

*Електронний журнал «Ефективна економіка» включено до переліку наукових фахових видань України з питань економіки (Категорія «Б», Наказ Міністерства освіти і науки України № 975 від 11.07.2019). Спеціальності – 051, 071, 072, 073, 075, 076, 292.
Ефективна економіка. 2022. № 9.*

DOI: <http://doi.org/10.32702/2307-2105.2022.9.33>

УДК 33.657

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METHODOLOGY OF MANAGING THE MOVEMENT OF THE MAIN FUNDS OF THE SPA COMPANIES IN THE MATHEMATICA ENVIRONMENT

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МЕТОДОЛОГІЯ КЕРУВАННЯ РУХОМ ОСНОВНИХ ФОНДІВ САНАТОРНО-КУРОРТНОГО ПІДПРИЄМСТВА У СЕРЕДОВИЩІ МАТЕМАТИКА

At spa companies, the management of the fixed asset's movement is of great importance. The significance is determined by the decisive role of these funds in the realization of most sanatorium-and-spa, health-improving measures. In the course of the movement, it is important to ensure such a state of fixed assets that will guarantee the quality and continuity of the range of services of the enterprises of the restated sphere. At spa companies, the management of the movement of the main funds is of great importance. This is possible when using Wolfram Research's computer algebra system. The article is therefore oriented on the formation of the methodology of management of the main funds of the spa companies in the MATHEMATICA program environment. Within the framework of the research, it is proved that the methodology of fixed assets management of spa companies in the MATHEMATICA program environment is more complicated than manual control of operations. This management, apart from the management work itself, requires a front-end configuration of the software and process environments. In the process of forming the methodology of managing the movement of fixed assets in the environment of the MATHEMATICA program, attention is paid to the following specificity. The basic categories of fixed assets, which should be paid special attention to in the process of movement management are: Full initial value; remaining initial value; balance value of fixed assets at the end of the year. The attention to internal dependence in the balance sheets of the main funds of the sanatorium-resort enterprise is important, the presence of which will allow for the introduction of the system of setting up processes of monitoring processes of systematic accumulation of funds in the depreciation fund. It is important to configure the algorithms for the selection of indicators of the state, movement, and efficiency of the use of fixed assets, under which the program automatically adjusts the processing and operating environment of the control of the movement of fixed assets. The prospects of further investigation in this direction lie in the complete methodology of managing the fixed assets movement of the spa companies by analyzing the factors of their successful performance.

У процесі руху основних фондів важливо забезпечити такий їх стан, що гарантуватиме якість та постійність номенклатури послуг санаторно-курортних підприємств. Надважливо, щоб данні, щодо руху основних фондів подавалися у взаємозв'язку та взаємозалежності та формували комплексну картину руху таких фондів. Це стає можливим у разі використання системи комп'ютерної алгебри компанії Wolfram Research. Відтак стаття

зорієнтована на формування методології керування основних фондів санаторно-курортного підприємства у середовищі програми МАНТЕМАТИСА. В межах дослідження доведено, що методологія керування рухом основних фондів санаторно-курортного підприємства у середовищі програми МАНТЕМАТИСА є складнішою, ніж ручне здійснення керівних операцій. Таке керування, окрім самої керівної роботи, потребує переднього налаштування програмного та процесного середовищ. В процесі формування методології керування рухом основних фондів у середовищі програми МАНТЕМАТИСА, звернено увагу на те, що базовими категоріями керування рухом основних фондів мають бути: повна первісна вартість; залишкова первісна вартість; балансова вартість основних фондів на кінець року. Важливою є увага до внутрішніх взаємозалежностей у схемах балансів основних фондів санаторно-курортного підприємства, наявність яких дозволить ввести системи налаштувань моніторингу процесів систематичного накопичення коштів у амортизаційному фонді. Важливим є налаштування алгоритмів обрахунку показників стану, руху та ефективності використання основних фондів (за якими програма налаштовує процесне й операційне середовища керування їх рухом). Перспективи подальших розвідок у даному напрямі полягають у доповненні методології керуванням рухом основних фондів санаторно-курортного підприємства аналізом чинників його успішного здійснення їх виробничої діяльності.

