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HOW IT IS POSSIBLE TO BALANCE THE DEVELOPMENT OF THE ENTERPRISE BASED ON THE SITUATION APPROACH IN MANAGEMENT: THE EXAMPLE OF UKRAINE

Alla POLYANSKA

AGH University of Krakow; polyanska@agh.edu.pl, ORCID: 0000-0001-5169-1866

Purpose: The purpose of this article is a comprehensive study of the state of balanced development of companies in conditions where their activities are characterized by complexity caused by the influence of many factors; uncertainty due to the low probability of predicting the future in crisis conditions and sudden changes in the parameters characterizing the business environment; volatility, when we observe a high degree of fluctuation in the value of a certain parameter or variable during a certain period of time.
Design/methodology/approach: The methodology is based on the use of factor analysis to study the factors of influence of the external and internal environment on the activity of industrial enterprises, the factors of which are divided into groups of latent variables; the application of the method of piecewise regression analysis, convenient in cases where the dependent variable changes dramatically after reaching a certain critical value, allows you to study such an environment and build scenarios as the paths along which enterprises plan to develop.
Findings: Situational models have been built, which allow obtaining data and cases, which in the future can become the basis for planning the future development of companies. For this, the idea of balanced development of the enterprise is used, which is aimed at determining the conditions of development, when due to the variables of the internal environment, which allow counteracting the determining factors of the external environment. The idea of modeling balanced development is used for enterprises of various industries.
Research limitations/implications: This study offers a comprehensive approach to study the situations that arise due to the environmental impact on the performance of companies, however, there are limitations caused by the analytical capabilities of the researchers in collecting and accessing the necessary information. In addition, today there are situations that are difficult to predict, such as wars and natural disasters. In the future, it is planned to supplement the considered method of situational analysis of the environment with methods of detecting signals of early detection and prevention of adverse situations.
Practical implications: The article examines the practical results of the application of the proposed approach to the analysis of the environment of industrial enterprises using the proposed methods, which allow to study the environment of an individual enterprise and to model scenarios of its potential development with a high level of reliability.
Social implications: The proposed research can have an impact on society, providing methods for studying the environment, which is characterized by complexity, uncertainty, as well as determining forecasts of its variability.

Originality/value: A method of studying situations that arise in the activities of companies due to the uncertainty, complexity and variability of the environment, in which it is difficult to plan future development due to the absence or insufficient information, is proposed. Its application is valuable for gathering information and forming cases, which can later be used to plan the development of companies using artificial intelligence technologies.
Keywords: situational management, scenarios, model, hidden factors, external and internal environment, balanced development, VUCA.
Category of the paper: conceptual paper, case study.

1. Introduction

The trends of modern development are characterized by the VUCA world as well as the need to understand it, anticipate and respond accordingly (Niehaus et al., 2024). Such work is greatly facilitated using the main achievements of management science, which considers various approaches to management, formed during its evolution (Fig. 1).

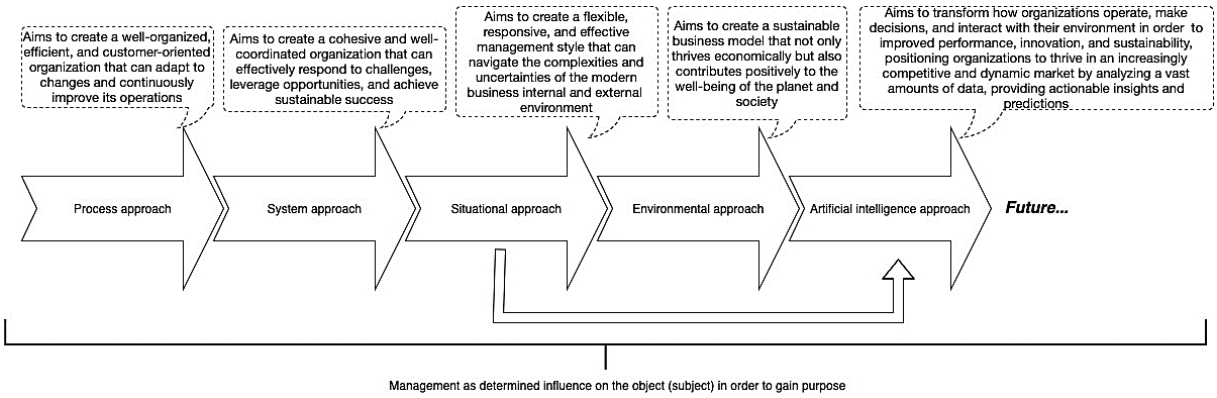

Figure 1. Modern management approaches evolution

Source: created by author.

Transformations that are taking place today in all spheres of economic activity occur because of current actions and the result of prediction (Zgurovsky et al., 2010). In this article, we focus on the situational approach, although we consider it in combination with other approaches to prepare the basis for conducting research on the relevance of situational management in today's conditions.

The emergence of situational approach in management as a result of the development of systems theory was determined by the need to understand what and how affects the system and the effectiveness of its functioning. The study of a wide range of factors made it possible to describe specific situations, or as they are also called "cases", the information base of which today serves as the basis for the development of neural networks and artificial intelligence technologies (Babets et al., 2023), etc.

The ability to consider the organization from the standpoint of an organizational structure capable of responding to the challenges of the environment of its functioning made it possible to adapt activities to modern challenges, such as global warming, digital transformation, natural disasters, wars etc. As a result of this progress, we have the expansion of the fields of new trends affecting arising situations based on artificial intelligence (Vladyko et al., 2022; Psyuk et al., 2024), digital transformation, sustainable development and energy transition (Polyanska et al., 2022, 2023) - this spectrum of changes allows forming a solid basis for predicting future, learning opportunities and planning development perspectives. All this determines the relevance of the study of situation management techniques and their application in practice.

2. Literature review

Scientists who study the problems of situational approach in management unanimously claim that there is no single correct way of enterprise development, because in the conditions of adaptation to the external environment, it is impossible to create such structures, methods, types of organizational order, to consider factors that would be ideal for use for any enterprise, time, goals, tasks, situations, etc. Each management situation corresponds to its optimal requirements for state, strategy, and structure (Woodward, 1965). The central point of the situational approach is the situation, that is, a specific set of circumstances that strongly affect the enterprise at a specific moment in time. Researchers note that to act within the framework of the concept of the general process of management and considering the situational approach, it is necessary to summarize and connect the existing knowledge, to give them the necessary framework, which is possible since a systemic approach using the main methodological provisions regarding situational management (Melnyk, 2009).

