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ACCOUNTING AND ANALYTICAL SUPPORT FOR THE COMPANY INNOVATIVE DEVELOPMENT STRATEGY FORMATION

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Abstract. *The development of economic relations, ways of managing them and the efforts of the scientific community to understand the causal links of such changes determine the intensity of proposals to modify the concept of accounting taking into account the strategic vector of its development. The effectiveness of management decisions depends on many factors, in particular, on the quality of accounting and analytical information, the formation of which is the quintessence of the arrangements and maintenance of strategic management accounting in the company. The functionality of strategic management accounting as the system integrity is increased within the system of accounting and analytical support for managing the activities of the economic entity. The announced descriptive model of the information process in the system of strategic management accounting is aimed at improving the accounting and analytical support for the processes of development and implementation of the strategy of innovative development of the company. Assessment of the strategic stability of the company in the implementation of the strategy of innovative development is a necessary condition for the formation of multi-dimensional accounting and analytical information, which confirms the need to improve analytical and assessment procedures to achieve a higher level of efficiency of management decisions.*

Keywords: *strategic management accounting, innovative development, sustainability, accounting and analytical information, efficiency of management decisions.*

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Introduction

The implementation of the innovative model of development of the national economy involves coordinating the innovation strategy of the industry, regions and companies. The analysis of the experience of developed countries shows that the introduction of innovations is one of the main factors (catalysts) for sustainable growth of the national economy.

The strategy of innovative development in the modern concept of management involves the development and implementation of management decisions aimed at ensuring the long-term operation and development of the company. External conditions of operation and development of the company are characterized by increasing aggressiveness of the competitive environment, risks and uncertainty of the external environment, which requires improvement of information support for the development and implementation of innovation development strategy, an element of which is strategic management accounting information.

In general, the formation of a portfolio (set) of innovation strategies of the company is taken place in the context of specific parameters of its overall socio-economic and innovation goals and the corresponding innovation objectives and the main determinants (factors) of innovation development.

The complexity of the formation of accounting and analytical support for building a strategy of innovative development of the company is due to:

diversity related to the implementation of different kinds of activities of the company and a complex of different types of works to manage these activities;

differences in conditions and rules of information formation in the subsystems of: accounting, analysis and control;

differences in the target direction of the generated information: in time (for activities in previous reporting periods, for current activities, for future activities), by areas of use (in planning, analysis, control, etc.), by including the number of objects and etc. in the information;

opportunities for systematization and processing of information with the help of professional, local, generally accepted and standardized computer programs and databases.

Literature Review

The analysis of scientific works allowed to conclude that the strategy of innovative development of the company:

- influences the entire value chain of the company, from the development and production of new products to the development of the customer base (Honggowati, S., Rahmawati, R., Aryani, Y. A., & Probohudono, A. N. (2017));

- takes into account the interaction with a wide range of stakeholders, whose impact on the long-term sustainability of the company can be significant (Doktoralina, C., & Apollo, A. (2019));

- is taken under conditions of uncertainty and risks, which shape the factors of the internal and external environment (Trigeorgis, L., & Reuer, J. J. (2017); Mahlendorf, M. D. (2014)).

The scientific works use different approaches to the study of innovation development strategy: systemic (Cinquini, L., & Tenucci, A. (2010); Taipaleenmäki, J. (2014)), comprehensive (Kalkhouran, A. A. N., Nedaei, B. H. N., & Rasid, S. Z. A. (2017)), process (Cooper, D. J., Ezzamel, M., & Qu, S. Q. (2017)), resource (Cuganesan, S., Dunford, R., & Palmer, I. (2012); Lambert, C., & Sponem, S. (2012)), however, the main characteristics of scientists are as follows:

attention to the implementation of long-term measures;

focus on new technologies allowing to depart from conservative rules, namely: analysis of development opportunities; identification of key technologies and competencies related to their implementation; managing the quality of new processes and products; strategic regulation of innovation processes, etc.

