

# THE MULTIFACTOR REGRESSION MODEL FOR EXPORT-ORIENTED SUSTAINABLE MANAGEMENT OF ENTERPRISE PROFITABILITY

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## Abstract

The article aims to determine and interpret the export-oriented sustainable management for Ukrainian industrial enterprise's profitability with the help of economic-mathematical modeling instruments. Considering the instability of the world trade economy caused in particular because of the full-scale war that Russian Federation started in Ukraine, intensification of European integration processes combined with restrictions of COVID-19 pandemic cycles, that changed directions of economic development in many European countries and the globe, there is a necessity for renewed approach to analyze and manage business activities of different companies. The research illustrates approaches of grouping and systematization of problems that define foreign economic activity under integration conditions with the usage of economic-mathematical modeling tools. In order to determine the impact of economic factors on the processes of sustainable management decision-making process, the multifactor regression model was used. The Ukrainian industrial export-oriented enterprise was chosen as a case study. The results allowed to underline the most positive influence on the enterprise's profitability level. The findings demonstrate that companies can analyze the structural-value indicators and identify the main factors of influence on the sustainable management of export-oriented company's profitability. The methodology presented throughout the article can be extrapolated to other situations that consider sustainable management for industrial export-oriented enterprises' profitability. Based on the results obtained the further research might be conducted on how companies can define the key factors influencing their export production potential and profitability with the aim to develop sustainable managerial decisions.

## Keywords 1

Export-oriented sustainable management; integration; profitability; multifactor regression model

## 1. Introduction

Under the current state of the full-scale war that Russian Federation started in Ukraine and its impact on economies of both countries and the whole world; the European integration processes; market economy development; foreign trade liberalization etc, the industrial enterprises have a lot of opportunities to strengthen their positions at foreign markets, but at the same time they face number of difficulties. Therefore it is of great importance for Ukrainian enterprises who are already working abroad or planning to do so, to understand the key factors contributing to their profitability through

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increase of export potential and certain managerial decisions to take. The topic is also relevant because of the Deep and Comprehensive Free Trade Area (DCFTA) between the European Union (EU) and Ukraine signed in 2014, provisionally applied since 1 January 2016 and the status of a candidate for accession to the EU which Ukraine was granted by the European Council in June 2022. The new status Ukraine was granted widens opportunities for Ukrainian enterprises to expand their activities at European market. According to this, sustainable management is considered to be one of the basic tools that allows export-oriented enterprises to achieve a proper level of profitability and promote its further economic growth in order to overcome economic crisis and risks. At the same time current conditions of market transformations set up new demand for study of internal and external environment impact on industrial enterprises' activities. It's related to the fact that a number of economic parameters are connected in constant correlation and complementarity. Therefore, the successful choice of approaches to economic analysis can provide the manufacturer with reliable tools for data processing in particular when it is necessary to determine the structural elements of its foreign economic activity (FEA) management.

## 2. Literature review

The analysis of past and recent studies shows that the problem of enterprises' internationalization success [1-3], free trade impact on their profitable foreign economic activities [4], in particular profitability analysis of export-oriented enterprises [5-6], and their influence on economic growth under industrialization and globalization processes [7] are relevant topics of research for scientists from different countries. The results of researches presented in different papers are obtained with the help of different methods of analysis. Besides the established economic models for data estimation with the help of regression analysis [8], in order to emphasize the role of data analysis on the microeconomic level there were reviewed advantages and disadvantages of different statistical models and how they can be used in the analysis of current capabilities of industrial enterprise to plan and manage production for export under the process of European integration. It was taken into consideration theoretical and practical aspects of regression analysis presented by Freedman D. A. [9], that allowed to define the model application to Ukrainian producers. According to Good, P. I. and Hardin J. W. [10] there are common errors that can cause limitations in making the data analysis which the attention was paid attention to in this research. The attention was paid to the researches devoted to modeling phasing [11], approach for meta-analysis in economics and business [12], conditional modes and predictions of multifactor analysis [13-14], probability points [15], correlation coefficients and regression percentage in estimation making [15-18], appropriate computer presentation and calculation [19], and optimization in economics with the help of vector analysis [20].

Beside this, the studies of profitability growth and its factors of influence [21-22] include researches that deals with quantile regression approach (combined with export analysis) [23], capital structure shaping [24], company's value prediction [25], currency valuation and export competitiveness [26].

At the same time, special attention is required to the usage of economic-mathematical modeling tools in order to analyze the enterprise's structural-value indicators and integrate their value into the structure of export-oriented sustainable managerial decisions. In this regard, many studies have been expanded to the scientific researches in the field of management [27], systematic risk caused by time-varying [28], production adaptive development [29] and impact of entrepreneurial leadership [30-31].

