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Sustainability in the Development of Green Organizations Based on the Example of Manufacturing Companies

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Abstract: There are many studies that address the topic of organizational development in the context of sustainability, but their results do not include a combined functional approach in the area of management as well as in the development of green organizations (GOs). Defining the development of GOs and their phases from a functional perspective in manufacturing companies has not yet been sufficiently studied. This refers to the process of organizational change including, but not limited to, production, human resources, marketing, environmental management, supply chain, resources, circular economy, zero-waste buildings or product design. The purpose of this paper is to characterize the criteria for describing GOs and to define the phases of their development against the background of the literature. Empirical research was conducted on a sample of 100 manufacturing companies. The development phases of GOs were determined using cluster analysis with the k-means method carried out in accordance with the Hartigan–Wong algorithm and compared with the publishing dates of scientific publications. The results indicate that it is possible to define organizations by their development phase, and thus, it is possible to identify criteria that, when refined, will make it possible to accelerate the development of GOs in accordance with the principles of sustainable development.

Keywords: sustainability management; green organizations; sustainable organizations; sustainable development; green phases; green supply chain; green human resource management; sustainable manufacturing; organizational life cycle

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1. Introduction

In recent years, issues of sustainability, environmental protection and the green economy have become the focus of intense work around the world [1]. In response to the growing challenges of environmental degradation, global warming and depletion of natural resources, a need has emerged to integrate sustainability into the field of many scientific studies [2] including that of manufacturing companies [3].

The first scholarly articles that referred to sustainable organizations dealt with Kyosei's concept of collaboration and Multidimensional Sustainability Influence Change supporting the understanding and promotion of integrated progress toward sustainability [4]. With regard to manufacturing, the academic literature addresses issues relating to Sustainable Manufacturing [5]. Studies conducted on manufacturing companies show that Lean Manufacturing and Cleaner Production reduce environmental risks and make a positive contribution to an organization's environmental performance [6]. The combination of industrial ecology, which has been known for decades, and strategic management can significantly contribute to achieving the UN Sustainable Development Goals that were defined in 2016 while building competitive advantages for companies [7].

1.1. Green Organizations

Achieving sustainability as an organization is a transformative process that demands substantial alterations in how businesses carry out their activities. This involves recognizing and prioritizing relevant matters, actively involving a diverse range of stakeholders,

effectively addressing climate and resource-related risks, cultivating sustainable opportunities and ensuring transparent reporting of actions and performance [8,9]. Based on previous research and a literature review [10], the author defines green organizations (GOs) as those in which production, organizational and marketing processes are carried out in accordance with the principles of sustainable development, using environmentally friendly technologies, waste reduction, energy efficiency and sustainable resource management based on social, natural and economic pillars. Research in this area has been carried out for only a few years and refers to selected aspects of the development of GOs.

Kuzior, A., et al. [11] pointed out the theoretical and methodological basis of organizational change and development as well as the use of artificial intelligence in the model of sustainable organizational development. A knowledge database is an important element of decision-making in the area of implementing sustainability activities.

Nawaz, W. and Koç, M. [12] examined the motives behind the sustainable development of organizations and functional areas as well as the most common practices of sustainable organizations. They identified nine themes that support the development of GOs including resource optimization; waste and emission minimization; business and operational excellence; corporate citizenship as well as social development; research and innovation; procurement, supply chain and logistics; governance; sustainability management tools; employee relations and health, well-being, safety and security.

The results of a study by Sroufe, R. [13] indicate that management specialists, especially those dealing with sustainability, have a key influence on change management in this area, including innovation and corporate strategy. It is pointed out that system-level integration and change management are key success factors for sustainable companies. On the other hand, Berlatta, I., et al. [14] presented a novel approach for senior management to define sustainable production capabilities by assessing their organizational sustainability readiness. Organizational transformation in relation to sustainability was also addressed by Bögel, P., et al. [15]. The authors examine the role of organizational change in socio-technical sustainability transitions. Heikkurinen, P., et al. [16], on the other hand, examined companies in terms of how they can leverage micro-level activities at the macro level to effectively address sustainability issues. The authors also discuss eco-efficiency and eco-sustainability strategies for producers and consumers.

Graczyk-Kucharska, M. [10] published the results of research relating to key green competencies that can influence selected aspects of GOs including 10 selected criteria (see Table 1) like Sustainable Manufacturing, Green Supply Chain, Environmental Management, Green Human Resources Management, Green Marketing, Circular Economy, zero-waste buildings, green knowledge, competences, skills and attitudes, Eco-design product management and Sustainable Resource Management. These criteria were also selected for further research to determine the development phases of GOs.

