ECONOMIC AND COST-BENEFIT ANALYSIS METHODS IN EDUCATIONAL MANAGEMENT

MÉTODOS DE ANÁLISE ECONÔMICA E CUSTO-BENEFÍCIO NA GESTÃO EDUCACIONAL

MÉTODOS DE ANÁLISIS ECONÓMICO Y COSTO-BENEFICIO EN LA GESTIÓN EDUCATIVA

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ABSTRACT: *Educational management implies the administration of the education system in which a group blends material and human resources to plan, supervise, strategize, and launch structures to execute an education system. Educational management is one of the most complex and multifaceted categories. The works of many Russian and foreign scholars are devoted to the problems of educational management and the adaptation of its foundations in the organization management system. The purpose of this study is to illustrate the usefulness and importance of analytical tools in making educational management decisions. To that end, The methods of general scientific, traditional and logical ways of data processing and analyzing are considered. Based on the results obtained, it can be concluded that linear programming methods allow making educational management decisions in terms of limited resources, if the number of limiting factors is two or more.*

KEYWORDS: *Educational management, Economic analysis, Ranking methods, Performance indicators.*

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***RESUMO**: A gestão educacional implica a administração do sistema educacional em que um grupo combina recursos materiais e humanos para planejar, supervisionar, traçar estratégias e lançar estruturas para executar um sistema educacional. A gestão educacional é uma das categorias mais complexas e multifacetadas. Os trabalhos de muitos estudiosos russos e estrangeiros são dedicados aos problemas da gestão educacional e à adaptação de seus fundamentos no sistema de gestão organizacional. O objetivo deste estudo é ilustrar a utilidade e a importância das ferramentas analíticas na tomada de decisões de gestão educacional. Para tanto, São considerados os métodos gerais científicos, tradicionais e lógicos de processamento e análise de dados. Com base nos resultados obtidos, pode-se concluir que os métodos de programação linear permitem tomar decisões de gestão educacional em termos de recursos limitados, caso o número de fatores limitantes seja dois ou mais.*

***PALAVRAS-CHAVE**: Gestão educacional, Análise econômica, Métodos de classificação, Indicadores de desempenho.*

***RESUMEN:** La gestión educativa implica la administración del sistema educativo en la que un grupo combina recursos materiales y humanos para planificar, supervisar, diseñar estrategias y poner en marcha estructuras para ejecutar un sistema educativo. La gestión educativa es una de las categorías más complejas y multifacéticas. Los trabajos de muchos académicos rusos y extranjeros están dedicados a los problemas de la gestión educativa y la adaptación de sus fundamentos en el sistema de gestión de la organización. El propósito de este estudio es ilustrar la utilidad e importancia de las herramientas analíticas en la toma de decisiones de gestión educativa. Con ese fin, Se consideran los métodos de las formas científicas generales, tradicionales y lógicas de procesamiento y análisis de datos. En base a los resultados obtenidos, se puede concluir que los métodos de programación lineal permiten tomar decisiones de gestión educativa en función de recursos limitados, si el número de factores limitantes es dos o más.*

***PALABRAS CLAVE**: Gestión educativa, Análisis económico, Métodos de ranking, Indicadores de desempeño.*

Introduction

Management accounting can be interpreted as a system of continuous management with information, accounting, and analytical units in an organization to implement management decisions with limited resources, focused on work organizing in the long term, including the accumulation of information, processing, accounting, analysis, forecasting, planning, problem identification ("bottlenecks"), their analysis and elimination. In this context, management accounting can be viewed as a synonym for the controlling system (Litvinova, 2019).

An analytical unit is highlighted in the presented definition, including the use of tools for economic analysis.

The purpose of economic analysis is considered in its applied aspect and consists in the analytical substantiation of managerial decisions taken by the subjects of different levels (Savitskaya, 2020; De Witte & Soncin, 2021).

The main tasks of economic analysis are the following ones:

- an objective and comprehensive assessment of business plans and standard validity in the process of their development;

- determination of the economic efficiency concerning the use of labor, material and financial resources;

- determination of the influence of various factors on the change in technical and economic indicators of an enterprise;

- identification and change of on-farm reserves at all stages of the production process;

- development of measures for identified reserve development;

- control of management decision optimality (Biryukov & Sharonin, 2018).

