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Integrating the circular business model into the packaging industry

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The article examines the integration of the circular economy business model into the packaging industry and analyses the integration of circular economy principles into the model of a functioning EU packaging company. The main objective is to offer adaptable solutions for the integration of the principles of the circular economy into the EU packaging company and the business models of other companies in the sector. The first part of this article provides an analysis of the scientific literature on circular economy principles, the models used, the identification and review of the basic principles of the circular economy, and the assessment of the main driving and limiting factors. When analysing the models applied, the one most suitable for enterprises in the field of packaging production is selected, thus creating a solid theoretical basis for the further integration of the principles of the circular economy into the company's operating model. The second part analyses the innovations that integrate the principles of the circular economy into the EU packaging company's business model. The goal is to find out what is important for customers in this sector and what is valued by the company's employees and management. The third part of the article describes the results of the empirical study.

Keywords: circular economy, business model, packaging industry, waste, plastic

INTRODUCTION

The global economy has long operated based on the linear flow of resources called the 'take, make, dispose' model, where raw materials are extracted, transformed into products, and finally discarded as waste. However, driven by growing concerns about environmental protection, resource scarcity, economic inefficiency and a growing awareness that the current model is unsustainable in the long term, the transition from the traditional linear economy to the circular economy (CE) has recently been increasingly emphasised and noticed. The quote from the American environmentalist and businessman [1] 'we steal from the future, sell it in the present, and call it GDP' (gross domestic product) clearly emphasises the short-sightedness of a linear economy when the long-term impact on the environment and future generations is not taken into account in pursuit of immediate economic gains.

The concept of the circular economy focuses on eliminating waste, promoting recycling, and restoring natural systems for environmental and economic sustainability [2]. Several factors and

criteria are identified that influence the application of circular economy principles in business and society, with economic incentives playing an important role, as circular practices can lead to cost savings, more efficient use of resources, and increased competitiveness [3]. Favourable regulations and government policies often encourage a shift towards circularity when consumers stimulate market demand by preferring sustainable and environmentally friendly products and services [4]. The practical implementation of circular economy principles is driven by technological advances and innovation in recycling, material recovery, and sustainable design [5]. Collaboration between all stakeholders, including businesses, researchers, governments and communities, is important in achieving a collective outcome, which promotes knowledge sharing and paves the way for successful deployment [6]. Similarly, environmental considerations such as reducing pollution and conserving natural resources are key factors driving the adoption of circular economy principles, balancing economic interests with ecological sustainability [7].

Circular economy models significantly differ from conventional business models, which take a resource-intensive and waste-management approach. The conventional business model often emphasises the linear 'take-make-dispose' approach where resources are extracted, products are produced, used, and then discarded as waste, resulting in significant environmental degradation. Meanwhile, circular economy models prioritise sustainability by focusing on minimising reducing waste and extending the life of products and materials. They promote recycling, reuse, and re-manufacturing practices, thereby reducing resource consumption, energy use and pollution. Compared to the conventional linear model, circular economy models emphasise a more sustainable and environmentally friendly approach, encouraging companies to design products with durability and reparability in mind [8]. The transition to the circular economy faces a number of challenges: promoting systemic change, addressing short-term economic issues, dealing with imperfect markets and regulatory issues, overcoming social factors, securing financing, and harmonising procedures. The properties of plastics, the complexity of products, the degradation of quality over time, and the difficulties in developing truly biodegradable plastics pose particular challenges for recycling and reusing plastics in the circular economy [7]. The circular economy is good for business by influencing sustainability and profits, encouraging resource-efficient practices and cost savings such as reusing and recycling materials, and reducing waste and waste disposal costs. It also ensures that companies comply with environmental rules, pay lower taxes, avoid fines, and increase their reputation among environmentally conscious people. The transition to the circular economy is not only a necessity but also a viable route to a more sustainable and prosperous future.

THE CONCEPT, SIGNIFICANCE, AND PRINCIPLES OF THE CIRCULAR ECONOMY

Growing environmental concerns, resource scarcity, economic inefficiency, and the growing realisation that the current model of the traditional linear economy is unsustainable require a shift towards the circular economy. While the linear model argues that products are discarded or stored at the end of their life cycle, the circular economy model is based on a new approach [9]. Figure 1 provides a comparison between the linear model and the circular economy model.

The concept of the circular economy was introduced by Stahel [10], one of the pioneers of the circular economy, who argued that it is necessary to move towards a model that uses recycling and remanufacturing strategies that maximise resource values by using resources for as long as possible and minimising waste [10]. The transition to a circular economy, sustainable consumption, and repetitive production is a win-win situation for companies, the environment, and individuals [7].

