Production System Management Based on a Balanced Development Model

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Abstract. The article shows that when developing a realistic vision of the industrial system, it is important to take into account those cardinal changes in the cognitive situation that have occurred in the economic science over the past three decades as a result of the economic community's recognition of the insolvency of the Washington consensus doctrine. Based on this, the conceptual aspects of industrial policy and industrial production development are analyzed in the context of the Post-Washington Consensus. Based on this, the conceptual aspects of industrial policy and industrial production development are analyzed in the context of the Post-Washington Consensus, associated with the rethinking of the accumulated world experience of economic transformations and the formation of a new stage in the development of the mainstream economic theories. A conceptual model of balanced development of the industrial system is developed and justified on the example of a vertically integrated oil company. The proposed model can be used in the formation of strategic plans for the industrial companies' development.

1. Introduction

It is important to take into account the fundamental changes that have occurred in economic science in recent decades in order to develop a successful industrial policy in the context of the approval of an innovative competition type. A concentrated expression of the changes in perceptions of the importance of industrial policy is the turn in the economic mainstream, which was associated with the transition in the middle of the last decade from the Washington-consensus political and economic cycle that emerged in the late 80-ies of the last century, to the Barcelona cycle. [6, 8]. The convictions enshrined in the Washington consensus that the state should not actively interfere in the formation of mechanisms for the development of the national economy in market conditions are going out of date. The functions of the state to ensure the competitiveness of the national economy through the creation of general conditions for reducing production and transaction costs as well as the ideas of economic development theories supporters about the need for state support for positive structural changes in the economy, individual sectors and industries with competitive advantages, are becoming generally recognized. are becoming generally recognized.

Today, as D. Rodnik writes, “in most of the most authoritative theories of economic policy choice, the key role is played by private interests (vested interests): elites, lobbyist groups, the rent-seeking agents - all of them solve their problems at the expense of society as a whole. Economists, political scientists and other social scientists appeal to the power of private interests to find an explanation to the main problems in the theories of regulation, international trade, economic growth and develop-
ment, and in many other areas... Any political and economic model that does not pay significant attention to private narrow group interests is likely to remain incomplete and meaningless. But this does not mean that interests are the key factor influencing the results of political processes... Once the changing nature of interests is understood, they will largely be seen as determining factors, and the space for possible outcomes will become much wider» [3].

2. Theoretical part

At this stage, the development of the modern direction of strategic management theory was largely promoted by the works of John. Barney, R. Grant, I. Direx, D. Collis, K. Kut, S. Montomery, M. Petrov, R. Romelt, D. Tisa, etc. The new quality of strategic management theories is associated with the recognition of the proactive nature of the firm's behavior and its ability to combine resources in different ways[4]. In the formation of the new research program, a special role belongs to the resource theory and the concept of dynamic abilities that emerged on its basis, which formed a viable alternative to the traditional concepts of the firm's strategies.

In accordance with the resource approach, the objectives of strategic management are to achieve long-term competitive advantages through the effective use of unique tangible and intangible assets. This approach points to what needs should be to be done to gain a sustainable competitive advantage, but it does not answer the question of how to do it. To a certain extent, the concept of dynamic abilities allows us to clarify the answer. Today, it is widely believed that the concept of dynamic abilities to the greatest extent contributes to the study of competitive behavior of the company. [1].

Conceptualization of the strategic process involves the development of theoretical and methodological tools to realistically describe the mechanism of changes in internal and external relations of the business environment of the company. In accordance with the evolutionary approach developed by R. Nelson and S.Winter in the description of structural changes, a special role belongs to the collective phenomena in the form of routines [5]. Within the framework of the concept of dynamic abilities, the description of these changes is proposed to be carried out on the basis of the division of organizational routines, which are the result of the implementation of the organization's abilities, into statistical and dynamic ones. Today there are many interpretations of the concept of routine, although it has a central place in the research on strategic management and is used for more than thirty years in describing the processes of structural change.

The research program of strategic management is important to develop taking into account the fact that in changing the internal and external business relations that determine the formation and development of strategic advantages of industrial enterprises, different subjects which are guided not only by non-economic values, but also a kind of system of economic values are the participants of this phenomena.

The successful solution of the complex problems caused by the change of the technical and economic paradigm involves the revision of the outdated system of economic and value priorities, the development of a balanced and proactive industrial policy that can involve new factors of generation and distribution of the total benefits of the development of cooperative and competitive advantages on the basis of the search and design of a favorable value-institutional compromise of the interests of all groups-participants [1].