To highlight the main theoretical and methodological principles of situational management in modern conditions, we will consider the main provisions that characterize the essence of the specified management category, the prerequisites for its emergence and the peculiarities of its evolution. That could be essential for understanding the sense and relevance of its utilization. The "law of the situation" was first formulated in the early 1920s by Mary Parker Follett (1868-1933). She argued that the manager's effectiveness depends on his possession of the necessary knowledge; but different circumstances call for different knowledge, and, accordingly, different people achieve the greatest success in them: the best leaders become better not because they are endowed with any special leadership qualities, but because they meet the demands of the situation.

The transformation of the situational approach into an influential theoretical position began in the late 1950s based on the development of the main provisions of the theory of open systems to develop a concept that would explain the properties of the organizational structure by the

specifics of its adaptation to the internal and external environment. Researching the issue of situational approach in management, scientists have studied various factors that determine such "situationism". The list of factors included: applied technology (Joan Woodward); organizational structure (Tom Burns, George Stalker); state of the environment (Lawrence and Jay Lorsch); the size of the organization (Derek Pugh, David Hickson, Peter Blau, Richard Shenher) and its strategy (Alfred Chandler, G. Mintzberg, I. Ansoff) etc.

The first work in the field of situational management is the research of T. Burns and J. Stalker, who concluded that each type of economic conditions is characterized by its own organizational structure: for stable conditions - "mechanistic", for changing conditions - "organistic" (Luthans, 1973, p. 133). According to the definitions of this concept by followers, namely by R. Mockler (1971), the situational theory of management is designed to solve practical management tasks. The theory of the organization's life cycle can also be considered from the standpoint of situational approach, since each stage of the life cycle requires appropriate technologies and management tools (Adizes, 1979). It is important to take into account the requirements of a dynamic environment under the influence of which economic processes take place based on the achievement of a certain creativity, that is, the ability to special perception of the situation, which takes into account many of its specific manifestations and at the same time ensures its processing in a creative, not a template mode and ensuring effectiveness in a time close to reality (Thomson, Strickland, 2006). Researchers note that the purpose of situational studies is an empirical study of comparative problem situations, influential factors, alternative scenarios from a set of operating enterprises (Staehle, 1976).

M. Meskon, M. Albert, F. Hedouri (1988) defined the situational approach as a concept that states that the optimal solution is a function of environmental factors in the organization itself (internal variables) and in the surrounding environment (external variables), aimed at management in a specific situation for more effective achievement of organizational goals. In the development of this statement, R. Griffin and V. Yatsura (2001) consider the enterprise as a dynamic structure that changes its activity depending on the state and influences of the external environment, and the uniqueness of each organization based on the collected information allows choosing behaviour that corresponds to a specific situation and its special circumstances. In particular, H. Kuntz and S. O'Donnell (1976) point out that effective management is management based on circumstances, or situational management. Scientists highlighted the need to apply knowledge in a certain field of activity, a practical problem to achieve the best results in a certain situation. Such an interpretation creates conditions under which it is possible to mathematically build a model that will allow describing situations, analysing them and making forecasts.

Considerable attention was paid to the issue of situational approach in the field of human resources development. Situational leadership styles are directly related to different categories of employee maturity (Fiedler, 1964), and the effectiveness of a target group or organization depends on two main factors: the personality of the leader and the degree to which the situation

gives the leader power, control and influence over the situation or, conversely, the degree to which the situation confronts the leader with uncertainty (Nebeker, 1975).

The result of the application of the situational approach in management could be projected into scenario planning, which allows considering alternative conditions of the organization's activity that arise as a result of various factors influence. Researching this issue, scientists claim that a scenario is constructed not with the goal to predict the future or make a forecast, but rather to construct multiple possible stories of future situations (Garvey, 2022). Therefore, scenarios are an important tool of situational management (Cordova-Pozo, Rouwette, 2023). Scenarios are considered as a way of planning successful outcomes of crisis management, in case of unforeseen situations (Eriksson, McConnell, 2011).

The opportunities offered by the situational approach in management have significantly expanded the scope of its application. Considering the elements of the situational approach within the framework of the modern TOGAF universal framework for building the IT architecture of enterprises, it is recommended to supplement the methodology of creating and using practices of building the architecture in accordance with the enterprise transformation plans in the long term and developing the necessary capabilities to support these transformations through situational management technologies (Kornyshovaa, Deneckère, 2022).

It is important to consider that the situational approach creates a situational context for the formation of organisational knowledge and its management (Sense, 2007). As noted earlier in this article, the results of different situations analysing form experience and reduce uncertainty in the management process. The result of knowledge management is a product that can be used to solve difficult situations (Polyanska, Malynka, 2014). Cognitive diversity, determined by the level of professionalism and cognitive abilities of decision-making subjects, can also be balanced by the achievement of the necessary knowledge (Polyanska, Psiuk, 2019). The deepening of the research methods of various aspects of enterprise activity creates a repository of knowledge (Bieda et all, 2023), which can also be used in situational management. Taking this into account is possible when there are relevant methods to research and explain occurring situations.

So, a broad description of situational theoretical models does not allow to fully and accurately describe the real state of organizations and completely rely on practical activities. The presence of situational development models increases the resilience of the business entity to possible changes in the external environment. It allows quickly reorganizing its activities when trends to changes in business conditions are detected as well as orienting scientific-technical and production-marketing activities to the realization of market opportunities for development. Research results have shown that situational awareness supports the continuous development of business models (Gottschalk et al., 2023).

