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PRODUCTION COST FORECASTING FOR A GIVEN VOLUME OF OUTPUT IN ORGANIZATIONS: CASE STUDY BASED ON REGRESSION MODEL

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ABSTRACT

Purpose: The objective of this study is the analysis and forecasting of Enterprise Production Cost for a given volume of output on the basis of historical data.

Theoretical framework: The theoretical framework of the study includes studies conducted by various researchers and professional regulatory bodies (ACCA) related to the the Production Cost forecasting in organizations.

Design/methodology/approach: The authors use trend analysis to determine a regression equation for the organisaton under investigation. Having the planned volume of production , it gives the opportunity to calculate the projected amount of production costs. The financial and managerial accounting reports (from 2015 to 2022) provided by "Effect Group" CJCS were used to study the topic.

Findings: Using the revealed dependences and the trend equation, the forecasting of Production Cost of the organization under investigation is obtained for the next two reporting periods.

Research, Practical & Social implications: The main findings of the article can be useful in the practical management of businesses, for financial analysis and forecasting. In addition, the results of this research can be used in scientific and teaching activities in covering the issues of financial management and analysis.

Originality/value: The value of the study is the contribution it makes to the literature on the cost analysis issues. Therefore, the article can be of benefit to the scientific community with an interest in the study of the subject.

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PREVISÃO DE CUSTO DE PRODUÇÃO PARA UM DETERMINADO VOLUME DE PRODUÇÃO NAS ORGANIZAÇÕES: ESTUDO DE CASO BASEADO EM MODELO DE REGRESSÃO

RESUMO

Objetivo: O objetivo deste estudo é a análise e previsão do Custo de Produção Empresarial para um determinado volume de produção com base em dados históricos.

Referencial teórico: O enquadramento teórico do estudo inclui estudos realizados por diversos investigadores e entidades reguladoras profissionais (ACCA) relacionados com a previsão dos Custos de Produção nas organizações.

Desenho/Metodologia/Abordagem: Os autores utilizam análise de tendências para determinar uma equação de regressão para a organização sob investigação. Tendo o volume de produção planejado, dá a oportunidade de calcular o valor projetado dos custos de produção. Os relatórios financeiros e de contabilidade gerencial (de 2015 a 2022) fornecidos pelo "Effect Group" CJCS foram utilizados para estudar o tema.

Resultados: Utilizando as dependências reveladas e a equação de tendência, obtém-se a previsão do Custo de Produção da organização sob investigação para os próximos dois períodos de relatório.

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Implicações de pesquisa, Práticas e Sociais: As principais conclusões do artigo podem ser úteis na gestão prática de negócios, para análise e previsão financeira. Além disso, os resultados desta pesquisa poderão ser utilizados em atividades científicas e docentes na cobertura das questões de gestão e análise financeira.
Originalidade/Valor: O valor do estudo é a contribuição que ele dá à literatura sobre questões de análise de custos. Portanto, o artigo pode beneficiar a comunidade científica interessada no estudo do tema.

Palavras-chave: Previsão de Custos, Análise Gerencial, Equação de Regressão, Análise de Tendências, Custos de Produção, Despesas.

PRONÓSTICO DE COSTOS DE PRODUCCIÓN PARA UN VOLUMEN DETERMINADO DE PRODUCCIÓN EN LAS ORGANIZACIONES: ESTUDIO DE CASO BASADO EN UN MODELO DE REGRESIÓN

RESUMEN
Propósito: El objetivo de este estudio es el análisis y pronóstico del costo de producción empresarial para un volumen de producción determinado sobre la base de datos históricos.
Marco teórico: El marco teórico del estudio incluye estudios realizados por diversos investigadores y organismos reguladores profesionales (ACCA) relacionados con la previsión de costos de producción en las organizaciones.
Diseño/Metodología/Enfoque: Los autores utilizan análisis de tendencias para determinar una ecuación de regresión para la organización bajo investigación. Tener el volumen de producción planificado permite calcular el monto proyectado de los costos de producción. Para estudiar el tema se utilizaron los informes contables financieros y gerenciales (de 2015 a 2022) proporcionados por “Effect Group” CJCS.
Hallazgos: Utilizando las dependencias reveladas y la ecuación de tendencia, se obtiene la previsión del costo de producción de la organización bajo investigación para los próximos dos períodos de informe.
Implicaciones de investigación, Prácticas y Sociales: los principales hallazgos del artículo pueden ser útiles en la gestión práctica de empresas, para análisis y previsiones financieras. Además, los resultados de esta investigación se pueden utilizar en actividades científicas y docentes para cubrir los temas de gestión y análisis financiero.
Originalidad/Valor: El valor del estudio es la contribución que hace a la literatura sobre las cuestiones del análisis de costos. Por lo tanto, el artículo puede ser de beneficio para la comunidad científica interesada en el estudio del tema.

