HYPOTHETICAL APPROACH TO EXTERNAL ENVIRONMENT FACTORS EVALUATION FROM THE VIEWPOINT OF VARIABILITY TO ENSURE THE ENTERPRISE DEVELOPMENT

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Abstract: The main problems of assessing the conditions of the external environment in the process of strategic planning of the development of the enterprise are outlined. The existing domestic and foreign methods of analysis of the conditions of the external environment, which can be used for the needs of the formation of strategies for the development of the enterprise, are analysed. The key attention is focused on the main factor such as the volatility having the maximum impact on the analysis process. It's evaluated either in terms of cyclicality or in manifestations of the "new economy". It is hypothesized that the uncertainty of the external environment should be evaluated from the point of view of variability, in order to obtain quantitative indicators. Such evaluation will not only take into account the relevant values in strategic planning but also enables seeing of changes in the spiral model visually.

Keywords: external environment, the enterprise development, the external environment factors analysis.

1 Introduction

Development strategies are regarded to be one of the priority directions in modern economic research. Today there is probably no enterprise that doesn't have a development strategy at every certain stage of implementation. The question arises on why our businesses can't always compete with foreign one in one or another direction of production as well as why the existing strategies need constant adjustment? All of us know the answer met almost in every scientific publication. It is the variability of the external environment. So in order to ensure both the effectiveness of the established strategy and the achievement of the planned results and forecasts one should to take into account possible changes in the external environment more conscious. But to do this it is necessary to develop a methodology for such an evaluation with a view to forecasting. The F. Taylor words "in order to manage it is necessary to measure at first" remain relevant and correspond to today situation [Teilor, 1911].

The external environment factors influence is clearly proved by the statistical data. Since the beginning of the 2008 crisis the number of unprofitable enterprises in Ukraine has increased by almost 5%, and in 2009 their number was 39.9%. In general, the indicator of operating profitability by type of economic activity decreased by 2 times [Statistical Yearbook of Ukraine for 2009, State Statistics Committee of Ukraine].

On the other hand it may be impossible to achieve the planned results due to the failure and not taking into account the development strategies of the external environment itself. But such strategies are embodied both in regional and national ones and therefore it's quite difficult to identify indicators that would have a direct impact on a particular enterprise. In addition most of the factors describing the impact of the environment are of a qualitative nature, that is, they can only be evaluated through expert evaluation, the result of which depends on the experts' competence.

And thirdly, there is no interpretation of the process arising due to changes that in one way or another have an impact on the company from the outside in any work. This process is often called variability. The main features of variability include such characteristic features as complexity, uncertainty, instability, rapid changes, and the emergence of new technologies. The issue of adaptation to the conditions but rather an adequate response to

the changes remains current in today's realities.

Thorough analysis of such contradictions puts the question what external environment factors make possible an achievement of the strategy the goal in particular development and whether there are ways to study such factors.

2 Theoretical basis

The methodology of the external environment factors notion study has become the basis of the economic community scientific researches in various fields of economic knowledge.

The notion of "external environment" has become the objects of scientific examination in the 60-70 years of the XX century together with the strategic management concept as well as of it separation from the operational one. The external environment of an enterprise is considered to be multi-level structure complex in modern economic literature. The elements of each level are formed under the influence of their own (specific) factors and in various ways (by force and direction) affect the activities of the enterprise.

The economists focus their attention on the fact that the external environment being a set of factors that have an impact on the enterprise activities management through the market subjects. Although in some sources the external environment is considered as the immediate conditions for carrying out the entrepreneurial activity that doesn't depend on the firm (enterprise, organization) but which must be taken into account when developing its development strategy, business plan, etc. [Besedovska, 2011].

S. Dziuba (2012) states that the external enterprise environment is a combination of actors and factors operating outside the enterprise, therefore, as a rule, they are not subject to direct control [Dziuba, 2012].