According to interpreted above, it is essential to admit that profitability is the economic category that can characterize the current state of production process development, as well as identify its predictive trends. In order to strengthen export orientation and increase the product sales return on national and foreign markets, a manager should understand the importance of qualitative and reliable analysis of those indicators that determine the level of enterprise's profitability from the side of productivity growth and costs minimization of its foreign trade.

Despite many researches to be held in this area, there are still gaps to fill in taking into account the constantly changing business environment when it comes to sustainable managerial decisions to take in order to boost foreign economic activity of a certain company.

## 3. Materials and Methods

Under the current conditions of economic transformations, the determining factors in shaping the structural elements of Ukrainian national enterprises' export-oriented activities should be those that reflect the macroeconomic impact, market trends, production potential, and financial support.

In order to make a qualitative analysis of factors that influence FEA and identify their key features in the development of appropriate sustainable managerial decisions, it is suggested that attention should be paid to the methodology of economic and mathematical modeling application. Such approach allows to predict possible limits of profitability growth and decrease based on data dynamic analysis that deals with the resultant indicator and its main variables. The architecture of the suggested model is based on the indicators of economic activity the as main variables, and enterprise profitability as the resultant indicator.

To intensify the influence on the resultant indicator, those variables represent a separate component of the enterprise's organizational and production operations. The representatives of the Chamber of Commerce and Industry of Ukraine, working at industrial enterprises and other regional firms-exporters, when developing sustainable managerial decisions for industrial export-oriented enterprise the following should be taken into account:

1. National producers must maintain their production potential with the appropriate amount of fixed assets that allow investing all the working capital in raw materials and accessories, production quality, energy resources, labor productivity, technology and software updates, and logistics.

2. It is necessary to take into account sales costs while planning production.

3. Also, while entering the foreign market, Ukrainian enterprises, it is considerable to conclude foreign trade contracts that deal with big volumes of export production in order to achieve the effect of economy of scales.

Based on the above mentioned the most significant indicators that are aimed to reflect the essence of Ukrainian enterprises' profitability making (in the context of their production processes) and must be taken into account while developing the sustainable managerial decisions to enhance export orientation, are: the average annual value of fixed assets, sales costs, and exports volumes.

These indicators describe tendencies, substantiate enterprises' profitability shaping and mark actual points for stable positions at national and foreign markets based on the production demand of the World Trade Organization (WTO), DCFTA, integration processes, restrictions caused by COVID-19 pandemic and war in Ukraine.

In order to carry out the analysis, it is considered that the most successful method in the structure of economic and mathematical modeling toolkit is regression analysis, which at the same time is operative and acceptable for determining the influence of several independent variables on the resultant indicator.

Regression analysis is a separate section of mathematical statistics that allows analyzing the dependence of one quantity on another. Regression analysis is used in cases when the relationship between independent variables is presented in the form of certain combinations that are used to predict a possible value of the dependent variable. Therefore, as economists, we apply such standard statistical method as linear regression.

A significant point for multifactor regression linear model making is that such kind of analysis doesn't determine a link between the researched indicators, but already uses its existence as an input parameter for estimation [9-11].

Due to this fact, elaborating the algorithm of determining the factors' influence on the industrial enterprise's profitability with the help of multifactor regression linear modeling, there will be the following interpretations:

1. For calculation basis, will be taken into account:

- the net sales revenue, which is the dependent variable (Y);

- the average annual value of fixed assets ( $X_1$ ), sales costs ( $X_2$ ), and export volumes ( $X_3$ ), which are independent variables.

The input data for the analysis are presented in the sample for the period of 2009-2020, as economic trends modeling makes it possible to obtain reliable predictions of the dependent variable (Y) if data is taken for the period not less than ten years (Table 1). In case of Ukrainian producers, it's important to make analysis for the period after 2008 when external relations where intensified due to Ukraine's membership in WTO. Starting from 2009, there were many of national companies which entered foreign market for the first time, and those that expanded product sales segments in European countries. It was an important step for Ukrainian economy on the way to future integration into the EU and significant source of foreign experience in obtaining approaches for more quality production and increasing profitability of Ukrainian producers.