The selected strategy of innovative development of the economic entity must meet the objectives and be developed in accordance with alternative strategies (Ax, C., & Greve, J. (2017)). To select strategic alternatives, management must have a clear concept of company development shared by all employees and rely on appropriate information support.

Methods

The need to take into account a significant number of heterogeneous and interrelated factors in the conditions when these relationships are not always clear and obvious and may remain unknown for some time requires the use of special methodological tools for assessing the strategic sustainability of the company.

In our opinion, such tool is the framework of fuzzy set theory (FST). Fuzzy set theory is a mechanism for formalizing one of the types of uncertainty that arises when modeling real objects. Within the framework of the fuzzy set theory, a mechanism for formalizing meaningful concepts was developed, examples of which are "stable situation", "high level of security", "stable financial condition", etc.

Thus, there appears an opportunity to reduce qualitative expert assessments to quantitative, numerical (though fuzzy) ones. On the other hand, fuzzy sets give the expert higher level of flexibility in the assessment of quantitative indicators and allow to include financial indicators along with non-financial ones in the model.

Within the framework of FST, the term set (T) is created – it is the set of all possible values of the linguistic variable (A), the values of which can be words or phrases of natural language. The modeling involves the construction of a binary (good-bad, high-low), three- (low, medium, high) or five-level (too low, low, medium, high, too high) basic term set.

Next, there determined the system of weights d_j, selected indicators, that is for each indicator y_i there matched the level of its significance for assessment d_j. If the levels of significance of all indicators are taken as equivalent, the coefficient d_j will be equal to *1/l* in the calculations.

If the levels of significance are not equivalent, d_j is calculated according to Fishburne's rule:

$$d_j = \frac{2(l - j + 1)}{l(l + 1)} \quad (1)$$

where *l* - number of indicators, *j* - level of significance of an indicator.

Recognition of membership levels of selected indicators is based on the membership function $b_A(y)$ for each linguistic variable of the base term set *T*. The membership function $b_A(y)$ is a function which domain is the member y and which range is a unit interval [0,1]. The higher $b_A(y)$, the higher the membership degree of the member element to the fuzzy set *A*.

At the next stage, it is necessary to create a set of nodes a_m, which determine the maximum of the membership function for each linguistic variable $b_{jm}(y_{mj})$. Then according to the fuzzy set theory, the linguistic variables in combination with the set of nodes are two-, three-, five-level fuzzy 01-classifier, depending on the results of modeling.

Then a classifier (two-, three-, five-level fuzzy 01-classifier) is built for each of the selected indicators, so you can go from a set of certain indicators to an aggregate of strategic stability S_i, the value of which is also recognized thanks to the classifier. Quantitative value of the aggregate of strategic stability is determined by the formula of double additive convolution:

$$h(S_i) = \sum_{m=1}^{p} a_m \sum_{j=1}^{l} d_j b_{jm}(y_{mj}) \quad (2)$$

where a_m - classifier nodes (m= 1..5); d_j - weight of factor j in the convolution (*j* = 1..7); $b_{jm}(y_{mj})$ - value of membership function of quality level m in relation to the current value of factor *j*.

Results

The dynamics of business, strengthening of a competitive landscape influence stability of operation and development of companies, therefore, maintenance of sustainable development of a

company in the long run actualizes introduction of effective mechanisms of assessment of threats of internal and external environments for the purpose of leveling their influence on stability of a company.

This requires the search for methodical approaches for assessment of the strategic stability of companies, which would make it possible to determine its level with a high degree of reliability, to identify threats in a timely manner. The formation and development of strategic management accounting can help solve the problem of generating and presenting information for assessment of the strategic stability of companies.

The summary of the calculation of the assessment of the strategic stability of the Renault Group is presented below.