The model, as a tool of management activity, allows to significantly simplify the idea of existing management systems and accurately reproduce the possible reactions of systems to the action of external and internal factors. An analysis of numerous publications devoted to the study and search for ways out of the current economic situation shows that their authors proceed from different models of reality. The model that allows you to manage crisis situations in modern conditions is decisive. Models that reproduce the innovative foundations of domestic development do not give way. Models that ensure sustainable economic development are relevant. More and more attention is paid to the formation of models of competitive development. Of course, each of the models has the right to exist, moreover, each of them allows to reproduce the situation that is characteristic of the conditions of domestic economic development. The choice must be appropriate to the conditions of development of the individual enterprise, and decisions made in the context of development must ensure more than just adaptation to the current operation. In his book "The Challenges of Governance in the 21st Century", Peter Drucker (2001) expresses the idea that to succeed in today's environment, it is necessary not only to adapt to change, but also to manage it. This thesis is also relevant in the study of developmental problems. To adapt to change, most businesses change their operations according to competitors' reactions, consumer demands, technological advancements, etc.

Developing an idea of modelling in situational management we highline the necessity of maintaining the balance of the enterprise as a system consisting of subsystems. Equilibrium is a state that compensates for the influence of the environment and is achieved by establishing a balance within the system and between the system (enterprise) and the environment (Polyanska, 2012). Under the conditions of the application of situational management, the firm's resistance to limiting activities and its effects is formed due to the protective adaptation mechanism. He is entrusted with the task of finding a new equilibrium point because of the separation of the system from the initial equilibrium point, which occurred under the influence of environmental factors.

Thus, today it is important to generalize the scientific principles regarding the application of the situational management approach and its theoretical and methodological justification in solving the problems of the development of industrial enterprises. This will make it possible to reduce the subjective approach to solving problems that hinder the development of industrial enterprises, on the one hand, and on the other hand, to consider the objective requirements of modern development.

3. Article purpose

The purpose of the article is to investigate the conditions of balanced industrial enterprise development with the identification of their potential for necessary changes based on the justification of the relevance of situational management technology usage, in particular, comprehensive analysis methods such as factor analysis, scenario modelling and pieces regression analysis method for the construction of nonlinear dependencies of hidden factors groups of the internal and external environment of enterprises under the study.

4. Methods description

Therefore, today it is important to generalize the theoretical and methodological foundations of the formation of the concept of modern development of industrial enterprises on the basis of situational approach considering the following issues: determination of the prerequisites for situational management, the tasks that it solves in the context of modern development problems; allocation of methodological bases for identifying the situation and factors that cause them, and methods of responding to them, taking into account the achievements of modern management. science and practice.

It is impossible not to agree with the opinion of scientists that no theoretical model provides a complete and accurate description of reality and in practice one should not completely rely on the use of theoretical models. Under such conditions, it is expedient to build a situational model, according to which it becomes possible to make management decisions considering the projected changes both at the level of an individual enterprise, and the macroeconomic situation and the problems that may arise in this case, complementing strategic, long-term management.

The use of mathematical methods for diagnosing the environment in which industrial enterprises operate and plan their development is relevant. One of such methods, which are proposed to be used to study the influence of the external and internal environment on the activities of industrial enterprises, is factor analysis (Iberla, 1980; Oliinyk et al., 2014.). It allows you to process a significant amount of information and identify hidden (latent) factors that characterize the retrospective situation, the consideration of which is the initial condition for modelling the future foundations of development. The data obtained as a result of the assessment are the starting point for building a model of dependence of performance results on the influence of the outlined factors. The model reproduces reality, allows you to combine both the experience of an individual enterprise and modern development trends. The main goal of factor analysis is to reduce the number of variables and determine the structure of interaction between variables, that is, their classification. Such a reduction is achieved by highlighting

hidden common factors, explaining the relationship between the observed variables of the object, that is, instead of the initial set of variables, it becomes possible to analyse data on selected factors, the number of which is much less than the initial number of interrelated variables. The factors selected in this way are called general, since they act on all the features of the object. These factors are hypothetical, hidden, they cannot be measured directly, but the proposed statistical methods allow them to be distinguished.

The application of factor analysis is based on the construction of a matrix of correlation interdependencies between the studied factors and their classification with the future interpretation of the results obtained to identify latent (hidden) factors that determine most of the aggregate variance of data (Khalafyan, 2007). If the output data is written in the form of a matrix $V = (v_{ij})$, where *i* is the number of the feature, and *j* – observation number, its elements, represented as the values of paired correlations of the *R* feature matrix, are calculated using the formula:

$$r_{ik} = \frac{s_{ik}}{s_i s_k} = \frac{\frac{1}{n-1}\sum_{j=1}^{n}(v_{ij} - \bar{v}_i)(v_{kj} - \bar{v}_k)}{\sqrt{\frac{1}{n-1}\sum_{j=1}^{n}(v_{ij} - \bar{v}_i)^2}\sqrt{\frac{1}{n-1}\sum_{j=1}^{n}(v_{kj} - \bar{v}_k)^2}}, \quad (1)$$

where:

n is the number of observations,

$\bar{v}_i = \frac{1}{n}\sum_{j=1}^{n} v_{ij}$ is the mean,

s_i is the standard deviation of the trait v_i,

s_{ik} and is the covariance of the *i*-th and *k*-th features.

The factor model consists in representing the *matrix Z* of standardized observations $z_{ij} = \frac{v_{ij} - \bar{v}_i}{s_i}$ as a product of:

$$Z = AF, \quad (2)$$

where: $F = (f_{pj})$ is the matrix of values of statistically independent latent factors f_p for each observation, and is the $A = (a_{ip})$ matrix of factor loads (factor mapping), which is determined from the relation:

$$R = AA^{\mathrm{T}}. \quad (3)$$

Provided that the factors are independent, f_p the square of the coefficient a_{ip}^2 shows what proportion of the variance of the *i*-th feature is determined by the *p*-th factor, and the sum is the proportion of the total variance of all traits that is determined by $\lambda_p = \sum_{i=1}^{m} a_{ip}^2$ the *p*-th factor.

Note that – are the eigenvalues of the correlation matrix λ_p R, and their sum shows the proportion of the aggregate variance, which is explained by this factor model.

