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Environmental innovation of packaging in Czech chemical companies

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Chemical companies are currently under the increasing pressure to enhance the sustainability of packaging for the products intended primarily for final consumers. To identify the extent of the implementation of environmental innovations in packaging, motivators thereof and barriers associated therewith, quantitative research was carried out among 26 Czech chemical companies. It has been found that the most common environmental innovations of packaging focus on the introduction of packaging made from biodegradable or recycled materials. However, it is innovations that allow savings in packaging materials that are considered successful. The main motivating aspect for the introduction of environmental packaging innovations is the expected growth in value for the customer(s). The biggest barriers include the fear that customers will not accept raised prices of innovated products and the incompatibility of packaging with its content.

Keywords: Environmental innovation; Packaging; Chemical industry

Introduction

In the recent years, Czech producers of consumer goods, and thus also producers of consumer chemical products, have come under considerable pressure to increase the sustainability of the packaging of their products. For them, this often means both making the effort and covering the costs associated with these environmentally oriented innovations. On the other hand, it is possible to appreciate the effort and costs spent by providing a higher value, especially for

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customers thinking environmentally [1] and subsequently also in communication on the increasing corporate social responsibility towards customers as key stakeholders [2].

Chemical companies have already begun to implement sustainable approaches to packaging their products [3]. In particular, they seek to reduce the amount of packaging material [4,5], replace currently used material (e.g. plastic) with more ecological material [6,7], introduce reusable packaging [8], or even completely eliminate primary packaging by selling their products in zero waste stores [9].

The chosen variant of packaging innovation is usually directly related to what the main motivator of these innovations is to be about. In addition to the development of legislation and efforts to satisfy customer requirements, these also include fulfilling the company's goals and strategies, cooperating with the external partners, improving product functionality, reducing costs [10,11] or increasing the company's profit [12,13].

However, none of the chosen packaging redesign strategies can do so without overcoming barriers. There can be many [14]. Reducing the functionality of packaging, increasing the production costs [11] and, also, concerns about how the change in packaging will affect the behaviour of immediate customers (retailers) and/or end customers [11,13] are considered the basic barriers to the implementation of environmentally oriented packaging innovations.

The issue of environmentally oriented packaging innovations in Czech producers of consumer chemicals has become the subject of primary research. Its basic goal was to identify:

- environmental innovations in packaging that have been implemented in companies in the last 5 years,
- the most successful environmental innovations in packaging that have been implemented in companies in the last 5 years,
- the main factors that motivate companies to implement environmental packaging innovations, and
- the main barriers to the implementation of environmental packaging innovations.

Research methodology

To achieve the goals defined above, quantitative research was carried out in Czech chemical companies. Data were collected by electronic surveying, using the method of random selection. The selection was based on the Administrative Register of Economic Entities [15], from which 200 enterprises with the main branch of economic activity CZ-NACE 20+ (manufacture of chemical substances and chemical preparations) were selected adventitiously. In the period from

3 March 2020 to 27 March 2020, the general manager of the company or the sales department of each company was contacted by e-mail with a request to participate in the research and to fill an electronic questionnaire or, eventually, forward it to a suitable respondent from the company. During the survey, the representative of each company was contacted twice.

The suitability of a palette of companies included in the research was verified *ex post* on the basis of the area of business as being specified by the respondents in the first point of the questionnaire. (Note: the production of consumer chemical products was required.) After the exclusion of inappropriate respondents or incorrectly filled out questionnaires, 26 questionnaires were submitted for further analysis (return rate 13 %). Descriptive statistics methods (multiple response analysis) were used in the data analysis.

Results of the research

In the first part of the research, respondents were asked to specify all the innovations that have been successfully introduced in the packaging of their products in the last 5 years. From these innovations, they subsequently selected one that they, by themselves, consider to be the most successful in terms of costs incurred and the benefits obtained. Since more frequently implemented innovations seem to have a better chance of being regarded as the most successful ones, a relative indicator has been constructed to evaluate the success of the innovation, which compares the frequency of each innovation being regarded as most successful with the frequency of companies in which the innovation has been implemented. Table 1 contains the results of the frequency analysis of implemented innovations and their perceived success.

