Journal of Engineering, Management and Information Technology

ASPUR PUBLISHING

Vol. 03, No. 03 (2025) 211-222, doi: doi:10.61552/JEMIT.2025.03.009 - http://jemit.aspur.rs

COGNITIVE SIMULATION OF ESG STRATEGIES OF RUSSIAN COMPANIES IN THE FIELD OF SMALL AND MEDIUM ENTERPRISE

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Received 03.07.2024.
Revised 11.08.2024.
Accepted 18.09.2024.

Keywords:

ESG, ESG-strategy, ESG-transformation, small and medium business, cognitive simulation, fuzzy cognitive model.

Original research

A B S T R A C T

This article presents the results of the study of ESG-transformation issues regarding Russian Small-and-Medium enterprises (SME). These results include the justification of relevance of ESG agenda for Russian business, carrying out the inquiry of companies' representatives, elaboration of the ESG strategy model for SMEs, based on the fuzzy cognitive logic technology. Based on a static analysis of system indicators of a fuzzy cognitive model, it was revealed that the content of the ESG strategy in the field of small and medium-sized businesses is determined by the level of ESG corporate culture, ESG motivation, and the integration of strategic management into ESG practices. On basis of impulse simulation of the ESG strategy, three scenarios for ESG business transformation implementation are substantiated, depending on its goals and resource provision. The significance of the study for practice lies in the possibility of businesses to use the cognitive model of ESG strategy when implementing ESG standards and developing a system for ESG transformation of SMEs. The authors consider the continuation of the study with an increase in its scale and assessment of the newly introduced organizational attributes of the ESG strategy of small and medium-sized businesses.

1. INTRODUCTION

The ESG agenda in business is an objective phenomenon caused by such trends as changes in climate conditions, an increase in the scarcity of natural resources, the rise of importance of working conditions, and growth in the scale of corporate conflicts. Organizations in developed countries take the implementation of ESG principles in their activities quite seriously. Thus, in 2022, 86% of G-250 companies and 76% of N100 companies used ESG information as a business management tool (Zhu & Huang, 2023). At the same time, 90% of companies included in the S&P 500 index officially publish ESG reporting (Governance & Accountability Institute, Inc., 2020). In Russia, ESG practice has now become a common agenda for leading domestic companies and does not need popularization and promotion at the level of large companies. Economy-leading companies are more or less actively integrating ESG principles into their management and business processes. The degree of activity depends on many reasons, ranging from the scale of the business, industry specifics, share capital structure and ending with such special and unique factors for a particular company as the type of corporate culture, leadership style, established business practices, management technologies used, etc. However, awareness to move from the paradigm of creating value for the owner to the paradigm of creating sustainable value for all stakeholders is no longer typical only for leading companies, but also for a fairly wide range of modern

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businesses in the country, including small and medium-sized businesses. Therefore, there is a great need to develop a mechanism for considering ESG factors in the activities of small organizations. The importance of small and medium-sized enterprises (SMEs) for the national economy is obvious. At the end of 2022, the contribution of this sector to the country's GDP exceeded 30 trillion rubles. Tax deductions from SMEs are also demonstrate upward trend (over the past two years the growth was more than 46%), and the number of SME companies is increasing (in February 2023 their number crossed the 6 million mark). However, the share of SMEs in Russia's GDP remains within 20%, which is almost 3 times less in comparison with developed countries (for example, Germany).

In the framework of the presented work, the ESG agenda is considered as a management toolkit for strategic management methodology. Therefore, as the goal of the study, the authors identified the development of a mechanism for modeling the ESG strategy of small and medium-sized businesses using cognitive technologies.

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2. LITERATURE REVIEW

2.1 Theoretical aspects of developing an ESG strategy for SMEs

Theoretical and empirical research in the field of application of the ESG concept in the strategic business management system is quite numerous (Ahmad et al., 2023). At the same time, they can be divided into two groups, which have fundamentally different positions on the impact of ESG principles on the performance of companies and their value. The first group of researchers, drawing on neoclassical economic theory, argues that ESG efforts and costs lead to lower business performance. The authors explain this by the fact that the ESG agenda is often accompanied by strong negative externalities, which forces company managers to act in their own interests, pushing organizational problems into the background. Research has shown, for example, that investors in the Korean stock market do not view ESG activities as a means to support their long-term sustainability (Do & Kim, 2020). High ESG performance has also been found to be associated with a decline in the value of European banks due to the effect of overinvesting in ESG and diverting idle resources away from business investments (Tommaso & Thornton, 2020). Another study assessed the relationship between ESG performance and corporate financial performance in Latin America and found a statistically significantly negative result (Aguilera et al., 2017).

The second direction of research is represented by works in which the authors, based on stakeholder theory, believe that the use of ESG approaches in their activities allows companies to increase their own income and positively influence the value of the business. Researchers empirically substantiate the sources of such results, linking them with strengthening the competitive position of business (Alsayegh et al., 2020; Mohammad & Wasiuzzaman, 2021), the ability to manage risk in their activities (Avramov et al., 2022), strengthening relationships with stakeholders (Alareeni & Hamdan, 2020).

A larger number of studies in assessing the impact of ESG practices on business performance are focused on considering the problem for developed markets (Buallay et al., 2023; Nekhili et al., 2021). However, the relevance of this problem for emerging markets in modern conditions is increasing, which is reflected in the growth of relevant scientific studies (Bahadori et al., 2021; Sun et al., 2022).