Palabras clave: Previsión de Costos, Análisis de Gestión, Ecuación de Regresión, Análisis de Tendencia, Costos, Gastos de Producción.

INTRODUCTION

In the modern world, cost classification, estimation and forecasting issues are remaining up to date. Cost information is used to make budgets, to assess the implementation of the plans, to determine the profitability of the production. At the same time that is necessary for the managers of the economic entity to make sound managerial and financial decisions. This information is the basis of the entire management accounting system for enterprise, regardless of the goals of the organization, its technology features and manufactured products.

Production cost, has the largest share in the costs of the organisation and plays an important role in the formation of the final results of the organization's activity, as a result of which there is a need to pay special attention not only to the ways of cost formation, but also to the development of special analytical methods and the implementation of analysis based on them.

Adequate cost forecasting enables to quickly respond to changes in market conditions and internal production factors, which, in turn, significantly increases the efficiency of the activities of organizations and the entire economy.

The problem of selecting cost estimation and forecasting method for all types of organizations are relevant. However, different disciplines and authors give different names to the same cost components (Sorrels et al., 2017) and much attention in the economic literature has been given to questions of the correctness of the production cost calculation, and in particular, the distribution of indirect costs. In parallel, forecasting has always been at the forefront of decision making and planning. (Petropoulos, F. et. al 2022) and in the professional literature different cost forecasting approaches and methods are proposed, various methods of forecasting estimation are used.

The objective of our research is to study the Production Cost forecasting literary approaches and show a case study of cost analysis and forecasting based on linear regression model for the organization under investigation. In order to achieve the goal, the following tasks were set:

- to study changes in the composition and structure of Production Costs,
- to analyse the composition and structure of Production Cost by Operating Segments,
- to conduct trend analysis and develop linear regression equation of cost forecasting for a given volumes of output.

THEORETHICAL FRAMEWORK

An extensive review of the professional literature was done and the following research was found to be touching upon the study.

Mauler and Duffner (Mauler. L et. al, 2021, Duffner et. al, 2021) classify four superordinate forecasting methods in order to derive cost or price estimates: technological learning, literature-based projection, expert elicitation and bottom-up modeling. These methods are briefly described in the following.

Technological learning, in literature also referred to as learning curve or experience curve analysis, assumes a fundamental relationship between technology cost and one or more learning parameters. (Argote L., 1990) This method has been introduced in the past century and since then, has been applied in strategic industries. In order to derive cost projections, first, the historical correlation between cost and the learning parameter is examined and learning rates

are calculated. Second, this learning rate is combined with future expectations for the learning parameter and future cost estimates can be obtained. (Mauler. L, 2021)

In literature-based projections, forecasts are derived by the aggregation of previously published predictions. These meta-forecasts are based on the idea that forecast accuracy can be increased by combining individual projections.(Atiya, 2020, Timmermman, 2006) This method has been used to derive economic trends in general and to obtain cost and price forecasts in particular.(Clemen, 1989) Consulted sources include academic publications as well as industry and analyst reports that are combined by an aggregation technique such as the determination of time-specific means or forecast ranges.

In expert elicitations, future-oriented cost estimates are derived by a structured interview process between authors and experts. This approach has been used widely specifically for cost forecasting. Questions during the interview process can be asked on different technology levels such as product-, component- or process level and can reflect distinct external scenarios such as regulatory support or R&D funding levels. (Bosetti V.et al, 2012).

Bottom-up modeling describes an approach to translate technical parameters underlying the product and production process into technology cost.(Hueber C. et.al, 2016)

In order to derive cost projections, the product is first separated into its individual components (Few S. et.al, 2021, Duffner F. et.al, 2021), required resources and processes are assigned, and cumulative cost are calculated. Regarding cost forecasting, estimates can be obtained by simulating parameter sets that reflect technological advances. According to several studies (see, Hueber C. et.al, 2016) these parameter sets can either be defined by the authors or by external sources such as academic literature, industry reports or experts.

Schwabe, Shehab and Erkoyuncu (Schwabe et.al, 2016, a) present an approach for determining the most appropriate technique for cost estimation of innovative high value manufacturing products depending on the amount of prior data available. The data attribute focused on is the computational complexity involved in identifying whether or not there are patterns suited for propagation. The paper proposes that below this threshold a generic dependency model and starting conditions should be used and iteratively adapted to the context. In the special case of having less than four datasets available it is suggested that no contemporary cost estimating techniques other than analogy or expert opinion are currently applicable and alternate techniques must be explored if more quantitative results are desired. By applying the mathematical principles of complexity groups the paper argues that when less than four consecutive datasets are available the principles of topological data analysis should

be applied. The preconditions being that the cost variance of at least three cost variance types for one to three time discrete continuous intervals is available so that it can be quantified based upon its geometrical attributes, visualised as an n-dimensional point cloud and then evaluated based upon the symmetrical properties of the evolving shape. Further work is suggested to validate the provided decision-trees in cost estimation practice. (Schwabe et.al, 2016, b)

The process for selecting the most appropriate estimation technique is based on the following factors: x n = the number of historical time intervals with a common complexity group for which data is available x d = the number of consistent cost variance dimensions n is available for x CERs means "Cost Estimating Relationships" x ∫ means the integral version of the dependency model describing the entirety of CERs. The approach begins with the cost estimator gathering all prior cost variance information available for historical discrete time intervals, i.e. the cost variance propagation in the time periods before the time of the estimate and determining its complexity group.