According to the results of the obtained groups of latent factors of the quantitative assessment of the impact of the environment on the activity of the enterprise, a methodical approach is proposed for researching the stability of the industrial enterprise to limiting external and internal influences by balancing the parameters of local models with the help of simulative models (formula 4). This will make it possible to neutralize or reduce the negative effects of the external environment by adjusting or adapting the internal environment according to the parameters of the local model:

$$\begin{cases} Y_i = b_{01} + b_{11}x_{ij} + b_{21}x_{ij}; \\ Y_i' = \gamma_{01} + \gamma_{11}z_1 + \gamma_{21}z_2 + \gamma_{31}z_3 + \gamma_{41}z_4 \end{cases}, \quad (4)$$

where:

Y_i, Y_i' are the resulting indicators of the *i*-th component of the industrial enterprise's potential, calculated according to local models that take into account the relevant influence of the internal Y_i and external Y_i' environment;

x_{ij} – the *j*-th internal factor of the *x*-th component of the industrial enterprise's potential, which affects the change in the resulting indicator;

z_i – external factors affecting the change in the resulting indicator of an industrial enterprise;

b_{ij}, γ_{ij} are model parameters.

In the conditions of dynamic influence of the external environment, the development processes of an industrial enterprise require the preservation of its state of equilibrium, which allows to compensate for negative external influences due to the purposeful use of the existing potential and considering the requirements of the external environment. The study of this condition is proposed to be carried out based on building a model of the sustainability of the development of an industrial enterprise, obtained by balancing the results of the influence of the internal and external environment, reflected in the values of the resulting indicators obtained according to local models:

$$\begin{cases} Y_i = Y_i' \\ b_{01} + b_{11}x_{ij} + b_{21}x_{ij} = \gamma_{01} + \gamma_{11}z_1 + \gamma_{21}z_2 + \gamma_{31}z_3 + \gamma_{41}z_4 \end{cases}. \quad (5)$$

The proposed approach makes it possible to investigate the condition of the sustainability of the enterprise's development and, based on the construction of an analytical model, to identify the necessary resources and directions for improvement of activity.

As a rule, all dependencies that occur in the environment are nonlinear. Therefore, when modelling the relationships characteristic of the processes and phenomena under study, it is advisable to consider nonlinear regression models along with linear regression models.

In particular, the piecewise regression model of estimation is convenient in cases where the dependent variable changes sharply when a certain critical value is reached. Then, until the critical moment is reached, it is advisable to carry out the assessment according to one model, and after reaching it, another one. Piecewise linear regression corresponds to the model (Polyanska, Babenko, 2012):

$$Y = (b_{01} + \mathrm{b}_{11}x_1 + ... + b_{m1}x_m)(Y\langle = Y^*) + (b_{01} + \mathrm{b}_{12}x_1 + ... + b_{m2}x_m)(Y\rangle Y^*), \quad (6)$$

where Y^* is the breakpoint that can be selected by the user or evaluated by the program. For this publication, the indicator of the average value of the integral indicator of efficiency of the investigated enterprises was used.

The application of this approach allows to form a set of alternative scenarios for ensuring the development of the studied enterprises. The choice of the final scenario is conditioned by the values y_c calculated within the framework of the built situational models for each enterprise.

Implementation of the built models allows to assess the efficiency of the studied enterprises and the potential for their development, considering the environment of functioning based on the formula (Polyanska, 2012):

$$\Delta_{\text{розвитку}} = y - y' \quad (7)$$

where y is the value of the integral performance indicator, predicted by the trend model based on its retrospective actual values; y' – the value of the integral performance indicator, predicted according to the built situational model; The sign "-" characterizes the adverse influence of the environment, respectively, the sign "+" is favourable.

Thus, each of these approaches is valuable for assessing the impact of the environment on the performance of enterprises, and their choice and application depend on the goals set by the management, the professionalism and competence of managers involved in this process, and the quality of corporate governance of the enterprise.

5. Research results

The state of the internal environment of the enterprise is a reflection, on the one hand of the influence of the external environment, and on the other hand, of the result of decisions that were made during activity. Today, any business is interested in the following questions: how to achieve stable functioning and ensure development in the future? The answers to these questions require clarification of the following positions: firstly, how the current state of the organization is assessed and, secondly, whether it has the potential for development in the future. It should be noted that in modern conditions, the diagnostic process also requires other tools for analysis and assessment of the condition, which would consider not only the financial aspect of the activity, but also other factors that cause or threaten a crisis state.

The functioning of the enterprise is possible in the presence of certain features, namely the means and objects of labour and capital, which are summarized in the assets of the enterprise. The results of activities, expressed in specific indicators, depend on how efficiently the company uses these assets. Currently, a wide range of indicators is offered for diagnosing the state of enterprises. It is important to choose indicators that characterize the quantitative and qualitative components of development and study the effectiveness of using indicators for assessing the components of the potential of enterprises.

Diagnostics of the internal potential of the enterprise is a complex process that requires significant resources, namely: qualified personnel, information support, financial resources. It requires adherence to certain principles, in particular, content, comprehensiveness, reasonable sufficiency, comparability, taking into account the time aspect, completeness (Sense, 2007, p. 56), and appropriate tools, which ultimately allows you to achieve the greatest effect from its implementation. The stated approach to diagnosing the impact of environmental factors on the activities of enterprise allows to carry out a current review of the potential capabilities of enterprise, to identify the influence of its main components and to adjust them considering the goals of future development. A number of indicators and financial ratios are used to conduct research in successful business management (Walsh, 2006).

Diagnostics of the potential for the development of industrial enterprises is proposed to be carried out using the resource concept, which focuses on the study of the main resource components that ensure effective results of work. As mentioned earlier, each enterprise has a certain potential, which is formed by factors of the external and internal environment. If the enterprise adequately responds to external and internal influences, then it progresses in its development, and if the factors have a negative impact, then a recession is observed, that is, such influences create a certain impulse, because of which the state of the organization resonates (Martinenko, 2006). To date, methods have also been developed and are widely used, which prevent companies from realizing their potential. In particular, the theory of constraints (TOC) developed by E, Goldratt, which is designed to eliminate obstacles and conflicts (Detmer, 1997). Thus, the potential for development of enterprise is formed under the influence of factors of the external and internal environment, considering a set of characteristics, indicators and properties that allow to fully use its capabilities to ensure the satisfaction of the relevant social need for goods for the future and the possibility of achieving the set goals. Since the current conditions of activity of enterprises are quite difficult, the range of key factors in the formation of their potential is also expanding.