An expert group of 10 experts from specialists and managers identified the following components of strategic stability: economic, environmental, social. The following is an assessment of strategic stability by the aggregate of economic stability. The assessment of other components was carried out in the same way. The experts have identified a set of indicators to assess the level of the aggregate of economic stability in terms of financial and non-financial indicators. For the selected indicators, the intervals of values of fuzzy linguistic variables – "very high", "high", "medium", "low", "very low" – are determined by the experts. For each linguistic variable, the parameters of the main membership functions (3-7) and nodes are entered a_m = (0.1; 0.3; 0.5; 0.7; 0.9):

$$b_1(y)=\begin{cases}1, & 0\le y\prec 0{,}15;\\ 10(0{,}25-y), & 0{,}15\le y\prec 0{,}25;\\ 0, & 0{,}25\le y\le 1.\end{cases}$$

$$b_2(y)=\begin{cases}1, & 0\le y\prec 0{,}15;\\ 10(y-0{,}25) & 0{,}15\le y\prec 0{,}25;\\ 1, & 0{,}25\le y\prec 0{,}35;\\ 10(0{,}45-y) & 0{,}35\le y\prec 0{,}45;\\ 0, & 0{,}45\le y\le 1.\end{cases}$$

$$b_3(y)=\begin{cases}1, & 0\le y\prec 0{,}35;\\ 10(y-0{,}35) & 0{,}35\le y\prec 0{,}45;\\ 1, & 0{,}45\le y\prec 0{,}55;\\ 10(0{,}65-y) & 0{,}55\le y\prec 0{,}65;\\ 0, & 0{,}65\le y\le 1.\end{cases}$$

$$b_4(y)=\begin{cases}1, & 0\le y\prec 0{,}55;\\ 10(y-0{,}55) & 0{,}55\le y\prec 0{,}65;\\ 1, & 0{,}65\le y\prec 0{,}75;\\ 10(0{,}85-y) & 0{,}75\le y\prec 0{,}85;\\ 0, & 0{,}85\le u\le 1.\end{cases} \qquad (3)$$

$$b_5(y)=\begin{cases}1, & 0\le y\prec 0{,}75;\\ 10(y-0{,}575) & 0{,}75\le y\prec 0{,}85;\\ 1, & 0{,}85\le y\le 1.\end{cases}$$

In order to determine the weights d_j of the selected indicators, the levels of significance of the indicators were assessed using an expert method. As a result, the levels of significance were defined as unequal.

In order to rank the indicators and determine the degree of consistency of experts' opinions, the indicators were ranked according to the degree of importance when assessing strategic stability, a matrix of transformed ranks and a matrix of normalized weights were created. The group opinion of the experts is based on the centroid method.

The assessment of the consistency of experts' opinions was carried out on the basis of the calculation of the multiple rank correlation coefficient in the presence of connected ranks *W*. As a result, is there was obtained the value of the concordance coefficient *W* = 0.742. The verification of the statistical significance of the concordance coefficient was carried out using the Pearson's consent criterion y_2. The results of ranking the selected indicators by the centroid method and determining the weight of each of the indicators by the Fishburne's method are presented in Table 1.

Table 1
Results of indicator ranking and the weight of each of the indicators by the Fishburne's method

Criteria for assessment of economic strategic sustainability S_A	Weight, d_j	Rank	Significance by the Fishburne's formula
dynamics of image and business reputation (y_1)	0.221	1	0.25
dynamics of the company market share (y_2)	0.121	4	0.1429
financial stability index (y_3)	0.079	7	0.0357
profitability of sold innovative products (y_4)	0.099	5	0.1071
current liquidity ratio (y_5)	0.089	6	0.0714
return on equity (y_6)	0.201	2	0.2143
strategic management effectiveness (y_7)	0.19	3	0.1786

To assess the strategic economic stability of the Renault Group, the levels of membership b_{jm} to the fuzzy subsets of the term set of variable values are calculated. The basis is a matrix with selected quality levels: "very high", "high", "medium", "low", "very low" - these are the columns of the matrix, the selected indicators are its rows, the cells of their intersection are the levels of membership to the quality levels. The results of calculation are given in Table 2.