According to Schmidt J (Schmidt J. et al, 2020) there are four main types of forecasting methods that financial analysts use to predict future revenues, expenses, and capital costs for a business. While there are a wide range of frequently used quantitative budget forecasting tools, in the article he focuses on four main methods: (1) straight-line, (2) moving average, (3) simple linear regression and (4) multiple linear regression.

From a management accounting perspective, it is important to discuss the cost forecast for a given volume of output. Some data are not applicable to traditional cost analysis, which dictates the implementation of alternative analysis. They are

1. High-Low method,
2. Scattergraph,
3. Regression analysis (Smith A. and Mason A.,1997, CFI Team 2022)

Several studies (see, Ward, T and Burg, B, 2003) compare the high-low method and the method of using a regression analysis by using a bootstrapping technique. Bootstrapping facilitates the simulated generation of entire distributions from a sample and allows statistical comparisons to be made between the distributions. The results of this study indicate that the high-low method, while easy to use, may be giving results that are significantly different from results obtained from regression. In their mind, because students now have the ability to do regression easily and inexpensively using a spreadsheet, and because of the theoretical shortcomings of the high-low method, it may be that educators should discontinue using and teaching the high-low method altogether (Ward, T., Burg, B, 2003).

According to Gritcyuk (Gritcyuk, K., 2017) forecasting of the cost price and other economic indices of the enterprise activity is a scientific analysis of tendencies in the activity of the enterprise and the most accurate and developed method of forecasting is regression analysis.

We consider regression analysis to be one of the most accurate and developed methods of forecasting. In contrast to the High Low Method, Regression analysis refers to a technique for estimating the relationship between variables. It helps understand how the value of a dependent variable changes when one independent variable is variable while another is held constant. Regression analysis is used in forecasting future data.

The analysis of professional literature has allowed us to develop the further logical order of this research.

METHODOLOGY

The research process consisted of a number of stages, through which the obtained results were formed and a number of conclusions were made. We started it by choosing the topic and justifying its relevance, indicated the purpose of the research, which was followed by the choice of the research implementation methodology. Taking into account the stated purpose and direction of the article, the method of comparative studies was used, as well as the methods of general scientific research methodology: analysis, generalizations and qualitative conclusions.

The theoretical and methodological basis of the research were the theoretical, analytical and practical works of domestic and foreign specialists, the methodological principles of the studied field, the approaches used by International Accounting Standards(IFRS) Board and in international practice, as well as RA laws, legislative and departmental normative acts, international accounting standards, regulations connected to the cost accounting, analysis and forecasting, etc. We then collected academic and reporting literature related to the topic. The financial and managerial accounting reports provided by the organization were used to study the topic.

The analytical process of costs we have started with the study of their composition and structure. For this purpose, first of all, it is necessary to consider the composition of costs. All expenses incurred by the organization under investigation (Effect GroupCJCS) are grouped in the following directions (Kenton W., 2023).

1. Operating Expenses
2. Non-operating Expenses

3. Profit Tax

Operating expenses include Cost of Sale, Selling, General and Administrative Expenses, Other Expesnses(based on the published financial statements of the organization).

Than, we continued the analytical works by applying the linear regression method that studies the relationship between continuous variables. The variables are plotted on a straight line. Assuming that costs change linearly, therefore, the relationship between costs and output will be presented as follows (ACCA team, 2023):

(1) $y=a+bx$

(2) $a=y-bx=\frac{\sum y}{n}-\frac{b\sum x}{n}$

(3) $b=\frac{n\sum xy-\sum x\sum y}{n\sum x^2-(\sum x^2)}$

where` y- Total Cost,

a- Fixed Cost,

b- Variable Cost per unit of activity,

x - Number of units of activity

Assumptions of Linear Regression are as followes (Dunn, P, 2023):

- The relationship between dependent variable Y and independent variable X is linear in the slope and intercept ‘a’ and ‘b,’ respectively.
- Independent variable X is not random.
- The value of the error term ∈ is 0 and is constant for all observations.

The above equation gives the possibility to predict the magnitude of Y (in this case production costs) at X level of production.