However, this is not enough, it is necessary to manage changes on the way to creating a new quality, considering the existing conditions and potential opportunities. In view of the above, today the issue of choosing such a model of development remains relevant, which would allow to combine the conceptual foundations of future development, focused on a more complete and effective use of the existing potential, and local models of development, which allow balancing

internal reserves of activity in accordance with the changes that occur in the environment of functioning of enterprises.

Factor analysis was used to build scenario models for the development of oil refinery, gas supply and petrochemical enterprises. The tables below present the indicators by internal latent factors influencing the activities of gas supply enterprise (Table 1); oil refinery enterprise (Table 2) and petrochemical enterprise (Table 3).

Table 1.
Classification of indicators by internal latent factors influencing the activities of gas supply enterprise

f_1	f_2	f_3	f_4
Cost of basic funds (0.91) Basic funds wear level (-0.899) Labor productivity (0.85) Inventory turnover (0.95) Intellectual Capital (0.95)	Actual rate of return (0.96) return on assets involved (0.945) Return on sales (0.709) The anti-crisis behaviour Index (0.802)	Share of borrowed Capital in assets (-0.76) Inventory volume (0.89) Administrative expenses (-0.83)	Return on equity (0.88) Intangible assets (0.72)

Source: own work.

Table 2.
Classification of indicators by internal latent factors influencing the activities of oil refinery enterprise

f_1	f_2	f_3	f_4
Cost of basic funds (0.71) Basic funds wear level (-0.73) Actual rate of return (-0.98) Return on equity (-0.95) Return on assets involved (-0.98)	Share of borrowed capital in assets (0.70) Return on sales (0.71) Inventory volume (0.81) Inventory turnover (-.95) Copyright (0.83) Intangible assets (0.81)	Labor productivity (0.91) The index of anti-crisis behaviour (0.87)	Level of depreciation of capital (0.61) Profitability of sales (0.62)

Source: own work.

Table 3.
Classification of indicators by internal latent factors influencing the activities petrochemical enterprise

f_1	f_2	f_3	f_4
Cost of basic funds (0.89) Basic funds wear level (0.85) Volume of processed raw materials (0.82) Return on assets involved (0.9) Profitability of sales (0.96) The index of anti-crisis behaviour (-0.91) Administrative expenses (-0.97) Intellectual potential (0.91)	Share of borrowed capital in assets (-0.74) Return on equity (0.91) Actual rate of return (0.99)	Labor productivity (0.94)	Inventory volume (-0.95) Inventory turnover (0.79)

Source: own work.

Relatively, the Table 4 presents the indicators by external latent factors influencing the activities of industrial enterprises.

Table 4.
Classification of indicators by external latent factors influencing the activities of domestic industrial enterprises

F_1	F_2	F_3	F_4
Capital investment growth rate (0.82); Export growth rate (0.92); Import growth rate (0.92); Index of industrial production (0.86); Labor productivity (0.967)	Number of industrial Enterprises (0.91); Degree of wear of basic funds (0.85); Exchange rate (0.83); gas price (0.85)	Share of loss-making Enterprises (-0.81); Creation of added value in industry (0.71); Introduction of new technological processes (-0.77); Euro exchange rates (-0.88)	The number of Industrial enterprises engaged in innovation (0.86); Types of innovative products were introduced (0.54)
The proportion of variance of all traits caused by *the p-th factor*			
29	30	18	11

Source: own work.

Its application to identify the influence of the operating environment on the efficiency of investigated enterprises allows study the activity performance results. To avoid the structural peculiarities in the working out of situational model as one of most impactful factors of situational management, it was chosen the enterprises of PJSC (public joint-stock company) form. The sample considering of oil refinery enterprise allowed to obtain the following results:

- the influence of factors of the internal environment of the researched enterprise on its efficiency is insignificant, which can be seen from the parameters of the obtained mathematical dependencies:

$$y = 0{,}2795 + 0{,}03366\ f_4 \tag{8}$$

where f_4 is the latent factor, which covers a group of indicators: the level of depreciation of fixed assets, profitability of sales (Table 2).

The adequacy of this model is characterized by the following coefficients: $R = 0.509$; $R^2 = 0.259$ ($p - level(f_4) = 0{,}198 > 0{,}05$), indicating that it cannot be used to describe a situation;
– somewhat different results characterize the influence of the external environment on the efficiency of enterprise, in particular, the obtained dependencies demonstrate the following:

$$y = 0{,}28 + 0{,}04F_1 - 0{,}03F_3 \tag{9}$$

where:
F_1 is the latent factor, which covers a group of indicators: growth rate of capital investments; export growth rate; import growth rate; index of industrial production; labour productivity; F_3 latent factor, which covers a group of indicators: the share of unprofitable enterprises; creation of added value in industry; introduction of new technological processes; euro exchange rate (Table 4).

The adequacy of this model is characterized by the following coefficients: $R = 0.75$, $R^2 = 0.554$ (c; $p - level(F_3) = 0{,}218 > 0{,}05$), which indicate that it cannot be used to describe the situation, but it demonstrates a significant influence of the external environment on the efficiency of the studied enterprise (Tables 5-6).

Table 5.
Influence of the internal environment on the efficiency of oil refinery enterprise

N=8	Model: Regression R=0,508, R2=0,258; F(1; 6)=2.0968, p<0.19777; Error 0.06680					
	Beta	**Standard error Beta**	**Into**	**Standard error V**	**t(3)**	**p – level**
Intersection			*0,279515*	*0,023617*	*11,83524*	*0,000022*
f4	0,508885	0,351434	0,036559	0,025248	1,44802	0,197772

Source: own work.

Table 6.
Influence of the external environment on the efficiency of oil refinery enterprise

N=8	Model: Regression R=0,99897, R2=0,9389, F(4; 3)=11,527<0,03636; Error 0.37755					
	Beta	**Standard error Beta**	**In**	**Standard error V**	**t(3)**	**p – level**
Intersection			0,277961	0,020121	13,81480	0,000036
F1	0,605244	0,298613	0,041437	0,020444	2,02685	0,098506
F3	-0,420273	0,298613	-0,028431	0,020201	-1,40742	0,218325

Source: own work.

Thus, the situation that is developing in the activities of oil refinery enterprise is difficult to predict, largely dependent on the external environment. The obtained results allow us to conclude that its efficiency and further prospects for development are associated with changes that not only relate to the activities of the enterprise, but also depend on the decisions that will be made in the context of stabilizing the activities of domestic refineries. And the settlement of issues mainly in the political and administrative spheres would significantly contribute to the promotion of the domestic energy sector to the European market and would be an impetus for effective economic reforms.

