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Methodical Toolkit of Managing Reproduction of the Fixed Assets of an Organization

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Abstract: The study deals with methodical toolkit of managing of reproduction the fixed assets of an enterprise. The methodology of economic substantiation of selecting method and sources of financing for fixed assets reproducing is pointed out and developed. The general algorithm of methodology of economic substantiation of selecting method and sources of financing for fixed assets reproducing has been described; stages and criteria of economic substantiation of selecting method and sources of financing for fixed assets reproducing are revealed. The technique is easy to use and provides the optimization of costs for reproducing fixed assets taking into account material, labour and financial resources of an enterprise and level of competition in the industry.

Key words: Managing reproduction, fixed assets, financing sources, economic justification, selecting methods of reproduction, selecting the financing sources

INTRODUCTION

Studying the problems of managing the reproduction of the fixed assets of an enterprise has rather a small level of elaboration of methodological basis of this process. In the Russian economical practice, the unified approaches to managing the mentioned process in an enterprise has not yet being formed, the methods of informational and organizational provision of fixed assets reproduction is not yet developed; methodologies, helping the efficient realization of this process are not developed as well (Koneva and Doroshenko, 2013; Doroshenko and Salmina, 2013). So, developing the methodological toolkit of managing the fixed assets reproduction of an enterprise is now relevant.

Now, it is long-standing need for organizations to develop a methodology of economic justification of selecting methods and sources of financing the fixed assets reproduction (Abakumov, 2014a).

Methodology of selecting methods and sources of financing the fixed assets reproduction should provide the optimization of costs for reproducing fixed assets taking into account material, labour and financial resources of an enterprise and level of competition in the industry, should be easy to use.

MATERIALS AND METHODS

Main part: The aim of the methodology is searching the efficient way of managing costs for fixed assets reproduction at which the partial and full indemnity of depreciation of fixed assets would happen in time and with maximum economic effect for an organization. Developing the methodology consists in the following algorithm (Fig. 1).

At the stage of designing the aims of fixed assets reproduction, there are developed the basic scenarios of reproducing fixed assets objects in different variants: liquidation of unnecessary objects; repairing/reconstruction of objects; buying new objects (including taking on credit and on lease); renting out the available fixed assets objects, etc.

Analyzing the state of fixed assets reproduction should be carried out with the use of indices characterizing the state of reproduction of fixed assets, age distribution, economical efficiency and the analysis of each object of renewal (machine, line, complex, structural subdivision of an enterprise) concerning their necessity in the manufacturing process.

One of the main criteria of substantiating the reasonability of carrying out the reproducing activities in the organizations by the existing objects are negative or minimum values of income, profitability of fixed assets maintaining and volume of fixed assets return. At that the minimum return level should correlate with the annual average interest rate from leading banks after profit tax or rate of return.

The criterion of need for purchasing a new object of fixed assets may be coefficient of expediency purchasing the fixed assets (C_{ep}), which is calculated as ratio of

