

Article

Circular Economy Implementation Based on ISO 14001 within SME Organization: How to Do It Best?

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Abstract: The circular economy (CE) has become an important issue within the European Union due to the Green Deal regulations. A CE makes sustainable development feasible by creating value in the economy and by closing the energy and materials loops. The aim of the study is to predict the most effective functioning of CEs at the macro-level by the selection of the best possible requirements addressed for small and medium enterprises (SMEs), as an extension supplement of a voluntary environmental management system—ISO 14001. For such aim, researchers developed a two-stage Delphi study. According to the performed Delphi study, the main conclusion is that a more circular management system is possible and needed in SME organizations. Two ISO 14001 sub-requirements were considered as definitely contributing to the implementation of the CE concept at the macro- and meso-levels. Those were: The scope of the CE system and communication. The most discussed requirements that should be further studied in that context were internal audits and managerial reviews. The most difficult goals to implement by SMEs were: limiting the use of primary raw materials, striving for the implementation of climate neutrality and sustainable development as well as closing the material loop.

Keywords: circular economy; ISO 14001; SME; certification; Delphi study; environmental management standard



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1. Introduction

The aim of the study was to predict the most effective functioning of circular economy at the macro-level by the selection of the best possible requirements addressed for SMEs (as an extension supplement of a voluntary environmental management system—ISO 14001). The main research question was what are the best and at the same time the most contributing CE implementation requirements coming from the ISO 14001 environmental management system?

The structure of the article consists of five sections: Introduction (where authors described the circular economy phenomena, barriers and difficulties that SMEs encounter while trying to implement CE, and also described the most popular standardized management systems used for CE); Materials and Methods; Results; Discussion and Conclusions.

The idea of a circular economy has been present in scientific literature since the end of the 1960s, but the implementation and improvement of its principles took place only at the beginning of the 21st century, first in Germany, China and Japan, and now, after recommendations presented in the documents of the European Commission (since 2014), in many EU Member States [1].

Circular economy is mainly an efficient resource management, and above all a new global economic model in which “win-win” solutions are sought, i.e., economically and ecologically effective. The implementation of the circular economy model requires the cooperation of many entities, often local, and the identification of the flow of materials in subsequent stages of the product life cycle, starting from obtaining the raw material, through the design, production, consumption, as well as waste collection and management.

Thus, in this aspect, the circular economy represents a promising strategy for saving relevant resources and reducing agricultural activities' negative environmental impacts while improving economic performance [2–4].

The results of the analyses show that cooperation develops dynamically when the market is transparent—the prices and quality of the product/waste are known, there are stable legal solutions (extended producer responsibility, sustainable public procurement) and the client is aware of not only economic benefits, but also ecological [5]. The definition of the Ellen MacArthur Foundation is the most commonly used: “A circular economy is an industrial system that is planned and designed to be restorative”. It replaces the concept of “decommissioning”, is geared towards the use of renewable energy, eliminates the use of toxic chemicals that impede reuse and aims to eliminate waste by better designing materials, systems and products within business models [6,7]. Due to the above, it is necessary to define a circular economy as an economic development strategy with appropriate legal and economic instruments and monitoring indicators, both the progress of its implementation and the use of the latest IT solutions. Therefore, Kulczycka et al. [5] proposed to refine the definition existing in the roadmap: “Circular economy is a global model of economic development promoting eco-innovative solutions and meeting the following assumptions:

- (a) the added value of raw materials/resources, materials and products is maximized along the value chain, i.e., from designer to consumer;
- (b) the amount of generated waste is minimized and the generated waste is managed in accordance with the hierarchy of waste management methods (waste prevention, preparation for re-use, recycling, other recovery methods, disposal)”.

There are many companies in the world that are interested in moving from linear business model to a circular economy. Unfortunately, they face a number of difficulties and limitations which constitute a serious barrier preventing easy transformation. There are quite a few articles in the literature describing the barriers encountered by SMEs in the implementation of circular-economy-specific activities. The barriers are usually divided in studies by sector, function (operational, financial, legal, etc.) or other specific characteristics of the organization [8–15].

