

Digital compliance of the formation and management of the investment portfolio of a metallurgical holding

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Abstract — The relevance of the research topic is determined by the high importance of investment activity for the successful functioning of companies. Investment activity occupies an important place in the organization's business, since without it it becomes impossible not only to develop the company (increase production, enter new markets, etc.), but even maintain current positions in the long and medium term due to the constant increase in competition, the need to periodically make significant investments to replace failed equipment. The formation and implementation of investment policy should be approached by shareholders and company management as responsibly as possible, since the right policy can lead the company to the leaders of its industry and help to maintain this place for a long time, and an erroneous investment policy can put a successful company in the past on the brink of survival. to which there are many examples. The subject of this study is economic relations arising in the digital compliance process of the formation and management of the investment portfolio of a metallurgical holding.

Keywords — *financial profile of the project, investment portfolio, investment strategy.*

I. INTRODUCTION

Investment activity of an industrial enterprise is carried out through the implementation of investment projects consisting in technical re-equipment, modernization of production, and obtaining economic and social effect.

The term "Investment portfolio of an enterprise" was considered at different times by different researchers. Sukharev O.S., Shmanev S.V., Kuryanov A.M., Topsakhalova F.M-G., Kasyanenko T.G., Makhovikova G.A. in their studies they define an investment portfolio as a set of objects of real investment. Blank I.A. considers the investment portfolio as a set of investment instruments. Bocharov I.A. defines an investment portfolio as a set of real projects and programs.

According to the authors, the investment portfolio of enterprises in the real sector should be defined as a set of investment

projects that take into account industry specifics, the external environment, the internal corporate environment, and aimed at meeting the interests of the company's stakeholders.

In modern studies, the following features of the enterprises investment portfolio formation in the real sector of the economy are highlighted:

- 1) the significant impact of the investment portfolio on the amount of taxable profit and shareholder income;
- 2) the predominance in the portfolio of projects aimed at technical re-equipment;
- 3) enterprises make mainly real investments;
- 4) the need for a comprehensive analysis of projects and the presence of a high level of expertise of employees;
- 5) investment projects are implemented, as a rule, with borrowed funds.

According to the authors, the following should also be added to the above features of portfolio formation:

- 1) investment projects affect dependent industries;
- 2) investment projects affect the social environment;
- 3) the portfolio must be formed taking into account industry specifics, the external environment, the financial situation of the enterprise.

In modern literature, there are different views on the selection criteria for investment projects.

Chelmakina L.A. considers it necessary to use net discounted income for evaluating investment projects and offers to conduct selection taking into account the technical level of production and environmental safety. Zubov I.O. considers it necessary to use the level of investment risk and return on investment as a criterion for deciding whether to include a project in a portfolio. Bulgakova I.A. highlights the effectiveness of the resources raised and the minimization of risks as the main decision-making criteria. Sukharev O.S. draws attention to the

need for a synergistic effect of investment projects in the portfolio. Practical experience in managing an investment portfolio shows that this criterion can indeed be called one of the most important in the process of making investment decisions [18].

The authors understand the "investment strategy" of an industrial enterprise as part of the organization's management system, which solves the problem of creating and maintaining competitive advantages in order to satisfy the interests of the company's stakeholders.

The company's investment strategy should take into account the following:

- 1) industry development goals;
- 2) company development goals;
- 3) the presence and level of competencies of the structural unit managing investment activities;
- 4) the availability and level of regulatory documents governing investment activities;
- 5) criteria for making investment decisions;

The significance of investment activity is dictated by the following:

- 1) the importance of having a developed industry for the country's economy;
- 2) a large amount of capital investment;
- 3) a significant impact of industry on the environment.

The discussion of the formation and management of the investment portfolio problems at a Russian enterprise in the context of the digitalization of the Russian economy should be adequately reflected in scientific and applied research that reveals the theoretical and methodological aspects of financial activity.

A huge contribution to the formation of the domestic investment theory, used by the author in a scientific study of the economic nature and content of investment activity, was made by: Volchkova E.N., Turgueva A.A., Firsov D.A., Petrenova E.A., Savitskaya G.V.

