

CIRCULAR ECONOMY IMPLICATIONS FOR E-COMMERCE – AN EXAMPLE OF INDIVIDUAL RETURNABLE PACKING

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Purpose: Circular economy affects the need for changes in the area of packaging in e-commerce. The article demonstrates the results of the research conducted in the field of expectations regarding the features of the packaging already present on the e-commerce market in accordance with the circular economy model as well as those concerning the online buyers' expectations regarding the parameters of packaging currently available and planned to be introduced – reusable unit packaging.

Design/methodology/approach: A review of the selected literature enabled the depiction of the essence of the circular economy and its implications for the functioning of packaging in e-commerce. Own research was conducted using the survey method – the questionnaire in an electronic form was made available from 04 May to 26 June 2021. 1213 respondents from all over the country took part in the survey.

Findings: Effective implementation of circular economy entails the introduction of modifications in each link of the supply chain – including packaging used in e-commerce and reverse logistics, i.e., employment of returnable packaging. This will require the cooperation of product manufacturers with packaging producers, logistics operators and transport companies servicing the last mile, and consequently the creation of new business models in supply chains that require close cooperation in the handling of returnable unit packaging.

Research limitations/implications: Since the selection of the sample for the study was non-random – the snowball method was used, the study itself is unrepresentative and the results cannot be generalized to the entire population of Poland. Research on the implementation of returnable unit packaging in e-commerce should be continued in the light of the circular economy requirements.

Practical implications: Study results enable the indication of the features of the returnable unit packaging in e-commerce indicated as important by the respondents, mainly: the material of the packaging (degradable, biodegradable or recyclable); reusability; protection against external factors (including unauthorized opening); packaging size that corresponds to the size of the product; how the product is packaged and the type of closure (e.g. ease of opening); resilience. The respondents see the need to introduce returnable packaging in e-commerce.

Social implications: The new social (influence on customer behavior to return packaging) and institutional (redesign of supply chains to improve reverse logistics) conditions will be required to introduce the returnable unit packaging in e-commerce, but then it may contribute to e.g., waste and carbon footprint reduction.

Originality/value: The article draws attention to a very narrow section of the circular economy model which covers the reusable unit packaging that can be used in e-commerce (to reduce the scale of packaging waste production in Poland/Europe). The results of the research may be cognitively interesting for the entities that operate on the e-commerce market – both producers of goods and logistics operators.

Keywords: circular economy, reverse logistics, returnable packaging.

Category of the paper: Research paper.

1. Introduction

The constantly growing amount of waste poses a challenge for the modern economy (and the environment), e.g. 95% of plastic packaging is used only once, thus raw materials worth USD 80-120 billion become waste and, what is more, the negative externalities generated by them are estimated at USD 40 billion (Ellen MacArthur Foundation, 2016). Moreover, it comprises one of the main use of primary raw materials – 40% of plastics and 50% of paper used in EU are intended for packaging. Polish Chamber of Packaging Recycling and Recovery (www.pioiro) reports that Europeans produce on average almost 180 kg of packaging waste per year (per person). In addition, rising online retail sales (an increase of 3.2% in June 2022 compared to June 2021¹) means that individual transport packaging present in economic circulation – most often used only once – is also growing in number. Circular economy model (circular economy, circularity, CE) draws attention to the issues of reducing the negative impact of the production and consumption on the environment (in particular in the context of reducing greenhouse gas emissions and waste generation) and thus may be employed to address the issue as described above. It constitutes an EU priority as it covers the entire product life cycle: from production (product and process design), through consumption to waste management and secondary raw materials market (*Waste*). Thus, reusable packaging of individual retail items employed in e-commerce could be a specific solution applied here.

The article presents the circular economy model and its impact on the need for changes in the functioning of packaging in e-commerce, as well as the results of research on the expectations of online buyers regarding the features of packaging currently available and planned to be introduced – reusable unit packaging. The article strives to answer the following questions:

¹ The largest increase was recorder in the following groups: ‘textiles, clothing, footwear’ (by 13.2%), ‘other’ (by 11.0%), ‘pharmaceuticals, cosmetics, orthopedic equipment’ (by 10.9%) and ‘food, beverages and tobacco products’ (by 7.9%) (www.parp.gov.pl/component).

- According to the circular economy model, what type of packaging should be used in e-commerce market?
- What are the users' expectations regarding the packaging used in e-commerce?
- What are the users' expectations regarding the packaging of the designed unit returnable packaging that could be used in e-commerce?
- What is the attitude of online buyers towards the reusable packaging that could appear on the market?

