ADJUSTMENT OF CORPORATE STRATEGY OF A MANUFACTURING COMPANY UNDER STRATEGIC UNEXPECTEDNESS

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Abstract. The paper discusses the method of adjustment of a corporate strategy of a manufacturing company, which unexpectedly finds itself in a crisis situation. The essence of the concept of this method is a constructive change of objective-setting preconditioned by a new objective, i.e. overcoming the crisis. To achieve this tasks, its structuring should be made via stating and solving optimization tasks at each step of structuring. Solving the whole complex of these objectives after completion of the structuring process allows decide on the best alternative of crisis bailout. A complex of measures constituting this alternative can be obtained more promptly and in a more reliable manner than the measures chosen on the basis of intuition or expert evaluations.

Keywords: objective–setting, structuring of objective, objective task, objectives and objective tasks free, global objective, criterion of effectiveness, objective model, strategic unexpectedness, forcing connections, corporate strategy, problematic situation.

In a rapidly evolving market, any manufacturing company is exposed to various external influences, among which there often are those that jeopardize the very existence of the company. These include both changes in the general environment (change in taxation, raised bank interest rates on loans, drop in personal incomes, increased turnover of goods manufacturing technologies) and the operational environment (changes in the structure of consumer demand, competitors' attacks, reduction of quality of resources supplied, emergence of aggressive and unreliable suppliers, lowering of personnel qualification).

We will consider such problematic situations when unexpectedly the company due to one or more of these factors faces the necessity to delay implementation of the corporate strategy.

These problematic situations are numerous and are becoming more and more unusual and rapid in their occurrence, and the chances to predict and prevent them are lessening (Ansoff, 2007). Therefore, the challenge of prompt identification of causes for such conditions and defining the most efficient ways to eliminate or at least reduce their greatest gravity is pressing.

The process of developing company’s corporate strategy if such a situation occurs cannot be repeated since there is an unrealistic time limit for this process. Great loss of time is due to the fact that at all stages of system analysis which is generally used to develop a corporate strategy either informal qualitative time-consuming methods or very complex formal methods are employed (Volkova, 2006, pp. 415-437; Lopuhin, 1971; Young, 1966; Ansoff, 1981).

Thus, without rejecting the system analysis procedures, especially the objectives tree, when adjusting corporate strategy, the informal methods should be avoided and replaced with analytical mathematical models that are implemented on the computer and reflect the dependence of the various criteria allowing achieve tree sub-objectives when the controlled variables change. These models have two purposes. The first one is to ensure structuring of objectives. The second is to enable find optimal values of the controlled variables and criteria extreme values. The realization of the second purpose is applicable for the procedure “Strategic management in real time”(Ansoff, 1081) for the companies operating under conditions of the turbulent external environment.

The modeling process begins with the selection of criteria reflecting in a quantitative form the degree of achieving the objective, and then a mathematical model describing dependence of the criterion on the factors determining elimination of the problematic situation is selected. In this case, the model should also take into
account a number of factors reflecting the influence of the company’s external environment on the process of its response to the problematic situation.

However, there are certain difficulties in the development of such models. If to start developing these models when the problematic situation occurs, the effect will be zero because of the considerable duration of the development. A proactive development of such models is required. For this purpose, the manufacturing company should create a knowledge base, which would store all the challenging situations that had taken place and the company’s response to them. This statistical data is important for understanding the diversity of problematic situations and options of a global objective to eliminate the particular situation. There is no doubt that elaboration of a suitable complex of such models requires a lot of time. But given the importance of this complex for maintaining the efficient functioning of the company’s corporate strategy in a hostile external environment, it is necessary to include the development of the mentioned models complex as a permanent sub-system into the system of preparing and adjusting corporate strategy.

Then a team of managers constantly examining possible challenging situations and the models being selected for them, as well as participating in employing these models in the process of responding to a specific problematic case, should be formed in the company.

