INTERCATHEDRA

4(49), 2021, 189–196

http://www.up.poznan.pl/intercathedra/
pISSN 1640-3622
eISSN 2545-2045

http://dx.doi.org/10.17306/J.INTERCATHEDRA.2021.00137
Accepted for print: 9.12.2021

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PERCEPTION OF ECO-INNOVATION FROM THE PERSPECTIVE OF PRODUCT LIFE CYCLE

Abstract. Eco-innovation presents a tool that helps companies transform environmental constraints into opportunities and advantages such as cost reduction, better reputation and benefit from new markets. This paper aims to evaluate the perception of eco-innovation in Slovakia and its relationship to the product life cycle. The research focused on the perception of basic requirements of the products, eco-innovation and enviro brands. The survey used the Kano model that allows getting customers' opinions regarding the requirements of the monitored object. To generalize the relationships among examined parameters, we applied satisfaction and dissatisfaction coefficients of examined parameters of ecological innovations. Based on the results, we can assume that the Slovak customers perceive ecological innovations in the initial phase of the life cycle. This means that innovators should support ecological innovation through marketing activities

Keywords: eco-innovation, life cycle, sustainability, green branding

INTRODUCTION

The scale of environmental problems and competitiveness challenges within the global economy increase the awareness of the need to change and renew existing technological production and social, behavioural patterns. Such awareness may produce innovative responses gradually leading to sustainability (Carrillo-Hermosilla et al., 2009; Könnöla et al., 2008). There are many innovative theoretical frameworks for achieving sustainability and competitive advantage based on coherence between dyadic and social contexts for the benefit of society and all stakeholders. This theory is further amplified by a synthesized explanatory basis, including a diverse mosaic of interdisciplinary ideas (institutionalism, non-institutionalism, viable systems approach, isomorphism and identity) to improve the performance of business and supply chains (Czinkota et al., 2014). The World Commission on Environment and Development defined sustainability as development that meets the present needs without endangering the ability of future generations to satisfy their own needs (Chabowski et al., 2011). The European Commission's project Measuring Eco-Innovation (European Commision, 2007) defined

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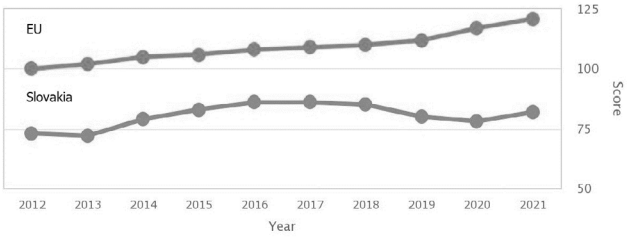

Fig. 1. Eco-Innovation Index 2012-2021, European Union (EU) and Slovakia
Source: retrieved via European Eco-Innovation Scoreboard Interactive Tool (European Commission, 2021).

eco-innovation as assimilation or use of a product, production process, service or management or business method that is new to the organization and that reduces environmental risks, pollution and other negative impacts of resource use compared to relevant alternatives or contributes to environmentally sound objectives sustainability (Klemmer et al., 1999). The Eco-Innovation Index illustrates the performance of eco-innovation in all EU Member States. It aims to capture various aspects of eco-innovation through 16 indicators grouped into five components: eco-innovation inputs, eco-innovation activities, eco-innovation outputs, environmental results and socio-economic results.

Slovakia ranked 23rd among the European Union countries in 2018 in terms of the eco-innovation indicator (Eco Index). Figure 1 shows a comparison in terms of the EU average. The strengths are eco-innovation activities, socio-economic results and environmental results with growing potential in environmental management. The weaknesses include eco-innovation inputs and outputs, mainly due to low public funding for environmental R&D and the lack of human resources in this area (Slovak Environment Agency, 2020).