RESULTS AND DISCUSSION

Production Cost Composition and Structure analysis in Effect group CJCS (2015-2021)

Before addressing the composition and structure changes of production costs, we have generally analysed the composition and structure of the organization's expenses. Table 1 shows, that during 2015-2021, the greatest increase in expenses occurred in 2018, which was mainly due to the increase in financial expenses. If during the previous 2 years the expenses from ongoing activities were 14-18% of the total expenses of the organization, then in 2018 it was 33%. This happened due to the 48% increase in non-current loans and borrowings and 41% increase in Trade and other Payables. This circumstance is caused by the decrease in sales volumes, while the volume of production increased by 19.75% compared to the previous year.

The increase in finished product balances in warehouses has in turn led to an increase in storage costs. In 2017, the sales volume increased more than three times while the production costs decreased by 1.52% compared to the previous year. Selling costs have been decreasing at a steady rate since 2015, reaching up to 9% in 2016, and administrative costs are also continuously decreasing year on year. Other Expenses have registered an increasing trend since 2016, in particular, since 2017, the share of other expenses has started to increase from 1.01% to 2% of total expenses - 93,563 thousand drams, and in 2018 it became 6 %: 366,224 thousand drams. In 2021, the same indicator reached 22%, 806,081 thousand drams. In 2018, the main reason for the increase was the cost of impairment, shortfall and penalties.

In 2019, the increase in other expenses was due to the increase in expenses related to the write-off of bad debts, expenses from penalties, fines and losses from disposal of fixed assets. Selling costs have hardly changed during 2015-2021. Since 2019, the share of selling costs in total costs has decreased.

The main components of the Selling Expenses include Salary and Social Contributions, Transport Costs and Fuel Costs. Administrative Costs have started to decrease since 2018, decreasing by 1 percentage point every subsequent year. Among the Administrative Costs, the main share belongs to the Salary and social contributions, as well as the costs of repairs and maintenance of the Fixed Assets. In 2021, Administrative Costs increased by almost 7%, compared to a 1% decrease in the previous year.

A clear implementation of cost analysis is related to the classification of the latter, which is done by several features.

Table 1 The composition and structure of Expenses in Effect Group CJCS (2015 -2021)

Expense items	2015		2016		2017		2018		2019		2020		2021	
	AMD	%	AMD	%	AMD	%	AMD	%	AMD	%	AMD	%	AMD	%
Operating Expenses, including	3,332,861	82	3,566,576	82	3,665,563	86	3,773,397	67	3,528,584	77	3,509,411	98	2,607,150	90
Cost of Sales	2,476,304	61	2,658,244	61	2,675,806	63	2,340,768	41	2,371,195	52	2,251,847	63	1,963,781	68
Selling Expenses	604,277	15	653,991	15	660,821	16	829,683	15	660,987	14	334,019	9	307,181	11
Administrative Expenses	212,482	5	203,094	5	235,373	6	236,722	4	199,343	4	117,464	3	284,901	10
Other Expenses	39,798	1	51,247	1	93,563	2	366,224	6	297,059	7	806,081	22	51,287	2
Expenses of other Continuing activities	735,297	18	757,951	18	593,905	14	1,893,386	33	1,040,655	23	115,184	3	294,750	10
Financial Expenses	449,134	11	427,346	10	474,452	11	825,146	15	938,988	21	78,104	2	269,039	9
Other financial items	179,273	4	169,570	4	75,025	2	1,017,419	18	70,779	2	25,154	1	12,703	0
Profit Tax	106,890	3	161,035	4	44,428	1	50,821	1	30,888	1	11,926	0	13,008	0
Total	4,068,158	100	4,324,527	100	4,259,468	100	5,666,783	100	4,569,239	100	3,587,515	100	2,901,900	100

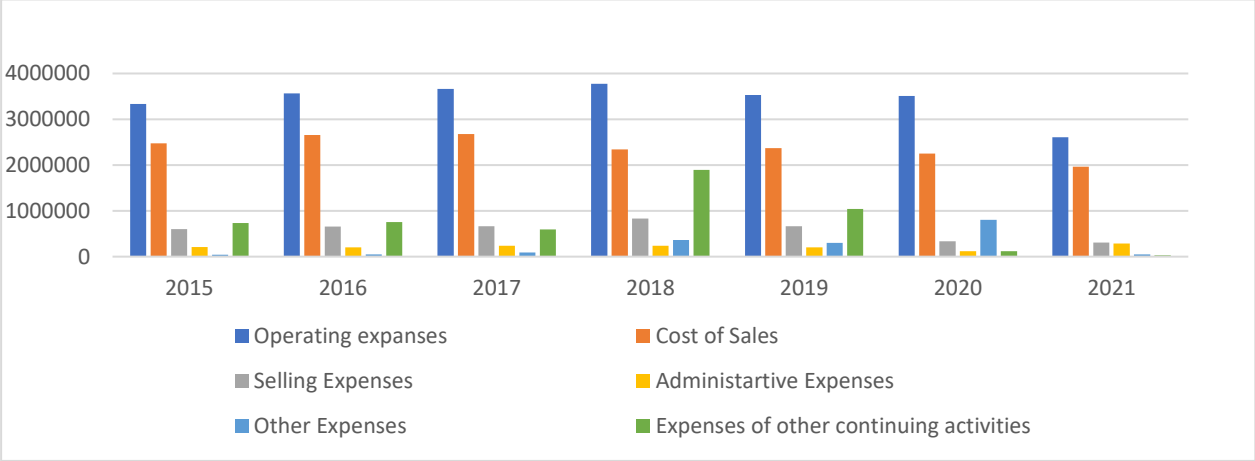
Source: Prepared using the information received from the management of "Effect Group" CJCS(2022)

