

4 PREVENTIVE ANTI-CRISIS MANAGEMENT OF ROAD ENTERPRISES IN CONDITIONS OF SUSTAINABLE DEVELOPMENT

Yana Dohadailo, Iaroslava Levchenko,
Inna Shevchenko, Valentyna Nesterenko, Igor Britchenko

ABSTRACT

Chapter 3 of this monograph discussed sustainable development and its management mechanisms. In continuation of the development of the direction of sustainable development, this chapter will discuss the justification of its indicators. Clarifying the results of the research of existing approaches to considering the features of the modern world showed that as a key tool of anti-crisis management, it is still advisable to use continuous CVP analysis. Therefore, the basis for the formation of indicators of preventive anti-crisis management of enterprises of Ukraine in conditions of sustainable development in the VUCA-, DEST-, BANI-, RUPT-, TUNA-world are the indicators calculated during the implementation of operational analysis. The work improved the methodical approach to the development of a system of indicators of preventive anti-crisis management of the enterprise based on the implementation of a set of actions, which ensures a justified choice of indicators of effective management of the enterprise due to the comprehensive consideration of the results of the study of the quantitative and qualitative composition of the CVP analysis indicators; the specifics of the industry in which the enterprise operates and the distribution of responsibility for each selected indicator. Approbation of the methodical approach for road enterprises of Ukraine allowed, firstly, to improve the list of indicators of operational analysis, which allows not only to fulfill all the main tasks of CVP analysis, but also new ones that arise in the conditions of sustainable development of society, and secondly, to substantiate the list of indicators preventive anti-crisis management of modern road enterprises, which corresponds to the principles and essence of controlling. The presented research results can be useful to specialists who are interested in effective enterprise management in the conditions of sustainable development in the VUCA-, DEST-, BANI-, RUPT-, TUNA-world.

KEYWORDS

VUCA-, DEST-, BANI-, RUPT-, TUNA-world, sustainable development, unstable world, indicators of preventive anti-crisis management, controlled indicators, CVP analysis.

4.1 FEATURES OF ANTI-CRISIS MANAGEMENT OF ROAD ENTERPRISES IN CONDITIONS OF SUSTAINABLE DEVELOPMENT IN THE VUCA WORLD

Modern enterprises operate in a rapidly changing world, largely due to the technological changes brought about by the "digital age". These changes create opportunities, but also cause

uncertainties, complexities, risks, etc. In such conditions, enterprises must be able to predict the future by developing scenarios of events that may occur and options for effective work in future situations [1] while simultaneously ensuring the preventive nature of their anti-crisis management. Thus, the implementation of preventive anti-crisis management is extremely urgent. In turn, for Ukrainian enterprises, as was revealed in previous studies, it becomes urgent to solve the task of independent organization of effective work in the conditions of sustainable development in the VUCA-world (including the pandemic) without any hope for significant support from the state [2].

Since February 24, 2022, Ukraine has experienced a treacherous and unpredictable military invasion by Russia. In work [3] it is noted that according to the data of the Kyiv School of Economics (Project for the collection, assessment and analysis of information on the material losses of Ukraine from the war with Russia, 2022), as of the beginning of July 2022, the losses of the Ukrainian economy from damage to the physical infrastructure since the beginning of hostilities amounted to about 600 billion USD, including 103.9 billion USD in case of complete destruction of objects. At the same time, the consequences of the attack on Ukraine for the world GDP in 2022 will amount to at least -1% growth, or 1 trillion USD [3].

All components of the multi-component mechanism of the road and transport complex of Ukraine suffered losses. In particular, since the beginning of the full-scale war in Ukraine, 305 artificial structures have been destroyed, and 24,000 km of highways need to be cleared, repaired or completely rebuilt. It will take approximately 3–4 years to restore the destroyed infrastructure, while basic things are planned to be restored in 1–1.5 years. The authors share the opinion [4] that while active hostilities are underway, it is very difficult to determine the speed of restoration of damaged highways. As highways and man-made structures continue to collapse, there is a need for demining. Therefore, it takes time for road infrastructure to become a priority. In turn, there is a possibility of active international financial and technical assistance in restoring the destroyed infrastructure [4]. Therefore, the possibility of obtaining financial assistance for road enterprises exists, but this not only does not cancel the need for independent organization of effective work in conditions of sustainable development in the VUCA-world, but above all requires it.

Today, it is expedient for road enterprises to manage the process of road works, which, taking into account their specific features, will: firstly, predict the future state of events through scenario planning of events and actions that ensure effective development of the enterprise, including preventive crisis management; secondly, to meet modern economic conditions; thirdly, to promote sustainable development; fourth, to ensure transparent, timely and high-quality execution of road works with minimal possible risks and costs.

The use during planning, organization, motivation and control of the enterprise's work of performance indicators of its activity, which will allow the implementation of formulated requirements, will provide road enterprises with the implementation of effective preventive anti-crisis management at the operational level of management.

4.2 INDICATORS OF CVP-ANALYSIS AS A BASIS FOR THE FORMATION OF INDICATORS OF PREVENTIVE ANTI-CRISIS MANAGEMENT OF ROAD ENTERPRISES OF UKRAINE IN CONDITIONS OF SUSTAINABLE DEVELOPMENT IN AN UNSTABLE WORLD

In previous studies, the modern business environment was characterized by two main features: the sustainable development of all countries of the world through the fulfillment of the seventeen Sustainable Development Goals (SDGs) and the VUCA-world. The expediency of using CVP analysis on a continuous basis as a key tool of anti-crisis management of a modern enterprise was also substantiated. For its implementation, the theoretical and methodological foundations of CVP analysis were deepened and improved by ensuring their compliance with the principles of sustainable development of the enterprise, organization and the possibility of implementing VUCA-solutions acting on anticipation [2]. In this context, continuous CVP analysis (cost-volume-profit relationship analysis, operational analysis, break-even analysis, margin analysis, cost-output-profit analysis) is considered as a tool for managing the process of achieving operational goals of the enterprise through continuous systematic improvement of the enterprise's work on the basis of systematic tracking and study of the dependence between changes in the volume of activity, total revenues from the sale of products, costs and profit. Continuous provides a weekly CVP analysis based on planned and actual indicators, which will significantly facilitate the process of managing the enterprise in conditions of sustainable development in the VUCA-world. Thus, it is the indicators of CVP analysis should be considered as a basis for the formation of indicators of preventive anti-crisis management of road enterprises of Ukraine in the conditions of sustainable development in the VUCA-world, therefore it is necessary to determine the quantitative and qualitative composition of their list.

