

System Analysis of Strategic Enterprise Management in the Post-Pandemic Period

Medennikov V.I.

*Dorodnitsyn Computer center of FRC "Informatics and Control" of RAS, Vavilova 44-2, 119333, Moscow, Russia
Corresponding author. Email: dommed@mail.ru*

ABSTRACT

The article considers the role of strategic management in the era of the digital economy in the post-pandemic period, which together exacerbated the unpredictability of social development and competition between enterprises in all industries of the world. The analysis of the transformation of approaches to the development of development strategies and the concept of efficiency of both production itself and management methods in the historical context is given. A model of strategic management in the digital economy is proposed, based on a system approach to all elements of the model. It is shown, that non-specific models of strategic management came into collision with new trends in business, it is necessary to take into account the importance of such factors as humanitarian, human, moral values, as well as the culture of the company. The digital economy is also making significant corrections to the concepts of both overall efficiency and economic efficiency, since the so-called factor "regulatory requirements of regulatory authorities and recently emerged requirements of third parties" begins to exert a significant influence on the products of many industries in the world. Forming digital platforms, based on cloud technologies: platforms for primary collection and accumulation of data and application platforms will make profound changes in management systems at all levels, in particular, will affect the interrelations between producers and partners in the value chain (logistics, wholesale companies, retail chains) due to the implementation of cloud technologies of the direct sales model, when the producer "sees" all participants in the chain, up to the end-user, respectively, the timing, volume, and range of demand; the transition to a new type of manufacturing enterprises: from the quality control phase after the production phase to the principle of monitoring all production operations; the transition in the formation of strategic purposes in the form of the company's competitiveness in the market through quality and price characteristics.

Keywords: *strategic management, digital economy, model, digital platform*

1. INTRODUCTION

We are currently witnessing the accelerating processes of disequilibrium and uncertainty of global social development, associated with structural changes in politics and economy, aggravated by the pandemic and the ongoing digital transformation. As a result, the dynamism of the external environment for all categories of business sharply increased, which, in turn, awoke significant scientific and practical interest in the problems of strategic management, which gives a chance for sustainable development of companies in market conditions, based on the possibility of quantitative assessment of various options of their development for a certain long period of time. This problem threw into sharp relief especially in the era of the digital economy (DE), which significantly increased competition around the world, an essential element of which is, first of all, quality, mobility, other components, that increase the competitiveness of enterprises.

Thus, the competitiveness of an enterprise in the market should be expressed through quality and price. This trend is becoming more and more stable. In this regard, on the

basis of the theory of strategic management, the genesis of the concept of efficiency in the economy, a formalized description of the competitiveness model, which is the purpose of such management, taking into account the quality and price of products, is considered, as well as an analysis of the necessary conditions for its implementation in the digital transformation of enterprises.

The relevance of these studies stems from one of the main laws of the development of the world economy, which states, that one cannot become a leader without providing leadership in the methods and systems of strategic management.

2. PROBLEM STATEMENT

The difficulty of choosing the most acceptable strategic option from various alternatives in a situation of a dynamically developing economy in conditions of increasing both external and internal uncertainty, associated with a large number of conflicting demands on various areas of enterprise activity: financial, production,

market influences, in particular personnel, relations with government agencies, suppliers and consumers, etc., requires a clear definition of the criterion of efficiency and the purpose of developing a strategy of the development of enterprises.

The theory of strategic management in the form of a scientific field was formed in 1980-1990, based on the theory of company management, although this terminology was known in the middle of the XX century as a result of the growing problem of economic agents of the influence of environmental factors on their activities. The methods and models of company management were formed at the beginning of the last century as a result of the works of F. Taylor, G. Gant, H. Emerson [1], and then the works of A. Fayolya, M. Weber, C. Bernard [2]. In these works, planning was defined as one of the main functions of company management, which had only a short-term nature and was expressed in the form of budgeting and control. This approach was based on the assumption of the stability of both the external business environment and its resource potential, proceeding from the general situation in the economy of the industrialized countries of that period in a whole. Therefore, business planning consisted in scrupulous, detailed formation of the company's annual budget. However, under the influence of the scientific and technological revolution, the emergence of transnational companies, there was a need for long-term planning and management, aimed at the future, which caused a large number of domestic and foreign studies, that finally formalized the concept of strategic management. Among the first foreign researchers were A.A. Thompson and A.J. Strickland [3], M. Mescon, M. Albert, F. Hedouri [4], I. Ansoff [5], G. Mintzberg, B. Alstrand, J. Lampel [6] and others, and among domestic O.S. Vihansky [7], L.S. Shekhovtseva, [8] and others.