Regarding the eco-innovation approach, the authors (Tiguero et al., 2013; Lee et al., 2015; Eiadat et al., 2018) state that the more innovative company is, the more environmentally friendly it is. Thus, effective management of both innovation and environmental issues assumes that a company with higher-quality innovation takes better care of the environment. Furthermore, some authors (e.g. Hua, 2011) identified equality and mutual benefit based on the relationship between eco-innovation and business performance. As Laperche and Picard (2013) presented, eco-innovation can serve as a tool for companies to transform environmental constraints into opportunities to reduce costs, gain a better reputation and benefit new markets. Therefore, marketing plays a vital role in implementing and promoting such initiatives, which brands can support to promote the value of sustainability for their customers, consumers and other stakeholders. This can be achieved through branding activities that emphasize sustainability practices and their impact on stakeholders. Furthermore, expressing sustainability measures as measurable and relative results and their connection with brands can further facilitate this integration of sustainability and brand building in society (Kumar and Christodoulopoulou, 2014). Therefore, it is necessary to redirect the attention of managers, which has been focused mainly on the effective creation of competitive advantages ensuring consumer preferences, to the implementation of activities that directly and positively impact sustainable development. This change should be evident not only in the case of eco-innovation and brands with a significant carbon footprint in the production process but also in brands considered traditionally as environmentally friendly.

There is a growing need to develop integrated models for creating and implementing sustainable brand management patterns focused on behaviourism in consumer shopping behaviour. Furthermore, there must be space to acquire new knowledge and formulate new postulates built on systematic and multidisciplinary approaches that form the core for sustainable development based on innovations that support sustainable growth and support them through brands (Wang and Shen, 2017; Liu et al., 2017; Loučanová et al., 2021). This leads us to set the evaluation of the perception of eco-innovations in Slovakia as this paper's goal.

MATERIALS AND METHODS

The research assesses the perception of eco-innovation and enviro brands using the Kano model. The Kano model aims to obtain the opinion of customers according to the requirements of the monitored object. The methodology consists of the following three basic steps.

1. Identification of investigated parameters

In this case, the research focuses on ecological innovations from the point of view of the following parameters:

- product price – the respondents' general attitude towards the cost of products in Slovakia as an amount that they must pay to obtain a good or service,

- the brand – the respondents' attitudes towards a brand representing a name, expression, sign, symbol, design or combination thereof intended to identify the goods or services of one seller or a group of sellers and distinguish them from the goods and services of competitors,
- the origin – the respondents' attitude towards goods in terms of identifying its provenance – the country or region of origin, the so-called economic nationality of the goods,
- Slovak products – the respondents' attitude towards the goods in terms of identifying its place of origin as Slovakia,
- the standards – the respondents' attitude to regulations determining certain values, properties, composition, production method, measurement, etc., of a product or service,
- environmental product safety –the respondents' attitude towards the relative safety of the society against products presenting environmental threats to society or individuals,
- eco-innovation importance – the respondents' general attitude towards the effort to protect the environment from the negative consequences of using goods and services to protect, alternatively to improve the current state of the environment to prevent the adverse effects that may be associated with its deterioration,
- eco-innovation origin – the respondents' attitude towards eco-innovation for business purposes in terms of identifying its place of origin,
- enviro brand – the attitude of respondents towards products and services that meet the given environmental criteria marked with the eco-label,
- Slovak products with enviro brand – the attitude of respondents towards products and services that meet the given environmental criteria marked with an eco-label, and Slovakia is their business place of origin,
- ecological innovation – the respondents' attitude towards products and services representing eco-innovation, i.e. any positive changes leading to a reduction of the environmental impact,
- eco-innovation availability – the respondents' attitude to the intuitively evoked idea of reachability and accessibility of eco-innovation in Slovakia,
- information on eco-innovation – the respondents' general attitude towards the availability of information on eco-innovation,
- eco-innovation advertising – the respondents' general attitude towards promoting eco-innovation and information about it focused on the potential market,
- eco-innovation price – the respondents' general attitude to the price of products representing eco-innovation in Slovakia as an amount they must pay to obtain eco-innovation of a product or service.

2. Compilation of the Kano questionnaire and determination of questionnaire measures

These parameters were elaborated in a constructed Kano questionnaire. Each examined parameter was addressed once by a positive and once by a negative statement. According to the Kano model methodological approach, the respondents had the opportunity to respond to each statement on a scale from 1 to 5 (1 represents a strong agreement, 5 – a strong disagreement with the question or statement). The survey was applied in Slovakia, and the sample consisted of 740 respondents.