Keywords: *movement; condition of fixed assets; material and production base; full initial cost; residual initial cost; balance value.*

Ключові слова: *рух; стан основних фондів; матеріально-виробнича база; повна первісна вартість; залишкова первісна вартість; балансова вартість.*

Problem-solving in general form and its connection with important scientific or practical tasks. At the spa companies, it is important to manage the movement of the fixed assets from their material-production base. The significance is determined by the decisive role of these funds in the realization of most sanatorium-resort, health-improving measures (among which are medical assistance, with preventive, therapeutic, or rehabilitation purposes). In the course of the movement, it is important to ensure such a state of fixed assets that will guarantee the quality and

continuity of the range of services of the enterprises of the restated sphere. At the same time, the combination of motion control methods used in the defined area is rather monotonous and is based on the current information gathering and its generalization in the form of separate reporting forms, noticeable information gap. Such an approach to the formation of the motion management methodology does not allow taking into account the real needs of such enterprises in the development of their material-production base, regulation of its condition, and effective use.

Analysis of the latest studies and publications, which have begun the solution of the problem and the allocation of previously unsolved parts of the general problem. Various issues of fixed assets management of enterprise during all periods of economic development were rather actual, therefore many scientists, among them Zadan T, Lozova N. [3], Shchirska A. [6], Dmytro E., Zavirukha I. [2]. However, in the current economic situation, this issue appears more acute, because fixed assets are a factor that provides quality and continuity of the range of services of sanatorium-resort enterprises. Most scientists focus on detailed and relevant data to manage the movement of fixed assets. According to its direction, the activity of the spa companies requires the most detailed and relevant data on the movement of fixed assets at full initial and residual value and changes in the average annual cost of fixed assets. At the same time, such information is not sufficient to correct the economic results of the activity, which are formed by the growth of the volume of services and incomes generated by the increase of fixed assets, and increase in labor productivity. We note that in the process of managing the movement of fixed assets important data on trends of changes of indicators of return on assets, capital intensity, and of the capital-labor ratio are important. It is important that all of the above data are presented in interrelation and interdependency, and form a comprehensive picture of the movement of such funds. This is possible when using Wolfram Research's computer algebra system.

Formulation of the aims of the article (setting the task). The purpose of the article is to form the methodology of management of the fixed assets of the spa

companies in the environment of the program MATHEMATICA (from the company Wolfram Research).

An example of the basic material of the research with full substantiation of the received scientific results. Management of the fixed assets movement of the spa companies we propose to consider as a combination of purposeful actions including assessment of the situation and the state of management of such funds (or methods of research), and a choice of management actions for their realization. In this case, the description of the management methodology uses the combination of methods of research, applied by spa companies, to maximize the movement of non-financial property (or production assets), taking into account that. How they are used - repeatedly or constantly during rendering (more than 12 months) during rendering of services and for management purposes. At the same time, a clear understanding of the assets of the enterprise should be developed, for the allocation of categories to which the management influence should be directed and which it should not touch (Table 1).

Table 1. Detailed enterprise assets by categories of management influence to be directed and which it should not touch

Objects of control of the movement of fixed assets	Objects of control of the movement of other funds, which are not among the basic ones
<p>These are objects for which the following conditions are fulfilled simultaneously:</p> <ol style="list-style-type: none"> 1) involvement in the processes of rendering services, management, and payment for temporary use; 2) long-term use (more than 12 months), regardless of the cost; 3) possibility of the next resale of the object; 4) ability to generate income in the future. 	<p>These are objects for which the following conditions are fulfilled:</p> <ol style="list-style-type: none"> 1) term of use till 1 year (regardless of cost) or one-time use; 2) accounting as finished products or goods in warehouses, as made in installation or such, which are subject to installation, on the road; 3) accounting as financial investments, intangible funds.

Source: [1; 4; 6]

According to the data in the table, the following items should be submitted to the objects of control of the movement of fixed assets:

- buildings (architectural and construction objects);
- structure (engineering and construction objects);

- transmitting devices (designed to perform special functions in the transmission of energy, matter, signal, information);
- machines and equipment (power, work, information devices), transport means (for movement of people and loads);
- tools and accessories, inventory (etc.), and household expenses [2].