As a result, a large number of strategic management models appeared, which have mainly the so-called iconographic form (the form of block diagrams and graphs), and differ from one another in the number and content of a number of successive steps. However, they all have a single logical chain, and in general, the process of forming strategic management contains the following five steps: determining the mission and purposes of the organization; strategic analysis; choice of development strategy; implementation of the strategy; monitoring and assessing the implementation of strategies.

So, fig. 1 shows one of the first models of strategic management, proposed by I. Ansoff [5].

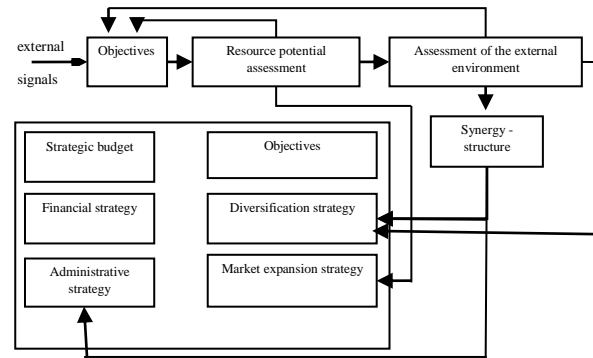


Figure 1: Steps of strategic plan of I. Ansoff

As is usually the case in science, the theory of strategic management appeared not without reason; long before that, many researchers set objectives of identifying patterns between production, its management, and the efficiency of both production itself and management methods. Here are just some of the significant ones. Thus, the economist G. Emerson [9] revealed a functional relationship between the organization of production and management principles, indicating, that an efficient company is that produces the maximum amount of products using 100% of resources without losses.

In the XX century. R. Coase introduced the concept of "neighbourhood effects". They can both increase efficiency and decrease it. Neighborhood effects are costs or income of a third party, that is not directly involved in the transaction process [10].

With an increase of services relative to material production in the share of production, the concept of public good and subjective value appeared, in which the product is presented not as an object with physical properties, but as a carrier of properties, that have a certain value to the consumer (the theory of marginalism) [11]. Based on the works of marginals, to whom, in addition to K. Menger it is possible to include U.S. Jevons and L. Walras, the theory of business processes was formed, with the purpose not to produce goods, but to satisfy the needs of the client. In 1963, R. Syert and J. March published the work "The Behavioral theory of the firm", which studied the dependence of the efficiency of the firm on the process of making economic decisions. Thus, for the first time, the dependence of the technical efficiency of the enterprise, that is, the efficiency of the product production process on the enterprise management process, was revealed.

Finally, in 1987 The International Commission on Environment and Development, established by the UN General Assembly, put forward the concept of sustainable development, which is based on the idea of environmentally safe development. It covers not only issues of environmental protection, but also a number of other problems: financial, social, demographic. The stability of an enterprise is a balanced state of material, economic, and labor resources, which is achieved with their effective use, providing conditions for expanded reproduction and adaptation to changes in internal and external factors.

Such a large number of works, which are mostly descriptive, often ontologically incompatible, should have led to the implementation of the well-known principle of the transition from quantity to quality. And so, at the 1st International Congress of the International Federation of Automatic Control (1960), interest in generalizing traditional control objectives was showed, which eventually marked the emergence of systems theory, or, as it is sometimes called, general theory. At the same time, the concept of economic efficiency from D. Ricardo to sustainable development with many particular interpretations of this concept was generalized to the concept of efficiency as an important characteristic of the system. According to systems theory, efficiency is the effectiveness of the use of resources in achieving some purpose.

Nevertheless, the dominant concept still remains the same, expressed in relation to the useful end results of its functioning to the expended resources. In almost any traditional economic reference book there is a definition of economic efficiency, which is understood as the ratio of the result to the cost of achieving it.