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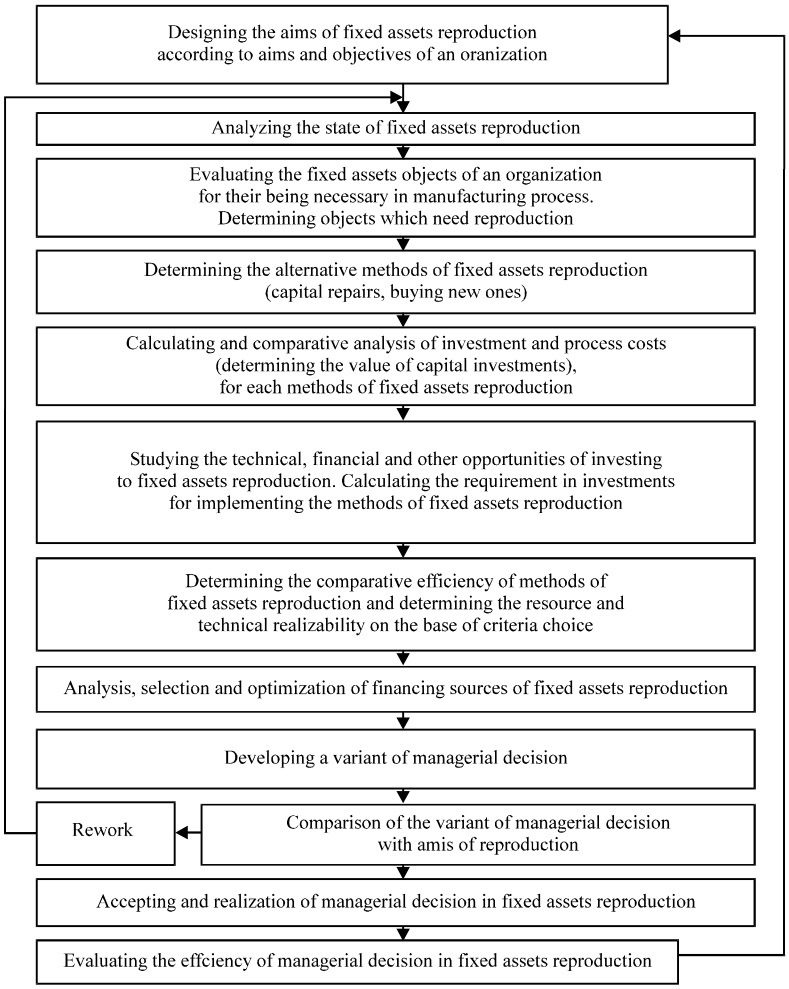

Fig. 1: General algorithm of selection methodology of methods and sources of fixed assets reproduction of an organization (Abakumov, 2012)

difference between the supposed quantity of demand for goods (works, services), produced by the object of fixed assets of the analyzed organization and the existing quantity of demand in the similar organization to the supposed quantity of demand of the analyzed organization:

$$C_{ep} = \frac{Q_{sim} - Q_{an}}{Q_{an}} \quad (1)$$

Where:

Q_{sim} = Quantity of demand for goods (works, services), produced by means of similar object of fixed assets, by a similar organization

Q_{an} = Quantity of demand for goods (works, services), assigned for producing by means of the considered object of fixed assets of the analyzed organization

The economic substance of the coefficient contains in the fact, that it shows that share of turnover, which the organization is not received by the organization due to the absence of the fixed assets object.

Determining objects, which need to be reproduced, on the basis of calculating the suggested indices allows identifying these fixed assets, the necessity of reproducing which is economically viable and is the condition of the organization's economic stability. The foundational criterion at prioritization in the order of objects, needed to be reproduces, is the aggregate integral value of the mentioned indices.

The initial data for the economic substantiation of methods and sources of financing the fixed assets reproduction is determining the necessary volume of investments by different methods of reproduction. The volumes of investments by various projects and their possible returns were compared (Abakumov, 2013).

The business environment implies by default the necessity of using various financing sources of fixed assets reproduction.

RESULTS AND DISCUSSION

Research of the technical, financial and other possibilities of investing to the fixed assets reproduction of the organization consists in determining the maximum value of investments is carried out on the base of financial and economical state of the organization, as well as opportunity of attraction of credit resources.

On the basis of the conducted research, we have arrived at the conclusion that at selecting the source of financing the fixed assets reproduction of the organization it's necessary to keep the following principles: reliability of funds; ability to pay for loan funds; achieving the minimum weighted average cost of capital (Abakumov, 2014b). These principles lay the foundation for the systematized criteria of selecting financing sources of the organization's fixed assets reproduction.

At designing the criteria of methodology of selecting method and financing sources of fixed assets reproduction, we have used an approach, based on the supposition, dependence of the degree of criterion relevancy on the stage of the organization life cycle. To select criteria and degree of criterion relevancy depending on the stage of the organization development, we have conducted, within the framework of the research, the enquiry of managers of thirty organizations being in various stages of life cycle.