Table 2
The matrix of the levels of membership b_{jm} to the fuzzy subsets of the term set of variable values

Criterion	Membership functions for the levels of economic strategic stability				
	too high, b_1	high, b_2	medium, b_3	low, b_4	too low, b_5
y_1	0	1	0	0	0
y_2	1	0	0	0	0
y_3	1	0	0	0	0
y_4	1	0	0	0	0
y_5	1	0	0	0	0
y_6	0	1	0	0	0
y_7	0	1	0	0	0

The calculation of the aggregate for assessment of strategic economic stability was carried out by formula (2). The results of its calculation are presented in Table 3.

Table 3
Results of calculation of the aggregate of economic stability

Quality levels, m	Nodes, a_m	Calculation of internal convolution $\sum_{j=1}^{l} d_j b_{jm}(y_{mj})$	Aggregate of economic stability, S_A
1	0.9	0.3571	0.771
2	0.7	0.6429	
3	0.5	0	
4	0.3	0	
5	0.1	0	

The linguistic recognition of the level of strategic economic stability of the company is given in Table 4.

Table 4
Classifier of levels of the aggregate of economic stability of the company, S_A

Value range	Linguistic value of the variable, A
[0; 0.2]	Very low level
[0.2; 0.4]	Low level
[0.4; 0.6]	Sufficient level
[0.6; 0.8]	High level
[0.8; 1.0]	Limit level

By the determined level, the aggregate of strategic economic stability of the Renault Group is high. By a similar algorithm, there were calculated the aggregates of strategic environmental and social stability with the corresponding levels of 0.38 and 0.522.

To the most important criteria of environmental stability, we propose to attribute: total amount of raw materials used (broken down by type); energy use (broken down by primary sources); energy consumption; water sources and ecosystems (habitats), which are significantly affected by water use; total environmental costs per 1 thousand US dollars of sales revenue; total environmental costs per employee of a company; dynamics of the values of environmental costs, including the amount of fines paid for violations of environmental legislation; amount of investment in environmental protection; "transparency" of environmental reporting.

To the most important criteria of social stability, we propose to attribute: expenses on the training of employees and specialists; expenses on the professional development of management staff; incentive and social payments (assistance to employees) from the company profits; sales volume and profit per employee.

The results of assessment of the strategic stability of a company by components are proposed to be displayed on the corresponding axes of the radar chart, which makes it possible to compare the magnitude of several values, each of which corresponds to a point on the axis, several periods, reference values (Figure 1).

The number of axes corresponds to the number of components of strategic stability. Based on the results of the assessment of strategic stability, management decisions and recommendations are made, the goals and methods of sustainable development management are adjusted.

The development of analytical functions of strategic management accounting is focused on providing information to managers in order to manage strategic stability and display information in

management reporting. Information on strategic stability can be provided in the form of open reporting.

