

ASSESSMENT OF THE READINESS OF MANUFACTURING COMPANIES IN IMPLEMENTING A CIRCULAR ECONOMY

Kamila PISKORZ^{1*}, Agnieszka SITKO-LUTEK²

¹ Maria Curie-Skłodowska University, Lublin; kamila.piskorz@mail.umcs.pl, ORCID: 0000-0002-3843-9671

² Maria Curie-Skłodowska University, Lublin; agnieszka.sitko-lutek@mail.umcs.pl,

ORCID: 0000-0002-3073-1184

* Correspondence author

Purpose: The article is devoted to the analysis of the genesis, ideas, assumptions, and implementation of the circular economy (CE) in the context of organizational and business management, with particular emphasis on the readiness of enterprises to introduce CE. The aim of the study is a comparative analysis of the readiness of manufacturing enterprises, taking into account their size, in terms of implementing the principles of the circular economy. Considering the developed readiness model for the introduction of the circular economy, the following research questions were created:

1. How do manufacturing enterprises assess the economic viability of the circular economy?
2. How does the external environment affect the pace of introducing the circular economy in enterprises?
3. What is the technological, infrastructural, financial, and competence readiness of the staff in terms of introducing the circular economy?
4. What practices related to the circular economy are already introduced, which are planned for introduction, and which are not considered in enterprises?

Design/methodology/approach: The method of analysis of subject literature and the quantitative method were applied, using the survey technique. The survey was conducted using the CAWI technique.

Findings: The key findings pertain to the role of external and internal factors in determining the readiness to implement circular economy practices in business operations. Research indicates that although many companies have a positive attitude towards the circular economy, discrepancies exist between their declarative scope and the level of implementation of good business practices in manufacturing enterprises. Standards such as BS 8001 can play a pivotal role in promoting the circular economy. Hence, state institutions should increase the availability of information on ISO standards and simplify certification procedures. The government, regulatory bodies, and the private sector must collaborate to enable the full implementation of the circular economy model. Large corporations have more financial resources, which can facilitate the implementation of CE practices, while small businesses are more constrained in terms of funding. Due to their visibility, large companies feel greater social pressure to adapt to CE principles. Despite environmental pressures, many companies do not feel strong competition or market pressure to accelerate their adaptation to the CE model. However,

both small and medium-sized, as well as large enterprises, recognize the economic viability of the circular economy.

Research limitations/implications: The following directions for further research have been proposed, including the development of measurement tools for Sustainable Development Goals (SDGs) alignment, analysis of the impact of SDGs on innovation, and the study of the role of leaders and organizational culture. There is a need for further exploration of the influence of regulations and public policies on SDGs alignment.

Practical implications: The circular economy has practical implications for changes in business models, resource management, strategy, and corporate marketing activities. It also recommends the development of tools for assessing the level of implementation of CE principles in enterprises and promoting pro-environmental attitudes among consumers.

Social implications: The circular economy has the potential to influence social attitudes and behaviors by promoting more sustainable consumption and production practices, which in turn may affect the quality of life and the balance of ecosystems. Actions in the field of the circular economy can also impact public and industry policy.

Originality/value: The article proposes a research model that takes into account various factors influencing the readiness of enterprises to implement circular economy practices, allowing for the identification of key barriers in the decision-making process by owners and managers of manufacturing companies in the aspect of changes bringing the company closer to the introduction of CE principles. This model can be valuable for researchers and practitioners interested in sustainable development, as well as governmental institutions wishing to support transformations towards CE.

Keywords: The readiness to implement a circular economy, a manufacturing enterprise, sustainable development, circular economy, level of readiness.

Category of the paper: Research paper.

1. Introduction

The concept of a circular economy (CE) has its origins in the late 1960s (Kulczycka, 2019), emerging as a response to the growing need for waste reduction and care for the natural environment. Today, the principles of CE are increasingly widespread due to the actions of political decision-makers and social movements. Changes in the business environment, aimed at a zero-emission economy, are forcing many companies to adjust their activities to meet environmental protection requirements. The research problem relates to globalization and the increasing consumption of resources, posing the question of how organizations can change their business models to have a lesser impact on the environment while maintaining appropriate product quality. The key issues involve understanding the main barriers to adopting the CE model in manufacturing enterprises and identifying the factors that influence companies' readiness to adopt this approach. The goal of this scientific paper is to conduct a comparative analysis of the readiness of manufacturing companies of different sizes to implement the principles of the circular economy. The readiness issue is crucial for the effective implementation of the CE concept, as it determines the extent to which organizations and

societies are prepared for changes associated with transforming processes and systems towards sustainable resource use.

2. Circular economy - the idea, objectives, and principles

The idea of a circular economy emerged in the late 1960s (Kulczycka, 2019), although it can also be traced back to earlier works in the field of economics. Initially, it was a concept associated with environmental protection and waste reduction. Currently, this concept assumes that the economy should be designed in a way that allows for the maximum utilization of resources by minimizing the production of waste and greenhouse gas emissions, as well as through the recovery and reuse of raw materials. For the purposes of further considerations in this paper, the applicable definition of a circular economy is adopted as created by X. Pin and Y. Hutao in 2007, which states that “a circular economy requires organizing economic activities in order to produce a “resources-products-secondary resources” feedback flow with characteristics of low exploitation, high utilization, and low emission. The entire substance and energy can be used in a reasonable and sustainable manner in a continual economic cycle, in order to reduce as much as possible the impact on the natural environment caused by economic activity” (Pin, Hutao, 2007).