The digital economy, on the other hand, makes significant corrections to the concepts of both overall efficiency and economic efficiency. For example, with the development of Internet technologies, the so-called factor "regulatory requirements of regulatory authorities and recently emerged requirements of third parties" is beginning to acquire a significant influence on the products of many industries in the world. This is most evident in the pharmaceutical and food industries due to the increased focus on health and nutritive quality in the world. In other industries, this effect manifests itself with a small lag and is not so obvious, therefore, in connection with the pandemic, we will demonstrate the manifestation of this factor, using the example of pharmaceuticals. The market places demands on the medical community to more accurately identify diseases and create targeted packages of solutions to protect the health of the population, requires a transition from the production of so-called "nondimensional drugs" to "targeted therapeutic solutions".

This is on the one hand. On the other hand, global trends in the field of standardization and regulation of the production of medicines (drugs) are focused on the global harmonization of requirements for the production of drugs throughout the entire life cycle of preparation from development to obtaining a therapeutic effect. Thus, here two main directions are clear cut:

- increasing social responsibility of the drug producer, imposed by the state and society as a whole;
- emphasis on ensuring the release of products of appropriate quality through organizational and management measures at all steps - from the development of a new preparation to the sale of a finished product.

As for third parties, recently there has been a demand for a concept, according to which, each buyer can check information about the quality, safety, and legality of products online, and the regulatory authorities can get access to the full range of information about the product.

In the agro-industrial complex, this concept is called product traceability. Therefore, when developing a strategy for the development of an enterprise, the target performance indicators should include not only target prices, but also quality indicators, that increase their competitiveness. The fallacy of taking only price as an indicator of competitiveness is given in [12], when analyzing the strategy of one of the largest companies in the country.

3. RESEARCH RESULTS

The growth of the competitiveness of enterprises in the digital era in the process of its strategic development is ensured through the inclusion of innovative and investment components in the strategy, which is confirmed by numerous studies of domestic and foreign scientists. In this case, the innovation and investment components solve the problem of adapting enterprises to a rapidly changing external environment. Thus, from the point of view of a product producer, competitiveness is its ability to maintain and expand sales markets through purposeful activity both in relation to the quality characteristics of products and in relation to competing producers. All decisions, related to entering new sales markets, reorganizing the organizational structure, modifying and mastering new types of products, changing the volume of its output, changing fixed assets, changing economic ties, and marketing policy are subordinate to ensuring the competitiveness of the enterprise. Then, from the point of view of a systems approach, the digital transformation of enterprises in the post-pandemic period can be represented in the form of a strategic management model, presented in fig. 2.

presented in fig. 2.

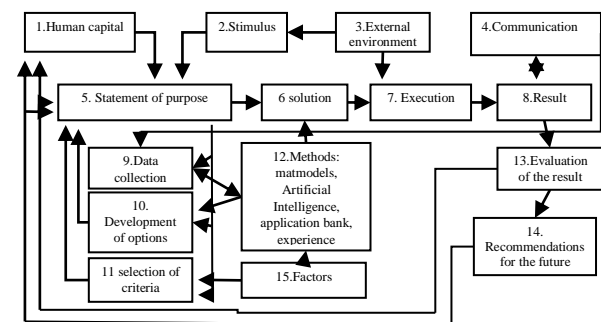


Figure 2: Block diagram of a strategic management model in the digital economy

Consider the individual blocks of this model. First of all (block 1), in terms of the ongoing digital transformation in the world in recent years, there has been a revision of the key role of human capital (HC) in social and economic life and the development of society with a radical change in the technological mode, associated with the DE at all its hierarchical levels: national, industrial, regional, corporate

and individual, since the DE requires a radical renewal of production, retraining of personnel, from workers to top managers, a transition to modern management methods, that correspond to the opened possibilities of ICT. For such an economy, highly qualified specialists are required, who have the necessary competencies and are able to invest their HC in production and develop.