Due to above, SMEs tend to look for solutions that would facilitate their attempt to move from a linear economy to a circular one. One of such solutions may be standardized systems, which would constitute a kind of guide leading entrepreneurs through the complicated process of implementing a circular economy and at the same time allowing meeting of legal requirements in a more accessible and comprehensive way. Of course, to facilitate the implementation of the principles of the circular economy, existing standardized management systems can be used to facilitate the conduct of business. As Jafarzadeh et al.'s model indicates, the lack of standardization is an important barrier in CE implementation [16]. The most popular management systems are systems built on the basis of the ISO 9001 standard, especially in its latest edition. Its design was based on the so-called high-level structure (HLS), which allows the system to be adapted to many industries. In the case of activities related to the circular economy, it seems natural to use the ISO 14001 environmental management standards, which in many of its requirements touches upon the principles of the circular economy. Currently, the most recognizable systems designed for use in the circular economy are [17–19]:

- British BS 8001:2017 Framework for implementing the principles of the circular economy in organizations—guide, and
- French X PX 30-901: 2018 Circular economy—Circular economy project management system—Requirements and guidelines.

The development of those standards and implementing them into the market shows that there is room for this type of document (based on HLS, due to its accessibility to integrate with other ISO-standards-based systems). However, both of them are relatively complicated and not very accessible to SME entrepreneurs, so that is introducing them to the wider audience is needed. Regarding the BS 8001, in 2017, BSI—British Standard

Institute—published the world’s first standard for the circular economy. The standard is designed to help organizations and individuals consider and implement more circular and sustainable practices in their companies, whether through improved working practices, providing more products and services produced in accordance with the principles of the circular economy or by redesigning the entire model business and value offerings. The standard also aims to provide frameworks and guidelines for a wide range of organizations of various sizes and levels of knowledge, as well as understanding the circular economy [20]. This British Standard focus on a circular economy that promotes optimal use of resources, reuse, repair, renewal, regeneration and recycling of materials and products, as well as the preservation and regeneration of natural capital by returning biological nutrients to the biosphere. Design and innovation in processes and products or services (e.g., for repair, reuse, recycling) can be supplemented with business model projects and innovations, using approaches such as performance-based models to manage the circulation of products and materials in the system. The purpose of this British Standard is to provide guidance to organizations of all types and sizes, regardless of where they are in the world, regarding the steps they can take to move to a more circular and sustainable mode of operation. Implementing the principles of a circular economy gives organizations the opportunity to rethink how they conduct business, potentially enabling them to remain in a circular environment, and have sustainability and competitiveness. The standard consists of three main elements: principles, structure and guidelines, which were discussed in [17,18,21]. The companies can apply the standard for life cycle assessment to quantify the environmental and life cycle impacts of the products and services they deliver to their customers. It can already be applied during the design to evaluate different possible product designs and circular economy business models as listed in the BSI circular economy standard [22,23].

Another standardized system on circular economy is the French standard published by ANFOR in 2018. This standard sets out the requirements for an organization’s project management system to improve environmental, economic and social performance, and to contribute to the development of a circular economy. Similar to the British standard described above, it applies to organizations of all sizes, functioning in all branches of business. It has been developed and is intended for organizations wanting to manage their projects in a systemic way. It provides requirements and practical recommendations for initiating, planning, implementing, measuring and managing projects by adopting an open and holistic approach. In particular, it sets out the various stages that organizations need to take for their project to contribute to the transition to a circular economy [18,24].

The French standard was built on the basis of a new approach to standardized management systems, named the HLS model (high-level structure), which is popular among current editions of ISO standards (ISO 9001, ISO 14001, ISO 45001). It also covers the universal management requirements [25–29]. One of the main assumptions of the organization functioning in accordance with the requirements of this standard is to define external and internal assumptions that are relevant to the defined final goal and which affect its ability to achieve the intended results in the project management system in the scope of the circular economy. In addition to system issues arising from the HLS structure, the most important element of the standard are the requirements for a project management system in a circular economy. The standard includes requirements to simultaneously take into account the contribution of projects to the three dimensions of sustainable development, taking into account direct and indirect effects [30]. If the project embodies the drive for change in products and services, impacts should be analyzed throughout the life cycle. In addition to the requirements and recommendations for applying the approach to the management system, this standard also provides organizations with a broader methodological framework based on cross-analysis taking into account the seven areas of project management activities proposed in the standard for CEs. In terms of system, considering the functioning of the project management system in the circular economy, the organization should establish, implement, update and constantly improve the management system of circular economy projects, including the necessary processes and their interactions, as required by