When developing a General concept of mechanisms for the formation of sustainable development of such a production system as a vertically integrated oil company (VIOC), it is assumed to take into account the presence of three main structure-forming levels. Firstly, at the value-normative level, which forms the Central zone of processes, the search and choice of the trajectory of updating the value-economic orientations and economic norms of behavior and interactions, which play the role of a of value-cognitive filter, as well as a system-integrating and system-coordinating role are being held.
Secondly, at the institutional and organizational level, there is a construction of strategic priorities, rules, procedures and business models aimed at achieving sustainable development of comparative advantages of the enterprise. Thirdly, at the level of business practices, specific forms of economic and communicative actions are created under the influence of changes in the business environment and mental and employees characteristics.

Balanced development, on the one hand, is an effective state of the system in which all its elements are in a state of coherence and complementarity. This characteristic of balanced development is static. Dynamic characteristics of balanced development reflect its other feature, expressed in a strategic direction. Therefore, on the other hand, balanced development is an effective way of managing, ensuring that the established ratios are achieved and maintained over a set period of time. In this interpretation, balanced development should be seen as an important element of the methodological framework of management. In which the needs of the structural elements of the company are coordinated and mutually supplemented, with the maximum satisfaction of the needs of the market, society and the non-worsening dynamics of economic indicators. Thus, the balanced development of VIOC characterizes such a process of reproduction of finished products, which is focused on the formation of conditions that ensure a balanced growth of key parameters of its business segments and sustainable development of the whole system.

One of the specific features of the valuation and forecasting of the market value of VIOC is the dependence of its value on stocks and production capacity. The presence of proven reserves in the VIOC forms the potential for growth in production, and in the refining and marketing systems of petroleum products – the potential for growth in the market value of the company. At the same time, the comparison of the average ratio of capitalization of oil and gas companies to the main property component – reserves - shows the total gap between the leading Russian and Western VIOC’s (Diagram 1). The average value of the ratio of the capitalization among the Russian oil companies’ reserves is 4, and 18$ per barrel – among Western companies.

The increase in the market value of the company for investors is the result of the growth of its internal value. Valuation of the company, regardless of who carries it out, is based on the analysis of performance indicators. In this regard, business value management is based on the management of key performance indicators. At the same time, investors distinguish different indicators as the key ones, which complicates this process. However, it should be noted that increasing the transparency of corporate governance in the field of sustainable development will reduce the impact of the risk factor in the managed part of the discount rate. Thus, international investment indices show an increase in the weight of intangible (socially responsible) factors in the companies’ market value (Fig. 2). The latter are evaluated as drivers of creating additional competitive advantage. Therefore, in the long term...
VIOCs which will deal with the issue of sustainable development will be ahead of other companies in the stock.

Formation of organizational abilities of the company to design balanced and productive forms of stable relations with all stakeholders leads to the emergence of positive reputational characteristics; the higher reputational characteristics of the company, the better possibilities it has to create a favorable external and internal environment, market position and mechanisms for sustainable development of the comparative advantages.

The existing approaches of the formation programs of development of companies aimed at optimization of decisions in the investment and production policies (both Western and Russian), usually are narrow (designed for each segment separately) and this overlooks the relation between the operating results of the VOIC business segments. Moreover, the applied technologies do not provide an effective link between strategic and operational planning. Most management decisions are made “intuitively” and are based on expert knowledge of specialists.

A key methodological component of the mechanism for improving the efficiency of the VIOC is a comprehensive assessment of efficiency, based on the model of balanced development, which allows to solve the problem of applying the cost approach in its calculation, to identify and make decisions on the direction of the company’s development.

The indicator of the level of balanced development of VIOC provides a comprehensive assessment of the efficiency of the business segments and the company as a whole and takes into account the degree of its balanced growth (compliance with the reference industry, socio-economic and environmental relations of the oil complex) and sustainable development (coordinated economic, environmental, social and innovative development of the system). These provisions formed the basis of the methodology for the integrated assessment of the VIOC effectiveness (Fig. 3).
Integrated index of the balanced development of VIOC or its business segment is calculated by the formula:

\[ I_b = \frac{I_g + I_s}{2} \]  

\( I_b \) – balanced development index of VIOC/business segment;
\( I_g \) – balanced growth index of VINK/business segment;
\( I_s \) – sustainability index of VIOC/business segment.

The basis of the balanced growth model of the VIOC is “the golden rule of the economy”: with balanced growth, the key indicators of the business segments change proportionally, which indicates the effective use of resources, an adequate change in the supporting processes and an increase in the company’s market value. Deviations from balanced growth can lead the organization to a crisis state. A balanced growth of the VIOCs will be achieved only in case of a balanced growth of its business segments.