In the classical formulation of strategic management in the formulation of purposes, only the experience of the enterprise management was taken into account. In recent years, in the theory and practice of industrial relations in setting targets, the importance of factors such as humanitarian, human, ideals, moral values, philosophy, and company culture has increased. Non-specific models of strategic management came collision with new trends in business. The human factor of the theory of strategic management develops mainly in the theory of behavior. Also considered as the most important factors in achieving the purposes of strategic management: motivational mechanism; personal characteristics of management and employees; improving the role functions of personnel and corporate values; level of professional knowledge; continuity of training [13]. In the work of M.I. Kruglov [14] the motivational mechanism (block 2) is studied, the structure of which consists of four mechanisms: labor motivation, production improvement motivation, entrepreneurship motivation, management. The increased unpredictability of world economic development is an additional incentive for the development of an enterprise development strategy.

As already considered above, the new environmental factors (block 3), that have a great influence on the strategic management of an enterprise, include the regulatory requirements of regulatory authorities and the requirements of third parties.

Further, one of the results of the analysis of the basic principles of digital transformation in the world is the creation of an information management system (block 4), i.e. collection, processing, storage, and distribution of the necessary data in a form, adapted to the daily operation of enterprises, based on the widespread integration of disparate data into a unified system. Thus, J'son & Partners Consulting company [15] considers, that currently two digital platforms (DP), based on cloud technologies, are being formed in the economy: platforms-aggregators of economic information (platforms for primary collection and accumulation of data) and applied platforms. At the same time, it is considered, that the greatest efficiency of digitalization of production will be achieved only with the cloud approach, since in this case, information becomes available for enterprises of all sizes, and not only for some of the largest of them, which is especially important for Russia with its large number of small farms. This concept will affect the interrelations between producers and partners in the value chain (logistics, wholesale companies, retail chains) through the implementation of cloud technologies of the direct sales model, when the producer "observes" all participants in the chain, up to the end consumer, respectively, the timing, volume and the range of demand. In Russia, in this direction, a

mathematical model of the formation of a digital platform (DP) of the country is developed and practically implemented, which is the integration in a single cloud database (CDB) of all data of primary, technological and statistical accounting of industries on the basis of a simulated unified system for collecting, storing and using it, unified classifiers, reference books, standards, other registers of all material, intellectual and human resources [16]. At the same time, the specified mathematical model made it possible to develop one significant standard. This is a standard for primary accounting information, which is a universal type of collection and storage: type of operation, object of operation, location, who carried out it, date, time interval, means of production involved, volume of operation, type and volume of consumed resource (block 9). This standard has a universal form, allowing communication with all enterprises in the value chain [16]. One of the significant mistakes in strategic investments is indicated in work [17], when an indicator of competitiveness, based only on the price of products, is taken as a target (blocks 5, 10, 11). That is why it is necessary to include quality characteristics in the targets. Based on the above considerations, write in general terms the dynamics of indicators of quality and net cost of manufactured products, that affect the competitiveness of an enterprise, in the form of a functional dependence on a set of factors of the external and internal environment of its functioning in the form:

$$y_{ijk}^{t+1} = y_{ijk}^t + F_{ijk}^t (W_i^t y_i^t z_{ko}^t V_{ik}^t z_{kc}^t L_k^t M_k^t \Phi_k^t IN_k^{t-\tau} r_k^{[t,T]}), \quad (1)$$

where y_{ijk}^t is the value of the j -th indicator of the competitiveness of the i -th product of the k -th enterprise in the t -th year, $j \in J$, $i \in I$, $n \in N$, $k \in K$, $j = 1$ reflects the quality of the product, $j = 2$ is net cost, W_i^t is the volume of demand for the i -th product in the market in t -th year;

y_i^t - regulatory requirements, requirements of third parties for the quality of the i -th product in the t -th year;

z_{ko}^t - the costs of ICT for general use of the k -th enterprise in the t -th year,

V_{ik}^t - volume of output of the i -th product of the k -th enterprise in the t -th year;

z_{kc}^t - the total costs of digitalization of the k -th enterprise in the t -th year;

L_k^t - investments of human capital in the quality of the k -th enterprise in the t -th year;

M_k^t - material and technical resources of the k -th enterprise in the t -th year;

Φ_k^t - the volume of available financial resources for the investment activity of the k -th enterprise in the t -th year,

$IN_k^{t-\tau}$ - total investments in the innovative production of the enterprise of the k -th enterprise, made in the $t - \tau$ year (we consider, that investments begin to give a return in τ years);

$r_k^{[t,T]}$ - integral risk estimation over the time interval $[t, T]$.