2. In the case of linear connection and multifactor regression linear model making, values of such parameters as  $a_0$  and  $a_1$  are used to present the following:  $y = a_0 + a_1 X_1 + a_2 X_2$ . In order to calculate the mentioned  $a_0$  and  $a_1$  parameters the following formulas are used:

$$a_1 = \frac{\sum_{i=1}^n (y_i - \bar{y})(x_i - \bar{x})}{\sum_{i=1}^n (x_i - \bar{x})^2}, a_0 = \bar{y} - a_1 \bar{x}, \bar{x} = \frac{1}{n} \sum_{i=1}^n x_i, \bar{y} = \frac{1}{n} \sum_{i=1}^n y_i \quad (1)$$

where  $x_i$  – the independent variable (factor) used to determine the dependent variable,  $y_i$  – the dependent variable, which is estimated or predicted (performing indicator),  $a_0$  – free indicator of the equation,  $a_1, a_2, a_3$  – regression model parameters as regression coefficients to show how much performing indicator will change while factors can be increased by one unit;

In order to determine the factors impact ( $X_1, X_2, X_3$ ) on the modeled estimated values of net sales revenue in 2009-2020 ( $Y$ ), the multifactor regression model has the following form:

$$y = a_0 + a_1 X_1 + a_2 X_2 + a_3 X_3 \quad (2)$$

While performing mathematical calculations, to eliminate the influence of the "zero value" of the parameter  $a_0$  on the final result of  $Y$  during the research period of 2009-2020, it is introduced a dummy factor:  $X_0 = 1$  [12-14].

However, according to analysts and economists, the parameters of the multifactor model are better to be estimated by using the matrix method:

$$A = [X^T X]^{-1} [X^T Y] \quad (3)$$

where  $A$  – is the model parameters vector.

For further analysis, it is necessary to make a graphical comparison of actual data and the data obtained by the model, as well as give the conclusions regarding its accuracy to describe the presented dependence. The analysis should take into account the calculated error that can be defined by the following formula:

$$\Delta_A = (Y_{\text{calculated}} - Y_{\text{actual}}) \quad (4)$$

where  $\Delta_A$  – the error of  $A$ .

3. Calculation of the percentage value of factors' influence is based on such statements as:

– such kind of parameters like  $a_0, a_1, a_2, a_3$  of model  $A$  have a separate economic content and are called regression coefficients that show how much  $Y$  will change its rate while  $X_1, X_2, X_3$  can be increased by one unit (namely by 100%);

– if the regression coefficient is positive, the link is straight, otherwise it's inverse [15-16, 18].

4. Calculation of the determination coefficient ( $R^2$ ) is done in order to verify whether the obtained analysis data confirms the model being made.

The determination coefficient is a statistical indicator used to determine the dependence degree of the dependent variable ( $Y$ ) variation on the changes of the independent variables ( $X_1, X_2, X_3$ ) and can be calculated by the following formula:

$$R^2 = 1 - \frac{v(y/x)}{v(y)} = 1 - \frac{\sigma^2}{\sigma_y^2} \quad (5)$$

where  $V(y/x) = \sigma^2$  – is the conditional variance of the dependent variable ( $Y$ ), which is a deviation measure of random value and average rate of distribution (calculate the multiple correlation coefficient, determination coefficient and multiple regression coefficients).

The closer the coefficient of determination ( $R^2$ ) is to 1 (or 100%), the more accurate the result is and the data obtained from the analysis fully confirms the model being made.

In order to test the relation significance, it is used Fisher's criterion (F-criterion) which is calculated as a part of variance analysis. Further, there must be interpreted the hypothesis that the equation as a whole is statistically insignificant:  $R^2 = 0$  at the significance level  $\alpha$ . If the criterion value is greater than the table value, the regression equation is significant and the correlation is significant:  $F_{\text{calculated}} > F_{\text{table}}$ .

The table value of F-criterion is the maximum possible value of the criterion under the influence of random factors at the corresponding degrees of freedom and significance levels of  $a$ . The significance level of  $a$  – is the probability of rejecting the correct hypothesis, if it is the true one. Typically,  $a$  is taken within the gap of 0,05 or 0,01.

F-criterion is calculated by the following formula:

$$F_{\text{calculated}} = \frac{\sum (y_{i\text{calculated}} - y_{\text{average calculation}})^2}{m} \times \frac{n - m - 1}{\sum (y_i - y_{i\text{calculated}})^2} \quad (6)$$

where  $m$  – is a number of independent variable;

$n$  – is a number of experiments that present the periods of studied indicators (in our case it is 12 years: from 2009 to 2020).

The table value of F criterion is calculated with the help of Fisher distribution table and its given level of significance. However, it should be taken into consideration that the magnitude of the freedom degree for the total sum of squares (which reflects the greater variance) is equal to 1 and the magnitude of the freedom degree for the finite sum of quadrants (which reflects the smaller variance) in linear regression is equal to  $n-2$  (probability; 1;  $n-2$ )).

5. Emphasizing the possible maximum and minimum sizes of  $X_1, X_2, X_3$  factors influence (in percentage) on the maximum and minimum possible change of the resultant indicator (Y) of future periods based on the obtained calculations of the lower and upper limits of  $a_1, a_2, a_3$  parameters of A model.

