sustainability

MDPI

Article

Performance Assessment of Sustainable Leadership of Enterprise's Circular Economy-Driven Innovative Activities

Iryna Bashynska [1,*], Yuliia Malynovska [2], Nataliia Kolinko [3], Taliat Bielialov [4], Marina Järvis [5,6], Krystyna Kovalska [7] and Mariia Saiensus [8]

1 Department of Enterprise Management, AGH University of Krakow, 30-059 Krakow, Poland
2 Department of Foreign Trade and Customs, Lviv Polytechnic National University, 79-013 Lviv, Ukraine; yuliia.b.molochnyk@lpnu.ua
3 Department of Management and International Entrepreneurship, Lviv Polytechnic National University, 79-013 Lviv, Ukraine; nataliia.o.kolinko@lpnu.ua
4 Department of Entrepreneurship and Business, Kyiv National University of Technologies and Design, 01-001 Kyiv, Ukraine; taliatbielialov@gmail.com
5 Department of Business Administration, Tallinn University of Technology, 12616 Tallinn, Estonia; marina.jarvis@taltech.ee
6 Estonian Entrepreneurship University of Applied Sciences, 11415 Tallinn, Estonia
7 Liverpool Hope Business School, Liverpool Hope University, Liverpool L16 9JD, UK; kovalsk@hope.ac.uk
8 Department of Marketing and International Logistics, Odessa National Economics University, 65-000 Odesa, Ukraine; mariasaensus@gmail.com
* Correspondence: bashynska@agh.edu.pl

Abstract: There is a need to explore and comprehend the performance of sustainable leadership in enterprises' circular economy-driven innovative activities. Firstly, there is a pressing necessity for businesses to remain agile and responsive to change, utilizing innovation not just as a buzzword but as a strategic tool for adaptation and growth. Secondly, the ethical dimension demands that innovation be pursued responsibly, considering its effects on communities, environments, and future generations. Lastly, the economic imperative underscores that sustainable innovation management can lead to efficiencies, cost savings, and new avenues for revenue generation. An improved comprehensive approach to evaluating the effectiveness of managing enterprises' innovative activities is proposed. This approach is based on the evaluation of 14 partial indicators, each reflecting a specific vector orientation. This assessment allows for the combination of indicators that essentially reflect the personal characteristics of the manager and the combination of formative and resultant factors of the management's influence on the state and results of innovative activity (the above-proposed factor approach). Consequently, it provides an opportunity to obtain a multifaceted, comprehensive, and most complete assessment of the sustainable management of innovative activity based on valid vector orientation within the scope of the subject and the object of research. Based on the proposed improved assessment, indicators of the effectiveness of managing innovative activities were calculated for the seven researched innovatively active industrial enterprises. Thus, the following were calculated: (1) the personal component (Pp) of the evaluation of the effectiveness of leadership in innovative activities using the expert assessment toolkit, (2) the managerial component (Plm), and (3) the innovatively sustainable component (Pis) of the evaluation of the effectiveness of sustainable management of innovative activities based on the internal reporting of the enterprise. This balances the partial subjectivity of the expert method with real data from specific enterprises. Consequently, based on the values of the three assessment components, a comprehensive integral indicator of the effectiveness of managing the innovative activity of the enterprise (Pef) was calculated. The proposed methodology's validation proved its effectiveness and efficiency. The authors forecast the degree of influence of external and internal factors, taking into account the results of a comprehensive, integrated assessment of the effectiveness of sustainable management (Pef) on the economic development and indicators of the enterprise's circular economy-driven innovative activities. This enables a significant strengthening of the resultant factors of managing innovative activities and predicting specific final results of all innovative activities.

Citation: Bashynska, I.; Malynovska, Y.; Kolinko, N.; Bielialov, T.; Järvis, M.; Kovalska, K.; Saiensus, M. Performance Assessment of Sustainable Leadership of Enterprise's Circular Economy-Driven Innovative Activities. *Sustainability* **2024**, *16*, 558. https://doi.org/10.3390/su16020558

Academic Editor: Adriana Del Borghi

Received: 26 November 2023
Revised: 23 December 2023
Accepted: 6 January 2024
Published: 9 January 2024

Keywords: circular economy; economy-driven innovative activity; leadership; management; sustainable leadership; sustainability

1. Introduction

The theme of sustainable management in the context of innovation is highly relevant today as companies continuously grapple with adapting to market shifts, technological advancements, and evolving consumer demands [1,2]. In the midst of rapid development and intense competition, the management's capacity to foster and sustain innovative processes within enterprises becomes paramount. It is not solely about implementing innovative solutions; it is equally crucial to cultivate an effective culture that nurtures creativity, stability, and efficiency across all business domains, ultimately determining success in the contemporary business landscape. Therefore, assessing the impact of sustainable management on enterprises' innovative activities is pivotal for comprehending and enhancing management strategies geared toward business growth and competitiveness.

Sustainable development embodies a principle aimed at meeting current societal needs without compromising the ability of future generations to meet their own requirements. This concept emerged from recognizing the constraints of natural resources and advocating for a balance among economic, social, and environmental facets of development.

Ensuring sustainable development stands as a fundamental objective for companies, organizations, and society at large [3,4]. Within the business realm, sustainable development necessitates accounting for the company's impact on the environment, fostering social equity, and sustaining economic viability. Companies embracing sustainable development not only work toward resource conservation and emissions reduction but also forge pathways for innovation, the advancement of new technologies, and the attraction of customers who prioritize sustainability and accountability.

This approach gains increasing significance amidst global challenges like climate change, dwindling natural resources, and social disparities. Therefore, exploring the influence of sustainable development on enterprise activities is pivotal for understanding and implementing positive changes in the future functioning of businesses.

In the rapidly changing landscape of modern business, the sustainable management of innovative activities within enterprises stands as a decisive factor for success and endurance. Innovation has traditionally been the cornerstone of progress, propelling growth, competitiveness, and adaptability in an ever-evolving marketplace. However, the way organizations cultivate, nurture, and maintain these innovative pursuits is increasingly pivotal, not only shaping their individual trajectories but also influencing broader socio-economic and environmental paradigms.

The significance of this subject cannot be overstated. In an era characterized by swift technological advancements, shifting consumer demands, and global challenges like climate change, how enterprises manage their innovative activities sustainably carries profound implications. It surpasses mere profitability and market dominance; it encompasses ethical obligations, environmental stewardship, and societal impact. Understanding how enterprises navigate and harmonize these multifaceted aspects while fostering innovation is paramount.

The necessity to explore and comprehend sustainable management of innovative activities stems from various angles. Firstly, there is an urgent need for businesses to remain agile and responsive to change, utilizing innovation not merely as a buzzword but as a strategic tool for adaptation and growth. Secondly, the ethical dimension insists that innovation be pursued responsibly, considering its impacts on communities, environments, and future generations. Lastly, the economic imperative emphasizes that sustainable innovation management can yield efficiencies, cost savings, and novel revenue streams.

Through this exploration, our aim is to delve into the intricacies of sustainable management practices within enterprise innovation.

The research aims to introduce an enhanced and comprehensive approach for evaluating the efficacy of managing innovative activities within enterprises, with a primary focus on sustainable leadership driving circular economy-based innovation. The objective is to devise a methodology that integrates diverse indicators to gauge the sustainable management of innovative activities within enterprises.

To achieve the set goal, the following tasks must be performed consistently:

- Review the existing literature to understand methodologies used for evaluating leadership performance;
- Define the prerequisites and criteria for the model's development;
- Identify the specific indicators that will serve as benchmarks for assessment;
- Formulate a comprehensive indicator that encapsulates the assessment outcomes;
- Validate the proposed model by applying it to a sample set of industrial enterprises.

2. Literature Review

To address the tasks of establishing a mechanism for managing enterprises' innovative activities, it is imperative to develop a methodology that can identify the optimal set of management tools while considering the enterprise's specific conditions. This methodology should involve assessing the current state of management and formulating recommendations to enhance its efficiency.

However, the complexity of leadership as a phenomenon and the challenge of evaluating the current state of leadership, considering the personal characteristics of managers complicate the transition from the existing leadership state to the desired one.

Studies [5–8] have indicated that managers often overlook the selection of influence methods, power types, and leadership styles in their managerial activities, relying more on inspiration or intuition without accounting for the management system's specifics.

Fundamentally, effective, sustainable leadership hinges on the correct amalgamation and application of primary tools (influence methods, power types, leadership styles) while considering operational conditions, the balance of internal and external factors, and assessing leadership effectiveness in the current context [9,10]. Subsequently, a crucial step involves understanding the personal traits of leaders in innovative activities and utilizing them optimally to foster effective leadership [11,12].

The methodology for modeling sustainable management essentially involves crafting a new practical management toolkit and relevant approaches based on both the manager's personal characteristics (intellectual component) and their efficacy in influencing innovative activity results (professional management and technological production component), each reflecting specific orientations.

Consequently, transforming the existing management system, including its outcomes, structure, and potential in the context of innovative activity, into the desired state requires a model for selecting a practical approach to managing innovative activities. This model involves several key stages:

Stage 1: Identifying the stage of life development and the directional management of innovative activity at that stage.

Stage 2: Assessing the comprehensive and directional effectiveness of managing innovative activities.

Stage 3: Formulating a model for choosing a practical approach to managing innovative activities.

Stage 4: Predicting the impact of internal and external factors.

These stages collectively facilitate the transformation of the existing management system into the desired one by guiding the selection of practical approaches tailored to the specifics of managing innovative activities. These stages are complex and require detailed consideration and processing, which will be presented below.

It is crucial to acknowledge that any enterprise engaged in innovative pursuits goes through distinct phases of development, commonly referred to as the "life cycle" of an enter-

prise. Similar to the life cycles of products, commodities, or organizations, the concept of a process or function life cycle is less common but still exhibits cyclic developmental patterns.

For managing innovation activities, we propose considering the concept of "life development" within a stage-by-stage process, encompassing its unity from the inception of groundbreaking ideas to their eventual absence. Most managers experience cyclical repetition in different phases of managerial activities' life development, responding to market changes, product obsolescence, modernization, and scientific and technological progress. Despite the diversity in leadership forms, methods, and styles, certain phases in its life development are common and are more influenced by external conditions than the internal traits of the leader [13]. Building upon research sources [14,15], we propose delineating the following stages in the life development of innovation management: initiation, activation, growth, engagement with the external environment, peak performance, maintenance, and a period of calm (preparation) before the start of the next cycle.

Each phase of management development is characterized by specific tools and organizational and innovative conditions determined by the direction of innovation activity and the enterprise's operational peculiarities. However, akin to any life cycle, these stages can be categorized into phases of effective and traditional leadership.

As the innovation process follows a cyclical pattern, the adaptation of management to the stages of innovation development also exhibits cyclic tendencies. In essence, the regularities governing the cyclicity of management's continuous adaptation to innovative development align with the dynamics of its phases and should be considered concerning the stages of life development in innovation management.

In constructing a structural–functional model of the life development of innovative activity management, we propose adopting the model of the life cycle presented by [14–17], albeit refined to consider specific clarifications about the number and sequence of stages in the development chain modeling the enterprise's innovation activity over time. This model also incorporates the leader's directional orientation in predicting potential choices regarding orientation.

It is essential to note that the management's orientation in innovative activity may shift depending on the developmental stage and the phase of innovation activity, as indicated by previous sections of the study regarding vector orientation. As life cycle stages of innovative projects or processes evolve, management adapts its tools and current priorities accordingly.

Consequently, most managers exhibit cyclical repetition in the life development stages of innovative activity management, aligning with changes in market dynamics, product aging, asset modernization, scientific and technical advancements, and transitioning from one innovative project to another post-completion. Managers often rely on proven behavioral and professional algorithms when navigating through changing cycles of innovative activity.