This model is based on principles such as: sharing, lending, utilizing, repairing, renewing, and manufacturing materials and products for as long as possible (Sitko-Lutek, Lutek, 2022). The introduction of the circular economy aims to limit the negative impact of businesses on the environment and ensure that nature is not excessively exploited for economic growth (European Environment Agency, 2016). In this context, the CE is the opposite of the linear economic model, which relies on the "take → make → consume → dispose" scheme (Lacy, Rutqvist, 2015). Implementing the CE requires the engagement of new business models and collaboration of all stakeholders in creating new relationships and value chains both within and outside the company (Lacy, Rutqvist, 2015). The main goals of the CE are: to maximize the added value of raw materials, materials, and products, to minimize the amount of waste generated, and to manage resources effectively (Stahel, 2016).

The circular economy encompasses a wide range of activities and areas, such as: eco-design, technological innovation, education, and environmental impact assessment (Stahel, 2016). The application of the circular economy can lead to economic, ecological, and social benefits, such as the reduction of greenhouse gas emissions, increased competitiveness and employment, and savings for consumers (European Environment Agency, 2016).

The concept of the circular economy gained popularity in the 1990s in connection with the growing interest in issues of sustainable development and environmental protection. A pioneer in research on ecological economics (a field of economics that focuses on sustainable

development and the protection of the natural environment, it is an economic approach that tries to take into account the impact of economic activities on the environment and consider ecological and social costs in making economic decisions) and sustainable development was the ecologist and economist Robert Costanza, who, together with co-authors in the work “The value of the world's ecosystem services and natural capital” (Costanza et al., 1997), emphasized that ecosystem services, such as food production, water purification, climate regulation, and providing habitats for wildlife, are essential for human life. Meanwhile, natural capital, understood as natural resources such as forests, waters, minerals, and oil, is indispensable for the economy's functioning. The authors in the aforementioned work presented an estimated value of ecosystem services and natural capital worldwide (most of which remains outside the market), amounting to \$16-54 trillion annually, averaging \$33 trillion per year. It was noted that natural capital is often undervalued and ignored by political decision-makers, leading to the degradation of the natural environment and irreversible loss of resources (Costanza et al., 1997).

The destruction or degradation of ecosystems can lead to a reduction or complete disappearance of certain ecosystem services, which has serious implications for humanity and the natural environment. Therefore, in the 1990s, various regulations and economic instruments were introduced to encourage entrepreneurs to implement practices consistent with the principles of sustainable resource management in their organizations. Asian countries, such as China and Japan, were pioneers in this field. Currently, following the recommendations of the European Commission, actions have been initiated in many member countries of the European Union to broaden the implementation of sustainable resource management (Kulczycka, 2019).

3. Circular economy in the light of management sciences and quality

Management in the context of the circular economy encompasses theories and models that consider economic, ecological, and social aspects. One of the key aspects of management according to the principles of the circular economy is the transformation of business models from linear to circular. Introducing the idea of the circular economy into management and quality sciences implies changes in various areas, such as (Wijkman, Skånberg, 2015):

1. Business models - management and quality sciences analyze how companies can transform their traditional business models to achieve the objectives of the circular economy, considering product durability and resource optimization.
2. Innovations - are crucial for designing products and services consistent with circular economy principles, such as ease of repair, reusability, or recycling. Management and quality sciences study how companies can develop and stimulate innovation.

3. Strategies and change management - management and quality sciences analyze how organizations can develop strategies that incorporate the goals of the circular economy, helping them in identifying and exploiting new market opportunities.
4. Collaboration strategies and networks of mutual relationships - the circular economy relies on cooperation between different entities, such as businesses, governments, and non-governmental organizations, to achieve common goals. Management and quality sciences examine how these entities can collaborate, create networks, and share knowledge and resources to support the development of the circular economy.
5. Marketing activities - based on consciously and consistently developing pro-environmental attitudes among consumers contributes to increasing demand for products that are less burdensome for the natural environment.
6. Metrics and impact assessment - in the context of the circular economy, management and quality sciences focus on developing metrics and assessment tools that can help companies measure and monitor progress in achieving circular economy-related goals. These metrics can include indicators for resource efficiency, waste reduction, greenhouse gas emissions, and social impact.

CE is not merely a theoretical concept, but an achievable and practical approach to modeling business activities that can bring benefits to the environment, societies, and enterprises. Therefore, management and quality sciences play an extremely important role in translating the theory and principles of CE into practical solutions in business (Kirchherr et al., 2017). Adapting business models to the framework of CE can open up new market opportunities and introduce innovative solutions that support sustainability and social responsibility (Korhonen et al., 2018). Collaboration between enterprises, the public sector, and other stakeholders can support broader-scale changes, enabling the creation of networks and communities based on common goals and values.

4. The readiness of manufacturing enterprises in terms of implementing a circular economy

4.1. Research model

The research model was developed based on a literature review. The creation of the model was based on the works of S.K. van Lengen, C. Vassillo, P. Ghisellini, D. Restaino, R. Passaro, S. Ulgiati (Van Lengen et al., 2021), M.P. Singh, A. Chakraborty, M. Roy (Singh et al., 2017) and M.G. Gnoni, F. Tornese, B.K. Thorn, A.L. Carrano, J.A. Pazour (Gnoni et al., 2018). The created model is based on the assumption that favorable external factors focused around stakeholders expectations, availability of support, and resources from recycling determine the perceptions and attitudes of entrepreneurs, which affects their level of readiness to implement

the principles of the circular economy in their organizations (Figure 1). This model assumes that understanding and engagement of different stakeholder groups in the transformation process to a circular economy are essential for its effective implementation and wide adoption. Factors determining the readiness to implement CE include: social pressure and expectations of external stakeholders; availability of raw materials and external support; attitudes and perceptions towards sustainable development; perceived behavioral control; and the internal potential of the organization to implement CE.