In 2010, Ellen MacArthur, a former sailor, founded the Ellen MacArthur Foundation, which focuses on promoting the concept of CE worldwide. The foundation's 2013 report, *Towards the Circular Economy*, sets out the principles, strategies, and innovations of the Green Economy, promotes collaboration between business and science, and plays a key role in creating

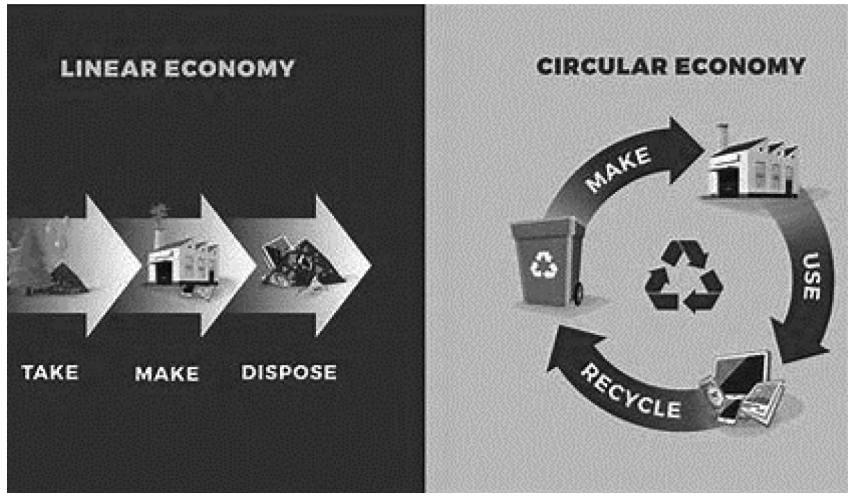

Fig. 1. Linear economy vs. circular economy

the conditions for the prosperity of the Green Economy, including the role of policymakers and business leaders. The linear production approach is based on the unsustainable 'take-make-dispose' model, while the circular economy is based on the continuous circulation and transformation of materials to reduce waste [11, 12].

There is no single definition of the circular economy, and many different explanations exist in the world of research and literature. These explanations have evolved over time and focus on different aspects [13, 14]. Table 1 shows the trends in definitions of the circular economy.

With a focus on optimising supply chains and processes, CE is seen as a closed material cycle strategy that increases cost-effectiveness by increasing firms' added value and reducing environmental impacts [15, 16]. McDonough and Braungart [17] highlight the importance of the product design phase, where products are developed to be reused or returned to the environment in a way that benefits ecosystems and eliminates waste.

Some scholars identify key elements of CE, such as eco-design of natural resources, recycling, optimisation and waste minimisation [13, 19, 20], linking them to environmental and resource considerations. Others emphasise the economic dimension of CE, through an economic framework dependent on business models that replace the traditional 'end-of-life' concept with resource reduction strategies and highlighting the potential for economic transformation in the future [13, 21, 23].

The European Commission defines CE as an engine for economic growth [22], with a focus on digital technologies, customer relations, the sharing economy, dematerialisation, and economic development. According to the European Parliament [24], CE is a model of production and consumption that promotes sustainability and extends the life cycle of products by sharing, renting, reusing, repairing, refurbishing, and recycling materials [24]. Some researchers point out the importance of integration of circular economy principles with digital technologies [25].

The Ellen MacArthur Foundation [18] has promoted and developed the concept of CE globally, and their proposed definition of CE is the most popular and widely used, as it takes a broader approach, defining CE as an industrial system that is deliberately designed to be restorative and regenerative, with a focus on renewable energy sources, non-toxic materials, and waste disposal.

Coelho et al. [8], Svanes et al. [26] point out that the packaging industry still operates on a linear model where packaging is designed, produced, consumed and discarded, and generates significant amounts of waste [8, 26]. Modern packaging is designed to protect products during distribution, storage, transport, sale, use, and reuse, but the linear consumption model has also contributed to environmental problems [27, 28]. Plastics are widely used in the packaging industry, and recently their global consumption has been growing exponentially [29], but recycling