It should be noted that there are other views on the list of features of the environment in which enterprises operate. Today, five approaches to considering the characteristics of the modern business environment can be distinguished [2, 5–10]:

- Volatility, Uncertainty, Complexity and Ambiguity – **VUCA-world** [2, 5, 6]. The essence of each characteristic is given in [2];
- Disorder (disorder – a world full of unexpected changes), Egocentrism (egocentrism – focused on personal interests and goals), Suppression (suppression – refusal to divulge or publish) and Turbulence (turbulence – manifested by conflict, confusion over which there is no control, on in contrast to the VUCA-world, where the focus is on controlling goals) – **DEST-world** [7];
- Brittle (brittle – illusory strength, it has become even more difficult to find support, everything that seemed strong yesterday can crumble today), Anxious (anxious – every choice seems potentially catastrophic, anxiety permeates life, many teams are immersed in hustle and bustle, increasingly employees complain about burnout), Nonlinear (nonlinear – many logical connections do not work; it is possible to make minimal efforts and get a breakthrough, or it is possible to work for a long time and get practically zero results; those who have built a culture of experimentation in their company win more and more often; everything is more difficult those who are used to living by plans) and Incomprehensible (incomprehensible – an incomprehensible and sometimes senseless world, lack of meaning

in the answers found) – **BANI-world** [5, 8]. The concept of "BANI" was developed by J. Cascio (Jamaica Cascio) in 2018 to work with a chaotic future, as a way to better understand and respond to rapid global disruptions and the current state of the world [8]. BANI-model is now increasingly used throughout the world. Successful work according to this model involves the use of scenario planning;

– Rapid (fast, rapid – a world full of rapid unexpected changes), Unpredictable (unpredictable – events are almost or impossible to predict, their sudden nature), Paradoxical (paradoxical – unexpected, strange, contrary to common ideas, not in accordance with natural expectations) and Tangled (tangled – manifests itself through confusion, over which there is usually no control or the exercise of control is difficult) – **RUPT-world**. The concept of "RUPT" is used by the Center for Creative Leadership in the USA as a publicized "VUCA" model, which was created for use by the American military [5];

– Turbulent (turbulent – messy world, i.e. full of unexpected changes), Uncertain (uncertain – lack of information to predict consequences and plan necessary actions), Novel (new, unusual, newly introduced – events that have not happened before, unusual events, events, created as a result of the intellectual activity of people) and Ambiguous (ambiguous – the ambiguity of the interpretation of certain events – in those cases when they can be interpreted in two ways) – **TUNA-world**. This concept is used by Oxford University's Executive Education program instead of the generally accepted VUCA. This program is award-winning. For successful functioning in the TUNA world, it is suggested [9, 10] to use the Oxford Scenario Planning Approach (OSPA), which was developed by three authors, including Rafael Ramirez [5, 10, 11]. In their work, Rafael Ramirez and Angela Wilkinson [10] note that the main emphasis in OSPA is on supporting the cycle of predictable understanding, which allows clarifying strategic choices and determining the best options for functioning [10].

Today, the majority consider the concept of VUCA as generally accepted, and at the World Economic Forum in Davos in the report dated 18.01.2023 "How 7 directors of digital technologies navigate in an unstable world", the VUCA approach is used [6]. But in a fast-paced world that is constantly changing predictably and increasingly unpredictably, this is not a constant either. On the website "VUCA-WORLD" [5], when comparing VUCA-, BANI-, RUPT- and TUNA-approaches, it is noted that "we enjoy a growing community that is sailing with us on the waves of VUCA and sailing with the wind of VUCA, BANI, RUPT and TUNA". It is appropriate to consider these approaches as an additional perspective on the consideration of the features of the world, which is moving forward and does not mean "exceptions to the rules" [5]. In the work, the researcher agrees that [5] "in any case, the problem is the same: the external environment changes quickly and unpredictably, putting companies and their stakeholders in front of what worked yesterday, will not work tomorrow and the day after tomorrow. That's why it is necessary to answer and a willingness to think anew!". A comparative analysis of existing approaches to considering the characteristics of the modern environment showed that, firstly, common to all approaches is that it is unstable, unpredictable, fast (**Fig. 4.1**), and secondly, the appropriateness of using scenario planning methods in approaches that arose in the last decade. In such conditions, it is necessary to use management tools that will ensure transparency, predictability of activity and efficiency of use of available resources, which is exactly what continuous CVP analysis of planned and actual current activities of the enterprise is.

The name of the characteristics of the world according to different approaches				
VUCA-world	DEST-world	BANI-world	RUPT-world	TUNA-world
Volatility	Disorder	Brittle	Rapid	Turbulent
Uncertainty	Egocentrism	Anxious	Unpredictable	Uncertain
Complexity	Suppression	Nonlinear	Paradoxical	Novel
Ambiguity	Turbulence	Incomprehensible	Tangled	Ambiguous
		Characteristics that can be considered as a group of synonyms for a noun. Color defines groups of synonyms		

Fig. 4.1 Characteristics of the world according to different approaches*

**Own view, created as a result of a comparative analysis of the approaches described in works [5–10]*

Thus, clarifying the features of the modern business environment confirmed the expediency of using the latter as a key tool of anti-crisis management of the road enterprise in conditions of sustainable development in an unstable world. Therefore, it is the indicators CVP analysis should be considered as a basis for the formation of indicators of preventive anti-crisis management by modern road enterprises of Ukraine.