The implementation of circular economy in enterprises is a complex and multi-stage process that can be driven or inhibited by various external factors, which the organization has limited influence over. These factors include social pressure and the expectations of external stakeholders, as well as the availability of raw materials and external support. Social pressure and the expectations of external stakeholders refer to the perceived pressures and requirements that society and external stakeholders (competitors, customers, suppliers, regulators, and strategic partners) place on the organization to conform to certain standards, values, and expectations. In analyzing this factor, it should be considered:

1. Social norms - general beliefs and expectations about how organizations should operate within a specific social context.
2. External stakeholders - individuals or groups that can influence an organization but are not part of its internal structure.
3. Expectations - specific requirements or desires expressed by stakeholders regarding the organization's activities.
4. Relationships and sanctions - potential consequences (positive or negative) that an organization may experience in response to its actions or inaction in the context of stakeholder expectations.

Social pressure and the expectations of external stakeholders can play a crucial role in shaping the attitudes and behaviors of organizations within the context of a circular economy. If an organization feels strong social pressure and faces increasing expectations from stakeholders (to implement practices associated with CE), this can influence its perceived behavioral control. Organizational leaders may believe that they have greater potential to implement these practices, seeing that these changes are necessary for their survival and success. Pressures and expectations can motivate the organization to invest in the resources, technologies, and skills necessary to implement CE. Organizations may be more inclined to seek partnerships, innovations, or training that will help them meet the expectations of the external environment, and the constant social pressures and stakeholder expectations can influence organizational culture, promoting values associated with sustainable development and CE.

The availability of raw materials and external support as a factor refers to the extent of the ubiquity of necessary raw materials and support from external units, institutions, or organizations that can support an organization's activities in the context of implementing CE. When analyzing this factor, the following should be considered:

1. Resource availability – the ease of obtaining material, financial, human, or other types of resources that are necessary for the introduction and maintenance of CE practices.
2. External support – the availability and extent of support from external parties, such as suppliers, business partners, financial institutions, non-governmental organizations, or governmental units, which can support the organization by providing key resources, knowledge, financing, or other forms of support.
3. Networks and partnerships – the ability to establish and maintain relationships with external units that can provide valuable resources or support to the organization.
4. Market conditions – the state and dynamics of the raw materials market and the availability of alternative sources of raw materials.

The availability of raw materials and external support is essential for the broader implementation of the circular economy in enterprises. A key aspect of CE is the reintroduction of resources and materials into the production cycle. Without access to recycled raw materials, organizations may encounter obstacles in effectively implementing CE practices. External support, by providing new technologies, knowledge, and innovations, can significantly enhance an organization's capabilities, as well as reduce the risk and uncertainty associated with implementing CE (by diversifying raw material sources and guaranteeing the necessary operational and financial support). Effective support in this area can lead to greater social pressure and stakeholder interest, which further strengthens the perceived behavioral control of the enterprise.

The internal factors that play a crucial role in shaping the behavior and readiness of organizations to implement CE include: the internal potential of the organization to introduce CE, attitudes and perceptions towards sustainable development, and perceived behavioral control. These concepts are related to the adaptation and implementation of sustainable development practices in organizations, but they differ in terms of their significance, scope, and implications.

The internal potential of an organization to implement CE is defined as the totality of an organization's actual resources, capabilities, skills, and values that enable adaptation and the implementation of CE practices, focused on waste minimization and the reuse of resources. Key to this potential are elements such as technological capability, financial ability, employee qualifications, infrastructure, environmental awareness, and pro-environmental attitudes, which indicate the company's readiness to implement CE. This objective approach, which can be measured through the availability of technology, financial resources, employee qualifications, etc., suggests that a strong internal potential of an organization can significantly increase perceived behavioral control, translating into greater certainty in taking action.

Attitudes and perception towards sustainable development focus on how an organization perceives the importance, benefits, and the need to implement sustainable development within the context of its operations. It centers on the subjective perception and beliefs of the organization regarding sustainable development. Key elements such as: economic profit, competitiveness, or the need for change play a significant role here. These attitudes have a direct impact on how the organization views its capabilities to implement changes and what actions it undertakes towards CE.

Perceived behavioral control refers to the perceptions regarding the level of difficulty or ease of performing a specific behavior or action, focusing around the perception of one's ability to effect change. In an organizational context, this is the belief about whether a company possesses the necessary resources, skills, and capabilities to implement changes, such as the adoption of circular economy practices. Organizations that perceive themselves as having significant resources and competencies (including in areas such as technology, recycling, environmental management, or IT strategies) and have the appropriate attitudes and perceptions, demonstrate a higher ability to introduce CE principles and may prove to be more ready to undertake actions in the field of sustainable development, compared to organizations that do not have the appropriate attitudes and perceptions or internal potential.

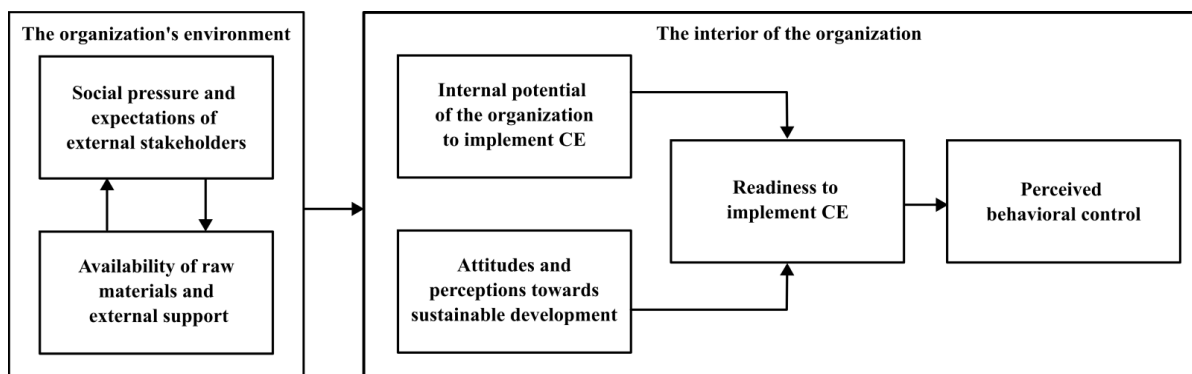


Figure 1. The Conceptual Model of Readiness for the Implementation of a circular economy.