Table 1. **Definitions of the circular economy (CE)**

Year	Definition	References
2008	CE express the implementation of closed loops of materials that generates the achievement of an increased economic efficiency, adds value to businesses, and reduces the environmental impact	[15]
2009	Considering CE as closed-loop supply chains, it has to be viewed as an innovative path to create value over the whole life cycle of the product. Furthermore, reverse logistics processes, through redesigning and dematerialising of products, estimate process flows.	[16]
2009	In the book *Cradle to Cradle: Remaking the Way We Make Things*, the authors present the concept of the circular economy as a system inspired by natural processes, where products are designed with materials that can be continuously reused or returned to the environment in a way that nourishes ecosystems and eliminates waste.	[17]
2013	A circular economy is one that is restorative and regenerative by design and aims to keep products, components, and materials at their highest utility and value at all times, distinguishing between technical and biological cycles.	[18]
2016	CE is a way to optimise the use of resources, add value, regenerate wastes, and increase both corporate and consumer responsibility. In other words, it accomplishes the goal of sustainability.	[19]
2018	The CE notion embraces optimisation of natural resources, reusing and recycling them in production processes, eco-design of products, waste minimisation, and the extension of their end of life.	[20]
2018	CE is an economic system based on business models which replace the end-of-life concept with reducing, alternatively reusing, recycling and recovering materials in production/distribution and consumption processes.	[21]
2020	Innovative models based on a closer relationship with customers, mass customisation, the sharing and collaborative economy, and powered by digital technologies, such as the internet of things, big data, blockchain and artificial intelligence, will not only accelerate circularity but also the dematerialisation of our economy and make Europe less dependent on primary materials.	[22]
2020	CE can be considered as an enabler of economic, environmental, societal benefits. This is due to the adoption of recovery, reuse, recycling, sharing and collaboration practices which redefine the corporate business model.	[23]
2023	The circular economy is a model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible. In this way, the life cycle of products is extended.	[24]

rates remain low, resulting in significant environmental pollution [30]. Zhu et al. [28] emphasised the significant role of packaging design as an important part of the circular economy model in addressing the aforementioned issues, as it affects materials, production processes, and end-of-life options [28].

The European Union (EU) has created a legal basis for promoting the circular economy, which is set out in the Waste Framework Directive and the Circular Economy Action Plan, which emphasise waste reduction, efficient use of resources, and sustainable production and consumption models [31]. Circularity practices have reduced waste generation and improved recycling rates for municipal waste and packaging waste in the EU [3]. The transition to the circular economy predicts economic benefits, cost savings, and increased GDP [32], fostering job creation and innovation that boost overall economic growth [33]. The circular economy in line with the UN Sustainable Development Goals, and the Paris Climate Agreement is a very important European policy direction [34].

In the scientific literature, the three main principles of circular economy – 3R – are often found [7, 11], which consist of three steps: *reduction*, which aims to reduce the amount of energy consumed and generated waste, through the improvement of production efficiency and

processes; secondary use, when the aim is not to classify products or their parts as waste, but *reuse* according to the original purpose; *recycling*, when waste is processed into products or secondary materials, depending on the existing or a new purpose.

According to Amudjie et al. [11], research has revealed that the application of the 3R model alone does not solve all the problems of recurrent waste on the environment, and to encourage further development, an extended model, the 6R model, has been introduced, which includes reuse, recycling, repurposing, remaking, reducing, and recovery and is applicable in the manufacturing industry [35]. Meanwhile, the 9R model has been proposed for the logistics industry, which includes the refusal to use excess of raw materials, reduction, reuse, repair, refurbishing, remanufacturing, repurpose, recycling and energy recovery [36]. He also presented the 5R model (Rethink, Reduce, Reuse, Repair, Recycle) for implementation in the construction industry [11]. In addition, Potting et al. [37]) presented the 10R model that tracks product chain innovation and includes recovery, recycling, reuse, remanufacturing, renewal, repair, reuse, reduction, revision, and abandonment. The latest proposal for the eleventh R found in the scientific literature created the 11R model, which includes recovery, recycling, reuse, remanufacture, renewal, repair, reuse, reduction, revision, abandonment and replacement [11].

The Ellen MacArthur Foundation [18] also provided definitions of key CE principles that provide a framework for the effective implementation of CE practices across sectors and industries, through resource efficiency, waste reduction, and sustainability:

- Develop easily degradable products and reuse biological and technical components to eliminate waste.
- Increase resilience through modularity and adaptability.
- Use renewable energy sources and shift taxation from work to consumption of energy and materials.
- Think systematically to understand the interaction of elements in the whole.
- Follow the 'waste is food' concept by re-introducing materials into the biosphere.
- Promote the transition from technical to biological use of nutrients in materials by repeatedly returning them to the biosphere.

The common goal of the different CE principles is to rethink product life cycles, reduce resource consumption, promote reuse and recycling, and align practices with sustainability goals. CE is increasingly recognised as an essential method for solving environmental problems and promoting economic growth.