The relevance of the use of operational analysis is also evidenced by the large number of publications published over the past three years and appearing now. These publications deal with certain aspects of the methodological foundations of practical application CVP analysis. Some scientists offer a refined CVP MODEL – an analysis that takes into account the features of the modern unstable world [11, 12], a change in the cost structure [13], multi-product production [14] and others. Many scientists use operational analysis to study the activities of certain enterprises with the help of operational analysis, using a certain list of its indicators of different quantitative and qualitative composition, for example, work [14, 15].

Therefore, in the future, in order to form indicators of preventive anti-crisis management of road enterprises, it is first necessary to make a justified choice of the list of CVP INDICATORS – analysis by quantitative and qualitative composition. At the same time, the indicators should ensure the organization of the work of the road enterprise in accordance with the principles of sustainable development of the enterprise [2] and provide the opportunity to implement actions aimed at getting ahead.

4.3 JUSTIFICATION OF THE LIST OF INDICATORS OF OPERATIONAL ANALYSIS OF ROAD ENTERPRISES

In the paper [16], a justified selection of profit management indicators of road enterprises was carried out according to the developed research algorithm with a description of all methodical

approaches to the implementation of each stage. As indicators of profit management, the authors considered indicators of CVP analysis. The methodical approach allows for the formation of a system of indicators for the operational analysis of an enterprise in a certain industry by taking into account its specific features, as well as the opinions of leading specialists in this industry and scientists in the field of enterprise profit management. Later, the selected list of indicators was refined according to the requirements of the time [17]. According to practical experience, the approach was refined in order to take into account the specifics of the work and the requirements of the enterprise where CVP analysis will be carried out. Another stage was added – the selection of indicators using the pairwise comparison method. A pairwise comparison is proposed to be carried out by the deputy in charge of economics, or the financial director or the chief economist. Thus, the improved algorithm for selecting CVP analysis indicators is presented in **Fig. 4.2**.

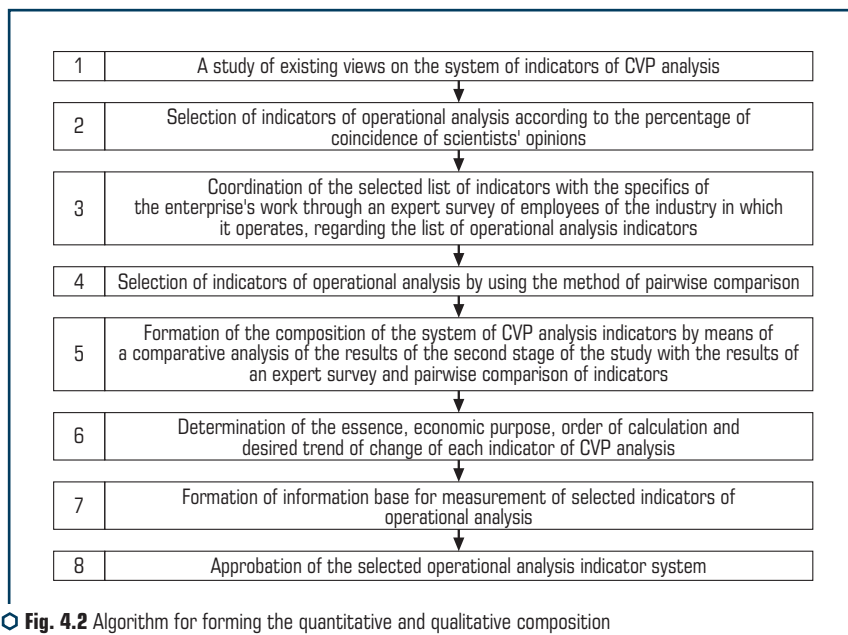


Fig. 4.2 Algorithm for forming the quantitative and qualitative composition of CVP analysis indicators of the enterprise's activity

Source: author's development

At the fourth stage, operational analysis indicators are selected by using the pairwise comparison method. This stage is not mandatory and is carried out if necessary for a specific enterprise. To form an information base for measuring selected indicators, the company's accounting data are used, which are processed using the method of statistical analysis of accounting

accounts [2]. The implementation of other stages is described in works [16, 17]. Thus, the proposed methodological approach (**Fig. 4.2**) makes it possible to substantiate the composition of CVP analysis indicators taking into account the peculiarities of the functioning of a certain industry and the coordination of the opinions of leading specialists both in the field of profit management and in a certain industry at the level of the entire industry and one enterprise at which will be analyzed.

In modern economic literature, there are many views on the composition of the system of CVP analysis indicators of the enterprise, therefore, there is no unified opinion on the qualitative and quantitative composition of the system of indicators of the operational analysis of the enterprise [16, 17].

As a result of the research, it was found that some indicators are considered by scientists under different names, although their essence is the same, for example, marginal income, marginal profit, coverage amount and gross result; break-even point, break-even point, critical point and equilibrium volume of operating activity and others. All such indicators during the study were considered identical [16, 17]. In work [17], a comparative analysis of 18 approaches to considering the quantitative and qualitative composition of CVP analysis indicators was carried out – the results of the analysis are shown in Table 4. The quantitative composition of the system of indicators varies from three to ten, on average the number is seven indicators. In the paper, these research results are somewhat updated by the developments of other scientists over the past three years (**Table 4.1**).

A comparative analysis of approaches regarding the composition of CVP analysis indicators of the enterprise's activity (**Table 4.1**) showed that there is no unity of opinion regarding the quantitative and qualitative composition of the CVP analysis indicators of the enterprise's activity.

The quantitative composition of the system of indicators varies from three to eleven, on average, the authors allocate seven indicators. After clarifying the comparative analysis of the existing approaches (**Table 4.2**), the percentages of agreement of scientists' opinions on some indicators changed slightly – the percentage of use of the break-even point decreased (from 100 % to 90.5 %), the coefficient of marginal income, the margin of financial strength, in turn, the applicability increased such indicators as: break-even sales by almost 5 %, operating leverage by 4 % and marginal income by 3 %.