Designing the chapter "External Environment" of the educational edition "Enterprise Economics" edited by Lipych L.G. we analyzed the existing works by Balabanova L. (2004), Brovkova E. (1999), Pokropyvnyj S. (2001), Kindratska G. (2006), Kuzmin O. (2003), Koretsky M. (2007), Skibitsky O. (2006), who were engaged in research of the external environment and grouped the main factors and conditions of the external environment having an impact on the enterprise, namely: economic, political, socio-cultural, demographic, scientific and technological progress, environmental factors, factors of the international environment and their constituents [Lipych&Fatenok-Tkachuk, 2010]. Later a similar classification has become the basis of the external environment methodology analysis in the context of individual conditions on the basis of correlation-regression analysis.

F. Kotler work (1991) served the basis for such research was the, where he identified six major macro-environment factors: demographic, economic, natural, scientific, technological, political, cultural ones.

Depending on the nature of the impact whether direct or indirect one all elements of the company external environment are divided into two groups [Mamaluy, 2004; Taranenko O., 2010]. In the manner that makes influence the impact of the direct action factors on the enterprise should independently calculate the subjects of management, and the probability of the influence of factors of indirect influence of various kinds of consultative state centers on the needs of the enterprise.

Having analyzed the works by Balabanova L. (2004), Brovkova E. (1999), Kindratska G. (2006), Kuzmina O. (2003), Skibitsky O. (2006) Ryzhkova G. (2011) it can be argued that the medium of direct action on the organization (so-called microenterprise)

form certain entities such as consumers, competitors, suppliers, government agencies, financial institutions, and other external agents and contractors. This external environment is also called the environment of tasks because it contains elements that are directly related to the organization activities. Since the enterprise is the system-forming core of the micro-environment any changes in its activities directly and retroactively affect all the interconnected elements of the environment and the environment as a whole. The factors of direct influence, in particular, include consumers, suppliers, competitors, intermediaries, economic laws and state authorities.

The environment of indirect action (or macro-environment) encompasses material and technical conditions, social relations, institutes and other factors that influence the organization indirectly. The main ones include economic, political, socio-cultural, scientific and technological, environmental. The external environment is complex, variable and as a rule largely uncertain. Its elements are interconnected and affect each other. The interconnection of factors of the external environment is the level of force with which the change of one factor affects other factors.

Such division is supported by the scientists engaged in the external environment research whose views we share. The study of the external environment of the enterprise is aimed at analyzing the status of those entities with which the enterprise is in direct interaction. Sax J. emphasizes that "an enterprise can significantly affect the nature and content of this interaction, and thus take an active part in shaping new opportunities and preventing the emergence of threats". [Sachs J., 1996].

Orlov D. believes that the general feature of external environmental factors is not their control of the firm since they don't depend on it. In spite of this, there are a number of methods that allow somehow make an evaluation of the external environmental conditions [Orlov D., 2013].

Changes in the external environment affect the strategic position of the company on the market. Therefore the purpose of the analysis of the external environment is to monitor and analyze trends or events uncontrollable to the company that may affect the potential effectiveness of its activities. Westkamper E. (2008) proposed to conduct an analysis of the external environment in seven stages taking into account the generalized characteristics of each of them. The main steps in the author's opinion are the definition of the analysis object; the analysis purpose defining; the draft of an analysis plan; the development of schedules for the information collecting and processing; data processing, their systematization; analysis of collected information; development of conclusions and recommendations.

The author suggests using an integral evaluation of each group of factors influence. Such impact can be measured with a maximum score of 3 points, the direction of influence should be (+1) or (-1). The integral evaluation of indicators is calculated – (a • в • с). The evaluation results are displayed graphically. As a result we will see the level of a factor influence on the external environment in the industry and each specific enterprise. Such an approach to evaluating the environmental conditions is shared by such scholars as Khrushch N., Nyzhnyk V. and Polinkevych O. (2012), Orlova K. (2015), Kalny S. (2009), etc. Majority of scholars accept the well-known classification of the factors or conditions given above to evaluate them. But the factors characterized by a number of authors are different.

