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DEVELOPMENT AND IMPLEMENTATION OF THE FINANCIAL MODEL OF EXPORT IN THE CONTEXT OF STRATEGIC PLANNING OF FOREIGN ECONOMIC ACTIVITY OF ENTERPRISES

ABSTRACT

The article deals with the development and implementation of a financial model of exports in the context of strategic planning of foreign economic activity of enterprises. The model described in this paper aims to measure, analyse, evaluate and propose improvements to administrative processes by identifying various variables involved in strategic foreign trade planning. This paper is a survey that is being developed for export activities in Ukraine. Exports in Ukraine were analysed to test the methodology and to build an additive model.

The model empirically shows the links that exist between the internal functions of a company and its ability to generate performance management indicators and business dynamics as a way to improve processes in strategic foreign trade planning. Some relevant findings from the first two stages of the empirical research conducted to date are presented. Validation has proven that the use of the methodology of strategic planning of foreign economic activity allows you to compensate for investments in new resources by increasing the number of operations carried out eliminating delays and attracting new customers as a result of improving the client's perception of the quality of service. During the audit, it was possible to determine that the delays created in the activities of support systems increase their negative impact on the process, consuming the slack of many actions of the central system and delaying their implementation, negatively affecting foreign economic activity. The model will be useful for enterprises engaged in foreign trade.

Keywords: modelling, implementation, financial model, additive model, strategic planning, foreign economic activity of an enterprise

JEL Classification: D210, L190

INTRODUCTION

Globalisation forces us to recognise that the market is the whole planet, so we need to develop business plans that take into account resources wherever they are, customers from all continents, suppliers from other latitudes - all to optimise business operations. That's why it's important to view the market economy as a natural field in which companies operate. Faced with these challenges, they must be flexible enough to transform the entire business structure and thus respond to strategic changes and market challenges in their foreign economic activity (FEA). In this sense, in order to achieve a position of competitive advantage, it is necessary to critically examine the environment in order to identify external and create internal opportunities. For this reason, it is important to constantly review the environment and in particular, the sector in which the organisation is involved, as it subsequently determines the strategic direction of the foreign economic activity through a sequence of different decisions. In this sense, the approach to strategic planning of foreign economic activity will undoubtedly contribute to the assessment of the environment, competition, technological advances as critical variables for the survival and strategic success of companies.

Strategic FEA planning is a tool for managing and ordering change, where organisational goals are defined and FEA strategies are established. It also recognises participation based on leadership and decision-making that meets the requirements of the immediate and future environment. Therefore, it is modelling in the changing environment in which the company operates that can help to adapt to change. The development and implementation of a financial model of exports in the context of strategic planning of foreign economic activity of enterprises becomes important.

LITERATURE REVIEW

Organisational change has evolved as human beings have generated mental and structural modifications to make them sustainable over time. The speed at which change has occurred over the years has become increasingly dizzying, creating a need for companies to be attentive to market trends in which customers have more information available every day due to ease of use. Therefore, for organisations to achieve competitive advantage and be sustainable, they need to be dynamic as part of their strategic B2B plan. To achieve this, they need to create knowledge, transfer it between their departments to develop and apply skills in the strategic planning process. It is important to emphasise what Ohmae (2004) points out, which is to break down what he considers to be problems, trends, events or situations that seem to be a single whole, and after identifying the significance of these components, to reassemble them to maximise the benefits, allowing for realistic responses to changing situations. In this sense, a manager should consider himself or herself an agent of change and transformation, leading organisations, new directions, processes, goals, strategies, technologies and even new risks. An agent who changes behaviour and attitudes towards human capital through their leadership style, reforms and promotes organisational culture, using management development methods aimed at enhancing leadership skills and emphasising institutional values should take everything into account when planning strategically.

For Garcia (2010), the purpose of strategic planning is to help organisations explore future challenges, both foreseeable and unforeseen, rather than to prepare them for a possible unique tomorrow. Business strategic planning, then, is the coordination of multiple creative minds within a shared perspective that enables the business to move into the future in a way that is satisfactory to all.

Strategic planning includes the values, mission, vision and strategy of the FEA, which are typically intuitive, feelings-based elements rather than analytical, information-based elements. Reaching agreement on these elements among members of the management team is an important prerequisite for effective strategic planning. This leads to the importance of strategic planning, which is that it is the basis for strategic decision-making. Without this basis, subsequent decisions and actions may be fragmented and inconsistent for the effective long-term operation of the company (Chavenato and Sapiro, 2011).

Garafonova O., Zhosan G., Khudolei V., Tiukhtenko N., Tymkiv I., & Riabets N. (2023) believe that in order to form the initial component of the strategic model of post-war revival, it is necessary to identify the main areas of activity, taking into account the level of territorial development and market potential.

Every organisation should have a goal, guidelines or policy so that someone contributing to the analysis, both internal and external, knows what goals are expected to be achieved in the future, and this is when strategic planning as part of strategic foreign trade management comes into its own. It is used to define the scope of activities, what the company wants to be, and to establish the reasons for the company's existence, which will allow it to offer the necessary strategies to meet expectations when operating in foreign markets.

In an organisation, foreign economic activity strategies can be analysed in terms of how they will be implemented in the short or long term in order to achieve the goals set out in the company's policy. But they can also be reviewed in terms of sustainability and targeting by setting global and specific goals that will lead to the best results with the available resources.

In addition, FEA strategies are likely to focus on competitiveness and the environment, and this is when many entrepreneurs show how valuable it is to learn and adapt to change faster than competitors. At the same time, the most important aspect of strategic planning is the financial aspect. Therefore, this study aims to analyse how a financial model of exports can be developed and implemented in the context of strategic planning of foreign economic activity of enterprises. What is a tool for decision-making in organisations, or as a manager and should outline the direction in the organisation that will allow them to be more competitive.

For the purposes of this study, the position is assumed to be formalised in a qualitative methodology. This research is characterised by a review of texts, academic journals, dissertations and other documents that are the result of other research, theorists' reflections, which is the basis that supports the research and, in this sense, knowledge is built from its reading, analysis, reflection and interpretation by the researcher.

Below are reflections on the development and implementation of a financial model of exports in the context of strategic planning of foreign economic activity of enterprises, describing some of the elements that make up the model, organisational diagnostics, company management philosophy, strategic direction and strategic assessment, and finally the financial model that can be applied.

