

THE DEVELOPMENT OF THE INNOVATION STATUS AND IMPACT OF SMART PACKAGING ON SLOVAK CONSUMERS

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Abstract: The decision about packaging belongs to the most substantial product characteristics. It has impact on the quality of food as well as shopping preferences of consumers. Because the significance of packaging keeps increasing, companies need to take a more innovative approach to packaging policy in the context of ecological innovations. The food packaging industry is largely subject to change from passive to innovative packaging resulting in making the smart packaging. The producing companies, processors of food, logistic operators as well as consumers constantly ask for more innovative packaging (smart packaging) to make products that fulfil standards in the area of quality, safety or identification of products within the logistic chain. The research of understanding and attitudes towards smart packaging as well as evaluation of its utility and requirements was used by the Kano model concept. The aim of the paper is to determine the development of innovation status and the impact of smart packaging on consumers in different age categories in Slovakia. The results show the positive impact of smart packaging on Slovak customers. Innovation status of smart packaging among Slovak customers in determined age categories has increased during the monitored period and younger respondents evaluate the smart packaging as an added value of the product. This added value of smart packaging supports the smart logistics to make the whole logistic chain more effective to develop a decentralized database storing the constantly increasing number of various records, such as product movement or its quality.

1 Introduction

The issue of foods packaging is a significant sphere during the processing of food [1] and nowadays it is essential to make changes in this area, especially to make it from inactive to more innovative. The new requirements in packaging should meet global trends, advances in the technological area and requirements of consumers [2-4]. Traditional packaging of food is created to eliminate the negative impacts of the environment on the product [2]. On the other hand, innovative packaging is aimed to raise the consumer's life standards through improved nutritious, health features of the product offered in more attractive design. Non-traditional packaging functions prolong durability, improve quality, safety of food products and make them also environmentally friendly [5-7]. They consequently reduce the number of complaints from sellers and consumers [8].

Therefore the aim of this paper is to determine the development of the innovation status and the impact of smart packaging on consumers in different age categories in Slovakia.

2 Smart packaging

Conventional theories of packaging divide the main packaging functions into four elementary categories: protective, convenient, communicative and containing [9,10]. Innovative smart packaging is the output of original, unconventional and creative thinking except the usual structure of mind [9,11] leading to the production of interactive features of the packaging. Basically, there are distinguished two groups of such packaging systems:

- active packaging,
- intelligent packaging.

The traditional understanding of protection function of the packaging presents it as an inactive barrier between product and product's environment. Regarding active packaging, the protective function of the packaging is focused on active protection of the product [9] that leads to extended shelf life or improved food safety while keeping the high quality of the food [12]. It can be obtained through smart package removal of negative impacts of environmental on food product quality [13]. Hopeful trend in wood processing industry is based on the smart packaging materials using incorporated antimicrobial agents [14]. Regarding the definition of active packaging materials we can divide them into groups following the

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way they influence the product's characteristics. Absorbers are understood as active packaging systems based on absorption and emitters and active packaging systems are based on the substances release [15,16].

Intelligent packaging can be described as a packaging system which allows carrying out intelligent functions, e. g. to verify, detect, record, trace, communicate, and apply scientific logic. These functions make easier decision leading to extended shelf life, enhanced safety, improved quality, information, and finally it highlights potential problems [9].

By Kačenač [12], the smart packaging is the term indicating systems aimed at monitoring conditions related to the product and thus providing information about the food quality - during transportation as well as storage. The smart packaging enables to recognize indicators of time-temperature, oxygen and carbon dioxide, temperature, pathogen and breakage [16]. The significance of smart packaging is especially related to considerable increase of importance of protective and information function of packaging.

Protective function of packaging is more important especially in active packaging which is obvious in its change from passive to the active product protection. Information function concerns smart packaging providing information about conditions of packing [17-20]. The smart packaging brings continuous information on the product condition. Packaging integrity is not the advantage just for the customer. It also enables to detect differences in the whole supply chain, from farmers to customers. It clearly results in reduction of food loss and waste and prevention of unnecessary transport and logistics. It presents more efficient as well as safer supply chain [21]. Basically, we can state that smart packaging is able to support better logistical handling and logistic costs decrease. Its other advantages are improved control of quality of packaging and contents, improved safety during use of packaging, improvements in production of packaging, improvement in re-use and recycling of packaging [22].