At the same time, the qualitative composition of indicators that have a percentage of coincidence of more than 50 % has not changed. These are the following indicators: break-even point, marginal revenue, marginal revenue ratio, margin of financial strength, operating leverage, break-even, and specific marginal revenue (coverage rate). But, since currently in the conditions of a modern socially oriented economy, focusing on consumer needs is relevant, it will be appropriate to add to the selected set of CVP analysis indicators: the consumer satisfaction index and the consumer engagement index [17], and the consumer constancy index. The proposed composition needs a more detailed justification according to the proposed algorithm (**Fig. 4.2**).

4 PREVENTIVE ANTI-CRISIS MANAGEMENT OF ROAD ENTERPRISES IN CONDITIONS OF SUSTAINABLE DEVELOPMENT

● **Table 4.1** Comparative analysis of approaches to the quantitative and qualitative composition of the CVP analysis indicators of the enterprise's activity

Indicator	Percentage of coincidence [17]	Literary source number			Total match percentage
		[14]	[15]	[18]	
Breakeven point	100.00			+	90.48
Marginal income	77.78	+	+	+	80.95
The coefficient of marginal income	72.22	+		+	71.43
Stock of financial strength	72.22	+		+	71.43
Operating lever	72.22	+	+	+	76.19
Profitability of implementation	66.67	+	+	+	71.43
Specific marginal revenue	66.67		+	+	66.67
The volume of product sales to obtain the target profit	44.44			+	42.86
Security zone	44.44			+	42.86
Power reserve coefficient	38.89	+	+	+	47.62
Power of operating leverage	38.89				33.33
The point of closing the enterprise	16.67				14.29
Financial leverage	11.11			+	14.29
Break -even price	11.11				9.52
Price coefficient	5.56				4.76
Net operating profit	5.56				4.76
Target volume of implementation	5.56				4.76
Assortment policy of the enterprise	5.56				4.76
Customer satisfaction index	5.56				4.76
Customer Engagement Index	5.56				4.76
Total number of indicators	–	6	5	11	–

"+" – this indicator is considered as a component of the list of CVP analysis indicators

● **Table 4.2** Assessment of the probability of the results of the expert survey

Number of interviewed specialists, m	Number of factors, n	The sum of squared deviations, S	Concordance coefficient, W	Pearson's test, χ	
				calculated	tabular
18	21	216172	0.87	362.6	156

The enterprise always operates in a certain industry, which has its own characteristics, which must be taken into account when making management decisions, and therefore also when justifying the list of operational analysis indicators. The specifics of the industry are best known by specialists who work in it. The study is devoted to enterprises of the road industry. The latter is a component of the coordinated road and transport complex, which is the basis of the development of the country as a whole. A group of 18 experts was created according to two methodical approaches to selecting the number of experts [16, 17]. The expert competence coefficient was 0.82. Each specialist was given a developed questionnaire, in which it was suggested to rank the indicators according to their strength in relation to the results of the work of road organizations. The list of investigated indicators included: X1 – specific marginal income; X2 – safety zone; X3 – break-even implementation; X4 – point of closing the enterprise; X5 – consumer satisfaction index; X6 – coefficient of operating leverage; X7 – effectiveness of financial leverage; X8 – marginal income; X9 – break-even point; X10 – power of the operating lever; X11 – financial leverage; X12 – operating lever; X13 – consumer engagement index; X14 – reserve of financial strength; X15 – safety factor; X16 – margin of safety; X17 – target volume of production; X18 – break-even price; X19 – coefficient of marginal income; X20 – price coefficient; X21 – index of consumer constancy. It was proposed to give rank 1 to the most important indicator, 21 to the least important. Based on the results of the questionnaire, a polygon was built for the distribution of the sums of the ranks of the CVP analysis indicators (**Fig. 4.3**).

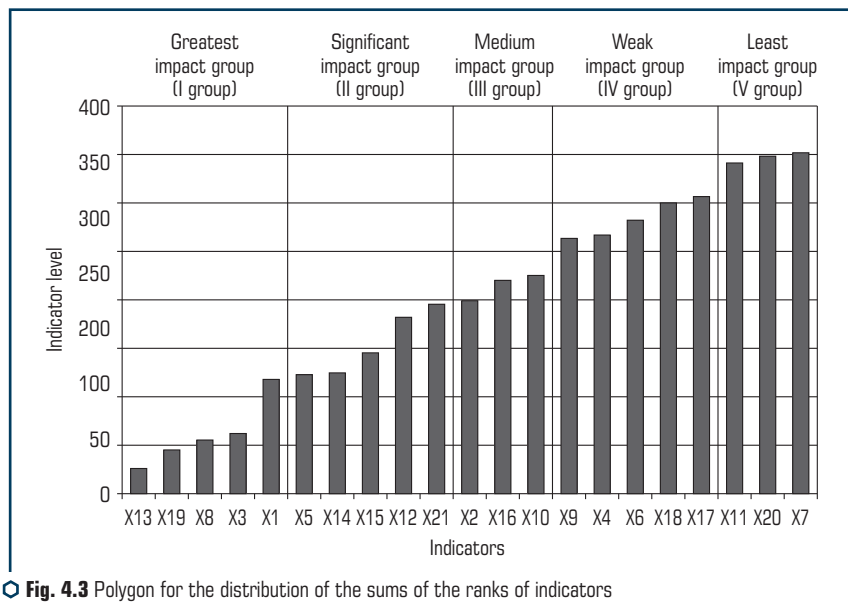


Fig. 4.3 Polygon for the distribution of the sums of the ranks of indicators of the operational analysis of the activities of road enterprises
Source: author's development

The assessment of the reliability of the obtained results according to the concordance coefficient and Pearson's criterion shows that the experts' opinions are in agreement by 87 %, and according to the Pearson's criterion it is not random (**Table 4.2**).

In the work, a pairwise comparison of the questionnaire indicators was carried out by the chief economist of the road organization of the Kharkiv region of Ukraine, where it was planned to use the selected indicators. On the basis of the obtained results, a histogram and a polygon of the distribution of the sums of the ranks of the CVP analysis indicators of the activity at this enterprise were constructed (**Fig. 4.4**).