Another enterprise that we have chosen for research belongs to the field of gas supply. The activities of these enterprises are significantly influenced by factors of the internal, external and internal environment.

Based on the use of factor analysis (Table 1), a model for gas supply enterprise was built, according to which the influence of the operating environment on its activities can be represented by the following equations:

$$\begin{bmatrix} y = 0{,}241 + 0{,}032 f_4 + 0{,}025 f_2 \\ y = 0{,}239 + 0{,}037 F_1 \end{bmatrix}, \tag{10}$$

where F_1 is the latent factor, which covers a group of indicators: growth rate of capital investments; export growth rate; import growth rate; index of industrial production; labour productivity; f_2 – latent factor, which covers a group of indicators: actual rate of return; profitability of assets involved; profitability of sales; sub-index of anti-crisis behaviour; f_4 – latent factor, which covers a group of indicators: return on equity; intangible assets.

The efficiency of a given enterprise depends on a group of latent factors f_2 and f_4, characterizing the internal environment (R = 0.877; R^2 = 0,769, p – $level(f_4)=0{,}023<0{,}05$; p – $level(f_2)=0{,}05\leq 0{,}05$). The influence of the external environment is determined by a group

of latent factors $F_1(R = 0.857; R^2 = 0.69; p - level(F_1)=0,01<0,05)$, while the influence of the external environment of the enterprise's functioning on the selected latent factors of the internal environment f_2, f_4 can be represented using the following mathematical model:

$$f_2 = -0,008 - 0,623F_3 + 0,504F_1 \quad (11)$$

The adequacy of this model is characterized by the following coefficients: R =0.857; R^2 = 0.734, ($p - level(F_3)=0,035<0,05; F_1=0,07$), i.e. it can be used to describe the situation of predicting future development trends;

– the description of the influence of the external environment on the internal latent factor f_4 can be represented by the equation:

$$f_4 = 0,05 + 0,567F_4 + 0,4774F_1 + 0,32F_3 \quad (12)$$

The adequacy of this model is characterized by the following coefficients: R =0.85; R^2 =0.723, ($p - level(F_1,F_3,F_4)=0,131;0,257;0,119>0,05$), i.e. it is inappropriate to use it for forecasting (Tables 7-8).

Table 7.
Influence of the internal environment (f_2, f_4) on the efficiency of gas supply enter

N=8	Model: Regression R=0,876871, R2=0,7689; F(2; 5)=8.3180, p<0.02567; Error 0.02653					
	Beta	Standard error Beta	In	Standard error V	t(3)	p – level
Intersection			*0,241433*	*0,009379*	*25,74281*	*0,000002*
f_2	0,541214	0,214986	0,025240	0,010026	2,51743	0,053342
f_4	*0,689922*	*0,214986*	*0,032176*	*0,010026*	*3,20914*	*0,023751*

Source: own work.

Table 8.
Influence of the external environment (F_1) on the efficiency of gas supply enter

N=8	Model: Regression R=0,8302, R2=0,6893; F(1; 6)=13.309, p<0.01073; Error 0.02808					
	Beta	Standard error Beta	In	Standard error V	t(3)	p – level
Intersection			0,239083	0,009949	24,03192	0,00000
F1	0,830222	0,227571	0,036898	0,010114	3,64819	0,010729

Source: own work.

Since the influence of the external environment on the activities of this enterprise is determined indirectly through the influence of the internal environment, the use of linear dependencies does not allow to fully reflect such influence. In this case, it is expedient to use nonlinear dependencies, in which the latent factor f_2 is represented through the influence of latent environmental factors. The method of piecewise linear regression allowed to build the following model, which considers two alternative options for development for the studied enterprise (Tables 9-11):

$$y = \begin{cases} 0,175 - 0,055f_4 + 0,043F_1 + 0,017F_3 \; if \; y_c \leq 0,241; \\ 0,223 + 0,034f_4 + 0,062F_1 - 0,01F_3, \; if \; y_c \rangle 0,241, \end{cases} \quad (13)$$

where F_3 is the latent factor, which covers a group of indicators: the share of loss-making enterprises; creation of added value in industry, introduction of new technological processes; euro exchange rate; y_c – in the observable, which is calculated as the predicted value of the integral indicator of efficiency of enterprises.

Table 9.
Influence of the external environment (F_1, F_3, F_4) on the internal environment (f_4) of gas supply enter

N=8	Model: Regression R=0,8504, R2=0,723; F(1; 6)=3.4824, p <0.12969; Error 0.69608					
	Beta	**Standard error Beta**	**In**	**Standard error V**	**t(3)**	**p – level**
Intersection			0,0512	0,2584	0,2033	0,8488
F1	0,500601	0,264876	0,477062	0,252421	1,889946	0,131759
F3	0,348274	0,263793	0,327942	0,248392	1,320257	0,257229
F4	0,348274	0,263793	0,327942	0,248392	1,320257	0,257229

Source: own work.

Table 10.
Influence of the external environment (F_1, F_3) on the internal environment (f_2) of gas supply enter

N=8	Model: Regression R=0,8565, R2=0,7337; F(2; 5)=6.8876, p<0.036; Error 0.6106					
	Beta	**Standard error Beta**	**In**	**Standard error V**	**t (3)**	**p – level**
Intersection			-0,008342	0,216505	-0,03853	0,970757
F1	0,529424	0,230843	0,504529	0,219988	2,29344	0,070347
F3	*-0,661565*	*0,230843*	*-0,622942*	*0,227366*	*-2,86587*	*0,035164*

Source: own work.

Table 11.
Parameters of the scenario model of gas supply enter

N=8	Model: piecewise regression with a break point Dependent variables: R=0.99822, variance: 99.645%								
	Const. B	**f_4**	**F_1**	**F_3**	**Const. B**	**f_4**	**F_1**	**F_3**	**Breaking Point**
Score	0,175314	-0,054717	0,043362	0,07413	0,222565	0,033870	0,061511	-0,00115	0,241433

Source: own work.