If we consider the substantive side of research on the subject of the importance of the ESG agenda for business, we should note the dominance of the conceptual direction of determining the impact of ESG indicators on the performance of companies. However, of particular interest is the data obtained from assessing ESG performance as a dependent variable (Crace & Gehman, 2023). As regressors on panel data for US companies, the authors considered internal effects associated with the CEO and the firm, and external factors determined by the specifics of the industry, time and location of the company. The results found that internal characteristics are most important in explaining company performance and that disaggregating ESG indicators into individual dimensions changes the relative importance of regressors.

In some works, the use of the ESG system in company management is revealed as a strategic process, which makes it possible to connect ESG technologies with strategic management methodology (Liang et al., 2022). Therefore, the authors recognize this concept as an important management strategy for the survival of the company. ESG strategy, as one of the most important determinants of sustainable growth, was selected to examine its mediating effect on the relationship between emerging markets and firm SMP (sustainable management performance). In addition, the authors link the content of the ESG strategy to the dynamic capabilities of the organization. In their view, to develop a successful overall firm strategy, it is necessary to focus core competencies on ESG strategy. In particular, it is also argued that dynamic capabilities should be considered in any strategic management process to enable enterprises to achieve their ESG objectives.

Other works show that in response to the changing business environment companies are redefining their roles and responsibilities to ensure sustainability beyond the mere pursuit of profit. Moreover, there is a movement to redesign existing management systems based on ESG strategies (van Duuren et al., 2016). Research on ESG

strategy clearly demonstrates that there is no doubt about the positive contribution of such strategy to creating company value (Wang & Ahmed, 2007; Parnell, 2011). It has been empirically proven that there is a relationship between ESG strategy, dynamic capabilities and firm value (Rashidirad et al., 2017).

In the context of the study, works on the problem of using ESG strategy in the practice of managing small and medium-sized businesses are of interest. Small and medium-sized companies are major contributors to job creation, economic growth, better income distribution and social entrepreneurship around the world. SMEs have a broad business base and close interaction with social subsystems. Consequently, their general impact on society in terms of sustainable consumption and lifestyle changes will only increase (Edussuriya, 2022). Zhu & Huang (2023) examine the impact of transformational leadership on ESG performance in SMEs, clarifying the place and role of organizational innovation in this process. However, there is a lack of discussion about how ESG can impact SMEs and whether it can offer solutions to some of the problems that SMEs face amid turbulence and new challenges. We highlight at least two potential advantages of small and medium-sized businesses, which actualize the problem of developing an ESG strategy in their activities in such conditions. First, ESG transformation expands opportunities for interaction with potential investors, which enriches the strategic vision of the business and increases its sustainability. Secondly, the use of ESG principles clearly makes it possible to identify bottlenecks in business management and enrich the company's knowledge assets. In this context it must always be remembered that ESG strategy involves a lot of procedures and reporting which can be costly for smaller organizations (Fenwick et al., 2022). From a strategic perspective, the importance of the ESG agenda in the SME sector is also revealed in a study conducted on the example of SMEs in Saudi Arabia (Shalhoob & Hussainey, 2023). The authors assessed the impact of environmental, social and governance disclosure on the sustainability performance of SMEs, identifying the creation of a good corporate culture as vital to achieving strategic goals.

According to Barclays Corporate, ESG strategies are becoming an increasing priority for SMEs abroad: for example, in the UK 95% of them implement an ESG strategy [1]. In Russia, the use of ESG transformation tools for small and medium-sized businesses is not widespread. At the same time, there is a noticeable positive trend in the increase in the number of companies using ESG strategies. The popularity of this approach in the activities of small organizations was influenced by both the value reorientation of public opinion towards the principles of sustainable development and the development of digitalization processes in the economy (Masalimova, 2021). Some authors also draw attention to the fact that in the context of political and economic global challenges, the importance of ESG-transformation of SMEs can be enhanced. There is a reorientation of Russian business towards the markets of the Asia-Pacific region, and this involves taking into account the requirements of Asian partners in the field of sustainable development, which are second after Europe in terms of the number of ESG regulation initiatives (Andreeva & Sonina, 2022). Exploring the problems of implementing ESG principles in small and medium-sized businesses in Russia, the authors argue that the success of developing and implementing an ESG strategy largely depends on the external conditions created by government authorities, financial organizations and investors, the media and public opinion in the area of the importance of the transition for sustainable development (Chepalo, 2023).

In general, based on the assessment of ESG practices in Russia, it can be argued that domestic business, following the global trend of public disclosure of the results of the implementation of the ESG strategy, in its non-financial reporting reflects the value proposition to the consumer about the products manufactured, features of personnel policy, and activities in the field of social and environmental responsibility, ethical work principles and the benefits of corporate culture (Izmailova, 2022).

A review of research results on the issue of ESG transformation of small and medium-sized businesses clearly demonstrates that despite the presence of a number of works revealing the essence of the ESG strategy and the main factors influencing its content (Lebedev, 2022; Kocharyan, 2022), questions about the tools for developing such a strategy remain outside the subject of scientific research. Therefore, the conducted research is focused not only on assessing the situation of development of the ESG agenda in the field of SMEs, but also on substantiating recommendations for the development of an ESG strategy using fuzzy cognitive logic.