AIMS AND OBJECTIVES

Thus, the purpose of building this conceptual financial macro-model is to simulate the system of indicators applied to the financing of foreign economic activity and used in strategic planning. The relevant goals that have been formulated in this process are, in turn, converted into indicators that are used to guide and monitor these goals, thus defining the guidelines that should be followed to achieve the strategy.

Similarly, the double-loop relationship between the indicator system and finance is shown as a key element of the financial macro-model. In this case, the indicator system will be responsible for monitoring and measuring the supply (supply chain management cycle) and returning as feedback, which will allow updating the set of indicators so that they can adapt the financial model of strategic planning of the FEA.

The suggested financial macro model of strategic planning of foreign economic activity seeks to effectively integrate various elements, from suppliers to customers, in order to meet customer needs at the lowest cost. On the other hand, the existence of a production system, which, in turn, consists of various subsystems that are interconnected with each other, is highlighted. For this purpose, this article proposes to create a systemic financial model that combines various elements, focusing on the production subsystem of strategic planning of foreign economic activity, including exports.

METHODS

The model described in this article is based on the methodology of system dynamics, an economic and mathematical apparatus. Using the sum of squares of the obtained absolute errors, moving averages, seasonal component, time series, least squares method, additive time series model in combination with software as a tool for modelling and simulation, a financial model of exports in the context of strategic planning of foreign economic activity of enterprises was obtained. This model aims to integrate the strategic variables of the economic environment of foreign trade (the manufacturing sector to which it belongs) with the internal variables of the company in the production subsystem.

RESULTS

Financial management models should integrate both the processes of strategic planning of foreign economic activity and control processes (integrated scorecard). Strategic management and operations management, respectively, are the main objectives of these subsystems. Although both subsystems manage different elements, the creation of a dual link between strategic planning and FEA is proposed as an important methodological suggestion of this paper, which will increase the efficiency of FEA management.

The economic management of companies is an integral result of the totality of all the parts that make up each of the subsystems of an organisation and influence its development, both the relevant external variables and all the internal actions that are carried out within it. For this reason, it is difficult to measure, monitor and evaluate the performance of some of the company's subsystems using static models. In the same way, a highly competitive and change-sensitive environment increases the risk for companies. Therefore, it is necessary to develop global FEA strategies [7] [2] that allow for the integration of new scenarios and facilitate financial management in the company. The above makes it necessary to develop strategies for controlling foreign economic activity that facilitate financial modelling at all levels, [3] [14] ensuring that action plans reflect the cause-and-effect relationship of decisions.

Therefore, the focus was made on management indicators, on the production subsystem as a contributing element of strategic business management from a systematic approach, which allows the company to guarantee the effective implementation of its policies, plans and strategic planning of foreign economic activity. From this point of view, the business system should contain a fully aligned control subsystem that accompanies the development of strategic foreign trade plans, and this subsystem will be management indicators. This subsystem aims to facilitate the functions of managers to plan, manage and control production and finance in a continuous and integrated manner, providing feedback and adjusting the behaviour of critical variables that were identified earlier [3]. The introduction of cross-functional and integrative systems

in companies, known as ERP (Enterprise Resources Planning) [3], has allowed the integration of business information systems, thus facilitating scenario modelling, which makes strategic management possible in an effective way.

The analysis of indicators has traditionally been carried out in the field of accounting and finance, but due to their short-term nature, does not contribute to the formation of systemic strategies and company policies that add long-term value [3].

In view of the above, management indicators should integrate other elements outside the financial subsystem, for example, those present in the production and commercial subsystems in the strategic planning of foreign economic activity. This way, a more systematic vision of strategic elements can be obtained, which should be focused on achieving financial business goals and strategic planning of foreign economic activity.

Formulation and description of the model. The model detailed in this article is based on the system dynamics methodology, and Powersim software is used as a modelling and simulation tool. The model aims to integrate the strategic variables of the economic environment of foreign trade with the internal variables of the company in the production subsystem.

Management models should integrate both the strategic planning and control processes (integrated scorecard) of the FEA, in line with the goal of strategic management and operations management, respectively. Although both subsystems manage different elements, the creation of a double-loop link between strategic planning and the financial dashboard is proposed as an important methodological proposal of this paper.

Thus, the purpose of developing this conceptual financial macro model is to ensure that strategic planning for foreign trade applies a financially based indicator system. The relevant objectives that have been formulated in this process would in turn transform this strategy and the indicators used to guide and monitor these objectives, thus defining the guidelines to be followed to achieve the said FEA strategy. In addition, it is expected that the feedback loop (strategic learning cycle) would inform adaptive strategic planning so that it can take corrective action if necessary. Similarly, the double-loop relationship between the scorecard and exports is illustrated as a key element of the macro model of foreign trade. In this case, the scorecard will be responsible for monitoring and measuring exports (the management cycle) and, as feedback, will allow the set of indicators to be updated in such a way that it makes it possible to see that the proposed macro model seeks to effectively integrate various elements, from suppliers to customers, in order to meet customer needs at the lowest possible cost. On the other hand, it highlights the presence of a production system, which, in turn, consists of various subsystems that are interconnected. One of the difficulties in making decisions on productive indicators is related to the limitations of collecting information in real-time for analysis and decision-making [8] [9]. In practice, it tries to adapt the indicator model according to the systems and formats of a particular company in the sector, capturing information in a simple and systematic way from the databases that the company has, referring to its production subsystem, in order to perform calculations and test the design and make sure it works, and then apply it as a tool that calculates reliable data. These metrics results are very useful for the company's decision-making [2] [5] [8] [9]. The dynamic model of indicators that has been described aims to be testable and adaptable to any company in the sector, allowing for future analysis of the behaviour of the variables that make up the indicators in different areas. Where performance indicators can be calculated quickly and efficiently [1] [3]. To test the methodology and to build an additive financial model, we analysed exports in Ukraine. The most exported categories of goods from Ukraine in the first eight months of 2023 are:

- food: USD 14.6 billion;
- metals and metal products: USD 2.7 billion;
- machinery, equipment and transport: USD 2.1 billion.