According to the fact that the values of  $Y_{\text{max}}$  and  $Y_{\text{min}}$  can reflect the "standard error" of the variance analysis calculations, the upper and lower limits of change of  $X_1, X_2, X_3$  factors that conditioned by  $a_1, a_2, a_3$  parameters of A model are defined as confidence intervals and can be calculated by the following formula:

$$\text{Lower limits of } X_1, X_2, X_3 \text{ factors} = C_{\text{regression } a_1, a_2, a_3} - \Delta_{\text{standard } X_1, X_2, X_3} \times t_{\text{criterion } X_1, X_2, X_3} \quad (7)$$

where  $C_{\text{regression } a_1, a_2, a_3}$  – is the regression coefficient;

$\Delta_{\text{standard}}$  – is a standard error;

$t_{\text{criterion}}$  – is the estimated coefficient of t-statistics (Student T-test criterion).

$$\text{Upper limits of } X_1, X_2, X_3 \text{ factors} = C_{\text{regression } a_1, a_2, a_3} + \Delta_{\text{standard } X_1, X_2, X_3} \times t_{\text{criterion } X_1, X_2, X_3} \quad (8)$$

Student's t-test criterion ( $t_{\text{criterion}}$ ) is a criterion for statistical verification methods that is used for checking the equality of average values in two and one samples (variables).

In order to calculate the maximum and minimum value of Y it is used the following formula:

$$Y_{\text{max}} = \frac{\Delta_{\text{regression average}}}{\Delta_{\text{regression standard}}} \times 100\% \quad (9)$$

where  $\Delta_{\text{regression average}}$  – is the average error of regression model;

$\Delta_{\text{regression standard}}$  – the standard error of regression model.

The value of  $Y_{\text{min}}$  is the inverse to the value of  $Y_{\text{max}}$ .

Based on the above mentioned explanations, it is considered that the most important feature of multifactor regression model is to confirm the hypothesis about direct dependence of net sales revenue (Y) on average annual value of fixed assets ( $X_1$ ), sales costs ( $X_2$ ) and export volumes ( $X_3$ ). Under the model's experiments, it is necessary to understand the procedure for observing changes in the net sales revenue and few main factors ( $X_1, X_2, X_3$ ) that can influence on its volumes in real market conditions.

The limitations of the research are: the case study company is of state ownership, so for private-owned companies it should be taken into account a set of indicators suitable for them; it must also be taken into account the necessity of the suggested model and conclusions adaptation in each case based on the specific conditions of both external and internal environments a certain company works in and a time period which is analyzed as both these influence on the results obtained and can vary greatly.

### 3. Results

As the case study it was chosen the business performance of Public Joint Stock Company (PJSC) «Ukrelectroaparat», a machine-building manufacturer in Ukraine, Khmelnytskyi region. Management of the company actively works on the production, service and improvement of its products at both national and foreign markets, producing power and complete transformer substations for industrial solar energy.

In order to make the model and do necessary mathematical calculations it was used Microsoft Excel (its special «Data Analysis» and «Regression» statistical functions. The initial data for regression analysis to define the factors' influence on PJSC «Ukrelectroaparat» profitability is presented in Table 1.

**Table 1**

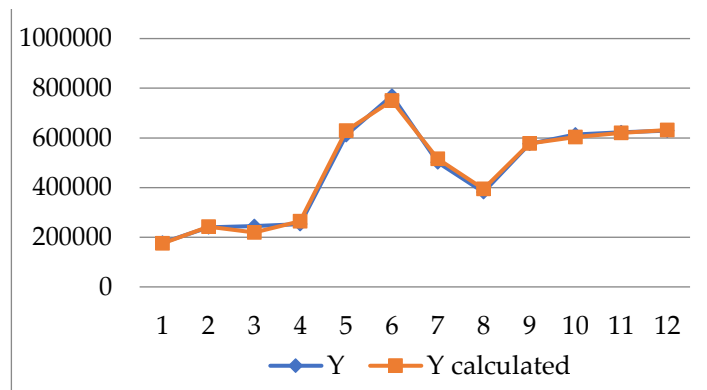
The initial data for regression analysis to define the factors' influence on PJSC «Ukrelectroaparat» profitability\*

Year	X <sub>0</sub>	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>	Y	Y <sub>calculated</sub> = a <sub>0</sub> +a <sub>1</sub> *X <sub>1</sub> +a <sub>2</sub> *X <sub>2</sub> +a <sub>3</sub> *X <sub>3</sub>	Error (Y <sub>calculated</sub> – Y <sub>actual</sub> )
2009	1	161270	128875	130888	178079	175071,8	3007,2
2010	1	200485	130454	155926	239518	241800,5	2282,5
2011	1	206025	132878	122080	244659	219826,1	24832,9
2012	1	197958	138748	195594	253295	264207,3	10912,3
2013	1	330883	228265	531797	610840	628663,1	17823,1
2014	1	389542	353496	709884	769940	750067,2	19872,8
2015	1	374568	324820	412600	501278	516038,4	14760,4
2016	1	317520	228170	258102	382031	394356,6	12325,6
2017	1	425850	250052	341463	576795	577104,5	309,5
2018	1	447887	269803	358219	613645	602856,8	10788,2
2019	1	454751	278038	376451	623236	619711,3	3524,7
2020	1	467237	287491	381563	628478	632090,4	3612,4