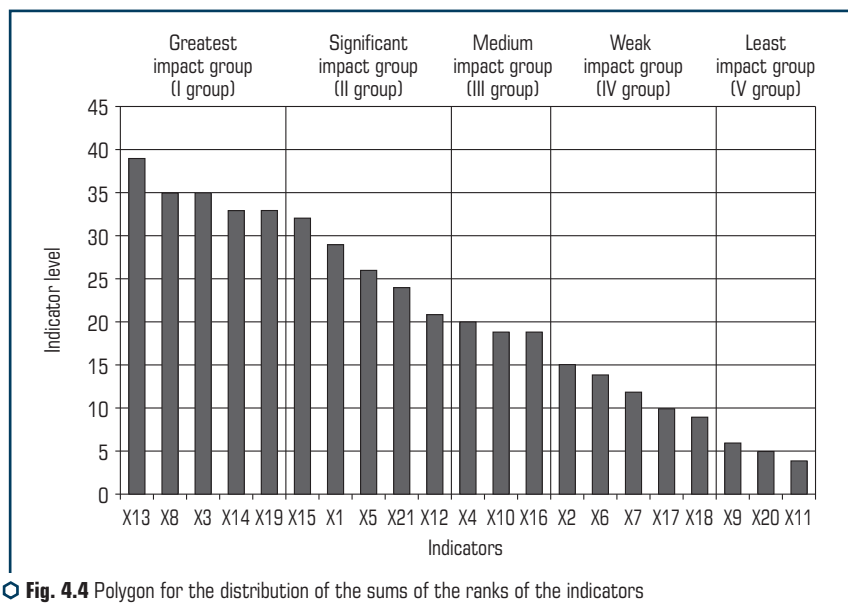


Fig. 4.4 Polygon for the distribution of the sums of the ranks of the indicators of the operational analysis of the road organization

Source: author's development

Thus, according to polygons for the distribution of the sums of the ranks of the indicators of the operational analysis of the company's activity based on a pairwise comparison and an expert survey (**Fig. 4.3, 4.4**), it is advisable to include ten indicators that form groups of the greatest influence and significant influence (**Fig. 4.5**).

An expert survey and a pairwise comparison of indicators made it possible to clarify their list, the number of indicators remained unchanged, their qualitative composition changed somewhat. Due to the fact that road enterprises perform several types of work at the same time, the use of the break-even point, measured in natural units, as an indicator is quite complicated, and experts consider it sufficient to calculate only the break-even point of implementation. The riskiness of

the decisions made, which in the conditions of an unstable world is important. In the future, to enable management decisions to be made on the basis of the chosen system of indicators, the essence, calculation procedure and desired trend of change of each indicator were determined. The results are presented in **Table 4.3**.

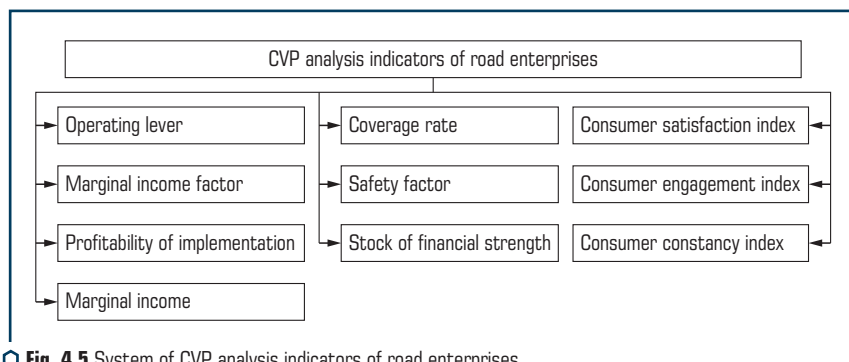


Fig. 4.5 System of CVP analysis indicators of road enterprises
Source: author's development

Table 4.3 Indicators of CVP analysis of road enterprises

Indicator	Designations	Measurement unit	Calculation formula ^a	The essence of the indicator	Desired change
1	2	3	4	5	6
Marginal income factor	K_{sh}	shares per unit, %	$1 - \frac{V_{CUA}}{P}$	Shows the increase in profit in relative terms when the income increases by 1 UAH	growth
Profitability of implementation	PI	money unit	$\frac{C_{CONST}}{C_R}$	Income equal to total expenses	fall
Marginal income	MI	money unit	$I - V_C$	Part of the income that remains for covering fixed costs and generating profit	growth
Coverage rate	C_r	money unit/national unit	$P - V_{CUA}$	It characterizes the increase in profit from the performance of every 1 m ² of work	growth
Stock of financial strength	Sfs	money unit	$I - I_{TB}$	Shows how close the actual income is to the critical one	growth
Safety factor	MTB	shares per unit, %	$1 - \frac{I_{TB}}{I}$	It is a measure of the risk of unprofitable work, the larger its value, the less likely that the company will suffer losses in the event of a decrease in volume	growth

4 PREVENTIVE ANTI-CRISIS MANAGEMENT OF ROAD ENTERPRISES IN CONDITIONS OF SUSTAINABLE DEVELOPMENT

● **Continuation of Table 4.3**

1	2	3	4	5	6
Operating lever	COL	shares per unit, %	$\frac{I_{CONST}}{I_{TOT}}$	It characterizes the degree of use of fixed costs: the greater this indicator, the greater the impact on profit provided by a change in sales volume	optimal ratio
Consumer satisfaction index	CSI	shares per unit, %	$\frac{C_P}{C} \cdot 100 \%$	Assessment of the level of consumer satisfaction after interaction with the enterprise	growth
Consumer engagement index	CEI	shares per unit, %	$\frac{C_N}{C} \cdot 100 \%$	Shows how many new customers the company managed to attract during a certain period	growth
Consumer constancy index	CCI	shares per unit, %	$\frac{C_{POST}}{C} \cdot 100 \%$	Shows how many regular customers the company managed to retain over a certain period	growth

**Conventional designations: I – income from the sale of products without VAT, money unit; V_c – variable costs, money unit; V_{cub} – variable costs per unit of activity, money unit; C_{const} – constant costs, money unit; P – price of a unit of activity, money unit; C – total number of clients (customers); C_p – the number of positive reviews from customers who purchased the product, units; C_n – the number of new customers, units; C_{post} – the number of consumers who made more than five orders, units*

To form the information base for measuring the selected indicators, the accounting data of the road organization were used, which were processed using the method of statistical analysis of accounting accounts [2]. On the basis of the received data, a CVP analysis of the activity of the road organization of Ukraine was carried out five years before the start of hostilities in the country (Table 4.4).