Table 1. Selection of keywords for the literature analysis of individual criteria for the development of green organizations.

Criteria	Keywords for Database Analysis
C1 Sustainable Manufacturing Management (SMM)	KEY (“sustainable manufacturing”) AND (“management”)
C2 Green Human Resource Management (GHRM)	KEY (“green human resource management” OR “green human resource”)
C3 Green Knowledge and Skills Development (GK&C&S)	KEY (“green competence” OR “green competencies” OR “green knowledge” OR “green skills” OR “green attitude” OR “sustainable competence” OR “sustainable competencies” OR “sustainable knowledge” OR “sustainable skills” OR “sustainable attitude”)
C4 Environmental Management (EM)	KEY (“environmental management”)

Table 1. *Cont.*

Criteria	Keywords for Database Analysis
C5 Sustainable Resource Management (SRM)	KEY ("resource management" OR "resources management") AND ("sustainability" OR "sustainable")
C6 Green Marketing (GM)	KEY ("sustainability MARKETING" OR "green MARKETING")
C7 Eco-design management (EDM)	KEY ("eco-design" OR "green product" OR "sustainable product") AND ("management" OR "development")
C8 Green Supply Chain Management (GSCM)	KEY ("Green Supply Chain Management" OR "Green Supply Chain" OR "GSCM" OR "GSC")
C9 Circular Economy (CE)	KEY ("Circular Economy" OR "CE" AND "management")
C10 Zero-waste Buildings (ZWBs)	KEY ("buildings") AND ("zero waste" OR "sustainable" OR "zero-waste") AND ("management")

1.2. Criteria for Green Organization Research

Despite the understanding of sustainability in environmental, economic and social contexts, the approach involving managing organizations with sustainability in different functional areas is still not very common. However, research is often conducted into a selected area of study in manufacturing companies like Sustainable Manufacturing [6,13,17], Green Supply Chain [18–20], Environmental Management [21], Green Human Resources Management [22–25], Sustainable Marketing [26–28], Circular Economy [29–32], zero-waste buildings [33,34] or building employee awareness and green competencies [16,35], Eco product design [36,37] or Sustainable Resource Management [21,38,39].

It can be noted that, in the scientific literature, research in the above areas has been undertaken at different times. The first to be published in the 1960s were publications relating to Environmental Management [40,41]. In the early 1980s, the first research results on Sustainable Resource Management appeared [42,43], and in the mid-1980s, papers on Sustainable Buildings were published [44]. In the early 1990s, research was taken up on the area of more environmentally friendly products [45,46] and, a few years later, in the area of Green Marketing [47,48] and the Green Supply Chain [49,50]. The early 21st century saw the beginning of research in the area of Sustainable Manufacturing [51–53], and a few years later, the first articles in the area of Circular Economy were also published [54,55]. In the second decade of the 21st century, the issue of competencies in relation to sustainable development including knowledge, skills and attitudes began to be addressed [56–58]. In the last decade, research has also been expanded to include Green Human Resource Management [59,60]. For sustainability to be included in the management strategy of the entire organization, it should be present and central in all processes and functional areas of companies.

Based on the above, it can be concluded that the issue of GOs is not sufficiently systematized while being scientifically relevant. The conclusions of the studies in the area of GOs so far do not capture the issue in a holistic way from a management perspective. The published approach that takes into account the presentation of the development phases of GOs is an improved and generalized version of the view on this issue. This means that, so far, they have not taken into account the functional approach while the research results presented in this paper in this area are of a utilitarian nature. The research in this scope will bring new knowledge of the development of GOs and will make it possible to draw practical conclusions in the area of implementation of sustainable development in organizations.

Despite the well-known definition of sustainable development, research into selected functions in companies has varied over time. This may also affect knowledge and practice concerning the development of GOs and the relevance of selected criteria in the context of their development. Therefore, the purpose of this research is to determine the degree of relevance of ten selected criteria in manufacturing companies and to divide them into

phases of GO development, then to compare these results against the timeline of scientific publications in the area of selected criteria for GO development.

The analysis of the literature was based on the SCOPUS database, taking into account the selected keywords for each of the ten studied criteria, as well as the time of publications and their number. In turn, the research part on the relevance of the criteria was conducted on a sample of 100 Polish manufacturing companies. Subsequently, the phases of development of GOs were classified using cluster analysis with the k-means method conducted in accordance with the Hartigan–Wong algorithm [61], and the results were compared with the volume and publication time of scientific articles on the selected criteria for the development of GOs. The empirical results were compared with the literature.