The interaction of the economic system of the enterprise and the external environment is proposed to be quantified using the coefficient of the external environment variability (K_{var}), which can be represented as a weighted average of its functional components:

$$K_{var} = \frac{\sum_{i=1}^{n} w_i k_i}{\sum_{i=1}^{n} w_i}, (1)$$

K_{var} – coefficient of variability of the external environment for the enterprise; k_i is the variability of the functional component of the external environment, $k \in [1;10]$; w_i – the value of the functional component of the external environment for the enterprise strategy (weight), $w \in (0;1]$; n – the number of selected functional external environment components.

According to the results of the analysis, determining the coefficient of variability can be concluded about the level of variability and, accordingly, about measures to adapt the enterprise.

After analyzing the above methodology it can be argued that it doesn't answer the questions which indicators of the enterprise activity will be affected by the external environment and how much they need to be adjusted. We only determine the probability of achieving the goals set but not their quantification. In addition some scientists propose to form forecasts for different levels of variability. For example, I. Karasev (2010) defines five such levels. Accordingly, the person during making the strategic decisions must make a decision depending on how much he is willing to risk. Although it is likely that the results thus obtained will be an additional argument for choosing an alternative or forming a specific target in the strategic perspective.

Regarding world practice the method of "5x5", the "list of four questions", the Wilson matrix, TEMPLES, PEST and SWOT, ETOM, QUEST analyzes can be considered the most well-known methods of the external environmental impact evaluating. The "5x5" method was suggested by A. H. Mescom in 1984. It includes five issues concerning five external environmental factors: name the five external environmental factors that you know about the information; which five external environmental factors are most dangerous; which five factors from your competitors' plans are known to you; which five factors are most important for achieving goals; name five external spaces change of which could be positive.

This method is a kind of interactive technique of the "Five Why" question used to identify the causal relationships that underlie a particular problem. This technique was formally developed by Sakita Toyoda and used by Toyota Motor Corporation during the development of production methodologies [Ono T., 2008].

Another evaluation tool is a methodology that includes a list of four issues including the main criteria for evaluating the impact of each significant external environmental factor on the future state of business processes at the industrial enterprise: how (positively or negatively) such factor can affect the state of the research object; what is the probability of the factor increasing and if it is possible to track its change; how much is the factor influence on the object of research; under what circumstances the influence of this factor on the object of research may weaken: in the nearest future? In the mid-term? In the long run? [Mamaluy, 2004].

Wilson suggested the matrix "the probability of increasing the factor – the influence of the factor on the enterprise" aiming at the practical application of this method. If the value of the factor is high according to the matrix then it should be given special attention. If it's slow, the value of the factor can be ignored. But this is a kind of correlation-regression analysis which by the way taking into account the multi-collinearity of factors will give a much more accurate picture of the external environmental factors influence.

World economic practice asserts that the most progressive method for analyzing the external environment is the PEST analysis. This is a method of external environmental analysis based on expert opinion and conducted to identify and identify the nature of the external environmental impact on the activities of the enterprise. PEST is the abbreviation of four English words: P – Policy, E – Economy, S – Society, T – Technology [Korenev, 2011]. An analysis of the four specified groups of

factors is performed by this method. Thus, based on various types of analysis of of external factors influence on the structure of the enterprise, it becomes possible to analyze the strengths and weaknesses, and on the basis of the analysis, modernize one or another system, or to radically change them.

The advantage of PEST analysis is that we can investigate the factor by factor due to its application and create a holistic characteristic of the external environment. This methodology is presented in Table 2, where an increase or decrease of the factor by PEST analysis is shown depending on the values. Such fact that most of the elements under consideration are hard to quantify is suboptimal therefore it may cause difficulties in assessing their impact and the dynamics of change. We can assume that the adaptation to the current realities of this technique as well as the analysis of the main external environmental factors by the T.E.M.P.L.E.S. method [Churlei, 2011] become the basis of domestic methods.