Exports of agricultural products are five times higher than exports of metallurgical goods, although for decades they have been quite equivalent channels for bringing foreign exchange earnings to Ukraine. Therefore, in order to build an adaptive financial model of exports in the context of strategic planning of foreign economic activity of enterprises, we took the data on exports and GDP of Ukraine and built an additive time series model. The general form of the additive model is as follows:

$$Y=T+S+E \tag{1}$$

This model assumes that each level of the time series can be represented as the sum of the trend (T), seasonal (S) and random (E) components of GDP and exports in Ukraine. The components of the additive financial model of the time series of exports in Ukraine were calculated using the conditional zero method. The modelling was carried out using the following steps:

Step 1. The initial levels of the Ukrainian exports series were levelled using the moving average method, for this purpose:

- Find moving averages (column 3 of Table 1) of exports and GDP in Ukraine. The levelled values obtained in this way do not contain a seasonal component.
- Estimates of the seasonal component of exports and GDP in Ukraine as the difference between the actual levels of the series and the centred moving averages (column 4 of Table 1). The results of the calculations are presented in Table 1.

Table 1. Alignment of the initial levels of the series using the moving average method of exports in relation to GDP in Ukraine.

t	y t	Moving average	Assessment of the seasonal component
gr.1	gr.2	gr.3	gr.4
-4.5	681899	-	-
-3.5	770121	917796.5	-147675.5
-2.5	1044541	1104879.3	-60338.3
-1.5	1174625	1314571.5	-139946.5
-0.5	1430230	1462540.3	-32310.3
0.5	1608890	1578233.8	30656.3
1.5	1636416	1776852.3	-140436.3
2.5	1637399	1834770.5	-197371.5
3.5	2224704	-	-
4.5	1840563	-	-

Step 2. The estimates of the seasonal component were used to calculate the values of the seasonal component S for 10 years of exports in Ukraine. For this purpose, we obtained the average estimates of the seasonal component S_i of exports for each year (for all years). In a model with a seasonal component, it is assumed that seasonal effects over the period cancel each other out. In the additive model, this is reflected in the fact that the sum of the seasonal component values for all years should be zero. The values of the seasonal component of Ukraine's exports by year in the additive model are presented in Table 2.

Table 2. Values of the seasonal component of Ukraine's exports by year in the additive model.

Indicators	1	2	3	4
1	-	-147675.5	-60338.25	-139946.5
2	-32310.25	30656.25	-140436.25	-197371.5
3	-	-	-	-
Total for the period	-32310.25	-117019.25	-200774.5	-337318
Average estimate of the seasonal component	-32310.25	-58509.625	-100387.25	-168659
Adjusted seasonal component, S_i	57656.281	31456.906	-10420.719	-78692.469

For this model, we have:

$$-32310.25 - 58509.625 - 100387.25 - 168659 = -359866.125$$

$$\text{Correction factor: } k = -359866.125/4 = -89966.531$$

Step 3. The influence of the seasonal component of exports in relation to Ukraine's GDP is excluded by subtracting its value from each level of the original time series. The resulting values are $T + E = Y - S$ (column 4 of Table 3). These values are calculated for each moment in time and contain only the trend and the random component. The parameters of the equation are found by the method of least squares. The system of equations of the OLS:

$$a_0 n + a_1 \sum t = \sum \quad (2)$$

$$a_0 \sum t^2 = \sum y * t \quad (3)$$

For Ukraine's export data, the system of equations looks like this:

$$10a_0 + 0a_1 = 13960274.81$$

$$0a_5 + 0_1 = 12676760.81$$

The result is $a = 1396027.481$, $b = 153657.707$

Average value:

$$\bar{y} = \frac{\sum y_i}{n} = \frac{13960274.81}{10} = 1396027.48$$

Table 3. Calculation of Ukraine's exports using the parameters of the least squares equation.

t	y	t ²	y ²	t*y	y(t)	(y - y) ²	(yy(t)) ²
gr.1	gr.2	gr.3	gr.4	gr.5	gr.6	gr.7	gr.8
-4.5	624242.719	20.25	389678971912.39	-2809092.234	704567.801	595651719627.18	6452118769.098
-3.5	738664.094	12.25	545624643395.51	-2585324.328	858225.507	432126623225.47	14294931630.726
-2.5	1054961.719	6.25	1112944228028	-2637404.297	1011883.214	116325854349.71	1855757553.873
-1.5	1253317.469	2.25	1570804677473.9	-1879976.203	1165540.921	20366147667.75	7704722330.918
-0.5	1372573.719	0.25	1883958613403.2	-686286.859	1319198.628	550078975.406	2848900329.554
0.5	1577433.094	0.25	2488295165257.7	788716.547	1472856.335	32907996246.5	10936298541.958
1.5	1646836.719	2.25	2712071178223.3	2470255.078	1626514.041	62905273615.331	413011211.531
2.5	1716091.469	6.25	2944969929116.5	4290228.672	1780171.748	102440956094.4	4106282226.624
3.5	2167047.719	12.25	4696095815339.6	7584667.016	1933829.455	594472206634.56	54390758493.56
4.5	1809106.094	20.25	3272864858443.4	8140977.422	2087487.162	170633940104.92	77496019122.05
0	13960274.813	82.5	21617308080593	12676760.813	13960274.813	2128380796541.2	180498800209.89

Step 4. Determine the T component of the (trend) financial model of Ukraine's exports. To do this, we analytically smooth the series (T+E) using a linear trend. The results of the analytical alignment are as follows:

$$T_t = 1396027.481 + 153657.707t$$

Substituting this equation for $t = 1, \dots, 10$, we found the levels of T of Ukraine's exports for each moment in time (column 5 of Table 4). column 4 ($y_t - S_t$) represents the deseasonalised sales volume, $A - S = T + E$. The results are summarised in Table 4.

Table 4. Deseasonalised exports in Ukraine.

t	y _t	S _t	y _t - S _t	T	T + S _t	E = y _t - (T + S _t)	E ²	E/y _t	E /y _t
gr.1	gr.2	gr.3	gr.4	gr.5	gr.6	gr.7	gr.8	gr.9	gr.10
-4.5	681899	57656.281	624242.719	704567.801	762224.082	-80325.082	6452118769.098	-0.118	0.118
-3.5	770121	31456.906	738664.094	858225.507	889682.414	-119561.414	14294931630.726	-0.155	0.155
-2.5	1044541	10420.719	1054961.719	1011883.214	1001462.495	43078.505	1855757553.873	0.0412	0.0412
-1.5	1174625	78692.469	1253317.469	1165540.921	1086848.452	87776.548	7704722330.918	0.0747	0.0747
-0.5	1430230	57656.281	1372573.719	1319198.628	1376854.909	53375.091	2848900329.554	0.0373	0.0373
0.5	1608890	31456.906	1577433.094	1472856.335	1504313.241	104576.759	10936298541.958	0.065	0.065
1.5	1636416	10420.719	1646836.719	1626514.041	1616093.323	20322.677	413011211.531	0.0124	0.0124
2.5	1637399	78692.469	1716091.469	1780171.748	1701479.28	-64080.28	4106282226.624	-0.0391	0.0391
3.5	2224704	57656.281	2167047.719	1933829.455	1991485.736	233218.264	54390758493.56	0.105	0.105
4.5	1840563	31456.906	1809106.094	2087487.162	2118944.068	-278381.068	77496019122.05	-0.151	0.151
						2.3283064	180498800209.89	-0.128	0.799

Step 5. The values of the levels of Ukraine's export series obtained by the additive financial model are found. To do this, the value of the seasonal component for the relevant years is added to the level T (column 6 of Table 5). The quality of the obtained financial model is checked. For this purpose, the average percentage error was calculated.

$$MPE = \frac{1}{n} \sum \frac{E_i}{y_i} = \frac{1}{10} * (-0.128) = -1.279\%$$

which is less than 5%.