Table 2 Changes in Expenses (2015 -2021)

Expense items	2016 compared to 2015		2017 compared to 2016		2018 compared to 2017		2019 compared to 2018		2020 compared to 2019		2021 compared to 2020	
	AMD	%	AMD	%	AMD	%	AMD	%	AMD	%	AMD	%
Operating Expenses, including	233,715	0.55	98,987	3.58	107,834	-19.47	-244,813	10.64	-19,173	20.60	-902261.0	-7.98
Cost of Sales	181,940	0.60	17,562	1.35	-335,038	-21.51	30,427	10.59	-119,348	10.87	-288066.0	4.90
Selling Expenses	49,714	0.27	6,830	0.39	168,862	-0.87	-168,696	-0.18	-326,968	-5.16	-26838.0	1.27
Administrative Expenses	-9,388	-0.53	32,279	0.83	1,349	-1.35	-37,379	0.19	-81,879	-1.09	167437.0	6.54
Other Expenses	11,449	0.21	42,316	1.01	272,661	4.27	-69,165	0.04	509,022	15.97	-754794.0	-20.7
Expenses of other Continuing activities	22,654	-0.55	-164,046	-3.58	1,299,481	19.47	-852,731	-0.64	-925,471	-19.56	179566.0	6.95
Financial Expenses	-21,788	-1.16	47,106	1.26	350,694	3.42	113,842	5.99	-860,884	-18.37	190935.0	7.09
Other financial items	-9,703	-0.49	-94,545	-2.16	942,394	16.19	-946,640	-6.41	-45,625	-0.85	-12451.0	-0.26
Profit Tax	54,145	1.10	-116,607	-2.68	6,393	-0.15	-19,933	-0.22	-18,962	-0.34	1082.0	0.12
Total	256,369	0.00	-65,059	0.00	1,407,315	0.00	-1,097,544	0.00	-981,724	0.00	-685615.0	0.00

Source: Prepared using the information received from the management of "Effect Group" CJCS (2022)

Figure 1 Dynamics of changes in the composition and structure of Expenses of "Effect Group" CJSC (2015-2021)



Source: *Prepared using the information received from the management of "Effect Group" (2022)*

Table 2 shows the changes in the composition and structure of production costs of "Effect Group" CJSC for 2015-2021. Studying the composition and structure of expenses of "Effect Group" CJSC for the mentioned period, can be concluded that there was an absolute increase in production costs in 2016, 2017 and in 2019 with 181,940, 17,562 and 30,427 thousand AMD, respectively. In 2016, this happened at the expense of the increase in other production costs, despite the fact that Material, Labor and Depreciation costs decreased compared to the previous year. Cost of goods manufactured in 2016 resulted in an overall 7.34% increase in costs compared to the previous year, but bring only a 2.6% increase in sales revenue, resulting in a 4.4% decline in gross profit. In 2019, the growth of production costs compared to the previous year was almost 1.3%. A 15% and 14% decrease in material and other manufacturing costs, respectively, was offset by an almost identical percentage point increase in labor and depreciation expenses. Revenue growth in 2019 was negligible at 0.18%, which in turn led to a 1.65% decline in gross profit. In 2017, compared to the previous year, Material, Labor, and Depreciation costs decreased, while other production costs increased, as a result, providing only a 0.66% increase in costs. Contrary to this, the Revenue from the sale recorded an increase of 3.73%, which led to an increase of the Gross Profit of 8.88%. The increase in sales revenue is explained by the flexible discount policy applied by the organization, as well as the ability to strengthen its position as a leader in the market. 2020 and in 2021 there was a continuous decrease in expenses in terms of all types of expenses. A total cost reduction of 12%, which in turn led to a 25.9% drop in sales revenue and a sharp drop in gross profit to 55.8%.