As managers initiate or intensify innovative activities, their orientation tends to shift from business processes toward personnel development and stimulation, eventually encompassing societal transformation due to the impact of their innovation activity results. Hence, based on our research and foundational conceptual models, a graphical model of innovative activity management development has been formulated (Figure 1).

At each stage of life development, a manager demonstrates a specific orientation to a varying degree. When inclined toward staff development, the manager dedicates maximum effort to internal communications, fostering teamwork, and encouraging subordinates to explore and generate ideas. A focus on implementing business processes involves stabilizing operations and minimizing innovation risks, prioritizing established and proven innovations. For those inclined toward societal transformation, the manager achieves objectives by meticulously planning, organizing, and controlling to create optimal conditions for creative work, fostering relationships, facilitating close contacts, and encouraging teamwork in the development, exploration, and implementation of innovations.

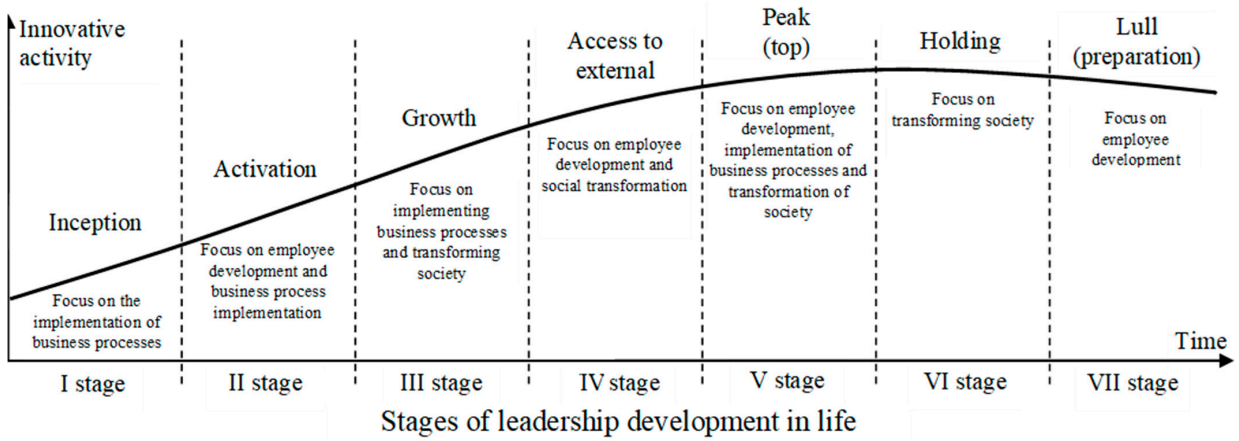

Figure 1. Graphical model of life development of innovation management taking into account combinations of vector orientation (source: proposed by the authors).

The evaluation process stands as a conclusion reflecting the outcomes of the leader's assessment of innovative activity, a complex procedure encompassing methodological intricacies and organizational interactions between the manager and subordinates.

Effectively assessing sustainable management involves both comprehensive and directional evaluations of enterprises' innovative activity management. Let us delve deeper into these components:

(1) Comprehensive assessment entails deducing the level of effectiveness in managing enterprises' innovative activities based on specific indicators that thoroughly encapsulate this effectiveness;

(2) Directional evaluation refers to establishing a manager's inclination toward one of the aforementioned vectors (society, business processes, employees) in implementing innovative activity. This determination stems from calculating indicator values that comprehensively depict these vector orientations. The evaluation is crucial to align the manager's inherent orientation with the one characteristic of a specific stage of life development. Detecting any deviations allows for proposing targeted corrective measures.

Regarding the comprehensive evaluation of managerial activity, numerous scholars have extensively studied this area, offering various methods [18–21]. In our research, we conducted an in-depth analysis of methods and approaches to evaluating innovative activity management found in the works of domestic and foreign scholars. It emerged that these scholars utilize different scales—two-point, five-point, ten-point, or one-point—to assess indicator values. However, the scale choice does not fundamentally alter the calculation process. Organizing and grouping the totality of indicators is vital, highlighting key assessment elements.

Examination of the scientific literature on this topic [22–24] reveals that researchers are consistently pursuing more sophisticated methods to appraise the performance of managerial personnel. Concurrently, evaluating the performance of innovation activity leaders remains pertinent and requires further elucidation due to the absence of a unified evaluation methodology.

Assessing the performance of an innovation activity leader relies on fundamental criteria the leader should fulfill. The primary principles for evaluating the management of innovative activities are outlined in Table 1.

The evaluation process in managing innovative activities serves multiple purposes: it offers feedback, motivates, and contributes to enhancing a manager's performance in implementing innovative strategies. Annual evaluation outcomes help pinpoint problematic areas in managing innovative activities and establish links between the manager's professional qualities and job responsibilities. These results, formulated as conclusions, essentially constitute an assessment.

Table 1. Principles of evaluating the effectiveness of management of innovative activities (source: supplemented by the authors based on [18–25]).

Principles	Characteristics of the Principle
Objectivity	It is based on the use of reliable information and a complete system of indicators.
Publicity	It is based on the familiarization of the manager with the order and methodology of evaluation, his activity.
Comprehensiveness	It is based on the maximum consideration of the criteria that the manager effectively uses.
Systematicity	It is based on the periodic evaluation of the work of the head of innovation activity to check compliance with the defined strategies, goals, and purpose of the enterprise to avoid and accumulate errors.
Definition	It is based on simplicity and accessibility because the more straightforward the rating system, the better it works and the more often it is used.
Operativeness	Based on speed and regularity of assessment.
Timeliness	It is based on timely and correct regulation of the manager's activities.
Flexibility	It is based on elasticity and adaptability to any changes that occur in the enterprise and business environment.
Economy	It is based on achieving the maximum possible results when evaluating the manager's performance at minimum costs.
Purposefulness	It is based on encouraging the manager to develop his activities in the right direction.
Democracy	It is based on the participation of enterprise team members engaged in research or implementation of innovations in the evaluation.
Science	It is based on the assessment of the innovative activity of the manager using the latest theoretical and practical achievements in science.
Transparency	It is based on providing complete and reliable information on managerial innovation activities of managers at all levels.
Performance	It is based on the mandatory and prompt adoption of appropriate measures based on the assessment results.

The subsequent phase of the assessment involves delineating the direct assessment procedure (see Figure 2).

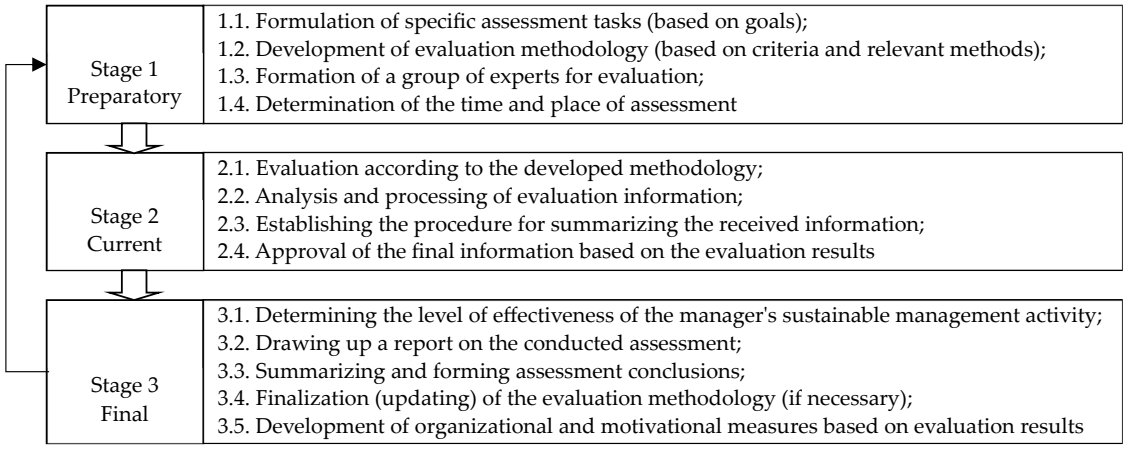

Figure 2. The procedure for evaluating the effectiveness of management of innovative activities (source: proposed by the authors).

The evaluation aims to enhance the management of innovative activities by acknowledging accomplishments aligned with the company's priorities. It is structured around:

(1) Establishing a consistent and uniform evaluation procedure;

(2) Aligning the planning system for innovative activities with priorities to form the basis for assessing outcomes;

(3) Enhancing the evaluation process for managers' innovative activity results based on predefined criteria, expected achievements, and the enterprise's strategic goals;

(4) Refining the mechanism for evaluating managers' innovative activity, incorporating transparent evaluation criteria and documented support;

(5) Implementing an effective system for analyzing the results of managers' innovative activity evaluations;

(6) Cultivating a broad understanding among managers about the necessity and process of evaluating innovative activities, fostering their accountability in enterprise management, and fostering communication between managers and employees regarding innovative activity plans and outcomes;

(7) Strengthening informational and methodological support for the annual evaluation of enterprise managers' innovative activities;

(8) Ensuring accessibility of innovative activity assessment results for all entities under evaluation.

3. Methodology

3.1. Formation of the Model

Taking the information provided earlier into account, we will construct a structural model depicting the key components involved in evaluating the efficacy of managing innovative activities (see Figure 3).

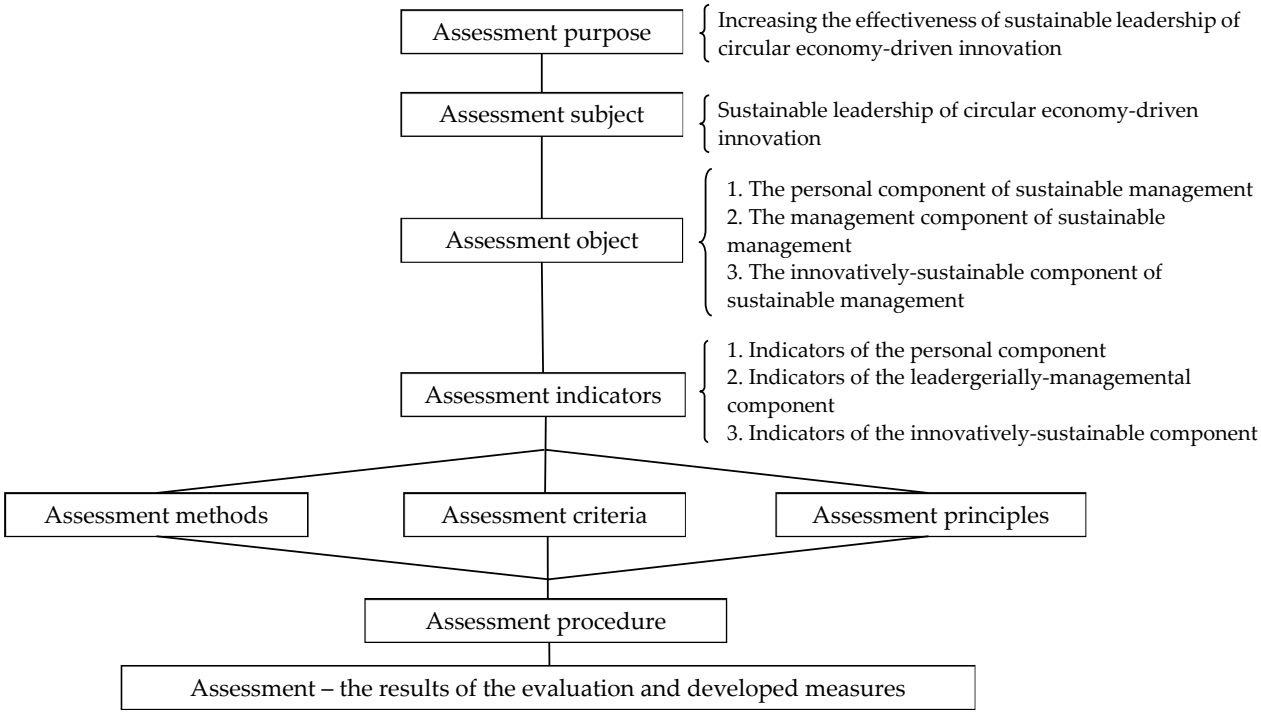

Figure 3. A structural model of the main elements of the process of assessment of sustainable leadership of enterprise's circular economy-driven innovative activities (source: proposed by the authors).