4.2. Research methodology

The aim of the study is to conduct a comparative analysis of the readiness of manufacturing enterprises, taking into account their size, in terms of implementing the principles of the circular economy. Considering the developed readiness model for the introduction of the circular economy, the following research questions were created:

1. How do manufacturing enterprises assess the economic viability of the circular economy?
2. How does the external environment influence the pace of circular economy implementation in enterprises?
3. What is the technological readiness, infrastructure, financial capability, and staff competence in terms of introducing the circular economy?

4. Which practices related to the circular economy are already implemented, which are planned for implementation, and which are not considered in enterprises?

The research method used is a survey conducted using the Computer-Assisted Web Interviewing (CAWI) technique, which involves respondents independently filling out the questionnaire via the internet.

The research tool was a questionnaire consisting of 38 questions, which utilized a five-point Likert scale, and 11 questions related to good practices associated with various aspects of business operations, where respondents indicated the level of implementation of a given practice in the daily functioning of the organization. The Likert scale questions measured the level of agreement or disagreement with a statement within one of the 5 groups of factors described in the research model, of which: social pressures and expectations of external stakeholders were assigned – 7 items; availability of raw materials and external support – 4 items; attitudes and perceptions towards sustainable development – 12 items; the internal potential of the organization to implement CE – 12 items; perceived behavioral control – 3 items. These questions concerned: the economic viability of the circular economy, the influence and pressure of the external environment (micro and macro environment) on the pace of CE implementation, the company's potential for implementing CE (potential: technological, infrastructural, financial, intellectual, and staff competencies), availability of recycled raw materials, and the organization's pro-environmental actions. In questions about the level of implementation of good practices, respondents had to mark one answer out of 4 proposed options: implemented; to be implemented within the next year; considered for future implementation at an unspecified date; there are no indications for its implementation in my company. These questions related to: ISO standards; monitoring and assessing the impact of production on the environment; cyclic analyses of: material flows, use of recycled materials, waste production levels, environmental costs; work on: designing sustainable product solutions and packaging, solutions that reduce the carbon footprint of products.

The subject of the study were manufacturing companies located in Poland, specifically their owners and managerial staff (Figure 2). The thematic scope included the assessment of companies' readiness in terms of implementing the principles of the circular economy, the analysis of their involvement in practices related to this economy, and the identification of potential obstacles and challenges. The study covered enterprises of various sizes and scopes of activity. The research sample was $N = 205$, consisting of $N = 134$ small and medium-sized enterprises (employing fewer than 250 people) and $N = 71$ large enterprises (employing 250 or more people). The owners and managers participating in the study work across multiple sectors, with the dominance of the food industry at 13%, followed by: automotive 9%, metal industry 7%, furniture production 7%, manufacturing (general) 6%, electronics 6%, wood processing/treatment 4%, machinery production 4%, paper production 4%, window production 3%, energy 3%, cable production 2%, chemical 2%, packaging production 2%, cosmetics 2%,

decoration/ornaments/candles 2%, with others comprising 22%. The companies under study have a regional (30% of respondents), national (74%), and international (49%) reach.

The study was conducted in the period from november 25 to december 11, 2022. After conducting the data analysis, the results were interpreted and presented in the form of research conclusions regarding the readiness of manufacturing enterprises to conduct a circular economy. The study is concluded with recommendations for enterprises, public policymakers, and other interested parties, aimed at improving forms of actions and supporting the transformation towards a circular economy in the manufacturing sector.

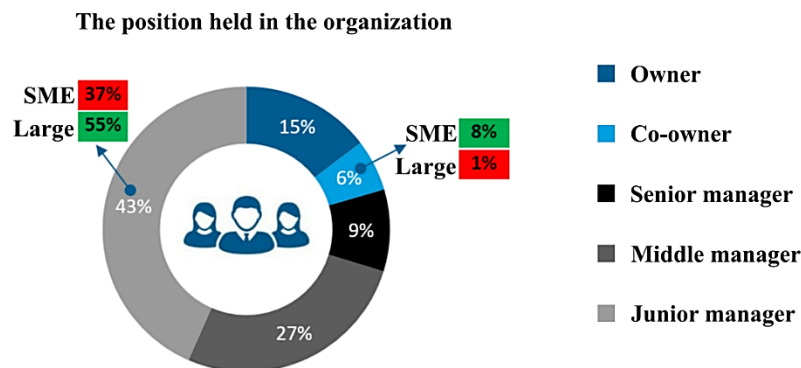


Figure 2. The position held by respondents in the manufacturing enterprise.

