shown by the age category 46 to 60, all activities and the perception of the given Zero Waste issue are perceived in the opposite way, which represents a negative attitude.

This finding is also confirmed by the research of Yam et al. (2005) and Helus (2015), which point to similar facts that younger age groups of respondents focus on information and warnings about possible problems.

It follows from the above that in the diffusion of the issue of Zero Waste in Slovakia, it is appropriate to focus mainly on the age category of 15 to 45 years as well as the age category of 61 and more years, which show a strong innovation status. However, where for the age categories 15 to 45, it is important to strengthen the impact of this innovation. Unlike the age group of 61 and over, where the impact of innovation is strong, it is important to inform about its benefits rather. However, the most important thing is to focus on the age category of 45 to 60 years, where a negative innovation status with a high impact is shown, which has an overall negative effect. Here it is all the more important to educate them and inform them so that they have enough information about this issue, which aims to increase their interest in this issue and to start behaving responsibly towards waste management.

5. Conclusions

By analyzing the data obtained using the Kano model, we came to the conclusion that the issue of Zero Waste in the context of eco-innovation in Slovakia is low compared to other EU countries, as the eco-innovation index of the Slovak Republic is below the EU average. The greatest importance of this issue is perceived by older age groups (61 and older), but they also feel the insufficient availability of Zero Waste in Slovakia and at the same time all age groups consider it mandatory to address this issue and pay sufficient attention to the environment. The results of the research point to the fact, as Helus (2015) describes in his work, that younger age groups focus more on information and point out problems, but the older age category also requires information on the issue, but focuses more on the benefits. From this we can state that it is this age category, 61 and older, is aware of the fact that it is not important to just sort the waste but it is important to eliminate it, as stated by Krása (2016).

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Author Contributions

Erika Loučanová elaborated chapters' literature review, methodology and empirical data, empirical results and conclusions.

Disclosure Statement

The authors declare no conflict of interest.

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