A diagram (Figure 4) can illustrate the primary evaluation domains. To maintain objectivity, it is recommended to utilize indicators of managerial and leadership potential derived from internal enterprise reports for assessing the second and third groups (indicators of managerial potential, indicators of production, and technological potential).

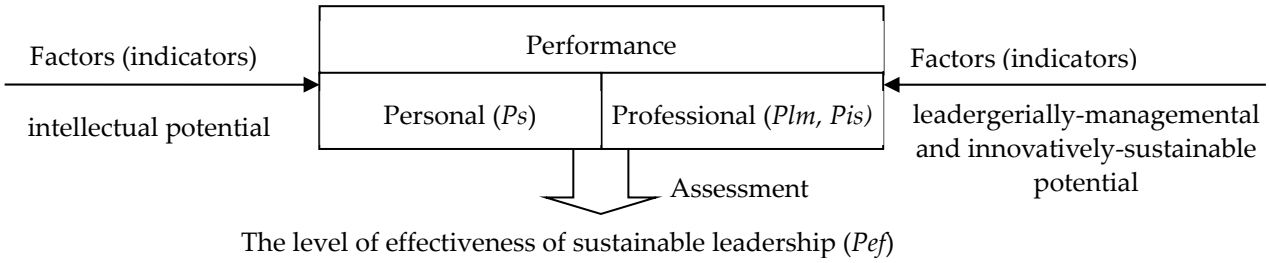

Figure 4. Directions and factors of evaluating the effectiveness of assessment of sustainable leadership of enterprise's circular economy-driven innovative activities (source: proposed by the authors based on [18–21,26–29]).

Hence, the assessment of management will encompass both individual traits and the outcomes achieved through their managerial role.

3.2. Determination of Evaluation Indicators

Attention is crucial in forming groups of evaluation indicators. The initial group pertains to indicators of intellectual potential. A comprehensive interpretation, as posited by A. Brooking [30], defines intellectual capital as a system of attributes that determine an individual's capacity—specifically, the quality of the workforce or enterprise in producing goods or services, based on each entity's economic interests as a whole.

Brooking delineates components of intellectual capital as follows:

- Human capital (personnel knowledge and experience);
- Market capital (client relationships, agreements, and contracts);
- Intellectual property (patents, trademarks, copyrights owned by the company resulting from employee efforts);
- Infrastructure capital (management philosophy, company culture, and business traditions).

Based on prior research, a set of eight elements was determined: six primary (personal characteristics) and two additional (results of labor activity). These elements aid in assessing the manager's personal development level and the impact of their work on innovative activity management. The primary personal characteristics influenced by upbringing, family values, character traits, environmental factors, and professional aspects include (1) skills, (2) knowledge, (3) values, (4) abilities, (5) thinking, and (6) qualities. Supplementing these are additional elements reflecting consciously formed personal characteristics that showcase the manager's potential and readiness to perform crucial managerial functions in innovative activity, following effective management principles:

(7) Degree of managerial function implementation by the innovation activity manager;
(8) Manager's adherence to effective management principles in innovative activities.

For the evaluation of professional managerial and production-technological components, the study suggests utilizing factors and management-influenced outcomes that are pertinent for assessing these components. These factors are to be reorganized based on the aforementioned selected assessment components. Economically, they will mirror management's impact on innovative activity processes by influencing employees (professional management component) and on the outcomes of innovative activity by influencing operational processes (professional production and technological component).

Article [31] sheds light on influential factors impacting leadership, especially in the context of sustainable performance. It underscores the importance of responsible leadership behaviors, noting a positive link between responsible leadership (RL) and sustainable performance. Moreover, the study identifies epistemic motivation as a crucial mediator, emphasizing transparency in knowledge as vital for achieving sustainable outcomes. Thus, two key indicators emerge: responsible leadership behaviors and motivation. Other studies [32,33] emphasize the significance of personal leadership qualities in fostering a positive and motivational environment for employees.

In [34], the study emphasizes the pivotal roles of leadership styles and organizational learning, elucidating their combined impact on sustainable competitive performance within Pakistani SMEs in the sports and textile sectors. It acknowledges a leader's personal beliefs and values as significant influencers in assessing sustainable leadership.

Another evaluation approach in [35], using the Tri-Intersectional Model of Leadership by Values, assesses the alignment and interaction of three essential axes of values: economic–pragmatic, emotional–developmental, and ethical–social. It identifies intersections like innovation, survival, and sensibility as pivotal markers for evaluating the model's effectiveness in driving sustainable innovations, promoting organizational survival, and fostering socially responsible practices.

Study [36] focuses on key aspects of leaders, including innovative work behavior, education, training, emotional intelligence, and understanding human behavior. Scholars [37] highlight a leader's active adoption of innovative technologies, especially artificial intelligence, as a pivotal characteristic signifying a profound understanding of sustainable development-focused strategies.

The Impact of factors influencing "anag'ment on the sustainability of innovative activity, integrated within the professional management component of assessing sustainable leadership in enterprises' circular economy-driven innovative activities, can be evaluated using the following indicators:

1.1. Circular economy integration—it is advisable to evaluate with indicators that will reflect the level of:
   - Resource circularity rate;
   - Lifecycle sustainability indicator.

1.2. The use of innovative equipment and technologies at the enterprise aimed at saving resources should be evaluated with indicators that reflect the level (included in the professional innovatively sustainable evaluation component):
   - Procurement of innovative equipment and production lines;
   - Introduction of new technological processes and products into production;
   - The volume of costs for the purchase of innovative equipment, production lines, etc.

1.3. The motivation of the company's employees involved in innovative activities can be evaluated by indicators that will reflect the level (included in the professional leadergerially managemental component):
   - The volume of expenses for wages of employees involved in innovative activities;
   - Changes in the cost of wages for employees involved in innovative activities;
   - Bonuses and additional payments for performing special tasks of innovative activity, etc.

The results of management's influence on the effectiveness of innovative activity, to be included in the professional innovatively sustainable component, can be determined by the following:

2.1. Quantity of implemented innovative products;
2.2. Monetary value of implemented innovative products;
2.3. Proportion of innovative products within the overall commercial product structure;
2.4. Profits generated from the sale of innovative products, among others.

Drawing from the identified factors and considering the aforementioned evaluation components, we will assemble groups of elements and indicators forming the foundation of the model for assessing the effectiveness of management in innovative activities within enterprises (Table 2). This evaluation aims to amalgamate indicators reflecting the leader's personal traits and the amalgamation of influential factors shaping the state and outcomes of innovative activities.

Table 2. Elements of the model assessing the effectiveness of management in evaluating sustainable leadership within enterprises' circular economy-driven innovative activities (source: supplemented by the authors based on [1,5,7,9–11,18,19,38]).

Assessment Components	Indicators	Method of Calculation	Legend
Indicators characterizing intellectual potential and vector orientation toward a sustainable society			
Personal component Pp	An integral indicator of the personal level of the manager	$Ps = \frac{\sum_{i=1}^{N} Ke_i}{N}$, (1)	Ke_i—the average expert assessment of that group of characteristics of the personal component of the evaluation of sustainable leadership of enterprise's circular economy-driven innovative activities; N—the total number of characteristic groups (N = 8; i = 1, 2, . . ., N)
Indicators characterizing managerial potential and vector orientation toward employees			
Leadergerially managemental component Plm	The level of personnel involvement in sustainable innovation activities	$Pm_1 = \frac{N_c^t}{N_z^t}$, (2)	N_c^t—the number of scientific, engineering, and technical workers involved in innovative activities (IA) for a certain period t, persons; N_z^t—the total number of employees for a certain period t, persons.
	The level of stimulation of employees of sustainable innovative activity	$Pm_2 = \frac{S_c^t}{S_z^t}$, (3)	S_c^t—the average salary of employees involved in IA for a certain period t, euro; S_z^t—the average salary of employees involved in IA for a certain period t, euro.
	The level of growth of employees' encouragement of sustainable innovative activity	$Pm_3 = \frac{B_c^t}{B_z^t}$, (4)	B_c^t-the average amount of additional material incentives (rewards, "bonuses", additional payments) of employees involved in IA in a specific period t, euro. B_z^t-the average amount of total additional material incentives (rewards, "bonuses", additional payments) of employees in a certain period t, euro.
Indicators characterizing sustainable development and vector orientation to business processes			
Innovatively sustainable component Pis	Indicator of the level of progressivity of products	$Pp_1 = \frac{Q_c}{Q_z}$, (5)	Q_c—number of types of manufactured (sold) innovative products, units; Q_z—the total number of manufactured (sold) types of products by the enterprise, unit
	Indicator of the level of progressiveness of technologies	$Pp_2 = \frac{T_c}{T_z}$, (6)	T_c—the number of newly implemented (purchased) technological processes (lines) by the enterprise for a certain period, units; T_z—the total number of technological processes (lines) used by the enterprise for a certain period, units.
	Indicator of the level of innovative potential	$Pp_3 = \frac{V_c}{V_z}$, (7)	V_c-amount of expenses for innovation (search, use, acquisition, implementation of scientific and technical achievements (expenses related to invention)) for a certain period, euro; V_z—total cost of production for a certain period, euro.

3.3. Construction of an Integral Indicator

The integral indicator (P_{ef}) aims to provide a concise numerical measurement of the quality of management in innovative activities within enterprises while retaining the fundamental properties of the evaluated components.

A simplified algorithm for constructing this integral indicator follows these steps:

(1) Formation of a set of characteristics of the studied phenomenon: $P_{ef} = \{P_s, P_{lm}, P_{is}\}$;

(2) Formation of values for the weighting coefficients vector $w = \{w(P_s), w(P_{lm}), w(P_{is})\}$, ensuring their summation equals 1, reflecting the relative significance of each integral

indicator component. Given our research, where all components have equal weight, each coefficient will be set to 0.33 (1/3);

(3) Selection of the synthesizing function, resulting in the calculation of the integral performance indicator $P_{ef} = \{w(P_s), w(P_{lm}), w(P_{is}), P_s, P_{lm}, P_{is}\}$, determining this indicator.

Given the limited data within the integral indicator and equal weighting factors, employing the weighted Euclidean distance method for calculation is advisable. Thus, based on the conditions outlined and utilizing the method of determining Euclidean distances, the formula for the integral performance indicator is:

$$P_{ef} = \sqrt{\sum_{i=1}^{3} w_i P_i^2}, \quad (8)$$

where P_{ef} represents the integral indicator for evaluating the effectiveness of management in innovative activities.

The subsequent crucial step involves calculating the components of this model, $P_i = \{P_s, P_{lm}, P_{is}\}$.

Drawing from the research conducted, a generalized algorithm for selecting effective leadership was developed. This algorithm facilitates a step-by-step comparison and assessment of constituent elements within the effective leadership modeling process, aiding in identifying discrepancies between desired and actual states. It also offers insights into resolving these contradictions while considering the nuances of the innovative activity management system's operation.