One of the most common and recognized methods for evaluating the external environment is the SWOT analysis, that is the analysis of Strength and Weakness points, as well as Opportunities and Threats. SWOT analysis is a method of strategic analysis, which includes an evaluation of both components internal and external.

Some of domestic authors state that SWOT analysis has advantages and disadvantages in comparison with other methods (Konovalova O. & Andrushkevich T., 2011). Its main advantage is the simplicity and the ability to spend a small amount of money on its conduct, as well as flexibility and availability of many options. It is also the systematization of knowledge about the internal and external factors that influence the process of strategic planning; the ability to determine the competitive advantages of the enterprise and form strategic priorities, periodically carry out diagnostics of the market and resources of the enterprise. The disadvantages of SWOT analysis, which need to be considered are the impossibility of taking into account all the forces and weaknesses, opportunities and threats; the subjectivity of choice and ranking of factors of the external and internal environment; poor adaptation to a constantly changing external environment.

The ETOM analysis (Environmental Threats and Opportunities Matrix) is a tool that is close to PEST analysis by its nature, but has a number of features: limiting the number of factors (often no more than 10-15 factors); the possibility of using a standardized list of factors from which the expert chooses the most weighty in his judgment; providing a quantitative assessment of the influence of factors. The result of the ETOM-analysis is the construction of a table that formed as a result of processing and generalization of expert evaluations, and usually contains information on three factors with the highest ratings.

QUEST analysis (Quick Environmental Scanning Technique) involves identifying external environmental factors, ranking them according to the degree of significance and selecting the most important ones. The choice is based on the limit – usually no more than five factors are analyzed. The next step is an expert assessment of each factor probability being implemented and an analysis of the interrelationship between them. The relationship is displayed either in the form of a ballroom score or in verbal form. The results are presented in a matrix form [Mekheda N. & Chernysh O.].

So at the current time there are methods that can be used by economic entities in order to formulate development strategies. Moreover the analytical departments of enterprises in practice use them for strategic planning. But there are problems with the implementation of such strategies, due to the impossibility of achieving any strategic plan indicators due to changes in the external environment. And such tendencies are observed all over the world. Therefore it is necessary to pay more attention not to the study of the analysis methods itself, but to the phenomenon of rapid changes in the conditions of the external environment and to describe it in terms of the process that can be evaluated.

3 The purpose of the research

The research is aimed to substantiate the theoretical provisions of the method applied to assess rapid external environmental changes in order to improve the effectiveness of the implementation of development strategies.

4 Methods

The method of analogies, identification and systematization in the process of determining the nature of the "external environment" and identifying the conditions and factors influencing the enterprise is applied. It is emphasized that correlation-regression analysis is the main method in the analysis and evaluation of external environmental conditions. An analysis of existing methods for assessing the external environmental conditions and their impact on the activities of the enterprise has been carried out. The absence of a universal methodology due to the complexity of accounting for the phenomenon of variability is proved. As a result a hypothesis dealing with the probability of change evaluating in the external environmental conditions due to the physical variability phenomenon is developed. It can be proved and can be described. It is suggested to use a screw line to simulate the cyclic development phenomenon as well as provide quantitative assessment.

5 Results

The external environment analysis is primarily a means helping the leader to see, predict and evaluate the influence of various factors on the company in a sufficiently concrete sense and. Its goal is to make the most effective management decisions basing on such information.

None of the existing methods gives an affirmative answer whether the existing enterprise strategy will be implemented in full.

If we analyze the characteristic features of the external environment variability then we can state that the following.

The complexity of the external environment is the number of factors that the organization is required to respond to as well as the level of variability of each factor. More complicated is the work of the organization which is influenced by a greater number of factors.

The variability of the external environment is the speed at which changes occur in the environment of the organization. In some of them the external environment is too mobile (computer technology, chemical technology, pharmacy, biotechnology). The food and woodworking industry enterprises are characterized by less mobile external environment.