Criteria of selecting financial sources of reproduction and indices, determining their essence are presented according to relevance degree based on the stage of organization's development, these indices are calculated in total for organization on condition of financing reproduction, e.g., characterized the alteration of an index as a result of using financial sources (Table 1). In the cells to the right there are presented the relevance level of this index in the given stage:

- The most relevant criterion (A)
- Moderately relevant criterion (B)
- The least relevant criterion (C)

Weighted Average Cost of Capital (WACC) characterizes the relative level of common cost of raising funds from all possible sources. This index reflects the minimum rate of return and is calculated by the formula:

$$WACC = \sum C_i \times S_i \quad (2)$$

Where:
C_i = Cost of ith source of financing funds
S_i = Share of ith source

The general formula of the cost of source of financing funds (C) appears as follows:

$$C = \left[\frac{R}{V} + \left(\frac{P+I}{V} - 1\right)\right] \quad (3)$$

Where:
R = Expenses for raising the fund
V = Volume of the received investment
P = Payments for primary loan
I = Interest payments

Financial Leverage (L_f) is calculated by the following formula:

$$L_f = \frac{LC}{EC} \quad (4)$$

Where:
LC = Volume of Loan Capital
EC = Volume of Equity Capital

Financial Profitability (P_f) can be presented as follows:

$$P_f = \frac{(EBIT - r \times LC) \times (1 - RCT)}{EC} \quad (5)$$

Where:
EBIT = Earnings Before Interest and Taxes
r = The weighted average interest rate of raised funds
RCT = Rate of Corporate Tax

Table 1: Criteria of selecting the financial sources of fixed assets reproduction depending on the stage of enterprise life cycle

Indices	Criterion of selecting a financial source of reproducing the organization's fixed assets	Relevance degree of a criterion depending on the stage of enterprise life cycle			
		Introduction	Growth	Maturity	Decline
Weighted average cost of capital	Minimum value	A	B	B	C
Financial leverage (ratio of loan capital to equity funds)	Maximum value	C	A	B	C
Financial profitability (ratio of profit to equity capital)	Maximum value	C	A	B	C
Financial risk (level of cumulative effect of operating and financial leverage)	Minimum value	A	B	B	C
Payback period	Minimum value	B	B	B	B

Financial Risk (R_f) can be calculated by the following formula:

$$R_f = \left[(r - r_{rf}) \times \frac{LC}{EC + LC} \right] \quad (6)$$

where, r_{rf} risk-free rate of return. Another criterion of selecting the financing sources can be Payback Period (PP) of the investment:

$$PP = \frac{EC + LC}{(EBIT - r \times LC) \times (1 - RCT)} \quad (7)$$

Using the mentioned criteria of selecting financial sources of reproducing fixed assets allows going to the next stage of economical substantiation of selecting financial sources of fixed assets reproducing. The next stage is optimizing the structure of financial sources of reproducing fixed assets of an organization.

Fee for financial sources requires taking into account the financial potential of an organization as well as risks which appear at raising investment funds (Avilova, 2007a, b). The main requirements to optimizing the structure of financial sources of organization's fixed assets reproduction are the following:

- Optimizing the structure of raising investment funds by separate sources
- Taking into account the risk at raising investment funds from various sources (Avilova and Strekozova, 2012)
- Taking into account the cost of investment funds from various sources
- Taking into account the own financial potential of an enterprise (Grabovyi *et al*., 2014)

The structure of financial funds of reproducing fixed assets has influence on the following indices: the economic profitability of an enterprise which is planned to achieve as a result of reproducing of fixed assets (P_e); Financial Profitability of equity capital (P_f); Self-Financing Ratio (SFR). The above-mentioned indices are calculated by Eq. 8-10:

$$P_e = \frac{\left(EBIT_{repr} + D_0 + D_1\right)}{TC} \quad (8)$$

$$P_f = \frac{\left(P_{net} + D_0 + D_1\right)}{\left(EC_0 + EC_1\right)} \quad (9)$$

$$SFR = \frac{\left(LC_0 + LC_1\right)}{\left(EC_0 + EC_1\right)} \quad (10)$$

Where:

EC_0, LC_0 = Volumes of the available equity and loan capital of the enterprise

EC_1, LC_1 = Volumes of the necessary equity and loan capital for financing the fixed assets reproduction

D_0, D_1 = Available and additional volumes of depreciation expenses before and after financing the fixed assets reproduction

P_{net} = Net profit

$EBIT_{repr}$ = Earnings before interest and taxes after financing the fixed assets reproduction

TC = Amount of total capital (equity and loan) capital after financing the fixed assets reproduction

