European Journal of Sustainable Development (2022), **11**, 3, 307-325 ISSN: 2239-5938
Doi: 10.14207/ejsd.2022.v11n3p307

Forming a System of Monitoring Business-Structures' Activity in the Circular Economy Development

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Abstract
The study's goal is to develop a set of recommendations for forming the system of monitoring the business-structure activities in the circular economy development. To achieve this objective, the structural components of the system of monitoring the business-structures are identified; the adjustment vectors of the system of monitoring the business-structure activity are identified by taking into account the circular economy priorities; the solution is chosen to improve the system of monitoring the business-structure activity in the circular economy development; a model of information and analytical support for the process of forming the system of monitoring business-structure activity in the circular economy development is made up. The management mechanism to choose solutions from improving the system of monitoring the business-structures activities in the circular economy development is developed. Unlike existing ones, it is based on taking into account the relative importance of the factors that affect the formation of the system of monitoring, the links between them, and the factors' priority, which allows selecting from numerous alternative solutions those that have the greatest potential to improve the system of monitoring and establish the possible solutions' implementation sequence. In addition, a model of information and analytical support for the process of forming the system of monitoring the business-structure activity in the circular economy development is proposed. It differs from the existing ones in that it takes into account the mutual influence of the signs and conditions to improve the system of monitoring in relation to the development object, and makes it possible to increase the level of the information content of monitoring subjects when making corrective management decisions.

Keywords: system, development, business-structure, circular economy, sustainable development, function, factor.

1. Introduction

Business-structures are market entities that create added value, and jobs, and meet the consumer needs of society. They are in a state of permanent need of searching the innovative solutions to gain new competitive advantages. This often provokes business-structures to put their own selfish interests over the needs of society. As a result, companies often implement policies to reduce the cost of reducing harmful emissions and the costs associated with achieving high quality of finished products. This practice contradicts modern needs of society, does not meet the goals of sustainable development and the idea of creating a circular economy. In Ukraine, at the level of state managing the national economy, this problem looks quite conscious. For instance, several years ago, in the National Report "Goals of Sustainable Development: Ukraine", the Decree of the President of Ukraine [1] supported the achievement of the Goals of Sustainable Development and the results of their adaptation, taking into account the specifics of

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Ukraine's development. The Cabinet of Ministers of Ukraine has approved a list of indicators to monitor the Sustainable Development Goals implementation [2]. The main program documents on circular economics are the following: National Waste Management Strategy until 2030; National Waste Management Plan until 2030; a strategy of state environmental policy of Ukraine up to 2030; a concept of state policy implementation in climate change up to 2030 and a plan of its implementation; a strategy of low-carbon development of Ukraine until 2050, etc. [3; 4]. In addition, at the initiative of the Ministry of Education and Science of Ukraine, the state investment project "Creation of a scientific and educational center of a circular economy and waste management ReYouth of the Lviv Polytechnic National University [5] is in a state of public discussion, the purpose of which is to solve the problems of stability and safety issues that arise due to environmental issues, as well as improvement of ecology through the introduction of new technologies in the field of waste processing, scientific cooperation on environmental issues, as well as the attraction of direct foreign investments in the economy of Ukraine.

In turn, at the micro level, national priorities in the context of a circular economy development are nearly traced. The facts of the emergence of specific corporate initiatives in this direction are isolated. This state is due to both objective and subjective reasons. As a result, the problem is to harmonize the goals of business-structures with the circular economy priorities. The presented research is aimed at developing methodological and applied recommendations for forming the system of monitoring business-structures activities in the circular economy development. This will help to harmonize the goals of business-structures with the circular economy priorities.

Analysis of recent research and publications. Among the scientists-economists and practitioners who dealt with the problems of forming and developing the system of monitoring business-structures activities, it should highlight the scientists who paid attention to such issues as:

- objects of monitoring (the studies have shown that the financial and economic security of enterprises is usually distinguished as the monitored objects – N. Iershova, M. Tkachenko, V. Garkusha [6], internal and external business processes – T. Mirzoieva, N. Tkach [7], L. Baresi, G. Meroni, P. Plebani [8], a state of resource provision-A. Alabdulkarim, P. Ball, A.Tiwari [9], quality of management and functionality of automation of management processes-M. Salun, Y. Palyanychka [10], M.-Y. Wu, M.-H. Yu [11], L.-T. Ly et al. [12], A. Janes, V. Lenarduzzi, A.-C. Stan [13];

- principles of forming a set of indicators in the system of monitoring the business structure (a number of authors – J. Grabara, P. Bajdor, L. Mihaescu [14], A. Skrypnyk et al. [15], O. Budziak, V. Budziak, O. Hrytsak [16], N. Bulavinova et al. [17] note that in today's conditions, systems of monitoring the business-structures activities should be based on the values of the sustainable development concept. Another group of researchers, R. Hyde, A. Bryce, M.-P. Hoflund [18], L. Xingyi, [19] L. Kucher et al. [20], note that it is necessary to take into account the principles that underlie the HACCP system, which is important from the point of view of food security. One of the most common views on forming a set of indicators in the system of monitoring the business-structure is the principle of accounting threats and assessing risks for the business-structure. In this direction, it should note the scientific heritage of such researchers as: A. Shamsuzzoha, P. Helo, M. Sandhu [21], E.-S. Borges, L.-H. Thom, M. Fantinato [22],