The method of economic analysis is understood as a systematic integrated approach to study the results of an economic entity activities, identify and measure the contradictory influence of individual factors on them, generalize analysis materials in the form of conclusions and recommendations based on the processing of all available information concerning the results of this activity by special methods (Gubina & Gubin, 2019).

The features of economic analysis method:

- a systematic approach and a comprehensive study of activities;

- the use of indicators to measure economic phenomena;

- identification and measuring the relationship and interdependence between indicators;

- the use of economic information after processing it in special ways;

- generalization of the analysis results (Grigorieva, 2019; López Seguí et al., 2021).

Let's consider the application of economic analysis methods in management accounting for the organizations of various industries.

METHODOLOGY

The theoretical and methodological basis of the study was provided by:

- scientific works of domestic and foreign scientists-economists on management accounting, controlling, and management;

- accounting (financial) statements of JSC "First Freight Company" (http; "Federal

Freight Company" JSC; JSC "NefteTransService" (Medina-Mijangos et al., 2021);

- accounting (financial) and management reporting of "Shinservice" LLC (Majerova & Abdrazakova, 2021).

To achieve the goal and solve the problems posed in the process of writing the work, the following methods were used: monographic, economic-statistical, abstract-logical, etc.

The simplest methods of comparative analysis can also be widely used in the process of management accounting with a wide branch network of the organization, which include the distance method, taxonometric method, the method of sum of places, and the method of sum of points (Kazakova, 2018). The effectiveness of this group of methods is also confirmed by the fact that the reference values used in their basis will be based on the standards individually calculated for the given organization in this case, taking into account its structure of funds.

RESULTS AND DISCUSSION

Let's consider the application of the sum of places method using the example of three transport companies:

- JSC "First Freight Company";
- JSC Federal Freight Company;
- JSC "NefteTransService".

Accounting (financial) statements serve as the basis for calculating ratios, which can be divided into four units:

- solvency;
- financial stability;
- turnover;
- profitability (Abdukarimov, M.V. Bespalov, 2019).

The financial indicators of "First Freight Company" JSC are shown in Table 1.

Table 1. Financial indicators of "First Freight Company" JSC

Indicator	2018	2019
Solvency		
Absolute liquidity ratio	1,41	2,76
Quick liquidity ratio	1,86	3,94
Current liquidity ratio	2,15	4,86

Cash flow synchronicity ratio	1,06	1,15
The ratio of accounts receivable and payable	1,13	1,35
Financial stability		
Autonomy ratio	0,74	0,88
Coefficient of provision with own circulating assets	0,52	0,78
Investment coverage ratio	0,75	0,89
Equity capital flexibility ratio	0,37	0,48
Supply ratio	5,6	5,61
Turnover		
Asset turnover ratio	1,06	0,95
Equity capital turnover ratio	1,54	1,17
Accounts receivable turnover ratio	6,64	7,78
Accounts payable turnover ratio	9,76	9,67
Return on assets	2,18	2,29
Profitability		
Return on sales, %	22,97	7,84
Return on assets, %	26,12	17,32
Return on equity, %	37,91	21,30
Return on cash flows, %	21,17	13,79
Return on cash	2,29	0,85

The financial indicators of JSC "Federal Freight Company" are shown in Table 2.

Table 2. Financial indicators of JSC "Federal Freight Company"

Indicator	2018	2019
Solvency		
Absolute liquidity ratio	0,25	0,01
Quick liquidity ratio	0,58	0,34
Current liquidity ratio	0,85	0,62
Cash flow synchronicity ratio	1,00	0,99
The ratio of accounts receivable and payable	0,55	0,77
Financial stability		

Autonomy ratio	0,77	0,68
Coefficient of provision with own circulating assets	-0,65	-1,9
Investment coverage ratio	0,84	0,82
Equity capital flexibility ratio	-0,11	-0,31
Supply ratio	-20,86	-31,68
Turnover		
Asset turnover ratio	0,85	0,82
Equity capital turnover ratio	1,10	1,13
Accounts receivable turnover ratio	13,92	14,23
Accounts payable turnover ratio	9,92	9,41
Return on assets	1,06	1,03
Profitability		
Return on sales, %	24,19	25,64
Return on assets, %	18,50	17,68
Return on equity, %	23,98	24,50
Return on cash flows, %	15,80	11,34
Return on cash	7,39	14,82

The financial indicators of JSC "NefteTransService" are shown in Table 3.