At carrying-out of the fixed assets reproducing the choice of financing structure can be realized on the base of maximization of the P_f index. Dependence of P_f on P_e and SFR can be observed by Eq. 11:

$$\begin{aligned} P_f &= (EBIT_{repr} - IC - PT + D)/EC = \{(1 - RCT) \times \\ &\quad [P_e \times (EC + LC) - r \times LC] - r_c \times LC\}/ \\ &\quad EC = (1 - RCT) \times P_e + [(1 - RCT) \times \\ &\quad (P_e - r) - r_c] \times LC/EC \end{aligned} \quad (11)$$

Where:

IC = Interest on loan funds

PT = Profit tax expenses

RCT = Profit Tax Rate

r = The weighted average interest rate of raised funds, the interest of which can be recognized as costs

r_c = The weighted average interest rate of raised funds, the interest of which can't be recognized as costs

At calculating financial return, it is necessary to distinguish the volume of equity and loan funds for financing the fixed assets reproduction:

$$\begin{aligned} P_f = (1 - RCT) \times P_e + [(1 - RCT) \times (P_e - r) - r_c] \times \\ [(LC_0 + LC_1)/(EC_0 + EC_1)] \end{aligned} \quad (12)$$

The average interest rate in this case should be calculated for the whole loan funds (available+raised for reproduction of fixed assets).

Equation 12 of dependence of financial profitability on economic illustrates the financial leverage effect. The effect characterizes the limit to which the efficiency of an

enterprise can be improved by borrowing funds at financing the fixed assets reproduction. If the general level of investment profitability, before interest charges, is higher than the interest rate by loan funds then the financial leverage would improve the financial profitability of equity capital. And on the contrary, if the investment profitability would be lower that the interest rate, the financial leverage would lower the level of efficiency of equity capital. So, it is reasonable to select the structure of funds for financing the fixed assets reproduction at which the maximum level of financial profitability is achieved.

At the next stage on the basis of calculations, carried out at the previous stages, the methods of financing the fixed assets reproduction are determined. At this stage it's necessary to carry out the calculation of the aggregate cost of the capital for each method of financing (Chechenina, 2014).

Determining the comparative efficiency of methods of fixed assets reproducing and determining resource and technical feasibility should also be carried out on the basis of the certain criteria. As the criteria, there are used such indices as:

- Minimum cost per unit of product (works, services) produced by means of fixed assets before depreciation expenses
- Maximum profitability of fixed assets
- Minimum purchase costs and maintaining expenses
- Maximum profit
- Maximum net present value (Avilova *et al*., 2013)
- Maximum additional cashflow
- Minimum cost of capital invested to fixed assets reproduction
- Minimum consumption cost of fixed assets

Criteria of choosing methods of the fixed assets reproduction and indices, determining their essence, are presented according to relevance degree, given the stage of organization's life cycle (Table 2). In the cells to the right there is presented the degree of relevance of this index at the given stage:

- The most relevant criterion (A)
- Moderately relevant criterion (B)
- The least relevant criterion (C)

Using the mentioned criteria of selecting methods of fixed assets reproduction combines two approaches:

- Criterion is the minimum of the aggregated costs of purchasing and maintaining of the fixed assets (Sharapova *et al*., 2014)
- Criterion is the maximum of the aggregated profitability of the fixed assets (Avilova *et al*., 2014)

Methodologically, at selecting the method of fixed assets reproduction the most interesting is calculation of consumption cost of fixed assets depending on methods of their reproducing. Consumption cost of fixed assets can be calculated as follows:

- At buying new equipment CC_{new}

$$C_{new} = C_{new} + \sum_{t=0}^{n}\left(FE_{new} + SS_{new} + SR_{new} + O_{new} + T\right) \times \frac{1}{(1+E)^{t}} - D \times \frac{1}{(1+E)^{t}} \quad (13)$$

- At carrying out modernization CC_{mod}

$$C_{mod} = C_{mod} + \sum_{t=0}^{n}\left(FE_{mod} + SS_{mod} + SR_{mod} + O_{mod} + T\right) \times \frac{1}{(1+E)^{t}} - D \times \frac{1}{(1+E)^{t}} \quad (14)$$

Table 2: Criteria of selecting method of fixed assets reproduction depending on the stage of enterprise life cycle