Gradually, the models development process intended to eliminate different problematic situations will lead to the creation of an ever-growing model library. The effectiveness of objectives structuring depends on the library completeness since over time the probability of unknown situations that the abovementioned team of managers faces is reducing, therefore, intuition and expert methods of dealing with the challenging situations will be applied more and more rarely. This article does not discuss the methods of forming companies’ integrated functional models under strategic unexpectedness. Most effectively these methods are elaborated within the new research area, i.e. conceptual to design of organizing management systems. The research within this area is carried out at MIPT (Moscow Institute of Physics and Technology) under the supervision of Nikanorov S.P. (Kucharov, 2004 and 2006; Nikanorov, 2002, 2008 and 2010).

This article presents only the method of seeking the best alternative in responding to the challenging case provided that a global objective to solve the problematic situation is set and a company’s integrated functional model under the given type of situation is made.

**Method**

1. Setting the objective. The manufacturing company has a certain corporate strategy and implements it through a developed perspective strategic plan involving a variety of measures aimed at changing the organizational structure of administration, at strengthening the firm’s position in its market segments, at constant turnover of the produced goods and at their quality improvement, at expansion of production capacities of the company. At some point, the team of managers involved in strategic management diagnoses the occurrence of problematic situation that has become apparent or a credible threat of such a situation by dangerous signs: decline in demand, stepping up of competitors, uneven profit shrinkage, as well as decline in the company’s real production capacities.

   It should be defined which problem arises in this case and what measures should be taken to make the previously determined company’s growth course deviate the least. And the set variety of measures should meet the time limit for preparation and implementation of each of the measures, which depends on the degree of gravity level of the situation.

2. Structuring of objectives using objective tasks. Now, system analysis is applied to the full extent. First, the core problem of the situation in place is formulated as a question: how to stop the dropping profit of the company? Therefore, the global objective of the situation is “To restore annual marginal profit”. Along with setting the objective to solve the problem, all the required forcing connections reflecting marginal valuations of attributes of the sought alternatives should be determined. The alternative of the considered problem is understood to be an option of a complex of various measures that solves the problem. The mechanism connecting the alternatives with the selected objective and ensuring verification of all forcing connections is the company’s mathematical functional model. It shows how the company’s profit depends on various economic indicators, which in their turn, characterize the efficiency of the company activities in its market segments, in the production sphere when it manufactures its products, as well as the performance of the whole management system in the area of operating cost saving.

   As a rule, the functional model of a company is complex since many different-type factors should be managed in seeking the extremum of the accepted criterion. This complication can be diminished by
employing a well-known method of models parametrization allowing divide the model into so many parts as it has the parameters, and then for each parameter create a new objective model turning the parameter into a local criterion. This is how the structure of objective models nested into one another is generated. This is the model structuring, which results in structuring of the global objective. The mentioned parts should constitute optimization tasks enabling find optimal values of the new controlled variables through extremalization of local criteria.

Let us consider the structuring procedure for the formulated task in details.

1) **Step 1.** The performance criterion is selected to compare alternatives of achieving the global objective and such analytical dependence connecting it with economic indicators, which would enable structuring of the global objective. Then, as a system of inequalities, forcing connections placed on changes of variables, are formed. The objective model formed as described above turns into an optimization zero objective task. Then its solution is made via optimization methods. In a particular case, when for the company management on the basis of the obtained optimal values of economic indicators it is absolutely clear which measures and in what amounts (volumes) should be taken in order to eliminate the problematic situation, the structuring process may be terminated. Otherwise, the shift to the second step is made.

2) **Step 2.** It generates the first level of the objectives tree. Those indicators (or functions there from) that have been optimized at the first step are set as sub-objectives of this level. This is done in order to bring sub-objectives’ analytical dependences on the controlled variables – economic indicators into proximity with the dependences of these sub-objectives on the measures (events) that can eliminate the problematic situation. Often it is possible already at the second level of structuring, which leads to setting objective tasks, the integrated solution of which allows design a plan of various events (measures) implemented in those company subsystems, in which the consequences of the occurred strategic unexpectedness have become apparent most of all. If the analytical dependences on the mentioned measures for all or some of the sub-objectives is not possible to establish at the step two, then the process of structuring through economic indicators can be continued, but in the direction of approximating to the measures. In this case, to the plan of various measures as a result of the second step of structuring, a set of technical and economic indicators can be added, the achievement of the latter would ensure a more effective solution of the occurred problem. The company management considers the result of step two as a recommendation for eliminating the problematic situation. In a number of cases this recommendation is accompanied by a list of required conditions necessary to be performed prior to implement the recommendation.