The authors view ESG strategy as a business model that pays special attention to environmental, social and governance responsibility. Organizations can use ESG strategy to make decisions, making their business more sustainable and ethical. The goal of an ESG business strategy is to ensure transparent management, implement responsible social policies and achieve an ecologically motivated attitude towards the environment.

3. METHODOLOGY

The development of an ESG strategy model for small and medium-sized businesses was part of a comprehensive study of the problems of ESG transformation of Russian commercial organizations. To form the information base of the study, at the first stage, a questionnaire was developed that contained 38 questions in three blocks, allowing to obtain information about the state of the

[1]https://www.barclayscorporate.com/insights/industry-expertise/sme-business-landscape/esg/#why-have-an-esg-strategy

company's management system, the level of social responsibility of the business and the characteristics of its attitude towards the environment. The survey was not limited by business size. This approach to the study, when data was analyzed for both large corporate structures and small companies, was aimed at obtaining information that would allow differentiating survey participants based on their specific characteristics in the context of ESG transformation. In addition, the comparative format of business analysis depending on its size made it possible to formulate hypotheses, the verification of which determined the content of the corresponding ESG strategies. At the second stage, statistical processing of the questionnaires was carried out in order to test the hypotheses and identify factors influencing the ESG transformation of the company. The tools for conducting statistical analysis of personal data and verifying hypotheses about the influence of organizational attributes on the degree of compliance of the company with the goals and objectives of the ESG agenda are described in detail in the author's article (Maksimov et al., 2023). The construction of ESG strategy models at the next stage in accordance with the results of hypothesis verification was carried out in two directions - for large businesses and small organizations. Cognitive technologies were used as tools for developing strategic alternatives for ESG transformation of companies, the choice of which was due to a number of reasons. Firstly, the ESG transformation of an organization as a system is poorly structured. Therefore, the development of an ESG strategy mechanism cannot be limited to using only formalized research methods; the need for expert assessments, "common sense" logic, and intuition in this process is obvious. Secondly, it is important to solve this class of problems on the principles of systemic information analysis. And thirdly, decision-making at the company management level is always associated with significant risk; the consequences of errors in choosing an ESG strategy are great. Therefore, it is necessary to be able to assess in advance the consequences of various strategic alternatives, eliminate unacceptable options and justify the most effective ones. It is the cognitive approach that collectively forms the specified conditions for solving the stated research problems. To build a model of the organization's ESG strategy, fuzzy cognitive maps (FCMs) by V.V. Silov were used. (Silov, 1995; Borisov et al., 2018) and the "IGLA" DSS software system (Podvesovsky et al., 2019). The mathematical apparatus of cognitive modeling, with the help of which strategic alternatives to the ESG strategy are developed, is also described in detail in the articles of the authors (Anokhina et al., 2023; Anokhina, 2023a). We provide only general information on the mathematical support for static and dynamic analysis of a fuzzy cognitive model (FCM) (Table 1).

Accordingly, within the framework of this area of research, a cognitive model of the ESG strategy of SMEs was built. At the final stage of scientific research, strategic alternatives for the ESG transformation of small and medium-sized businesses were analyzed, and the basic conditions for their implementation were determined.

4. RESULTS

The formation of a testing ground for analysis and statistical assessment of the current state of ESG practices of Russian enterprises was carried out based on a survey of managers and specialists of 64 companies. The distribution of respondents according to the criteria of business size and its industry is presented in Figure 1, and Figure 2.

Respondents were also stratified for the presence of a special body or official in the company whose competence includes responsibilities for ensuring and developing ESG practices. It turned out that 56% of the surveyed companies have such structural units.

As part of the study, five hypotheses were put forward:

1. The size of the organization influences the level of compliance of activities with ESG standards.
2. Industry specifics influence an organization's commitment to ESG principles.
3. The organizational and legal form of an enterprise determines the level of implementation of ESG practices.
4. The presence of a special body or person responsible for promoting the ESG agenda improves the company's results in its implementation.
5. The presence in the organization of regulatory documents regulating the ESG agenda increases the effectiveness of ESG practices.

As a result of statistical processing of the survey material using the analysis of variance method, all hypotheses were confirmed, which made it possible to justify the need to develop an ESG strategy model for large businesses and SMEs, taking into account their size specificity (Maksimov et al., 2023). Other confirmed hypotheses also determined the feasibility of differentiating the companies under study, especially according to the criterion of industry characteristics. However, the scale of the study did not allow us to take into account the entire set of factors of organizational attributes of ESG strategies, which determined the possibility and feasibility of further scientific research. It should be noted that during cognitive modeling these factors were partially taken into account.

The construction of a fuzzy cognitive model (FCM) of the ESG strategy of SMEs was carried out on the basis of the knowledge gained during:

1. Monographic study of the works of specialists on the ESG agenda (Vederin et al., 2022; Turbina & Yurgens, 2022; Witold & McGlinch, 2019).
2. Survey of experts (15 people) in the field of ESG management of SMEs.