The article is of theoretical and empirical nature.

2. The essence of circular economy

The foundations of the circular economy assumptions can be found in the works of environmental economists on waste-free (e.g., Ellen MacArthur Foundation, 2015; Pieńkowski, Kośmicki (2016)). The interest in the concept is visible not only in the economic practice but also in theoretical discourse (though it is difficult to reach agreement on its one universally accepted definition). The European Commission emphasizes that in CE the value of products (or resources in general) is maintained for as long as possible and the generation of waste is kept to a minimum (Communication from the Commission, 2015). With a slightly more detailed viewpoint, World Business Council for Sustainable Development indicates that the goal of circular economy is to retain as much value as possible from resources (products, parts, materials) and to create a system that ensures long life, optimal reuse, refurbishment, remanufacturing and recycling (WBCSD, 2017). The Responsible Business Forum, on the other hand, associates the circular economy essence with the cradle to cradle concept (C2C), i.e. such a way of designing and manufacturing products in accordance with the sustainable development philosophy so that after their use they can be put back into circulation (Gospodarka okrężna). Thus, the reusable unit packaging idea – that could become a reality in online trade – is in line with the C2C concept. Furthermore, from the point of view of the subject of the article, the approach presented by Deloitte is also significant. According to Deloitte, circular economy serves as a development strategy that enables economic growth while optimizing resource consumption and significantly transforms the patterns of production and consumption chains as well as redesigns industrial systems to take into account the entire life of the product together with its packaging (from creation, through repeated use and environmentally safe withdrawal from economic circulation).

The presented approaches enable the creation of sustainable supply chain management, i.e. managing the economic, social and environmental impact of the supply chain throughout the product life cycle in order to create value for all stakeholders involved in the process.

(Wandosell et al., 2021) Individual packaging used in transport to the final customer, but also during the return of the purchased product to the logistics operator/manufacturer as part of the so-called reverse logistics, comprises one of the elements of this chain, yet crucial from the e-commerce functioning point of view².

The circular economy should be implemented in accordance with the 3xR rule (reduce, reuse, recycle), i.e.:

- reduction of the amount of waste (including packaging, e.g. by introducing returnable, reusable packaging to e-commerce) and the raw materials used,
- extension of the life of raw materials (e.g. by reusing, repairing them),
- recycling (composting).

As a tool for assessing planned solutions, the 3xR principle suggests that the higher they are in the hierarchy, the better and, for example, reusing packaging is more desirable than recycling it. In addition, it points to eco-design (i.e. designing that considers the environmental impact along the entire value chain) and systemic thinking (about the entire products and services life cycle) so packaging used in e-commerce remains designed in such a way that it can be reused numerous times and then composted. (Svanes et al., 2010)

3. Packaging in e-commerce

The Gemius report shows that 77% of Polish Internet users shop online. The covid-19 pandemic has affected the way of the purchase – one third of the respondents shop more often, and almost one third of the respondents order more products online than before the pandemic. (E-commerce in Poland 2021) As a consequence, the number of individual packaging used to deliver products to customers is increasing. Thus, from the perspective of the functioning of economics and ecology of the supply chains, the issue of packaging management and/or reuse becomes particularly important. In addition, the amount of returning purchases is also growing, which implies the necessity not to increase the number of packaging in use, but instead to offer a packaging that can be returned to the seller as a part of reverse logistics and reused to deliver an online order to the customer.

According to the EU Directive 94/62/EC, e-commerce uses commercial (basic) packaging – for goods offered for sale, collective – for larger online purchase, and transport – that facilitate handling and secure the purchase on the way from the manufacturer/logistic center to the customer, this type constitutes an additional burden for packaging management. The report of

² According to Council of Logistics Management, reverse logistics is a broad term referring to the logistic management of skills and activities involved in recycling, management and disposal of product and packaging waste. It includes reverse distribution which enables the flow of goods (in disposable or reusable packaging – ABP) and information in the direction opposite to basic logistic activities (Szołtysek, 2009).