4. Results

Thus, as established earlier, the assessment of the integral indicator for evaluating the effectiveness of management in enterprises' innovative activities will revolve around the evaluation of its three components (P_s, P_{lm}, P_{is}).

The evaluation of the personal component (P_s) regarding the effectiveness of managing innovative activities will involve calculating the integral indicator of the leader's personal component. This calculation will be based on assessing eight isolated elements. These elements are expected to express the personal and intellectual aspects of the head of innovative activity. Their enhancement and, consequently, the improvement in ratings primarily hinges on the manager's intrinsic characteristics and their ability to effectively shape these elements under external influences rather than being solely influenced by the environment. Many of these elements and traits develop throughout a manager's life or career, reflecting the manager's personal and reflective stance toward external influences. Hence, the leader's self-awareness regarding these characteristics and their mastery are crucial. To assess the manager's level of self-awareness of their personal traits and establish them objectively, we propose a two-stage assessment process:

(1) Self-assessment of the elements constituting the personal component of the leader in the enterprise's circular economy-driven innovative activities;

(2) Expert evaluation of the elements characterizing the personal component of the leader involved in the enterprise's circular economy-driven innovative activities [39].

The integration of these two stages aims to establish the personal level indicator's value and identify deviations between self and expert assessments. This process helps pinpoint areas where certain elements are more or less expressed. It enables the manager to take necessary measures for enhancing the competencies and skills required for implementing innovative activities. Managerial self-development involves a conscious, purposeful effort to independently improve skills, knowledge, values, thinking, abilities, qualities, and management functions that ensure innovative activity effectiveness.

Both self-assessment and expert evaluation should follow pre-developed methods, ensuring objectivity in assessing deviations in specific characteristics. The group of experts includes three enterprise managers: the evaluated person's direct manager, personal development specialists, personnel service employees, HR managers, or designated commissions (assessment centers) in larger enterprises. These assessment centers, commonplace in major

international firms, usually hold confidential methodologies considered trade secrets. A 2019 study by TalentLyft specialists confirmed the global significance of employing similar techniques in corporate activities.

We have proposed a rating scale for evaluations, ranging from 1 to 5 in increments of 1 point. This scale simplifies ratings for subsequent calculations:

- Absent characteristic in the leader (absent innovative management)—1 point;
- Rarely found characteristic (weak innovative leadership)—2 points;
- Mediocre characteristic (medium innovative leadership)—3 points;
- Often found characteristic (good innovative leadership)—4 points;
- Systematically present characteristic (best innovative management)—5 points.

Experts' evaluations on this scale (1 to 5 points) will be converted to a scale from 0 to 1, allowing the assessment coefficient of the personal component (P_s) to be derived and compared with other indicator components. This interpretation is performed post-expert evaluations and before calculating average values and the assessment coefficient for the personal component (P_s) using the scaling matrix (Table 3).

Table 3. Scaling matrix of the results of expert assessment for the personal component in evaluating sustainable leadership of enterprise's circular economy-driven innovative activities.

Expert Assessment, Points	Interpreted Value, Points
1	0.0
2	0.25
3	0.50
4	0.75
5	1.0

To help both the manager for self-evaluation and experts for evaluation, the developed "Scale for evaluating the personal component of the assessment of sustainable leadership of enterprise's circular economy-driven innovative activities" (Table 4) and "Map for evaluating the personal component of the assessment of sustainable leadership of enterprise's circular economy-driven innovative activities" (Table 5) are provided.

Table 4. Scale for evaluating the personal component of the assessment of sustainable leadership of an enterprise's circular economy-driven innovative activities.

Evaluated characteristics of the manager	Tendency to the authoritarian	Rating on a five-point scale					Tendency to the innovative
		1	2	3	4	5	
1. Managerial skills		Absent, it does not show, and it harm	Weak, does not show, but does not harm	Average, manifests partially and periodically	High, manifests itself quite constantly	The best, manifests to a higher degree and constantly	
2. Manager's knowledge							
3. Manager's values							
4. Manager's thinking							
5. Manager's abilities							
6. Qualities of a manager							
7. Manager's functions							
8. Principles of the manager							

Table 5. The responsibility for filling in this interpretation rests either with an expert or with the individual designated by the company's management for data processing.

Assessed Characteristics of Intellectual Potential Head of Innovative Activity and Their Content		Conditional Late	Expert Evaluation, Value [1–5]	Interp. Evaluation, Value [0–1]
1. The average rating of the manager's skills, $i = 1$, $L_1 = 2$		K_1		
1.1. Professionally acquired skills	Skills of rhetoric, communication, listening, argumentation and persuasion, delegation, management, accurate transfer and analysis of information, and analysis of innovative activity (according to functional duties)	$O_{1.1}$		
1.1. Personally acquired skills	Self-control skills, punctuality	$O_{1.2}$		
2. Average assessment of the manager's knowledge, $i = 2$, $L_2 = 2$		K_2		
2.1. Professional knowledge	Knowledge about the specifics of the company's activity (job instructions, activities of subordinate units) and specifically in the subject area (innovative activity, innovative processes)	$O_{2.1}$		
2.2. General knowledge	Knowledge from related industries or spheres (technical features of production, psychological aspects of management, creative approaches to motivation), which are often equated with the universality and general erudition of a person	$O_{2.2}$		
3. The average assessment of the manager's values, $i = 3$, $L_3 = 4$		K_3		
3.1. Life values	The manager is an honest person and demands absolute honesty and directness from his employees, acts on the principles of general morality, respect for individual rights, respect for the value of life and health of subordinates	$O_{3.1}$		
3.2. Moral values	The manager, when communicating with subordinates, is inherent in fairness, respect, truthfulness, and conscientiousness	$O_{3.2}$		
3.3. Spiritual values	The manager shows care and freedom of speech in the team, helps establish trust between subordinates, promotes creative decision making and mutually beneficial cooperation	$O_{3.3}$		
3.4. Social values	The manager orients units and employees to strategic goals, supporting the initiative of employees engaged in the field of innovation, ensures dedication to the common cause, supports creativity, facilitates communication	$O_{3.4}$		
4. The average assessment of the manager's abilities, $i = 4$, $L_4 = 4$		K_4		
4.1. Conceptual abilities	Speed of thinking, physical endurance, and positive mental attitude in solving issues in any field	$O_{4.1}$		
4.2. Organizational abilities	The ability to quickly respond to changes in the company, the ease of resolving conflicts among subordinates, arrangement, orderliness, achieving the unity of the innovation process, organization and orientation to innovative activities, achieving the set strategic goals	$O_{4.2}$		

Table 5. *Cont.*

Assessed Characteristics of Intellectual Potential Head of Innovative Activity and Their Content		Conditional Late	Expert Evaluation, Value [1–5]	Interp. Evaluation, Value [0–1]
4.3. Interpersonal skills	Creation of new innovative projects through the creation of a favorable microclimate in the team, uniting employees to achieve results, communication, persuasion	$O_{4.3}$		
4.4. Technical abilities	Solving tasks of a production nature, which is part of the enterprise's innovative business process	$O_{4.4}$		
5. Average rating of the manager's thinking, $i = 5$, $L_5 = 3$		K_5		
5.1. Professional thinking	Formation of a theoretical system of knowledge that is used to implement innovations in practice by finding and forming new knowledge, solutions, and judgments for the implementation of innovative activities)	$O_{5.1}$		
5.2. Practical thinking	Solving practical tasks and problems of innovative activity in a rational–analytical way (forming conclusions based on the analysis of previous data, observing cause-and-effect relationships when forming conclusions or judgments)	$O_{5.2}$		
5.3. Rational thinking	Comprehensive and deep understanding of the problems of innovative activity with the help of systematicity, flexibility, non-standardization, practicality, and the ability to determine a strategy for their solution (immersion in the problem)	$O_{5.3}$		
6. Average rating of the manager's qualities, $i = 6$, $L_6 = 3$		K_6		
6.1. Professional qualities	Management skills: organization of people, collective task solving, delegation of authority, planning of working hours	$O_{6.1}$		
6.2. Specific qualities	Possession of business and managerial qualities, according to the position: education, competence, innovative thinking, analytical activity, professional erudition, creative search, sense of intuition, scientific imagination	$O_{6.2}$		
6.3. Inherent qualities	Possession of personal qualities: determination, risk taking, creativity, intelligence, initiative, confidence, perseverance, openness, accuracy, demandingness, diligence, self-criticism	$O_{6.3}$		
7. The average assessment of the manager's management functions, $i = 7$, $L_7 = 6$		K_7		
7.1. Prognostication	Justifies the main directions of the innovation strategy, covering the development of programs and measures for updating products, improving technologies, and organizing its production, which aims to determine the promising directions of the organization's development based on its innovative potential and projected changes in the external environment	$O_{7.1}$		

Table 5. *Cont.*

Assessed Characteristics of Intellectual Potential Head of Innovative Activity and Their Content		Conditional Late	Expert Evaluation, Value [1–5]	Interp. Evaluation, Value [0–1]
7.2. Planning	Distributes functional responsibilities among subordinates for the implementation and implementation of innovative plans, programs, projects	$O_{7.2}$		
7.3. Organization	Directs the efforts of subordinates to fulfill the tasks of innovative activity, ensuring their positive implementation using the material, financial, labor, energy, and information resources of the enterprise, skillfully conveys to his subordinates the necessary knowledge, skills, and abilities regarding the implementation of innovative activity	$O_{7.3}$		
7.4. Motivation	Determines effective incentives to encourage employees to be interested in the results of their work on the creation and implementation of innovations	$O_{7.4}$		
7.5. Teaching	Observes the compliance of the actual state of innovative activity with the goals of the enterprise, carries out accounting, and evaluates and analyzes the results of the development and implementation of innovative development	$O_{7.5}$		
7.6. Controlling	Analyzes through feedback the implementation of innovative activities, takes measures to eliminate and correct detected deviations	$O_{7.6}$		
8. The average assessment of compliance with the principles of the head of sustainable development, $i = 8$, $L_8 = 8$		K_8		
8.1. Purposefulness	Focuses on the formation of strategic goals and tasks for sustainable development	$O_{8.1}$		
8.2. Certainty	Endowed with a high level of intelligence to evaluate proposed innovative ideas	$O_{8.2}$		
8.3. Complexity	Practically organizes the implementation of specific goals and tasks of innovative activity for sustainable development	$O_{8.3}$		
8.4. Systematicity	Reconciles the defined goals of innovative activity and their implementation from the standpoint of sustainable development	$O_{8.4}$		
8.5. Interdependence	Carries out the application of a set of measures agreed among themselves for the implementation of sustainable development	$O_{8.5}$		
8.6. Sequence	Implements consistent implementation and implementation of measures of innovative activity	$O_{8.6}$		
8.7. Operativeness	Implements measures to ensure sustainable development promptly	$O_{8.7}$		
8.8. Regularity	Carries out a constant search for innovations to ensure sustainable development	$O_{8.8}$		

The developed assessment form includes a scale and map outlining criteria that define the qualities relevant to evaluating the performance of the head of innovation activity. This

form provides fields for determining scores or evaluations and explains how these scores are scaled. Additionally, it features a section for interpreting assessments based on Table 2.

In the future, for calculations, we will use exclusively interpreted grades' values, i.e., values ranging from 0 to 1.

The average score (K_i) of each of the eight groups of characteristics of the personal component, which is determined in the process of self-evaluation, is calculated according to the following formula:

$$K_i = \frac{\sum_{j=1}^{Li} O_j}{L_i},\ i = 1, 2, \ldots, 8, \tag{9}$$

where O_s is the evaluation of the characteristic of the group of the personal component, determined in the self-evaluation process; L_i¯the number of characteristics in the i-th group.