\*Source: own calculations based on the financial statements of PJSC «Ukrelectroaparat» [32]

As for the initial data calculation of Y<sub>calculated</sub> for 2009-2020 (Table 1), the obtained results show that the researched enterprise is characterized by a positive tendency in profitability increase, as the dynamics of its indicators is growing. However, according to the fact that the error between Y<sub>calculated</sub> and Y<sub>actual</sub> doesn't show a stable positive gap, this trend may not be resistant in future periods. In this aspect, it should be considered that in the activity of PJSC «Ukrelectroaparat», it is necessary to provide constant monitoring of analyzed indicators dynamics and predict the situation regarding its potential contribution to the value of the resultant indicator. Mainly, it is related to the fact that even a slight deviation from the previous period's value can mean a significant loss in the number of further profits. Mostly, this relates to cost indicators that can be variable under foreign markets exchange rate differences and dependable on the import price of raw materials for export production.

The comparison of actual and obtained data of the multifactor regression model results for PJSC «Ukrelectroaparat» profitability is shown in Figure 1. Despite the fact that there is an error in the calculation process (Table 1) and the graphs don't coincide by 100%, the regression model fairly accurately describes the presented dependence and is acceptable for further analysis of defining the influence of factors that shape profitability of the studied enterprise.



**Figure 1:** Graphical comparison of actual and obtained data based on the regression model of PJSC “Ukrelectroaparat” profitability (period of 2009-2020)\*, thsd UAH

\*Source: own research results based on the financial statements of PJSC “Ukrelectroaparat” [32]

The matrixes of model parameters and the calculated regression coefficients ( $a_1, a_2, a_3$ ) determine the potential change in  $Y$  by increasing  $X_1, X_2, X_3$  by one unit (namely by 100%) is presented in Table 2. If the enterprise has the possibility to increase the average annual value of fixed assets ( $X_1$ ), sales costs ( $X_2$ ), and export volumes ( $X_3$ ) by 100% – the net sales revenue ( $Y$ ) can reach 122,26%, 0,07%, and 79,66% of growth accordingly. It was found that the most influential factor is the average annual value of fixed assets, whilst the least significant is sales costs. In addition, it is important to emphasize that the average annual cost of fixed assets has significant place in the net sales revenue of PJSC «Ukrelectroaparat».

**Table 2**

The Matrixes of parameters vector of multifactor regression model of PJSC “Ukrelectroaparat” profitability\*

	$A=[X^T X]^{-1}[X^T Y]$	Factors influence, %
$a_0$	-31503,6378	
$a_1$	1,2226	122,26
$a_2$	0,0736	0,07
$a_3$	0,7966	79,66

Regression model of PJSC “Ukrelectroaparat”:  $y = -31503,64 + 122,26 \times X_1 + 0,074 \times X_2 + 0,797 \times X_3$

\*Source: own calculations based on the financial statements of PJSC “Ukrelectroaparat” [32]

This trend indicates that enterprise’s projected profitability depends on the contribution of financial inputs to the material and technical base, infrastructure, as well as quality resources for export production.

Considering the model’s regression statistics and the variance analysis of data validation (Table 3-4), the following must be noted:

1. According to the fact that the determination coefficient of the regression model ( $R^2$ ) is more closely approximated to one (0,98), it can be concluded that obtained result reflects accuracy of 98%. It means that data of profitability analysis of PJSC «Ukrelectroaparat» fully confirm the model.

2. Regarding the results of variance analysis of enterprise’s profitability regression model,  $F_{\text{calculated}} > F_{\text{table}}$  ( $103,32 > 9,76$ ), which indicates that the regression equation is significant and the found correlation is essential.

**Table 3**

Validation statistics of regression model of PJSC “Ukrelectroaparat” profitability\*

Parameter	Multiple R	R-square	Normalized R-square	Standard error	Observation
Indicator	0,987340202	0,974840674	0,965405927	34916,49279	12

\*Source: own calculations based on the financial statements of PJSC “Ukrelectroaparat” [32]

**Table 4**

Variance analysis of regression model of PJSC "Ukrelectroaparat" profitability\*

	df	SS	MS	F <sub>calculated</sub>	The significance of F (F <sub>table</sub> )
Regression	3	3,77908E+11	1,25969E+11	103,3245141	9,76069E-07
Remainder	8	9753291752	1219161469		
Total	11	3,87661E+11			