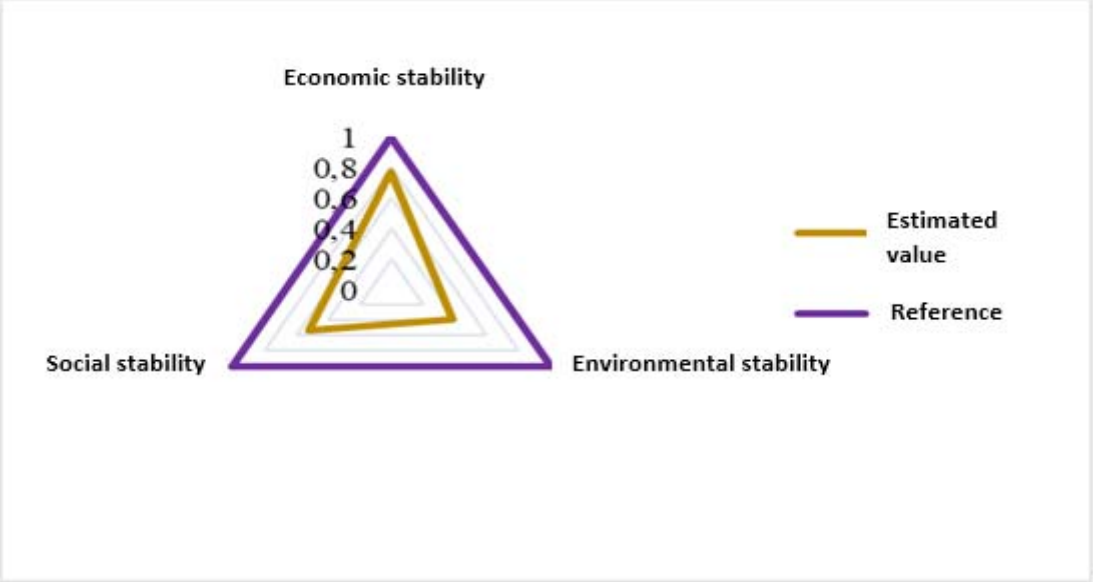

Figure 1. Results of assessment of strategic stability of Renault Group and comparison with reference values
Source: author's development

Thus, the principles of completeness and relevance of reporting data acquire their further development due to the fact that, along with information of a current or general nature, it contains data on opportunities and threats to the company.

The selection of a method for assessment of strategic stability depends on the accuracy of the obtained estimates, the complexity of the calculations, intuitive understanding of the calculation algorithm and other factors that provide convenience in the practical application of the method. Thus, in many works it is argued that fuzzy-set tools are in many cases simpler than probabilistic methods.

Discussion

The synergizing effect of the use of converged forms of accounting-analytical support for the development and implementation of strategies for innovative development of firms through mergers, and the imposition of a complex set of factors, actions and efforts of accountants and managers of the company.

This effect can be assessed using several groups of criteria that characterize different aspects, significant changes in the practice of modern business structures. In our opinion, the following groups of criteria are the most important:

organization and management: strength and reliability of internal and external relations of the organizational form; flexibility and adaptability of the organizational management structure; scale of activity; availability of qualified management and strategic management system; formation of knowledge and innovation activity management system; development of a strategy for diversification of services and forms of service, improving the quality of service; competence and efficiency of decision-making;

economic: dynamic of sales volumes by types of services; growing market share; cost reduction; indicators of production costs, profitability, profit;

financial: solvency; debt to counterparties; level of tax payments; financial stability index, liquidity ratio, debt ration, working capital ratio; growth of market value (capitalization) of the company; financial risks;

social: activity, creativity, satisfaction and interest of staff; staff qualification growth; social security and social protection of employees; stimulation and development of team motivation, etc.

Conclusion

The most relevant system of information support for the management of innovative development of the company is an integrated system that combines systems of strategic management accounting, planning, analysis and control, and is focused on:

from the standpoint of organizational, methodological and methodological support, on the formation of the information field of the company development strategy by conducting accounting, control and analytical procedures;

from the standpoint of ensuring efficiency and effectiveness, on the accumulation of a significant amount of information to meet the information needs of users of different levels of management of a company;

from the standpoint of goal setting, on the compliance with the information determinant of the organizational and economic mechanism of development and implementation of the company development strategy.

There was proposed a methodical approach to the assessment of the strategic stability of the company in the system of strategic management accounting, which includes preparatory (development of methodical tools for the assessment of the strategic stability), analytical (implementation of analytical procedures to determine the integrated value of the strategic stability) stages and assessment stage, which gives an opportunity to assess the strategic stability of the company in key areas: economic, social and environmental. The advantage of this method is the ability to obtain the resulting value, which is defined as the weighted average of all selected criteria, on the one hand, and all qualitative levels of these criteria, on the other hand.

The proposed methodology allows to include financial criteria along with non-financial criteria in the model. At the same time, the formalization of the assessment process, on the one hand, will allow the correct use of analytical techniques based on a balanced approach, and on the other hand, this will increase the validity and reliability of strategic management decisions as regards ensuring sustainable operation and development of the company. The use of the proposed technique in practical activity will increase analytical possibilities of diagnostic and will ensure implementation of multi-level assessment of strategic stability of a company.

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