the Institute of Environmental Protection – National Research Institute shows that only 45% of packaging waste from municipal systems was recycled in 2020. Despite the selective collection, less than 29% of plastics, 54% of metals and 60% of paper and cardboard packaging are recycled. Meanwhile, the goals set by the EU in the area of raw materials recovery assume that at least 70% of packaging waste is to be recycled annually by 2030 (Nowicki). With changing consumer consumption habits along with the continued growth of online retailing (and the focus of logistics operators and transport companies on the last-mile logistics), a holistic approach to waste management in supply chains is becoming an urgent challenge. The entities involved in creating the offer and providing customers with online purchases should notice the issue of the increased amount of packaging in supply chains (and many are already doing it) and take joint actions aimed at applying the circular economy assumptions in this area. Not only will this enable the implementation of the sustainable development policy by enterprises (including the environmental pollution reduction), but it will also facilitate the reduction of costs and therefore lead to a broadly understood minimization of resource consumption. Circular economy resource efficiency means more than a departure from wasting resources (removed as waste), but rather their more effective use (also in connection with extending the life of products and their cycles), switching to renewable resources and conscious consumption. Such a way of thinking (and acting) should be visible in relation to the packaging in the supply chains – when shopping on-line and returning goods. Environmentally friendly packaging can be related to:

- materials – use of 100% biodegradable materials or those obtained from secondary raw materials,
- production method that minimizes the consumption of e.g. water and reduces the carbon footprint,
- reusability – designing the packaging that can be reused in the commercial circuit extending its life cycle (GlobalWebindex Report).

Interestingly, modern packaging is designed not only to protect the goods and facilitate transport, but also to offer additional functionalities. (Coelho et al., 2020) QR codes or smart labels improve transport efficiency, ensure control over the transported goods and their protection; enable the customer to track shipments in real time (thanks to the access to current GPS data). Furthermore, modern technologies allow the packaging to monitor temperature, humidity and whether the shipment has been dropped, tilted or opened.

4. Methods

Cardboard packaging (and also poly mailers) is most often used in e-commerce. Global WebIndex research shows that users expect e-commerce cardboard packaging to be:

- recyclable – 64% of respondents,
- reusable (not necessarily in the same form) – 53% of respondents,
- filled with the products that are not overpacked – 46% of responses,
- biodegradable – 39% of respondents,
- made of recycled materials – 36% of responses (GlobalWebindex Report).

A survey was conducted to recognize the expectations/opinions of on-line buyers with regard to the parameters of unit transport packaging currently in circulation and compare them with the expectations regarding reusable packaging that could be introduced³. The survey questionnaire was made available in electronic form (access via an internet link – respondents answered the questions themselves) – the on-line survey (CAWI) was carried out from 04 May 2021 to 26 June 2021. 1213 respondents from all over the country anonymously took part in it⁴. The selection of the sample for the study was non-random; the snowball method was used (sampling methods make the study unrepresentative so the results cannot be generalized to the total population of Poland). The report on the entire study – with a wider scope – was presented to the client and remained unpublished. Only the results of the study that correspond to the purpose of the article will be presented below.

5. Results

It is difficult to indicate an unambiguous, narrowly defined set of features of a unit transport packaging important for the respondents (cf. Table 1). Nevertheless, most of the respondents paid a lot of attention to the following:

- protection against external factors and damage,
- protection against an unauthorized opening,
- packaging size corresponding to the size of the product,
- package resilience.

³ The study was conducted on the basis of a contract for research and development signed by the Logistics and Innovation Faculty of the University of Lodz with Arvato sp z o.o. on April 2, 2021. Selected results are presented in the article.

⁴ Among the respondents, 62% were women, 37% were men, and 1% of the respondents did not specify their gender. People aged 17 to 79 took part in the study. The largest amount, nearly 50% of the total, comprise respondents aged 21-30, i.e., those who will be the main online buyers in the near future. Most of the respondents - 76% - are city dwellers, while 24% of the respondents indicated the village as their place of residence.

Table 1.

Features of the unit transport packaging of the product (and the share of a response frequency in %)