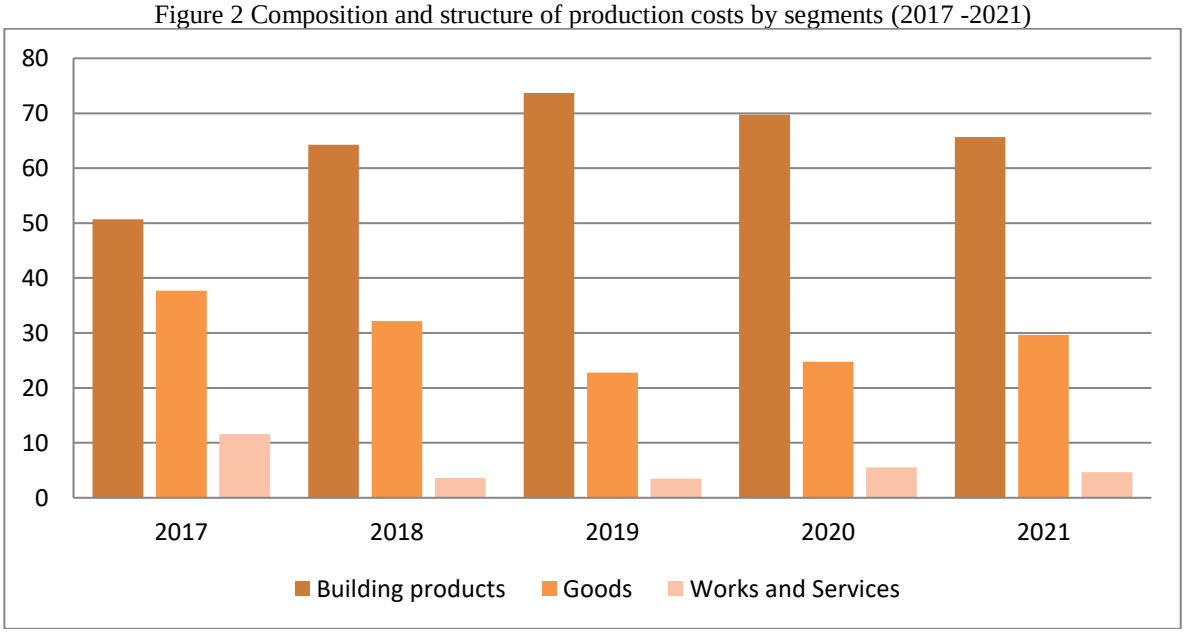
Composition and Analysis of Production Cost by Operating Segments

In "Effect Group CJSC", the majority of production costs are allocated to 6 types of products with their subtypes: dry mortars, water-based paints, fillers, alkyd enamel, standard blocks, mining products.

The company now has three branches as operating segments: "Building Products", "Goods" and "Works and Services". The activities of the "Building Products" segment include the Company's production of construction materials. The "Goods" segment includes imported textile products and products that the Company acquires for the purpose of carrying out construction work. The "Works and Services" segment includes construction contracts and the provision of handling, storage and transhipment services. These operating segments are monitored and strategic decisions are made based on the results of adjusted segment operations.

The composition and structure of the company's production costs by segments is presented in Figure 2

Figure 2 Composition and structure of production costs by segments (2017 -2021)



Source: Prepared using the information received from the management of “Effect Group” (2022)

In the structure of segments, since 2017, the share of "Construction Pproducts" has been expanding from 50% to 74% in the total structure of production costs in 2019. This growth occurs at the expense of a decrease in the relative weight of "Goods", "Works and services". The decrease takes place both in relative terms and in absolute terms.

This decrease is due to the changes of production volumes, which is particularly related to the decrease in the organization`s activity in 2020, which can be generally attributed to the