the standard. To enrich its management system and related processes, the organization should also take into account the analysis of problems, risks and opportunities, and the mutual expectations of stakeholders [31].

The development of the above-mentioned standards has shown that there is room for this type of document. However, both of them are relatively complicated and not very accessible to SME entrepreneurs, especially the French standard which paradoxically seems easier to understand due to it having been built on the HLS structure.

The system that has gained the greatest popularity in the market in the context of environmental management is ISO 14001. It seems natural that it can constitute the basis for the most convenient implementation of the requirements and principles of the circular economy. One of the ways may be to develop a supplement that would constitute the basis of circular economy requirements precisely tailored to the structure and nature of the ISO 14001 standard, which would also be a guide in the implementation, which is much sought after by SME entrepreneurs. To sum up the above, standards in general offer key points about how companies can progress towards CEs (especially the big ones), but they still do not offer companies information on how to start as well as a guideline for SMEs.

Similarly, like Prieto-Sandoval et al. [32], to the best of our knowledge, there is no specific guidance for assessing CE implementation level at the micro-scale, meaning the CE efforts made by individual companies. It is important to point out that some companies are implementing CE actions, even though they do not know what the linear or circular economy is. Thus, such a supplement containing precise requirements, and at the same time being a guide to the implementation of circular economy, is most needed for SMEs, as they struggle most with the transition to a circular economy. Due to the fact that SMEs represent about 90% of all organizations, the most important thing is that these enterprises should be much more involved in CEs, because it is largely up to them how effectively the circular economy rules will be implemented. Of course, large enterprises can give an example of how to implement a circular economy and they, due to their resources and strength, will cope with this aspect without major problems; however, due to the scale effect and a much larger number of SMEs on the market, it will be possible to talk about the success of circular economy. SMEs operate on the micro-scale, and the effective functioning of CE makes sense only if there are coordinated activities throughout the entire life cycle of products, in which cooperation not only with suppliers and recipients is necessary, but also coordination of activities that will take into account the behavior of competitor companies as well as law regulators.

2. Materials and Methods

The Delphi study technique attempts to address “what could/should be” [33]. The study was performed in the form of an anonymous, written, multi-stage survey process focusing on the experts’ consensus. In this study, the two-stage Delphi method was used. The following research assumptions have been specified: (1) The use of the ISO 14001 standard as the basis for the selection of requirements. (2) Requirements must apply to any type of activity (production, services) of SMEs. (3) The requirements will be implemented by SMEs (taking into account their often-limited resources and possibilities to operate and compete on the market).

The first round of the study involved the collection of data from a panel of experts through a survey. The Delphi method uses a panel of experts and attempts to gain consensus from them. In this study, a panel of 17 experts was chosen from different countries, such as Poland, Japan, Montenegro, Portugal and Spain. The panelists were selected based on their expertise and experience in circular economy and the ISO 14001 management system. As a requirement for the experts’ selection, publications in Scopus journals within that area of CE and ISO 14001 were required. Through article research with the keywords “circular economy” and “ISO 14001”, 131 possible experts were chosen and invited to participate in the study. That was the whole sample, all identified experts were invited to participate in the study. The response rate was 13%.

Round two gave statistical feedback to panelists considering the group response statistics and the individual's response. After that, panelists were asked for changes or answer justifications. As von der Gracht claimed [34], due to the lack of standards for consensus measurement in Delphi study, researchers can apply different approaches. In this study, the difference between the median and the mean of the quartiles provided the basis for the end of the rounds.

The study was conducted in October 2022. The data were analyzed using Statistica software. As a measure of experts' consensus, median and average median were used as in Hears et al.'s study [35].