For example, the most often condition is the lack of financial resources, so the required amount to be added with the allocation among certain combinations of the planned measures, should be stated.

If the recommendation is not clear to the company management, especially in terms of the description of the set of generated technical and economical indicators, then the transfer to step three of structuring is made, often with adjustment of initial information, in particular about the number of employed various measures, their effectiveness and cost.

3) **Step three.** It is possible only if among the objective models of the first level of the objectives tree there would be at least one value for which new objective models can be generated. Otherwise the structuring process is terminated. If step three is possible, the process of structuring of new tree sub-objectives starts, whereas values suitable for structuring are selected. As a rule, these values are not in all branches of the first level of the objectives tree, thus the structuring process may change the tree into an asymmetric tree-structured subordination of objectives. Formation of objective tasks takes place in the same way as at step two of structuring. Simultaneous solution of the objective tasks should involve not only new objective tasks, but also the tasks the models of which have not been changed. The final actions at step three, related to solving the problem and continuation of structuring process are the same as in step two.

Further steps of structuring in terms of procedure and the solutions taken are similar to those in the third step.

The process of structuring is finite. But for each step of the process four outcomes are possible:

- Structuring has taken place and the simultaneous solution of objective tasks is achieved;
- Structuring has taken place, simultaneous solution of objective tasks is not achieved, but the following step of structuring is possible;
- Structuring has taken place, simultaneous solution of objective tasks is not achieved, but the following step of structuring is not possible;
Structuring has not taken place.

The most desirable is the first outcome and the management should streamline all its efforts to increase the probability of this outcome due to increasing the library of mathematical models of the company’s ways out of various problematic situations and advancing methods of optimization of simultaneous solution to different objective tasks.

The described procedure of structuring can be called method of structuring and solving objective tasks. We apply it to resolve a problematic situation in the considered manufacturing company.

First, we introduce notations of values that are in the zero objective task:

\( \pi \) – maximized annual marginal profit of the company;

\( \pi_0 \) – the lower limit of maximized profit set by company management;

\( W \) – average price of the traded product;

\( C_0 \) – average operating costs per unit of traded product prior to problematic situation;

\( M_0 \) – production capacities in value terms prior to problematic situation;

\( \Delta M \) – the required expansion of production capacities;

\( N_0 \) – average annual number of company’s product buyers prior to problematic situation;

\( \Delta N \) – needed increment of average annual number of buyers;

\( \Delta C \) – required total reduction of average operational costs per unit of product;

\( p_1 = 1 - \frac{\Delta_1}{100} \) – production capacities degradation factor, where \( \Delta_1 \) is the percent of this degradation in the result of problematic situation;

\( p_2 = 1 - \frac{\Delta_2}{100} \) – reduced company’s annual income factor, where \( \Delta_2 \) is the percent of this reduction in the result of problematic situation.

Mathematical formulation of the zero objective task is shown in Fig.1

In its form, this is an optimization task. The objective function of this task is the marginal profit of the company and this profit should be increased to value \( \pi_0 \) by changing controlled variables \( \Delta N, \Delta C, \Delta M \). The complex of the controlled variables depend on the next causes. The growth of the values \( \Delta N \) and \( \Delta M \) leads to the direct increase in annual income and production capacities of the company. The growth of \( \Delta C \) plays a key role as it increases the resistance to the threats of the external environment, because it simultaneously activates up two processes:

– Reduction in the demanded production capacities;

– Reduction in the manufacturing costs.