3. Evaluation and interpretation

The answers were evaluated according to the cross rule, which allows placing the examined objects into the following categories according to how the respondents perceived these objects (Loučanová et al., 2021; Grapentine, 2015; Ducar et al., 2006):

- M (must-be requirements) – mandatory requirements that customers consider to be normal. They are expected automatically, and their fulfilment is reflected by customer satisfaction,
- O (one-dimensional requirements) – those attributes of the product whose fulfilment leads to customers' satisfaction and dissatisfaction in case of non-fulfilment. There is a direct linear relationship between meeting these requirements and customers' satisfaction, i.e. the higher the rate of compliance with these requirements is, the more satisfied customers are,
- A (attractive requirements) – they have a clear impact on customers' satisfaction as this is a requirement that the customers did not expect but find attractive,
- R (reverse requirements) – they are contradictory. The customers find them disagreeable because they necessitate taking further action,
- I (indifferent, irrelevant requirements) – they do not affect customer satisfaction or dissatisfaction,
- S – sceptical and questionable requirements.

The identified consumer requirements are divided into groups and redistributed with regard to the proportions of respondents' sample in percentage. The most represented group of requirements describe the resulting perception of the examined parameter or value.

The derived categorizations can be utilized further by aggregating them across all respondents using the customer satisfaction and dissatisfaction indices (Berger et al., 1993; Shahin et al., 2013; Beier et al., 2020):

$$\text{Consumer satisfaction} = \frac{\#A + \#O}{\#A + \#O + \#M + \#I} \quad (1)$$

$$\text{Consumer dissatisfaction} = \frac{\#O + \#M}{\#A + \#O + \#M + \#I} x - 1 \quad (2)$$

with #A, #I, #M, and #O being the categorization frequencies, i.e. the number of respondents who classified the offering as attractive, indifferent, must-be or one-dimensional.

The indices reflect the proportion of respondents for whom the existence or absence of an offering attribute influences customer satisfaction or dissatisfaction. Additionally, consumer satisfaction has a minus sign to emphasize the adverse effects on customer satisfaction (for historical reasons). For each offering, the satisfaction index is within the range of 0 to 1 and for customer dissatisfaction within −1 to 0. A value close to 1 of consumer satisfaction indicates a high proportion of customers among whom satisfaction can be generated. A value close to −1 indicates a high proportion of respondents among whom dissatisfaction can be generated. The scale means of 0.5 for consumer satisfaction or −0.5 for consumer dissatisfaction indicate whether the majority of respondents can be positively (or negatively) stimulated, yielding a two-dimensional grid with four quadrants:

Attractive offerings
if {0.5 ≤ consumer satisfaction ≤ 1 and 0 ≥ consumer dissatisfaction > −0.5
Indifferent offerings
if {0 ≤ consumer satisfaction < 0.5 and 0 ≥ consumer dissatisfaction > −0.5
Mandatory offerings
if {0 ≤ consumer satisfaction < 0.5 and −0.5 ≥ consumer dissatisfaction ≥ −1
One-dimensional offerings
if {0.5 ≤ consumer satisfaction ≤ 1 and −0.5 ≥ consumer dissatisfaction ≥ −1

The respondents classify the offering as reverse (category R, frequency #R) or questionable (category Q, frequency #Q). However, those are not reflected in the consumers' satisfaction and dissatisfaction indices and the table because only respondents with "strong" assessments are considered. Afterwards, the relationship between the perception of eco-innovation and enviro brands related to the life cycle was graphically represented using the inductive-deductive method.

RESULTS AND DISCUSSION

The research results (see Table 1) concerning the perception of eco-innovation and enviro brands in the context of sustainable development point to the perspectives indicated below. Slovak respondents in the case of a brand, standards, enviro brand, Slovak products, Slovak products with enviro brand and advertising of eco-innovation are more satisfied the higher the extent of compliance with these requirements is. We illustrate these requirements as one-dimensional. Product price and ecological innovation appear to be attractive requirements for Slovak respondents. The respondents do not expect these parameters in product and therefore find them very attractive, leading to their great influence on the shopping behaviour.

On the contrary, the Slovak respondent perceives the price of eco-innovation negatively. Other examined parameters (the origin, environmental product safety, eco-innovation importance, eco-innovation origin, eco-innovation availability and information on eco-innovation) do not influence the respondents' decisions.