4.3. Assessment of the readiness of manufacturing enterprises to Implement the circular economy

In the results obtained, it was observed that social pressures and the expectations of external stakeholders play a significant role in only a few aspects of exerting pressure on manufacturing companies regarding the introduction of circular economy principles in the organization. The average number of ratings for statements assigned to the group of these factors fluctuates between 3.26 and 4.01. Ratings characterized by high variability and significant discriminator power concern two following areas: the role of regulatory institutions and the need for CE principles adaptation. The role of regulatory institutions, which insist on compliance with stringent waste management rules, was emphasized. The overall average was 3.84, with small and medium-sized companies rating this question at 3.92, and large companies at 3.69. Considering the urgent need for companies to adapt to CE principles due to pressures from outside the organization, the average response was 3.27, with small and medium-sized companies scoring significantly lower at 3.18, compared to large companies at 3.44. The distribution of responses on this subject is highly varied among both groups of respondents, which precludes drawing definitive conclusions regarding the importance of this factor's pressure on the company. Analyzing results that are characterized by low variability and low discriminator power, of significant importance for companies, revealed that the market exerts pressure on manufacturers to produce cheaply while minimizing environmental impact. The overall average rating for the question measuring this aspect was 4.01. When separating small and medium-sized and large companies, scores of 4.03 and 3.97, respectively, were

obtained. It was also found that customers and consumers are interested in the environment and willing to make positive changes in their behaviors or business practices. The overall average for this question was 3.62, with both small and medium-sized, as well as large companies, rating it at 3.62 and 3.63, respectively. It was recognized that financial institutions are increasingly demanding that companies consider environmental parameters, with an overall average of 3.78. Small and medium-sized companies gave a response of 3.76, while large companies rated it slightly higher at 3.82. Evenly distributed responses across the scale concerned buyers' readiness to pay higher prices for ecological products and society's demand for the implementation of CE. The overall average response for the question regarding buyers' willingness to pay higher prices for ecological products was 3.24, with small and medium-sized firms at 3.20, and large firms at 3.32. Respondents indicated that society demands the introduction of CE with an overall average of 3.49. Small and medium-sized companies gave this aspect slightly more importance with a score of 3.54 compared to large companies, which responded with 3.41.

The analysis of the study results in the context of raw material availability and external support shows that the responses to the presented questions are mixed and oscillate around the answer "no opinion," indicating variable perceptions in the context of the following aspects. The average number of ratings for statements assigned to the group of these factors ranges between 3.01 and 3.58. It should be emphasized that the results in this area are characterized by relatively higher variability and discriminative power. Regarding the availability of grants and tax benefits for the implementation of CE practices, the overall average response was 3.01. The distinction in responses between small and medium-sized enterprises and large companies is noticeable, where SMEs scored 2.89 and large companies 3.24, suggesting weaker support and/or lack of awareness of government support among smaller enterprises. The availability of recycled materials compared to primary raw materials received an overall average response of 3.29. Although the results for small and medium-sized enterprises (3.23) and large firms (3.41) are not significantly different, they indicate a moderate perception of the financial benefits resulting from the availability of secondary raw materials. In terms of financial incentives in promoting CE, entrepreneurs and managers rated it on average at 3.23, with subtly lower ratings from small and medium-sized enterprises at 3.17 compared to larger companies at 3.35, which again may suggest differences in access to or awareness of available financial incentives. Meanwhile, regarding the financial attractiveness of CE and related activities, the highest average response was 3.58. Here, it is clear that both SMEs (3.53) and large enterprises (3.68) recognize certain financial factors that make CE-related activities attractive.

The analysis of results in the context of attitudes and perceptions towards sustainable development allows for an understanding of how manufacturing enterprises perceive the significance and benefits of implementing CE principles within their operations. The average number of ratings for statements attributed to this group of factors ranges between 3.34 and 4.07. The profitability of CE as determined by respondents is deemed significant,

with an overall average response of 3.72. The difference between small and medium-sized enterprises (3.73) and large companies (3.69) is marginal, suggesting a similar perception of CE profitability in both groups. The responses in this aspect are characterized by low variability. Ecological awareness in terms of the organization's evaluation of product and production process obtained an average response of 3.97. It is interesting to note that both small and medium-sized as well as large companies expressed very similar opinions in this aspect. Considering the focus on reducing the consumption of primary raw materials and the emphasis on recycling, the overall average response was 4.07, indicating that the majority of respondents 'strongly agree' with the statement relating to the reduction of primary raw materials and orientation towards recycling. Small and medium-sized enterprises showed a greater tendency towards this approach (4.13) compared to large companies (3.94), which indicates a significant discrimination between small and large firms. In the axiological aspect, owners and managers of companies declare that their organization is environmentally oriented. This means that they value the natural environment and take into account environmental responsibility in their actions. In this aspect, an overall average response of 3.98 was obtained. The differences between small and medium-sized (3.99) and large firms were minimal (3.96). In the aspect of promoting product design in such a way that they are suitable for reuse and recycling, the overall average response was 3.76. Most respondents 'agree' with this statement, and both small and medium-sized as well as large companies have similar opinions on this subject, each obtaining an average response of around 3.76. Encouragement to implement a recycling system for used and defective products received an average response of 3.88. The results suggest that the majority of respondents "agree" with this statement, with larger companies showing slightly more inclination towards this approach (3.97) compared to small and medium-sized enterprises (3.84). In the aspect of recognizing the gap between what an organization is currently doing and what it could and should do in the field of circular economy, the average response was 3.34. Larger firms, with a response of 3.48, indicate slightly greater concerns regarding the mismatch of organizational actions to environmental capabilities and needs, while SMEs with a score of 3.26 seem more confident that they do not have such a gap. Considering the distribution of responses, only 7% of large companies and 3% of SMEs are certain of the absence of a gap, while 12% of large companies and 9% of SMEs are definitely convinced of the existence of discrepancies in this aspect. Taking into account external pressures for sustainable development in today's world, changes to embrace a circular economy are the right response for organizations, which received an average response of 3.73. Here, large firms (3.99) show a clearly positive attitude towards this statement, in contrast to smaller firms (3.59). In terms of awareness and the level of preparedness for CE activities, respondents' answers hover around an average of 3.71, with minimal differences between small (3.70) and large firms (3.72). Generally, organizations will acquire funds and also invest significantly to build operations around CE principles. The average response regarding this statement was 3.56. The distinction in responses between SMEs (3.50) and large firms (3.68) indicates a slightly greater willingness

