Development of a Regression Model of the System of Factors Influencing the Development of Strategic Management

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Keywords: Strategic management, Regression analysis, Change, Survey, Key levers of change, Corporate culture, Resistance to change.

Abstract: Using the questionnaire method, studies were conducted on the influence of 15 factors on the development of strategic management in the 161 organization, grouped into blocks: the context of the company, the key levers of change, the processes of preparation and implementation of change. The purpose of the work is to develop a multidimensional regression model of the process of implementing strategic management in a developing economy, which makes it possible to effectively develop the company's key system that affects human capital and its labor productivity. Using regression analysis, it is shown that each of the four blocks of factors makes approximately the same contribution (0.245 – 0.260) to the total optimal predictor, with the coefficient of determination $R^2 = 0.62$, which indicates the presence of a relatively strong statistical relationship between these variables. For the dependence of the results of strategic development on the blocks, the preparation process and the implementation of the change $R^2 > 0.53$, which also indicates the presence of a statistical relationship. Among the individual indicators, the following had the greatest impact on the results of strategic development: "Reasons for strategy development" (contribution coefficient $K_3 = 0.14$), "Personnel education" ($K_7 = 0.09$) and "Organization structure" ($K_6 = 0.095$). A significant contribution ($K_N = 0.075 – 0.09$) is also made by the indicators: "Company size", "Change preparation", "Level of resource support", "Preparation for change", "Top management support", "Resistance to change", and "Consolidation of change". The results of the work can be applied in the implementation of strategic management projects, as well as in business schools at strategic management courses.

1 INTRODUCTION

In the context of modern technological transformation (Schwab, 2017; Silberglitt, 2006; Grinin, 2020; Schwab, 2018; Prichina, 2020) one of the most urgent tasks is the development and implementation of strategic management systems corresponding to new realities (Hawksworth, 2017). This is especially important for developing countries, in which strategic management was previously used to a limited extent. This is due to the need to increase the efficiency of the use of human capital and increase labor productivity.

In Russia, strategic management began to develop actively about 25 years ago, following the development of business education (Godin, 2014). Since then, a corps of strategic management specialists has been formed, which makes a significant contribution to improving management. However, the process of strategic management development is far from complete and its condition has not been sufficiently investigated. Therefore, the issue of research on the development of strategic management is important at the present time.

The specifics of strategic management helps managers to pay attention to changes in the external environment and react to the cardinal changes taking

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place in it, including digital transformation. A strategic view of the company's activities initiates a departure from established patterns and principles of activity and the development of innovative approaches and directions of development. That is why strategic management develops most successfully when new opportunities arise, which are characteristic of the period of technological transformation.

One of the acute problems of Russia is that having the richest natural resources and one of the most powerful human capital in the world, it lags far behind developed countries in terms of GDP per capita. Among the possible reasons for such a gap may be a lag in the use of strategic management. This makes the study of the level of development of strategic management an extremely urgent task.

Earlier, the authors presented studies of the development of strategic management in Russia based on a survey of graduates of the MBA program of the International Institute of Management LINK, studying under the program The Open University (UK). However, at the first stage, the processing of the research results was carried out in the form of paired dependencies of the implementation results on 16 different factors. The disadvantage of this approach is that it does not allow you to understand the results of the implementation as a system of interacting factors. In this paper, a multidimensional regression analysis of the research data is carried out and the factors that have the greatest impact on the effectiveness of the development of strategic management are identified.

The aim of the work is to develop a multidimensional regression model of the process of implementing strategic management in a developing economy, which makes it possible to effectively develop the company's key system that affects human capital and its labor productivity.

1.1 Purpose and Objectives of the Study

In this study, the aim was to identify the motives that characterize the choice of a pedagogical profession by young teachers, and to establish the dynamics of these motives in the conditions of professional activity of young teachers, to develop recommendations based on them for improving measures aimed at the professional adaptation of teachers.

2 METHODOLOGY

The research methodology is based on a multidimensional regression analysis of the results of a survey of 161 graduates of the MBA program. The questionnaire was formed based on the analysis of works in the field of strategic management (Balogun, 1998; Porter, 1985; Mintzberg, 1979; Cameron, 2011).

As indicators of the results (E) of the implementation of strategic management, a block of 3 questions given in Table 1 was used.

Table. 1: Indicators of implementation results – E.