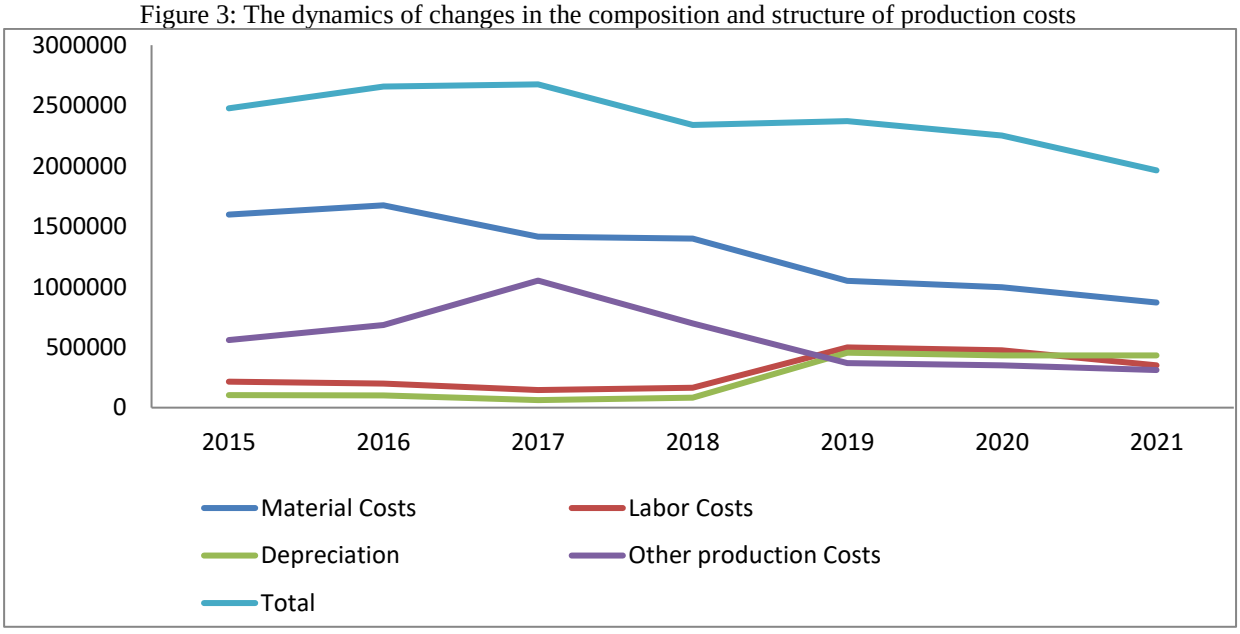
effects of COVID-19 and the 44-day war (unleashed by the Republic of Azerbaijan) situation prevailing in Armenia that year.

Most of the operating costs are the cost of the manufactured products. The latter is the sum of the costs incurred for the production of the product, in monetary value. It is value of resources used for specific purposes. This indicator is used for determining product sales prices, calculating profit and profitability indicators, evaluating the effectiveness of introducing new technologies, evaluating the decisions on the expediency of continuing or stopping the production of the given product.

Trend Analysis: Creation of Linear Regression Equation

Trend analysis is one of the subtypes of horizontal analysis, in which each direction of accounting is compared with a series of indicators of previous periods and the trend is determined, that is, the main tendency of the dynamics of indicators, separated from random effects and peculiarities of the organization's activity for a specific period.

Figure 3: The dynamics of changes in the composition and structure of production costs



Source: Prepared using the information received from the management of “Effect Group” CJCS(2022)

Table 3. Production costs composition and structure analysis in Effect Group CJSC (2015 -2021)

	The structure and composition analysis of Production Costs in Effect Group CJSC for the years of 2015-2021													
Cost items	2015		2016		2017		2018		2019		2020		2021	
	AMD	%	AMD	%	AMD	%	AMD	%	AMD	%	AMD	%	AMD	%
Material Costs	1,598,901	64.6	1,674,541	63.0	1,416,384	52.9	1,396,094	59.6	1,050,467	44.3	997,594	44.3	869,977	44.3
Labor Costs	215,509	8.7	198,851	7.5	145,555	5.4	164246	7.0	498,396	21.0	473,310	21.0	350,749	17.9
Depreciation	103,831	4.2	101,006	3.8	62,293	2.3	82,123	3.5	454,636	19.2	431,753	19.2	431,753	22.0
Other production Costs	558,063	22.5	683,846	25.7	1,051,574	39.3	698,305	29.8	367,696	15.5	349,189	15.5	311,301	15.9
Total	2,476,304	100	2,658,244	100	2,675,806	100	2,340,768	100	2,371,195	100	2,251,847	100	1,963,781	100

Source: Prepared using the information received from the management of "Effect Group" CJCS(2022)

The trend analysis has a prospective, predictive nature, as it allows to predict the prospective value of the indicator based on the study of patterns of changes in the economic index in the past.

For this, a regression equation is created, where the analyzed index acts as a variable, and the time interval (year, month, etc.) acts as a factor under the influence of which the variable changes. Least squares regression calculates the best line fitting parameter using data from previous periods. The regression equation makes it possible to build a line expressing the dynamics of the analyzed indicator. Inserting the number of the planned year into the equation, the predicted value of the indicator is calculated. We have calculated the amount of production costs for the next two reporting peropds by means of trend analysis. As we mentioned, the trend analysis is performed using the regression equation:

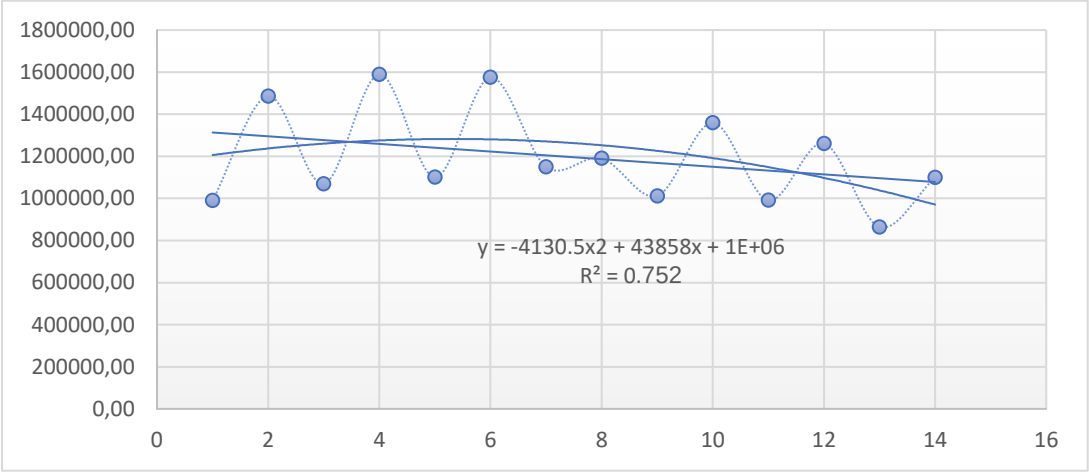
The above equation gives the possibility to predict the magnitude of Y (in this case production costs) at X level of production.

Table 4 The level of Production and the amount of production costs (2015 -2021)

Year(x)	**Volumes of Production (AMD)**	**Cost of Production(y) (AMD)**
2015 1-st semster	34,250.00	990,521.60
2015 2-nd semster	51,375.00	1,485,782.40
2016 1-st semster	25,115.60	1,068,876.00
2016 2-nd semster	37,673.40	1,589,368.00
2017 1-st semster	90,525.95	1,100,389.00
2017 2-nd semster	130,269.05	1,575,417.00
2018 1-st semster	129,558.45	1,150,218.00
2018 2-nd semster	134,846.55	1,190,550.00
2019 1-st semster	404,256.72	1,011,738.00
2019 2-nd semster	558,259.28	1,359,457.00
2020 1-st semster	284,522.92	990,812.68
2020 2-nd semster	362,120.08	1,261,034.32
2021 1-st semster	425,647.64	864,063.64
2021 2-nd semster	541,733.36	1,099,717.36

Source: Prepared using the information received from the management of the “Effect Group” CJCS (2022)

Figure 4 Trend of production costs (2015 -2021, by semesters)



Source: Prepared by the authors (2023)

The diagram shows the trend of production costs of "Effect Group" CJSC during 2015-2021 by semesters. As a result of the trend analysis, a regression equation was created, where by placing the half of the forecasted year, we have recived planned index, which later can be compared with the actual data and understand what factors caused the deviations. R^2 is the coefficient of determination, which shows how much the dependent variable changes regardless of the change in the independent variable. The coefficient of determination is the squared correlation coefficient. In the above example of production costs and output, R=0.86 and therefore R^2=0.752 or 75.2%. MS Excel and a number of online calculators have the ability to automatically calculate coefficients of determination and correlation after entering the necessary data.

Thus, 75.2% of the change in results is due to the change in X 's. The amount of production costs of the organization in 2022 can be projected using the regression equation. As variables X and Y, let's take, respectively, the volume of production and the amount of production costs. Assume that the regression line of y with respect to x is represented as (we have alresady presented in the Methodology of this Research):

(4) b= -156545774658.17/491730834519.66 = -0.31836

(5) a=1195567.5 - (-0.32x229296.71) = 1268565.63078

The linear function of Y depending on X for the “Effect group”CJCS will be represented as:

(6) y= -0.31836X + 1268565.63078

Having the volume of the production, it is possible to calculate the projected amount of production costs. In the 1st and 2nd semesters of 2022, the organization has planned to produce

12% more output than the same indicator of the previous year, which in numerical terms will be 476,725AMD and 606,741 AMD for the 1st and 2nd semesters, respectively. Inserting into the following equation, the forecasted amount of production costs for the 1st and 2nd semesters of 2022 will be: 1,116,795.3 and 1,075,403.45 thousand AMD, respectively.

CONCLUSION

Based on the results of this research, we can state that the analysis and forecasting of the Production Cost is an important tool in the cost management system. Cost information is used not only for the loose and profits calculation for external reporting purposes, but also in management procedures for accounting, analysis, budgeting, performance organization and measurement. In the present article a trend analysis was carried out, as a result of which the trend of production costs according to the semesters of 2015-2021 was determined. Also a projection of production costs for the next two reporting periods was shown based on the planned quantities of released products using a linear regression equation.

On the basis of the found coefficients of correlation R and determination R^2, it is determined that the constructed model is adequate to experimental data and can be used for anlysis and forecasting.

The obtained results can be used for analysis, forecasting and management of indices of enterprise activity in organisations.

For the further research: The debatability and ambiguity of the approaches to costs and cost forecasting that exist in modern economic literature require further clarification of their conceptual apparatus, the development of new classification features, the improvement of accounting and analytical support and cost management.

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