Previous studies described packaging as an essential needful part of the product; current studies point to its change to product's wantable component [23,24]. However, packaging creates the first impression influencing the willingness to buy a product, therefore it should be functional as well as user-friendly. Moreover, it should be simple to use, provide substantial information and be suitable for storage [25]. Another important issue are consumers' attitudes towards smart packaging that are different in various countries. Smart packaging materials are more popular and accepted by consumers in the US, Japan or Australia. On the other hand, they are not so popular and preferred in European countries [26]. This could be partially caused by differences in individual cultures or by lack of understanding of their advantages. Only a few products packed this way are offered in the market compared to the number of options mentioned in

the literature, but it is likely these disproportions will be solved and smart packaging soon becomes generally available [27]. Over the last 20 years an important improvement in active packaging systems has been observed. Some packaging concepts that belong to this category have been used for a long time, but only in the last 20 years systematic research has been applied [13].

However, customers must be better informed about the intention and usage of a smart packaging system to obtain its wider use and higher acceptance by consumers. A report from Europe Active and Intelligent Packaging Market [28] shows that there has been a remarkable increase in this area and is assumed to increase to a great extent by the end of 2020 because of increasing demand for products with smart packaging. This fact is caused by changes in lifestyle and the request of manufacturers for longer shelf life.

Prasad & Kochhar [29] indicate that smart packaging offers a significant potential as a marketing tool. However, this type of packaging progress and introduction depends on the acceptance and effectiveness of cost for both industry and consumers.

This is the main reason why understanding of consumer attitudes towards the new generation of packaging is a necessary source of information for producers during marketing strategies making that are focused on new goods designs and their location on the market [30].

3 Methodology

To meet the given aim of the paper the Kano model was used. The model allows to determine customers' opinions regarding the requirements on the researched object. The method of identifying specific customer requirements is based on the elementary steps of the Kano model questionnaire [31], taking into account the dependence between the significance of the individual features of the chosen object, in this case smart packaging, and the satisfaction of the customer.

The research validity was defined by the methodology focusing on the calculation of respondents' sample [32]. It was given at a confidence level of 95%, a tolerance error of +/- 5% of the standard deviation of 0.5. At the given data it represents the value of 384.16, i.e., 385 respondents. The research was realized in September and December 2017 as well as the same time next year 2018 to identify the development of the innovation status according to the annual changes in the attitudes of respondents. There were asked 552 respondents. Regarding a confidence level, standard deviation, and margin of error we can consider the results to be relevant. The representative sample in terms of age was represented by 4 age categories equally: 15-26 years, 27-40 years, 41-60 years and 61 years and older. All determined age categories were equally represented.

Through interviews with experts in the given field, there were identified research attributes (parameters) for: the concept of intelligent and active packaging, their availability, awareness, functionality, voice performance,

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attractiveness of packaging, advertisement, freshness indicators and price.

The received responses to the positively and negatively asked question are evaluated according to the Kano cross rule to define the requirements for smart packaging as a research object, according to Ducár et al. [33] and Ullah & Tamaki [34] into Mandatory requirements (M), One-dimensional requirements (O), Attractive requirements (A), Reverse requirements (R), Irrelevant requirements (I) and Questionable requirements (Q).

The categorized customer requirements are stated in percentages. The highest percentage category defines the particular category of the researched attribute of packaging. Thereafter the innovation status is computed as the amount of points set to the individual identified categories of parameters examined in accordance with the above methodology, where M = weight 3, A = weight 2, O = weight 1, I = weight 0, R = -1 and Q = weight -2. The weights of the individual requirements were assigned according to the importance of the requirements of the Kano model [31]. Subsequently, the innovation status was calculated as the sum of the weights of the individual requirements and the impact of the factor size for every age category is calculated as the weighted average of each percentage of the resulting parameter of the specified customer requirements identified by the Kano model (the factor size is presented in positive values and therefore in

the case of the influence of reverse requirements on its resulting value it is multiplied by -1).

The results for individual age categories are shown in the innovation perception typology matrix, which illustrates the impact of the studied innovation on individual age categories.