The statistical characteristics of this model (R^2 = 0,996 Fisher's statistics F = 280,4, p = 0,000013 standard deviation of residuals s_{er} = 0,027) indicate that the constructed models can be used to predict the impact of the environment on the efficiency of the studied enterprise.

The first variant of the model makes it possible to predict the value of the integral performance indicator under unfavourable conditions, namely, when the predicted value of the integral performance indicator (y_c) is less than the value established by the model. The second option considers an optimistic forecast in a more favourable situation for enterprises at the macro and micro levels.

Thus, the built model of development of gas supply enter describes alternative options for the influence of the external and internal environment of the enterprise's functioning on the integral indicator of efficiency. It allows predicting the influence of factors on the value of this indicator based on considering the potential capabilities of the enterprise to achieve its optimistic and pessimistic trends. Provided that the predicted value $y_c \le 0{,}241$ is reached. The efficiency of the enterprise will depend on the return on equity, intangible assets. As for the external environment, the growth rate of capital investment will have an impact; export growth rate; import growth rate; index of industrial production; labour productivity in industry, as well as such qualitative indicators as the share of unprofitable enterprises; creation of added value in industry; introduction of new technological processes.

A slightly different situation is expected provided that the forecasted value is achieved $y_c \rangle 0{,}241$, and this difference lies in the inverse dependence on such macroeconomic indicators as the share of loss-making enterprises, creation of added value in industry, introduction of new technological processes, euro exchange rate. Of course, improving the efficiency of gas industry enterprises depends on the state of industrial enterprises, which are the main consumers of gas. It is also clear that that the introduction of new technological processes requires additional financial resources, which may lead to a decrease in the efficiency of the enterprise in the short term. Therefore, considering these trends can have a significant impact on the value of the integral performance indicator, and therefore the formation of potential opportunities for future development.

It should be noted that the situation is difficult not only for enterprises in the fuel and energy sector, but also for other industries. Since the carried-out study of the environment of functioning of enterprises of the petrochemical industrial complex, a scenario model of development has been built, which indicates the dependence of the potential opportunities for their development on the technological factor, innovation activity and competitive advantages of products in comparison with imported analogues.

The studies of the influence of the environment on the activities of petrochemical enterprise, carried out with the help of factor analysis, allowed to obtain the following results:
– the efficiency of the specified enterprise through the influence of factors of the internal environment can be represented with the help of dependence:

$$y = 0{,}2657 + 0{,}043 f_2 \qquad (14)$$

where f_2 is the latent factor, which includes the indicator of the share of borrowed capital in assets, return on equity, and the actual rate of return.

The adequacy of this model is characterized by the following coefficients: $R = 0.85$; $R^2 = 0.72$ ($p - level(f_2) = 0{,}008 < 0{,}05$), i.e. it can be used to describe the situation. At the same time, the latent factor f_2 is most influenced by those environmental factors that are grouped into a latent group F_4. The mathematical dependence of such an influence can be represented by the equation:

$$f_2 = -0{,}131 - 0{,}789F_4 \quad (15)$$

The adequacy of this model is characterized by the following coefficients: R = 0.731; R^2 = 0.53 (p – $level(F_4)=0{,}039<0{,}05$), i.e. it allows detecting an external influence, so its coefficient presented in the model can be used to predict the influence of an internal factor f_2;
– the study of the influence of the external environment on the efficiency of the researched enterprise demonstrates the following dependence:

$$y = 0{,}261 - 0{,}029F_4 \quad (16)$$

The adequacy of this model is characterized by the following coefficients: R = 0.537; R^2 = 0.288 (p – $level(F_4)=0{,}17>0{,}05$), i.e. it cannot be used to describe the situation. In this case, it can be concluded that the latent factor F_4 does not have a direct impact on the efficiency of the enterprise but affects through the internal environment.

As mentioned above, since the influence of the external environment on the activities of this enterprise is determined indirectly through the influence of the internal environment, the use of linear dependencies does not allow to fully reflect such influence. In this case, it is advisable to use nonlinear dependencies, which can be represented by the equation (Tables 11-16).

$$y = \begin{cases} 0{,}182 - 0{,}051f_2 - 0{,}077F_4, \ if \ \mathrm{y_c} \le 0{,}266; \\ 0{,}304 - 0{,}012f_2 - 0{,}007F_4, \ if \ \mathrm{y_c})0{,}266, \end{cases} \quad (17)$$

where F_4 is the latent factor, which covers the macroeconomic indicators presented in Table 3, the number of industrial enterprises engaged in innovations, the number of introduced types of innovative products.

Table 11.
Influence of the internal environment on the efficiency of petrochemical enterprise

N=8	Model: Regression R=0,9587, R2=0,919149; F(4; 3)=8.5264, p<0.05469; Error 0.02182					
	Beta	**Standard error Beta**	**In**	**Standard error V**	**t(3)**	**p – level**
Intersection			*0,272468*	*0,008433*	*32,30859*	*0,000065*
f_1	-0,786275	0,293694	-0,039492	0,014751	-2,67719	0,075228
f_2	*0,006135*	*0,180448*	*0,050032*	*0,009063*	*5,52035*	*0,011709*
f_3	-0,689242	0,350225	-0,038132	0,019376	-1,96800	0,143727
f_4	0,3314221	0,240292	0,016646	0,012069	1,37924	0,261655

Note: Italics indicate significant factors.

Source: own work.

Table 12.
Influence of f2 internal environment on the efficiency of petrochemical enterprise

N=8	Model: Regression R=0,8487, R2=0,7203; F(1; 6)=15.453, p<0.00770; Error 0.02869					
	Beta	**Standard error Beta**	**In**	**Standard error V**	**t (3)**	**p – level**
Intersection			*0,265756*	*0,010144*	*26,19965*	*0,000000*
f_2	*0,848717*	*0,215901*	*0,042628*	*0,010844*	*3,93105*	*0,007703*

Note: Italics indicate significant factors.

Source: own work.

Table 13.
Influence of F4 external environment on the efficiency of petrochemical enterprise

N=8	Model: Regression R=0,5369, R2=0,2883; F(1; 6)=2.4308, p<0.1699; Error 0.04577					
	Beta	**Standard error Beta**	**In**	**Standard error V**	**t (3)**	**p – level**
Intersection			*0,260923*	*0,016475*	*15,83755*	*0,000004*
F4	-0,536959	0,344402	-0,029097	0,018663	-1,55911	0,169986

Note: Italics indicate significant factors.