O. Bogma et al. [23]);

- goals of the systems of monitoring the business-structure activity. In this direction, there are the works of such scientists as D.-W. Curry [24], A. Draghici, A.-D. Popescu, L.-M. Gogan [25], H. T. Tun et al. [26], F. Koetter, M. Kochanowski [27], D.-T. Goomas, S.-M. Smith, T.-D. Ludwig [28], K. Van De Voorde, J. Paauwe, M. Van Veldhoven [29], L. Kren J. L. Kerr [30], R. Gilsing et al. [31], S. Galletta, S. Mazzù, V. Naciti [32], A. Ba [33], J. P. Katz et al. [34], T. Miksa et al. [35];

- approaches to classifying information sources in the systems of monitoring the business-structure. Among the scientists who dealt with the problems of classifying information sources, there were C. P. Ugbala et al. [36], J. Gómez, I. Salazar, P. Vargas [37], M. Weiss [38], J.-B. Chan, J.-Z. Farhadi et al. [39], etc.

One of the areas of scientific research, which has been rapidly gaining momentum in recent years, is a circular economy development. V. Meseguer-Sánchez et al. conducted a thorough analysis of research in this area. These authors found that in 2020, the number of countries that paid attention to research on a circular economy development increased by 125 compared to 2005. In addition, the authors found that during this period, the number of journals where the results of research on this topic were published increased from 39 to 1028 [40]. It should be recognized that due to the fact that the very concept of "a circular economy" is interdisciplinary, as well as the fact that the essence and goals of a circular economy development are considered at the global level, at macro- and meso-levels [41-49], the scientific research on the problems of forming the systems of monitoring in the context of a circular economy development at the micro level is practically absent. Despite this, there are studies of the circular economy of the systems of monitoring at the macro - and meso- levels. In this direction, it should mention such names as M. Bianchi, M. Cordella, P. Menger [50], K. Navare et al. [51], J. Švarc, M. Dabić, J. Lažnjak [52], A. Kofos et al. [53]. Analysis of the scientific works of these authors indicates that in the near future, the business environment will be largely subordinated to the values of sustainable development and the priorities of a circular economy development. The implementation of these values and priorities in the business sector will take place through the conditions of bank lending, insurance, taxation, issuing permits and licenses for the right to carry out certain types of business activities, etc. As a result, the importance of forming systems of monitoring the business-structure activities in the circular economy development is growing.

2. Materials and Methods

The paper's goal is to develop a set of recommendations for forming systems of monitoring the business-structure activities in the circular economy development. To achieve this purpose, it's necessary to:

- identify structural components of the business-structure of the system of monitoring;
- identify the vectors of adjusting the system of monitoring the business-structure activity, taking into account the circular economy priorities;
- choose a solution to improve the system of monitoring the business-structures activities in the circular economy development;

- make a model of information and analytical support for the process of forming the system of monitoring the business-structure activities in the circular economy development.

When identifying the structural components of the monitoring system the business-structures and analyzing the effectiveness of the functions performed by this system, a system-functional approach and Delphi method are applied. The adjustment vectors of the system of monitoring the business-structure by taking into account the circular economy priorities are identified by a cluster analysis of the factors that affect the system of monitoring and the study of these factors based on the Mann-Whitney criterion. To choose a solution for improving the system of monitoring the business-structure activity in the circular economy development, the methods for constructing preference matrices and generalization are applied. While constructing the model of information and analytical support for the process of forming the system of monitoring the business-structure activity in the circular economy development, a structural-process approach, as well as the elements of set theory and the Hausdorff theorem, are applied to justify that the phenomenon of developing of the system of monitoring the priorities of the circular economy development arise due to combining the sets that do not intersect with each other.

3. Results

Traditionally, among the components of the systems of monitoring business-structures, the monitored objects and subjects, as well as technologies and methods of monitoring are distinguished [54]. The objects of monitoring are not often subjected to both scientific and methodical-applied analysis for essential characteristics and structure. However, it should be recognized that to a large extent the uncertainty of the monitoring object itself is the reason for the low level of information content of monitoring results [55]. When making and developing the system of monitoring, it is important to clearly define the boundaries of the monitored object. The problematics of this task is that the choice of methods and technologies for accumulating, processing and using management information directly depends on the specifics of the monitored object. As a result, if the object is defined incorrectly or not clearly, then the managers of the business-structure will not have the necessary information for effective management of the enterprise [54].