No.	Indicators of results (questions)
1	To what extent has the strategic management development project been implemented
2	How noticeable are the changes that have occurred in the market position of the organization
3	To what extent has the implementation of changes led to an improvement in culture, structure and systems

For each question, respondents were asked to give answers that could be evaluated using a 5-point scale, which is given in Table. 2. Using this scale, the arithmetic mean of the result E_S of the implementation of strategic management for each respondent was determined (S = 1 – 161).

Table. 2: Scale of implementation results indicators.

Question 1	R
In full	5
The main results have been achieved	4
The result has not been achieved sufficiently	3
The project was educational	2
Question 2	
Excellent results	5
Significant improvement	4
Moderate changes	3.5
Small changes	3
There are no changes	2
Educational project	2
Decline	1
Question 3	
Noticeably improved	4.5
The changes are average positive	3.5
Small improvements	2.5

Fifteen main questions (indicators – I_N) of the questionnaire were grouped into four blocks according to the principle of the input-output scheme:

A. Company context

V. Key levers of change
C. Preparing the change
D. Change process

Abbreviated names of indicators I_N are presented below:

1. The state of strategic management
2. Company size
3. Reasons for the development of strategic management
4. Type of corporate culture
5. Type of control system
6. Type of organization structure
7. Staff education level
8. The level of business education of management
9. Management level of the initiator
10. Forming a team or structure
11. Preparation for change
12. Level of resource support
13. Top management support
14. Resistance to change
15. Fixing the change.

Respondents were asked to choose one of 5-8 gradations for each of the 15 indicators I_N, which were numbered with the index – $_{M.}$

For about half of the indicators, the answers allowed direct quantitative ranking according to a 5-point scale. For example, gradations were set for the indicator "Level of preparation for change": good, medium, insufficient and "other". For groups of responses with such gradations of the indicator, the average values of the E_{NM} implementation results were obtained: 4.0; 3.8; 3.4 and 2.8. It could be assumed that these answers received grades: 5, 4, 3 and, for example, 2. The second option is to take the values of the E_{NM} implementation results for each group as estimates of these responses. This approach allows us to obtain estimates for those indicators whose gradations cannot be directly ranked.

For example, for the type of corporate culture, it was proposed to choose between one of the types of values of corporate culture – OCAI. The survey results are shown in table 3.

As estimates of the contribution to the effectiveness of the implementation of strategic changes in these gradations of the indicator, it is appropriate to take the E_{NM} estimates. This approach was used in the work to assess the level of influence of various indices on the overall effectiveness of the development of strategic management.

Table 3: Type of corporate culture.

Type of culture	%	E_{NM}
Adhocracy	12	3.7
Market	24	3.7
Clan	24	3.3
Hierarchical	35	3.3
It's hard to answer	5	3.1

First, the average value of the result E_{NM} for each gradation ($_M$) of all indicators I_N and their proportion were determined. This made it possible to assign these estimated values to all 161 respondents, depending on the groups of indicator responses, and to form a database of indicator estimates $I_{SN} = E_{SN}$.

Next, the statistical regression dependence of the results E_S of each respondent on the optimal linear composition of indicators I_N was analyzed. For this purpose, the search for the optimal predictor was carried out, which was a set of coefficients K_N for all indicators $I_{N.}$ The expression for the optimal predictor of Block A has the form:

$$P_{SA} = K_1 \bullet I_{S1} + K_2 \bullet I_{S2} + K_3 \bullet I_{S3} \quad (1)$$

The search for coefficients K_N was carried out by varying the values of coefficients K_P and determining their optimal values, providing the highest coefficient of determination R^2 between the predictor of each block of indicators I_N and the results of the implementation of strategic management $E_{S.}$

In conclusion, the optimal coefficients K_P were selected in the same way for a predictor that includes all 15 indicators.

3 RESULTS

3.1 Impact of the Company Context

The "Company context" block included three indicators: the state of strategic management (I_1), the size of the company (I_2) and the reasons for the development of strategic management (I_3). Thus, as a result of processing the survey results, data on the initial state of strategic management (I_1) were obtained, presented in Table 4.

The estimates obtained indicate that the initial state is unlikely to have a significant impact on the development of strategic management, since the differentiation of I_{NM} estimates is not high.

Table 4: The state of strategic management.

The state of strategic management	%	I_{NM}
Strategy played an important role in the management of the organization	17	3.7
Formally, there was a strategy, but the managers did not use it	15	3.5
Apparently the strategy was only in the minds of the leadership	25	3.4
Implementation of natural strategies due to changes in the environment	19	3.6
There were strategies of some large divisions	2	3.4
There were functional-level strategies	6	3.3
The company was practically not engaged in strategic management	15	3.5

The survey data on the reasons for the development of strategic management showed that the most successful results were obtained in cases of the emergence of new opportunities or the development of the company. These are exactly the reasons that are positive in the conditions of technological transformation.