of large firms to invest in this issue. Considering the distribution of responses, a comparable number of large enterprises (58%) and SMEs (56%) will be acquiring funds to build operations around the circular economy. Significant differences between these groups emerge in terms of the definite lack of participation in this aspect, with 5% of owners and managers of large firms declaring that they are unlikely or definitely will not undertake such actions, while in the group of SMEs this number rises to 20%. Considering the need to improve actions in terms of sustainable development, an average response of 3.70 was obtained. With a slight difference between SMEs (3.64) and large firms (3.80), this indicates that overall organizations are aware of the need for changes in sustainable development through the implementation of organizational changes in favor of the circular economy. Analyzing the distribution of responses, a significant portion of entrepreneurs declare that they must take action in this aspect, with 70% of large and 66% of SMEs of this opinion. The belief that changing actions towards a circular economy will improve organizational outcomes received an average response of 3.62, with minimal differences between small (3.60) and large firms (3.66). In summary, responses to questions about attitudes and perceptions towards sustainable development fall into the category "the majority of respondents agree," with the exception of recognizing the gap between current and expected actions, which falls into the category "no opinion." Large companies seem to be slightly more certain and positive in their approach to CE than SMEs, although these differences are not distinctly marked, excluding the focus on reducing the consumption of primary resources and emphasis on recycling, here there is a significant difference between large and small and medium-sized companies.

Based on responses regarding the assessment of the internal potential of organizations to implement the circular economy, we can assert that answers in this area range between 3.29 and 3.96. In terms of technological capacity, the overall average score indicates that respondents agree with the statement that their company has the technological capability to implement circular economy practices (3.61). The analysis highlights slight differences in responses, with small and medium enterprises hovering around a value of 3.63, and large firms scoring 3.58. With such close results, the variability of responses is low, and the power of discrimination is limited. The financial ability to implement sustainable waste management practices has been estimated at an average of 3.75. Here, the differences shown between small and medium enterprises (3.67) and large firms (3.90) suggest greater variability and a significant power of discrimination among responses. Considering the distribution of responses, a similar number of respondents declare the capability, with 72% among large firms and 68% among SMEs; a significant difference between these groups exists in the area of lack of financial capacity, where 8% of large firms declare it, compared to 15% of SMEs. Employee preparedness for recycling activities is rated relatively high, with an overall average of 3.96, with SMEs rated slightly higher (4.01) than large firms (3.86). In the context of infrastructure supporting CE practices, the average response is at 3.57. Responses are relatively uniform across different types of firms (SMEs: 3.54, large: 3.61). Conversely, the issue of increasing the share of reused

or recycled/renewable materials obtains an overall average of 3.79, with SMEs (3.77) and large firms (3.83) yielding quite close results, with little variability. In the aspect of the organization's impact on increasing demand for products by lowering production costs and minimizing their environmental impact throughout the lifecycle, it shows an average of 3.66. In this case, the difference between SMEs (3.75) and large firms (3.49) indicates greater variability of responses and potentially a higher power of discrimination. Considering the distribution of responses, 58% of large companies and 66% of small and medium-sized enterprises declare an influence, while 18% of respondents from large companies claim that as an organization they have no impact on the increase in demand, and similarly, 10% of SMEs share this opinion. Analyzing the respondents' answers, it has been shown that the average rating for the statement "We have an adequate number of qualified people in the field of environmental management" is 3.65. Comparative analysis between SMEs and large enterprises reveals slight differences, at 3.69 and 3.58 respectively. In the case of the capacity of information technology and information systems to support the transition to a circular economy, the overall average is 3.54, suggesting that respondents generally agree with this statement. Here too, the value for SMEs is slightly higher (3.60) compared to large enterprises (3.44). As for the availability of capital for investments in business models and activities related to CE, the average response (3.53) suggests agreement with this statement, whereas SMEs show less readiness (3.44) compared to large companies (3.69). Considering the distribution of responses, among SMEs 57% declare that they have the funds, and 23% indicate a lack of capital, while 65% of large companies declare capital availability, and 12% lack thereof. Moreover, regarding the organization's possession of technical knowledge and ideas for developing new skills necessary for adapting CE practices, responses indicate general agreement, with an average of 3.62 and similar results among SMEs (3.63) and large enterprises (3.61). Responses to the statement concerning a clearly defined strategy for adapting the organization to operate in a CE also hover around agreement, with an average of 3.44. SMEs (3.45) and large enterprises (3.42) present similar perspectives in this area. In the context of having a detailed implementation plan for CE, the average response of 3.29 leans closer to the "no opinion" category, with small differences between SMEs (3.30) and large companies (3.27).

Based on responses concerning perceived behavioral control, we are able to assert that the average responses in this domain range between 3.48 and 3.76. In terms of belief in the availability of resources and the ability to manage them, with the aim of implementing circular economy principles in the organization, the overall average rating of this factor was 3.57. This indicates that the responses are mostly positive. Differences are noticeable between small and medium-sized companies (3.52) and large enterprises (3.65), where the latter demonstrate a slightly greater conviction regarding the availability of resources and capabilities to manage them. In the aspect of availability and possibilities of implementing CE from a technical perspective and utilizing available know-how, the average rating was 3.48. Both small and medium-sized firms (3.49), as well as large enterprises (3.46), exhibit similar beliefs,

which suggests that the perception of availability and capabilities of implementing CE technically and know-how is comparable and independent of the size of the company. Considering the flexibility of a company's organizational culture and its ability to adapt CE practices, the highest average rating among the presented results in this group of factors was obtained, amounting to 3.76. Such a result signals that the majority of respondents agree with the statement that the company's organizational culture is flexible and can easily implement changes adapted to circular economy practices. It is noteworthy that the distribution of responses is extremely close between small and medium-sized enterprises (3.76) and large companies (3.75), which suggests that the organizational culture and readiness to adapt in terms of CE is perceptually similar in organizations of different sizes.