The investment portfolio management of an industrial enterprise was reflected in the work of the scientific elite: Blau S.L., Nagoev A.B., Savin O.N., Kollegova E.O., Vdovina M.S. and others.

The diversity and significance of the theoretical and practical aspects of the investment portfolio formation and management require deepening of fundamental and applied research. This is quite relevant, since the active investment policy of the corporate sector of the economy has come to the fore in most subjects of economic relations, in this regard, the topic of the dissertation research, devoted to the development of the theory and practice of forming and managing the investment portfolio of an industrial enterprise, is relevant and of great practical importance, as for the national economy, and for an individual business entity.

II. MATERIALS AND METHODS

The company should formulate its investment strategy depending on the stage of development at which it is located. A variant of this relationship is given in table 1.

TABLE I. THE DEPENDENCE OF THE REAL ENTERPRISE INVESTMENT STRATEGY DIRECTION ON THE DEVELOPMENT STAGE

Development stage	Target Type		
	<i>The main goal of the overall development strategy</i>	<i>The main goal of current activities</i>	<i>The main objective of the investment strategy</i>
Occurrence	access to the market	survival	sufficient initial investment
Survival	market consolidation	breakeven	completion of initial investment
Self-sufficiency	increase in market share	profit margin	new investment phase to increase market share
Self-financing	Product diversification	profit growth	new investment phase to ensure diversification
Height	Industry diversification	balanced profit growth	providing the necessary technical re-equipment
Value creation	stable performance	ensuring the required profit, sustainability	maintaining the required level of production
Update	company quality growth	ensuring shareholder value	large-scale investment

Well-established enterprises have in their portfolio a sufficient number of various projects that are at different stages. In order to conduct successful investment activities, each project must be thoroughly worked out, monitored during implementation and conclusions drawn upon its completion. An investment project has unique features, however, any project goes through the same standardized stages in its implementation.

The completion of the phase is the commissioning of the equipment complex. The operation phase consists in monitoring the achievement of project targets. The performance and quality of equipment are evaluated; regulated production process. The operation phase starts from the moment the complex of equipment is put into operation and goes into operational activities.

The stage of project closure is primarily necessary for learning lessons, processing information that will be useful in the future and will help to avoid the repetition of mistakes made in the investment activities of the enterprise based on the implementation of this project. For these purposes, a comprehensive review is carried out and an assessment of the conformity of the set and achieved goals is given; analyzed factors that led to inconsistencies; an audit of the implementation of the investment project is carried out; an information base is compiled that systematizes the experience of the economic feasibility of investment projects for further use in the investment activities of the company. Also, at the stage of project closure, production tasks are solved: possible negative consequences of the project are eliminated; reoriented or liquidated production.

III. RESULTS

The objects of research are the Nizhny Tagil Metallurgical Combine and the Kachkanar Mining and Processing Plant.

An investment portfolio may contain projects that correlate in different ways. In this case, it is necessary to mention the dependence or independence between investment projects included in the portfolio of the enterprise.

The uncertainty of the future parameter values on which the successful implementation of investment projects depends, necessitates taking into account and measuring the risks arising from the implementation of the project. Furthermore, in the process of managing a portfolio of real investments, any enterprise has to solve the problem of limited investment opportunities.

Investment projects are development projects or maintenance projects. It should be noted that when preparing materials

for the investment committee on maintenance projects, economic efficiency is not calculated as on development projects. The economic efficiency indicators of various options for their implementation can be compared with each other, but fundamentally for the project, performance indicators are not approved, since in any case the project will have to be implemented to maintain current production volumes.

At the metallurgical plant, projects are underway to expand steelmaking capacities, rolling capacities, improve the quality of rolled metal, increase its own generation of electricity, increase energy efficiency, and environmental projects. An example of an investment portfolio is shown in table 2.