● **Table 4.4** Calculation of CVP indicators – analysis of the activity of the road organization of Ukraine

Indicator	Value by year by year				
	2017	2018	2019	2020	2021
Marginal income factor, share unit	0.300	0.300	0.300	0.300	0.260
Profitability of implementation, thousand UAH	3968.03	7717.77	8974.53	13976.50	17839.44
Marginal income, thousand UAH	1154.01	2332.83	2797.56	4003.35	5452.95
Coverage rate, UAH	22.75	34.03	13.80	21.11	26.19
Stock of financial strength, thousand UAH	–121.33	58.33	350.67	–632.00	3133.46
Safety factor, fraction of units	–0.03	0.01	0.04	–0.05	0.15
Operating leverage, shares per unit	0.31	0.30	0.29	0.31	0.23
Consumer satisfaction index, %	73.33	72.00	90.91	84.00	100.00
Consumer engagement index, %	31.82	27.78	25.00	23.81	27.27
Consumer constancy index, %	23.33	28.00	31.82	28.00	31.82

It was revealed that a negative trend is observed for all indicators of profit management, i.e. the results of operations have become worse, the reason for which was the unstable state of the volume of work performed (dynamics of the margin of safety ratio) and the growth of the company's costs (the value of the operating leverage). Based on the analysis, recommendations are offered to improve the efficiency of work.

In this way, the methodical approach to forming a list of indicators of CVP analysis of the company's activity was further developed. The approach includes the sequence of actions necessary for the formation of the list and proposed methodical approaches to their implementation. It allows the formation of indicators of the operational analysis of an enterprise of a certain industry by taking into account its specifics, as well as the opinions of leading experts in this industry and the latest scientific and practical developments in the field of enterprise profit management, taking into account, if necessary, the specific features of the functioning of an individual enterprise. The proposed methodical approach is universal and can be used to form a reasonable list of CVP analysis indicators of the road enterprise (**Fig. 4.5, Table 4.3**). It allows not only to carry out all the main tasks of operational analysis, but also new ones arising in the conditions of sustainable development in an unstable world. Using this list during management will enable the road company to work ahead of schedule, creating scenarios for future ongoing activities. The determined composition takes into account the peculiarities of the functioning of the road industry and does not contradict the opinions of leading specialists both in the field of profit management and in road management at the level of the industry and individual enterprises. In the road organization, it is advisable to carry out CVP analysis by types of activities, by orders (projects) and by the organization as a whole.

4.4 JUSTIFICATION OF THE LIST OF INDICATORS OF PREVENTIVE ANTI-CRISIS MANAGEMENT OF A MODERN ROAD ENTERPRISE

Preventive anti-crisis management involves management that allows to prevent a crisis situation by ensuring break-even activity in the future with continuous control and coordination of current activities to achieve break-even activity, which consists in maintaining the established value of the reserve of financial strength. It is possible to realize this thanks to the implementation of activities according to the principles of controlling with the use of operational controlling tools, namely the formation of a list of controllable indicators of effective management of the enterprise during the organization of budgeting as a management technology. The term "monitorable indicators" provides for the definition of officials who monitor their implementation. The main levels of formation of the list of controlled indicators should be structural units of the enterprise, whose managers are able to influence them [19]. By preventive anti-crisis management indicators (PAMI) it is proposed to understand controlled indicators of effective management of the enterprise, which is the starting point for calculating the selected CVP analysis indicators of the enterprise's activity (**Table 4.4**) and are functionally independent of each other (4.1):

$$PAMI = \{V_{cua}, C_{const}, P, LC, E, C, C_p, C_n, C_{post}\}, \quad (4.1)$$

where V_{cua} – variable costs per unit of activity, money unit; C_{const} – constant costs, money unit; P – price of a unit of activity, money unit; LC – logistics costs, money unit; x – volume of activity, nature unit; C – total number of clients (customers), units; C_p – the number of positive reviews from customers who purchased the product, units; C_n – the number of new customers, units; C_{post} – the number of consumers who made more than five orders, units.

These nine indicators correspond to the general principles of forming a system of controlled indicators [19]. It is proposed to distribute responsibility with the help of the developed Mark Razu, professor, Doctor of Economics, distribution matrix of administrative tasks (DMAT), used in project management. The DMAT matrix is a table in which the names of positions, divisions and services are located, as well as the tasks performed by these divisions, services, etc. are listed [20]. In a specific case, the PAMI tasks. The conditional sign indicates the relationship of each service unit or a specific employee to the performance of the planned indicator. When using responsibility matrices, it is necessary to be guided by the expediency of using certain symbols. The complexity of the responsibility matrix should correspond to the complexity of the tasks to be solved. The DMAT matrix uses symbols that reflect the three principle objects of each job performance [19]: making decisions about work; work management; performance of work and its technical and informational maintenance. The rules for filling the DMAT matrix with symbols are described in detail in the works of the developer Mark Razu, professor, Doctor of Economics.

Thus, in order to substantiate the list of indicators of preventive anti-crisis management of a modern road enterprise, it is advisable to add two more stages to the developed algorithm for the formation of quantitative and qualitative CVP analysis indicators of the enterprise's activity (**Fig. 4.2**):

- formation of the list of indicators that is the starting point for calculating the selected CVP analysis indicators of the company's activity and are functionally independent of each other;
- formation of a list of the controlled PPAU of the enterprise based on the construction of a matrix for the distribution of administrative management tasks.

Approbation of the added stages was carried out for road industry enterprises. A fragment of the DMAT symbolic matrix of controlled indicators of the road organization of Ukraine is presented in **Table 4.5**.