The average absolute percentage error was calculated.

$$MPE = \frac{1}{n} \sum \frac{|E_i|}{y_i} = \frac{1}{10} * 0.799 = 7.99\%$$

Since MAPE < 10%, the financial model is fitted with high accuracy. Average error:

$$ME = \frac{\sum E_i}{n} = \frac{2 * 3283064365387E - 10}{10} = 2 * 3283064365387E - 11$$

Average absolute deviation:

$$MAD = \frac{\sum |E_i|}{n} = \frac{1084695.686}{10} = 108469.569$$

Root mean square error:

$$MSE = \frac{\sum E_i^2}{n} = \frac{18498800209.89}{10} = 1849880020.989$$

To evaluate the quality of the built financial model, the sum of squares of the obtained absolute errors was used. The coefficient of determination was calculated using the formula:

$$R^2 = 1 - \frac{\sum E^2}{\sum (y_t - \bar{y})^2} \quad (4)$$

For the financial model of exports in the context of strategic planning of foreign economic activity of enterprises, 1404938.8, b=152353.818 has been obtained. Average value: $\bar{y} = \frac{\sum y_i}{n} = \frac{14049388}{10} = 144938.8$

Coefficient of determination: $R^2 = 1 - \frac{180498800209.89}{2120349814536.6} = 0.91$

Indicators for assessing the quality of the built financial model of exports in the context of strategic planning of foreign economic activity of enterprises are presented in Table 5.

Table 5. Indicators for assessing the quality of the developed financial model of exports in the context of strategic planning of foreign economic activity of enterprises.

t	y	(y _i - y) ²
-4.5	681899	522786552384.04
-3.5	770121	402993639196.84
-2.5	1044541	129886574244.84
-1.5	1174625	53044446470.44
-0.5	1430230	639644797.44
0.5	1608890	41596091981.44
1.5	1636416	53581694119.84
2.5	1637399	54037744584.04
3.5	2224704	672014983131.04
4.5	1840563	189768443625.64
0	14049388	2120349814535.6

Thus, it can be said that the additive financial model of exports in the context of strategic planning of foreign economic activity of Ukrainian enterprises explains 91% of the total variation in the time series levels. Verification of the adequacy of the financial model to the observed data: $F = \frac{R^2}{1-R^2} \frac{n-m-1}{m} = \frac{0.91^2}{1-0.91^2} \frac{10-1-1}{1} = 85.98$

where m is the number of factors in the trend equation ($m=1$). $F_{kp} = 5.32$. Since $F > F_{kp}$, the equation is statistically significant.

Step 6. Forecasting using the additive financial model. The forecast value F_t of the time series level of Ukraine's exports in the additive financial model is the sum of the trend and seasonal components. To determine the trend component, the trend equation was used:

$$T = 1396027.481 + 153657.707t.$$

Forecast for 1 year: $T_{5.5} = 1396027.481 + 153657.707 * 5.5 = 2241144.86$ 0.719. Thus, $F_{5.5} = T_{5.5} + S_3 = 2241144.869 - 10420.719 = 2230724.15$.

Forecast for the 2nd year: $T_{6.5} = 1396027.481 + 153657.707 * 6.5 = 2394802.576$ Seasonal 2. Thus, $F_{6.5} = T_{6.5} + S_4 = 2394802.576 - 78692.469 = 2316110.107$

Forecast for year 3: $T_{7.5} = 1396027.481 + 153657.707 * 7.5 = 2548460.282$. The value of the seasonal component for the corresponding period is equal to: $1 = 57.51 = 2548460.282 + 57656.281 = 2606116.564$. An additive financial time series model for exports in Ukraine is presented in Figure 1.

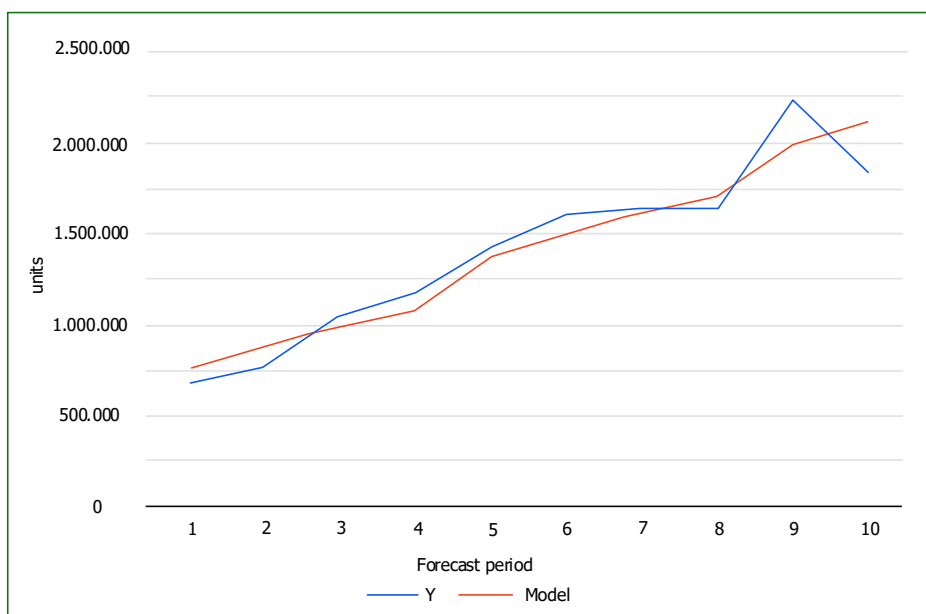


Figure 1. Additive financial model of the time series of Ukraine's exports.