CIRCULAR ECONOMY MODELS

CE models include a variety of approaches to make traditional linear systems sustainable, resource-efficient, and environmentally friendly. These models promote strategies focused on resource conservation, waste reduction, and long-term sustainability. A business model conceptually explains how business operations are carried out, describes how the organisation generates, delivers, and captures values [38]. It is important to clearly formulate how values are created, delivered, and captured in closed material chains [39]. The UK Resource Recovery from Waste programme divides CE models into three categories, prioritising waste prevention, reuse, repair, and recycling, emphasising different approaches to achieve circularity in the economy [40]. Circular business models include various processes, including design, production, optimal product use, value recovery, and circular process support focused on reducing waste, extending product life, and increasing resource efficiency [41].

Circular business models are divided into three types of business model innovation:

Type 1: Integrating circularity strategies into existing linear business models.

Type 2: Strengthening circularity strategies by improving existing circular business models.

Type 3: Circularity-oriented strategies, development of entirely new business models. This type focuses on creating, delivering, and capturing value [42].

In the transformational period of transition from linear to circular systems, circular business models play a key role in achieving sustainability and resource efficiency [43]. After identifying different types of circular business models, it was discovered that the circular supply chain type

focuses on recycling and the use of natural resources. The use and recycling type is characterised by waste reduction and resource utilisation. The product life extension type extends the life of products through durability and repairability. Sharing platforms facilitate the use of resource sharing by both the provider and the user and delivering products as a service, including the use of a circular business model of leasing and pay-as-you-go [42].

Circular economy models cover different levels, from the micro level involving companies and consumers, to the meso level, which includes ecological parks, and even to the macro level, which includes entire regions and cities [44]. In promoting the circular economy, it is important to develop different production models, cleaner production practices, and apply strategies for ecological consumption and efficient waste management at each level [45]. Six main areas of integration of circular principles into business models relevant to the success of CE are distinguished: sales model, product design and material composition, information technology management, maximum use of recycled materials, operational strategy, and human resources. The said areas contribute to the development of sustainable and circular business practices [46].

Looking at the different circular economy models, each with their own unique characteristics, advantages, and disadvantages, it is clear that choosing the right model for the packaging manufacturing sector requires careful consideration. In particular, the model should follow the guiding principles set out in the section 'The concept, significance, and principles of the circular economy', which aim to rethink how products are made, use fewer resources, promote reuse and recycling, and ensure that everything is in line with sustainability goals.

The packaging industry is an important player in global supply chains, and its practices have significant implications for sustainability, resource use, and waste management [8]. Therefore, choosing the right circular economy model is essential in addressing the unique challenges and opportunities of this sector. The transition to the circular economy requires a change in society, technology and institutions along existing linear models, a conceptualisation that includes the elements 'social actors', 'networks', 'technology and infrastructure', and 'institutions', and the mechanisms of innovation: 'experimentation', 'visioning', 'networking', 'learning', 'protection', 'resource mobilisation', and 'legitimisation' [42].

Fig. 2. Business model across a product lifecycle

The practical implementation of CE business models differs significantly from promising theoretical ideas that remain undeveloped, underutilised concepts, and not necessarily successful innovative business models [43]. There is a need to differentiate between circular objectives and business models, to identify circular objectives at each stage of the life cycle, and to distinguish between the creation of successful circular business models through the creation and capture of value in the life cycle of the product [38].

The European Environment Agency's [38] Business Model emphasises the sustainability of things throughout the life cycle of a product (Fig. 2), which is very relevant for short-lived products and packaging. This business model develops circular thinking and encourages the retention of products for as long as possible in their life cycle by promoting reuse, repair, and recycling. Businesses need to develop new methods or adapt the existing ones to comply with circular principles.

The European Environment Agency has made a strategic choice to apply a business model focused on advancing the circular economy in the packaging industry and beyond throughout the entire product lifecycle, with a clear framework for implementing and scaling up circular business models, the need for innovation, and a clear transition towards a more sustainable and circular economy in Europe [38].

TRENDS IN THE PACKAGING PRODUCTION SECTOR

The results of Global Data research show that the packaging industry is experiencing changes in the influence of trends, especially after the emergence of COVID-19. The pandemic has significantly changed the normal behaviour and procedures of both companies and consumers. The packaging market decreased slightly, by 1.1%, at the beginning of the pandemic, and it grew by 6.2% between 2020 and 2022; Global Data predicts that the market will continue to grow and until 2026 it may increase to 12.4%. Packaging is important not only for product protection, it is also used by consumers to collect and buy various products; according to Global Packaging Services, as many as 87% of markets for food and beverage packaging and 63% of all packaging markets fall into flexible and rigid plastics, which dominate in the market. Since 2008, market shares have remained relatively stable. The industry is gradually getting used to using as much recycled content as possible, reducing the resistance to abandoning plastic altogether, gradually replacing plastic with other materials.