In order to develop a methodology for assessing the balanced growth of the business segments of the VIOC and the company as a whole, it is necessary to identify the key parameters of business processes. In general, the control parameters of business processes are not comparable in statics, since they have different units of measurement. Characteristics of vertically integrated companies, which can’t be matched in statics, dynamics become comparable, as evidenced by the comparability of the dynamic properties and dynamic hierarchy. Thus, it is possible to compare the results of production and economic activities of the VIOC, to link the value of the parameters both inside and outside of each business process, thereby taking into account the synergetic effect achieved with its balanced growth.

To identify key indicators and build regulatory dynamics, we will use the process-target approach to the management of the VIOC. This approach allows us to identify and make management decisions on key processes of the VIOC and combine disparate actions on business segments in order to achieve a common goal of the company. To integrate the key parameters into the dynamic model of balanced growth based on the process-target approach, we consider the technological infrastructure of the VIOC, formed by various subsystems (Fig. 4). The reference balance sheets of key performance indicators of the business segments are formed in accordance with the company’s strategic activities.
**Figure 4.** Logical scheme of the relationship of key indicators of business segments with the VIOC’s objectives based on the process-target approach (compiled by the author).

Reference dynamics of VIOC’s activities indicators in the form of a matrix built according to the rule:

\[
M[E] = \{a_{ij}\}
\]

\[
a_{ij} = \begin{cases} 
1, & \text{if } Rate^E(i) > Rate^E(j) \text{ and for } i = j, \\
-1, & \text{if } Rate^E(i) < Rate^E(j), \\
0, & \text{if ordering between Rate}^E(i) \text{ and } Rate^E(j) \text{ is not determined.} 
\end{cases} 
\]

(2)
$a_{ij}$ element of the reference matrix;

Indicator number, $i$ – line number, $j$ – column number;

Rate $\ell(i)$, Rate $\ell(j)$ the pace of the standard growth indicators $i$ and $j$.

The indicator's growth rate is calculated as the ratio of the value of the indicator in the current period to its value in the previous period. The formula for calculating the elements of the matrix of actual growth values is estimated in a similar matrix (3).

$$
M[F] = \{b_{ij}\}
$$

$$
b_{ij} = \begin{cases} 
1, & \text{if Rate}^E(i) > \text{Rate}^E(j) \text{ and } i = j, \\
-1, & \text{if Rate}^E(i) < \text{Rate}^E(j), \\
0, & \text{if ordering between Rate}^E(i) \text{ and Rate}^E(j) \text{ not determined},
\end{cases}
$$

Rate $\ell(i)$, Rate $\ell(j)$ the pace of the actual growth indicators $i$ and $j$.

Elements of the balanced growth matrix may differ from those of the actual growth matrix. It is the degree of proximity of the reference and actual rates levels that will describe the level of the achieved balanced growth of the VIOCs. The method of estimating the proximity of the actual growth to the reference growth is based on the distance method. Thus the deviation matrix is the matrix the elements of which can be defined as difference module between the corresponding elements of the reference alignment matrix and the matrix of actual results. For elements whose growth rate corresponds to the reference the difference will be 0. The difference modulus is 2 for those pairs of elements whose order does not coincide with the reference. Thus the order breach of growth rates indicators can be defined in the resulting deviation matrix by the cells with two. The degree of achievement of the benchmark dynamics needs to be assessed by a single indicator. In this case, the calculated value can be easily interpreted and reduced to the system of company's achieved results. This approach reveals the possibility of comparing the estimates of the VIOC with its competitors in the market and with the structural business units.

The structure of the developed integral indicator of sustainable development is represented for each business segment by traditional, in fact, indices of economic efficiency, environmental and social responsibility, as well as expanded by the index of innovation activity. The final structure of indicators and parameters of the sustainable development indexation system, as well as their calculation formulas are presented in the Chart 6.
Table 1. System of indicators and internal parameters of the system of sustainable development indexation of VINK and its business segments (compiled by the author).