Summarising the data of the financial model of exports, we can suggest strategic variables of the economic environment (business sector) that can directly influence the management indicators of the production subsystem. These include:

1. Competitiveness of the company in terms of the percentage of the company's participation in the market.
2. Investment in R&D: the amount of money a company allocates to research and development (R&D) over and above the revenue generated from operating sales.
3. Exports: The percentage of industrial output intended for export.
4. Suppliers in terms of their qualification in terms of quantity, their relative importance for the production of the industrial product and their importance in the company as a whole - reliability.
5. Environmental protection, in terms of the type and amount of funds allocated to environmental management and protection programmes due to the polluting waste produced by the company.

Considering this, Figure 2 shows a general cause-and-effect diagram for the production subsystem of the enterprise's strategic planning of foreign economic activity.

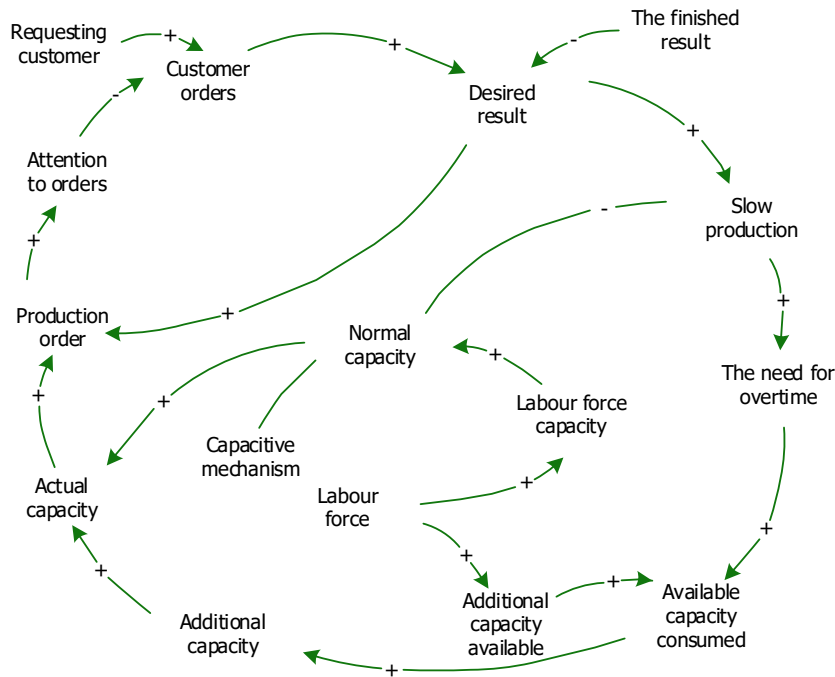


Figure 2. General causal diagram for the production subsystem of strategic planning of foreign economic activity.

Additionally, it can be suggested to analyse the main elements:

1. The production system used by the company:

- *type of production*: refers to the production system or their combination in terms of the type of process organisation (continuous, batch or project production);
- *production process*: refers to the main industrial transformation process that a company carries out to produce its products;
- *technical work measurement systems*: refer to the extent to which technical methods are used to control and improve the production system (methods and time to measure work).

2. Productive planning variables:

- *production planning*: refers to the methods used by the company to carry out production planning processes.
- *purchasing forecasting*: refers to the data used by a company to forecast raw materials, supplies, and consumables according to sales forecasts;
- *production planning and control*: refers to the quantitative methods used to plan and control production;
- *quality control*: refers to a subsystem of quality management based on statistical and operational control methods;
- *quality investment*: refers to the amount of money a company allocates to quality control, acquisition and maintenance of resources (human and technological).

3. Variables related to technological infrastructure. This group brings together various variables related to the design and production of a process approach (machines, tools, materials and equipment) that contribute to business productivity:

- *type of technology used in processes*: refers to whether it is manual, mechanical or automated, or a combination of these modalities;

- *technological feasibility*: this refers to a qualitative assessment of the machines, tools and equipment that the company owns in relation to existing technological advances that are offered on the market and that other companies in the same production sector (competitors) have and can give them an advantage. competitive in terms of quality and cost;
- *technological surveillance*: refers to the formal or informal activities of a company to obtain information from its environment related to new advanced technologies;
- *installed capacity utilisation*: is the ratio between the amount of output produced and the number of hours a machine is used;
- *installed capacity versus unit demand*: represents the percentage of demand for a company's products that can be met in relation to the company's installed capacity;
- *machine efficiency levels*: is the degree to which the actual production of the installed equipment meets its theoretical production capacity;
- *preventive maintenance of machines*: refers to the scope and programming allocated to the preventive maintenance plan;
- *effectiveness of the maintenance plan*: indicates the degree of compliance with the maintenance requirements in terms of the number of scheduled machine outages according to the maintenance plan.

4. Variables related to foreign trade:

- *procurement*: indicates the level of control that the company exercises over the procurement of raw materials needed for the production process;
- *distribution efforts*: refers to the control exercised over distribution channels to ensure efficient delivery levels;
- *average inventory*: refers to the level of raw materials, supplies and finished goods that a company holds in relation to purchases and sales;
- *inventory cost*: refers to the inventory costing system used by the company;
- *decision support information system*: This refers to the effectiveness of the numbers, data and facts (information) that a company uses to make decisions and control its productive operations.

5. Variables related to human resources:

- *training*: refers to the degree of experience (educational training + work experience) of employees in relation to the position held;
- *investment in training*: indicates the amount that a company invests in education and training programmes;
- *absenteeism*: indicates the level of absenteeism among the company's staff;
- *staff turnover*: refers to the rotation of staff within the company;
- *satisfaction*: refers to the level of employee affiliation with the company;
- *labour productivity*: refers to the level of efficiency of employees in connection with the optimisation of raw materials and resources of the production process.

Thus, the following indicators are proposed for the production subsystem that serves the company to find better results and thus achieve a competitive advantage over the competition. The list below is not intended to be exhaustive, and given that there are others in the study, and we also believe that it can be expanded with additional requirements, we tried to show some general indicators for all manufacturing sectors, rather than reducing them exclusively to the textile sector under study:

1. Percentage of non-conforming units: non-conforming units/total units produced;
2. Percentage of recycling: recycled units/total units produced;
3. Percentage of rework by non-conforming units: reworked units/non-conforming units;
4. Percentage of planned production: total number of units produced/total number of units planned.
5. Percentage of installed capacity utilisation: actual utilisation time/potential utilisation time.