Analysis of empirical data of a number of business-structures (Fozzy-Food, Epicenter K, Vogue retail, Metro Cash And Carry Ukraine, Auchan Ukraine Hypermarket, Food Network, Diesa, Omega, Handicap, COMFI trade, M T I, Novus Ukraine, Tavria plus, rush, Eco, New line, Retail Group of Ukraine, Malvi, Parquet plant, Foxtrot, Eldorado, Comfy, Moyo, TTT, ZHZHUK, Rozetka, Allo), which have the developed systems of monitoring their activities showed that usually, the systems of monitoring are focused on both the internal and external environment of the business-structure. They accumulate the information on: sales dynamics; volume and structure of balances of finished products, raw materials and materials in the warehouse; financial condition and profitability of the business-structure; structure and dynamics of costs; number of competitors; prices for similar goods and services on the market; volume of taxes and fees paid; dynamics of consumer requests for service and warranty service of products offered to the market.

Table 1 provides an expert assessment of the relative significance of information describing business-structures' activities.

Table 1:
Relative significance of the information describing business-structures' activities

Information describing business-structures' activities	Relative significance of the information, %
Sales dynamics	27
Volume and structure of the remaining finished products, raw materials and materials in the warehouse	11
Financial condition and profitability of a business-structure	6
Cost structure and dynamics	12
Number of competitors	4
Prices for similar products and services on the market	17
Amount of taxes and fees paid	7
Dynamics of consumer requests for service and warranty service of products offered to the market	16

Source: created by the authors.

Analyzing the obtained expert data, there are grounds to assert that managers of enterprises measure the success of business activities by sales volumes [54]. As we can see, none of the indicators that are subject to monitoring is related to the priorities of the circular economy development and the sustainable development goals. The business-structures' development and their competitive position on the market are not considered in relation to the performance of the business-structure's social function, business responsibility for environmental safety, conservation, and reproduction of natural resources, and energy restoration. The identification of negative increases in sales volumes or the absence of positive increases is considered in direct dependence on the activity of competitors, in particular their pricing policy, as well as on, to a large extent, the compromise quality of goods and services offered to the market.

To deepen the analysis of the practical usefulness of the information accumulated by the systems of monitoring the companies under study, we also interviewed the heads of business-structures on how effectively the systems of monitoring implement analytical and predictive functions. The results of survey are shown in Table 2.

Table 2:
The survey results of business managers on problems of ensuring the performance of the systems of monitoring

Problems of ensuring the performance of the systems of monitoring	Relative significance of the identified problems, %
Timely and complete input of input information to the system of monitoring database	25
Justification of criteria for determining the optimal and pessimistic forecast of sales changes	23
Taking into account the human factor in preparing and implementing the decisions approved by the business-structure managers	52

Source: created by the authors.

As it turned out, analytical and predictive functions are mainly implemented in automated mode to calculate indicators of financial stability, profitability, and riskiness of implementing management decisions, taking into account a pessimistic, optimistic or average forecast of sales changes. Having obtained the results of analysis and forecast from the automated data processing system, they are mostly discussed collectively and a collective management decision is made. The information obtained, obviously, indicates that the quality of the personnel of the business-structure is an important factor influencing both the results of the business-structure's activities and all the key processes on which this result depends. However, again, due to the lack of priorities for the circular economy development, which should be reflected in the concept and strategy of the business-structure, as well as the system of its tactical goals, experts assess the problems of ensuring the effectiveness of the system of monitoring exclusively through the prism of selfish economic interests. Given this, there are reasons to state that during the initial formation and in the process of the system of monitoring development, its objects should include, in addition to such particular things as staffing of business-structure divisions with personnel of the necessary qualifications; the quality of performing the functions by the business-structure staff; the emotional and psychological state of the business-structure's employees and the level of their motivation for quality work, as well as: the quality level of waste disposal; the share of the renewable energy sources' use in the total amount of energy consumed by the business-structure; the level of carbon emissions; the share of ecologically clean raw materials and materials in the total amount of resources used in production, etc.

The reason for the need to adjust the monitoring system of the business-structure may be the lack of relevance of monitoring goals or an insufficient level of their implementation. In addition, the system of monitoring the business-structure activities is affected by a set of certain factors. Among them, let us focus on those which monitoring the priority of a circular economy development depends on, namely: a) awareness of management entities that perform the function of monitoring the circular economy development priorities; b) motivation of management entities that perform the function of monitoring the circular economy development priorities; c) the qualification level of management entities that perform the function of monitoring the circular economy development priorities; d) discipline and responsibility of management entities that perform the function of monitoring the circular economy development priorities; i) formalization of management processes that relate to the formation and implementation of goals in the field of the development of circular economy; f) automation of the system for monitoring the development of priorities of circular economy), which are in causal relationships (Fig. 1) [56].

Given this, in the context of these factors, it is advisable to identify the vectors of adjusting the system of monitoring the business-structure's activity. To perform this task, the Mann-Whitney criterion can be applied. This criterion determines whether the area of overlapping values between two rows is sufficiently small (the ranked series of parameter values in the first sample and the same in the second one). The lower the criterion value is, the more likely the differences between the parameter values in the samples are significant. Applying the Mann-Whitney criterion to the empirical data of the studied business-structures, these values are graded on the Harrington scale (Table 3).