Uncertainty of the external environment is a relative amount of information on the external environment and the probability of its reliability. Organizations striving to reduce the level of uncertainty of the external environment can apply two strategies such as to adapt to change or influence the external environment in order to make it more favorable for its functioning. The first strategy is implemented through the creation of flexible organizational structures with a high degree of power decentralization. The leaders of such organizations should be able to use modern tools to predict future changes and to have market intuition. As a rule the second strategy is only applicable at large companies or those that are united to increase their capabilities. They can use advertising and media to influence the external environment and political activity to lobby their interests.

"Variability" of the external environment is characterized in terms of cyclicality or manifestations of the "new economy".

The paradigm of cyclical changes in aggregate demand and supply, the volume of production and income and, accordingly, the state of the economy are the basis of the economic cycles and

economic conditions theory [Afanasyev N. & Rogozhin V., 2003]. Any system aspires to the stability and strives to avoid chaos. However, the laws of dialectics indicate the opposite position. Stability can't exist on its own without chaos and crisis. Stable situation and crisis are constant antagonisms in the development of any system. Historically the development of mankind was associated with a constant struggle with disagreements – wars, epidemics, natural disasters, etc.

On the other hand, the world economy has entered an era characterized by unbelievable rigidity of competition such as "commoditization" (the transformation of once unique products into ordinary ones) at rapid changes [Danylyshyn B., 2008]. The combination of all these manifestations is called the new economy. Here's how it is characterized: "When we talk about a new economy, we mean a world where people work by brains, not hands ... The world where innovations are more important than mass products. The world in which fast changes take place constantly. The world is so different that it can be described in one word – the revolution" [Wallersnight I, 2000].

In today's realities the question is not about adaptation to the external environment but how to adequately respond to their variability. It is impossible to quantify the level of "variability" or "rapid changes" in the external environment as this is a qualitative parameter that can't be evaluated. But we are inclined to think that this phenomenon can be described by the term variability.

This statement can be confirmed by the statistical interpretation of any changes, namely by variation in the difference of any indicator value in different units of the aggregate in the same interval of time. Variation is a necessary condition for the existence and development of mass phenomena. Definition of variation is necessary to the organization for selective observation, statistical simulation, and planning of expert surveys.

In terms of mathematical interpretation such changes can be described as a function variation. Further the numerical characteristic of the function with one real variable associated with its differential properties is called the function variation.

For a function with a segment on a real line in R^n is a generalization of the concept of the length of the curve.

It means that by using the functional approach to the planned indicator which we want to maximize in the process of implementing the development strategy we will be able to significantly increase the probability of this task under conditions of imposing the restrictions including the impact of external environmental conditions. To use a mathematical approach to quantify the impact of changes in the external environment it is necessary to systematize indicators that can describe the state of the main factors that affect the enterprise from the outside.

It is obvious that as a result of using the mathematical method for predicting changes in the external environment we will obtain a complex task but for solving it we will need to form a large database for a long period in order to avoid the error. The same process in physics is called the variation method.

The variation method is nonperturbative method of an approximate solution of a complex mathematical problem by its reduction to the problem of finding the minimum of a certain functional. Usually the variation method is applied in quantum mechanics to approximate the solution of the Schrödinger equation and to estimate the energy of the ground state and some excited states and based on the variation principle. This allows you to calculate approximate wave functions such as molecular orbitals. The method is to select a test function that depends on one or more parameters, and to find the values of these parameters in which the selected function will reach the minimum [Sommerfeld T., 2011. That is, we believe that the expression of the variability of external environmental

conditions can be replaced by the variation of external environmental conditions. This is a process that can be really evaluated. There is only a question that should serve as a function of this process.

Most authors argue that cyclicality is inherent in development. It is clear that the speed of changes is increasing but this was always the case. Even in the 1967 article "Modern Cycles and Crisis" is stated that "... the mechanisms of the cycle have changed a lot, but the form of the cyclic movement has still been preserved. Capitalism by its nature requires a cyclical movement can't exist without it and therefore can't get rid of it".