The second process is actively referred to by Porter who used it as a foundation of his competition theory (Porter, 1985). Together with increase in the competitiveness of the company this process also increases the effectiveness of the fight with the strategic unexpectedness.

Forcing connections 1)-2) reflect natural restrictions on the process of \( \pi \) maximization. Inequality 1) places restrictions on changing \( \pi \) from below, so maximization of profit can be stopped only when it reaches \( \pi_0 \) value set by the company management. Inequality 2) shows that production capacities of the company should not be disrupted. The occurrence of a problematic situation due to the effect of external environment can create different levels of threat for the company depending on the values of \( q_1 \) and \( q_2 \) factors.

The major purpose of zero objective task is to define directions of global objective structuring, i.e. “Profit Restoring” after the occurred problem. These directions are defined by types of variables \( \Delta N \) (increment of demand), \( \Delta C \) (reduction of operational costs), \( \Delta M \) (expansion of production capacities). Other values of this task, \( \pi_0, q_1, q_2, W, N_0, M_0, C_0 \), are set as initial information.

According to step one of structuring process, we solve the set zero objective task. To simplify the solution, we introduce certain nonessential changes into this task statement:

– introduce notation \( M = M_0 q_1 + \Delta M \) and consider \( M \) one of the controlled variables;

– taking into account the fact that any large company always tracks its production costs and plans their reduction, we set \( \Delta C \) as a planned reduction of production costs for the current year; then solving of the problem will come down to searching the values of two variables \( M \) and \( \Delta N \);

– limit change in profit by only one value \( \pi = \pi_0 \), and the change of production capacities \( M \) we place into strict dependence on \( \Delta N \).

Then the solution of zero objective task will be just the solution of the following system of equations:
The solution to the system will be the following:

\[
\begin{align*}
\pi_0 &= (q_2 N_0 + \Delta N)(W - C_0 + \Delta C) \\
M &= (q_2 N_0 + \Delta N)(C_0 - \Delta C)
\end{align*}
\]  

(1)

Prior to structuring the global objective, we introduce additional values that are part of objective tasks of the first level of objectives tree (Fig. 1):

- \(X_1\) - multitude of measures reducing production costs; \(n_1\) - maximum number of measures; \(\gamma_1\) - number of the measures combination, \(\gamma_1 \in G_1\); \(\Gamma_1\) - amount of measures combinations from \(X_1\);
- \(X_2\) - multitude of measures to increase production capacities by increasing labor productivity (the list of these measures is given in the description of objective task 1.2); \(n_2\) - maximum number of types of measures; \(\gamma_2\) - number of combination of measures types, \(\gamma_2 \in G_2\); \(\Gamma_2\) - amount of combinations of measures types from \(X_2\);
- \(X_3\) - multitude of measures increasing increment of buyers (changes in the market segmentation, product differentiation, focus on servicing buyers); \(n_3\) - maximum number of measures; \(\gamma_3\) - number of the measures combination, \(\gamma_3 \in G_3\); \(\Gamma_3\) - amount of measures combinations from \(X_3\);
- \(\beta_j\) - output per worker in value terms in \(j\) production department prior to problematic situation;
- \(\lambda_j\) - structure of the production capacities of company departments defined by single cost of the manufactured product in \(j\) production department; \(m\) - number of production departments;
- \(\|p_{j,v}\|\) - matrix of percent of output \(\beta_j\) increase when measures of \(v\)-type from \(X_2\) are applied; \(j = 1,2,...,m; \ v = 1,2,...,n_2\);
- \(\bar{\mathbf{q}}\) - average annual number of company workers;
- \(\Delta C_k\) - reduction of production costs when \(k\) measure from \(X_i\) is applied; \(k = 1,2,..., n_i\);
- \(\Delta N_r\) - increment of average annual number of buyers when \(r\) measure from \(X_3\) is applied; \(r = 1,2,...,n_3\);
- \(S\) - financial resources sum;
- \(s_1\) - the cost of development and implementation of combination of \(\gamma_1\) measures from \(X_1\);
- \(s_{1,k}\) - the cost of development and implementation of \(k\) measure from \(X_1\);
- \(s_2\) - the cost of development and implementation of combination of \(\gamma_2\) measures from \(X_2\);
- \(s_{2,j,v}\) - the cost of development and implementation of \(v\)-type measures from \(X_2\) in \(j\) production department;
- \(s_3\) - the cost of development and implementation of combination of \(\gamma_3\) measures from \(X_3\);
- \(s_{3,r}\) - the cost of development and implementation of \(r\) measure from \(X_3\).