That the basic categories that should pay special attention to in the process of traffic management are:

- 1) full initial value;
- 2) remaining initial value;
- 3) balance value of fixed assets at the end of the year.

The content of the basic categories, which is aimed at the detailed management of the movement of fixed assets according to such indicators is systematized in Table 2.

The categories outlined form the possibilities for the current selection of the average annual cost of fixed assets, monitoring of the processes of systematic accumulation of funds in the depreciation fund (using annual depreciation charges (a), which increase the cost of the provided services of sanatorium-resort enterprises).

Note that the problem of traffic management is that the accumulated funds in the depreciation fund (A) and the change in the average annual cost of fixed assets (C) are the nominal categories, which quickly transform the scheme of the balance of the fixed assets of the spa companies. For example, depreciation on fixed assets is calculated monthly according to different methods (among direct (even), reduction of the residual value, and accelerated reduction of the residual value).

On the objects, again received, depreciation is calculated from the first day of the month following the month of the adoption of the fund in operation, and the explosion - ends on the first day of the month, the next month before the write-off of this object from accounting. The change in the average annual cost of fixed assets is carried out at the time of their introduction and decommissioning.

Table 2. Basic categories of the process of managing the movement of the fixed assets of spa companies

Basic categories of motion control	Category characteristic	definition algorithm	Significant in motion control processes
full initial cost (F_{ic})	the cost of fixed assets reflected in the prices available at the time of their adoption on the balance sheet	$F_{ic}=P+ Cost + Cost^{\text{ri}} + E^{**}$	Current figure of average annual value of fixed assets,
remaining initial value (R_{ic})	The cost of fixed assets in the balance-sheet prices is reduced by the amount of wear that was available on the last reporting date (deterioration)	$R_{ic} = \text{initial cost of the fixed assets} - \text{deterioration}$	monitoring of processes of systematic accumulation of funds in the depreciation fund.
average annual cost of fixed assets	the cost of fixed assets at the end of a certain reporting year	$\bar{C} = C1 + C0 \times T1/12 - C2 \times T2/12^*$	

* $C1$ – the cost of fixed assets at the beginning of the year (on the balance sheet); $C2$ - the cost of the fixed assets that have been lost in a year; $C0$ - initial cost of fixed assets introduced during the year; $T1$ – the number of full months during which the funds received in the reporting year were operating; $T2$ – the number of full months during which the funds that were released in the reporting year did not operate;

** P – fixed assets price, UAN; $Cost$ – fees, duties, indirect taxes UAN; - risk insurance costs, UAN; E – expenses for installation, assembly, and bringing to the necessary state of the fixed assets.

Source: [3, c. 5-21].

Any changes transform the scheme of the balance of the company's fixed assets at the full initial value and the scheme of the balance of the company's fixed assets at the residual value. At the same time, the transformation affects the indicators of the state, movement, and efficiency of the use of fixed assets. The outlined schemes are further influenced by the removal of physical depreciation of fixed assets through repairs (including capital). The illustration of internal dependencies in the balance sheets of the fixed assets of the spa companies is given in Table 3.

Thus, such process schemes are best built and adjusted in the environment of the MATHEMATICA program, which contains many functions for both monitoring interrelated indicators and for analytical transformations (its necessary component of the movement of fixed assets management). For example, if you enter balance sheets in the number account functions (Fig. 1), then through the service of settlement of recurrence in online mode is determined the average annual cost of fixed assets and the balance of fixed assets movement at the full initial and residual value. Internal

dependencies in the balance sheets of the fixed assets of the spa companies allow for the introduction of systems of adjustment of processes monitoring processes of systematic accumulation of funds in the depreciation fund.