Optimization of the predictor of this block of indicators showed that its coefficients (1) have the values: $K_1 = 0.22$, $K_2 = 0.3$, $K_3 = \mathbf{0.48}$. The regression dependence (degree 3 polynomial) of the results of the development of strategic management on the predictor of Block A is given in Fig.. 1.

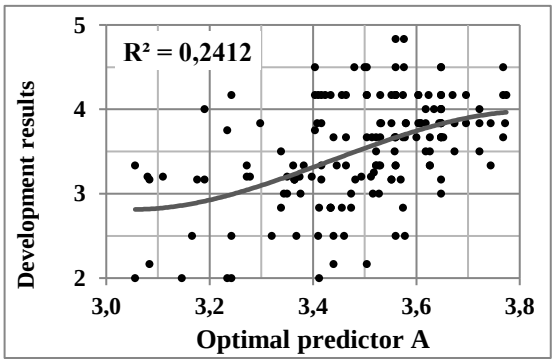

Figure 1: The impact of the company context on the results of strategic management development.

The coefficient of determination of this regression dependence is R^2=0.24, which indicates a weak influence of the company's context on the effectiveness of strategic management development. The indicator has the greatest impact: "Reasons for the development of strategic management".

3.2 Impact of Key Levers of Change

The results of the study of the influence of types of corporate culture on the development of strategic management are presented in Table 3. It can be seen that the highest results of the development of strategic management $E_{NM} = I_{NM} = 3.7$ are characteristic of adhocratic and market cultures, but their results are moderately higher than those of clan and hierarchical cultures.

Estimates of the impact of the type of organizational structure on the development of strategic management are presented in Table 5. The highest results were shown by divisional and adhocratic structures.

Table 5: Impact of the type of organization structure.

Type of structure	%	I_{NM}
Simple structure	31	3.4
Machine bureaucracy	22	3.5
Professional bureaucracy	20	3.6
Divisional form	11	3.9
Adhocracy	15	3.8
Other	1	3.4

From among the systems, only control systems were analyzed. At the same time, an approach was applied according to which integration of various points of view on control, including both formal and informal control systems, is in demand in a volatile environment. The evaluation results are given in Table 6.

Table 6: Impact of the type of control systems.

Type of control system	%	I_{NM}
Based on the participation of various stakeholders	20	3.7
With extensive use of informal procedures	13	3.7
Formal, well-structured	11	3.6
Formal, using IT	39	3.5
Financial control only	5	3.2
Random type	10	3.2

The characteristics of personnel (human capital) were characterized by the level of tertiary education of personnel, as well as business education of top managers. The results of assessing the impact of personnel characteristics on the results of strategic management development are shown in Tables 7, 8.

Table 7: Percentage of staff with tertiary education.

Percentage of staff with tertiary education	%	I_{NM}
At least 50%	80	3.5
About 20%	11	3.3
Less than 10%	5	3.6
It is difficult to determine	5	3.5

It can be seen that the level of tertiary education of personnel has little effect on the results of the implementation of strategic management. The business education of top managers has a more significant impact.

Table 8: Share of managers with business education.

Share of managers with business education	%	I_{NM}
At least 50%	57	3.7
About 20%	21	3.6
Less than 10%	17	3.2
It is difficult to determine	5	2.9

Optimization of the predictor of key levers of change showed that its coefficients have the following values: $K_4 = 0.07$, $K_5 = 0.13$, $K_6 = 0.25$, $K_7 = 0.25$, $K_8 = 0.30$. The greatest contribution to the optimal polynomial is made by the business education of top managers. The regression dependence of E_S on the optimal predictor of Block B (a polynomial of degree 3) is shown in Fig. 2.

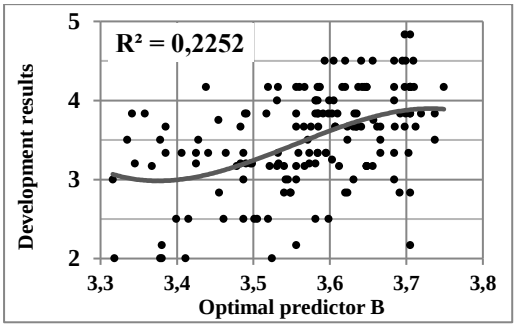

Figure 2: The impact of key levers of change on the results of strategic management development.