As a result, to build a model of the ESG strategy of small and medium-sized enterprises, 18 of the most important factors (concepts) were selected, which, according to their functional content, were divided into four blocks: target, E-factors, S-factors and G-factors. During

cognitive modeling, the ESG strategy system was represented as a directed weighted graph (Figure 3) and studied using static and dynamic analysis. Parametric identification of the cognitive model of the ESG strategy of SMEs made it possible to form a fuzzy cognitive matrix (Table 2). The selected concepts are complex in nature and have high-quality content, therefore the strength of their influence on each other was determined by the expert method based on a survey of specialists. Expert knowledge was processed as follows: for simple "nodes" of connections (when there is only one pair of concepts), the expert method was used with a direct assignment of weight. For complex "nodes" of connections (when there is more than one pair of concepts), to increase the level of objectivity, the expert assessment was adjusted using the method of paired comparisons using an alternative scale (Isaev, 2016).

The result of the static analysis of the fuzzy FCM ESG strategy of SMEs was the main system indicators (Table 3). The consonance of the influence of concepts on the system and systems on concepts is quite high. The values of these indicators mostly exceed 0.9, which determines a high degree of both confidence in the sign and the strength of influence. Accordingly, dissonance indicators as a fuzzy addition to consonance have a low value.

Analysis of system indicators made it possible to determine that the following concepts have the greatest positive impact on the system: "Level of ESG-corporate culture" ($\vec{P}_5 = 0{,}3671$), "ESG-motivation" ($\vec{P}_6 = 0{,}3167$), " Integration of strategic management into ESG issues " ($\vec{P}_{10} = 0{,}3324$), "Personnel Training and Development" ($\vec{P}_{14} = 0{,}3116$). By influencing these parameters, it is possible to "shift" the FCM in a positive direction, i.e. accelerate and ensure high-quality ESG transformation of the organization. Therefore, it is these concepts that should be considered as manageable in the process of dynamic simulation of the ESG strategies of a particular organization. However, it should be considered that of these factors, the greatest positive impact on target concepts is exerted by "Level of ESG-corporate culture", and "ESG-motivation". The concept "Resistance to Change" has a negative impact on the system. ($\overrightarrow{P_7} = -0{,}2101$). The system weakens the concept to a greater extent ($\overleftarrow{P_7} = -0{,}2545$). With this two-way negative influence, negative cycles arise. This means that if a given concept is influenced negatively, then its influence will be weakened, which will lead to a positive effect for the system as a whole. The relationship between the consonances of the concept and the system ($\overleftarrow{C}_7 = 0{,}98731$ и $\vec{C}_7 = 0{,}956$) allows to identify this concept as well balanced. It should be considered that this concept has the greatest negative impact on the target concepts (data from a negative transitively closed matrix). Therefore, by negatively influencing the concept, you can definitely improve the quality of the organization's ESG transformation. Thus, this concept is important for the development of the system as a whole, and when modeling ESG strategies of a particular organization, it is necessary to at least control it, and at most use it as a controlled one.

It is advisable to analyze the concepts recommended as manageable ones in terms of the level of centralization of influence. Such data will make it possible to achieve the adequacy of the choice of combinations of managed concepts in the dynamic modeling of ESG strategies. The indicator of centralization of influence for the concepts "Level of ESG-corporate culture", "ESG-motivation" and "Resistance to change" is low, which determines the high degree of consistency of these factors. Such consistency is manifested in the almost equal influence of the concept on the system and the system on the concept.

However, for the concepts "Integration of strategic management into ESG issues" and "Personnel Training and Development" such consistency is not achieved - the influence of these concepts on the system significantly exceeds the influence of the system on them. This indicates that these concepts are not supported by the system and almost independently strengthen the system, having a higher level of potential.

Scenario analysis of the behavior of cognitive maps of the ESG strategy was carried out on the basis of the mathematical apparatus of impulse processes (Silov, 1995; Erokhin et al., 2010) (Table 1). This technique allows you to predict the meanings of concepts at certain points in time.

The selection of scenarios for the ESG strategy of SMEs was developed based on the static analysis of the FCM. The choice of controlled concepts, their level and time of impact were determined by the expert method, considering the specifics of small and medium-sized businesses.

The values of the concept state in accordance with the cognitive technology used were specified and predicted by the values of the linguistic variable (Table 4).

Three ESG strategy scenarios were identified:

- scenario 1 describes a situation where the main managed concept is "Level of ESG corporate culture";
- scenario 2 is a forecast of the development of the situation under the influence of the concepts that form the strategic management system in the organization - "Integration of Strategic Management into ESG-issues" and "Value Creation Chain";
- Scenario 3 is complex in nature and assumes a phased moderate impact of all controlled concepts.

The results of scenario modeling of the ESG strategy of SMEs are presented in table 5.

Scenario 1. The presented scenario is implemented in the format of the "ESG-corporate culture" strategy. Accordingly, the concept "Level of ESG corporate culture" was considered as the main control influence. Under this scenario, it is possible to achieve target concepts at the initially specified level. In this case, the concept of "Enterprise Image" in a comparative format will have a higher value. The highest level of the ESG motivation concept will also be ensured. When implementing the "ESG-corporate culture" strategy, one should expect the least negative impact of the company's

activities on the surrounding ecosystems. The choice of this strategy can also be made according to the criterion of the level of the "R&D" concept of group G - factors, which in alternative versions of strategic initiatives is the highest.