The average rating (Ke_i) of each of the eight groups of characteristics of the personal component is determined in the process of expert evaluation according to the following formula:

$$Ke_i = \frac{\sum_{g=1}^{M} \sum_{j=1}^{L_i} O_{jg}}{ML_i},\ i = 1, 2, \ldots, 8, \tag{10}$$

where O_{jg}—assessment of the -th characteristic of the i-th group of characteristics of the personal component, determined by the g-th expert; g—expert index ($g = 1, 2, \ldots, M$); M—the number of experts.

Determining the assessment of each separate group of characteristics allows for a general evaluation of the manager's mastery of individual elements of the personal component (skills, knowledge, values, thinking, abilities, qualities, implementation of functions, compliance with the principles of sustainable development). This evaluation helps outline the priority directions of the manager's actions.

Comparison of ratings to determine rating deviations will be carried out horizontally by comparing the average expert rating of each characteristic ($\overline{O_j}$) with the manager's self-rating (O_j):

$$\Delta O_j = \overline{O_j} - O_j = \frac{\sum_{g=1}^{m} O_{jg}}{M} - O_j \tag{11}$$

If the deviation is positive or equal to zero ($\Delta O_j \geq 0$), it indicates that the expert assessment of the j-characteristic is higher than the manager's assessment. Conversely, a negative deviation value ($\Delta O_j < 0$) signifies a situation in which the manager evaluates their personal component higher than the group of experts.

In the former case, it is crucial to provide the manager with space to bolster their confidence in their own characteristics and competencies and to exhibit confidence in their activities. In the latter case, it is necessary not only to devise measures for further development (if possible) of these characteristics but also to elucidate to the manager precisely where and why their perception of their own characteristics and competencies differs from the average expert assessment.

The overall assessment of the personal component (P_s) of the effectiveness of the management of innovative activities will rely on the expert assessment, which is professionally defined and relevant to the conditions of the manager's activity. It will be determined as the average value of the ratings for all eight groups of characteristics:

$$Ps = \frac{\sum_{i=1}^{N} Ke_i}{N} \tag{12}$$

where Ke_i is the average expert assessment of each group of characteristics of the personal component; i—index of intragroup characteristics; N—the total number of groups of characteristics (N = 8).

Aggregating Formulas (10) and (12), we get the following:

$$P_s = \frac{\sum_{g=1}^{M} \sum_{j=1}^{L} O_{jg}}{NML} \quad (13)$$

5. Approbation and Discussion

The outcomes are compiled into the 'Map of Deviations in the Evaluation of the Personal Component of the Assessment of Sustainable Leadership of Enterprise's Circular Economy-Driven Innovative Activities' (Table 6).

Practical computations of the personal component indicator (P_s) can be performed for enterprises identified through ABC-XYZ analysis as part of the cluster encompassing the most successful innovative enterprises [40]. The selected enterprises include.

1. LLC "Joint Ukrainian-German enterprise "Electrotrans"" (E1);
2. TzDV "Lvivagromashproekt" (E2);
3. LLC "Zavod elektronpobutprilad" (E3);
4. Ukrainian–German joint venture in the form of International Cutter Manufacturer LLC (ISM) LLC (E4);
5. Private enterprise "Scientific and Production Enterprise "TROYAN"" (E5);
6. State enterprise "Experimental Plant "Hvylia"" (E6);
7. "TIME AND SPACE" LLC (E7).

The derived computation outcomes for each characteristic group for these enterprises are presented in both an expanded and concise format in Table 7, while the consolidated average expert assessments are displayed in Table 6.

To visually compare the average expert evaluations of the personal component's characteristics in assessing sustainable leadership across the investigated enterprises, a petal diagram will be constructed (Figure 5).

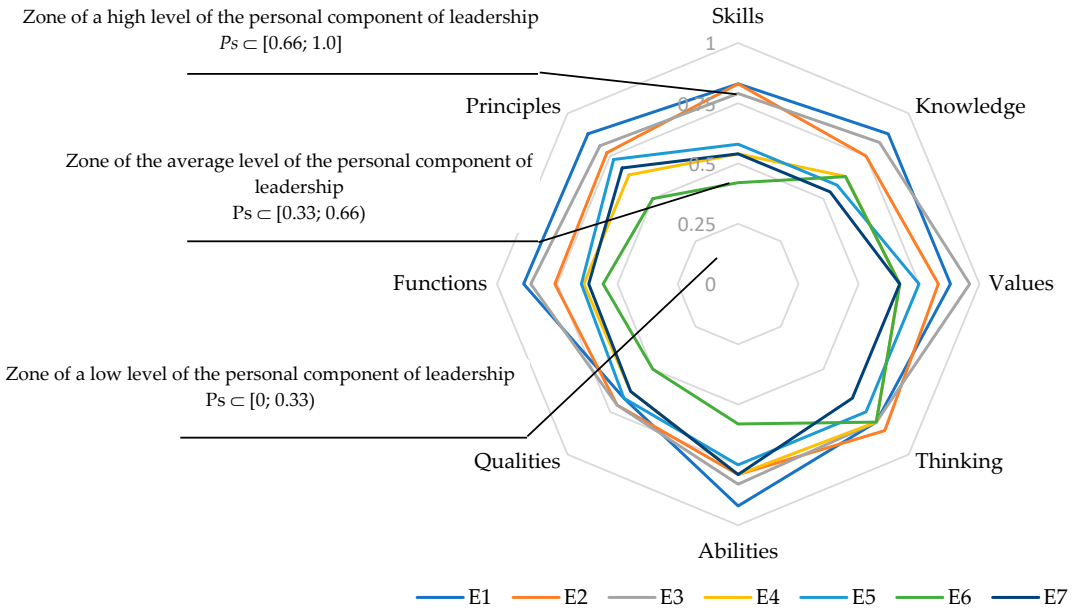

Figure 5. Graphical representation of the average expert evaluations of the characteristics of the personal component of leadership (calculated by the authors).

Table 6. Average expert assessments, self-assessments, and deviations for groups of characteristics of the personal component of the evaluation of sustainable leadership of enterprise's circular economy-driven innovative activities at the studied enterprises.

Personal Characteristics of the Manager	Average Expert Assessment, Ke_i							Self-Esteem, K_i							Deviation of Grades (Absolute +/−; Relative %)											
	E1	E2	E3	E4	E5	E6	E7	E1	E2	E3	E4	E5	E6	E7	E1		E2		E3		E4		E5		E6		E7	
															+/−	%	+/−	%	+/−	%	+/−	%	+/−	%	+/−	%	+/−	%
1. Skills	0.83	0.83	0.79	0.54	0.58	0.42	0.54	0.88	0.88	1.00	0.75	1.00	0.88	0.88	0.05	6.02	0.05	6.02	0.21	26.58	0.21	38.89	0.42	72.41	0.46	109.52	0.34	62.96
2. Knowledge	0.88	0.75	0.83	0.63	0.58	0.63	0.54	0.88	0.63	1.00	0.63	0.88	0.63	0.88	0.00	0.00	−0.12	−16.00	0.17	20.48	0.00	0.00	0.30	51.72	0.00	0.00	0.34	62.96
3. Values	0.88	0.83	0.96	0.67	0.75	0.67	0.67	1.00	0.88	0.88	0.63	0.88	0.75	0.75	0.12	13.64	0.05	6.02	−0.08	−8.33	−0.04	−5.97	0.13	17.33	0.08	11.94	0.08	11.94
4. Abilities	0.81	0.86	0.81	0.81	0.75	0.81	0.67	1.00	0.92	0.92	0.83	0.75	0.67	0.83	0.19	23.46	0.06	6.98	0.11	13.58	0.02	2.47	0.00	0.00	−0.14	−17.28	0.16	23.88
5. Thinking	0.92	0.79	0.83	0.79	0.75	0.58	0.79	0.88	0.75	0.75	0.75	0.88	0.63	1.00	−0.04	−4.35	−0.04	−5.06	−0.08	−9.64	−0.04	−5.06	0.13	17.33	0.05	8.62	0.21	26.58
6. Qualities	0.67	0.71	0.71	0.63	0.67	0.50	0.63	0.75	0.75	1.00	0.75	0.88	0.63	0.63	0.08	11.94	0.04	5.63	0.29	40.85	0.12	19.05	0.21	31.34	0.13	26.00	0.00	0.00
7. Implementation of management functions	0.89	0.76	0.86	0.64	0.65	0.56	0.62	0.89	0.75	0.89	0.71	0.93	0.79	0.82	0.00	0.00	−0.01	−1.32	0.03	3.49	0.07	10.94	0.28	43.08	0.23	41.07	0.20	32.26
8. Compliance with the principles of sustainable development	0.88	0.77	0.81	0.64	0.73	0.50	0.68	0.81	0.84	0.91	0.69	0.91	0.75	0.72	−0.07	−7.95	0.07	9.09	0.10	12.35	0.05	7.81	0.18	24.66	0.25	50.00	0.04	5.88
General evaluation of the personal component of performance, P_s	0.84	0.79	0.83	0.67	0.68	0.58	0.64	0.89	0.80	0.92	0.72	0.89	0.71	0.81	0.05	5.95	0.01	1.27	0.09	10.84	0.05	7.46	0.21	30.88	0.13	22.41	0.17	26.56

Table 7. Summary calculations for expert evaluation and self-evaluation of the head of innovation activity.