Source: own work.

Table 14.
Influence of F4 of the external environment on the f2 of the internal environment of petrochemical enterprise

N=8	Model: Regression R=0,7309, R2=0,5342; F(1; 6)=6.8817, p<0.03941; Error 0.7372					
	Beta	**Standard error Beta**	**In**	**Standard error V**	**t (3)**	**p – level**
Intersection			-0,130978	0,265365	-0,49358	0,639151
F4	-0,730907	0,278620	-0,788570	0,300601	-2,62331	0,039411

Note: Italics indicate significant factors.

Source: own work.

Table 15.
Parameters of the scenario model of petrochemical enterprise

N=8	Model: piecewise regression with a break point Dependent variables: R=0.97057, variance: 94.201%						
	Const. B	**f2**	**F4**	**Const. B**	**f2**	**F4**	**Breaking Point**
Score	0,181700	-0,051480	-0,076666	0,303955	-0,012188	-0,007247	0,265756

Source: own work.

The statistical characteristics of this model (R^2 = 0,942 Fisher's statistics $F(6,2)$ = 16,2; p = 0,0035 standard deviation of residuals (s_{er} = 0,012) indicate that the constructed models can be used to predict the influence of the environment on the efficiency of the enterprise under study.

The developed mathematical models of development of enterprises in the petrochemical industry demonstrate pessimistic and optimistic variants of development, considering the situation both in the internal environment (latent factor f_2) and at the macro level (latent factor F_4).

The application of the scenario approach has formed a set of alternative scenarios for ensuring the development of the studied enterprises. The choice of the final scenario is conditioned y_c by the values calculated within the framework of the built situational models for each considered enterprise.

Implementation of the built models allows assessing the efficiency of the studied enterprises and the potential for their development, considering the environment of functioning using the formula 7. Table 17 estimates the expected value of the integral indicator of efficiency and development potential of the studied enterprises.

Table 17.
Assessment of the development potential of an industrial enterprise

Projected values of the integral indicator of enterprise efficiency	Petrochemical enterprise $y_c > 0{,}266$		Gas supply enterprise $y_c > 0{,}241$	
	Base year	Predicted year	Base year	Predicted year
y	0,347	0,365	0,276	0,286
y'	0,294	0,292	0,252	0,254
$\Delta_{development}$	-0,053	-0,073	-0,024	-0,032

Notes: y_c – is the average value of the efficiency index of the studied enterprises.

Source: own work.

The obtained results allow us to summarize that the assessment, carried out according to the optimistic model in accordance with $y > y_c$ the condition, characterizes unfavourable development trends for the studied enterprises, namely, that the influence of the environment reduces their efficiency. Such a conclusion determined the need to substantiate a set of measures aimed at improving the efficiency of enterprises.

The way out should be sought in new forms and methods of economic activity, considering the real state of enterprises and situations that limit their development or create favourable conditions for it. It is important to reduce the subjective factor in the formation and implementation of an alternative variant of development, which is possible based on the use of the built scenario models of development, the implementation of which is proposed with the help of the presented mechanism of development which requires to be developed for specific situation.

6. Discussions

The article is not without certain limitations, which are determined by the situational nature of the results and the possibilities of their use. The list of latent factors selected for analysis is debatable. Their list may vary depending on the industry and characteristics of the enterprise under study. In the article, the resulting indicator is defined as an integral indicator of efficiency, which we did not calculate within the scope of this article but took it from the results of previous studies. Another indicator can be chosen as the resulting, the achievement of which is a necessary condition for the development of the enterprise. Approaches to modelling can also be different, but in this article, we have chosen a piecewise regression dependence, which, in our opinion, is the most suitable for the situations of the world's crisis.

The model of piecewise regression scenario modelling is proposed for use in crisis situations, when it is necessary to study indicators whose values change in accordance with new conditions, and dependencies and forecasts of which are formed based on historical data and cannot be used to model future situations. Data on the activity of industrial enterprises during the crisis period of 2008-2009 were used for the research. During this period, we observed significant changes in the results of the enterprises' activities and tried to investigate and

consider the trends of their development in the formation of future scenarios. In our further research, we plan to apply the research methodology developed and discussed in the article on the balanced development of industrial enterprises in the conditions of post-war recovery in Ukraine. This technique can also be used to form development scenarios for enterprises that have experienced crisis phenomena, which were reflected in the results of their activities.

7. Conclusions and recommendations

Thus, today it is important to further develop the idea of a situational approach in management, which allows collecting and accumulating valuable information and data about the business environment and business results of companies. In the era of artificial intelligence, this is a valuable source of modelling future situations and predictions. The application of the scenario modelling method will allow reducing the subjective approach to the assessment of problems that hinder the development of enterprises, on the one hand, and on the other hand, to consider objective requirements for planning of future development. The article defines groups of latent factors of the internal and external environment, which are used in factor analysis to identify hidden, implicit variables that can influence economic processes and results. Considering the specifics of the studied enterprises, the conditions of their balanced development, which is achieved by identifying the indirect influence of the external environment of companies on the indicators of the state of the internal environment, are substantiated. The application of mathematical methods for checking the adequacy of the obtained modelling results determined a sufficient level of their ability to assess the situation due to the identified hidden variables for the enterprises of the petrochemical and gas supply industries. A sufficiently low level of reliability of using the results of the situation assessment based on the obtained models was determined for the oil refining enterprise. The relevance of the situational approach in management, which aims to consider various situations, analyse them and form a repository of knowledge for decision-making in the conditions of the influence of the external and internal environment on activity, is summarized. The application of scenario modelling tools made it possible to construct non-linear dependences of enterprise efficiency on internal and external environmental factors based on the selection of optimistic and pessimistic forecasts. The results of calculations based on the built models allow determining the potential of future enterprises development, as well as identifying weaknesses and obstacles on this path. The use of examples of enterprises of various industries allowed us to trace how the specifics of the enterprise's activity and environmental factors interact with each other. The obtained results can serve as an analytical basis for making decisions about managing activities in conditions of uncertainty. We plan to conduct further research in the direction of applied application of situational approach technologies in identifying potential risks in management.

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