Scenario 2. The ESG strategy – transformation of small and medium-sized businesses within this scenario involves the development of the company's strategic management system and its integration into ESG management. The main management impacts are considered to be a gradual change in two concepts - "Integration of Strategic Management into ESG-issues" of G – factors group, and "Value Creation Chain" of S – factors group. The implementation of this scenario will also allow achieving the established level of target concepts. However, of all the scenarios under consideration, the level of the target concept "Business Value" will be the highest, which determines the priority for the development of a strategic approach to ESG-transformation of small and medium-sized businesses. The strategic management methodology within this scenario will provide a very low level of resistance to change, which in general can also be considered as a criterion for choosing the considered scenario for the development of a SME company based on the results of the implementation of the ESG strategy. Another effective factor of scenario 2 is the achievement of a very high value of the concept "Level of Resource-saving and Waste-free Technologies".

Scenario 3. Development and implementation of an ESG strategy for SMEs involves significant cost and effort, which is often limited given the scale of the operation. Therefore, one of the ESG transformation scenarios justified a strategy option in which all managed concepts, considering their content, were changed in a complex. However, this change has been gradual and moderate, which can be considered as an ESG strategy for SMEs in conditions of limited resources and capabilities. The moderate nature of the changes in the controlled concepts suggested their corresponding strengthening or weakening by only one level. Therefore, when implementing the ESG strategy under consideration, it is possible to improve the company's performance parameters, but it will not be possible to achieve the desired level of target concepts. The concepts "Business Value" and "Company's Image" will increase by three levels and reach the average value. The competitiveness of the enterprise will increase by four levels and will be noted at the final stages of the model time with a value above average. Of course, it will not be possible to ensure breakthrough changes in ESG factors using this strategy, but a clear improvement can be achieved. ESG – motivation will increase by three levels, the concept "Level of Resource-saving and Waste-free Technologies" will also increase by three levels, the value of the R&D indicator will improve by two levels. And the negative impact of the company's activities on external ecosystems will be weakened by just one level.

Based on the results of scenario analysis within the framework of cognitive modeling of a weakly structured system of ESG strategy for small and medium-sized businesses, the following conclusions can be drawn.

1. The most preferable ESG strategy from the point of view of achieving the highest value of target indicators is an approach based on the development of a strategic management system and its integration into the company's ESG management (Scenario 2).
2. A company can achieve fairly high ESG parameters by implementing the "ESG-corporate Culture" strategy (Scenario 1). If the organization has the appropriate potential and management is interested, this scenario can be highly effective in achieving the highest level of ESG motivation of staff and the least negative impact of the company on external ecosystems.
3. In conditions of limited resources and opportunities to improve the company's ESG parameters, it is advisable to use a comprehensive ESG strategy based on a moderate change in all managed concepts (Scenario 3). However, with a general improvement in the company's ESG position, it will not be possible to achieve high values of indicators of value, competitiveness and image of the organization. Those. we can conclude that ESG strategy activities require significant effort and a moderate level of change in managed concepts will not provide breakthrough values for the target parameters of the activities of SMEs.

5. DISCUSSIONS

The cognitive approach in modern scientific research practice is increasingly being used to solve various problems (Amini et al., 2022; Papageorgiou et al., 2020; Anokhina, 2023b; Dodouras & James, 2007; Gray et al., 2015; Mezei & Sarlin, 2016; Solana-Gutiérrez et al., 2017; Podgorskaya et al., 2019). A number of authors also use fuzzy cognitive logic in the study of ESG factors. Thus, it has been proven that the inclusion of ESG factors in the decision-making process of financial institutions leads to increased sustainability of financial systems. It is fuzzy cognitive maps that have been used by researchers to determine ESG factors that influence the level of sustainability of such structures (Ziolo et al., 2019). 62 factors were identified, of which 21 were environmental, 25 were social, and 16 reflected corporate governance features (Ziolo et al., 2020). A continuation of the authors' research using NCM is the analysis of ESG risk in various business sectors (Ziolo et al., 2023). Using the NCM, Bąk and Cheba (2020) also examine 23 indicators describing the goals of the Sustainable Development Strategy of the 2030 Agenda and prove that such goals are not always interrelated. The results obtained indicate a lack of relationships between the individual indicators chosen to describe the sustainable development goals. In general, it should be noted that the current state of research in this area is not large-scale, in particular for SME organizations. The reason is the novelty of the problem and the lack of broad experience in the practice of using ESG standards by business, especially domestic companies. Researchers most often follow the path of

identifying ESG factors and building a cognitive model of ESG strategy depending on industry specifics. Given a sufficiently large number of factors, unfortunately, the mechanism for using the developed models for SMEs is not considered. As part of our research, we propose an NCM ESG strategy for SMEs, which a business, depending on its specifics and goals, can use when implementing ESG standards and developing an ESG transformation system. At the same time, we do not exclude the possibility for a particular organization, depending on the characteristics of the business, to adjust the proposed model during the static analysis of the NCM and the development of strategic alternatives during impulse modeling. Such an adjustment can take place if a more specific information base is available, which in this case makes it possible and appropriate to use formalized methods (for example, statistical ones) to establish connections between concepts. This approach will certainly enhance the reliability of the dynamic analysis of NCM and increase the validity of the choice of the company's ESG strategy.