Define through the y_{ijk}^t j -th indicator of competitiveness of the k -th enterprise in the t -th year, where $y_{jk}^t = \sum_{i=1}^n \alpha_i y_{ijk}^t$, where $\sum \alpha_i = 1$, $0 \leq \alpha_i$.

Then we'll call the expression y_k^t an integral indicator of the competitiveness of the k -th enterprise in the t -th year:

$$y_k^t = \beta_1 y_{1k}^t + \beta_2 y_{2k}^t, \quad \text{where } \beta_1 + \beta_2 = 1, \quad 0 < \beta_1 < \beta_2 < 1 \quad (2)$$

In this situation, introducing through c_{it}^t - the predicted or real price of the i -th products of the k -th enterprise in the t -

th year on the market, it is possible to set the objective of increasing the integral indicator of the competitiveness of the k -th enterprise in the t -th year without taking into account the risks

$y_k = \max(\beta_1 y_{1k} + \beta_2 y_{2k}),$ (3)
with restrictions: $y_i^m \leq y_{ik}^m$ (requirements for the quality of the i -th products); $\sum V_{ik}^i \leq W_i^i$ (the total turnout should not exceed the volume of demand for the i -th product on the market); $f_{ik}^i(y_{i2k}^i) \leq c_{ik}^i$ (the price of the i -th products of the k -th enterprise in the t -th year on the market should not be lower than its net cost, expressed through the corresponding indicator of competitiveness); $z_{k0}^i + z_{k0}^i + L_k^i + IN_k^i \leq \Phi_k^i$ (financial investment restrictions).

The objective (3) is solved in a simulation mode with various predicted parameters of market prices, as well as factors, included in expression (1).

At present, many are already aware, that digitalization of production will require profound changes in the management system at all levels (block 6, 7). For example, in [18] it is said: "Digitalization is, first of all, a tough battle for superiority in the development of advanced systems for managing forces and assets in all categories of development potentials". That is, the decision-making toolkit is significantly expanded up to the formation of the DP of applied platforms, taking into account a much larger number of internal and external factors (blocks 10, 11, 12, 13, 14, 15). At the same time, it is considered, that the added value of products, produced using digital technologies, results from an increase in the accuracy of management decisions and the efficiency of work. The highlight of digitalization in the transition to platforms for the primary collection and accumulation of data, according to French experts, is that, the widespread introduction of digital technologies in any production allows the transition to a new type of manufacturing enterprises. If in the 80s of the last century, after the production phase, there was a

5. CONCLUSIONS

The need to form a unified information Internet space for digital interaction in connection with the coronavirus epidemic, which forced the transition of offline business and public services to online, led to the transformation of this problem from a purely theoretical format at conferences and in scientific journals into practice. There is a great risk that after the end of the pandemic, these ideas will not acquire sufficient critical mass for their implementation.

REFERENCES

- [1] Teylor F.U. Printsipy nauchnogo menedzhmenta. - M., 1991. - 49 s.
[2] Fayol' A. Obschcheye i promyshlennoye upravleniye. - M., 1991. - 122 s.

phase of quality control, then nowadays production begins to be based on the principle of current control of all operations, which made it possible to bring the production process to perfection. This will make it possible to implement the predictive principle of production formation, based on a deep analysis of the entire set of data on fluctuations of supply and demand, opportunities, availability of resources, financing and other equally important components of the entire production-consumption chain.

The results of the execution (block 8) of strategic management should be entered into a unified database of the digital platform for primary accounting, collection and accumulation of data.

4. DISCUSSION OF FINDINGS

As seen, the proposed model of strategic management of an enterprise in the DE requires a significant amount of structured information for its implementation. There are two ways to obtain such a volume. The first way involves large-scale questionnaires of a huge number of enterprises, as happened to prove the economic effect of the introduction of ICT [19]. The second way is the formation of some cloud unified information Internet space of the country's digital interaction [20]. The lack of a sufficient amount of structured data in the country was called number one problem by the developers of artificial intelligence technologies, unexpectedly faced with it [21]. In the West, they are also gradually coming to an understanding of the need to form some cloud unified information space for digital interaction of members of the value chain [15].

