
Challenges for Circular Economy Strategies in Polish Enterprises during the Pandemic Crisis

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Abstract:

Purpose: The paper aims to identify challenges for circular economy strategies in Polish enterprises in the COVID-19 pandemic.

Design/Methodology/Approach: The methodology is based on the assessment model designed during the literature review and introduced into the survey, realised in 2021 among 319 small and medium-sized enterprises (SMEs) in Poland. The statistical dependency analysis (Kruskal – Wallis and U Mann-Whitney tests) allowed scrutinising two sets of variables and verifying research hypotheses.

Findings: There was identified a group of significant challenges for the CE strategies in Polish enterprises. Among four scrutinised strategies, the especially vulnerable is the following one minimising/preventing waste generation (e.g., introduction of new technologies or materials to production or services).

Practical Implications: If we know the areas of COVID-19 impact, we can predict precisely which CE strategies will be at risk in another crisis. The paper shows strategies of special concern during long-term planning and facilitates the development of future scenarios to overcome the CE challenges and strengthen the companies' competitive position.

Future research: It is worth applying the model to benchmark the international cases. Future studies on this topic should identify problems, needs, solutions and good practices among companies across the world.

Originality/Value: The study delivers a diagnosis of the pandemic challenges which determine the development of CE strategies in Polish SMEs. The designed assessment tool should be useful to identify, evaluate but also anticipate and overcome the future challenges for CE strategies in enterprises.

Keywords: Management, SMEs, waste, circular economy, COVID-19, strategic planning.

JEL Codes: L19, Q01, Q53.

Paper type: Research article.

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1. Introduction

The crisis of COVID-19 pandemic appeared as a Black Swan phenomenon - enormous in scale, powerful in consequences and unlikely (Brzezinski *et al.*, 2021). Its sudden, unexpected, but mostly shocking impact has changed (Lal *et al.*, 2020) and broke many organisations, causing new challenges in all business and industry sectors. The problems which necessitated the special attention of managers during the pandemic concerned also circular economy strategies. These strategies aim at the utilisation of less natural resources and generation of lower environmental pressure (Potting *et al.*, 2017), according to the general idea of the circular economy (CE) which addresses sustainability challenges (Markard *et al.*, 2012) i.e., the environmental, social, and economic problems.

The CE concept is vital for mitigating the global catastrophic risks of climate change and ecological collapse. It became the priority in the present public policy of the European Union, which established A new Circular Economy Action Plan (COM/2020/98) within the framework of the European Green Deal (COM/2019/640). In the pandemic's result, however, the adopted circular economy action plans have been suspended, cancelled, or postponed what generated some still undervalued implications, e.g. in the environment (Baran, 2021).

The environmental and socio-economic consequences of "collapse of waste management chains" during the pandemic were observed throughout the world (Djalante *et al.*, 2020; You *et al.*, 2020). However, the impact of COVID-19 on the circular economy strategies is still an open question in public policy and enterprises (Sharma *et al.*, 2020), and should be prioritised (Djalante *et al.*, 2020; You *et al.*, 2020).

The knowledge deficiency on the implications of the pandemic crisis for the CE area makes up the research problem and determines the purpose of this study. To answer the question on the relations between COVID-19 and circular economy management in enterprises, the paper aims to identify challenges for circular economy strategies in Polish enterprises. The assessment model was developed for this purpose. Its structure was designed during the desk research, and the statistical data for the analysis of dependency between variables were collected through the questionnaire. According to the research methodology, 15 hypotheses were developed and then statistically tested what resulted in the formulation of the conclusions.

2. Literature Review

The Global Challenges Foundation classified the pandemics into the group of global risks. Their catastrophic impact might be mitigated or eliminated by the following three actions: better understanding the risks, developing governance models (The Global Challenges Foundation, 2021), and designing national resilience or enterprise security systems. The efficient implementation of these actions is determined by two

issues, the steady increase in “the frequency and diversity of disease outbreaks” over the past 30 years (Grima *et al.*, 2020), and pandemic experts’ observations that “the world is still ill-prepared to detect and stop outbreaks” of pandemic threat (World Economic Forum, 2019).

The coronavirus disease pandemic in the year 2019 unveiled problems within many management systems of public policy and companies. Also, the waste management systems were affected, showing their ineffectiveness (Rupani *et al.*, 2020). In the course of the pandemic disruption, the need of considering the waste management systems to design “sustainable waste management chains, including logistics, recycling, and treatment technologies and policies” (Djalante *et al.*, 2020; You *et al.*, 2020) became the evident priority.

Along with the better understanding of dependencies between sustainable waste management and reduction of economic, social and environmental effects of COVID-generated waste, also the contribution of circular economy model to the pandemic problems was slowly acknowledged (Das *et al.*, 2021; Ibn-Mohammed *et al.*, 2021).