In general, it can be noted that the ESG agenda for modern small and medium-sized businesses is quite relevant, its solution requires a systematic approach and, accordingly, the use of cognitive technologies as an instrumental basis for developing a mechanism for the ESG strategy of SMEs is quite justified and logical.

6. CONCLUSION

The results of the study expand knowledge about the mechanism of ESG transformation of domestic small and medium-sized businesses using strategic management methodology.

Table 1. Mathematical apparatus of static and dynamic analysis of a FCM

Indicators	Formulas of calculatipn
FCM static analysis	
p_{ij} – impact of the i-th concept over the j-th concept; z_{ij} – power of positive impact of the i-th concept over the j-th concept; $\overline{z_{ij}}$ - power of negative impact of the i-th concept over the j-th concept; sign(x) – returns the sign of the x value	$p_{ij}=\text{sign}(z_{ij}+\overline{z_{ij}})\max(\lvert z_{ij}\rvert, \lvert\overline{z_{ij}}\rvert), \lvert z_{ij}\rvert \neq \lvert\overline{z_{ij}}\rvert$
$\overrightarrow{P_i}$ - impact of the i-th concept over the system; n – number of concepts; p_{ij} – impact of the i-th concept over the j-th concept	$\overrightarrow{P_i} = \frac{1}{n}\sum_{j=1}^{n} p_{ij}$
$\overleftarrow{P_j}$ - impact of the system over the j-th concept; n – number of concepts; p_{ij} – impact of the i-th concept over the j-th concept	$\overleftarrow{P_j} = \frac{1}{n}\sum_{i=1}^{n} p_{ij}$
I_i^p – impact's centralization; $\overrightarrow{P_i}$ – impact of the i-th concept over the system; $\overleftarrow{P_i}$ – impact of the system over i-th concept	$I_i^p = \overrightarrow{P_i} - \overleftarrow{P_i}$
c_{ij} – impact consonance of the i-th concept over the j-th concept	$c_{ij} = \frac{\lvert z_{ij} + \overline{z_{ij}}\rvert}{\lvert z_{ij}\rvert + \lvert\overline{z_{ij}}\rvert}$
$\vec{C}_i$ - impact consonance of the i-th concept over the system; c_{ij} - impact consonance of the i-th concept over the j-th concept; n – number of concepts	$\vec{C}_i = \frac{1}{n}\sum_{j=1}^{n} c_{ij}$
$\overleftarrow{C_j}$ - impact consonance of the system over the j-th concept	$\overleftarrow{C_j} = \frac{1}{n}\sum_{i=1}^{n} c_{ij}$
I_i^c –consonance centralization	$I_i^c = \overrightarrow{C_i} - \overleftarrow{C_i}$
d_{ij} –dissonance of the i-th concept over the j-th concept	$d_{ij} = 1 - c_{ij}$
$\vec{D}_i$ - dissonance of the i-th concept over the system	$\vec{D}_i = \frac{1}{n}\sum_{j=1}^{n} d_{ij}$
$\overleftarrow{D_j}$ –dissonance of the system impact over the j-th concept	$\overleftarrow{D_j} = \frac{1}{n}\sum_{i=1}^{n} d_{ij}$
FCM dynamic analysis	
$v_i(t+1)$ – the i-th concept value at the time instance t + 1; $v_i(t)$ – the i-th concept value at the time instance t; $q_i(t+1)$ – external action over the i-th concept at the time instance t + 1; $o_i(t+1)$ – managerial action over the i-th concept at the time instance t + 1;	$v_i(t+1) = S(v_i(t) + q_i(t+1) + o_i(t+1) + \sum_{j=1}^{K} T(w_{ij}, p_j(t)))$,

$w_{ij} = w(e_j, e_i)$ – connection strength between i-th concept and the j-th concept; $p_j(t)$ – change of the j-th concept value at the time instance t; T – T-norm function (multiplication operation); S – S-norm function (S-norm by Lukasevich).	

The authors have developed a cognitive model of ESG strategy, considering, on the one hand, the specifics of SMEs, and, on the other hand, modern trends in the ESG agenda of a national and global nature.

The conclusions from the study are as follows.

1. The relevance of the ESG agenda for Russian business, including SMEs, will increase. At the same time, it is important to ensure the need to develop theoretical and methodological provisions of the ESG concept, considering national characteristics and priorities.
2. The need to develop an ESG strategy model for SMEs was substantiated through a survey of Russian business representatives and statistical analysis of the information received, which made it possible to identify factors for the company's ESG transformation.
3. Using fuzzy cognitive logic technologies, a model of the ESG strategy of SMEs was developed, the static and dynamic analysis of which made it possible to identify the three most important scenarios for the implementation of the company's ESG transformation, depending on its goals and available resources.
4. The results obtained during the study determine the possibility of continuing scientific research on the issue of ESG transformation of Russian business by expanding the range of survey respondents and introducing various organizational attributes that influence the mechanism of the company's ESG strategy.