Figure 2 illustrates previous findings. The parameters represented by individual ecological innovation are positioned with respect to their customer satisfaction and dissatisfaction values. The four quadrants visualize the respondents' majorities divided into mandatory, one-dimensional, attractive and indifferent requirement categories.

If we consider the perceived quality of attributes in accordance with the life cycle – they go from sceptical, through indifferent, attractive, one-dimensional to mandatory quality attributes. At this point, the customer may find a quality attribute attractive but may make it mandatory in the future. Therefore, to finalize good creation of innovation management, the firms should primarily aim for the development or innovation of the product that considers the product life cycle (Fig. 3).

Table 1. Evaluation of the perception of base requirements concerning products, eco-innovation and enviro brands

	Parameters	Satisfaction coefficient	Dissatisfaction coefficient	Requirements
Products	Product price	0.6096	–0.3542	A
	The brand	0.6089	–0.6243	O
	The origin	0.4195	–0.4127	I
	The standards	0.6217	–0.5965	O
	Slovak products	0.5257	–0.7135	O
Eco-innovation and enviro brands	Environmental product safety	0.3380	–0.3478	I
	Eco-innovation origin	0.3982	–0.3092	I
	The origin of eco-innovation	0.4515	–0.2621	I
	Enviro brand	0.6606	–0.5844	O
	Slovak products with enviro brand	0.4950	–0.5167	O
	Ecological innovation	0.5806	–0.2243	A
	Eco-innovation availability	0.4941	–0.4985	I
	Information on eco-innovation	0.4390	–0.4421	I
	Eco-innovation advertising	0.4762	–0.1775	O
	Eco-innovation price	0.4318	–0.5414	S

Source: own elaboration.

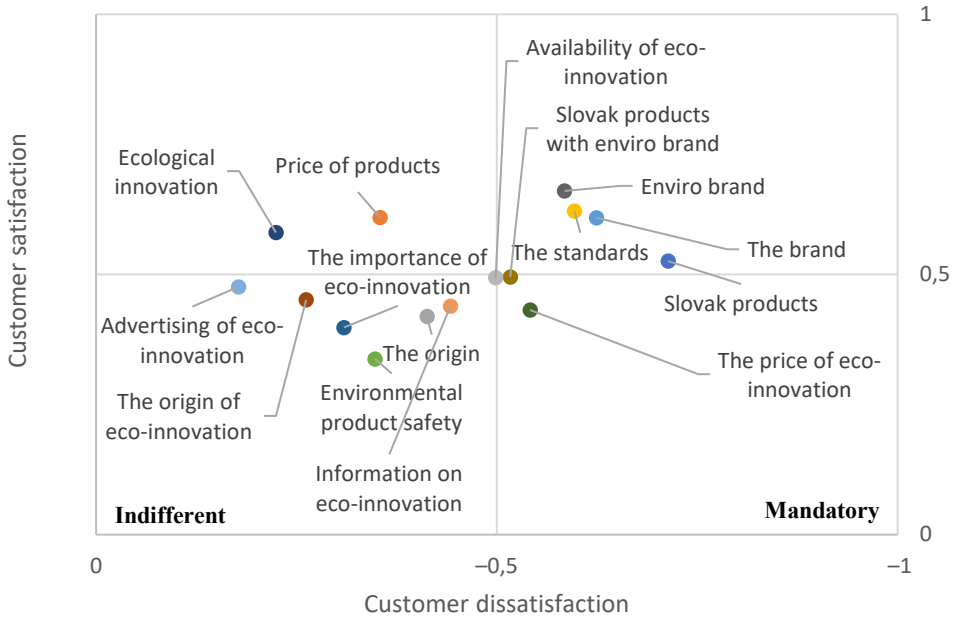

Fig. 2. View of the overall assessment of ecological innovation
Source: own elaboration.

Based on the results of the Kano model projected subsequently into the life cycle curve, we can assume that ecological innovations are perceived in the initial phase of the life cycle in Slovakia. Therefore, they do not influence the respondents significantly.