According to Global Data analysts, global inflation is an important trend that also affects the packaging industry, as 55% of global consumers are very concerned about how inflation will affect their household budgets and are actively looking for more cost-effective alternatives, which affects sales. Manufacturers are faced with the dilemma of whether to cover the rising costs themselves or pass them on to consumers. In 2022, there were various global disruptions such as climate change, the ongoing impact of COVID-19, geopolitical conflicts and trade barriers, exacerbated supply chain issues, which led to price fluctuations that were difficult for companies to manage. The industry increasingly prefers shorter global supply chains and greater localisation as strategies to combat rising energy prices and storage costs.

According to data [38], Europeans throw away a huge amount of plastic waste every year and only 30% of all waste collected in Europe is sent for recycling: the rest is burned or disposed of in landfills. The latest set of documents adopted by the EC in 2018 [48] for the first time included a plastics strategy at the European level, the goal of which is to ensure that all plastic packaging on the EU market is recyclable, to reduce the amount of single-use plastics, and to limit the deliberate use of microplastics. The countries of the European Union are gradually adapting to the ambitious goals of the circular economy and the EU plastics strategy. Companies need to adapt to these innovations in order to become market leaders, as more advanced companies can quickly fill the gap.

A number of companies are already introducing modern recycling technologies to ensure high-quality secondary raw materials. The implementation of the EU Plastics Strategy and the pursuit of the circular economy objectives will have a positive impact on the business sector as the plastics recycling sector will create new

jobs and open up more investment opportunities. The market for green industries is forecast to double over the next decade, which is relevant for companies that are already leading the way in recycling and energy efficiency.

Companies, including those in the packaging industry, are under increasing pressure to move towards sustainability and environmental protection and must find solutions. Zero emissions have become a key objective and the companies involved in the production and distribution of packaging, which typically generates a high carbon footprint per kilogram of packaging, are actively seeking strategies to significantly reduce their environmental impact. Forecasting future packaging trends, it is anticipated that the pursuit of sustainability will become an important packaging innovation driver in the near future. Consumer demand for greener packaging continues to grow as they become aware of the environmental impact of packaging waste.

The growing influence of e-commerce is driving innovation in packaging, which needs to be made of robust, reliable materials that can withstand the challenges of shipping and handling in order to meet the different requirements of online shopping. E-commerce retailers will also seek to reduce packaging waste from online shopping by making shipping more efficient, using more sustainable packaging materials and optimising packaging design. Personalised packaging is important as consumers are increasingly looking for products tailored to their individual preferences, and packaging can facilitate their search. This means that tailor-made packaging materials for specific products or industries will be created with personalised packaging designs, with personalised lettering or graphics.

INTEGRATING CIRCULAR ECONOMY PRINCIPLES INTO THE PACKAGING PRODUCTION SECTOR

The main role of product packaging is to ensure product safety [28]. Nowadays, the packaging industry is characterised by huge growth, which is significant for the economy. For example, in Western Europe, the packaging industry accounts for around 2% of the total, but the sector still faces major challenges in terms of sustainability and resource efficiency [8]. The traditional linear consumption model identifies a major problem for the packaging sector: the environmental impact of packaging waste, in particular, plastic packaging, which is the most widely used in the packaging industry and whose global consumption has increased exponentially since the 1950s. In EU countries, only 34.6% of plastic packaging is recycled, and even around 23% of it ends up in landfills, compared to 25% in China and only 9% in the United States. In particular, plastic packaging waste is highly polluting and has negative environmental consequences [30].

The move towards the circular economy model is seen as a potential solution to the challenges of the packaging sector by reducing waste and promoting reuse and recycling of materials to create a more sustainable and efficient system. The EU is promoting the improvement of recycling rates by reducing waste generation and emphasising the importance of packaging design that allows reuse and recycling of materials [22]. Packaging design is an integral element of the circular economy influencing the materials used in production and their further use once the job is done. Sustainable product design takes a step forward by focusing on the environmental impact of a product throughout its life cycle and is also known as eco-design, which is essential for circularity [28, 49]. Sustainable manufacturing and economic growth require a comprehensive understanding of product design, manufacturing methods, supply chain management, and logistics. In the circular economy, the stage of product design and packaging becomes particularly important, because at this stage decisions are made that will provide an opportunity to plan product resources, predict the impact on the environment, provide an opportunity to easily repair, remanufacture, and recycle the product. Such decisions affect the entire life cycle of the product. Thus, the product design stage is like the key to the operation of circular systems, the goal of which is to maintain the high value of products, their parts and materials, and to make them last as long as possible. The circularity of a product depends on its design, how it is used, and how it fits into the overall picture [50].