4 Result and discussion

Under the influence of global changes and improvement, considerable changes are apparent in the attitudes toward packaging materials. The changes are also on consumers' approaches to the product packaging and favourite functions. Innovative packaging is the output of original, unconventional and creative thinking extending beyond the ordinary thinking limits. In the paper we researched a perception of smart packaging as innovation, its availability, evaluation of its functionality and other requirements by using the Kano model, based on the assumption, that new products do not have equal success in the market [35]. Some products are accepted by consumers almost immediately whereas others need much time to get consumers' appreciation. Even a very successful innovation can end in failure because consumers are unaware of it [36].

The results of our research indicate that smart packaging has various impacts on consumers in different age categories (Table 1).

Table 1 The smart packaging perception in different age categories and the innovation status

Age / Parameters	15-26		27-40		41-60		61 and more	
	Requirements	Point	Requirements	Point	Requirements	Point	Requirements	Point
Concept of intelligent and active packaging	A	2	A	2	I	0	R	-1
Availability	I	0	I	0	I	0	I	0
Awareness	R	-1	I	0	R	-1	R	-1
Functionality	O	1	I	0	I	0	I	0
Voice performance	I	0	I	0	I	0	I	0
Attractiveness of packaging	I	0	I	0	I	0	I	0
Advertisement	I	0	I	0	I	0	I	0
Freshness indicators	Q	0	Q	0	Q	0	Q	0
Price	I	0	R	-1	I	0	R	-1
Innovation status*	2		1		-1		-3	
Age / Parameters	15-26		27-40		41-60		61 and more	
Concept of intelligent and active packaging	30.02	2	38.5	2	37.63	0	36.97	-1
Availability	55.20	0	46.52	0	51.55	0	56.10	0
Awareness	50.24	-1	42.25	0	46.91	-1	46.67	-1
Functionality	27.32	1	60.97	0	59.79	0	61.82	0
Voice performance	51.14	0	58.29	0	55.15	0	57.58	0
Attractiveness of packaging	47.06	0	52.40	0	52.06	0	49.70	0
Advertisement	47.51	0	56.15	0	45.88	0	49.09	0
Freshness indicators	32.58	0	31.55	0	43.30	0	35.15	0
Price	52.94	0	43.32	-1	44.33	0	53.33	-1
Factor size*	4.12		3.74		5.21		15.22	

*Innovation status is calculated as the sum of weights of the researched parameters

Factor size is calculated as the weighted average of each percentage of the resulting parameter of the specified customer requirement identified by the Kano model (in the case of the negative value of the factor size, the result is multiplied by -1)

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In Slovakia the consumers' knowledge of smart innovations is still very low. Consumers do not positively evaluate its features. This fact is apparent in particular from the frequency of identified irrelevant (I), questionable (Q) and reverse (R) requirements by the Kano model (Table 1).

The positive perception and attitude to the concept of smart packaging is evident in the age category 15 to 26 and then 27 to 40 years. For these consumers smart packaging is attractive. On the contrary, these innovations are differently perceived by the elderly respondents. The age categories 41-60 and especially older respondents are

specific by experiencing such innovation with negative satisfaction. With increasing age the innovation status shows a downward trend (Figure 1). The research results have clearly confirmed the theoretical basis noting consumers' fears of innovation, especially more in terms of technical innovations [37]. These findings are consistent with Loučanová et al. [17,38,39], O'Callaghan & Kerry [5] and Brook Lyndhurst Ltd. (2009 In [5]), Dopico [40] who consider older people to be more worried, less-positive and more likely they feel fewer advantages connected with smart packaging technologies.