If we consider the theory of cyclic development and take into account that any development takes place in a spiral then we can assume that we should use the interpretation of variation in terms of biology. Genetic variation occurs due to random mutations that occur in the genomes of organisms. Precisely such "mutations" can definitely explain the complexity of predicting changes in external environmental conditions. By having determined those indicators that have suffered the greatest deviation from the forecast we will have the highest probability of "mutations". That is their influence will precisely require minimization.

The spiral is a curved line that makes a series of naturally changing turns around a certain point on a plane or around the axis [Dovbnya, 2017]
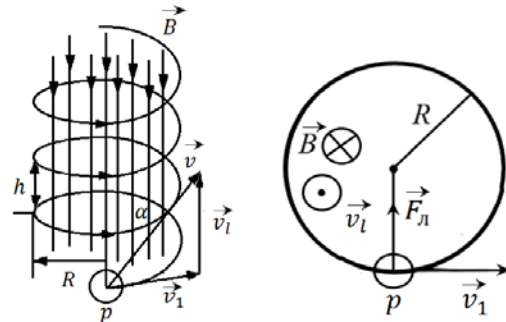

Figure 1. Model of developmental spiral

We assume that such spiral schematically reflecting the development should be screwed or a three-dimensional spiral. Such a form occurs in nature, the double double-stranded DNA and spiral (for example, alpha-helix) of the secondary structure of proteins are very well-known. Usually the screw line is divided into two types, cylindrical and conical, although the cylindrical screw line can be represented as a separate case of a conical spiral line with an infinitely distant vertex. In Cartesian coordinates, the cylindrical screw line is determined by a parametric formula:

$$\begin{cases} x = a\cos t \\ y = a\sin t \, (2) \\ z = bt \end{cases}$$

In vector form r = r(t) = (a cos t; a sin t; bt), $0 < t \le 2\pi$. (3)

The front projection of a cylindrical screw line is sinusoidal, and the horizontal is a circle. The scroll of a cylindrical screw line $(A_1, A_2, A_3, A_4, A_5, A_6, A_7, A_8, A_9, A_{10}, A_{11})$ is straight.

There are certain rules for constructing such a spiral. In terms of economics the construction of such a spiral will depend on a set of points that are described by certain coordinates. We need to identify these points by carrying out a retrospective analysis of the activity of the enterprise and the development of the external environment. In our opinion, ideally, there should be two spirals – the spiral of enterprise development, and the spiral of the development of the external environment. The accuracy of the start of a spiral depends on the number of points that the executor will be identified, that is, the indicators that will be taken into account as a result of taking into account the variation of the external environmental conditions.

6 Discussion

Despite a large number of the external environment analysis methods there is no single accepted method. All existing methods require an enterprise to retain highly qualified analyst in their staff who will constantly be able to analyze the enterprise external environment in order to strategic planning and continually adjusting the existing strategies to appropriate changes or to hire appropriate consulting groups. The costs of both options are not always admissible for the current economic situation at the domestic enterprise.

On the other hand even using one of them does not guarantee the high effectiveness of the strategy implementation due to changes in the external environment that are difficult or impossible to predict.

7 Conclusion

That is due to the complexity of the application of existing methods for predicting external environmental conditions at the macro level for the needs of the enterprise and due to the high probability of deviations occurrence from the planned indicators one should find the opportunity to consider other calculation theories.

We think that the solution to this situation is a visual simulation of development in the form of a spiral. But there should be two spirals, the spiral of enterprise development and the spiral of the development of the external environment. The spiral movement should be carried out through the fulfillment of certain conditions. The accuracy of the motion is due to a set of factors that are taken into account when forming the motion of the spiral. The task of the person who generates predictive indicators is to find the points of coincidence of the spirals for which it is necessary or vice versa it is not necessary to implement certain measures in order to achieve development.

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