The table also shows that environmental innovations in packaging have been implemented in the last 5 years in most of the companies contacted (77 percent of companies). The respective business transactions most often sought to mitigate the environmental impact of packaging by changing the type of packaging material (38 percent of companies) and introducing packaging made of 100% recycled materials (35 percent of companies). On the contrary, the least implemented were the product innovations reducing the required amount of packaging material (15 percent of companies), introduction of returnable packaging (15 percent of companies), and introduction of zero waste products (12 percent of companies).

The introduction of high-volume product packaging with its redesign reduces the required amount of material (success rate of 67 percent in both cases), which belongs amongst the most successful environmental innovations. In contrast, the introduction of reusable packaging in consumer households and the maximization of the space used inside the existing packaging have not been identified as the most convenient way in any case.

Table 1 Types of implemented innovations and their success rate

Innovation	Number of companies with implemented innovation		Number of companies with the most successful innovation	Success rate[a] [%]
	Absolute	Relative [%]		
Changing the type of packaging material to a more environmentally friendly material	10	38	1	10
Introduction of packaging from 100% recycled materials	9	35	4	44
Introduction of more easily recyclable packaging	6	23	1	17
Packaging redesign that reduces the required amount of packaging material	6	23	4	67
Introduction of high-volume product packaging	6	23	4	67
Introduction of reusable packaging	6	23	0	0
Maximizing the use of space inside the existing packaging	5	19	0	0
Product innovation that reduces the required amount of packaging material	4	15	2	50
Introduction of returnable packaging	4	15	2	50
Introduction of zero waste products	3	12	1	33
No innovation	6	23	x	x

[a] Quotient of the number of companies that identified the innovation as the most successful and the companies that implemented the innovation

In the second part of the research, the main motivating factors and barriers to the introduction of these packaging innovations in the company were identified. In both cases, respondents were asked to identify a maximum of three variants in a pre-specified list of motivators (or barriers) with the possibility to identify other ones that are not included in the original list. A comparison of the frequency of motivators and barriers to the implementation of innovation in the company is shown in Figures 1 and 2.