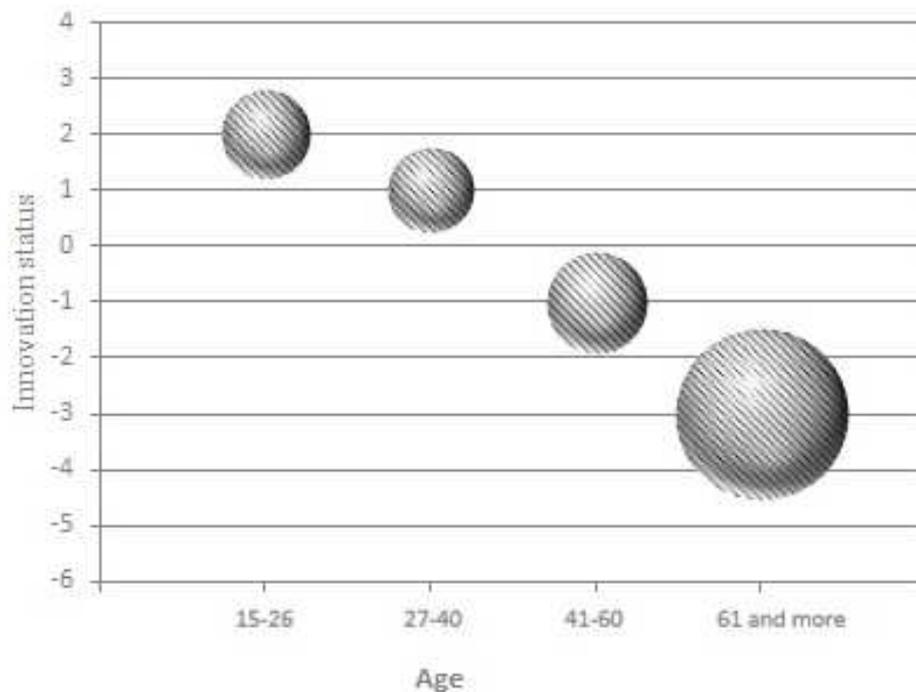


Figure 1 A typology matrix of smart packaging perception by respondents in Slovakia (2018)
Source: Research results

Nevertheless, the research results indicate low understanding of smart packaging, it is interesting to monitor the innovation status development according to the annual status change for the years 2017 and 2018 (Figure 2), indicating a significant change in the perception of this issue.

Continuously for the youngest monitored age category (15-26 years), smart and active packaging is still attractive. While retaining the innovation status at the same level, the impact of smart and active packaging has changed. It signifies the acceptance of this innovation by a still larger percentage of consumers in this age category. Constantly for this age group, this kind of innovative packaging is still attractive with clear positive impact on customers'

satisfaction. The most important and interesting shift of innovation status is in the age category 27-40 years, representing a significant change from the previously negative to the positive innovation status. It means wider acceptance of that kind of innovation and positive improvement of consumers' attitudes.

Nevertheless, the innovation status of smart packaging in the age category 41 years and older is still negative, a significant positive shift is seen mainly according to category 41-60 years, which means that a higher percentage of customers in this age category perceives them more positively. These changes indicate gradual learning and awareness about active and smart packaging issue also by elder people.

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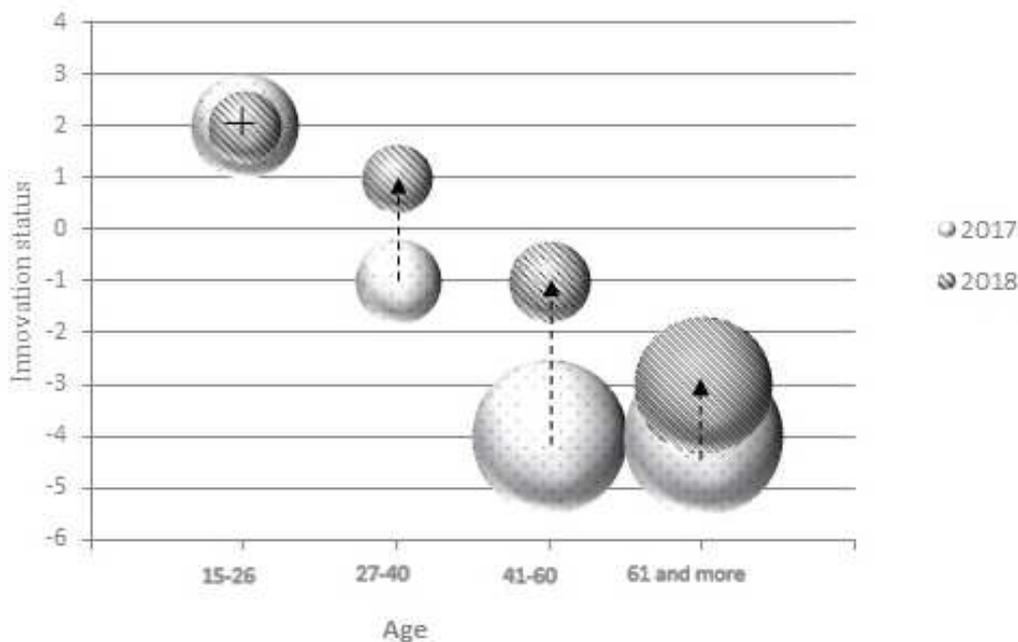