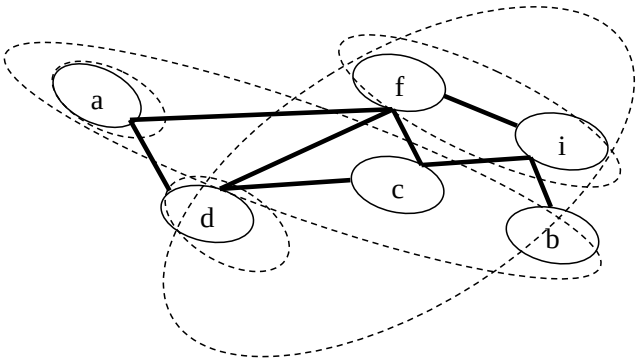

Figure 1: The integrated model of relationships between the factors influencing the formation of the system of monitoring the circular economy development priorities
Note. Symbols – a solid line indicates factors; a dashed line indicates clusters; and a bold line indicates linear and indirect relationships between factors.
Source: created by the authors.

For this, the obtained values were previously converted into fractions of a unit, taking the maximum value of the Mann-Whitney criterion as the basic value.

Table 3
Harrington verbal-numerical scale

Gradation measure	Numeric value	Factors studied
Very high	0.80 – 1.00	*b* (1)
High	0.64 – 0.80	-
Average	0.37 – 0.64	*a* (0,59), *d* (0,43)
Low	0.20 – 0.37	*c* (0,32), *i* (0,31), *f* (0,29)
Very low	0.00 – 0.20	-

Source: composed by the authors.

As the lower the criterion value Manna-Whitney is, the more likely the differences between the parameter values in the samples are reliable, so using the data in Table 3 we can state that among all the studied factors, such factors as *c* (the qualification level of management entities that perform the function of monitoring the priorities of the circular economy development), *i* (formalization of management processes related to the formation and implementation of goals in the development of circular economy), *f* (automation of the system of monitoring the priorities of the development of circular economy). Factors *a* (awareness of management entitles who perform the function of monitoring circular economy development priorities), *d* (discipline and responsibility, awareness of management subjects who perform the function of monitoring the circular economy development priorities) have somewhat greater potential, and factor *b* (motivation of management subjects who perform the function of monitoring the priorities of the development of circular economy).

Based on the research results, there are grounds to assert that, on the one hand, each factor that affects the system of monitoring the business-structure activities should be considered as a vector for improving this system, and, on the other hand, due to the unequal

significance of these factors, it is important to determine the turn (priority) of managerial response to them.

As a result of studying the empirical data of such business-structures as Parus Group, TAS Group, Naftogaz Group, Arsenal-Center Group, Continental Farmers Group, Neftakhim, Ukrmet, Potochishche, Spetsprominvest, Fozzy-group TPH, Furshet group, ATB-Market LLC, Kviza-Trade LLC, Foxtrot, Comfy, Eldorado, a list of possible solutions has been formed that can be aimed at improving the system of monitoring the priorities of the circular economy development (Table 4).

Table 4:
The solutions aimed at improving the system of monitoring the business-structure activities

A list of solutions	Vectors for improving the system of monitoring					
	a	b	c	d	i	f
1. Increasing channels to obtain the information by the entities that perform the function of monitoring the priorities of the development of circular economy	•					
2. Introducing automated modules for processing management information on the state of implementing the priorities of the development of circular economy into the information management system by a business-structure	•					•
3. Introducing the training and seminars related to the accumulation, processing and using the management information on the priorities of the development of circular economy into the practice of the business-structure personnel management	•					•
4. Introducing the "goal management" system into the practice of business-structure management		•				
5. Diversifying the methods of motivating entities that perform the function of monitoring the priorities of the development of circular economy		•				
6. Creating the system of permanent identifying the level and nature of motivation of management entities that perform the function of monitoring the priorities of the development of circular economy in the business-structure		•				
7. Introducing a permanent system of advanced training and retraining of personnel responsible for performing the function of monitoring the priorities of the development of circular economy into the practice of personnel management of the business-structure			•			
8. Introducing a system for permanent identifying the level of qualification of management entities that perform the function of monitoring the priorities of the development of circular economy into the practice of the business-structure management			•			
9. Introducing a system of permanent identifying the level of discipline and responsibility of management entities that perform the function of monitoring the priorities of the development of circular economy into the practice of the business-structure management				•		

10. Introducing a system of sanctions for violation of discipline and facts of irresponsible behaviour of management entities that perform the function of monitoring the priorities of the development of circular economy into the practice of personnel management of the business-structure				•		
11. Creating rules and procedures in the business processes management and fixing them with orders, and directives of the business-structure management					•	
12. Digitalizing rules and procedures in business process management related to the priorities of the development of circular economy					•	•
13. Informing the structural divisions and officials the essence of the rules and procedures concerning the priorities of the development of circular economy					•	
14. Providing business-structure management entities with technical means and software products for high-quality performance of the function of monitoring the priorities of the development of circular economy						•

Source: created by the authors.