Conditional Late Characteristics of the Manager's Intellectual Potential *	Expert Evaluation, Value [1–5]							Interpretation of Evaluation, Value [0–1]							Self-Esteem, Value [1–5]							Interpretation of Self-Esteem, Value [0–1]						
	E1	E2	E3	E4	E5	E6	E7	E1	E2	E3	E4	E5	E6	E7	E1	E2	E3	E4	E5	E6	E7	E1	E2	E3	E4	E5	E6	E7
K_1	4.33	4.33	4.17	3.17	3.33	2.67	3.17	0.83	0.83	0.79	0.54	0.58	0.42	0.54	4.50	4.50	5.00	4.00	5.00	4.50	4.50	0.88	0.88	1.00	0.75	1.00	0.88	0.88
$O_{1.1}$	4.33	4.33	4.00	3.00	3.33	3.00	3.00	0.83	0.83	0.75	0.50	0.58	0.50	0.50	5	4	5	4	5	5	4	1	0.75	1	0.75	1	1	0.75
$O_{1.2}$	4.33	4.33	4.33	3.33	3.33	2.33	3.33	0.83	0.83	0.83	0.58	0.58	0.33	0.58	4	5	5	4	5	4	5	0.75	1	1	0.75	1	0.75	1
K_2	4.50	4.00	4.33	3.50	3.33	3.50	3.17	0.88	0.75	0.83	0.63	0.58	0.63	0.54	4.50	3.50	5.00	3.50	4.50	3.50	4.50	0.88	0.63	1.00	0.63	0.88	0.63	0.88
$O_{2.1}$	4.33	3.67	4.00	4.00	3.33	4.00	3.33	0.83	0.67	0.73	0.75	0.58	0.75	0.58	5	3	5	3	4	3	4	1	0.5	1	0.5	0.75	0.5	0.75
$O_{2.2}$	4.67	4.33	4.66	3.00	3.33	3.00	3.00	0.92	0.83	0.92	0.50	0.58	0.50	0.50	4	4	5	4	5	4	5	0.75	0.75	1	0.75	1	0.75	1
K_3	4.25	4.33	4.83	3.67	4.00	3.67	3.67	0.88	0.83	0.96	0.67	0.75	0.67	0.67	4.75	4.50	4.50	3.50	4.50	4.00	4.00	0.94	0.88	0.88	0.63	0.88	0.75	0.75
$O_{3.1}$	4.33	4.33	5.00	4.00	4.00	4.00	4.00	0.83	0.83	1.00	0.73	0.75	0.75	0.75	5	5	4	4	4	5	3	1	1	0.75	0.75	0.75	1	0.5
$O_{3.2}$	3.67	4.33	5.00	4.00	4.00	3.23	3.33	0.75	0.83	1.00	0.73	0.75	0.58	0.58	4	4	5	3	5	3	5	0.75	0.75	1	0.5	1	0.5	1
$O_{3.3}$	4.33	4.33	5.00	3.43	4.00	4.00	4.00	0.83	0.83	1.00	0.63	0.75	0.75	0.75	5	5	5	3	4	4	4	1	1	1	0.5	0.75	0.75	0.75
$O_{3.4}$	4.67	4.33	4.33	3.23	4.00	3.23	3.33	0.92	0.83	0.83	0.58	0.75	0.58	0.58	5	4	4	4	5	4	4	1	1	0.75	0.75	1	0.75	0.75
K_4	4.17	4.44	4.22	4.22	4.00	4.22	3.67	0.81	0.86	0.81	0.81	0.75	0.81	0.67	5.00	4.75	4.67	4.33	4.00	3.67	4.33	1.00	0.94	0.92	0.83	0.75	0.67	0.83
$O_{4.1}$	4.67	4.67	4.67	4.66	4.66	4.66	4.00	0.92	0.92	0.92	0.92	0.92	0.92	0.92	5	5	5	5	5	4	4	1	1	1	1	1	0.75	0.75
$O_{4.2}$	4.00	4.41	4.67	4.66	4.00	4.41	3.33	0.83	0.83	0.92	0.92	0.75	0.83	0.67	5	5	5	4	4	4	5	1	1	1	0.75	0.75	0.75	1
$O_{4.3}$	4.00	4.67	3.55	4.00	3.33	4.41	4.00	0.75	0.92	0.63	0.75	0.58	0.83	0.42	5	5	4	4	3	3	4	1	1	0.75	0.75	0.5	0.5	0.75
$O_{4.4}$	4.00	4.00	4.00	3.55	4.00	3.38	3.33	0.75	0.75	0.75	0.63	0.75	0.67	0.67	5	4	5	4	4	4	4	1	0.75	0.75	0.75	0.75	0.75	0.75
K_5	4.67	4.17	4.33	4.17	4.00	3.33	4.17	0.92	0.80	0.83	0.79	0.75	0.58	0.79	4.67	4.00	4.00	4.00	4.50	3.50	5.00	0.83	0.75	0.75	0.75	0.75	0.88	0.63	1.00
$O_{5.1}$	4.67	4.00	4.00	4.33	4.00	3.33	4.33	0.92	0.75	0.75	0.83	0.75	0.58	0.83	4	4	4	3	5	4	5	0.75	0.75	0.75	0.5	1	0.75	1
$O_{5.2}$	4.67	4.19	4.33	4.00	4.00	3.33	4.00	0.92	0.83	0.83	0.75	0.75	0.58	0.75	5	4	4	5	4	3	5	0.75	0.75	0.75	1	0.75	0.5	1
$O_{5.3}$	4.67	4.33	4.66	4.00	4.00	3.33	4.00	0.92	0.83	0.92	0.75	0.75	0.58	0.75	5	4	4	4	5	3	5	1	0.75	0.75	0.75	1	0.5	1
K_6	3.67	3.83	3.83	3.50	3.67	3.00	3.50	0.67	0.72	0.71	0.63	0.67	0.50	0.63	4.00	4.00	5.00	4.00	4.50	3.50	3.50	0.75	0.75	1.00	0.75	0.88	0.63	0.63
$O_{6.1}$	3.33	3.67	3.50	3.00	3.67	2.50	3.17	0.58	0.67	0.63	0.52	0.67	0.34	0.58	4	4	5	4	5	3	4	0.75	0.75	1	0.75	1	0.5	0.75
$O_{6.2}$	3.67	3.81	4.00	4.00	3.67	3.00	3.67	0.67	0.75	0.75	0.75	0.67	0.52	0.67	4	4	5	4	4	4	3	0.75	0.75	1	0.75	0.75	0.75	0.5
$O_{6.3}$	4.00	4.00	4.00	3.50	3.67	3.50	3.67	0.75	0.75	0.75	0.63	0.67	0.63	0.67	4	4	5	4	4	4	4	0.75	0.75	1	0.75	0.75	0.75	0.75
K_7	4.61	4.05	4.43	3.57	3.62	3.24	3.48	0.89	0.76	0.86	0.64	0.65	0.56	0.62	4.67	4.00	4.57	3.86	4.71	4.14	4.29	0.92	0.75	0.89	0.71	0.93	0.79	0.82
$O_{7.1}$	4.67	4.67	4.60	4.60	4.60	4.60	4.50	0.92	0.92	0.92	0.92	0.92	0.92	0.92	4	4	4	3	5	5	5	0.75	0.75	0.75	0.5	1	1	1
$O_{7.2}$	4.33	4.33	4.33	3.00	3.00	2.33	3.00	0.83	0.75	0.83	0.50	0.50	0.33	0.50	4	5	4	5	5	4	5	0.75	1	0.75	1	1	0.75	1
$O_{7.3}$	5.00	3.33	4.33	3.33	3.33	2.87	3.33	1.00	0.58	0.83	0.58	0.58	0.42	0.58	5	4	5	4	4	4	3	1	0.75	1	0.75	0.75	0.75	0.5
$O_{7.4}$	4.33	3.81	4.00	3.83	4.10	3.00	3.00	0.83	0.75	0.75	0.67	0.75	0.50	0.50	5	3	4	4	4	3	4	1	0.5	0.75	0.75	0.75	0.5	0.75
$O_{7.5}$	5.00	3.81	5.00	3.33	3.33	3.33	3.33	1.00	0.75	1.00	0.58	0.58	0.58	0.58	5	4	5	3	5	5	4	1	0.75	1	0.5	1	1	0.75
$O_{7.6}$	4.33	4.33	4.33	3.33	3.33	3.33	3.33	0.83	0.83	0.83	0.58	0.58	0.58	0.58	5	4	5	4	5	4	5	1	0.75	1	0.75	1	0.75	1
K_8	4.50	4.08	4.25	3.54	3.92	3.00	3.70	0.88	0.77	0.81	0.64	0.73	0.50	0.68	4.25	4.38	4.63	3.75	4.63	4.00	3.88	0.81	0.84	0.91	0.69	0.91	0.75	0.72
$O_{8.1}$	4.33	4.33	4.33	2.67	4.00	2.67	4.00	0.83	0.83	0.83	0.42	0.75	0.42	0.75	4	4	5	4	4	4	5	0.75	0.75	1	0.75	0.75	0.75	1
$O_{8.2}$	4.67	3.67	4.33	3.33	3.33	3.33	3.30	0.92	0.67	0.83	0.58	0.58	0.58	0.58	4	4	5	3	4	4	4	0.75	0.75	1	0.5	0.75	0.75	0.75
$O_{8.3}$	4.67	4.00	4.00	3.67	4.00	2.00	3.67	0.92	0.75	0.75	0.67	0.75	0.25	0.67	3	5	5	3	5	3	5	0.5	1	1	0.5	1	0.5	1
$O_{8.4}$	5.00	4.33	4.67	3.67	3.67	2.67	3.67	1.00	0.83	0.92	0.67	0.67	0.42	0.67	5	5	5	4	5	5	4	1	1	1	0.75	1	1	0.75
$O_{8.5}$	4.33	3.67	4.00	3.33	3.67	3.33	3.33	0.83	0.67	0.75	0.58	0.67	0.58	0.58	5	5	4	5	5	3	3	1	1	0.75	1	1	0.5	0.5
$O_{8.6}$	4.67	4.33	4.33	3.33	4.33	2.67	3.33	0.92	0.83	0.83	0.58	0.83	0.42	0.58	5	4	4	3	5	4	3	1	0.75	0.75	0.5	1	0.75	0.5
$O_{8.7}$	4.00	4.00	4.00	4.00	4.00	4.00	4.00	0.75	0.75	0.75	0.75	0.75	0.75	0.75	4	4	4	4	4	5	3	0.75	0.75	0.75	0.75	0.75	1	0.5
$O_{8.8}$	4.33	4.33	4.33	4.33	4.33	3.33	4.33	0.83	0.83	0.83	0.83	0.83	0.58	0.83	4	4	5	4	5	4	4	0.75	0.75	1	0.75	1	0.75	0.75
Total score:	4.34	4.16	4.30	3.67	3.73	3.33	3.56	0.84	0.79	0.83	0.67	0.68	0.58	0.64	4.54	4.20	4.67	3.87	4.54	3.85	4.25	0.89	0.80	0.92	0.72	0.89	0.71	0.81

* Interpretation of indicators seen in Table 5.

Providing an objective assessment of the effectiveness of the management of innovative activity based on the proposed three components: personal, managerial, and production-technological, will undoubtedly offer a clearer picture of the manager and help develop recommendations for further shaping and enhancing the management of innovative activity.

To classify enterprises according to the value (level) of the overall assessment of the personal component of leadership, we will outline the following (Figure 6):

- A low-level zone, if the total score is in the interval $0 \leq P_s \leq 0.33$;
- Middle-level zone, if it is in the range of $0.33 \leq P_s \leq 0.66$;
- High-level zone, if it is in the range of $0.66 \leq P_s \leq 1.0$.

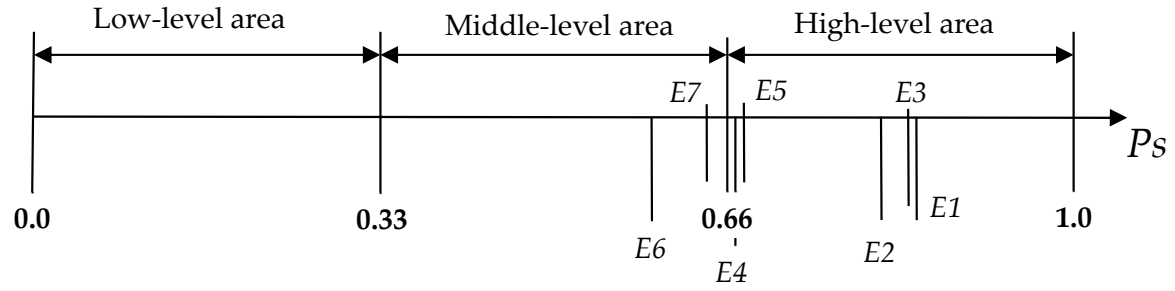

Figure 6. Graphical interpretation of the average expert evaluations of the characteristics of the personal component of leadership (calculated by authors).

Taking into account the calculations and the results they yielded for the personal component evaluation scale (P_s), let us illustrate the performance of leaders in innovative activities (Table 8).

Table 8. Characterization of the level of the personal component of leadership.

The Level of the Personal Component of Leadership	Characteristics of the Manager's Managerial Activity	Range of Assessment
High level	The leader consistently applies modern management principles, overseeing, planning, and assessing the resources necessary for innovative activities. They collaborate with subordinates, actively considering their suggestions in decision making, fostering an environment that encourages creativity and initiative. The manager comprehends and emphasizes the importance of the enterprise's innovative development.	$0.66 \leq P_s \leq 1.0$
Average	The leader engages partially in the enterprise's innovative activities. However, due to an understanding, willingness, and openness to the ideas of young, creative, and proactive employees, they achieve satisfactory results in innovation. The manager typically introduces innovations that might be new to the enterprise but not necessarily novel in the market.	$0.33 \leq P_s \leq 0.66$
Low level	The leader tends to react negatively and instills an atmosphere of fear, resorting to coercive methods for cooperation. They rely solely on personal experience in making innovative decisions and disregard any initiatives from employees, typically implementing ideas without acknowledging their input. There is a lack of action in developing and executing an innovative strategy for the enterprise.	$0 \leq P_s \leq 0.33$

Therefore, based on the assessment results of the personal component in evaluating sustainable leadership of enterprises engaged in circular economy-driven innovative activities, none of the investigated enterprises fell into the low-level zone ($0 \leq P_s \leq 0.33$). This indicates that all managers are qualified, experienced specialists possessing the necessary set of skills, knowledge, values, thinking abilities, and qualities.