\*Source: own calculations based on the financial statements of PJSC "Ukrelectroaparat" [32]

In order to give an interpretation of the potential maximum and minimum values of  $X_1$ ,  $X_2$ , and  $X_3$  factors' influence on the maximum and minimum possible change of  $Y$  of PJSC «Ukrelectroaparat» in future periods (Table 6), it is important to use the obtained data presented in Table 5. In this case, it is considered  $Y_{max}$  as the ratio of standard and average error of the enterprise's profitability regression model,  $Y_{min}$  as the inverse [20]. Taking into account the standard error of regression model of PJSC «Ukrelectroaparat» equal to 35648,65 thousand of UAH and the average one is 10337,64 thousand of UAH,  $Y_{max} = (10337,64 / 35648,65) \times 100 = 29\%$ , accordingly  $Y_{min} = -29\%$ .

**Table 5**Upper and lower limits of change of  $Y$ ,  $X_1$ ,  $X_2$ ,  $X_3$  by the regression model of PJSC "Ukrelectroaparat" profitability\*

	Coefficients	Standard error	t-statistics	P-value	Lower limits 95%	Upper limits 95%
Y	-31503,64	35648,65	-1,47	0,18	-134475,66	29936,21
$X_1$	1,22	0,36	5,11	0,0009	0,45	1,185
$X_2$	0,07	0,0013	1,05	0,33	-0,2	0,54
$X_3$	0,796	0,098	6,25	0,0002	0,39	0,85

\*Source: own calculations based on the financial statements of PJSC "Ukrelectroaparat" [32]

As shown in Table 6, the most influential factor on the value of maximum net sales revenue ( $Y_{max}$ ) of PJSC «Ukrelectroaparat» is the cost of sales ( $X_2$ ) which captures the lowest value of the need for its percentage growth and is set on the level of 53,76%. The maximum reduction potential of this indicator for  $Y_{max}$  and  $Y_{min}$  is -120,19%.

**Table 6**Potential maximum and minimum values of  $X_1$ ,  $X_2$ ,  $X_3$  factors' influence on the maximum and minimum possible change in  $Y$  of PJSC "Ukrelectroaparat" profitability\*, %

Potential percentage change of $Y$ in future periods	Upper limits of $X_1$ , $X_2$ , $X_3$ factors' influence on $Y_{max}$ , percentage of growth			Lower limits of $X_1$ , $X_2$ , $X_3$ factors' influence on $Y_{min}$ , percentage of reduction		
	$X_1$	$X_2$	$X_3$	$X_1$	$X_2$	$X_3$
$Y_{max} = 29\%$ ; $Y_{min} = -29\%$	118,51	53,76	84,51	-44,8	-120,19	-38,94

\*Source: own calculations based on the financial statements of PJSC "Ukrelectroaparat" [32]

To conclude this part of the research, it must be admitted that the presented profitability indicators regression model for the researched machine-building enterprise made it possible to determine that the most influential economic factor in increasing company's profitability in the future periods could be the average annual value of fixed assets that underprovided 100% of growth which allowed to increase net sales revenue by 122,26% (Table 2). The lowest value of the need for  $Y_{max}$  percentage growth for PJSC «Ukrelectroaparat» captures sales costs (53,76%) (Table 6).



## 4. Discussion

Based on the well-grounded trends that have been outlined in the research, in our opinion, it is important to mention that integration processes, DCFTA and foreign trade liberalization should be considerable points in determining the structural elements of export-oriented sustainable management of industrial producer's profitability. Nowadays, the EU market and economic system of Ukraine offer a number of institutional tools for the activation of national enterprises' foreign economic activity that operate at both national and regional (foreign) levels. The main ones are: INNO-Metrics (European Innovation Scoreboard (EIS) and Innobarometer), International Trade Council, Export Credit Agency (ECA), and Government Office for Export Promotion of Ukraine. These institutional instruments provide opportunities for cooperation of national and foreign enterprises to address the issues of direct penetration into the external segment of the foreign market, attract investment and technologies, implement innovations, get new experience in production, and find necessary resources. All of the above-mentioned instruments can provide stable on-line work provided by the special electronic platform and software, which is of great importance nowadays due to the economic conditions caused by the war in Ukraine.

In this regard, it should be considered that national producers received a significant number of benefits for their FEA development. It means that it is already laid the basis for proper export-oriented environment creation and the use of opportunities for appropriate production programs and management [28]. The main task of management should be the development of the company's internal potential which will make it possible to obtain a competitive advantage over the long-term period [29]. Also, there are a few questions still unsolved that deal with the issue of whether national producers are ready to cooperate openly with foreign partners and other institutional representations in order to make useful changes to their strategic plans, and management systems, as well as to submit operational and commercial data for market situation monitoring and developing new projects on foreign economic development.