◆ **Table 4.5** Fragment of the DMAT symbolic matrix of controlled indicators of the road organization in Ukraine

No.	PAMI name	Officials and structural divisions			
		Director	Chief Accountant	...	Economist
1	Logistics costs	!K	PT	...	T
2	Scope of activity	JAPOHAKT	RPOHAT		T

9	Number of new customers	JAPOHAKT	T	...	T

In addition to the developed apparatus for depicting various types of participation in the performance of work, the DMAT matrix has another advantage: the possibility of transitioning from the symbolic designation of responsibility to numerical and using the obtained indicators in the analysis and design of organizational solutions. This transition is carried out through a table of pairwise comparison of types of responsibility marked with symbols [19]. A fragment of such a table is presented in **Table 4.6**.

● **Table 4.6** Pairwise comparison table

Symbols	!	R	JA	P	O	H	A	K	T	Σ	V, %
!	1	2	1	1	1	1	2	1	0	10	12.3
...
T	2	2	1	1	1	2	2	2	1	14	17.3
Σ	8	15	7	6	5	13	11	12	4	81	100.0

According to the rules and principles of building the DMAT matrix, there were indicators that were selected as controlled, and they were assigned to the structural units of the enterprise using the DMAT matrix. After that, an assessment of the performance of the planned controlled indicators was carried out, a fragment of the results is provided in **Table 4.7**.

● **Table 4.7** Table of pairwise comparison of labor intensity of controlled indicators

No.	PAMI name	1	2	3	4	5	6	7	8	9	Σ	W, %
1	Logistics costs	1	0	0	1	1	0	0	0	1	4	4.9
2	Scope of activity	2	1	1	2	2	0	0	1	2	11	13.6
...
9	Number of new customers	1	0	1	1	2	0	0	0	1	6	7.4
Σ		14	7	8	12	15	2	4	7	12	81	100.0

As a result, it was found that the most labor-intensive indicators are variable costs per unit of activity, the total number of customers, the price of a unit of the volume of activity, the volume of activity. Next, the character matrix is converted into a numerical one. This can be done using Microsoft Excel. For convenience, the calculated final values can be presented as a percentage, i.e., divide the labor intensity of work execution and loading of structural units by the total number of points and multiply by 100. A fragment of the obtained results is shown in **Table 4.8**.

As a result of compiling the DMAT matrix, it was found that the most labor-intensive indicators are variable costs per unit of activity (23.3 %) and volume of activity (16.9 %). The least labor-intensive are logistics costs (2.8 %). The obtained data can be used to determine the internal cost of activity of structural units. Including, it is possible to translate the obtained values into

monetary indicators. The matrix of the distribution of administrative tasks of management is not only a matrix of responsibility, which allows to visually depict the system of responsibility of structural units and executors for the performance of work on the project, but is also a full-fledged tool for organizational analysis and design.

● **Table 4.8** Fragment of the numerical matrix of DMAT controlled indicators of the road organization in Ukraine

No.	PAMI name	Director	Chief Engineer	...	Economist	<i>C</i>	<i>S</i> , %
1	Logistics costs	97.5	103.6	...	85.4	542.6	2.8
2	Scope of activity	1140.1	905.3	...	234.7	3219.0	16.9
...
9	Number of new customers	621.9	128.0		128.0	1518.1	8.0
<i>S</i>		3478.1	5974.7	...	1493.7	19076.4	100.0
<i>S</i> , %		18.2 %	31.3 %	...	7.8 %	100.0 %	19076.4

Conventional designations: C – estimated labor intensity of the performed work; S – assessment of the labor intensity of all operations performed by a specific position, structural unit

Thus, the methodical approach to the development of the PAMI list by the enterprise on the basis of the use of the proposed set of actions for the formation of the composition of the system of controlled indicators of effective management of the enterprise, which provides a reasoned choice by conducting a study of existing approaches to the composition of performance indicators, taking into account the specifics of the industry in which it operates, received further development enterprise and the use of the DMAT matrix for the distribution of responsibilities, which is a full-fledged tool for organizational analysis and planning.

4.5 DISCUSSION OF THE RESULTS OF THE METHODOLOGY OF PREVENTIVE ANTI-CRISIS MANAGEMENT OF ROAD ENTERPRISES

As a result of the conducted research, the following results were obtained:

- expediency of using indicators of operational analysis is justified as a basis for forming indicators of preventive anti-crisis management of road enterprises of Ukraine in conditions of sustainable development in the VUCA-, DEST-, BANI-, RUPT-, TUNA-world. Continuous CVP analysis of planned and actual current activities of the enterprise will ensure transparency, predictability of activities and efficiency of use of available resources;
- the methodical approach to forming a list of CVP analysis indicators of the road enterprise's activity was further developed by coordinating the opinions of leading specialists both in the field of profit management and in the industry in which the enterprise operates, as well as taking into account, if necessary, the specifics of the latter's work. The proposed methodical approach is

universal and can be used to form a justified list of CVP analysis indicators of the enterprise's activity in any branch of economy;

– the qualitative composition of the CVP analysis indicators of the road enterprise has been improved, it is formed by ten indicators that allow not only to carry out all the main tasks of the CVP analysis, but also new ones that arise in the conditions of a socially-oriented economy and an unstable external environment. With the help of the formed system of CVP analysis indicators, road enterprises will be able to constantly monitor the dynamics of indicators and respond to negative changes in a timely manner, predicting them or creating positive changes;

– the methodical approach to the development of the list of indicators of preventive anti-crisis management of the enterprise has been improved due to the comprehensive consideration of the results of the study of the quantitative and qualitative composition of CVP analysis indicators; the specifics of the industry in which the enterprise operates and the distribution of responsibility for each selected controlled indicator with the calculation of the labor intensity of its implementation. Approval of the proposed approach made it possible to form a PAMI list by road enterprises of Ukraine.

The application of the obtained results in the activity of road enterprises of the road and transport complex of Ukraine will prevent a crisis thanks to the formation of an opportunity to work ahead of schedule, creating scenarios of future current activities taking into account the requirement of continuous improvement of work and carrying out transparent implementation of their implementation with rational use of resources. All this contributes to the fulfillment of the following Sustainable Development Goals: overcoming poverty; decent jobs and economic growth.