The circular economy (CE) is an economic model conveying sustainable development (Campbell-Johnston *et al.*, 2020). As an economic system, it replaces the linear model of the economy with the circular approach (Szczygiel and Kowalska, 2021). In the CE system, the raw materials, “waste, emission, and energy leakage are minimised by closing material and energy loops, by means of proper” strategies (Geissdoerfer *et al.*, 2017). In the model, the “material flows, production and patterns of consumption” (Church *et al.*, 2014) run on renewable energy (Nyström, 2019), and waste is transformed into valuable resources (Das *et al.*, 2021; Witjes and Lozano, 2016), e.g., “commercial and domestic waste into renewable jet fuel for” aircraft (Amankwah-Amoah, 2020).

The circular economy system is built by the circular economy strategies, called also R-imperatives (Campbell-Johnston *et al.*, 2020; Ziółkowski and Wyrwa, 2021). After the evolution of the initial 3Rs (Reduce, Reuse and Recycle), the present circularity strategies (circular economy strategies) constitute the group of 10Rs which embraces the following value retention options (Campbell-Johnston *et al.*, 2020; Ziółkowski and Wyrwa, 2021), “refuse, rethink, reduce, reuse, repair, refurbish, re-manufacture, repurpose, recycle, and recover” (Potting *et al.*, 2017). All approaches are classified among the three groups of strategies: “smarter product use and manufacture”, “extended lifespan of product and its parts”, “useful application of materials” (Potting *et al.*, 2017).

The strategies are used in companies and public policies at national and international levels to solve the sustainability challenges (e.g., when fostering the Sustainable Development Goals of the United Nations). Despite their transformative role, the circular economy strategies can be also subject to pandemic implications.

3. Research Methodology

To achieve the purpose of this paper focused on the identification of the dependency between COVID-19 and circular economy strategies in enterprises, the research model was designed. This study develops a tool for identifying key determinants of circular economy strategies in the pandemic era. To learn the implications for small and medium-sized enterprises (SMEs), the 5-point scale survey questionnaire was applied at the beginning of the year 2021 among 319 companies in Poland. To identify potential problems, the question on difficulties caused by pandemic was formulated. The research model embraces two sets of variables: 15 socio-demographic parameters and four CE strategies.

There were selected the following characteristics describing the circular economy strategies:

- A. *Minimising/preventing waste generation (e.g. introduction of new technologies or materials to production or services).*
- B. *Reusing waste.*
- C. *Waste processing.*
- D. *Recycling waste and recovering energy from waste.*

The four CE strategies were scrutinised against 15 indicators (marked in *Italics*) to verify the following hypotheses:

- H1: *Enterprise category* determined the circular economy strategies in the pandemic.
- H2: *Company hub* determined the circular economy strategies in the pandemic.
- H3: *The activity range of enterprise* determined the circular economy strategies in the pandemic.
- H4: *Share of foreign capital in the company* determined the circular economy strategies in the pandemic.
- H5: *A sector of the company activity* determined the circular economy strategies in the pandemic.
- H6: *The entrance of the enterprise into a new sector* determined the circular economy strategies in the pandemic.
- H7: *The period of the activity in the market* has determined the circular economy strategies in the pandemic.
- H8: *The gender structure of employees* determined the circular economy strategies in the pandemic.
- H9: *The gender of the owner of the company* determined the circular economy strategies in the pandemic.
- H10: *Percentage of employees who suffered from COVID-19* determined the circular economy strategies in the pandemic.
- H11: *Laying off the employees* determined the circular economy strategies in the pandemic.
- H12: *The introduction of remote work (from home)* determined the circular

economy strategies in the pandemic.

H13: *The introduction of innovations* determined the circular economy strategies in the pandemic.

H14: *Enterprise activity in CSR before the outbreak of COVID-19* determined the circular economy strategies in the pandemic.

H15: *The presence of a management system (e.g. ISO, EMAS)* determined the circular economy strategies in the pandemic.

To investigate the dependencies between variables, the Kruskal – Wallis and U Mann-Whitney tests were applied. The results of the statistical analyses should help identify both the types of challenges and the most affected circular economy strategies in enterprises during the pandemic crisis.

4. Results and Discussion

In the statistical sample of 319 entities, the biggest group (35%) was represented by microenterprises, 23% by small enterprises, 23% by one-man businesses, and 19% by medium-sized enterprises. The location of most enterprises (63%) was city hubs. The activity range of the companies was rather balanced across local (27%), regional (32%), national (23%) and international entities (18%). Most of the enterprises (82%) did not report any share of foreign capital in their financial structure.

The companies activity was classified generally in the sector of other services (37,3%), trade (18,8%), and construction (13,8%). According to the period of the market activity, most organisations (33%) were ranked between 5-10 years and over 15 years (31%). The mean employment of women was 43%. In 27% the women were the owners of a company. The mean percentage of employees who suffered from COVID-19 in companies was 28%.