Table 3. Calculated indicators of JSC "NefteTransService"

Indicator	2018	2019
Solvency		
Absolute liquidity ratio	0,07	0,08
Quick liquidity ratio	0,76	0,54
Current liquidity ratio	0,97	0,71
Cash flow synchronicity ratio	1,00	1,01
The ratio of accounts receivable and payable	0,78	0,72
Financial stability		
Autonomy ratio	0,33	0,38
Coefficient of provision with own circulating assets	-1,77	-1,57
Investment coverage ratio	0,75	0,66

Equity capital flexibility ratio	-1,30	-1,00
Supply ratio	-27,77	-25,03
Turnover		
Asset turnover ratio	2,07	1,76
Equity capital turnover ratio	6,19	4,96
Accounts receivable turnover ratio	10,13	10,84
Accounts payable turnover ratio	9,98	8,17
Return on assets	16,58	12,89
Profitability		
Return on sales, %	7,73	4,15
Return on assets, %	22,88	29,49
Return on equity, %	68,25	82,91
Return on cash flows, %	7,32	12,51
Return on cash	10,19	13,06

Ranking by the sum of places method for 2018-2019 are given in table 4.

Table 4. Ranking by the sum of places method in 2018-2019

Indicator	2018			2019		
	FFC	FFC	NTS	FFC	FFC	NTS
Absolute liquidity ratio	2	1	3	3	1	2
Quick liquidity ratio	3	1	2	3	1	2
Current liquidity ratio	3	1	2	3	1	2
Cash flow synchronicity ratio	3	1	2	3	1	2
The ratio of accounts receivable and payable	3	1	2	2	1	3
Autonomy ratio	1	2	3	2	1	3
Coefficient of provision with own circulating assets	2	1	3	3	1	2
Investment coverage ratio	1	2	3	2	1	3
Equity capital flexibility ratio	2	1	3	2	1	3
Supply ratio	2	1	3	3	1	2
Asset turnover ratio	3	2	1	3	2	1

Equity capital turnover ratio	3	2	1	3	2	1
Accounts receivable turnover ratio	1	3	2	1	3	2
Accounts payable turnover ratio	2	3	1	2	1	3
Return on assets	3	2	1	3	2	1
Return on sales, %	1	2	3	1	2	3
Return on assets, %	3	1	2	2	3	1
Return on equity, %	3	2	1	2	3	1
Return on cash flows, %	2	1	3	3	1	2
Return on cash	2	3	1	1	3	2
Sum of places	45	33	42	47	32	41
Rating	3	1	2	3	1	2

Results of transport company ranking by the sum of places method during 2018-2019 are shown in Table 5.

Table 5. Results of transport company ranking

Year		JSC "Federal Freight Company"	JSC "First Freight Company"	JSC "NefteTransService"
2018	Sum of places	45	33	42
	Rating	3	1	2
2019	Sum of places	47	32	41
	Rating	3	1	2

The indicators obtained in the course of financial analysis that characterize the financial condition and financial results of organization activities can be used as the basis for obtaining a system of key performance indicators. For this purpose, we use one of the methods of expert assessments - the ranking method.

Having slightly changed the composition of the indicators, let us rank them according to the “Solvency” unit.

Five experts rated seven KPIs in the Solvency unit within the scale from one to seven. The examination results are shown in table 6.

Table 6. The results of "Solvency" unit examination

Indicator	Э$_1$	Э$_2$	Э$_3$	Э$_4$	Э$_5$
Cash flow to debt ratio	6	5	7	6	6
Absolute liquidity ratio	3	3	3	3	4
Quick liquidity ratio	5	6	6	4	5
Current liquidity ratio	4	2	5	5	3
Cash flow synchronicity ratio	2	4	2	1	1
Coefficient of cash flow synchronicity for current activities	1	1	1	2	2
Cash flow reinvestment ratio	7	7	4	7	7

To assess the consistency of expert opinions, let us calculate the Kendall coefficient of concordance (Boronenkova & Melnik, 2019).