| Index                  | Indicator                                                                 |
|------------------------|---------------------------------------------------------------------------|
| Sustainable development (traditional conception) | Profitability of sales, %                                                  |
|                        | Labor productivity, RUB/person                                             |
|                        | Specific energy consumption, ratio                                        |
|                        | Operating efficiency ratio                                                |
|                        | Costs for environmental protection in revenues, ratio                     |
|                        | Specific emissions into the atmosphere, 1/(t/u.t.)                        |
|                        | Specific water consumption, 1/(m³/u.t.)                                   |
|                        | Specific amount of waste, 1/(t/u.t.)                                     |
|                        | HSE's share of revenue, ratio                                             |
|                        | The share of social benefits in the revenue, ratio                       |
|                        | Charity's share of the revenue, ratio                                     |
|                        | Industrial injuries, 1/(pers./u.t.)                                      |
|                        | Innovative activity R &D funding share of revenue, ratio                 |
|                        | Share of intangible assets in total assets of the company, ratio         |
|                        | The depth of refining (the oil recovery factor)                           |

* To analyze the calculation of the index, the inverse value of the indicator is used, since it has a negative characteristic.

In order to ensure functioning of VIOCs integrated business segments of different scales for all indices of the indexing system, relative indicators were selected. The method of calculating the relative indicators of the sustainable development system involves the use of denominator parameters characterized by the most stable upward trend among analogues (which increases the efficiency of the indexing system) – revenue and production. Application as indicators of the various parameters ratio parameters to the total VIOC revenue is also advisable due to the fact that it allows to assess the entire structure of cash flows of the company. The advantage of the proposed approach is to ensure a high degree of comparability of statistical series with their sufficient completeness for analysis. The accepted estimates of the system parameters are objective (the method of expert assessments is excluded) and reveal the possibility of assessing sustainable development in business segments separately.

3. Practical part
In Table 2 the VIOC's market value dynamics and the assessment of their balanced growth index are presented. In General, 2015 was characterized by a decrease in the market value of Russian VIOCs by an average of 50%, which was influenced by macroeconomic factors. At the same time, the table shows that the decline in the value of the company was deeper in the case of the worst degree of its balanced growth.
Table 2. Dynamics of market value and the extent of balanced growth of Russian VOIC.

| VIOC            | 2014 | 2015 | Capitalization growth for the year, % | Balanced growth index, % |
|-----------------|------|------|--------------------------------------|--------------------------|
| Rosneft         | 37,7 | 37,3 | 1,2                                  | 44,61                    |
| Lukoil          | 22,3 | 27,2 | -18,1                                | 29,96                    |
| Surgutneftegas  | 18,5 | 16,8 | 10,7                                 | 46,79                    |
| Gaspromneft     | 8,4  | 10,0 | -15,8                                | 35,75                    |
| Tatneft         | 10,1 | 9,5  | 6,2                                  | 38,64                    |
| Bashneft        | 5,2  | 4,2  | 24,1                                 | 44,75                    |

It is evident that the three leaders in terms of balanced growth corresponds to the three leaders in the dynamics of capitalization of the company – PJSC "Surgutneftegas", PJSC "Tatneft", PJSC "Bashneft". There is a clear correlation between the balanced growth of the company and the dynamics of its value. Thus, with a large balanced growth have greater strength to the effects of negative factors, are more resistant to speculative factors, quickly restore its market value.

The indicators of sustainable development of Russian companies calculated on the basis of the proposed methodology are in most cases lower than those of foreign companies, which may be due to the following factors (figure 6): firstly, the lack of relevant information and poor quality of open data; secondly, the relatively low technological equipment, which leads to inefficient use of production capacity and labor, low efficiency of processes, a high degree of negative impact on the environment, etc.; thirdly, Russia's inherent oligopolistic competition.

The high degree of correlation between capitalization and the level of balanced development of the VIOC confirms the hypothesis that "balanced development of the VIOC determines the capitalization of the company" (Fig. 5).

Figure 5. Capitalization and the index of balanced development of Western and Russian VIOCs (compiled by the author).

The obtained results of the calculation and analysis shown in figure 5 indicate that the balanced development model is applicable to assess the capitalization of the VIOC; the developed indexation at the level of business segments can be used and developed in the construction of a balanced scorecard. Thus, the formation of VIOC development program is advisable to carry out on the basis of a comprehensive criterion – the index of balanced development.

4. Conclusion

Thus, the implementation of program aimed at improving VINK's efficiency will allow achieving consistency of investments in its segments, while respecting the principles of balanced development. The
The proposed method of integrated assessment of VINK effectiveness is a convenient tool for the formation of a balanced program to improve efficiency and its rational financing. The developed method of complex VINK effectiveness assessment in terms of its compliance with the principles of balanced development demonstrates the range of changes in certain aspects of its activities and answers questions about the type of situation and the nature of competitiveness management. It allows receiving not only the generalizing conclusions, but also problems of functioning of a business segment of activity, to find out places of communication violations between them.

5. References

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