In the matter of implementing best practices, manufacturing enterprises most frequently introduce cyclic analyses of waste production (48%), systems for utilizing recycled materials (47%), complete cost analyses (including environmental costs) (39%), monitoring the impact of production on the environment (36%), and the application of the ISO 14001 standard (35%). Large companies more often make use of the ISO 14001 standard as well as planning and evaluation of actions to minimize the negative impact on the environment. The differences in these two cases are substantial, with 49% of large firms conforming to the ISO 14001 Standard, whereas only 27% of small and medium-sized enterprises do. Planning and evaluation of actions to minimize the negative impact of production on the environment is declared by 39% of large firms, and among medium and small ones, 31%. However, there is also an area of practices that are rarely implemented and not planned for future implementation. Among these is the BS 8001 standard concerning the implementation of circular economy within an organization.

4.4. The conclusions regarding the readiness of manufacturing enterprises to implement a circular economy

In response to the first research question, we can assert that company owners and managers positively appraise the economic profitability of the circular economy. Regarding the size of enterprises, it has emerged that managers of larger companies are more inclined to view the circular economy as economically viable. There are several key elements contributing to these results. From an axiological perspective, the study demonstrated that owners and managers of companies, regardless of size, are environmentally oriented. This suggests that values and beliefs related to environmental protection are deeply rooted in the organizational culture of businesses. Both large and small organizations seem to recognize the financial appeal of the circular economy. This is due to the fact that practices such as recycling, reuse of raw materials, or efficient resource management can lead to cost savings. Moreover, the ability to create products with a lower environmental impact can attract more ecologically aware customers. A significant conclusion from the research is that the profitability of the CE is perceived by managers and business owners as key, both in financial terms and in terms of business sustainability.

In response to the second research question, based on the results, we can assert that managers of large enterprises (with 250 or more employees) are more likely to recognize the need for shifts towards sustainable development in response to environmental pressures. Primarily, the large scale of their operations and their market visibility mean that they more readily become prime targets of public criticism and are subject to stricter regulations. Consequently, there is a stronger motivation within these organizations to adapt to new business models based on the principles of the circular economy.

Considering the social pressure and expectations of external stakeholders, regulatory institutions play a significant role in forcing organizations to adapt and align with the principles of circular economy, particularly in terms of waste management (a factor that determines the operations of small and medium-sized enterprises more than large ones). Financial institutions, as well as society, also impact organizations, demanding the inclusion of environmental parameters by companies in the production process. Nevertheless, less than 50% of respondents agree with the statement that there is an urgent need for their organizations to adopt CE principles due to falling behind other competitive firms. This may suggest that many enterprises do not feel direct competition or market pressure to accelerate adaptation to the circular economy model. Additionally, the assertion regarding the existence of a gap between the current actions of companies and what they could and should do in terms of implementing CE principles also found agreement among less than half of the respondents. This indicates a possible underestimation by firms of the potential or benefits of full adaptation to the circular economy. As a result, the external environment, in the form of market competition or societal expectations, does not seem to be the main motivator for many enterprises to implement CE-related practices more swiftly.

In response to the third research question, which refers to the readiness to implement circular economy principles in the technological, infrastructural, financial, and staff competency contexts, we can ascertain that in enterprises of various sizes, this readiness can take different forms. In terms of employee competencies, we observe that both small and medium-sized as well as large companies report positive evaluations. According to owners and managers, employees are prepared to carry out activities in the area of recycling and waste management, which is a key element of the circular economy. In small and medium-sized enterprises, there appears to be an even stronger declaration of employee readiness to act in this area, which may be due to the smaller scale of operations and the potential for a more individualized approach. Technological and infrastructural readiness is a matter that can be assessed differently in the context of the organization's size. Large enterprises may have access to more advanced technologies and infrastructure, which facilitates the implementation of circular practices on a larger scale. On the other hand, smaller organizations may be more flexible and capable of quickly adapting to technological novelties, although they may be more limited in terms of access to certain infrastructural solutions. The financial capacity to implement changes is a point of clear divergence between large and smaller companies.

Large enterprises often have access to greater financial resources, which eases investments in new technologies, processes, and training necessary for the implementation of the circular economy. Small and medium-sized enterprises, despite potentially being more flexible and innovative, may struggle with budgetary constraints that hinder their ability to carry out more costly sustainable economic practice initiatives.

In the research, a general readiness of enterprises to adopt circular economy practices is evident, albeit with a slightly higher degree of certainty regarding the availability of capital, technological capabilities, and staff competencies. It is also noteworthy that small and medium-sized enterprises often exhibit a similar, and sometimes even higher, level of readiness compared to large companies. The clear differences in perception between small and medium-sized firms and large enterprises may serve as a starting point for further, in-depth analyses and support strategies in the process of implementing CE in the manufacturing sector.