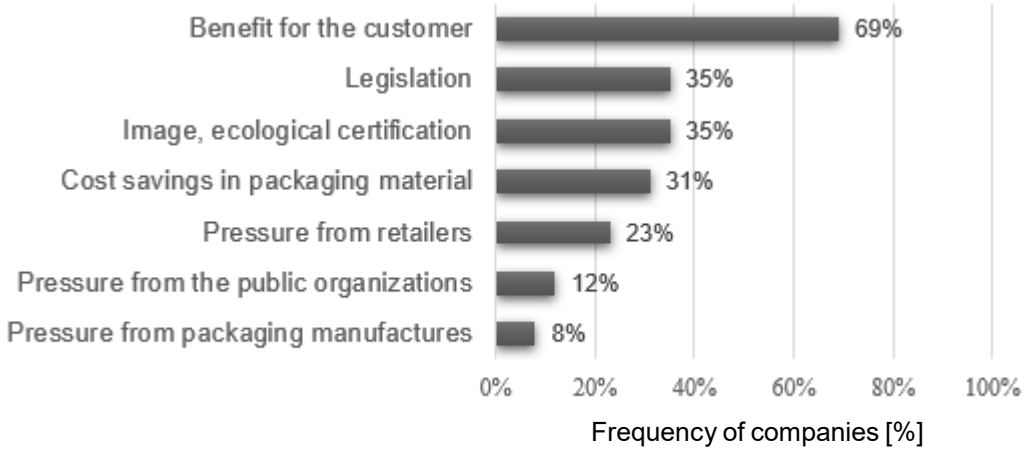

Fig. 1 Motivators for the introduction of environmental innovations

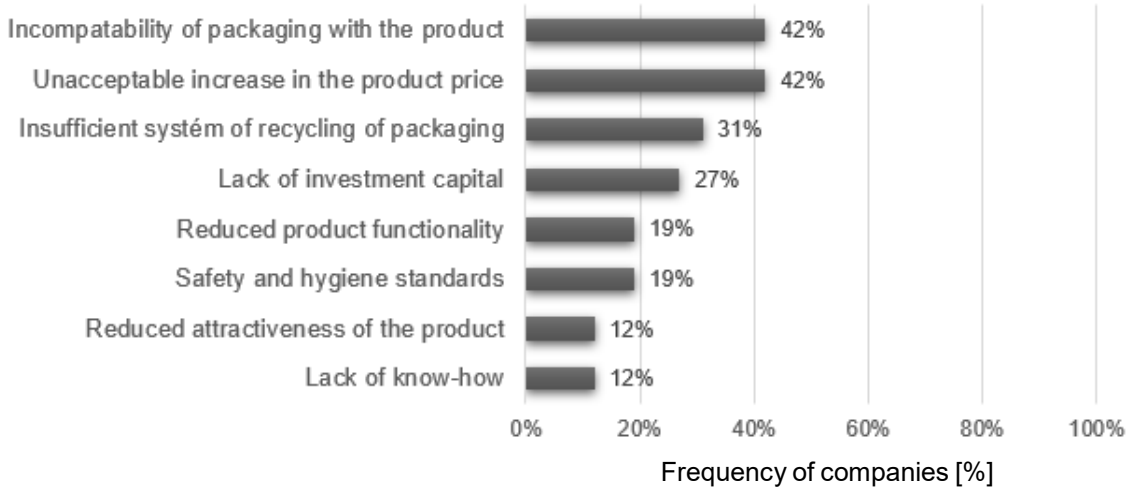

Fig. 2 Barriers to the implementation of environmental innovations

It was found that the main motivator for the introduction of environmental packaging innovations is the expected growth in the customer value (69 percent of respondents). In contrast to this, the least motivating aspects to innovate are stimuli from packaging manufacturers (8 percent of respondents) and the public (12 percent). The biggest barriers for these innovations include the incompatibility of proposed packaging with the product and the apprehension that customers would not accept increased price for innovated products (42 percent of respondents in both cases). Nearly a third of respondents also perceive the insufficient system of return and recycling of packaging applied in the Czech Republic as a barrier. Interestingly, however, respondents do not consider the lack of know-how in the given area and the reduced attractiveness of the innovated product for consumers to be a major problem (these barriers were identified in only 12 percent of cases).

Discussion and conclusion

In environmental packaging innovations, chemical companies prefer innovations based on changes in the materials chosen. Herein, we evaluate the effort to use biodegradable materials and recycled material as very suitable for fulfilling the principles of circular economy. Unfortunately, these innovations are not considered by companies to be very successful. In fact, when analysing the success rate of innovations, it was found that the approaches that primarily reduce the required amount of packaging material (innovations aimed at changing the shape and size, or the introduction of returnable packaging and unpackaged sales) are considered more successful. Changes in the package size is often associated with product innovations. In companies producing consumer chemicals, it is introducing of a product in concentrated form [4], for example. Such innovations can have a number of benefits, not only of an environmental and economic nature, but also it can mean better adaptation to the needs of the final consumer.

After all, customers are the main motivator for introducing environmental packaging innovations in companies. At the same time, however, it is the main barrier (the main barrier is the concern of companies that customers would not accept price increases for innovative products). This conclusion about the importance of the customer in packaging innovation in favour of sustainability is in line with the previous research [11,13]. However, concerns about not accepting innovation due to higher prices may not be justified in relation to all customers. For example, customers with a strong preference for environmental aspects of purchased products may be less price sensitive.

Yet another way to alleviate concerns about a possible price increase can also be addressed by popular innovations in the packaging achieved by reducing the material. This should contribute to maintaining the price or to only an acceptable price increase. This is one of the reasons on why the cost savings motivate a significant part of respondents in research. This conclusion also confirms experiences from the previous research [10,11]. However, a new finding is that the incompatibility of innovated packaging with a chemical product can also be a major barrier to sustainable innovation in the chemical industry.

Based on the results from research, it can be concluded that most Czech chemical companies are already implementing environmental packaging innovations. The speed of expanding the scope of these innovations can be increased not only by legislative pressure, but also by the pressure of business partners and the public. State aid for packaging recycling and return policy would undoubtedly contribute to further massive expansion of sustainable packaging-related innovations (not only for consumer chemical products). Financial support for such innovations which are extremely investment-intensive for companies but have a large environmental effect, would also be very appropriate.

Regarding further research in this area, a survey focused on customer attitudes towards environmental packaging innovation seems to be appropriate and needful. This would help not only to explain the identified discrepancy between the most frequently implemented packaging innovations and their perceived success, but also to identify in general the appropriate directions for packaging innovations from a customer point of view.

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