The coefficient of determination in this case is also relatively small ($R^2 = 0.225$), which indicates a weak correlation of E NM and the key levers of change.

3.3 Impact of Change Preparation

The only indicator of Block C that did not allow direct quantitative ranking was the position or status of the initiator of strategic development. In relation to this indicator, the survey results are given in table 9.

Table 9: Impact of the initiator's position on I_{NM}.

Position (status) of the initiator	%	I_{NM}
Company owner	13	3.7
Owner and head of the company	11	3.8
Head of the company	14	3.7
Top manager responsible for strategy development	19	3.7
Initiator of the company's strategy development	7	3.3
Manager of a large division whose strategy was being developed	9	3.6
Functional Service Manager	16	3.4
Development for educational purposes	6	2.9
Other	6	3.0

It can be seen that the strategic development of the company is most effective if the initiator is its owner and the head $I_{NM} = 3.8$, which is due to his high power in the organization. As the level of power decreases, the effectiveness of the implementation of strategic management monotonously decreases.

According to the optimization results of the Block C predictor, its coefficients have the values: $K_9 = 0.27$, $K_{10} = 0.19$, $K_{11} = 0.16$, $K_{12} = 0.38$. The greatest contribution to the predictor is made by the indicators: preparation for change ($K_{12} = 0.38$) and the managerial level of the initiator of the change $K_9 = 0.27$. The trend of the dependence of the development results on the predictor of Block C (a polynomial of degree 2) is shown in Fig. 3.

It can be seen that the coefficient of determination for Block C is more than twice as high as R^2 for Blocks A and B. The value of $R^2 > 0.5$, which means that there is a significant statistical relationship between the outcome of development and the optimal predictor of Block C.

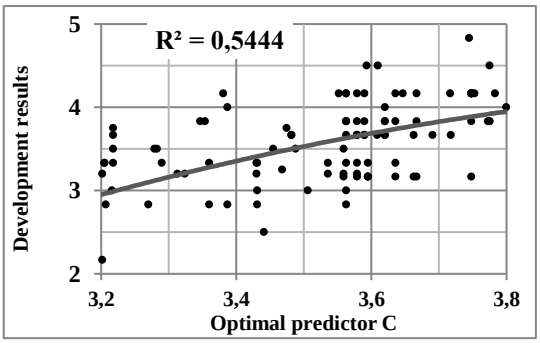

Figure 3: Impact of change preparation on results.

3.4 Impact of the Change Process

In Block D, all factors could be directly ranked according to the survey results. The highest values of E_{NM} were 3.8 – 4.1, and the lowest were 2.6 – 3.1. An example of the obtained values of I_{NM} for various values of the indicator I_{15} is given in table 10.

Table 10: Impact of fixing changes.

Fixing changes	%	I_{NM}
Carried out in full	14	4.1
Not carried out in all aspects	51	3.7
Not enough has been done	19	3.0
Practically not carried out	7	2.6
It is difficult to estimate	9	3.1

The results of optimization of the predictor of Block D showed that its coefficients have the following values: K_{13} = 0.31, K_{10} = 0.29, K_{11} = **0.40**. All three indicators make a significant contribution to the optimal predictor. The regression dependence (degree 3 polynomial) of the results of the implementation of strategic change on the optimal predictor of the change process is shown in Fig. 4.

For Block D, the coefficient of determination is about the same level as for Block C, and is about 2 times higher than the values of R^2 for Blocks A and B. The value of $R^2 > 0.5$, which indicates a significant statistical dependence.

3.5 Total Impact of All Indicators

Having received a preliminary understanding of the impact of various indicators on the results of the development of strategic management, it is possible to proceed to the formation of an optimal predictor that includes all 15 indicators. In this case, the initial values of the coefficients will be selected based on the coefficients K_N obtained above and what values of R^2 they provide.

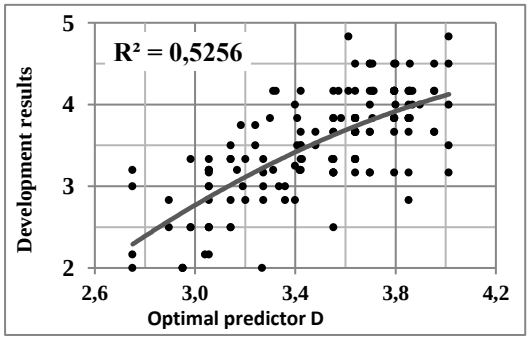

Figure 4: The impact of the change process on the results.