Based on these results and the definition of sustainable development by the World Commission on Environment and Development, there is a need to create and/or maintain dyadic consonance while respecting contextual needs (Cox, 1999; Darnall et al., 2008). In this regard, Lindgreen et al. (2012) refer to the new brand concept of a socially responsible business based on sustainability as an integral part of the strategy. Fare et al. (1994) and Picazo-Tadeo et al. (2014) stated environmental behaviour changes in proportion to ecological changes. Thus, eco-innovation and eco-brand can serve as a tool for companies to transform environmental constraints into opportunities and gain a better reputation and benefits of new markets. The performance of ecological product innovations is one of the key issues that interest the customer. The results show that respondents perceive eco-innovations at the beginning of the product life cycle. At the stage of launching a product on the market, massive marketing support is typical. Therefore, we recommend that innovators focus on supporting eco-innovation through targeted marketing communication.

This paper has theoretical and practical benefits in the form of recommendations for innovators regarding ecological innovation. They can be reflected in the performance of companies and their investment decisions, as stated by Ipate et al. (2015). As for the supply side, Lesákova et al. (2017) studied the Slovak enterprises and summarized that they suffer from a lack of financial sources to innovation, which significantly reduces their innovation activity; yet, the major obstacle lies in bureaucracy and corruption. This is based on the Slovak SMEs' experience gained while raising money and developing innovation activities.

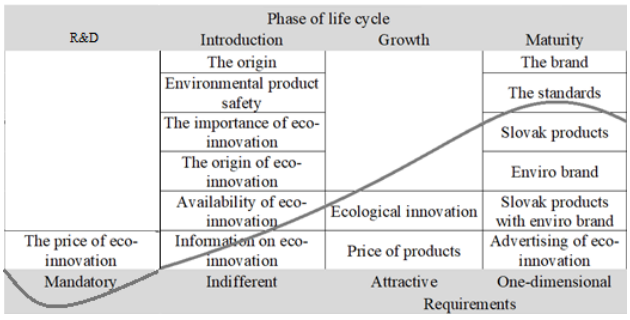

Fig. 3. The perception of eco-innovation and their relations to the product life cycle
Source: own elaboration.

CONCLUSIONS

Nowadays, markets show intense competition where innovation represents an important tool for achieving a competitive advantage. Therefore, it is significant to redirect companies and their focus on the real implementation of activities that directly impact sustainability. From the customers' point of view, eco-innovation and their brands present a tool that differentiates individual companies from their competition. It can be perceived as a competitive advantage because promoting environmental product innovation is one of the vital interests of society. Moreover, customers in Slovakia perceive them in the initial phase of the life cycle.

ACKNOWLEDGEMENTS

The authors would like to thank the Scientific Grant Agency of the Ministry of Education, Science, Research and Sport of the Slovak Republic and the Slovak Academy of Sciences, grant number 1/0674/19, "Proposal of a model for the eco-innovation integration into the innovation process of companies in Slovakia in order to increase their performance."

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POSTRZEGANIE EKOINNOWACJI Z PERSPEKTYWY CYKLU ŻYCIA PRODUKTU

Abstrakt. Ekoinnowacje stanowią narzędzie, które pomaga firmom przekształcić ograniczenia środowiskowe w możliwości i korzyści, takie jak redukcja kosztów, lepsza reputacja i korzyści na nowych rynkach. Celem artykułu jest ocena percepcji ekoinnowacji na Słowacji i ich relacji do cyklu życia produktu. Badania koncentrowały się na percepcji podstawowych wymagań wobec produktów, ekoinnowacji i marek ekologicznych. Badanie zostało zrealizowane za pomocą modelu Kano, który umożliwia uzyskanie opinii klientów na temat wymagań monitorowanego obiektu. Do uogólnienia zależności między badanymi parametrami zastosowano współczynniki zadowolenia i niezadowolenia z badanych parametrów innowacji ekologicznych. Na podstawie wyników można przyjąć, że innowacje ekologiczne są postrzegane przez słowackich klientów w początkowej fazie cyklu życia. Oznacza to, że przedsiębiorcy powinni wspierać innowacje ekologiczne poprzez działania marketingowe.

Słowa kluczowe: ekoinnowacje, cykl życia produktu, zrównoważony rozwój, marki ekologiczne