3. Results

3.1. ISO 14001 Requirements as a Contribution to Circular Economy Concept

The first part of the survey was dedicated to the main requirement points of the environmental management standard—ISO 14001. The experts were asked how much the fulfillment of the following requirements can contribute to the implementation of the circular economy concept at the macro- and meso-levels. In Table 1, there is a summary of expert opinions after the last round of study. All expert responses were coded in 5-point Likert scale where 1 was “definitely no” and 5 was “definitely yes”.

Table 1. Requirements of ISO 14001 that contribute to the implementation of CE.

ISO 14001 Requirements	Median	Quartile Average
4. Context of the organization	4	4.33
4.1. Understanding the organization and its context	4	4.00
4.2. Needs and expectations of interested parties	4	4.00
4.3. The scope of the CE system	5	4.67
4.4. CE management system	4	4.33
5. Leadership	4	4.33
5.1. Leadership and commitment	4	4.33
5.2. The CE policy should contain a commitment to meet the requirements of the CE system	4	4.00
5.3. Top management should allocate responsibilities and powers in the field of CE	4	4.00
6. Planning	4	4.00
6.1. The organization should implement and apply processes related to the determination of risks and opportunities in the same way as in ISO 14001	4	3.67
6.2. Transformation plans and CE goals and planning to achieve them	4	4.00
6.3 Indicators of the CE system	4	4.33
7. Support	4	4.33
7.1. Resources	4	4.00
7.2. Competencies	4	4.33
7.3. Awareness	4	4.00
7.4. Communication	5	4.67
7.5. Documented information	4	4.00
8. Operational activities	4	4.00
8.1. Planning and supervision of operational activities	4	4.00
8.2. Preparedness and response to emergencies	4	3.67
8.3. Sustainable procurement	4	4.33
9. Assessment of the effects of activities	4	4.33
9.1. Monitoring, measurement, analysis and evaluation	4	4.33
9.2. Internal audits	4	4.33

Table 1. *Cont.*

ISO 14001 Requirements	Median	Quartile Average
9.3. Review of the management system	4	4.33
10. Improvement	4	4.33
10.1. Improvement	4	4.33
10.2. Non-compliance and corrective actions	4	4.33

Source: own study.

As for the main points of ISO 14001, all of them were assessed as equally high with the median 4. Considering the quartile average, it is possible to indicate requirements that were assessed as lower than others, such as: 6. Planning and 8. Operational activities.

Only two ISO 14001 sub-requirements were considered by experts as definitely contributing to the implementation of the CE concept at the macro- and meso-levels. Those were: 4.3. The scope of the CE system and 7.4. Communication.

Preparedness and response to emergencies (8.2.) as well as determination of risks and opportunities (6.1.) were considered as a result of the consensus of experts, the least contributing to CE implementation goals. Nevertheless, their rating is still high with the median 4 and quartile average 3.67 for both sub-requirements.

3.2. Main Obstacles for SME to Achieve the Circular Economy Goals

The second part of the survey was dedicated to the main obstacles for SMEs to achieve the circular economy goals. In Table 2, data considering the main obstacles as well as median and quartile average values after the two rounds of study are presented. All expert responses were coded in a 5-point Likert scale where 1 was “very difficult” and 5 was “very easy”.

Table 2. Main obstacles for SME to achieve the circular economy goals.

Main Obstacles	Median	Quartile Average
Limiting the use of primary raw materials	2	2.00
Increasing the use of ingredients from sustainable primary production (e.g., organic or integrated production) and supporting activities to conserve biodiversity	2	2.33
Increasing resource efficiency	3	3.00
Reduction of the EU material and consumption footprint	2	2.33
Striving for the implementation of climate neutrality and sustainable development (environmental, economic and social)	2	2.00
Closing the material and energy loops	2	2.00
Improving the well-being of internal and external stakeholders	3	3.33
Activities for the rational management of water, including its reuse	3	2.67
Recovery of bio-waste and the use of by-products	3	2.67

Source: own study.