	It does not matter	It matters a little	It is important	It is very important	I have no opinion
Aesthetics	25.1%	40.4%	26.6%	6.6%	1.2%
Information of the package not being thrown	6.4%	21.8%	47.9%	22.8%	1.2%
Color	50.6%	38.3%	7.6%	2.1%	1.4%
The material of the package is degradable, biodegradable, or recyclable	14.6%	26.4%	37.1%	19.3%	2.6%
Reusable	11.9%	26.2%	39.3%	20.7%	1.9%
The name of the product manufacturer placed on the packaging	44.5%	35.3%	13.3%	4.9%	2.1%
Protection against external factors	5.1%	14.8%	45.6%	33.6%	0.8%
Protection against unauthorized opening	4.0%	11.0%	43.5%	40.7%	0.7%
Protection against destruction	2.4%	9.1%	43.4%	44.3%	0.8%
Consignment labelling	10.8%	26.4%	43.8%	17.3%	1.7%
Packaging size corresponds to the size of the product	4.5%	15.1%	44.0%	35.4%	1.0%
The method of packaging the product	5.6%	16.6%	45.4%	30.8%	1.6%
Closure type (e.g., ease of opening the package)	11.0%	23.7%	40.4%	23.2%	1.6%
Appearance	36.8%	36.8%	19.0%	5.9%	1.5%
Comfortable to use (e.g., a handle)	27.2%	35.4%	25.7%	9.3%	2.3%
Resilience	3.9%	14.3%	45.9%	34.4%	1.5%

Source: own study.

To sum up, the very basic function of the packaging, i.e., product protection, remains the most important for the majority of respondents.

Table 2 presents the share of respondents' answers regarding the potential features of the new returnable packaging (possible to be used as part of online shopping). According to the respondents, very important and the most important features comprise:

- information about the package not being thrown,
- the material of the package (degradable, biodegradable, or recyclable),
- reusability,
- protection against external factors, unauthorized opening and destruction,
- consignment labelling,
- packaging size matching the product size,
- product packaging method, type of closure (e.g. ease of opening the packaging),
- resilience.

Table 2.

Potential features of returnable product packaging in online shopping and the share of a response frequency (in %)

	It does not matter	It matters a little	It is important	It is very important	I have no opinion
Aesthetics	23.4%	41.3%	26.5%	6.4%	2.3%
Information of the package not being thrown	7.3%	20.2%	45.5%	24.4%	2.6%
Color	33.6%	47.2%	13.0%	3.7%	2.4%
The material of the package is degradable, biodegradable, or recyclable	6.3%	17.2%	40.0%	33.6%	2.9%
Reusable	3.4%	8.0%	35.0%	51.4%	2.3%
The name of the product manufacturer placed on the packaging	32.9%	38.6%	19.0%	6.9%	2.6%
Protection against external factors	2.7%	7.2%	38.8%	48.9%	2.4%
Protection against unauthorized opening	3.2%	7.1%	37.4%	49.7%	2.6%
Protection against destruction	2.8%	5.7%	36.4%	52.7%	2.5%
Consignment labelling	11.7%	24.7%	40.0%	20.6%	3.0%
Packaging size corresponds to the size of the product	4.9%	12.3%	41.5%	38.0%	3.3%
The method of packaging the product	6.8%	14.8%	44.2%	31.1%	3.1%
Closure type (e.g., ease of opening the package)	7.6%	17.1%	42.6%	29.8%	3.0%
Appearance	27.0%	41.1%	22.1%	6.8%	3.1%
Comfortable to use (e.g., a handle)	18.1%	29.9%	33.6%	15.3%	3.1%
Resilience	2.2%	5.9%	36.9%	52.4%	2.6%

Source: own study.

To determine the differentiation of the respondents' views (or lack of it) on the unit transport packaging currently functioning in e-commerce and the reusable packaging that can be introduced, the weights assigned to individual packaging features were compiled (cf. Table 3).

Table 3.

Comparison of the weights assigned to standard and potential packaging features in online shopping

	It does not matter		It matters a little		It is important		It is very important		I have no opinion	
	1	2	1	2	1	2	1	2	1	2
Aesthetics	0.10	0.12	0.10	0.12	0.05	0.05	0.02	0.01	0.05	0.05
Information of the package not being thrown	0.02	0.04	0.06	0.06	0.08	0.08	0.06	0.05	0.05	0.06
Color	0.19	0.17	0.10	0.14	0.01	0.02	0.01	0.01	0.06	0.05
The material of the package is degradable, biodegradable, or recyclable	0.06	0.03	0.07	0.05	0.07	0.07	0.05	0.07	0.11	0.07
Reusable	0.04	0.02	0.07	0.02	0.07	0.06	0.06	0.11	0.08	0.05
The name of the product manufacturer placed on the packaging	0.17	0.17	0.09	0.11	0.02	0.03	0.01	0.01	0.09	0.06
Protection against external factors	0.02	0.01	0.04	0.02	0.08	0.07	0.10	0.10	0.03	0.05
Protection against unauthorized opening	0.02	0.02	0.03	0.02	0.08	0.07	0.12	0.11	0.03	0.06
Protection against destruction	0.01	0.01	0.02	0.02	0.08	0.07	0.13	0.11	0.03	0.06
Consignment labelling	0.04	0.06	0.07	0.07	0.08	0.07	0.05	0.04	0.07	0.07
Packaging size corresponds to the size of the product	0.02	0.03	0.04	0.04	0.08	0.08	0.10	0.08	0.04	0.08
The method of packaging the product	0.02	0.03	0.04	0.04	0.08	0.08	0.09	0.07	0.07	0.07

Cont. table 3.