The evaluation of the leadergerially managemental component of the assessment of sustainable leadership of an enterprise's circular economy-driven innovative activities, as defined above, will be based on the calculation of three components of such evaluation, namely (see Table 2):

- The level of involvement of personnel in innovative activities P_{lm1};
- The level of stimulation of employees of innovative activities P_{lm2};
- The level of increase in encouraging employees of innovative activities P_{lm3}.

Note that the data for calculating the specified indicators are taken from financial, accounting, and management reports for the actual period, are available, and quantitatively measurable. This reduces the subjectively probabilistic component in their assessment and ensures high validity, reliability, and relevance. We recommend using a time frame that closely approximates the actual evaluation time.

Based on the obtained data, we calculated the indicators of the leadergerially managemental component for the investigated enterprises (Table 9).

Table 9. Calculation of the leadergerially managemental component of the assessment of sustainable leadership of enterprise's circular economy-driven innovative activities of the investigated enterprises.

№	Indexes	Conditional Late	Value for Enterprises						
			E1	E2	E3	E4	E5	E6	E7
1.	The number of scientific, engineering, and technical workers involved in IA for a specific period t, person	N_c^t	45	37	41	38	15	15	75
2.	The total number of employees for a specific period t, persons	N_z^t	107	155	105	55	38	60	159
3.	The level of involvement of personnel in innovative activities	P_{lm1}	0.42	0.24	0.39	0.69	0.39	0.25	0.47
4.	The average salary of employees involved in IA for a specific period t, hryvnias,	S_c^t	607.5	303.4	609.7	512.2	148.1	133.1	1416.8
5.	The average salary of the company's employees for a specific period t, hryvnias	S_z^t	1626.4	1743.8	1771.5	868.4	489.1	781.5	2695.7
6.	The level of stimulation of employees of innovative activity	P_{lm2}	0.37	0.17	0.34	0.59	0.30	0.17	0.53
7.	The average amount of additional material incentives (rewards, "bonuses", additional payments) of employees involved in ID in a specific period t, hryvnias	B_c^t	65.1	97.5	44.1	39.8	24.7	0	97.8
8.	The average amount of total additional material incentives (rewards, "bonuses", additional payments) of employees in a specific period t, hryvnias	B_i^t	81.5	195.8	96.3	45.8	35.7	45.7	167.8
9.	The level of increase in the encouragement of employees of innovative activities	P_{lm3}	0.80	0.50	0.46	0.87	0.69	0.00	0.58
Leadergerially managemental component		P_{lm}	0.53	0.30	0.40	0.72	0.46	0.14	0.53

The evaluation of the innovatively sustainable component of the effectiveness of the management of innovative activity, as defined above, will be based on the calculation of three components of such an assessment, namely (see Table 2):

- An indicator of the level of sustainability of products P_{is1};
- An indicator of the level of sustainability of technologies P_{is2};
- An indicator of the level of innovative potential P_{is3}.

Based on the obtained data, we calculated the indicators of the technological component of the effectiveness of the management of innovative activity for the enterprises under study (Table 10).

Table 10. Calculation of the technological component of the effectiveness of the management of the innovative activity of the investigated enterprises.

№	Indexes	Conditional Late	Value for Enterprises						
			E1	**E2**	**E3**	**E4**	**E5**	**E6**	**E7**
1.	Number of types of produced (sold) sustainable innovative products, units	Q_c	9	7	8	4	2	1	2
2.	The total number of manufactured (sold) types of products by the enterprise, units	Q_z	12	15	11	9	8	6	22
3.	Product sustainability level indicator	P_{is1}	0.75	0.47	0.73	0.44	0.25	0.17	0.09
4.	The number of newly implemented (purchased) technological processes (lines) by the enterprise for a certain period, units	T_c	7.0	8.0	2.0	0.0	1.0	1.0	1.0
5.	The total number of technological processes (lines) the enterprise uses for a certain period, units	T_z	9.0	15.0	2.0	2.0	5.0	3.0	19.0
6.	Indicator of the level of sustainability of technologies	P_{is2}	0.78	0.53	1.00	0.00	0.20	0.33	0.05
7.	The volume of expenses for innovations (search, use, acquisition, implementation of scientific and technical achievements (costs related to invention)) for a certain period, hryvnias	V_c	6456.0	682.1	79.0	8.0	2.8	0.0	0.0
8.	The total cost of production for a certain period, hryvnias	V_z	16,709.9	23,763.9	4586.0	5463.8	2789.8	4482.1	32,878.3
9.	Indicator of the level of innovative potential	P_{is3}	0.39	0.03	0.02	0.00	0.00	0.00	0.00
Innovatively sustainable component		P_{is}	0.64	0.34	0.58	0.15	0.15	0.17	0.05

Providing an objective assessment of the manager's effectiveness based on the proposed three components (personal, managerially managemental, and innovatively sustainable) will provide a clear understanding of the manager. This will enable us to formulate recommendations for further developing sustainable leadership in the enterprise's circular economy-driven innovative activities.

According to the results of the calculations regarding the evaluation of the effectiveness of the management of innovative activities at the specified enterprises, we provide their interpretation based on relevant management approaches (Table 11).

Table 11. Management approaches based on the results of evaluating the effectiveness of management of innovative activities at the studied enterprises.

A Selection of the Most Successful, Innovatively Active Industrial Enterprises	Orientation to			Management Approach	Orientation of the Leader of Sustainable Innovative Activity
	Sustainable Innovation Processes of Employees	Sustainable Innovative Business Processes	Sustainable Innovative Processes of Society		
	Coordinate Axis *X*	Coordinate Axis *Y*	Coordinate Axis *Z*		
E1	0.84	0.64	0.53	Collegial management approach	Collective Innovative Enterprising
E2	0.83	0.58	0.40	Cooperative management approach	Collective Innovative Spiritless
E3	0.67	0.15	0.72	Complicit management approach	Collective Conservative Enterprising
E4	0.79	0.34	0.30	Consultative management approach	Collective Conservative Spiritless
E5	0.68	0.15	0.46	Consultative management approach	Collective Conservative Spiritless
E6	0.64	0.05	0.53	Complicit management approach	Collective Conservative Enterprising
E7	0.58	0.17	0.14	Consultative management approach	Collective Conservative Spiritless

The proposed methodology stands out from existing models by integrating a multifaceted evaluation approach. It combines personal, managerial, and sustainable development aspects to assess leadership in innovation management within a circular economy framework. While some models tend to focus solely on managerial traits [5,41,42] or sustainable practices [2,43], this methodology offers a holistic evaluation of personal characteristics, managerial potential, and sustainable development indicators, providing a more comprehensive perspective on evaluating sustainable leadership in innovation management.

In contrast to the models proposed in various areas [27,44–46], your study explores nuanced aspects of sustainable leadership specifically tailored to industrial settings. It assesses how specific industrial nuances impact the effectiveness of the proposed methodology and investigates the scalability and adaptability of the assessment model across different scales and stages of growth within innovative industrial contexts.

6. Conclusions

The evaluation of sustainable leadership in enterprise-driven circular economy-focused innovation activities is a complex endeavor that requires a multifaceted approach. This study aimed to assess the effectiveness of managerial activities in fostering innovation within enterprises through a meticulous evaluation framework encompassing three key components: the personal, leadergerially managemental, and innovatively sustainable aspects.

We consider the following developments as the most important results of this study:

(1) Proposing an improved comprehensive approach to evaluating the effectiveness of management of enterprises' innovative activities based on the evaluation of 14 partial indicators, each reflecting a specific vector orientation. This evaluation combines indicators that reflect the personal characteristics of the manager and the formative and resulting factors of management's influence on the state and results of innovative activity, providing a multifaceted and comprehensive assessment within the study's scope;

(2) Calculating indicators for the effectiveness of management of innovative activity across seven industrially active enterprises. This involved determining: (1) the personal component (P_p) through expert evaluation tools, (2) the leadergerially managemental component (P_{lm}), and (3) the innovatively sustainable component (P_{lm}) based on internal enterprise reporting. These components contributed to calculating a comprehensive integral indicator (P_{ef}) reflecting management effectiveness;

(3) Forecasting the degree of influence of external and internal factors, considering the comprehensive integrated assessment of management effectiveness (P_{ef}), on the economic consequences of industrial enterprises' production and economic activities. This forecasting strengthens the resulting factors of leadership in enterprise-driven circular economy-driven innovative activities, predicting specific outcomes;

(4) Formulating a comprehensive set of recommendations for effective leadership development. These recommendations consider management approaches, vector orientation, developmental stages, necessary tools for effective innovation management, and specific managerial profiles. They offer a robust framework for assessing the state of innovative activity management and outlining specific measures for further development;

(5) The study's comprehensive nature and meticulous evaluation process contribute to its novelty, providing a systematic and structured approach to assessing and understanding the nuances of managerial effectiveness in fostering innovation within the context of a circular economy-driven enterprise.

In conclusion, the findings emphasize the importance of continuous development and enhancement in managerial practices to optimize sustainable leadership in circular economy-driven innovation. The insights gleaned from this study offer valuable guidance for enterprises seeking to refine their organizational approaches and foster a culture of innovation within a circular economy framework.

7. Limitations of This Study

For clarity of presentation of the results and ease of approbation of this study, the authors set certain limitations:

- It is important to note that while the chosen partial indicators offer a well-rounded perspective, comprehensive coverage might involve additional dimensions. The list of relevant indicators can be further expanded or narrowed depending on specific organizational contexts, evolving industry standards, or the emphasis on particular aspects of sustainable leadership in innovation. Flexibility in indicator selection allows tailoring assessments to suit unique enterprise needs and evolving sustainability goals;
- The proposed method serves as a foundational model and has proven effective for industrial enterprises through testing but might require adjustments for non-industrial or service sector enterprises due to variations in indicators. The core methodology remains applicable, but specific metrics and assessment forms need modification to

suit different industry types, ensuring broader applicability while preserving the fundamental approach;

– The study is constrained by the absence of sensitivity analyses or robustness checks within the proposed methodology. This omission stems from several reasons: (1) the primary aim of the study has been centered on developing the methodology rather than conducting extensive sensitivity analyses. Therefore, the focus remained on establishing the framework rather than on testing it comprehensively. (2) the study represents an initial phase or a pilot study. The focus might have been on establishing the groundwork for future research, with sensitivity analyses planned for subsequent investigations.

The limitations of this study underscore the need for further examination and validation of the methodology under varying conditions or assumptions in future research endeavors.

Future research avenues arising from the limitations of this study encompass tailoring the proposed methodology for non-industrial or service sectors by adapting metrics and assessment tools to suit diverse industry types, conducting sensitivity analyses or robustness checks to validate the methodology under varying conditions, integrating case studies or real-world applications to demonstrate the practical functionality of the model, pursuing longitudinal studies to assess the long-term impact of sustainable leadership on circular economy-driven innovation, and conducting comparative studies to benchmark the proposed methodology against existing frameworks, thus contributing to its refinement, adaptability, and broader validation in varied contexts.