Solution of zero objective task in the form of obtained values of variables \(\Delta C, \Delta N, M\) is hard to be applied to the solution of the occurred problem since the set of measures implementing these variables is not in place yet. So for each of these variables there should be formed an objective task with controlled variables in the form of measures combinations, out of which those combinations should be selected that minimize a certain criterion. We suggest one type of criterion for all values \(\Delta C, \Delta N, M\). This is the difference of a variable calculated for a certain combination of measurements and its value obtained at the solution of a zero objective task.

Specifically such criteria for objective tasks 1.1, 1.2, 1.3 will be \(\Delta C_{\gamma_1}, M_{\gamma_2}, \Delta N_{\gamma_3}\). They should be minimized searching respectively combinations of measures \(\gamma_1, \gamma_2, \gamma_3\) from the given sets \(X_1, X_2, X_3\).

Below, we consider structure of objective tasks 1.1, 1.2, 1.3.

As can be seen from Fig. 1, the forcing connections in all three tasks are similar in type. Condition 1) requires that only positive values of differences, which are selected criteria, are sought. Condition 2) in each of the tasks verifies if financial resources are sufficient. Note, that in the right-hand member of relevant inequalities the sequence of tasks solution is taken into account. For the considered problem, sequence 1.1 → 1.3 → 1.2 as when solving zero objective task enlargers profit \(\pi\) quicker than sequence 1.3 → 1.1 → 1.2. Let us see how left-hand members of inequalities 2) are calculated:

\[
s_1 = \sum_{k \in H_1} s_{1,k}
\]  

(3)
\[ S_2 = \sum_{j=1}^{m} \sum_{v \in I_2} y_{2,j,v} \]  
\[ S_3 = \sum_{i \in I_3} s_{3,i,v} \]

where \( I_1 \) – multitude of numbers of measures from \( X_1 \) applied in their selected combination;  
\( I_2 \) – multitude of values of \( v \)-type measures from \( X_2 \) applied in their selected combination;  
\( I_3 \) – multitude of number of measures from \( X_3 \) applied in their selected combination.

Now we should look into optimization procedures \( \gamma_1, \gamma_2, \gamma_3 \) in tasks 1.1, 2, 1.3. To form various combinations of measures from sets \( X_1, X_2, X_3 \) we apply formula for calculating the number of combinations of elements by \( v \) from \( n \). Then for each of \( X_i \) (\( i = 1,2,3 \)) sets we get the number of various combinations of measures from \( n_i \):

\[ \Gamma_{n_i} = \sum_{v \in I_1} \frac{n_i!}{(n_i-v)!} \]

In each combination of measures from \( X_1 \) and \( X_3 \), a sum up of \( \Delta C_k \cup \Delta N_r \) values that are part of this combinations, is done:

\[ \Delta C_{Y_2} = \sum_{k \in I_{Y_1}} \Delta C_k, \gamma_i \in \Gamma_{n_i} \]
\[ \Delta N_{Y_3} = \sum_{i \in I_{Y_3}} \Delta N_r, \gamma_3 \in \Gamma_{n_3} \]

where \( I_{Y_1} \) – multitude of values of number of measures from \( X_1 \) applied in combination \( \gamma_1 \);  
\( I_{Y_3} \) – multitude of values of number of measures from \( X_3 \) applied in combination \( \gamma_3 \).