That's why, in order to find a way to identify problems in providing quality managerial decisions, it is important to carry out a detailed assessment of internal factors that influence export orientation and lead to an analysis of other coefficients. As it was shown by the results of the presented regression model calculations for profitability indicators of PJSC "Ukrelectroaparat", the most important are those that are able to characterize the efficiency of the enterprise's main production assets usage. This indicates that these factors exert the greatest influence on the national producer's export management program, which aims to multiply profits and reach higher levels of profitability.

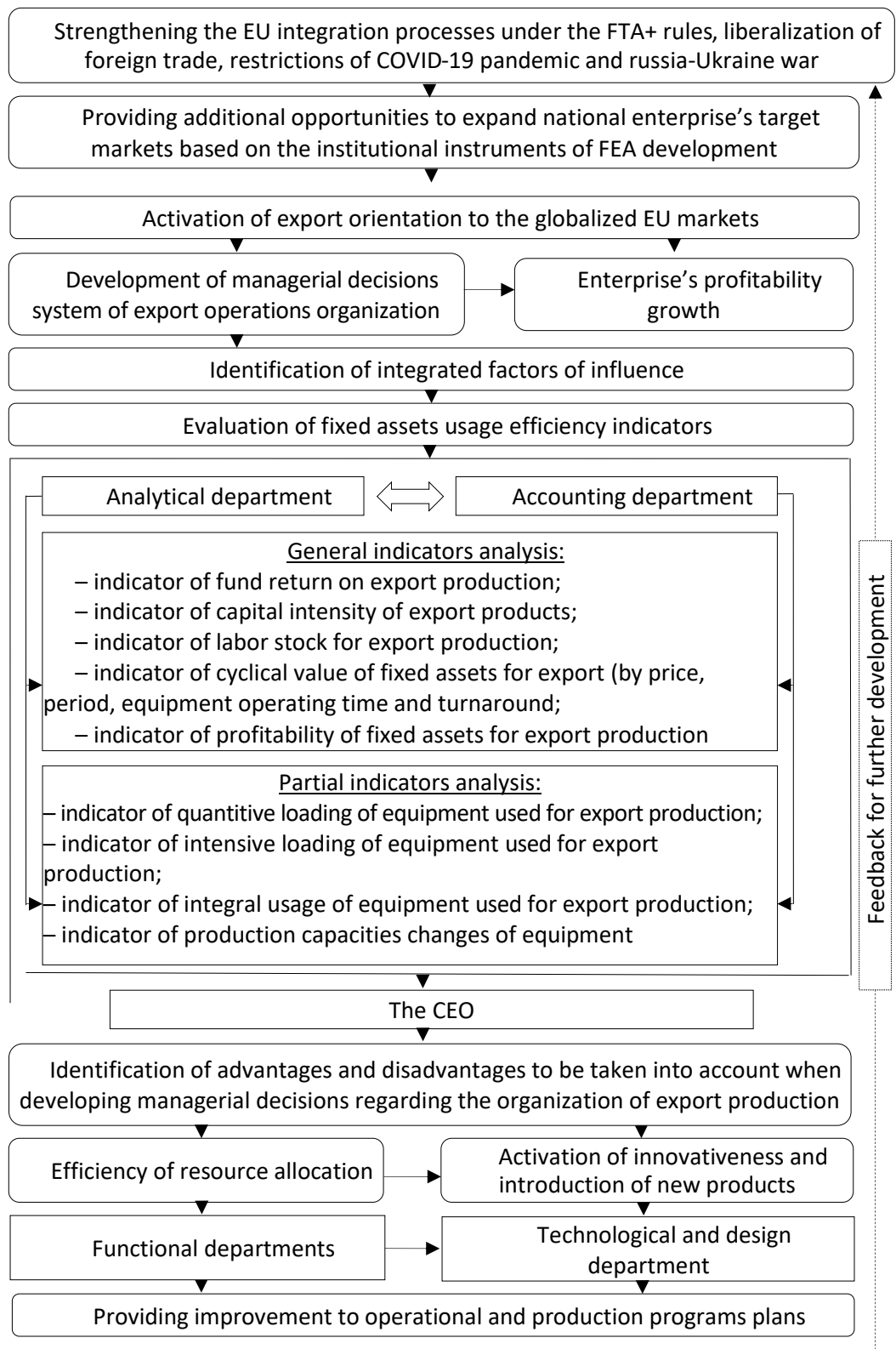
In our opinion, in order to start such processes, it is necessary to activate the enterprise's analytical mechanism, which in its internal structure must be represented by the work of economists, analysts and accounting staff.