Meeting the challenges requires collaboration between stakeholders in the packaging sector

and the application of the 6R methodology based on innovation [51].

For products to become an integral part of the circular economy, they must be designed in such a way that their materials, parts, or even the resulting waste can be easily integrated back into the system. Circular product design achieves this by extending the useful life of a product through methods such as maintenance, reuse, refurbishment, remanufacturing, and recycling [52]. It is important for designers and engineers to understand the materials they are working with, especially how plastic packaging will behave during recycling, how many times plastic can be recycled, whether it will lose its quality after repeated recycling and become unusable [28].

In the world of sustainable materials, it is important to understand whether simple, recyclable materials can replace more complex ones, such as composite materials, which have certain environmental benefits but should be used only when necessary, in order to reduce their impact on the environment [4]. Simplifying the packaging of everyday products is also important because it facilitates recycling and improves waste management [34].

For the development of the circular economy, it is important to have quality standards for secondary raw materials, to improve the reliability and availability of data in the field of waste management, and to create public information platforms [53]. In order to dismantle products after use, the complexity of materials in products should be reduced and environmentally-friendly materials and products should be promoted, at the same time taking into account the principles of sustainable chemistry in resource management. Information plays a key role in preventing the transfer of pollutants from used materials to recycled resources [34]. Maintaining clean material cycles, just as maintaining material quality and safety in recycling processes, is vital to the safety and economic viability of the circular economy. Consumers' willingness to buy recycled materials depends on the properties of the materials and consumers' trust in them, which is in line with EU chemicals legislation and the strategy for a non-toxic environment [50].

Advances in plastics recycling require labelling, sorting, separation, and digitisation technologies, and product design is important in finding long-term solutions for difficult-to-recycle plastics [4, 28]. Financial and non-financial incentives are important for companies in reducing initial costs and encouraging the maturation of circular products [38]. Progress in the circular economy is measured by a set of indicators reflecting the transition from a linear to a circular business model, covering resource efficiency, waste management, recycling rates, circular business models, and sustainability indicators [37]. Synergies between upstream industrial recyclers, distributors, retailers, consumers, and waste collection service providers are also important for the transition to the circular economy [54]. This transition requires structural changes and a shift in the mindset, behaviour, and priorities of the market actors [33]. For circular economy models to work, they need the participation of all stakeholders. In the process of business model innovation, customers need to be involved as a key element for business success. This is the only way to ensure that the business model is aligned with customer values and expectations [55].

In summary, the packaging sector is facing environmental challenges stemming from its linear consumption pattern and plastic waste, and it is important to move towards the circular economy and to prioritise sustainable product design that easily recycles or reuses materials, involving stakeholders from the entire circular ecosystem. The development and deployment of innovative technologies and financial incentives are relevant to the practical implementation of the circular economy. Resource efficiency, waste reduction, and sustainable growth are essential pillars on the road to a thriving circular economy while monitoring progress and strengthening commitment.

RESEARCH METHODOLOGY

The aim of the empirical study was to investigate and identify focal economic principles that companies can integrate into their current business models. This study aims to find out what innovations are needed to integrate them into the business model. The main objectives of this study were:

– to assess the relevance, benefits, potential risks and investment needs associated with each

key innovation/action based on an individual assessment,

– to identify any additional key innovation/action that may not have been previously recognised in the literature review,

– to prioritise the key innovations/actions according to their importance and compare these priorities with the results of the individual assessment.

Actions and approaches. The empirical study, which was carried out in four steps, is presented in Table 2.

The first phase of the study is divided into six main perspectives: (1) materials, (2) design, (3) production and distribution, (4) use, (5) end-of-life, and (6) other. A business model across the product lifecycle was selected and innovations relevant to packaging manufacturers were identified on the basis of innovations published by the European Environment Agency in 2021 [38].

The second stage of the study involved a survey – a structured interview using the Google Forms platform to analyse the needs of the customers of a packaging company in an EU country. The questionnaire consisted of nine questions, and respondents were asked to rate the importance of these questions on a Likert scale from 1 to 5, which included two negative, two positive and one neutral score, and which is commonly used to assess predefined factors [56].

The five Likert scale scores represent the following values: 1 – strongly negative attitude, 2 – slightly negative attitude, 3 – neutral attitude, 4 – slightly positive attitude, 5 – strongly positive attitude.