As seen in Table 4, the essence of these solutions is mainly aimed at ensuring that all business processes related to the priorities of the circular economy development are documented and digitalized. This will allow transparency of cause-and-effect relationships in making and implementing management decisions, in particular regarding the formation of liabilities and assets, the occurrence of expenses and obtaining specific performance results. The choice of solutions for improving the system of monitoring the business-structure activities is polycriteria, so it should be based on taking into account more than two requirements (Fig. 2).

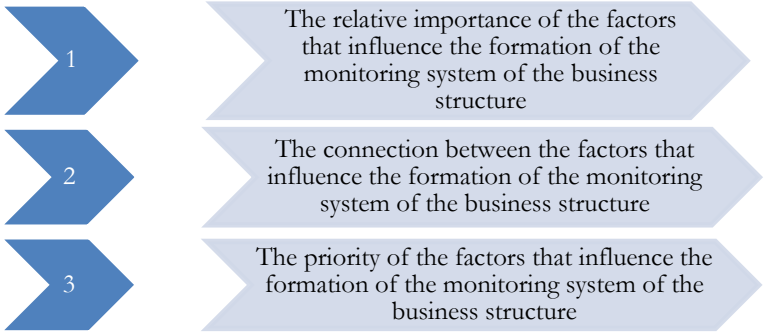

Figure 2: Requirements for choosing the solutions to improve the system of monitoring the priorities of the development of circular economy
Source: created by the authors.

Each of these requirements is equivalent in importance, so the proposed solutions in the context of vectors for improving the system of monitoring the business-structure activities require an integrated assessment, taking into account each requirement. To perform this task, the preference matrices built for each requirement in particular will be used:
(1) a matrix of preferences that takes into account the relative importance of factors influencing the formation of the system of monitoring the priorities of the circular

economy development

	a	b	c	d	i	f
a	-	0	1	1	1	0
b	1	-	1	1	1	0
c	0	0	-	1	0	0
d	0	0	0	-	0	0
i	0	0	1	1	-	0
f	1	1	1	1	1	-
	2	1	4	5	3	0

(2) a matrix of preferences that takes into account the relationship between the factors that influence the formation of the system of monitoring the priorities of the circular economy development

	a	b	c	d	i	f
a	-	0	0	1	0	1
b	0	-	0	0	1	0
c	0	0	-	1	1	1
d	1	0	1	-	0	1
i	0	1	1	0	-	1
f	1	0	1	0	1	-
	2	1	3	2	3	4

(3) a matrix of preferences that takes into account the priority of factors that influence the formation of the system of monitoring the priorities of the circular economy development

	a	b	c	d	i	f
a	-	1	0	0	0	0
b	0	-	0	0	0	0
c	1	1	-	1	0	0
d	0	1	0	-	0	0
i	1	1	0	1	-	0
f	1	1	0	1	0	-
	3	5	0	3	0	0

The results of the analysis of preference matrices are shown in Table 5.

Table 5:
The results of analysis of preference matrices

Vectors	The number of advantages in terms of requirements for decision approval			Vector priority levels
	x	y	z	
a	2	2	3	High level
b	1	1	5	
d	5	2	3	
c	4	3	0	Average level
i	3	3	0	
f	0	4	0	Low level

Source: created by the authors.

Using the results of the analysis of preference matrices (see Table 5) let us build a logically structural diagram of implementing the selected decisions to improve the system of monitoring the priorities of the development of circular economy (Fig. 3). The presented

logical block diagram is focused on implementing the complex solutions within each of the vectors. This assumes that all the solutions within each of the vectors are interconnected, and they are not alternative. In addition, despite the different levels of gradation of priority vectors, each of them is considered to be one that needs to be implemented to improve the system of monitoring the priorities of the circular economy development. Therefore, the constructed logical-block diagram is a graphical demonstration of the spatiotemporal order of improving the system of monitoring the priorities of the circular economy development.