The optimal values of the coefficients of the 15-factor predictor are given in Table 10. Coefficients having values less than 0.005 are omitted.

Table 10: Coefficients of the total predictor.

K_1	K_2	K_3	K_6	K_7	K_8	K_9
0,015	0,09	0,14	0,10	0,095	0,05	0,06
K_{10}	K_{11}	K_{12}	K_{13}	K_{14}	K_{15}	
0,04	0,075	0,085	0,085	0,08	0,085	

The regression dependence of the results of the development of strategic change on the total predictor, including all 15 indicators of Blocks A, B, C, D, are given in Fig. 5.

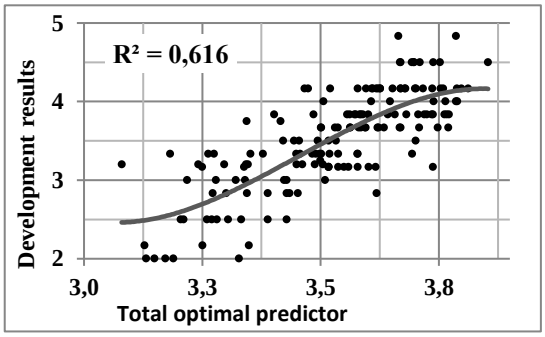

Figure 5: The impact of the total predictor on the results.

The coefficient of determination for the total predictor R^2 = 0.616. Since $R^2 > 0.6$, the results of the development of strategic management correlate relatively well with the optimal predictor.

The sums of the coefficients of each of the three indicator blocks are approximately equal and amount to 0.245 – 0.260. This means that they contribute approximately equally to the overall optimal indicator. The regression analysis of the development results with each of these blocks performed above showed that the coefficient of determination for Blocks A and B is about half that of C and D. This means that the synergetic interaction of indicators is realized within the framework of the total predictor.

Among the individual indicators, the following had the greatest impact on the results of strategic development: "Reasons for strategy development" (K_3 = 0.14), "Personnel education" (K_7 = 0.095) and "Organization structure" (K_6 = 0.10). However, the following indicators lagged slightly behind them: "Company size", "Change preparation", "Level of resource support", "Preparation for change", "Top management support", "Resistance to change", and "Consolidation of change", for which K_N = 0.08 - 0.09.

Attention is drawn to the fact that from the block Coefficients K_N for the indicators "Corporate Culture" and "Control System" are zero, that is, their contribution was not statistically significant. This is probably due to the fact that in this case the study was conducted in organizations in which strategic management is under development. At the same time, it is of key importance to improve the technique of implementing strategic management, including the stages of preparation and consolidation of changes, as well as the presence of challenges for improving strategic management and the human capital factor.

4 DISCUSSION

The values of the determination coefficient (R^2 = 0.62) obtained during the analysis of the survey results are relatively small. Therefore, measures should be taken to improve the regression model. To this end, it is desirable to increase the number of questions in the results block in subsequent studies. It is also advisable to consider what other indicators can play a significant role in the development of strategic management.

The fact that such key levers of change as the type of corporate culture and the type of control system did not have a significant impact on the development of strategic management also raises questions. It is necessary to pay attention to alternative approaches to the definition of corporate culture, as well as to study in more detail the impact of control systems.

5 CONCLUSIONS

The influence of 15 factors characterizing the context of the company, the key levers of change, the processes of preparation and implementation of change on the development of strategic management in the 161 company has been studied.

Using regression analysis, it is shown that each of the four blocks makes approximately the same contribution to the total optimal predictor – 0.245 – 0.260.

The coefficient of determination for the regression dependence of the results of strategic development (E) on the 15-factor optimal predictor (P) is R^2 = 0.616, which indicates the presence of a relatively strong statistical relationship between these variables.

For the dependence of the results of strategic development on the blocks preparation for change and implementation of change, the coefficient of determination $R^2 > 0.53$, which also indicates the presence of a statistical relationship.

Among the individual indicators, the following had the greatest impact on the results of strategic development: "Reasons for strategy development" (contribution coefficient K_3 = 0.14), "Personnel education" (K_7 = 0.09) and "Organization structure" (K_6 = 0.095).

A significant contribution (K_N = 0.075 – 0.09) is also made by the indicators: "Company size", "Change preparation", "Level of resource support", "Preparation for change", "Top management support", "Resistance to change", and "Consolidation of change".

ACKNOWLEDGEMENTS

The reported study was funded by RFBR, project number 19-29-07328.

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