In the third phase of the study, we sought to gather insights and gauge the views of the employees of a packaging company in an EU country on potential innovations to achieve circular economy objectives. The questionnaire consisted of 18 clearly worded questions asking the respondents to rate the importance of key innovations on a scale of 1 to 5 and to rate the ease of the implementation of these innovations on the same scale. The Likert scale, which is commonly used to assess predefined factors [56], was chosen to assess the importance of key innovations, and one open-ended question was included to allow respondents to suggest their own innovative ideas.

The fourth step was to determine the view of the company's top management and owners on the circular economy efforts and the importance of key innovations.

According to Pažėraitė et al. [57] and Žičkienė et al. [58], there are no strict requirements for the sample size in qualitative research: it can be as small as three respondents, and as few as six respondents can ensure at least 90% accuracy. With this in mind, five members of top management were selected for the semi-structured interviews, which was considered a sufficient number of respondents.

RESULTS OF CUSTOMER SURVEY RESULTS

To find out the attitudes towards sustainability and whether they value suppliers that follow the principles of the circular economy, a questionnaire was developed to gather the views of the customers of a packaging company in an EU country and was administered to the 20 largest customers, which account for 62% of the company's revenue. Eighteen customers responded and none of them expressed complete indifference or disrespect for the company's provision of sustainable solutions

Table 2. **Steps of the empirical study**

Steps	Research methodology	Research methods/data
Step 1	Compilation of the most variable innovation	Systematic content analysis; comparative analysis of secondary data
Step 2	Researching the most important needs of the customers of the packaging company	Structured interviews – survey (semi-quantitative research)
Step 3	Assessing employee perceptions of key circular economy initiatives	Survey (quantitative research)
Step 4	Assessing the view of the company's management on key initiatives to implement the circular economy	Semi-structured interviews (qualitative research)

and its commitment to circular economy principles. Five respondents indicated a neutral position, indicating that this aspect may not yet be very important in their current activities. However, the vast majority of 72% of the respondents stressed the importance of sustainable solutions and commitment to the circular economy for a packaging company.

Customers were asked to rate the importance of nine different innovations for the packaging company on a scale from 1 (not important) to 5 (very important).

The survey results showed that the proposed innovations did not have a significant gap, with the highest initiative scoring 4.83 points and the lowest one scoring 3.33 points (Fig. 3). The survey gave an insight into the innovations that are most important to customers, but it is possible that customers' opinions may be somewhat subjective. The most relevant innovations are the following: avoiding hazardous chemicals that harm the environment, promoting circular and eco-design, and reducing material mix by using homogeneous materials.

An internal staff survey was also carried out in the printing department, which has a total of 51 employees. Twenty-one innovations were proposed to the staff, and they were asked to rate them in terms of their perceived importance, also on a scale of 1 (not important) to 5 (very important). A total of 37 staff completed the questionnaire.

The results showed that the implementation of the carbon foot print methodology was considered the least important innovation. The employees were asked to identify important innovations that were not mentioned in the questionnaire; only three employees had ideas on the use of bio-based materials that are more environmentally friendly, the importance of educating employees on the principles of the circular economy, and a unique suggestion to create a fleet of electric vehicles that meets the company's sustainability objectives.

The biggest concern expressed by eight out of 13 employees was the financial risk of having to spend a considerable amount of money to implement these changes, as well as increased costs of production and the possible reluctance of customers to pay more for green products.

The results of the staff survey showed a difference in their awareness of the circular economy, with a clear preference for innovations to improve efficiency, including investment in technology, avoidance of environmentally harmful chemicals, and initiatives to promote circular and green design practices. In implementing circular practices, the staff expressed particular concern about financial risks, investment, increased costs, and whether customers would accept green products. The employees highlighted the importance of education and training, effective government tax policy, learning from market success stories, and cooperation through industry associations as possible means to promote circular economy principles within the company.

CONCLUSIONS

As the concept of the circular economy is becoming popular and relevant in the world based on