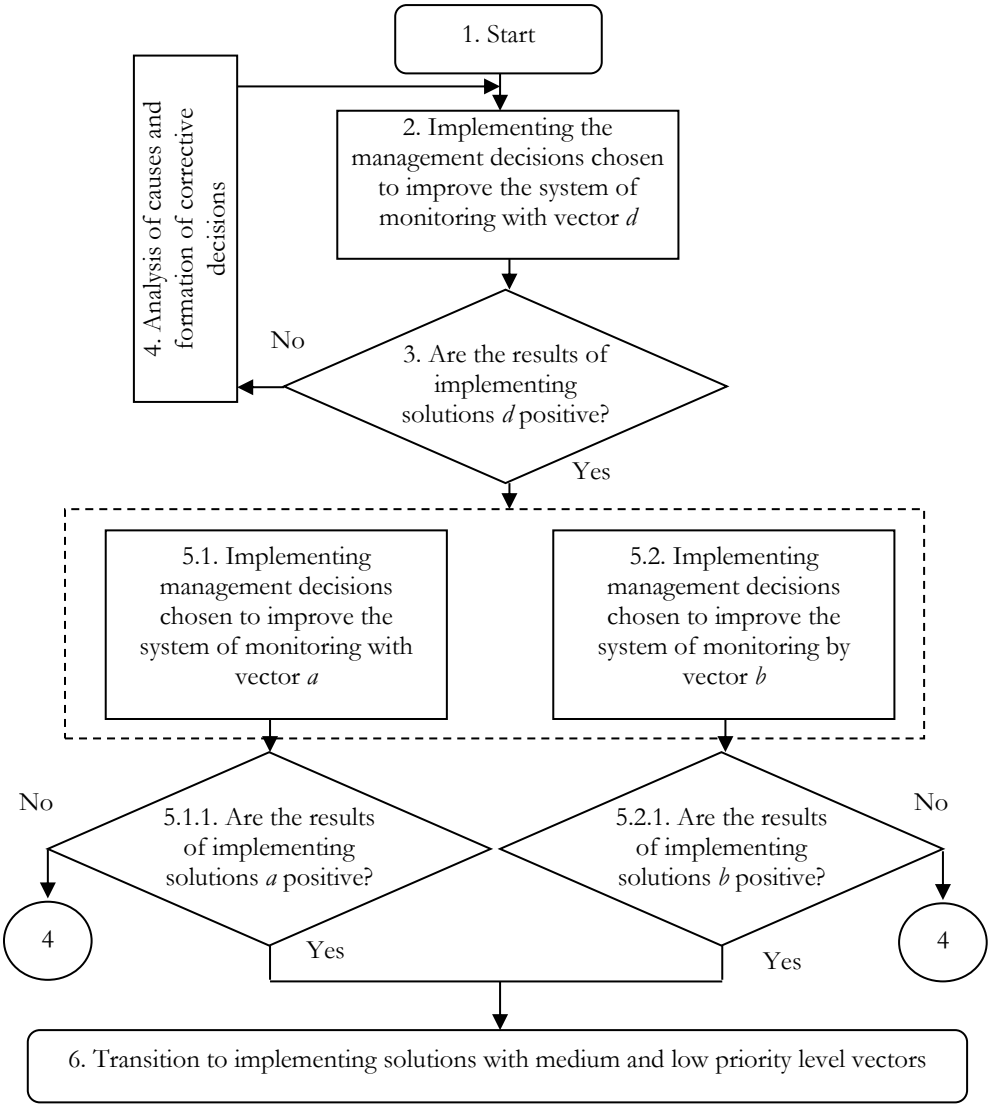

Figure 3: Logical and block diagram of implementing selected solutions for improving the system of monitoring the priority for the circular economy development. Source: created by the authors.

Forming the information and analytical support for developing the system of monitoring

of the circular economy priority development directly depends on developing the system of monitoring as it is. To perform this task, it is necessary to highlight the features of developing the system of monitoring priorities for the circular economy development: expanding the functionality of the system of monitoring; accelerating the implementation of various operations by the system of monitoring, in particular, data processing and using; increasing security; convenience and simplification of the interface of the automated system of monitoring; perception of a wider list of data formats at the entrance to the system in automated mode; approaching the classification of domains of the system of monitoring database to the needs of entitles who are the users of this system. The performed research indicates that for the signs of developing the system of monitoring the priorities of the circular economy development, it is necessary to create certain conditions, namely: the interest of the business-structure management in the growth of the results of its activities; the presence of permanent feedback between the goals of monitoring and its results, as well as between the developers of this system and its users; the constant adaptation of databases and technologies for processing management information to the needs of the users of the system of monitoring the priorities for the circular economy; achieving linear consistency of monitoring results with regulatory (corrective) decisions that are made and implemented by the business-structure's managers at all the levels of management.

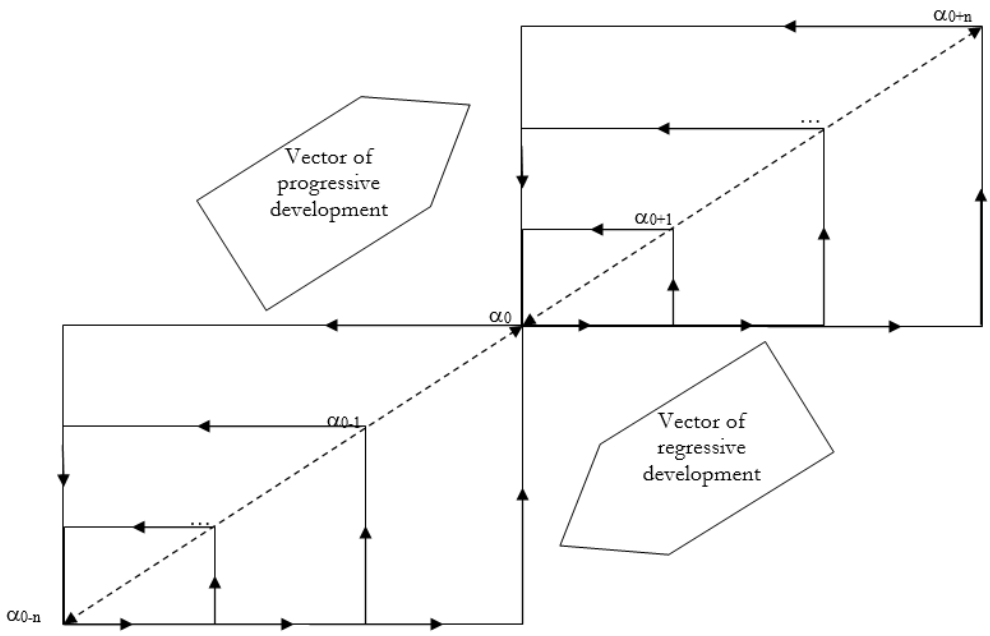

Figure 4: The vector model of developing the system of monitoring the priorities of the development of circular economy in dynamics