- [3] Tompson A., Striklend A. Strategicheskoye upravleniye menedzhmenta: iskusstvo razrabotki i realizatsii strategii. - M.: Banki i birzhi, 1998. - 576 s.
[4] Meskon M., Al'bert M., Khedouri F. Osnovy menedzhmenta. - M.: Delo. 1997. - 704 s.
[5] Ansoff I. Strategicheskoye upravleniye. - M., 1989. - 519 s.
[6] Mintsberg G., Al'stend B., Lempel Dzh. Shkoly strategiy. - SpB.:Piter. 2002. - 330 s.
[7] Vikhanskiy O.S. Strategicheskoye upravleniye: Uchebnik. - 2-ye izd., pererab. i dop. - M.: Gardarika, 1998. -296 s.
[8] Shekhovtseva L.S. Strategicheskoye upravleniye. - Kaliningrad: Izd-vo RGU im. I. Kanta, 2006. - 153 s.
[9] Emerson G. Dvenadtsat' printsipov proizvoditel'nosti / per. s angl. 2-ye izd. - M. 1992. - 224 s.

- [10] Kouz R. Firma, rynek, pravo / per. s angl. - M., 2007. - 224 s.
- [11] Menger K., Bèm-Baverk Ye., Vizer F. Avstriyskaya shkola v politicheskoy ekonomii. - M.: Ekonomika. 1992. - 496 s.
- [12] Effektivnyye modeli strategicheskogo menedzhmenta [elektronnyy resurs]. – URL: <http://rosinvest.com/page/effektivnye-modeli-strategicheskogo-menedzhmenta> (data obrashcheniya 12.07.2020).
- [13] Bulygina O.V., Yemel'yanov A.A., Yemel'yanova N.Z. Imitatsionnoye modelirovaniye v ekonomike i upravlenii. M.: NEOLIT – INFRA-M. 2018. – 592 s.
- [14] Kruglov M.I. Strategicheskoye upravleniye kompaniyei. – M.: Russkaya delovaya literatura. 1998. – 768 s.
- [15] Tsifrovizatsii sel'skogo khozyaystva v Rossii ne khvatayet dannykh [Elektronnyy resurs]. – URL: <http://www.iksmedia.ru/news/5533967-Czifrovizacii-selskogo-xozyajstva.html#ixzz6KBD7IYEP> (data obrashcheniya 25.07.2020).
- [16] Ereshko F.I., Medennikov V.I., Salnikov S.G. Modeling of unified information internet space of the country. IEEE Xplore Digital Library. Tenth International Conference Management of Large-Scale System Development (MLSD), Moscow, Russia, 2017.
- [17] Effektivnyye modeli strategicheskogo menedzhmenta [elektronnyy resurs]. – URL: <http://rosinvest.com/page/effektivnye-modeli-strategicheskogo-menedzhmenta> (data obrashcheniya 12.07.2020).
- [18] Ageyev A.I. Naskol'ko Rossiya podgotovlena k vyzovam KHKHI veka. NG-ENERGIYA ot 16.01.2019.
- [19] Akayev A.A., Rudskoy A.I. Konvergentnyye IKT kak klyuchevoy faktor tekhnicheskogo progressa na blizhayshiy desyatiletii i ikh vliyaniye na mirovoye ekonomicheskoye razvitiye. International Journal of Open Information Technologies ISSN: 2307-8162 vol. 5, no. 1, 2017. - s. 1-18.
- [20] Medennikov V.I. Matematicheskaya model' formirovaniya tsifrovyykh platform upravleniya ekonomikoy strany. / V.I. Medennikov // Tsifrovaya ekonomika. 2019, № 1. S. 25-35.
- [21] Pyat' problem, kotoryye poka ne mozhet reshit' Iskusstvennyy intellekt [Elektronnyy resurs]. – URL: <https://rb.ru/opinion/problemy-ii/> (data obrashcheniya 03.03.2020)