Research into GOs can help companies pay attention to areas that have not previously been the focus in the context of sustainability, helping them to better respond to environmental challenges [62–64] and accelerating the development of sustainable organizations [65].

2. Materials and Methods

The research methodology was based on three areas: literature analysis, quantitative data and analysis of results in these two areas (Figure 1). The literature analysis was based on a framework review of the literature on the development of GOs.

Figure 1. Methodology of the research about green organizations.

2.1. Literature Analysis

The selection of criteria for the study was adopted in accordance with published guidelines [66] in order to facilitate the process of selecting them and making it possible to assess and indicate the development phases of GOs. Among them are the following:

- Comprehensiveness: the selected criteria should encompass all aspects of sustainability to showcase progress in every dimension;
- Applicability: the selected criteria should be applicable to a variety of alternative options, ensuring comparability among them;
- Transparency: the process of selecting criteria should be transparent to all stakeholders, providing clarity and openness;
- Practicality: the chosen criteria should be practical, considering the available tools, time and resources for analysis and assessment.

Based on the above requirements, it was decided to select criteria for further analysis in accordance with Graczyk-Kucharska, M. [16]. The rationale for this approach is the dimension of the division of criteria by functions in the enterprise, which can have practical applications in organizations and contribute to easier classification of areas whose development needs to be accelerated or help define those that contribute to increasing the pace of GO development.

Further criteria and algorithms for searching scientific publications were included in the scientometric analysis (Table 1). The analysis of the search results was limited to articles published in peer-reviewed scientific journals and the time of their publication. The number of analyzed publications is indicated in Table 2. The analysis produced results in

the form of the duration of the research on a given topic and the publications of its results appearing in scientific journals. This information will make it possible to compare the level of relevance of a given criterion in the surveyed manufacturing companies in order to verify the relevance of a given criterion identified by company representatives in relation to the exploration of scientific research in a given area.

Table 2. The number of articles for each criterion for the development of green organizations searched according to the defined keywords.

Criteria	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
Abbr. of criteria	SMM	GHRM	GK&C&S	EM	SRM	GM	EDM	GSCM	CE	ZWBs
No of publication	1006	323	216	41,155	20,159	813	2435	28,762	2551	35,902
Sum	133,340									

2.2. Quantitative Data

2.2.1. Characteristics of the Quantitative Research Sample

The survey was conducted during May–June 2022 on a sample of 100 companies (Table 3) from the manufacturing industry. The sampling was random and reflected the actual share of the size of manufacturing companies in the Polish market, which means that the research sample is representative of the error at the level of 10%. The respondents included designated individuals from various departments, who are involved in sustainability issues in the manufacturing companies. Overall, 46% of the respondents were owners, co-owners, presidents, company board members or environmental directors. Together with the group of production directors, technical directors or managers, technical directors or managers or office managers, they represented 74% of all respondents. The other respondents included mostly (92%) directors or managers of other departments, such as marketing, logistics, sales or human resources divisions (Table 4).

Table 3. Size of surveyed companies by number of employees.

No.	The Number of Employees	The Number of Companies Surveyed
1	2–9	12
2	10–49	37
3	50–249	35
4	250–999	2
5	1000 and more	14
	TOTAL	100

Table 4. The number of survey respondents by job position in the surveyed manufacturing companies.

No.	The Respondent's Job Position	Number of Survey Participants
1	President/Owner/Vice President/Co-Owner/Plant Manager	35
2	Production Director/Manager	9
3	Director of Environmental Affairs	11
4	Quality Control Manager	12
5	Director/Technical Manager	3
6	Director/Chief Administrative Officer	3
7	Director/Chief Commercial Officer	3
8	Director/Manager of HR Department	4
9	Spec. Human Resources Department	7
10	Chief Financial Officer	5

Table 4. *Cont.*

No.	The Respondent's Job Position	Number of Survey Participants
11	Manager/Office Manager	4
12	Head of Finance and Personnel Department	1
13	Director of Marketing and Sales	1
14	Head of Logistics and Administration	1
15	Quality Officer	1
	SUM	100

The data, as primary data, were obtained from the responses of enterprise representatives in a CATI interview. Part 1 dealt with the respondents' metrics and included such information as the type of company, the province of the company's location, the average number of employees in 2021, the position of the person filling out the survey, gender and location in terms of city/village size. In Part 2, the respondents assessed the degree to which each category specified in Table 1 was met. For this purpose, a Likert scale of 0–5 was used. If the respondents were not familiar with the concept describing the criterion selected from the 10, they did not evaluate its degree of fulfillment in the company.