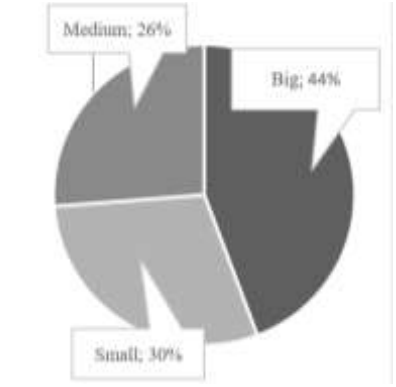


Figure 1. Distribution of respondents by business size
Source: The authors

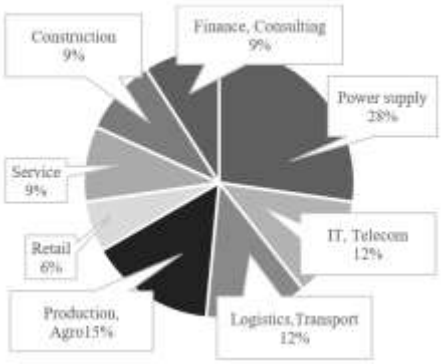
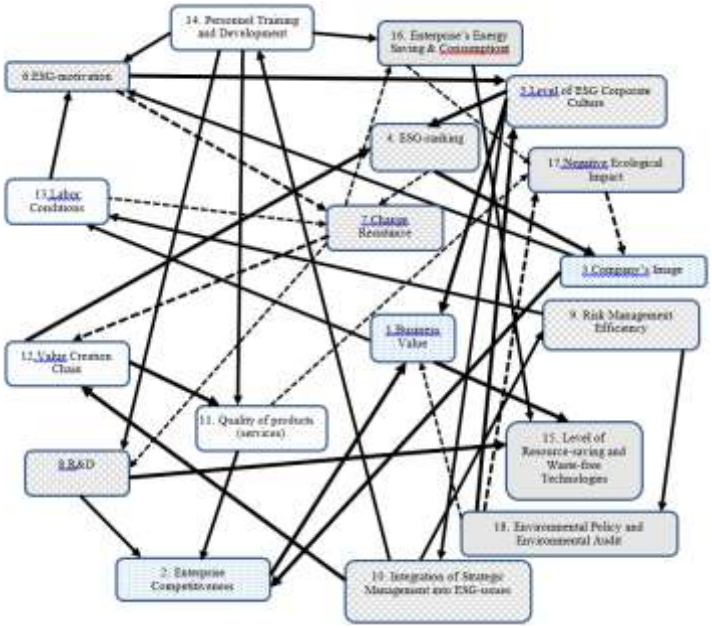


Figure 2. Distribution of respondents by industries
Source: The authors



Legend:

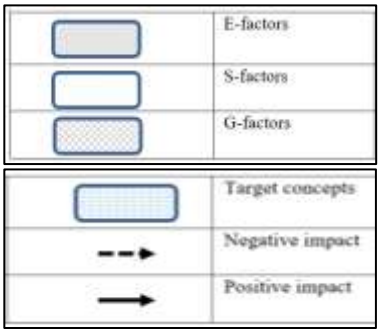


Figure 3. FCM ESG strategy of SMEs
Source: The authors

Table 2. Fuzzy cognitive matrix of SME ESG strategy model

№ of impact concept	№ of concept impacted																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	0	0	0	0	0	0	0	0	0	0	0	0	0,62	0	0,7	0	0	0
2	0,9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0,75	0	0	0	0,33	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0,7	0	0	0	-0,35	0	0	0	0	0	0	0	0	0	0	0
5	0,85	0	0	0,75	0	0	-0,45	0	0	0,67	0	0	0	0	0	0	0	0
6	0	0	0	0	0,8	0	-0,65	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	-0,3	0	0	0	-0,55	0	0	0	-0,38	0	0
8	0	0,62	0	0	0	0	0	0	0	0	0	0	0	0	0,8	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0,8	0	0,45	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0,7	0	0	0,7	0	0,52	0	0	0	0
11	0	0,8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0,52
12	0	0	0	0,76	0	0	0	0	0	0	0,85	0	0	0	0	0	0	0
13	0	0	0	0	0	0,75	-0,4	0	0	0	0	0	0	0	0	0	-0,25	0
14	0	0	0	0	0	0,65	0	0,52	0	0	0,61	0	0	0	0	0,45	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0,75	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0,65	0	0	0
17	0	0	-0,65	0	0	0	0	0	0	0	0	0	0	0	0	0	-0,25	0
18	-0,13	0	0	0	0,65	0	0	0	0	0	0	0	0	0	0	0	-0,3	0