In response to the fourth research question, we can determine that manufacturing enterprises are increasingly engaging in eco-friendly activities. The study indicates that over 80% of surveyed companies confirm the reduction in the use of primary raw materials, focusing on the reuse and recycling of resources. Equally important for them is the environmental awareness of the product and the production process. These enterprises also increasingly identify themselves as environmentally responsible, which underscores their commitment to sustainable development issues. However, there are areas that still require attention and are planned for implementation by the companies. Approximately 40% of the surveyed firms intend to conduct an internal audit in the field of the circular economy and introduce innovative technological solutions in this area. This suggests that although there is an awareness of the need for change, these processes are still in the planning phase and have not yet been fully implemented. Nevertheless, it is noteworthy that only a small number of entrepreneurs have actually introduced practices that allow for the precise determination of the use of recycled resources or monitoring the level of waste emissions. For this reason, it is necessary to increase the role of standards and certifications. The BS 8001 standard could play a key role in promoting good practices in the field of the circular economy. To accelerate this process, state institutions could simplify certification procedures and increase the availability of information about such standards, which would encourage more enterprises to implement them.

In examining the readiness of enterprises to implement a circular economy, we can identify aspects where this readiness was greatest: reducing the consumption of primary raw materials, emphasizing the reuse and recycling of resources (4.07); the market pressures to produce inexpensively while simultaneously minimizing environmental impact (4.01); the organization values the natural environment and identifies itself as environmentally responsible (3.98); the organization considers the potential environmental awareness of the product and production process in its activities (3.97). The aspects where this readiness was lowest are: the conviction of an urgent need for the organization to adopt CE principles because it is behind other similar organizations (3.27); the belief that institutional and retail buyers are willing to pay a higher

price for ecological products (3.24); the belief in the existence of financial incentives to promote the transition to a circular economy (3.23); confidence that the government provides grants and tax benefits for the implementation of circular economy practices (3.01).

To summarize, the study results indicate the existence of differences between the declarative level and the level of implementing good practices as part of a company's operations. Therefore, the government and public institutions should take advantage of the willingness to introduce a circular economy and support it by creating favorable conditions, such as increased government support, promoting the benefits of the circular economy, and encouraging cooperation between the private and public sectors which can bring about positive changes. The enactment of the aforementioned measures may contribute to accelerating the transformation towards sustainable development and a circular economy.

5. Summary

The study results indicated that owners and managers of manufacturing enterprises positively assess the economic viability of the circular economy, with managers of larger companies being more convinced of the benefits arising from CE. Over 80% of companies focus on reducing the consumption of primary raw materials in favor of those sourced from recycling. Managers of large firms more often recognize the need for a shift towards sustainable development, mainly due to greater market visibility. However, there is an unnoticed gap by a large number of organizations, existing between the actual actions of enterprises and what they could be doing in terms of the circular economy. A significant number of respondents declare that they have no opinion on the presence of a gap between what is done and what could be done, yet comparing this with the degree of readiness to implement CE and the level of environmentally friendly practices in the enterprise, it is evident that organizations are not utilizing their full potential with respect to the principles of CE. Interpreting the study results, it was noted that values and beliefs associated with environmental protection are deeply rooted in corporate culture. Yet the external environment, in the form of market competition or societal expectations, is not the main motivator for many companies to introduce practices related to the circular economy. Financial readiness and staff competencies vary depending on the size of the company, with larger firms often having greater resources but may be less flexible in introducing environmentally friendly practices. In small and medium-sized enterprises, owners and managers report a slightly higher readiness of their employees to act in the realm of CE, which may be due to a smaller scale of operations and the possibility of a more individualized approach than in large companies.

In practical terms, the study reveals that companies of various sizes require different types of support in the process of implementing a circular economy. Small and medium-sized enterprises more often than large ones report a lack of financial capacity to introduce pro-environmental changes in production (8% of large companies; 15% of SMEs), and their owners and managers are not aware of the existence of financial support directed to them from state institutions.

The research results can be useful for management staff in manufacturing enterprises, decision-makers, and regulators. They can serve to shape appropriate strategies and support programs to accelerate the transformation of manufacturing companies towards more sustainable business models.

The study's results present a positive view of the economic viability of the circular economy, particularly among larger companies. Owners and managers, regardless of company size, exhibit environmentally friendly beliefs, which may promote the broader implementation of circular economy practices. The financial attractiveness of such practices is evident, arising from cost savings and the appeal to more environmentally conscious customers. Larger firms, those employing from 250 people upwards, feel environmental pressures to a greater extent and recognize the need for actions towards sustainable development. Many of these organizations feel the pressure from various institutions and societal expectations, yet less than 50% of respondents see an urgent need to implement CE practices due to market competition.

The limitation of the study was primarily the use of a questionnaire as the sole research tool, which may affect the depth of analysis. In the future, it would be worthwhile to apply qualitative research, particularly interviews conducted with management staff or analysis of companies' internal documentation to, for example, estimate the extent of the use of renewable sources and recycled materials. The study is also dominated by companies in the food industry, therefore, further research on readiness should focus on individual industries or groups of industries that use similar technologies, patents, or raw materials. In light of the findings, it is worth continuing research on the readiness of companies to implement circular economy principles, taking into account the differences resulting from the size of the enterprises.

From a theoretical standpoint, the study confirms and extends existing theories regarding the implementation of sustainable practices in business, highlighting key factors influencing corporate decisions. Insight into the understanding of the dynamics and perceptions of the circular economy in various types of enterprises can support the development of models and theories related to the adaptive processes of CE principles.

There is a need for intensified educational and informational actions and support, aimed at facilitating the transition of enterprises to more sustainable business models, also taking into account the diversity of needs and perceptions of companies of various sizes and industries. The results of the study are significant not only for the academic world but also for politicians, policymakers, business owners, and managers. In a world where ecological issues are becoming increasingly important, understanding the motivations and readiness of firms to act towards sustainable development is key to the advancement of future economic and social strategies.

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