The respondents evaluated the degree to which the category was met in the company in two steps. First, they indicated whether they knew and understood the concept. In cases where they had not heard of it and were not familiar with it, the data were not included in further analysis. The second step was to evaluate the analyzed criterion in terms of its degree of fulfillment in the enterprise. The respondents were given the opportunity to assess the degree of fulfillment of the criterion in the enterprise in 2017 and in 2022 on a scale ranging from 0, which meant that the category was not important and not implemented, to a value of 5, which signified the implementation of sustainable development at a high level.

At the beginning of the analysis, the percentage of respondents who did not know at least one concept that appeared in the survey was determined. The results of these analyses are presented in Section 3.2. Because these percentages significantly narrowed the sample size, it was decided to recode the responses. The answers given on a 0–5 Likert scale were converted to a 0–6 Likert scale as follows: 0—I do not know this concept; 1—the criterion is not fulfilled at all in the company; 2—to a very small degree; 3—to a small degree; 4—on average; 5—to a large degree; 6—to a very large degree. This rescaling of the answers does not affect the results; however, it does make it possible to introduce a score of 0 for concepts unknown to the respondents. This is necessary in order to carry out mathematical analyses to reflect the examined reality in the research results.

2.2.2. Cluster Analysis

In order to distinguish groups of companies with similar characteristics, a k-means cluster analysis conducted according to the Hartigan–Wong [61] algorithm was used. It consists of dividing the dataset into k groups (clusters) in such a way that the elements in each cluster are as similar to each other as possible. The differences between the distinguished groups, on the other hand, are as large as possible. The measure of the diversity of entities subjected to clustering is called the distance measure. The measure of distance between elements in a group is the square of the Euclidean distance (Equation (1)):

$$d(\boldsymbol{x}, \boldsymbol{y}) = \sqrt{\sum_{i=1}^{p} (x_i - y_i)^2}, \quad (1)$$

where

$d(\boldsymbol{x},\boldsymbol{y})$—the Euclidean distance between vectors $\boldsymbol{x}$ and $\boldsymbol{y}$;
p—length of vectors $\boldsymbol{x}$ and $\boldsymbol{y}$ (number of parameters);
x_i, y_i—i-values of the i-th parameter of vectors $\boldsymbol{x}$,$\boldsymbol{y}$.

The researcher assumes the number of clusters (***K***) in advance. In the first step of the algorithm, the observations are randomly divided into ***K*** groups. For each parameter, the average of the observations in each cluster is calculated. The vector of average parameters for a given cluster is called the centroid or cluster center. The next step is to determine the distance between the observations and the centroids of each cluster. The observations are assigned to those clusters to which they have the smallest distance. This changes the content of the clusters. Again, the centroids are calculated, and the distances are determined. The process continues until cluster changes no longer occur.

To estimate the number of clusters, a scatter plot is used [67], which represents the sum of the squares of the distances of observations from centroids in groups. It is determined from Equation (2):

$$\sum_{k=1}^{K} \sum_{i \in S_k} \sum_{j=1}^{p} \left(x_{ij} - \overline{x}_{kj} \right)^2, \quad (2)$$

where

K—the number of clusters;
S_k—the set of observations in k of these clusters;
p—the number of parameters;
$\overline{x}_{kj}$—the average value of the j-th parameter in the k-th cluster.

The criterion of the settlement is a graphical criterion. It involves choosing a number of variables such that, to the left of the cutoff point, the graph has the shape of a settlement.

3. Research Results

3.1. Literature Analysis of Criteria Describing Green Organizations

Based on 10 criteria and selected keywords, the number of scientific publications was quantified. Since the database was compiled in 2023 until June 30, the number of publications in 2023 was simulated based on the number of publications calculated by way of doubling the number of publications in the first six months. In the chart, the value in 2023 is an approximate number calculated for the purpose of this analysis. Figure 2 presents the timeline of publications, which shows that the few scientific articles published in the period until 1986 were related to work in the area of C4 Environmental Management. A few years later, there was a rapid increase in research papers in the area of C5 Sustainable Resource Management. After 2000, C10 Zero-waste Buildings began to be taken up in large numbers in the scientific literature, followed also by C8 Green Supply Chain. Both of these areas have been addressed in the highest number of publications in the last decade.