It is worth noting that in none of the four sections of the monograph the language was devoted to the human factor. Therefore, in the next Chapter 5, in order to fill this gap, attention will be paid to the personnel management system.

REFERENCES

1. October 2018 issue of the ECA Journal: Foresight exploring possible futures for better decisions today. European Court of Auditor. Guardians of the EU finances. Available at: <https://www.eca.europa.eu/en/Pages/NewsItem.aspx?nid=11072> Last accessed: 01.10.2021
2. Dohadailo, Ya., Kyrchata, I., Kovalova, T., Dmytriiev, I., Losonczi, P.; Dmytriiev, I., Levchenko, Ia. (Eds.) (2021). Continuous CVP-analysis as a key tool of anti-crisis management of an enterprise in the conditions of sustainable development in the VUCA-world. Problems and prospects of development of the road transport complex: financing, management, innovation, quality, safety – integrated approach. Kharkiv: PC TECHNOLOGY CENTER, 81–95. doi: <http://doi.org/10.15587/978-617-7319-45-9.ch6>
3. Shevchuk, O., Ilyash, O., Mazhara, G., Roshchyna, N., Hrynkevych, S., Lavrov, R., Kozlovskiy, S. (2023). Modeling Regional Sustainable Development in Ukrainian Crisis and War. *Problemy Ekorozwoju*, 18 (1), 37–50. doi: <https://doi.org/10.35784/pe.2023.1.04>

4. Ponad 14 % dorih v Ukraini zruinovani rosiiskymy zaharbynkamy (2022). Tsina Derzhavy. Available at: <https://cost.ua/ponad-14-dorig-v-ukrayini-zrujnovani-rosijskymy-zagarbynkamy/> Last accessed: 30.06.2022
5. Where do the terms "VUCA" and "BANI" come from? And who knows "RUPT" and "TUNA"? VUCA-WORLD. Available at: <https://www.vuca-world.org/vuca-bani-rupt-tuna/> Last accessed: 02.09.2022
6. Manju, G. (2023). 7 chief digital officers on how they are navigating an unstable world. World Economic Foru. Available at: <https://www.weforum.org/agenda/2023/01/chief-digital-officers-transformation-davos23/> Last accessed: 20.01.2023
7. Tepluk, M., Shapran, O. (2021). Activation of Innovative Development in the Conditions of the DEST World. *Edukacja Ekonomistów i Menedżerów*, 59 (1), 85–93. doi: <https://doi.org/10.33119/eeim.2021.59.4>
8. BANI and Chaos. A framework for understanding a turbulent world. BANI Facing the Age of Chaos. Available at: <https://ageofbani.com/> Last accessed: 02.09.2022
9. Gordon, A. V. (2016). You Say VUCA, I Say TUNA: How Oxford Helps Leaders Face the Complex and Uncertain Future. *Forbes*. Available at: <https://www.forbes.com/sites/adamgordon/2016/04/06/oxford/?sh=535443bd4314> Last accessed: 02.09.2022
10. Ramirez, R., Wilkinson, A. (2016). Strategic Reframing: The Oxford Scenario Planning Approach. Oxford: Oxford University Press, 272. doi: <https://doi.org/10.1093/acprof:oso/9780198745693.001.0001>
11. Guo, Y. (2022). Enterprise Management Decision and Financial Management Based on Dynamic Cost Volume Profit Model. *Journal of Function Spaces*, 2022, 1–8. doi: <https://doi.org/10.1155/2022/9016060>
12. Liang, H., Guiffrida, A. L., Liu, Z., Patuwo, B. E., Shanker, M. (2021). A Generalized Stochastic Cost-Volume-Profit Model. *Systems*, 9 (4), 81. doi: <https://doi.org/10.3390/systems9040081>
13. Zhao, L., Yang, Z. (2022). Time-Driven Activity-Based Cost Expansion Model. *Journal of Engineering, Project, and Production Management*, 12 (2), 116–125. doi: <https://doi.org/10.32738/jepm-2022-0011>
14. Babiak, N., Krutous, N. (2021). CVP-analysis in the conditions of multiproduct manufacturing as a tool of operational controlling. *Ukrainian black sea region agrarian science*, 109 (1), 11–19. doi: [https://doi.org/10.31521/2313-092x/2021-1\(109\)-2](https://doi.org/10.31521/2313-092x/2021-1(109)-2)
15. Huppes, C. M., Bigolin, T., Muhl, J. J., de Souza Ângela, R. L. (2020). Análise Custo-Volume-Lucro para Ponderação de Sistemas de Produção Leiteira. *Anais Do Congresso Brasileiro De Custos – ABC: XXVII Congresso Brasileiro De Custos*. Available at: <https://anaiscbc.emnuvens.com.br/anais/article/view/4737> Last accessed: 19.09.2022
16. Dohadailo, Ya. V., Kiselova, Ya. E. (2012). The formation of profit management scorecard of the road industries enterprises. *Ekonomika transportnoho kompleksu*, 19, 102–111. Available at: http://etk-journal.khadi.kharkov.ua/fileadmin/journal/2012/19/ETK19_2012.pdf Last accessed: 21.09.2022

17. Dubrovyn, V., Labunskaya, A., Dohadailo, Ya. (2018). The justification of operational analysis scorecards of enterprise. *Modern Scientific Researches*, 4 (6-4), 50–55. Available at: <https://www.modscires.pro/index.php/msr/article/view/msr06-04-071> Last accessed: 21.09.2022
18. Mytsak, O., Kovtun, N., Lychach, O. (2019). Improvement of the management of an enterprise's financial results. *Galician economic bulletin*, 56 (1), 115–122. doi: https://doi.org/10.33108/galicianvisnyk_tntu2019.01.115
19. Petrenko, S. N. (2004). *Kontrolling*. Kiev: Nika- Tcentr, Elga, 341.
20. Dogadailo, Ia., Dubrovin, V. (2018). Formating main controlled indicstors of effective firms management. *Modern Scientific Researches*, 3 (3-3), 44–47. Available at: <https://www.modscires.pro/index.php/msr/article/view/msr03-03-057> Last accessed: 30.09.2022