Figure 2 A typology matrix of smart packaging perception by Slovak respondents – the annual change 2017-2018
Source: Research results

The results comprehensively point to a positive shift in the evaluation of smart packaging by Slovak consumers. Therefore, it is very important to constantly inform and disseminate awareness of this issue, as increasing awareness of such innovations could ensure a more positive approach of the customers to the given innovations [41,42], because as Rogers [37] says, the customers are accepting the innovation when they feel no threat at all (it is in the case they are sufficiently informed) and, basically, that innovation will become a tradition. Also, according to Odeck & Bråthen [43], Frischer et al. [44] Parobek et al. [45], Straka [46,47] it is often the case people have a really negative attitude towards the innovations because the lack of proper information and clear explanation. This is the reason why companies must comprehend the customer's requests, preferences and attitudes and then to find the right way how to communicate with customers. The positive detection of the research is seen in a fact that respondents are interested in the concept of smart packaging, even in cases when they do not have any experiences with these specific products. This is the potential for demand for smart packaging in Slovakia. In the future, this support the development of products with smart packaging that can be considered as a smart system when it becomes part of an a control or feedback mechanism in relation to its usage environment (Improved logistical handling and reduction of logistic costs, control of quality of packaging and contents, improved safety during use of packaging, improvements in production of packaging and improvement in reuse and recycling of packaging) [22]. Effective operating on the market is not possible without innovation in the packaging within the integrated

innovation process on the market as well as without suitably organized logistics. Suitably organized logistic chains represent increased chance to survive in the hypercompetitive environment through innovation. Based on the aforementioned information it is obvious that the basic role of smart packaging in the logistics is to arrange complex solutions of transportation processes in all aspects and mutual relations of the innovation packaging. It is also essential to keep consistency among the smart logistics, economy and business [48,49]. Benefits of smart packaging are clear. However, there are still questions that must be solved before packaging of this type spreads widely [27]. The issue of smart packaging is very attractive from the point of view of consumers and it makes them curious. Their interest can be used when creating the marketing strategy of products using smart packaging. We agree with the statement of Chukhray [35], that the accomplishment of innovation significantly depends on the ability to predict consumers' response to it.

5 Conclusion

Regarding the results we can state that the companies are interested in making packaging more innovative and creative. The selection of adequate packaging material is an extremely important task, too. In the future, smart packaging represents an opportunity to become a competitive advantage of products that are able to fulfil customers' needs and so to increase their satisfaction. Diffusing and managing of innovation certainly cannot exist without research of customers' opinions because innovation acquiring is definitely an important factor for innovation success. In this paper we wanted to point out

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that consumer preferences and attitudes to the innovation in the form of smart packaging vary according to the factor age and knowing which packaging attributes and factors can determine consumer attitudes leads to better understanding of consumers and influencing behaviour towards innovation in the desired way. To conclude, we pointed out a positive shift in the opinions on smart packaging by Slovak consumers, what identifies with global trends (Stora Enso 2014 [50]; RISE – Sweden's Research Institute 2018 [51]) regarding a clear future demand for innovative packaging and a great need for smarter packaging.

The results also indicate the positive impact of smart packaging on Slovak customers, as the innovation status of smart packaging among Slovak customers in the given age categories has increased over the course of one year. Smart packaging is perceived as an attractive. Moreover, younger age category evaluates the functionality of smart packaging as an added value compared to the product perception as a concept.

This positive perception of the added value of smart packaging can be reflected in the technological development of block chain, which ensures product tracking and evaluation to make the whole logistic chain more effective within the development of innovation and eco-innovation.

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Review process

Single-blind peer review process.