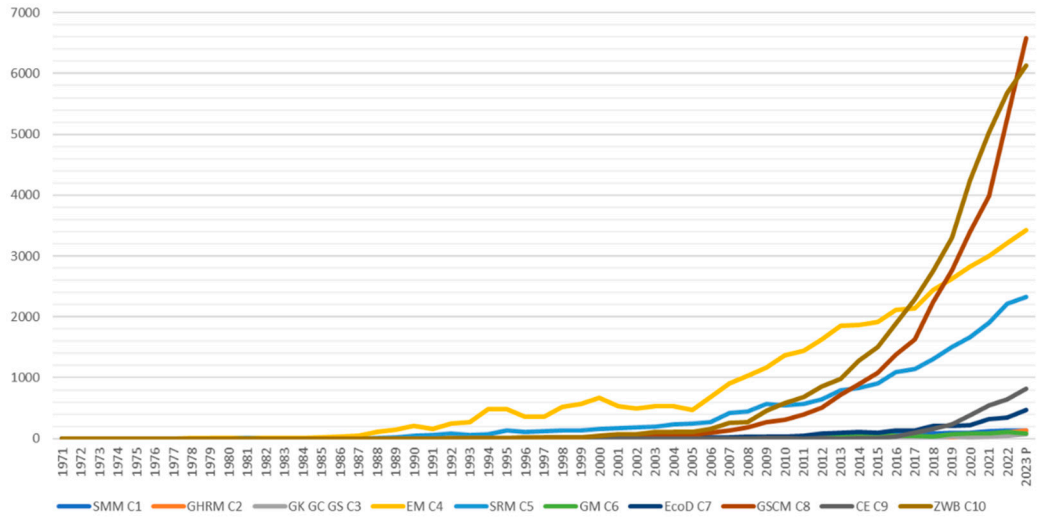

Figure 2. The timeline of counts of scientific articles published in scientific journals in the areas of selected criteria and keywords.

Based on the number of publications and the time of publication of scientific articles in peer-reviewed journals in relation to the studied criteria, it can be assumed that knowledge in the areas where the most scientific articles are published is the most common. This applies to C4 (EM), C5 (SRM), C8 (GSCM) and C10 (ZWBs). The second category of criteria that may be known to those surveyed includes the most numerous publications with values from 1000 to 3000. This applies to criteria C1 (SMM), C7 (EcoD) and C9 (CE). It is concluded that the issues in C2 (GHRM), C3 (GK&GC&GS) and C7 (GM) may be less known and thus not addressed in large numbers in the area of sustainability implementation, which will be verified at the empirical research stage.

3.2. Comparison of Quantitative Survey Results with Scientometric Analysis

Respondents evaluated a specific category only if they knew and understood it. It was assumed that the lack of knowledge in a specific area in the company under study could be related to the number of scientific publications and the time since when knowledge in that scientific area developed. Therefore, Table 5 summarizes the following data for the studied criteria: the number of publications in peer-reviewed scientific journals indexed in the SCOPUS database, the year of the first publication in the SCOPUS database for the given criteria according to the keywords defined in Table 1 and the dropout resulting from primary research conducted in manufacturing companies in Poland. The dropout for all criteria in quantitative research for this study was 71%. This means that criteria with a large dropout are not yet understandable and clear in manufacturing companies. It concerns GHRM, GM, ZWBs, GSCM and SMM the most.

Table 5. Summary of the number of scientific articles published in scientific journals in the areas of selected criteria and keywords with dropout for each category of study.

Criteria	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
Abbr. of criteria	SMM	GHRM	GK&C&S	EM	SRM	GM	EDM	GSCM	CE	ZWBs
No of publications	1006	323	216	41,155	20,159	813	2435	28,762	2551	35,902
Year of 1st publication including keywords	2002	2012	2009	1971	1980	1995	1993	1996	2005	1988
Dropout	23%	42%	5%	8%	1%	27%	8%	24%	2%	34%

3.3. Defining Development Phases of Green Organizations Using the Cluster Analysis Method

Before conducting the cluster analysis, a scatter plot was first created to determine the number of clusters and, at the same time, the number of development phases of GOs. However, the results were not conclusive. The slope of the curve indicates that clusters 3, 4 and 5 can all be used in further analysis (Figure 3). After deeper analyzes carried out for clusters 3, 4 and 5, the research included division into three clusters, which is explained later in the article.