Table 3. The illustration of internal dependencies in the balance sheets of the main funds of the spa companies

the scheme of balance of the company's fixed assets at full initial value	the scheme of balance of the company's fixed assets at the residual value	Related dependencies
$C_{\text{end of the year}} = C_{\text{at the beginning of the year}} + C_{\text{put into operation}} - C_{\text{thrown out of operation}}$ (The category influences on \bar{C} and A)	$C_{\text{end of the year}} = C_{\text{at the beginning of the year}} + C_{\text{HOB}} + C_{\text{put into operation}} - C_{\text{thrown out of operation}} - \text{deterioration}$ (The category influences on \bar{C})	Indicators of the state, movement and efficiency of the use of fixed assets **

* $C_{\text{end of the year}}$ - the cost of fixed assets at the end of the year; $C_{\text{at the beginning of the year}}$ - the cost of fixed assets at the beginning of the year; $C_{\text{put into operation}}$ - initial cost of the fixed assets put into operation during the year; $C_{\text{thrown out of operation}}$ - cost of fixed assets that were thrown out of operation for a year; deterioration - accumulated funds in the depreciation fund.

** indicators of the status of fixed assets (coefficient of depreciation of fixed assets, index of validity of fixed assets), indicators of movement (reproduction) of fixed assets (coefficient of proceeds, coefficient of renewal, coefficient of disposal).

Source: [3, c. 5-21]

The advantage of the program is its multi-functionality. In particular, in case of introduction of algorithms of selection of indicators of state, movement and efficiency of use of fixed assets, the program automatically adjusts the processing and operational environment of control of movement of fixed assets (in particular, determines the basic management procedures, selects indicators of the state, movement and efficiency of fixed assets use).

 functions of work with numerical accounts → **START MENU**

Units of measure: UAN; thousands UAN; million UAN;

Residual value of fixed assets at the beginning of the year

Full initial cost of fixed assets at the beginning of the year

The following fixed assets were received during the year:

PERIOD	NEW FIXED ASSETS
1... JANUARY	*
1... FEBRUARY	*
....	*
1... DECEMBER	*

service of decision of recurrently equalizations* 

The following assets were disposed of during the year:

PERIOD	FIXED ASSETS AT RESIDUAL VALUE
1... JANUARY	*
1... FEBRUARY	*
....	*
1... DECEMBER	*

service of decision of recurrently equalizations* 

In addition: Depreciation rate: % or depreciation of fixed assets per year UAN

Production in the amount of UAN

Average number of employees

- Include in the control of the movement of fixed assets:
- Average annual value of fixed assets.
- Balance of movement of fixed assets at full historical cost.
- Balance of movement of fixed assets at full residual value.
- Indicators of changes in the value of fixed assets.
- The coefficients of wear and life of plant and equipment .
- Coefficients of the renovation and replacement of fixed assets.
- Coefficient of return on assets, capital intensity and stock ratio.

Fig. 1. The appearance of the numeric account function should be corrected in the MATHEMATICA environment

Source: MATHEMATICA program environment.

At that time the calculation is carried out on condition that in the menu functions of work with numerical accounts are entered the expressions allocated in Table 4 or other, important for effective control of movement of the basic funds of the enterprise.

Table 4. Expressions for automatic selection of indicators of the state, movement, and efficiency of the use of fixed assets

A group of indicators	Indicator	Expression to enter into the software environment
rates of state of fixed assets	<u>Coefficient of depreciation of fixed assets</u>	<Cd =deterioration / total cost>
	<u>Coefficient of life of fixed assets</u>	<Cl= residual value / total cost>
rates of motion (reproduction) of fixed assets	<u>Coefficient of income of fixed assets</u>	<Ci= cost of fixed assets received this year / the total cost of fixed assets at the end of the year>
	Coefficient update	<Cu= cost of new fixed assets put into operation this year / the total cost of fixed assets at the end of the year>
	Retirement coefficient	<Rc= cost of fixed assets that were lost during the year / the total cost of fixed assets at the beginning of the year>
performance indicators of fixed assets use	Capital productivity	<Cp= Volume of manufactured goods/ Average annual value of fixed assets>
	Capital-output ratio	<Co= Average annual cost of fixed assets/ Volume of manufactured goods>
	Current capital-labor ratio	<Cc= Average annual cost of fixed assets/ Average number of staff>

Source: [3, c. 5-21]

Thus, the methodology of managing the fixed assets movement of the spa companies in the MATHEMATICA program environment is more complicated than its classic variant (oriented on manual management of management operations). It's because such management, besides the management of works, requires a front-end configuration of both the software environment and the processing environment, without which the operative information on the fixed asset's movement will not be produced correctly. Depending on the specifics of the settings and sets of the expressions entered (approximate set of which are shown in Table 4), the program forms an analytical report of the movement of the fixed assets, which, in aggregate, is the result of the application of the methods of research).