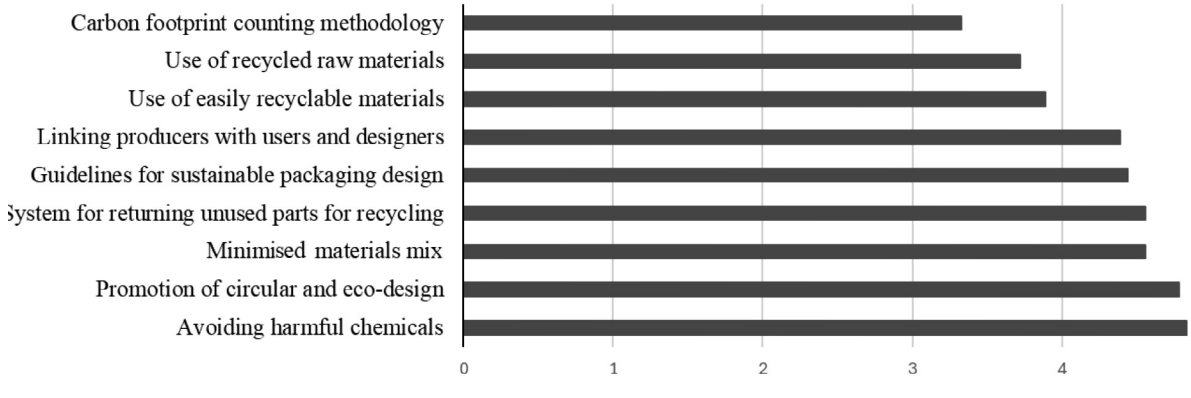

Fig. 3. Customers rating of innovations

sustainability and resource management, it aims at the rethinking of the life cycles of products, reduction of resource consumption, promotion of reuse and recycling, and aligning practices with sustainability objectives. The circular economy is being increasingly identified as the method that addresses environmental problems and stimulates economic growth. The promotion and adoption of circular economy principles influences a number of interlinked factors and criteria that include addressing environmental challenges, legislative frameworks, economic incentives, innovation, links to global sustainability goals, supply chain resilience, and international cooperation. The business model that is focused on fostering the circular economy throughout the life cycle of a product in the packaging industry and beyond is in need for innovation in different areas. Therefore, the article provides insights for a comprehensive framework for circular implementation and scalability of business models that promotes the transition to a more sustainable and circular economy. After analysing the literature and based on the model, the article examines the main innovations that can be introduced within a packaging company in an EU country.

With a linear consumption model and plastic waste, the packaging sector is facing significant environmental challenges. It is important to ensure a successful transition to the circular economy, in particular by prioritising sustainable product cooperation between all stakeholders, by developing deeply innovative technologies, and attracting financial incentives that will accelerate circular practices. Analysis of secondary data made it possible to understand how the innovations described in the literature are perceived by customers, employees, and managers of the company, focusing on prioritisation. The results of the surveys give a comprehensive picture of the adoption of the principles of the circular economy in an EU packaging company, the challenges and opportunities faced by the packaging manufacturing industry. Customers associate the most important innovations with environmental responsibility and sustainability, the main priorities are the avoidance of harmful chemicals, the promotion of circular and eco-design practices, and the reduction of the materials mix using disposable materials. This demonstrates growing awareness among customers about the environmental impact of packaging materials and the desire to align their practices with the principles of the circular economy. The different level of awareness of employees about the circular economy emphasises the importance of education and training in the organisation. The employees' desire to know more about the application of circular economy principles demonstrates the potential of internal initiatives to raise awareness and foster a culture of sustainability. Although the employees prefer certain innovations, they were first of all concerned about financial risks, investments, increased costs, and the buyers' approval of environmentally-friendly products. Overcoming these concerns will be very important in promoting the application of circulating and sustainable principles in the company.

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ŽIEDINIO VERSLO MODELIO INTEGRAVIMAS Į PAKUOČIŲ PRAMONĘ

Santrauka

Straipsnyje nagrinėjamas žiedinės ekonomikos verslo modelio integravimas į pakuočių pramonę ir žiedinės ekonomikos principų įtraukimas į veikiančios ES pakavimo įmonės modelį. Pagrindinis tikslas – pasiūlyti pritaikomus sprendimus dėl žiedinės ekonomikos principų integravimo į ES pakavimo įmonę bei kitų to sektoriaus įmonių veiklos modelius.

Pirmąją šio darbo dalį sudaro mokslinės literatūros analizė apie žiedinės ekonomikos principus, taikomus modelius bei nustatomi ir apžvelgiami pagrindiniai žiedinės ekonomikos principai, įvertinami pagrindiniai skatinantys ir ribojantys veiksniai. Analizuojant taikomus modelius, parenkamas labiausiai tinkantis modelis pakuočių gamybos srities įmonėms, sukuriant tvirtą teorinį pagrindą tolesniam žiedinės ekonomikos principų integravimui į įmonės veiklos modelį.

Antrojoje dalyje analizuojamos inovacijos, galinčios prisidėti prie žiedinės ekonomikos principų integravimo į ES pakavimo įmonės veiklos modelį. Siekiama išsiaiškinti, kas svarbu šio sektoriaus klientams, ką vertina įmonės darbuotojai ir vadovybė. Trečiojoje dalyje aprašomi tyrimo rezultatai. Straipsnis baigiamas išvadomis.

Raktažodžiai: žiedinė ekonomika, verslo modelis, pakavimo pramonė, atliekos, plastikas