To estimate the number of clusters, the spread of the centroid values was analyzed. In a further stage of the study, a variable named phase was created and assigned to the corresponding clusters listed in the cluster analysis stage, according to the increasing values of the centroids. Thus, Cluster 3 with the lowest values for each category became Phase 1, Cluster 2 became Phase 2, and Cluster 1 became Phase 3. The average values obtained for each parameter are shown below.

The cluster analysis is based on the premise that the clusters should be as distinct from each other as possible, and the curves should not trim. Therefore, the division into four and five clusters, where the clusters were not clearly separated, was rejected. In further analysis, the division into three clusters (Table 6 and Figure 4) and three phases of the development of GOs was considered. For nine variables, an increase in phase co-occurred with an increase in average values. However, for variable C10, a higher average value was found in cluster Phase 1 than in Phase 2. This may be due to the fact that as many as 34%

of respondents said that they did not understand the concept. It was the least understood category among the respondents.

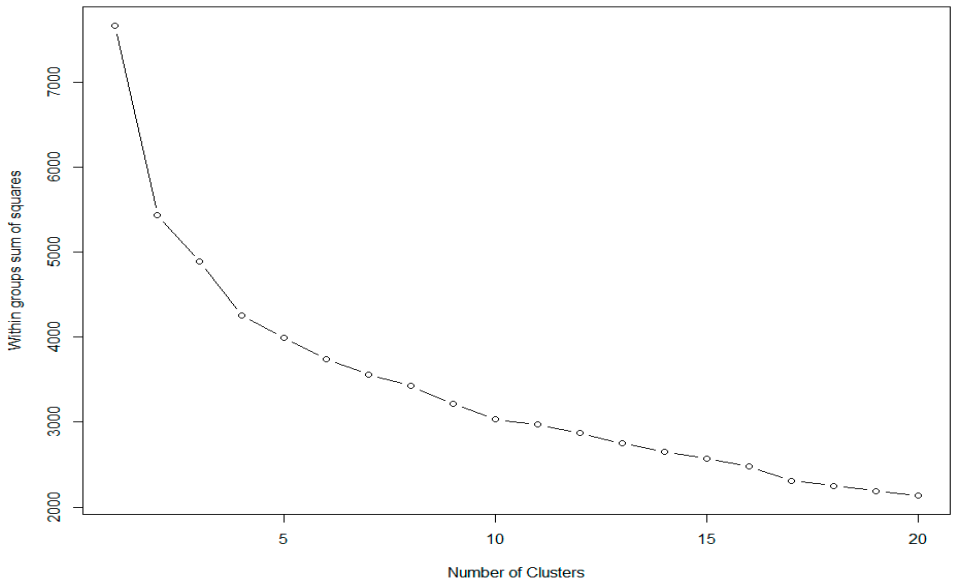

Figure 3. Sludge chart.

Table 6. Summary of centroids for 3 clusters of green organization development.

No.	Criteria	Cluster 1	Cluster 2	Cluster 3
C1	SMM	4.61	3.77	1.67
C2	GHRM	3.6	3.31	0.6
C3	GK&C&S	5.14	4.69	3.33
C4	EM	4.8	4.62	2.82
C5	SRM	4.9	4.48	3.79
C6	GM	4.15	2.81	0.71
C7	EDM	4.43	3.58	2.47
C8	GSCM	4.83	1.69	1.3
C9	CE	5.06	4.27	2.89
C10	ZWBs	3.81	0.71	1.29

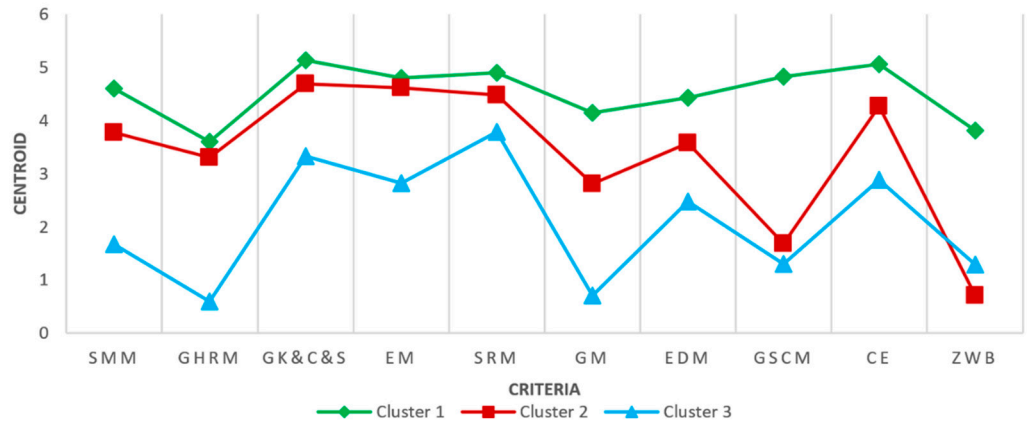

Figure 4. Comparison of centroid scatter for 3 clusters.