At the point when a company decides to implement a scorecard and especially a production subsystem, the information should be sufficient and chronological so that comparisons and verification over time are possible.

Therefore, when proposing a management scorecard for the production subsystem of a foreign economic activity that models various aspects of the business, it is necessary to have a systematic approach, focusing on a number of conditions or characteristics that require consideration of the following requirements [4-6, 17]:

- ease of management, as it consists of a small number of benchmarks for each factor;
- clarity of its structure, consisting of specific and consistent indicators;
- it is used in the production subsystem;
- adaptive to changes in the environment and strategies.

Despite the above, the company should carry out a continuous feedback process that allows it to adjust, revise and modify the indicators in accordance with its strategic changes in foreign economic activity and the business environment to which it is subject.

Empirical results and conclusions. The empirical results obtained during the study, which allowed the development and implementation of the financial model of exports in the context of strategic planning of foreign economic activity of enterprises, ensure that the process is managed effectively, reaching the desired levels while maintaining a balance between various productive factors (resources) and productive improvement. Indicators of management of the production subsystem of foreign economic activity in this model reflect information corresponding to the production process in time. In analysing the results, the parameters defined in three possible scenarios (optimistic, probable and pessimistic conditions) are used. It is convenient to take into account how the model should behave before starting to study different simulations. Figure 3 shows the values assumed by the stock variable in the three scenarios (1, 2 and 3), and they tend to remain constant, indicating that the process is stable. The finished product maintains this trend with a delay as a result of the operations performed and the delivery of the product to the customer during the foreign trade.

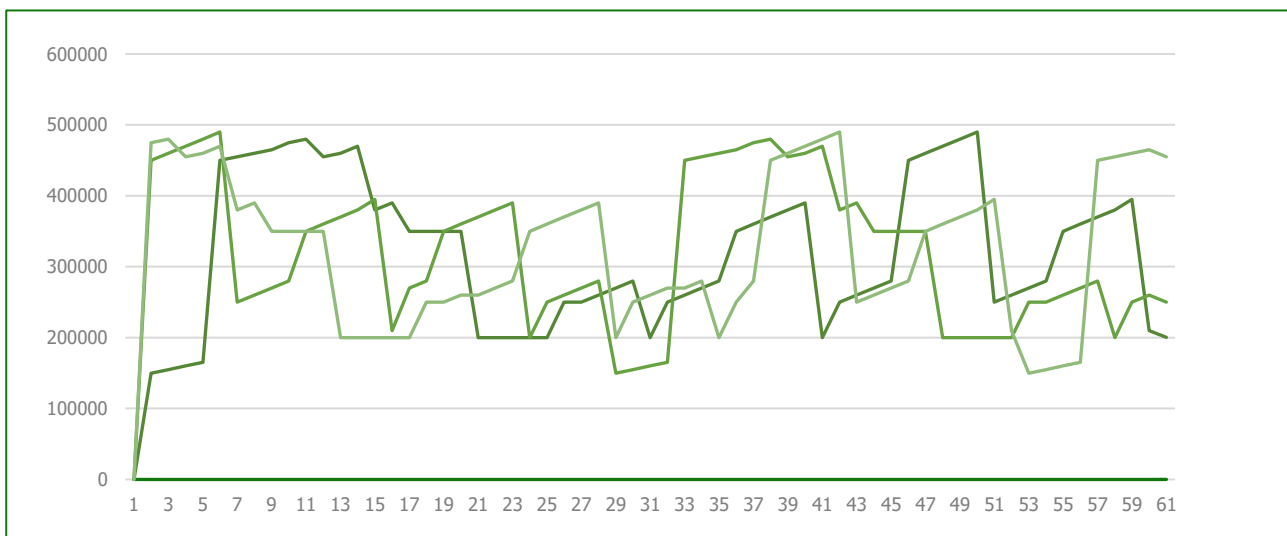


Figure 3. Values assumed by the stock variable in three scenarios (1, 2 and 3) of the FEA. (Source: built by the author)

At this stage of the methodology, a dynamic model of the FEA is constructed, which represents the provision of services as a sequence of projects, whereby the needs of each customer generate a project. This construction is based on a causal analysis of the structure, which is complemented by a comprehensive and dynamic characterisation of the FEA. To model the system operation, the Methodology for developing dynamic models of CPM and PERT networks [2] was adapted and modified, namely

Activity representation. To build a dynamic model, the FEA is represented by variable levels, which are defined as the percentage of activity performance and are based on the speed of execution and exit from the FEA, Formula 5.

$$NEA_k = NEA_j + (TEA_{jk} - TSA_{jk}) * \partial t \quad (5)$$

where: NEA_k : Level of performance of FEA A at time k ; TEA_{jk} : The rate of execution of FEA A from time j to time k ; TSA_{jk} : The speed of execution of FEA A from time j to time k ; ∂t : Time interval; j and k : Time points $k > j$

The speed of execution of foreign economic activity is determined as a percentage and depends on the technical standard of the activity, which is the standard duration of the activity, Formula 6.

$$TEA_k = 100/NTA \quad (6)$$

where: *FEA Technical Standard.*

The activities of the supplier company in FEA are performed as many times as customers request the service, for this reason, when an activity is fully completed, it must be available for repeated performance, therefore, activities must be associated with flows that represent the output rate of the activity, these flows depend on the priorities between the activities required to provide the service. To represent the impact of uncontrollable variables, the Forrester chart uses auxiliary variables that depend on a probability function. These auxiliary variables can stop, allow or change the amount of resources required to perform an activity by increasing or decreasing the Technical Standard for the activity (NTE). In these cases, the NTE ceases to be a constant and becomes a dependent variable on the uncontrollable variables. Possible applications of this model are:

- establishing an inventory control policy;
- setting targets for inventory levels and finished goods to reduce delivery times to customers;
- determine the level of utilisation of installed capacity and formulate optimisation strategies;
- develop FEA strategies aimed at improving the production planning system;
- determine policies on desired production levels and overtime workload;
- define a policy to reduce costs by reusing surplus products and improving methods of forecasting their consumption.