Among \( \Delta C_{Y_2} \) and \( \Delta N_{Y_3} \) values those closest and larger relative to \( \Delta C \) and \( \Delta N \). For this, two never increasing sequences \( \{ \Delta C_{Y_2} \}, \gamma_i \in \Gamma_{n_2} \) and \( \{ \Delta N_{Y_3} \}, \gamma_3 \in \Gamma_{n_3} \) should be generated. Naturally, the sequence numbering of elements of these sequences will change. We select \( Y_2 \) and \( Y_3 \) as order indexes and according to them we place sequences \( \{ \Delta C_{Y_2} \} \) and \( \{ \Delta N_{Y_3} \} \), and among their elements we place values \( \Delta C \cup \Delta N \) obtained earlier. Then the closest to \( \Delta C \) values \( \Delta C_{Y_2} \) and the closest to \( \Delta N \) values \( \Delta N_{Y_3} \) will be determined from the following inequalities:

\[ \Delta C_{Y_2} \geq \Delta C > \Delta C_{Y_2+1} \]
\[ \Delta N_{Y_3} \geq \Delta N > \Delta N_{Y_3+1} \]

Therefore, the optimal combinations of measures from \( X_1 \) and \( X_3 \) are the following

\[ \gamma_1^{(opt)} = Y_2 \quad \text{and} \quad \gamma_3^{(opt)} = Y_3 \]

and the preliminary extreme values of the costs being reduced and of the increment of number of buyers will be \( \Delta C_{Y_2}^{(opt)} \) and \( \Delta N_{Y_3}^{(opt)} \). But they are required to be checked for fulfillment of conditions 2).

It is far more difficult to find optimal combinations of types of measures that ensure the maximum production capacities \( M \).

Here we give the development of expression for \( M \) – quantitative assessment of the firm’s production capacities. It is based on the ratio of outputs \( \beta_j \) per worker in the company departments and annual production output \( M \) in value terms. The following obvious transformations will be made:

\[ \Psi = \sum_{j=1}^{m} \Psi_j = \sum_{j=1}^{m} \frac{M_j}{\beta_j} = M \sum_{j=1}^{m} \frac{\lambda_j}{\beta_j} \]

where \( \Psi_j \) – number of workers in \( j \) production department of the firm,  
\( M_j \) – production output in \( j \) department in value terms.

Solving equation (11) with respect to \( M \), we get

\[ M = \frac{\Psi}{\sum_{j=1}^{m} \frac{\lambda_j}{\beta_j}} \]
where \( \frac{1}{\sum_{i=1}^{n_i} y_{i,1}^{3}} \) is the average output per worker for the firm in general prior to the problematic situation. The description of the considered problem shows that one of the reasons for the problematic situation is the decrease in labor productivity by \( \Delta_1 \) per cent. This means that to obtain dependence of \( M \) on the problematic situation, the average output should be multiplied by value \( q_1 = \left(1 - \frac{\Delta_1}{100}\right) \).

### Fig. 1. Objectives and Objective Tasks Tree

Then expression (12) will look as follows

\[
M = \frac{p_{\gamma_1}}{\sum_{j=1}^{m} p_{\gamma_1, j}}
\]

To ensure growth of production capacities \( M \) to value \( M_0 \), often it is required to combine measures from \( X_2 \). In general, the dependence of production capacities \( M \) on the applied types of measures can be presented with the help of introducing into expression (13) the following coefficient that increases output \( \beta_1 \):

\[
p_{\gamma_2, j} = 1 + \frac{1}{100} \sum_{v} \gamma_{2, v} p_{\gamma_1, v} \quad \gamma_{2, v} \in \Gamma_{\gamma_2} ; \quad j = 1, \ldots, m
\]

where \( \Gamma_{\gamma_2} \) –multitude of values of \( \nu \)-type measures from \( X_2 \) in \( \gamma_2 \) combination.