Determining the affiliation of the 100 surveyed companies to individual clusters, and thus the phases of development of GOs, we obtained the following results: cluster 1 contains 79 sites and cluster 2 has 48 sites, while cluster 3 contains 73 sites. We analyzed how the development phase of a given company changed between the situation in 2022

and 2017. It turns out that 83 companies did not change phase, 15 recorded an increase in the level of green competence and, in 2 companies, a change in phase to a less advanced one was noticed.

4. Discussion

When the empirical research was compared to the literature, it was possible to analyze the GO criteria in the direction of accelerating their development. Figure 5, based on the results of the study, presents the feasible direction of implementation of measures in the following areas of the studied criteria. It can be concluded that knowledge and its dissemination in the company influence the knowledge of the examined category in the manufacturing companies and thus also the implementation of activities in a specific functional area of the organization. It can be assumed that new areas of scientific research, especially those related to GM and GHRM, are the areas that most require action and improvement in line with the principles of sustainable development in production enterprises. These issues (e.g., SRM), which have been discussed in the literature for decades, have been practiced and widely used in companies for years. Therefore, due to the ease of access to knowledge and its universality, companies often implement those that are known and commonly practiced as the first actions. According to Figure 4, both categories (GM and GHRM) can become a catalyst for accelerating changes and the organization's transition from cluster 1 to cluster 2. This is an innovative way of building GOs. It can be hypothesized that changes in the area of GM and GHRM may accelerate the development of a GO in its holistic perspective. However, this hypothesis requires confirmation and continued research. Some of these results can be explained by the primary research and explanation of the hierarchy of the distinguished categories, also with relation to the scientometric analysis referred to below.

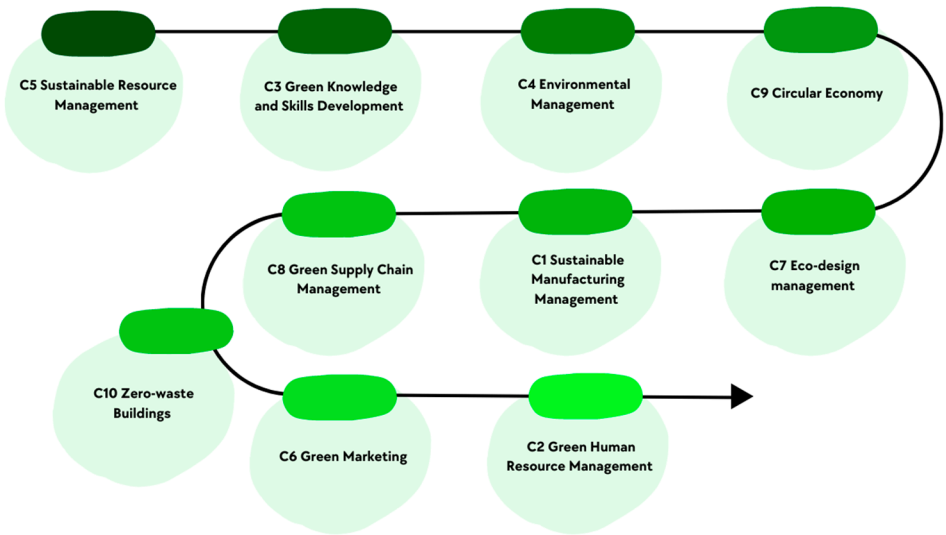

Figure 5. The order of implementation of criteria in the functional area toward the development of green organizations.

Comparing the hierarchy of measure implementations relating to the 10 selected categories studied with the literature analysis, it can be seen that the number of publications, year of first publication and the dropout resulting from the empirical study overlapped in most studies. This was particularly true for C1 (SMM), C2 (GHRM), C4 (EM), C5 (SRM), C6 (GM) and C7 (EDM). In the case of C3 (GK&C&S), the low dropout may be due not so much to knowledge of green competences but to knowledge in the area of sustainability, which was developed as early as the 1970s. C9 (CE), on the other hand, has recently been one of the key priorities in the EU and the world, making knowledge in this area increase dramatically; hence, the low dropout in this case (see Table 5). The C8 (GSCM) and C10 (ZWBs) categories indicate a relatively high dropout that is disproportionate to the number

of publications in this area (see Table 5). This may be because there is a large diversity of subject matter in the areas of the criteria studied and additional classification for C8 and C10 should be considered when continuing the study.