Indices	Criterion of selecting method of reproducing the organization's fixed assets	Relevance degree of a criterion depending on the stage of enterprise life cycle			
		Introduction	Growth	Maturity	Decline
Cost per unit of product (works, services), produced by means of fixed assets before depreciation expenses	Minimum value	A	B	B	C
Profitability of fixed assets	Maximum value	A	B	B	A
Purchase costs and maintaining expenses	Minimum value	C	A	B	C
Profit	Maximum value	C	A	B	C
Net present value	Maximum value	B	B	A	B
Additional cashflow	Maximum value	C	B	A	C
Cost of capital invested to fixed assets reproduction	Minimum value	A	B	B	C
Consumption cost of fixed assets	Minimum value	C	B	A	C
Calculated efficiency rate	Minimum value	C	B	A	C

- At carrying out capital repairs CC_{rep}:

$$C_{rep} = C_{rep} + \sum_{t=0}^{n} \left(\begin{matrix} FE_{rep} + SS_{rep} + \\ SR_{rep} + O_{rep} + T \end{matrix} \right) \times \frac{1}{(1+E)^t} - D \times \frac{1}{(1+E)^t} \quad (15)$$

Where:

C_{new}, C_{mod},

C_{rep} = Costs purchasing new, modernization of worn-out and out-of-date and capital repair of equipment, respectively

D = Volume of depreciation expenses

T = Amount of tax expenses at performing fixed assets reproduction (property tax, profit tax)

FE_{new}, FE_{mod},

FE_{rep} = Cost of fuel and energy resources, connected with maintenance of new equipment, equipment after its modernization, equipment after its capital repair during the useful life respectively

SS_{new}, SS_{mod},

SS_{rep} = Salary and social security contribution of staff maintaining the new equipment, equipment after its modernization, equipment after its capital repairs respectively during the useful life

SR_{new}, SR_{mod},

Sr_{rep} = Costs connected with scheduled and running repairs of new equipment, equipment after its modernization, equipment after its capital repairs during the useful life respectively

O_{new}, O_{mod},

O_{rep} = Other costs connected with maintaining the new equipment, equipment after its modernization, equipment after its capital repairs during the useful life, respectively

If the new equipment purchased within the fixed assets reproduction differs in productivity then the consumption cost of fixed assets should be determined per unit of product (works, services).

The fixed assets reproduction must be carried out by the method, at which the minimum consumption cost, cost-per-unit and reproduction costs are achieved. The criterion of selecting the method of the fixed assets reproduction is a state when specific discounted costs per unit are minimal at the unchanged productivity of fixed assets during useful life.

At calculating the additional cashflow the methods of fixed assets reproduction are compared and of all the methods the one which provides the largest increment in a long-run period with account of discounting is selected.

If according to the results of selecting the method of fixed assets reproduction the compared indices correspond to optimality values and financing sources are available, then the selection and realization of the most effective method seems appropriate. As each of the listed criteria is not enough for taking the optimal decision about selecting the method of fixed assets reproduction, than the management decision should be made taking into account all the listed criteria as well as aims and stages of enterprise life cycle.

Summary: The problems of optimal managing the reproduction of the fixed assets of an enterprise could be revealed with a help of proposed methodical toolkit. The methodology of economic substantiation of selecting method and sources of financing for reproducing fixed assets had developed. The general algorithm of methodology of economic substantiation of selecting method and sources of financing for reproducing fixed assets has been described in stages and criteria of economic substantiation of selecting method and sources of financing. The technique is easy to use and provides the optimization of costs for reproducing fixed assets taking into account material, labour and financial resources of an enterprise and level of competition in the industry.

CONCLUSION

The suggested methodology of choosing methods and sources of fixed assets reproduction, based on the alternative optimality criteria, reproduction variant and assessment of criteria relevance depending on the stage of enterprise life cycle, allows evaluating the economic efficiency of reproducing methods and optimizing the structure of sources of financing the fixed assets reproduction which contributes to the forming of additional cashflow of organizations.

Thus, the presented methodology makes it easier to select methods and sources of financing and by this provides the new opportunities for the effective management in fixed assets reproduction. Flexibility and a wide range of implementation of this methodology enables automation of decision making, minimization of costs for data searching and information processing.

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