The initial information for calculation is matrix \( \|p_{\gamma_1}\| \). The example of such matrix is the following:

\[
\|p_{\gamma_1}\| = \begin{bmatrix}
7,0 & 5,6 & 5,0 & 4,0 & 2,8 & 2,2 \\
5,6 & 4,0 & 6,4 & 2,8 & 2,2 & 2,8 \\
4,0 & 2,8 & 2,8 & 4,0 & 2,2 & 2,0 \\
5,5 & 3,0 & 2,8 & 4,0 & 2,5 & 2,5 \\
0 & 2,8 & 1,4 & 0 & 0 & 0 
\end{bmatrix}
\]

When setting the combination of \( \gamma_2 \)-type measures, i.e. combination of matrix columns (15) in its \( j \) line, elements of this combination should be summed up.

Here are most frequently applied possible major measures that impact several production departments at the same time, and their notation \( \nu = 1, 2, \ldots, n \):

1. technological changes in the process of manufacturing products \( (\nu = 1) \);
2. changes in the company production structure in the areas of deepening specialization and concentration of production \((v = 2)\);  
3. labor motivation \((v = 3)\);  
4. job simplification \((v = 4)\);  
5. personnel development \((v = 5)\);  
6. management development \((v = 6)\).

The company knowledge base should include values \(p_{i_j} – \) per cents of output \(\beta_{i_j}\) growth in \(j\) production department when a \(v\)-type measure is applied. These values can be obtained either from statistics, or by elaborating and implementing mathematical models of labor productivity changes, or through expert assessments.

Having considered expression for \((14)\), formula \((13)\) will become as follows:

\[
M_{12}^{11} = \frac{\sum_{l=1}^{m_{11}} q_{i_l}}{\sum_{l=1}^{m_{12}} p_{i_l}} \cdot \gamma_{i_l} \in \Gamma_{n_2}
\]  \hspace{1cm} (16)

With this formula, production capacities for all combinations of measures from \(X_2\) are calculated and placed into a never increasing sequence of values \(\{M_{12}^{11}\}\). Among the elements of this sequence, value \(M\) that is calculated by formula \((16)\) should be placed in such a way that the following inequality is made

\[
M_{12}^{11} \geq M > M_{12}^{11+1}
\]

Then the closest larger value relative to \(M\) will be the value \(M_{12}^{11}\), and the solution to objective task 1.2. will be the combination of measures \(y_{12}^{(opt)} = y_{22}\), if condition 2) is met in this task in Fig. 1.

Thus, the structuring process of sub-objectives 1.1, 1.2, 1.3 is completed, and simultaneous solution of the formulated objective tasks should be performed. For this, an algorithm of such solution is generated showing its possible outputs(Fig.2). Below is the description of its blocks.

**Block 1.** Solution to the zero objective task, the output values of which are \(\Delta C, \Delta N\) and \(M\).

**Block 2.** Calculation of the sum of the reduced production costs when optimal combination \(y_{12}^{(opt)}\) of measures from \(X_1\) and expenditures \(s_1\) of financial resources for this combination:

\[
\Delta C_{12}^{(opt)} = \sum_{l \in I_{11}} \Delta C_{l_2} ; \quad s_1 = \sum_{l \in I_{11}} s_{l_2}
\]

If there is no optimal combination \(y_{12}^{(opt)}\), i.e. \(\Delta C_1 < \Delta C\), then the following values are calculated

\[
\Delta C_1 = \sum_{l \in I_{11}} \Delta C_{l_2} ; \quad s_1 = \sum_{l \in I_{11}} s_{l_2}
\]

where \(I_{11}\) – set of measures from \(X_1\), which are part of the first element of the never increasing sequence \(\{\Delta C_{12}^{(opt)}\}\).

**Block 5.** Calculation of the sum of increment of buyers when optimal combination \(y_{32}^{(opt)}\) of measures from \(X_3\) and expenditures \(s_1\) of financial resources for this combination:

\[
\Delta N_{32}^{(opt)} = \sum_{l \in I_{32}} \Delta N_{l_2} ; \quad s_1 = \sum_{l \in I_{32}} s_{l_2}
\]

If there is no optimal combination \(y_{32}^{(opt)}\), i.e. \(\Delta N_3 < \Delta N\), then the following values are calculated

\[
\Delta N_3 = \sum_{l \in I_{31}} \Delta N_{l_2} ; \quad s_1 = \sum_{l \in I_{31}} s_{l_2}
\]

where \(I_{31}\) – set of measures from \(X_3\), which are part of the first element of the never increasing sequence \(\{\Delta N_{32}^{(opt)}\}\).