All main obstacles for SMEs to achieve the circular economy goals discussed within the study were assessed by experts as being rather difficult with medians of 2 or 3. Considering the quartile average, the most difficult goals were: Limiting the use of primary raw materials, striving for the implementation of climate neutrality and sustainable development as well as closing the material loop. Relatively, the easiest goal is the improvement of the well-being of internal and external stakeholders with a quartile average of 3.33 that could be considered as an organizational one.

4. Discussion

The idea of CEs in SMEs is increasingly important. As one of the experts pointed out during the discussion on the legal requirements, “Legal compliance requirements in terms of working protocol, standards or guidelines enforced by national/regional government or from clients. It is also observed that country’s plan or policy to aspire for closing the loop, zero waste or carbon neutrality also motivate SMEs to adopt CE”. Moving beyond SMEs towards CE strategies seems to be a rational and interesting approach. It is in line with the observations of Kristensen et al. where Danish organizations were analyzed. Implementation of circular economy through new product designs, business models, etc., without having integrated these initiatives into their environmental management system (EMS) is a weakness that should be overcome [36]. On the other hand, among the most important barriers of CE implementation, according to Karuppiah et al. [37], some of them, mainly: the uncertainty of consumer demand, stakeholders with short-term agendas or challenges in the safe return of waste to the biosphere, go beyond the scope of influence of a single organization and its environmental management system.

CE is a concept that has become one of the most recent ways to address environmental sustainability and is studied mostly on the macro- and meso-levels [20]. According to Barreiro-Gen and Lozano, CE implementation in organizations requires a more holistic method, mainly through collaboration with stakeholders on CE activities and efforts [20]. It is crucial for CE effective functioning to go beyond the scope of the single organization. That conclusion also has a reflection on the conducted research. As one of the experts highlighted: “Important that the management system bridges circular economy and the activities across the SMEs. The scope must be broadened to cover business model and product development.” The scope of the CE management system related to requirement 4.3. of ISO 14001 as well as communication (requirement 7.4) were indicated by experts as the most important ones. The communication requirements can relate to both internal and external communication [27]. From that perspective, the external communication relevant to CE effectiveness should be maintained as a process which finally should include the ability to adapt to a changing environment outside the organization.

Determination of risks and opportunities similar to the ISO 14001 is, in the expert’s opinion, less important for SME organizations for the effective functioning of CE at the macro- and meso-levels. The risk assessment as well as lifecycle perspective introduced in the ISO 14001:2015 standard are the most useful concepts and are perceived by organizations as the most relevant added values in the environmental management system [38]. That leads to the conclusion, that however, not all solutions highly rated by EMS users will translate well into CE effectiveness.

Sustainable supply chain management was addressed by experts during the study as an important tool that should be included into the requirements of the designed CE system. For example, “Integrated supply chain management, mainly regarding inventories and warehousing” should be included in parts 7—support and 8—operational activities. That result fits in with the research of Erol et al., indicating the importance of building higher levels of trust in supply-chain ecosystems [39]. In support sections, experts highlight the need of competencies, for example: “Understanding the specific requirements in context of organizational activities and other requirements is key to effective planning for CE”. Competencies should cover not only the CE strategies, but also design competencies for CE. This conclusion is in line with other studies by Sumter et al. where the set of key circular economy competencies was proposed [40].

Small organizations are usually considered to be more flexible and operate less formally and less strategically than larger organizations [38]. Considering that, the improvement of the well-being of internal and external stakeholders were assessed in the study as causing the least difficulties. The second less difficult result related to the increase in resource efficiency. That result is not a surprise, considering the flexibility and ease of changes for SMEs. The global problems arising from Russia’s attacks on Ukraine necessitate the search for new ways of operating and acquiring raw materials and energy resources.

The oil and gas embargo in the EU is a challenge for the European economy, but on the other hand it could be a trigger for adaptations in line with CE requirements [36]. This adaptation in the form of the speed-up of the greening transition of the EU should be less difficult for SMEs.