Author Contributions: Conceptualization, I.B., M.J. and K.K.; Methodology, I.B. and N.K.; Software, N.K.; Validation, N.K.; Formal analysis, Y.M., N.K. and M.S.; Investigation, I.B., Y.M., N.K., T.B., M.J., K.K. and M.S.; Resources, Y.M., T.B., M.J., K.K. and M.S.; Data curation, Y.M., T.B. and M.S.; Writing—original draft, T.B. and M.S.; Writing—review & editing, I.B., M.J. and K.K.; Visualization, I.B., M.J. and K.K.; Project administration, I.B. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The study analyzed publicly available datasets. The data can be found here: https://databank.worldbank.org (accessed on 1 July 2022), http://www.ukrstat.gov.ua (accessed on 08 August 2023), https://saee.gov.ua (accessed on 2 August 2022). Other data were collected by the authors. The data presented in this study are available on request from the corresponding author.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Prokopenko, O.; Prokopenko, M.; Chechel, A.; Marhasova, V.; Omelyanenko, V.; Orozonova, A. Ecological and Economic Assessment of the Possibilities of Public-private Partnerships at the National and Local Levels to Reduce Greenhouse Gas Emissions. *Econ. Aff.* **2023**, *68*, 133–142. [CrossRef]
2. Prokopenko, O.; Kazanska, O.; Deineha, I.; Butenko, N.; Omelyanenko, V.; Bovkun, O. Communication Business Processes of Industrial Enterprises in the Conditions of Globalisation. *Int. J. Manag.* **2020**, *11*, 884–895. [CrossRef]
3. Berniak-Woźny, J.; Rataj, M. Towards Green and Sustainable Healthcare: A Literature Review and Research Agenda for Green Leadership in the Healthcare Sector. *Int. J. Environ. Res. Public Health* **2023**, *20*, 908. [CrossRef] [PubMed]
4. Sotnyk, I.M. Trends and problems in management of production and consumption dematerialization. *Actual Probl. Econ.* **2012**, *134*, 62–67.
5. Dalati, S.; Raudeliûnienë, J.; Davidavièienë, V. Sustainable leadership, organizational trust on job satisfaction: Empirical evidence from higher education institutions in Syria. *Bus. Manag. Econ. Eng.* **2017**, *15*, 14–27. [CrossRef]
6. Lewicka, D. Supporting innovation through HRM practices—Importance of motivation. *Int. J. Innov. Learn.* **2013**, *14*, 217–240. [CrossRef]

7. Malynovska, Y.; Bashynska, I.; Cichoń, D.; Malynovskyy, Y.; Sala, D. Enhancing the Activity of Employees of the Communication Department of an Energy Sector Company. *Energies* **2022**, *15*, 4701. [CrossRef]
8. Halkiv, L.; Karyy, O.; Kulyniak, I.; Kis, Y.; Adamovsky, A. Human Potential Innovatization Analysis: The System of Crisis Management Determinants Context. In Proceedings of the 6th International Conference on Computational Linguistics and Intelligent Systems, COLINS 2022, Gliwice, Poland, 12–13 May 2022; Volume 3171, pp. 1606–1616.
9. Bek-Gaik, B. , *Surowiec, A. Integrated Reporting and Performance Measurement Systems*; Routledge: London, UK, 2024; 190p.
10. Krot, K.; Lewicka, D. Human side of innovation-individual and organizational environment-related aspects: The case of IBM. *Int. J. Innov. Learn.* **2011**, *9*, 352–371. [CrossRef]
11. Piwowar-Sulej, K.; Iqbal, Q. Leadership styles and sustainable performance: A systematic literature review. *J. Clean. Prod.* **2023**, *382*, 134600. [CrossRef]
12. Hajduova, Z.; Klimek, M.; Daneshjo, N.; Prokopenko, O. Competitiveness of Franklin Templeton Fund Managers: Do the Fund Managers Exceed the Benchmark? *J. Compet.* **2019**, *3*, 70–80. [CrossRef]
13. Krot, K.; Lewicka, D. Relationship between impersonal trust and innovative culture: An empirical study. *Ekon. Manag.* **2020**, *23*, 82–100.
14. Adizes, I. *Management/Mismanagement Styles: How to Identify a Style and What to Do about It*; The Adizes Institute Publishing: Santa-Barbara, CA, USA, 2004; 236p.
15. Adizes, I. *Leading the LEADERS: How to Enrich Your Style of Management and Handle People Whose Style Is Different from Yours*; The Adizes Institute Publishing: Santa-Barbara, CA, USA, 2015; 306p.
16. Hersey, P.; Blanchard, K.H. Life cycle theory of leadership. *Train. Dev. J.* **1969**, *23*, 26–34.
17. Hersey, P.; Blanchard, K.H. *Management of Organizational Behavior: Utilizing Human Resources*; Prentice Hall: Hoboken, NJ, USA, 1977.
18. Gerard, L.; McMillan, J.; D'Annunzio-Green, N. Conceptualizing sustainable leadership. *Ind. Commer. Train.* **2017**, *49*, 116–126. [CrossRef]
19. Liao, Y. Sustainable leadership: A literature review and prospects for future research. *Front. Psychol.* **2022**, *13*, 1045570. [CrossRef] [PubMed]
20. Dykan, V.; Pakharenko, O.; Saienko, V.; Skomorovskyi, A.; Neskuba, T. Evaluating the efficiency of the synergistic effect in the business network. *J. East. Eur. Cent. Asian Res.* **2021**, *8*, 51–61. [CrossRef]
21. Skibina, T.; Kurbatova, T.; Sotnyk, I.; Telizhenko, O.; Sotnyk, M.; Hyrchenko, Y. Estimation of Management Effectiveness of Electricity Supply Enterprises in Emerging Economies. *TEM J.* **2021**, *10*, 238–248.
22. Montgomery, C.A. Putting leadership back into strategy. *Harv. Bus. Rev.* **2008**, *86*, 54–60. [PubMed]
23. Halkiv, L.; Karyy, O.; Kulyniak, I.; Ohinok, S. Innovative, Scientific and Technical Activities in Ukraine: Modern Trends and Forecasts. In Proceedings of the 2020 IEEE Third International Conference on Data Stream Mining & Processing (DSMP), Lviv, Ukraine, 21–25 August 2020; pp. 321–324. [CrossRef]
24. Sala, D.; Pavlov, K.; Pavlova, O.; Demchuk, A.; Matiichuk, L.; Cichoń, D. Determining of the Bankrupt Contingency as the Level Estimation Method of Western Ukraine Gas Distribution Enterprises' Competence Capacity. *Energies* **2023**, *16*, 1642. [CrossRef]
25. Bashynska, I.O. Models of integrated marketing communications forming for innovatively active machine engineering enterprises. *Econ. Ann.-XXI* **2012**, *11*, 52–54.
26. Prokopenko, O.V.; Domashenko, M.D.; Shkola, V.Y. Management features of economic security in foreign economic activity of ukrainian machine-building enterprises. *Actual Probl. Econ.* **2014**, *160*, 188–194.
27. Kyrylenko, K.; Martyniuk, M.; Mahometa, T.; Mykolaiko, V.; Tiahai, I.; Beniuk, O. The Impact of Combination of Natural Sciences and the Humanities on the Quality of Modern Education. *Int. J. Learn. Teach. Educ. Res.* **2023**, *22*, 515–532. [CrossRef]
28. Sotnyk, I.M. Energy efficiency of Ukrainian economy: Problems and prospects of achievement with the help of ESCOs. *Actual Probl. Econ.* **2016**, *175*, 192–199.
29. Khan, R.U.; Saienko, V.; Tolchieva, H. Dependence of the company's reputation and the quality of customer relations. *Econ. Stud. J.* **2021**, *2*, 159–176.
30. Brooking, A. *Intellectual Capital: Core asset for the third millennium*, 1st ed.; Cengage Learning: Belmont, CA, USA, 1996; 224p.
31. Huo, C.; Safdar, M.A.; Ahmed, M. Impact of responsible leadership on sustainable performance: A moderated mediation model. *Kybernetes*, 2023; *ahead of print*. [CrossRef]
32. Azanza, G.; Moriano, J.A.; Molero, F. Authentic leadership and organizational culture as drivers of employees' job satisfaction. *J. Work. Organ. Psychol.* **2013**, *29*, 45–50. [CrossRef]
33. Cortés-Denia, D.; Luque-Reca, O.; Lopez-Zafra, E.; Pulido-Martos, M. Does authenticlea dership promote higher job satisfaction in public versus private organizations? Exploring the role of vigor and engagement. *Heliyon* **2023**, *9*, e12906. [CrossRef] [PubMed]
34. Kusa, R.; Suder, M.; Duda, J.; Czakon, W.; Juárez-Varón, D. Does knowledge management mediate the relationship between entrepreneurial orientation and firm performance? *J. Knowl. Manag.* **2023**, *in press*. [CrossRef]
35. Brillo, J.; da Silva, E. Erivelton Muniz da SilvaTri-Intersectional Model of Leadership by Values: A Fuzzy Multi-Criteria Decision Making Open Technology Assessment System. *Chin. Bus. Rev.* **2020**, *19*, 141–156.
36. Burton, S.; Burrell, D.; Nobles, C.; Jones, L. Exploring the Nexus of Cybersecurity Leadership, Human Factors, Emotional Intelligence, Innovative Work Behavior, and Critical Leadership Traits. *Sci. Bull.* **2023**, *28*, 162–175. [CrossRef]

37. Bashynska, I.; Lewicka, D.; Filyppova, S.; Prokopenko, O. *Green Innovation in Central and Eastern Europe*; Routledge: London, UK, 2024; 200p, *in press*.
38. Dudek, M.; Bashynska, I.; Filyppova, S.; Yermak, S.; Cichoń, D. Methodology for assessment of inclusive social responsibility of the energy industry enterprises. *J. Clean. Prod.* **2023**, *394*, 136317. [CrossRef]
39. Leithwood, K. The Personal Resources of Successful Leaders: A Narrative Review. *Educ. Sci.* **2023**, *13*, 932. [CrossRef]
40. Danylkiv, K.; Kloba, L.; Mata, M.; Martins, J.; Correia, A.; Dantas, R.; Zelenitsa, I.; Havran, M. Diagnostics of Innovative Activity of Small Entrepreneurship Structures in The Lviv Region. *Acad. Entrep. J.* **2021**, *27*, 1–14.
41. Kopp, U.; Martinuzzi, A. Teaching sustainability leaders in systems thinking. *Bus. Syst. Rev.* **2013**, *2*, 191–215.
42. Hopp, C.; Wentzel, D.; Rose, S. Chief executive officers' appearance predicts company performance, or does it? A replication study and extension focusing on CEO successions. *Leadersh. Q.* **2023**, *34*, 101437. [CrossRef]
43. Székely, F.; Knirsch, M. Responsible leadership and corporate social responsibility: Metrics for sustainable performance. *Eur. Manag. J.* **2005**, *23*, 628–647. [CrossRef]
44. Chang, A.; Lee, T.-S.; Lee, H.-M.; Wang, J. The Influence of Responsible Leadership on Strategic Agility: Cases from the Taiwan Hospitality Industry. *Sustainability* **2023**, *15*, 2760. [CrossRef]
45. Castañeda García, J.A.; Rey Pino, J.M.; Elkhwesky, Z.; Salem, I.E. Identifying core "responsible leadership" practices for SME restaurants. *Int. J. Contemp. Hosp. Manag.* **2023**, *35*, 419–450. [CrossRef]
46. Nisha, N.T.; Nawaz, N.; Mahalakshmi, J.; Gajenderan, V.; Hasani, I. A Study on the Impact of Sustainable Leadership and Core Competencies on Sustainable Competitive Advantage in the Information Technology (IT) Sector. *Sustainability* **2022**, *14*, 6899. [CrossRef]