DISCUSSION

According to Garafonova O., Zhosan G., Khudolei V., Tiuktenko N., Tymkiv I. & Ryabets N., the adoption of the strategic planning model allows you to track the actions performed by the organization, while facilitating the process of evaluating and monitoring the activities performed by each of its members, using indicators that measure the contribution of their work to achieving the company's goals. As a result of this process, a comparison can be made between the results obtained and the desired results, which allows you to make the necessary feedback at each stage of planning to take appropriate remedial measures. Similarly, according to González L., Kalenatic D., López C., proper implementation of strategic planning allows an organization to develop business plans so that there is no sense of incomplete, hidden, inconsistent information or information that poses a risk to you in any way. Shuhalii A. believes that strategic planning also provides other tangible benefits, such as increasing awareness of external threats, better understanding of competitors' strategies, increasing employee productivity, reducing resistance to change and understanding the clearer relationship between performance and reward. In this sense, it encourages organizations to invest in people in such a way that the main task of entrepreneurs is to evaluate the qualities, knowledge and effectiveness of their employees in an analytical, strategic, objective and ethical way, in order to create an atmosphere of well-being, productivity, personal growth as a professional, which contributes to the preservation of human talents, as it promotes training, engagement of all participants, improving communication and motivation of employees. On the other hand, for Wheelen & Hunger, some of the administrative elements that can be used in implementing strategic planning are market research and product lifecycle studies that the company offers, as this allows the manager to make decisions with greater confidence about what products the company offers, product quality, reach, location, sales promotion, advertising, and pricing so that you can identify potential customers, new types of products being developed, and ways to ensure that the company's various products do not compete directly with each other. Similarly, it allows you to identify the distinctive competencies or skills of the company, i.e. the specific opportunities and resources that the company has and how best to use them, as well as opportunities that are not used due to the lack of adequate resources. The strategic plan of foreign economic activity will be formulated, it will be possible to develop more effective programs in order to achieve the basic strategy, increase business competitiveness, increase flexibility in the organization's response to unforeseen changes, and develop creativity in solving problems, anticipating future events, and eliminating intuition when making decisions to cover the entire company's activities, benefit it as a whole, and not just by achieving the goals of a particular department.

Taking into account the number of tools that the methodology of strategic planning of foreign economic activity integrates and the variety of interactions between them, its mass implementation in the business environment requires the use of supporting software, so the development of a computer tool based on this proposal is planned as a necessary stage for its dissemination and application in strategic planning of foreign economic activity at the enterprise. The validation proved

that the use of the methodology of strategic foreign trade planning allows to compensate for investments in new resources by increasing the number of transactions by eliminating delays and attracting new customers as a result of improving the customer's perception of the quality of service. During the audit, it was determined that the delays created in the activities of support systems increase their negative impact on the process, consuming the weakness of many central system actions and delaying their implementation, negatively affecting the FEA.

CONCLUSIONS

Representing the operation of service companies as a sequence of projects that share resources over time, in interaction with the different conceptual tools used, facilitates the identification and measurement of repetitive delays caused by resource allocation and allows them to be easily distinguished from those caused by uncontrollable events of a sporadic nature. Expansion of the methodology for developing dynamic models of CPM and PERT networks allowed to change the FEA, moving from the PSP-type environment to the RCPSP-type sequential application environment as a representation of the service delivery process. The developed model of FEA empirically allowed us to draw the following conclusions:

- the system facilitates the setting of indicators necessary for decision-making in a simple way;
- the FEA model is adaptable and integrates with the company's information systems and its system;
- the dynamic modelling tool allows calculating indicators in a parameterised way, ensuring flexibility and accuracy of the results;
- the data obtained as a result of the calculation of indicators can be expressed graphically;
- the model allows to reduce the number of possible permutations and variations, thus facilitating a reasonable reflection of the real situation of foreign trade;
- it allows to classify and organise information about the company in such a way as to facilitate its work and calculations.

The validation proved that the combination of FEA management, system dynamics and project management generates a useful methodology for conducting a comprehensive analysis of the service provider's performance and making strategic, tactical and operational decisions that allow for FEA improvement.

Taking into account the number of tools integrated by the methodology of strategic planning of foreign economic activity and the variety of interactions between them, its massive implementation in the business environment requires the use of auxiliary software, so the development of a computer tool based on this proposal is planned as a necessary stage for its dissemination and application in strategic planning of foreign economic activity in the enterprise.

The presented modelling thus generates important signals for decision-makers and entrepreneurs to develop plans, projects and strategies for foreign trade aimed at creating value derived from effective management and their combination with financial leverage. The contribution of the proposals is to present and empirically validate a tool that combines judgment with historical information. The results show low efficiency of FEA. Thus, the background of the paper presents two scenarios as a common cause: survival and competition. Therefore, there is a need to reconsider and look for FEA strategies that provide more associativity, emphasising the need to stay and compete through economic blocs that allow them to strengthen their positions in markets with larger structures.

In this order of ideas, the modelling contributes to the work on developing FEA strategies that aim to reconvert the sector, turning on the alert where elements such as the price situation resulting from recent currency fluctuations allow for the adoption of using surpluses for transformation and technological upgrading. At this point, the government could create concessional credit lines for technological upgrades to improve the efficiency of the sector.

ADDITIONAL INFORMATION

AUTHOR CONTRIBUTIONS

All authors have contributed equally.

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CONFLICT OF INTEREST

The Authors declare that there is no conflict of interest.