The Kruskal – Wallis and U Mann-Whitney tests revealed the lack of dependences between CE strategies against the following traits: *company hub, sector of the company activity, period of the activity in the market, the gender structure of employees, percentage of employees who suffered from COVID-19, introduction of remote work (from home), enterprise activity in CSR before the outbreak of COVID-19.*

The dependency analysis proved the existence of two tendencies regarding the circular economy strategies in enterprises during the COVID-19. On the one side, there is a homogenous group of significant challenges threatening the CE strategies in organisations. On the other side, one CE strategy is especially vulnerable to the risk of the pandemic.

Table 1 groups the challenges exerting the utmost risk of development of circular economy strategies in enterprises.

Table 1. *Challenges for the circular economy strategies*

No	Challenges	Circular economy strategies
1	The larger enterprise, the higher difficulties	A
2	The larger activity range, the higher difficulties	A
3	Share of foreign capital determines higher difficulties	A, B, C, D
4	The entrance into a new sector determines higher difficulties	A, B, C, D
5	Male owners of the company rank higher difficulties than female owners	A, B, C, D
6	Laying off the employees determines higher difficulties	A, B, C, D
7	The introduction of innovations determines higher difficulties	A, B, C, D
8	The presence of a management system (e.g. ISO, EMAS) determines difficulties	A, B, C, D

Note: *The numbers of circular economy strategies (A, B, C, D) are corresponding to the research methodology.*

Source: *The own work based on the realised research.*

When analysing the pandemic implications for single CE strategies, the significant differences in opinions between samples regarded the following factors: *enterprise category, activity range of enterprise, share of foreign capital in the company, entrance of the enterprise into a new sector, gender of the owner of the company, laying off the employees, introduction of innovations, presence of a management system (e.g., ISO, EMAS).*

The most affected CE strategy during the pandemic was *minimising/preventing waste generation (e.g., introduction of new technologies or materials to production or services)*. This waste management domain was determined by eight parameters evaluated in the study.

There was identified also a group of six challenges that affected every scrutinised CE strategy. In the case of the first strategy (A), there were observed two additional determinants, i.e.: *enterprise category*, and *activity range of enterprise*. The procedure of testing dependencies between indicators proved the existence of significant differences between samples, thus the purpose of this study can be accomplished. The detailed results of statistical tests are presented in Table 2.

Table 2. *P-value of statistical tests for positively verified hypotheses*

Hypothesis	Circular economy strategies (p-value, $p < \alpha$)			
	A	B	C	D
H1	0,0238	–	–	–
H2	–	–	–	–
H3	0,0364	–	–	–
H4	0,0000	0,0001	0,0009	0,0005
H5	–	–	–	–

H6	0,0065	0,0415	0,0434	0,0272
H7	–	–	–	–
H8	–	–	–	–
H9	0,0495	0,0405	0,0232	0,0524
H10	–	–	–	–
H11	0,0002	0,0000	0,0001	0,0009
H12	–	–	–	–
H13	0,0046	0,0072	0,0028	0,0007
H14	–	–	–	–
H15	0,0000	0,0001	0,0034	0,0028

Note: P-values were calculated in Kruskal – Wallis and U Mann-Whitney tests.

The numbers of hypotheses (H1, ..., H15) and circular economy strategies (A, B, C, D) are corresponding with the research methodology.

Source: The own work based on the realized research.

The study allows learning the challenges affecting the management in Polish small and medium-sized enterprises. The presented research model identified the CE strategies affected during the pandemic that can facilitate the development of apt scenarios and proactive actions in the future to help overcome the CE challenges.

This answers also the basic business questions, e.g., what elements to pay more attention to, or where to expect special problems. The knowledge is necessary to prepare the companies for possible changes and support them in the development of a strategic response to a pandemic or other risky events. For this purpose, the results should be considered by business leaders when creating enterprise security systems, during long-term planning of the CE strategies in SMEs. Regarding the scientific applicability, the assessment model can be used (both in the present or improved form) to rank the challenges according to different business and industry sectors, but also for international benchmarking.

5. Conclusions

The study delivers an answer to the question: what is the dependency between COVID-19 and circular economy strategies in enterprises? The knowledge on factors that generate the highest constraints during a pandemic is crucial for maintaining the effectiveness of organisations. To this end, the identified COVID-19 challenges should be of special attention among top-level managers who develop the risk management regulations and during strategic planning of business directions. The model designed for this study is an assessment tool that should be useful for decision-makers when anticipating and solving the potential problems concerning the circular economy strategies during future pandemic threats.

The knowledge on problems to CE strategies in crisis settings (e.g., pandemic) could be a subject of comparative analysis between different business and industries

sectors. Future studies should also identify problems, needs, possible solutions and good practices among companies across the world.

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