Closure type (e.g., ease of opening the package)	0.04	0.04	0.06	0.05	0.07	0.08	0.07	0.06	0.07	0.07
Appearance	0.14	0.14	0.09	0.12	0.03	0.04	0.02	0.01	0.06	0.07
Comfortable to use (e.g., a handle)	0.10	0.09	0.09	0.09	0.05	0.06	0.03	0.03	0.10	0.07
Resilience	0.01	0.01	0.04	0.02	0.08	0.07	0.10	0.11	0.06	0.06

Legend: 1 - currently functioning packaging, 2 - new returnable packaging.

Source: own study.

Changes in expectations as to the features of the new returnable packaging compared to the currently functioning packaging are insignificant, although the respondents indicated certain elements that should be made more visible in the new returnable packaging: the material of the packaging (it should be degradable, biodegradable or suitable for recycling); its reusability (though it is consistent with the definition of returnable packaging, the respondents pointed out to this feature), and the size of the packaging should correspond to the size of the product. Paradoxically, according to the respondents, the importance of the *convenient to use* feature of the new packaging seems less important than in the currently functioning packaging.

In conclusion, it is worth emphasizing that the respondents notice the necessity to introduce returnable packaging to the market. More than half of them (50,6%) indicated that reusable packaging should complement the offer of existing packaging on the market and replace it over time. And 19,9% of the respondents claim that reusable returnable packaging should replace other packaging while 20.9% – it should supplement the offer of the packaging already existing on the market.

6. Discussion

The analysis of the ‘Development prospects of the e-commerce market in Poland’, conducted by PwC, shows that there are currently over 150,000 enterprises on the Polish market that offer access to goods and services via online stores and sales platforms. The value of e-commerce in Poland is estimated to amount to PLN 92 billion (one of the fastest growth in Europe) and in 2026 it is expected to reach PLN 162 billion. (www.parp.gov.pl/component) Hence, the significance of individual transport packaging – whether it is disposable or, in accordance with circular economy, reusable – will increase. Thus, research towards the implementation of reusable unit packaging used in e-commerce should be intensified.

Effective implementation of circular economy entails the introduction of modifications in each link of the supply chain (perceived in terms of the value chain) – including packaging used in e-commerce and reverse logistics, i.e. employment of returnable packaging (Radhakrishnan, 2015). This will require the cooperation of product manufacturers with packaging producers, logistics operators and transport companies servicing the last mile, and consequently the creation of new business models in supply chains that require close cooperation in the handling

of returnable unit packaging (in search of interdisciplinary solutions and ensuring their scalability). Thus, from the circular economy perspective, in the long run, it will be necessary to redesign supply chains (to improve reverse logistics), invest in new – returnable packaging for the distribution of products purchased online and create customer-friendly and cost-effective return processes for enterprises, which may bring the following benefits:

- less waste,
- reduction of the carbon footprint,
- promotion of the circular economy,
- cost optimization.

7. Summary

To sum up, circular economy is a model of production and consumption consisting of, among others, sharing, reusing (here: individual transport packaging used in e-commerce), renewing and recycling of materials and products already existing (as long as possible to extend their life cycle). This means reducing waste to a minimum – when a product's life cycle comes to an end, the raw materials and waste that comes from it should remain in the economy (and thus generate additional value) (www.europarl.europa.eu).

The directions of change in supply chains can be linked to the results obtained in the study, namely:

- for the customers buying on-line – individual transport packaging needs to fulfill basic protective functions,
- there were no significant differences in customer expectations regarding returnable packaging compared to traditional packaging used in online shopping,
- differences in the importance of individual packaging features for users of future returnable packaging may serve as a guideline for those designing returnable packaging for e-commerce,
- the vast majority of respondents notices the possibility of packaging reuse,
- the vast majority of respondents see the need to introduce returnable packaging to the market (some of them point to the need to replace the existing packaging with the returnable one), which corresponds with the circular economy idea.

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