Source: *The authors*

Table 3. System indicators of the cognitive model ESG strategies for SMEs

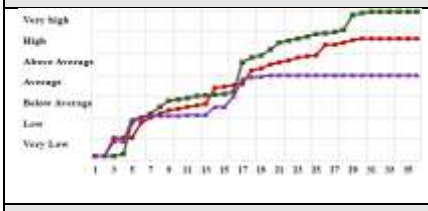
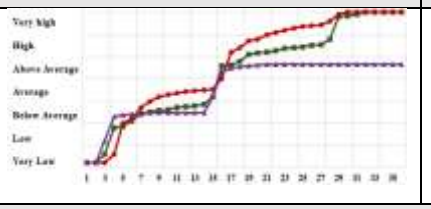
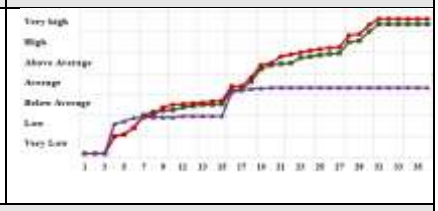
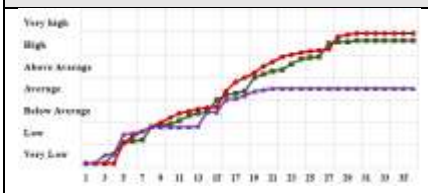
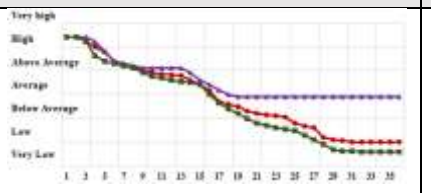
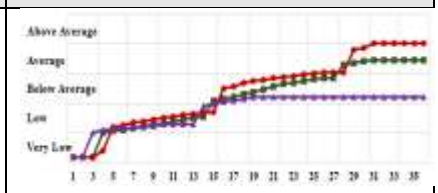
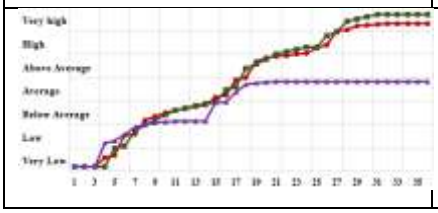
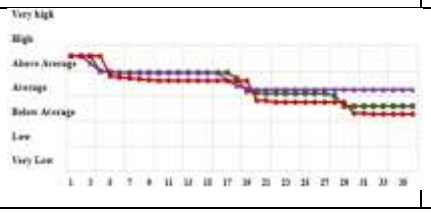
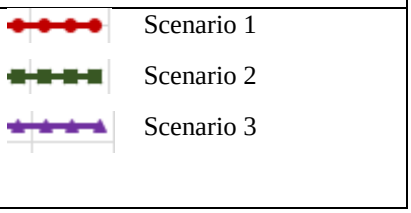
№ of concept	$\vec{C}_i$	$\overleftarrow{C_j}$	$\vec{D}_i$	$\overleftarrow{D_j}$	$\overrightarrow{P_t}$	$\overleftarrow{P_t}$	I_i^p
1	0,9784	0,9296	0,0216	0,0704	0,2704	0,4601	-0,1897
2	0,9806	0,9611	0,0194	0,0389	0,2773	0,3803	-0,1030
3	0,9809	0,9623	0,0191	0,0377	0,2392	0,2557	-0,0165
4	0,9836	0,9605	0,0164	0,0395	0,1954	0,3620	-0,1666
5	0,9586	0,9601	0,0414	0,0399	0,3671	0,2973	0,0698
6	0,9629	0,9424	0,0371	0,0576	0,3167	0,2982	0,0184
7	0,9873	0,9560	0,0127	0,0440	-0,2101	-0,2545	0,0445
8	0,9846	0,9654	0,0154	0,0346	0,2683	0,0997	0,1687
9	0,8489	0,9670	0,1511	0,0330	0,2783	0,1519	0,1264
10	0,9233	0,9624	0,0767	0,0376	0,3324	0,2228	0,1096
11	0,9821	0,9526	0,0179	0,0474	0,2426	0,3691	-0,1265
12	0,9852	0,9426	0,0148	0,0574	0,2852	0,3384	-0,0531
13	0,9652	0,9341	0,0348	0,0659	0,2659	0,3150	-0,0491
14	0,9739	0,9670	0,0261	0,0330	0,3116	0,1405	0,1711
15	0,9860	0,9339	0,0140	0,0661	0,2422	0,4012	-0,1590
16	0,9869	0,9610	0,0131	0,0390	0,1738	0,1025	0,0713
17	0,9818	0,9691	0,0182	0,0309	-0,1848	-0,1229	-0,0619
18	0,7507	0,9738	0,2493	0,0262	0,2502	0,1046	0,1456

Source: *The authors*

Table 4. Initial states of cognitive model concepts ESG strategies for SMEs

Concept	**Grade**
1 – Business Value	Very Low
2 – Enterprise Competitiveness	Very Low
3 – Company's Image	Very Low
4 – ESG-ranking	Very Low
5 – Level of ESG Corporate Culture	Low
6 – ESG-motivation	Very Low
7 – Change Resistance	High
8 – R&D	Very Low
9 – Risk Management Efficiency	Very Low
10 – Integration of Strategic Management into ESG-issues	Very Low
11 - Quality of products (services)	Under average
12 - Value Creation Chain	Low
13 - Labor Conditions	Under average
14 - Personnel Training and Development	Low
15 - Level of Resource-saving and Waste-free Technologies	Very Low
16 - Enterprise's Energy Saving & Consumptiont	Very Low
17 - Negative Ecological Impact	Above Average
18 - Environmental Policy and Environmental Audit	Very Low

Table 5. Results of scenario modelling of SME ESG strategy

Dynamics of the state of target concepts		
Concept «Business Value»	**Concept «Enterprise Competitiveness»**	**Concept «Company's Image»**
		
Dynamics of the state of uncontrollable concepts		
Concept «ESG-motivation»	**Concept «Change Resistance»**	**Concept «R&D»**
		
Concept «Level of Resource-saving and Waste-free Technologies»	**Concept «Negative Ecological Impact»**	**Legend**
		

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