The initial data for assessing the consistency of expert opinions on the unit of indicators "Solvency" are shown in Table 7.

Table 7. Initial data for assessing the consistency of expert opinions

Indicator	Э$_1$	Э$_2$	Э$_3$	Э$_4$	Э$_5$	Sum of ranks	Deviation from the mean	Deviation squared
Cash flow to debt ratio	6	5	7	6	6	30	10	100
Absolute liquidity ratio	3	3	3	3	4	16	-4	16
Quick liquidity ratio	5	6	6	4	5	26	6	36
Current liquidity ratio	4	2	5	5	3	19	-1	1
Coefficient of cash flow synchronicity	2	4	2	1	1	10	-10	100
Coefficient of cash flow synchronicity for current activities	1	1	1	2	2	7	-13	169
Cash flow reinvestment ratio	7	7	4	7	7	32	12	144
Sum	28	28	28	28	28	140	x	564

Kendall's concordance factor is 0.81 [(12 x 564): (25 x 336)]. The concordance coefficient characterizes the high consistency of experts' opinions, which makes it possible to rank the factors according to the degree of significance.

The first rank conversion matrix is shown in Table 8.

Table 8. First rank conversion matrix

Indicator	Э$_1$	Э$_2$	Э$_3$	Э$_4$	Э$_5$
Cash flow to debt ratio	1	2	0	1	1
Absolute liquidity ratio	4	4	4	4	3
Quick liquidity ratio	2	1	1	3	2
Current liquidity ratio	3	5	2	2	4
Coefficient of cash flow synchronicity	5	3	5	6	6
Coefficient of cash flow synchronicity for current activities	6	6	6	5	5
Cash flow reinvestment ratio	0	0	3	0	0
Sum	21	21	21	21	21

The second rank conversion matrix is shown in Table 9.

Table 9. The second rank conversion matrix

Indicator	Э$_1$	Э$_2$	Э$_3$	Э$_4$	Э$_5$
Cash flow to debt ratio	0,05	0,10	0	0,05	0,05
Absolute liquidity ratio	0,19	0,19	0,19	0,19	0,14
Quick liquidity ratio	0,10	0,05	0,05	0,14	0,10
Current liquidity ratio	0,14	0,24	0,10	0,10	0,19
Coefficient of cash flow synchronicity	0,24	0,14	0,24	0,29	0,29
Coefficient of cash flow synchronicity for current activities	0,29	0,29	0,29	0,24	0,24
Cash flow reinvestment ratio	0	0	0,14	0	0
Sum	1,00	1,00	1,00	1,00	1,00

To determine the result, let's calculate the arithmetic mean of the weights for each factor (table 10). The values of the weights determine the significance of the factors.

Table 10. Determination of the factor significance

Indicator	Sum of weights by factor	Arithmetic mean	Rank
Cash flow to debt ratio	0,24	0,05	6
Absolute liquidity ratio	0,90	0,18	3
Quick liquidity ratio	0,43	0,09	5
Current liquidity ratio	0,76	0,15	4
Coefficient of cash flow synchronicity	1,19	0,24	2
Coefficient of cash flow synchronicity for current activities	1,33	0,27	1
Cash flow reinvestment ratio	0,14	0,03	7

Thus, according to experts, the most important indicator of the “Solvency” unit is the “Coefficient of cash flow synchronization in current activities”. Indicator ranks should be considered during KPIs generation.

The simplest statistical methods, which include the most common methods such as averages, index method, Lorentz curve, etc., do not have special restrictions when used in making management decisions. When they use the index method, a comprehensive assessment is achieved via concentric matrix models (Nikolaev & Krupetskikh, 2021).

The group of mathematical methods, which include integral, logarithm, matrix, etc., allows you to achieve high accuracy of results, but it has the limitation in the range of models used. Multivariate statistical methods provide excellent results in the process of prospective analysis and diagnostics. But their use is associated with a large amount of data.