Note: developed by the authors of the paper. Symbols: α_{0+1}– the first positive iteration of the increase in the value of the integral indicator of the development of the system of monitoring;α_{0+n} – the n-th positive iteration of the increase in the value of the integral indicator of the development of the system of monitoring ; α_{0-1} – the first negative iteration of the increase in the value of the integral indicator of the development of the system of monitoring;α_{0-n} – the n-th

negative iteration of the increase in the value of the integral indicator of the development of the system of monitoring.
Source: created by the authors.

Highlighting the features and conditions of developing the system of monitoring the priorities of the development of circular economy, let us present a vector model of the system of monitoring in dynamics (Fig. 4) and a model of information and analytical support to develop the system of monitoring (Fig. 5). The first of these models demonstrates two vectors of developing the system of monitoring – progressive and regressive. The progressive vector of development indicates the reproduction and growth of the system's potential. In turn, the regressive vector represents a decrease in the system's potential. Definitely, this model is largely theoretical, since progress and regression can have different rates and different intensity, but it demonstrates the fundamental understanding of the "development" category. Often the "development" category is identified with changes, but from a dynamic and meaningful point of view, changes do not always provide a positive result.

Taking this into account, regulatory decisions that are made based on the results of monitoring the priorities of the circular economy development should be exclusively reasonable and target the main blocks of the system of monitoring (see Fig. 5).

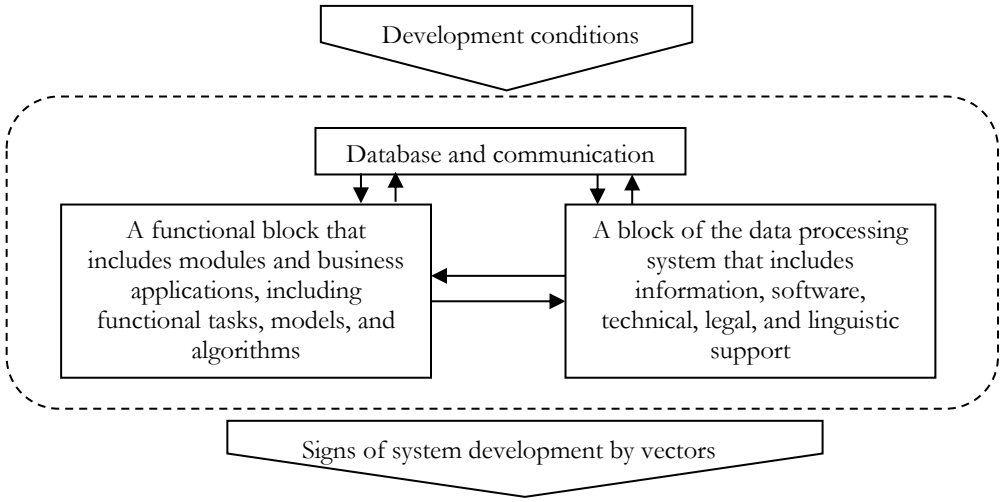

Figure 5: The model of information and analytical support to develop the system of monitoring the priorities of the development of circular economy
Source: created by the authors.

Based on Hausdorf's theorem, let us substantiate that the phenomenon of developing the system of monitoring the priorities of the circular economy development arises as a result of combining sets that do not intersect with each other. Given this:

$$R = X \cup Y \cup Z, \quad (1)$$

where R – the development of the system of monitoring the priorities of the development of circular economy; X – conditions for developing the system of monitoring the priority for the development of circular economy; Y – the development object (the system of

monitoring the priority for the development of circular economy); Z – the signs of development of the system of monitoring the priority of the development of circular economy.

Sets c-congruent to each other (sets that are the elements of the same set) and sets $Y \wedge Z$, i.e.

$$X = yZ;\ Y = y^{-1}Z;\ X \cup Y \subset X \cup Y \cup \{1, x\} = xZ, \quad (2)$$

where y – many values of factors on which X depends; y^{-1} – many values of factors on which Y depends; x – set of values of all other factors on which R depends.