Thus, the result of the application of the above-mentioned methodology of movement control of fixed assets for 2021 can be considered in the example of sanatorium "Polyana", on which the analytical report of movement of fixed assets form in the program MATHEMATICA environment (Table 5). It: 1) allows to

determine the optimal management of physical assets and their operating modes using the possibility of their movement balance, supplemented by a quick screen of desirable indicators of the state, movement, and efficiency of the use of fixed assets; 2) to determine of optimization ways of fixed assets movement and their operating modes.

Table 5. Analytical report of the movement of the fixed assets of the sanatorium "Polyana", 2021

Balance of movement of fixed capital						Indicators of the state, movement and efficiency of the use of fixed assets	Conclusions regarding optimal motion control
During the year, fixed assets were received:			During the year, fixed assets were issued:				
Date	New funds	Operating time till end of year, months	Date	Residual value	operation period since the beginning of year, months.		
1.01	34	12	1.01	21.7	0	rates of motion: $C_u = 23.9\%^*$; $R_c = 8,4\%^*$; Ratio of the value of liquidated and new funds: $K_{\text{primary cost}} = 174.325/306.833 = 0.57$ $K_{\text{the remaining cost}} = 174.325/306.833 = 0.57$ efficient use indicators: current capital-labor ratio: 0 thousand. UAH. per person. Labor productivity (production) = 10.252 thousand. UAH. per person	Motion control is not optimal. Recommendations: Purchase of new fixed assets is necessary; upgrading/modernization of fixed assets that ensure the production process
1.04	100	9	1.03	53	2		
1.05	10	8	1.04	122	3		
1.06	44	7	1.06	22.5	5		
1.07	163	6	1.09	8	8		
1.08	3	5	1.10	3.2	9		
1.10	324	3	1.12	4.4	11		
1.12	21	1		-	-		
Average annual value of retired fixed assets				174.325			
Average annual value of fixed assets				2922.508			
Annual depreciation on new fixed assets				36.82			

* Represents the share of new fixed assets in total end-of-period assets (as complete an assessment).

** Represents the share of capital stock disposed of during the period as a percentage of the total value at the beginning of the period.

Source: MATHEMATICA program environment.

Obvious that the program function allows to detail the movement of fixed assets and analyze the current specifics of operation of fixed assets with any level of detail. In addition, if the information is detailed about the fixed assets that provide the

service production process, the program can form detailed recommendations, concerning their effective use and restoration.

Conclusions on this research and prospects of further examination in this direction. The framework of the research proved that the methodology of fixed assets management of spa companies in the MATHEMATICA program environment is more complicated than its classic variant (oriented on manual management work). Because such management, besides the managing performance, requires a front-end configuration of both the software and the processing environments, without the operative information on the movement of fixed assets will not be produced correctly. In the process of forming the methodology for managing the fixed asset's movement in the MATHEMATICA program environment, the following specifics should be noted:

1. The basic categories of fixed assets, given special attention in the process of movement management are: 1) the total initial value; 2) the remaining initial value; 3) the balance value of fixed assets at the end of the year. Since these categories form opportunities for monitoring the processes of systematic accumulation of funds in depreciation funds and the current balance of the average annual value of fixed assets;
2. Internal dependence on the balance sheets of the fixed assets of the spa companies allows for the introduction of systems of adjustment of processes monitoring processes of systematic accumulation of fixed assets in the depreciation fund.
3. Algorithms of selection of indicators of the state, movement, and efficiency of fixed assets use, according to which the program automatically adjusts the processing and operating environment of the movement of fixed assets (in particular, determines the main management procedures, selects indicators of the state, movement, and efficiency of the use of fixed assets).

Prospects of further investigation in this direction lie in the complete methodology of managing the fixed assets movement of the spa companies by analyzing the factors of its successful performance.

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Стаття надійшла до редакції 05.09.2022 р.



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