ABC analysis and XYZ analysis are one of the most effective mechanisms for operational management accounting in the field of managing an organization's inventory. ABC analysis can be used to structure resources by value and degree of importance to achieve the objectives of an economic entity, and can be used as a general approach when identifying the most urgent problems that require maximum attention from top management (i.e., setting priorities) (Kazakova, 2020).

It is advisable to consider these methods of analysis on the example of the retail trade organization LLC "Shinservice" (Krasnodar), which sells agricultural machinery.

In table 11, within the framework of the ABC analysis, the ranking of the main types of equipment is carried out for 2019.

Table 11. Ranking of the main types of equipment for 2019

Nomenclature	Revenue, rub	Specific weight, %	Category
Machinery	31698916,45	100,00	x
Stubble cultivator Vektor 800	6116833,54	19,30	B
Cultivator SKM (twelve-row)	4946024,71	15,60	B
Cultivator SKM (sixteen-row)	4782476,74	15,09	B
Disc harrow 800T	4214980,83	13,30	B
Multipurpose cultivator Vektor 460	3962410,71	12,50	B
Semi-mounted reversible plow SERVO 6.50	2551629,50	8,05	C
Subsoiler Delta New	1929156,67	6,09	C
Chain harrow "Striegel"	1466540,21	4,63	C
Twelve-row row-crop cultivator SKR	949690,60	3,00	C
Chain harrow	779172,94	2,46	C

In 2019, goods are presented in groups B and C.

Let's carry out an XYZ analysis of the constant assortment goods from the "Machinery" group (table 12) to assess the stability of sales.

Table 12. XYZ-analysis of goods from the "Machinery" group

Group product	2018	2019	Arithmetic mean	Standard deviation	The coefficient of variation	Group
16-row cultivator SKM	2453939,44	4782476,74	3618208,09	1164268,65	32,18	Z
Chain harrow "Striegel"	592363,14	779172,94	685768,04	93404,9	13,62	Y

It is necessary to combine ABC and XYZ analysis. The combination results are shown in Table 13.

Table 13. The results of the analysis for the group "Machinery"

Group product	ABC-analysis	XYZ-analysis	Combination
16-row cultivator SKM	B	Z	BZ
Chain harrow "Striegel"	C	Y	CY

The obtained results indicate the need to stabilize sales.

Let's analyze the stage of the product life cycle from the "Machinery" group.

The arithmetic mean value of the change in proceeds from the goods of the permanent assortment of the "Machinery" group was 1257673.55 rubles.

The standard deviation was 81,066.87 rub.

$\bar{y}$ – 0,5 σ = 1257673,55 – 0,5 x 1070863,75 = 722241,68 rub.

$\bar{y}$ – 0,5 σ = 1257673,55 + 0,5 x 1070863,75 = 1793105,43 rub.

The results of the analysis are shown in Table 14.

Table 14. The results of the life cycle analysis concerning the group "Machinery" goods

Group product	2018, rub	2019, rub	Proceeds change, rub.	Stage
16-row cultivator SKM	2453939	4782476,74	2328537,3	Growth
Chain harrow "Striegel"	592363	779172,94	186809,8	Decrease

Only one permanent product is in the growth stage. The conducted marketing analysis of the product range made it possible to conclude that there is a need for a significant change in the range of products sold, and that measures to stabilize sales should be taken.

CONCLUSIONS

The analytical unit of management accounting is one of the most important in making management decisions. This article discusses only a few methods of economic analysis in the context of two industries: transport and retail. An illustration of the application of more methods is beyond the scope of this article. The purpose of this study was to illustrate the usefulness and importance of analytical tools in making management decisions.

For example, the standard deviation considered in the product life cycle assessment also applies during:

- a point-rating assessment using the taxonometric method;
- risk assessment and management decision making in conditions of uncertainty.

Expert assessment methods allow to rank not only indicators when identifying KPIs, but also when ranking project risks, etc.

Linear programming methods allow making management decisions in terms of limited resources, if the number of limiting factors is two or more.

The rank correlation coefficients allow for diagnostic analysis.

There is a lot of such examples. Thus, any major management decision is based on the use of economic analysis methods.

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