As $X, Y \wedge Z$ – a set of many variants of the values of the factors that determine them, then it is obvious that there is a certain set of many variants of values $X, Y \wedge Z$, which are marked as $\overline{S}^2$. Therefore,

$$\because \overline{S}^2 \square R \therefore \overline{S}^2 = X \cup Y \cup Z. \quad (3)$$

where $X = |X|;\ Y = |Y|;\ Z = |Z|;\ |...|$ - the number of elements of a finite set.

$$\text{So we have, } X = yZ;\ Y = y^{-1}Z;\ X \cup Y \subset xZ. \quad (4)$$

Thus, since x and y are phenomena of transformation of metric space, which are accompanied by conservation of space, i.e. the equivalence of units of their measurement (isometers), then we get congruence X, Y and Z, where $X \cup Y$ is congruent to subset Z. Based on this, x and y are quality measures, properties that determine $X, Y \wedge Z$, i.e. R.

The task of business-structures' managers, who, in fact, are the users of the system of monitoring, is to create conditions for developing this system and achieve such a level of causality between X, Y, so that there are the development signs of the system. Based on expression (1), it is obvious that $R \neq Z$, i.e. $R \setminus Z$ indicates the dynamism R. In other words, the signs of development should become dynamic and lead to qualitative changes characterized by specific effects i.e. an increase in the productivity of making managerial decisions on implementing the priorities of the development of circular economy, an increase in the number of rationally made decisions, etc.

4. Conclusions

1. Based on the conducted research, it was revealed that business-structures' managers mainly form systems of monitoring so that to be informed about the dynamics of sales and the factors on which these dynamics depend linearly. Despite this, it is revealed that society's requests and current global trends indicate that business-structures that intend to take a leading position in the market among the monitored objects should also have the priorities of circular economy development and sustainable development goals, in particular, the following: the level of quality of waste disposal; the share of renewable energy sources in the total amount of energy consumed by the business-structure; the level of carbon emissions; the share of environmentally friendly raw materials and materials in the total volume of material resources used in production, etc.

2. The management mechanism to choose solutions from improving the system of monitoring the business-structures activities in the development of circular economy is developed, and a model of information and analytical support for the process of forming the system of monitoring of the business-structure activity in the circular economy development is proposed.
3. Based on the application of the Mann-Whitney criterion, the choice of the vectors for developing systems of monitoring is justified. Based on the fact that the lower the criterion value Manna-Whitney is, the more likely the differences between the parameter values in the samples are significant. So, it can reasonably be stated that among all the studied factors, such factors as – the level of qualification of management entities that perform the function of monitoring the priorities of the circular economy development; formalization of management processes that relate to the formation and implementation of goals in the circular economy development; automation of the system of monitoring the priorities of the circular economy development. Factors such as awareness of management entities, which perform the function of monitoring the priorities of the circular economy development, have somewhat greater potential; discipline and responsibility of management entities that perform the function of monitoring the priorities of the circular economy development, and the biggest factor is the motivation of management entities that perform the function of monitoring the priorities of the development of circular economy.
4. Based on the empirical data of the studied business-structures, it is argued that the decision to improve the system of monitoring the priorities of the circular economy development should be chosen on the basis of taking into account the relative importance of factors that affect the formation of the system of monitoring; relationships between factors that affect the formation of the system of monitoring; the priority of factors that affect the formation of the system of monitoring. The obtained analytical information allowed forming a matrix of preferences that characterizes the priorities in the choice of solutions. For practical application of this matrix, a logical and block diagram of the implementation of the selected solutions to improve the system of monitoring the priorities of the circular economy development has been developed. The practical application of this scheme allows choosing from a large number of alternative solutions those that have the greatest potential to improve the system of monitoring, as well as establish the sequence of implementation of possible solutions.
5. In business-structure management, monitoring is an element of the function of control. The development of monitoring based on a system approach is impossible without certain informational and analytical support. This is due to the fact that management, as well as management in general, have an information basis. Based on Hausdorf's theorem, it is proved that the phenomenon of developing the system of monitoring the activities of a business-structure is characterized by several independent sets, which, when combined, actually cause the development of the system of monitoring. It is proved that during the interaction of these sets and the factors acting on them, many opportunities arise for developing the system of monitoring, which ultimately lead to progressive or regressive development, which is caused by isometry and congruence of subsets of the phenomenon of the circular economy development.

6. The practical value of applying the developed management mechanism and the proposed model of information and analytical support for the process of forming the system of monitoring the business-structure activity in the circular economy development is that it is possible to use them by business-structures when making decisions that relate to reducing environmental risks, quality management, ensuring an increase in the level of environmental safety of goods offered on the market etc. Considering that the adherence to the values of the circular economy sustainable development and priorities provides positive effects, which, in general, reduce the conflict of interest between the business-structures and society, the author's proposals have good prospects for practical application that are practically proven on the empirical data of such business-structures as Parus, TAS, Naftogaz, Arsenal-center, continental farmers group, Naftakhim, Ukrmet, Potochishche, Spetsprominvest, TPH "Fozzy-group", Group "Furshet", LLC "ATB-Market", LLC "Kviza-Trade", Foxtrot, Comfy, Eldorado, etc.

Acknowledgments. Some material on the circular economy was prepared within the framework of the scientific project "Strategy and innovative technologies for the processing of organic animal waste in the context of ensuring land degradation neutrality: from linear to circular economy" (state registration number 0122U001484).

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