**Block 7.** Calculation of production capacities \(M_{12}^{11}\) under optimal combination of measures types from \(X_2\) by formula \((16)\) and expenditures \(s_1\) of financial resources for this combination by formula \((5)\). If there is no optimal combination \(y_{22}^{(opt)}\), the calculation is made by the same formulas but for combination \(y_{22} = 1\). This meets condition \(M_1 < M\).

**Block 4.** Recalculation of \(\Delta N\) and \(M\) by formulas \((2)\) in order to compensate drop in profit \(\pi_0\) due to reducing \(\Delta C\).
Fig. 2. Algorithm of Simultaneous Solution of Objective Tasks on the First Level of Objectives Tree

Block 12. Termination of solution process due to the necessity to adjust initial information – expanding of the composition of \( X_2, X_3 \) sets to increase the number of combinations of relevant measures in order to eliminate
the generated differences of values ΔN–ΔN₁ and M–M₁. Following this, implementation of algorithm is repeated from the beginning. If the composition of sets X₂, X₃ cannot be expanded, the next step of structuring should be attempted.

**Block 13.** Termination of the process of simultaneous solution of objective tasks due to lack of financial resources.

**Blocks 8,10 –** Verification of sufficiency of financial resources after objective tasks are solved.

**Blocks 3,6,11.** Logic blocks to check conditions ΔC₁ < ΔCᵢ, ΔN₁ < ΔNᵢ, M₁ < Mᵢ, which show that values ΔC, ΔN, M are not achievable under any measures combinations out of relevant sequences.

**Block 14.** Successful completion of simultaneous solution of objective tasks. Results:

- optimal combinations of measures are obtained from X₁,X₂,X₃ sets: \( y^{(opt)}_1, y^{(opt)}_2, y^{(opt)}_3 \);
- these combinations allow define the closest larger values of variables
  \[ \Delta C^{(opt)}_1, \Delta N^{(opt)}_2, M^{(opt)}_2 \];

Related to variables (values) ΔC, ΔN, M, which are the core components of objective functions of tasks 1,1,2,1,3.

- calculation of maximum marginal profit under implementation of the obtained optimal measures combinations reflects the achieved solution to the considered problem:
  \[ \pi = \left( N_0 + \Delta N^{(opt)}_2 \right) \left( W - C_0 + \Delta C^{(opt)}_1 \right) \].

This solution brings back the course of the company corporate strategy to the moment when the problem situation had emerged. The problem situation described in the current article with some variations often arises in functioning of the production companies. Therefore, it is recommended to include the complex of the described objectives tasks in the libraries mentioned above.

Complex of the global controlled variables, ΔC, ΔN, M, is changing over time. In most cases, the costs ΔC together with measures lowering their value are constant in the functioning of the production companies. In this case, the increase or the retention of the competitive advantages of the company becomes the main tool of the fight with the strategic unexpectedness.

**Conclusion**

The stepped structuring of objectives and objective tasks method can be applied in several directions. First of all, its direct designation is prompt formalized and performed on a computer search for a better alternative to eliminate the existing or probable problematic situation in the frame of the procedure “Strategic management in real time” (Ansoff, 1981). It can also be applied for the development and regular adjustment of a corporate strategy of a company when the tree of one or several objectives of the company development is changed if the assessment of achieving sub-objectives that arise under these conditions is performed at least partially using qualitative criteria and complex of economical and mathematical models. The third direction of applying the method along with methods to predict problematic situations is the rationalization of creating a complex of reserve measures, which is included into the company’s corporate strategy. Under progressive and hard to predict strategic unexpectedness, the golden mean between the reserve of prepared measures and the set of measures pending to be formed and implemented in case strategic unexpectedness does arise, should be found all the time.

**References**