REFERENCES

1. Garafonova, O., Zhosan, G., Khudolei, V., Tiuktenko, N., Tymkiv, I., & Ryabets, N. (2023). Strategic model and potential sources of funding for the post-war revitalisation of agricultural enterprises in the de-occupied territories. *Financial and Credit Activity Problems of Theory and Practice*, 2(49), 207–218. <https://doi.org/10.55643/fcaptop.2.49.2023.3983>
2. Garafonova, O., & Kozlovsky D. (2023). The agrarian crisis in ukraine in wartime: status, trends and prospects for change. *Economic Synergy*, 1, 112–123. <https://doi.org/10.53920/ES-2023-1-9>
3. Garafonova, O., & Kurmaiev, P. (2021). Features of Formation of the Change Management Mechanism as a Basis for Strategic Development of Business Organisations. *Naukovyi visnyk Polissia*, 3(15), 7–11. [https://doi.org/10.25140/2410-9576-2018-3\(15\)-7-11](https://doi.org/10.25140/2410-9576-2018-3(15)-7-11)
4. Bezzub, I. (2022). Current state and prospects of Ukrainian European integration. http://nbuviap.gov.ua/index.php?option=com_content&view=article&id=1209:suchasnij-stan-i-perspektivi-ukrajinskoji-evrointegratsiji&catid=8&Itemid=350
5. González, L., Kalenatic, D., & López, C. (2006). Methodology for developing dynamic models of CPM and PERT networks. Work document. Bogotá DC, 1-17.
6. Álvarez, Y. (2007, November 7-10). Dynamic Service Quality Management. *Materiales V Latinoamericano del congreso de la dinámica de sistemas ITBA*. Buenos Aires, Argentina, 1-5.
7. Ford, D., & Serman, J. (1998). Dynamic modelling of product development processes. Massachusetts Institute of Technology (MIT). Cambridge, Massachusetts, 31-68. <https://onlinelibrary.wiley.com/doi/pdf/10.1002/%28SICI%291099-1727%281998%2914%3A1%3A%3AAID-SDR141%3E3.0.CO%3B2-5>
8. Jianguo, J., Xia, F., & Yu, L. (2007). Modelling system dynamics for a software project overtime management strategy. *Systemna dynamika*. Konferentsia. Boston (Massachusetts), 1-8. <https://proceedings.systemdynamics.org/2007/proceed/papers/JIA341.pdf>
9. Williams, T., Eden, C., Ackermann, F., & Tait, A. (1995). The impact of design changes and delays on project costs. *Tovarystva operatyvnykh doslidzhen*, 46, 809-818. <https://doi.org/10.1057/jors.1995.114>
10. Gronroos, C. (1990). *Service Management and Marketing: Managing the Moments of Truth in Service Competition*. Lexington Books, Lexington, 1-298.
11. Kotler, P., & Bloom, P. (1976). *Strategies for market participation*. Harvard Business Administration Library. Expansión Publishing Group. Mexico, 237-238.
12. Stanton, W., Etzel, M., & Walker, B. (2004). *Fundamentals of Marketing* (13th ed) McGraw Hill (Ed). Mexico, 1-741.
13. Eiglier, P., & Langard, É. (1989). *Service. Marketing of services*. Makhrou Khill (Ed.) Madrid, 1-220.
14. Heskett, J., & Sasser, E. (1993). In Díaz Santos (Ed.), *Creative change in services*. Madrid, 1-336.
15. Sotres, A. (2006). *Logistics model based on information technology*. México, R. <http://esp.mexico.org/lapalabra/una/24861/modelo-de-logistica-basado-en-las-tecnologias-de-la-informacion>
16. Muntaner, E. (2005). *Mathematical models*. National University of Technology. Regional Faculty (Ed.), Buenos Aires (Argentina), 5-28.
17. Godet, M. (2002). *A set of tools for strategic forecasting*. Cuadernos de Laboratoire d'Investigation Prospective et Stratégique (LIPS). Madrid, 1-114.
18. Shuhali, A. (2023). STRATEGIC GOALS OF THE STATE REGULATION OF FOREIGN ECONOMIC ACTIVITY OF INDUSTRIAL ENTERPRISES OF UKRAINE IN THE CONTEXT OF THE EUROPEAN VECTOR OF DEVELOPMENT. *Green, Blue and Digital Economy Journal*, 4(2), 48-61. <https://doi.org/10.30525/2661-5169/2023-2-6>
19. Talipova, N., Makhmutkhodjaeva, L., & Khazratkulova, L. (2022, December 15). EVOLUTION OF INNOVATIVE DEVELOPMENT OF FOREIGN ECONOMIC ACTIVITY OF THE REPUBLIC OF UZBEKISTAN. In *The 6th International Conference on Future Networks & Distributed Systems (ICFNDs '22)*, Tashkent, TAS, Uzbekistan. ACM, New York, NY, USA. <https://dl.acm.org/doi/pdf/10.1145/3584202.3584211>
20. Shtal, T., Poliakova, Y., Hasanov E., Ukubassova G., & Kozhabaeva, S. (2018). Formalization of the Enterprise International Economic Activity Efficiency Management. *Utopia Y Praxis Latinoamericana*, 23(82), 64–82. <https://www.redalyc.org/journal/279/27957591004/27957591004.pdf>
21. Druchek, K. S., & Shvedun, V. O. (2017). Otsinka ryzkyv zovnishnio-ekonomichnoi diialnosti promyslovoho pidpriemstva u derzhavnomu upravlinni. *Visnyk Natsionalnoho universytetu tsyvilnoho zakhystu Ukrainy*. Seria: Derzhavne upravlinnia, 2, 106-115. http://irbis-nbuv.gov.ua/cgi-bin/irbis_nbuv/cgiirbis_64.exe?C21COM=2&I21DBN=UJRN&P21DBN=UJRN&IMAGE_FILE_DOWNLOAD=1&image_file_name=PDF/VNUCZUDU_2017_2_18.pdf

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РОЗРОБКА ТА ІМПЛЕМЕНТАЦІЯ ФІНАНСОВОЇ МОДЕЛІ ЕКСПОРТУ В КОНТЕКСТІ СТРАТЕГІЧНОГО ПЛАНУВАННЯ ЗОВНІШНЬОЕКОНОМІЧНОЇ ДІЯЛЬНОСТІ ПІДПРИЄМСТВ

У дослідженні здійснено розробку та імплементацію фінансової моделі експорту в контексті стратегічного планування зовнішньоекономічної діяльності підприємств. За допомогою описаної в статті моделі можна виміряти, проаналізувати, оцінити та запропонувати вдосконалення адміністративних процесів, ідентифікуючи різні змінні, задіяні в стратегічному плануванні ЗЕД. Ця робота є дослідженням, яке розробляється для експортної діяльності в Україні. Для апробації методики та для побудови адитивної моделі було проаналізовано експорт в Україні.

Модель емпірично показує зв'язки, які існують між внутрішніми функціями компанії та її здатністю створювати показники управління виробництвом і динамікою бізнесу як шлях до вдосконалення процесів у стратегічному плануванні ЗЕД. Показано деякі відповідні висновки, отримані на перших двох етапах емпіричного дослідження, проведеного на сьогодні. Валідація довела, що використання методики стратегічного планування ЗЕД дозволяє компенсувати вкладення в нові ресурси за рахунок збільшення кількості проведених операцій через усунення затримок і залучення нових клієнтів як наслідок покращення уявлення клієнта про якість послуги. Під час перевірки можна було визначити, що затримки, які виникли в діяльності систем підтримки, посилюють свій негативний вплив на процес, споживаючи слабину багатьох дій центральної системи та затримуючи їх виконання, негативно впливаючи на ЗЕД. Модель буде корисною для підприємств, що займаються ЗЕД.

Ключові слова: моделювання, імплементація, фінансова модель, адитивна модель, стратегічне планування, зовнішньоекономічна діяльність підприємства

JEL Класифікація: D210, L190