According to the postulates of economic theory, analysis of the economic activity and production planning, in order to assess the efficiency of fixed assets usage, it is necessary to take into consideration a number of general (indicators of fund return, capital intensity, labor stock, fixed assets profitability) and partial indicators (indicators of quantitative and intensive load of equipment, integral usage of equipment and production capacity changes). As for the enterprise's export orientation, these indicators should be adjusted to the component of FEA and concern production processes aimed at creation of export products. At the same time, it is suggested another indicator that must track and adjust the cyclical value of fixed assets for export and should be taken into account not only in the development of operational management decisions but also in the perspective sustainable strategic plans.

The necessity to introduce such kind of indicator is related to the possible change of fixed assets' influence on export production and therefore the following should be taken into account:

1. The cost aspect that is aimed at the adjustment of the contract price, which is set in the foreign economic contract when selling the manufactured batch and supplying raw materials in the import mode.
2. Quantitative aspect that is aimed at adjustment of attracted resources, input and output equipment for a certain period (quarter, year, operation duration etc.).
3. Turnaround aspect that is aimed at the adjustment of invested capital in accordance to its value in time.

To systematize the conducted research and summarize the above-mentioned suggestions it is presented the generalized scheme of shaping the structural elements of an enterprise's profitability export-oriented sustainable management (Figure 2), which includes the following:



**Figure 2:** Structural elements of the export-oriented sustainable management of industrial enterprise's profitability\*

\*Source: own development

- integration processes units such as functioning under the requirements of deepening FTA and foreign trade liberalization;
- export orientation activation units;
- evaluation of fixed assets usage units (common and partial indicators analysis);

– operational plans and production programs change units (efficiency of resources allocation and implementation of innovation).

According to Figure 2, it should be noted that evaluation of fixed assets usage is an important element of an enterprise's profitability export-oriented sustainable management, as it allows to carry out a careful analysis of many significant indicators regarding the contribution of resources for export production, their returns, technological and labor component. In order to develop logic and timely accurate managerial decisions that will intensify export operations and address quality issues in the organization of the production process, sustainable management should rely on achieving efficiency in approaches that have been applied to solve issues of resource balancing. Otherwise, the innovativeness of the enterprise's business processes and the introduction of new products should be a determinative element of export management.

In order to activate such kinds of operations, in the structure of enterprise's functional departments, it is necessary to provide a detailed analysis of those resources that are intended for production start-up. Regarding the innovation component, strengthening of these issues should be entrusted to the work of the enterprise's technological and engineering department(s). The employees of this department(s) should determine the potential capabilities of available technologies and approaches to be used in export production with the aim to meet the requirements of international standards, agreements of foreign trade contracts and target market demands.

At the same time, in order to increase the competitiveness of national products in the foreign markets, the enterprise's sustainable management should prefer to make the constant search for new technologies that allow improvement not only the production process but also standard methods of materials processing, modeling and computer designing.

As the result, the above-mentioned problems will contribute to quality changes in operational production plans and programs that are based on the need to develop appropriate management decisions to improve export operations. In the end, it allows to evaluate the current market situation and increase the enterprise's profitability.

## 5. Conclusions

According to the research results the following conclusions can be made:

1. Based on the multifactor regression model created for the export-oriented enterprise PJSC «Ukrelectroaparat» the structural elements of the export-oriented sustainable management of industrial enterprise's profitability were defined. Under the current conditions of business environment and overall economic situation in Ukraine to the most significant factors that might increase profitability level belong the following: fixed assets, sales costs and export volumes.

2. Fixed assets were found as the most important one. If the enterprise has the opportunity to increase the average annual value of fixed assets by 100% – the net sales revenue (Y) can reach 122,26%, and accordingly it will have huge influence on further profitability level. At the same time it was found that the less influencing factor is sales costs.

3. The net revenue sales can be maximized to the 29% if management can provide separately 118,51% growth of fixed assets and 84,51% growth of export volumes, even in case when sales costs have 53,76% increase.

4. The constant attention should be paid to the efficiency of resource allocation, activation of innovativeness and introduction of new products, functional departments performance and technological changes with the necessity of providing improvement to operational and production programs plans. All of these should take place on a regular basis taking into account constantly changing external business environment and must be oriented to the requirements of DCFTA rules, foreign trade liberalization, changes in macro- and global economic environments caused by the Russia-Ukraine war.

This will help to identify the advantages and disadvantages of making further managerial decisions on the organization of export production, amend operational plans and programs, and provide conditions for profitability growth.

As for practical implications of the article, the usage of economic-mathematical modeling tools allows to analyze the enterprise's structural-value indicators, identify main factors of influence and integrate their value into the structure of export-oriented profitability management.

The future research will be targeted to the development of different models of business performance analysis in different time frames important for the economic development of the country: 2022 – the

ongoing russia-Ukraine war; post-war Ukraine economic recovery and the first decade of Ukraine as a member of the European Union. This will be useful for future strategic (operational) plan developments based on the different time gaps.

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