The Delphi study requires reaching a consensus and allowing dialog between experts [41]. Data from Tables 1 and 2 indicate that the level of consistency measured by the quartile average is high. An interesting issue to discuss could be the starting point of the study and the ISO 14001 requirements where the greatest differences in the obtained responses were observed. The two most controversial requirements were from 9.2 and 9.3. Both of them considered the performance evaluation, accordingly the internal audits and management reviews. It is significant that those requirements are strictly connected with the management system's fundamentals and on the other hand are usually not mentioned while discussing CEs. The PDCA cycle used by managers with the support of internal audits and management reviews are the tools that support management of the organization but cannot be easily implemented on the macro- and meso-levels of the CE. As one of the experts said: "Internal audits are appropriate for verification of audit criteria and relate to the scope of activities at the scale of the organization. It will be difficult to use internal audit to assess the macro-performance of CE". Sousa-Zomer et al.'s studies confirmed that all cleaner production practices and principles implemented by the organization are connected to each other and across the processes [42]. From that perspective, internal audits and management reviews can be good tools to improve environmental management and finally lead to more efficient functioning of CEs at the macro-level.

From the discussed barriers during the study, increasing resource efficiency was the one that required consensus. As some of the experts claimed, the reward for introducing CEs and material reuse is the benefit for the company. From that perspective, higher resource efficiency is rather easy to obtain by SMEs. On the other hand, some experts emphasized the difficulty within the increase in resource efficiency without changing the business model and operating within the chain as a small subcontractor. Finally, the consensus was in the middle, between easy and difficult. That discussion led to the disadvantage of the approach used in management systems that comply with the requirements of ISO 9001 or ISO 14001. These are general requirements that will not always respond to the specifics of industries or organizations. The problem of general and sector-specific paths in standardization is quite old and has its opponents and followers [18,43]. There are also significant added values coming from the standardized management systems based on HLS structure, that cannot be forgotten. They are meant to support organizations in the development of environmental objectives, delegation of responsibilities, the provision of training and development, as well as in formulating performance management audits. Those standards are setting up a guideline framework for practitioners to evaluate their environmental practices and externalities [44–50].

5. Conclusions

Despite the clear potential of circular-oriented EMS to contribute to sustainability, there are many challenges to adopting such a management system in SMEs. Circular-oriented EMS requires management of the EMS beyond operation and into the strategic levels. According to the performed Delphi study, the main conclusion is that a more circular management system is possible in SME organizations. The main contribution of this work is that the implementation of EMS with some targeting to CE goals is a good recommendation for SMEs. Based on the obtained results, it is possible to point out the particular requirements of ISO 14001 that emphasize the benefits of EMS implementation. There is no discussion about the positive beneficial impact of ISO 14001 as well as the size of the organizations on the effectiveness of CE, including, for example, the reduction of CO₂ emissions intensity. This has been demonstrated in studies by Arocena et al. [51]. The question is, which ISO 14001 requirements need to be strengthened to obtain better CE results.

Two ISO 14001 sub-requirements were considered as definitely contributing to the implementation of the CE concept at the macro- and meso-levels. Those were: The scope of the CE system and communication. The most discussed requirements that should be further studied in that context are internal audits and managerial reviews. The most difficult goals to implement by SMEs were: limiting the use of primary raw materials, striving for the implementation of climate neutrality and sustainable development as well as closing the material loop.

Considering the development of further research in this area, it is recommended to perform a survey conducted among managers of small- and medium-sized enterprises that are considering the option of switching to a CE. This will provide answers to questions related to the immediate needs of SME entrepreneurs. Future studies can also investigate the opportunities to efficiently influence on external stakeholders for better CE implementation on the macro- and meso-levels. The size of the expert sample may be considered the greatest limitation resulting from the conducted research. Therefore, the next stage could combine the results of experts and company managers, which will certainly produce a much more accurate picture of the current situation related to the implementation of circular economy in SMEs. In the context of management implications, an important course of action is the fact that since some SMEs have an implemented, functioning and certified ISO 14001 system, even though there are no official guidelines for implementing circular economy, it is worth getting interested in it and trying to gradually impose the requirements of implementing the circular economy rules, which will bring about the expected results and profits in the long-run.

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