Referring to Figure 4, it can be noted that GHRM is an important criterion for classifying the change from Phase 1 to Phase 2. The authors have previously indicated that GHRM can significantly contribute to the development of GOs [68] through environmental training, green recruitment, engagement assessment or compensation, among other things. Theoretical perspectives such as ability–motivation–opportunity and a resource-based view [69] can significantly contribute to increasing the level of sustainability implementation in HRM and accelerate a company's leap from Phase 1 to Phase 2. The situation is similar in the case of C6 (GM). Green marketing can support an organization at the level of product, price, promotion, consumption and strategy, on the one hand to better align with customer expectations, and on the other hand, to minimize negative impacts on the environment [70,71]. In turn, for an organization's development to move more quickly from Phase 2 to Phase 3, it is worth paying attention to C8 (GSCM) and C10 (ZWBs). These two criteria, along with C6 (GM) significantly distinguish Phase 2 from Phase 3 in the development of GOs. Research confirms that GSCM activities have a positive impact on corporate performance where competitiveness and investment recovery play a mediating role among green practices within the organization [72], also contributing to green performance through, e.g., green purchasing activities [73]. The literature here emphasizes the important role of sustainability specialists and change management [12]. It seems that it is the human resources departments that can contribute to increased organizational sustainability readiness through appropriate activities such as training [13]. Similarly, thinking holistically about a sustainable organization applies to energy consumption and a holistic approach to sustainability in terms of buildings [74].

In the context of sustainable organizations, it is important to plan activities and cover sustainability in various aspects of the company's activities, not only those related to buzzwords such as SMM, CE or SRM. It is also important to report and monitor progress related to sustainability, set indicators to measure progress [75] and goals achieved in the company and, above all, rely on the knowledge and experience of companies that operate in many areas in relation to sustainability [16] and are in phase 3 of GO development.

5. Conclusions

The purpose of this paper was to characterize the criteria for describing GOs and to define the phases of their development against the background of the literature. This type of research and an attempt to systematize the concept of GOs is important for identifying measures to accelerate the development of GOs, as well as for determining further research directions.

The study was conducted in the scientometric area of literary research on selected criteria describing GOs. Then, the results of the empirical research were characterized by defining the development phases of GOs and comparing them against the literature. As a final result, recommendations were obtained for sustainability implementations in organizations in relation to the selected criteria, and areas of action that can accelerate the development of GOs were suggested. The results showed that there is a need to continue research in this area, especially with regard to defining the development cycle of GOs, which can be described by empirical research, e.g., in the area of good practices, especially in companies classified in the three phases of GO development.

Moreover, comparative studies in developed and developing countries are an opportunity to compare results and design future studies. Research alliances between different centers, especially universities, in different countries are also an important step for future research into GOs.

This study contributes to the literature on the development of GOs. Identifying the development phases of GOs using manufacturing companies as an example is a step toward identifying the criteria that require more input from companies to better and

more effectively implement sustainability activities. The research conducted and the conclusions of this study are a step toward clarifying the development cycle of GOs. The results of this research can also provide a basis for further empirical studies to further understand the criteria and relationships affecting the acceleration of the development of GOs and to continue research in the area of the GO development cycle. The role of sustainable development in many areas of business also functionally deserves further study. The general significance of the data is presented in Figures 4 and 5, which indicate the stages of GO development and the stages of development implementation from a functional perspective.

The research conducted also has its limitations. The sample was limited to manufacturing companies in Poland. The development cycle of GOs in this country may differ significantly from that in other, more developed economies, which has already been pointed out as a necessity and direction for further research in this area. There is scope for future research to determine the relevance of the criteria describing GOs, taking into account the refinement of the C8 (GSCM) and C10 (ZWBs) criteria. Another topic of relevance to the research is the inclusion of issues related to the digitization and digitalization of processes in the context of GO development including the use of AI for improving enterprise processes and functions, innovation and strategy.

Initiating a shift toward becoming a sustainable organization starts with the support of senior management. However, it necessitates the integration of a sustainability-oriented culture throughout the entire organization, ensuring that it permeates the daily activities, mindset and behavior of each employee [8].

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