TABLE II. INVESTMENT PORTFOLIO OF THE METALLURGICAL PLANT

No.	Directivity	Phase	Budget, m \$ with VAT	IRR, %	NPV, m \$	Type of project
1	Maintenance of iron smelting capacities	Summary	190.2	-	-	maintaining
2	Steelmaking Expansion	Options	168.1	24.1	132.4	development
3	Extension of rolling facilities 1	Implementation	225.7	22.8	176.1	development
4	Extension of rolling capacity 2	Engineering	47.9	14.6	29.7	development
5	Extension of rolling capacity 3	Options	3.3	78.4	10.1	development
6	Increase in own power generation 1	Options	58.7	28.4	67.7	development
7	Increase in own generation 2	Concept	18.2	24.3	21.0	development
8	Ecological project 1	Options	4.2	-	-	development
9	Ecological project 2	Engineering	1.1	-	-	development
Total			717.4		437.0	

As can be seen from Table 2, most of the investment projects at the metallurgical plant are development projects. Also, increased attention is paid to environmental projects. The company's investment portfolio is effective.

The graphs below show the distribution of the budget in the investment portfolio by phase and the distribution of projects by phase:

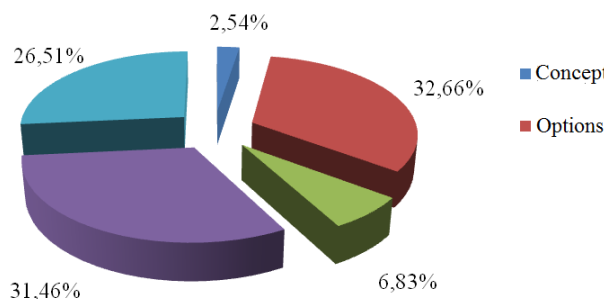


Fig. 1. Phase allocation of the total project budget

As can be seen from Figure 1, projects that are currently at the stage of implementation and debriefing have a total budget of more than half of the entire portfolio of projects.

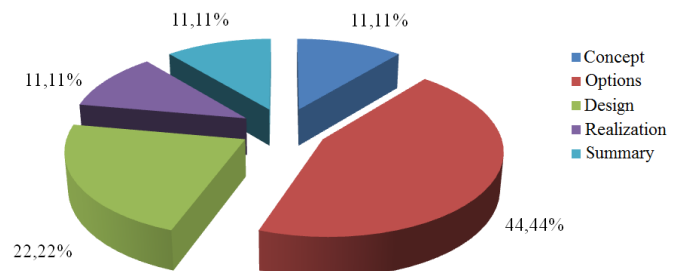


Fig. 2. Phase distribution of projects

As can be seen from Figure 2, most of the projects in the current investment portfolio of the metallurgical plant are in the phases of choosing options for implementation and design.

Consider the results of financial modeling of three investment projects from the portfolio of the metallurgical plant: a project aimed at expanding steelmaking capacities, a project aimed at expanding rolling capacities, a project aimed at increasing its own electricity generation.

Figure 3 shows an analysis of the financial results of the project aimed at expanding the rolling capacity.

ФИНАНСОВЫЕ РЕЗУЛЬТАТЫ		2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	TV
Δ Выручка	\$m	-	-	-	40,4	54,0	55,0	56,0	57,0	58,0	59,2	60,4	61,6	62,8	64,1	65,3	66,7	68,0	69,3	70,7	
Δ Себестоимость	\$m	-	-	-	5,8	24,3	24,4	24,4	24,5	24,6	24,6	24,7	24,8	24,9	25,0	25,1	25,2	25,3	25,4	25,5	
EBITDA эффект	\$m	-	-	-	34,6	38,8	39,8	40,7	41,6	42,6	43,7	44,8	45,9	47,1	48,2	49,4	50,6	51,8	53,1	54,3	
Рост	%		n/a	n/a	n/a	12,3%	2,4%	2,3%	2,3%	2,3%	2,6%	2,5%	2,5%	2,5%	2,5%	2,4%	2,4%	2,4%	2,4%	2,4%	
EBIT эффект	\$m	-	-	-	34,6	29,7	30,6	31,6	32,5	33,5	34,5	35,7	36,8	37,9	39,1	40,3	41,5	42,7	44,0	45,2	
Проценты к уплате		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Налог на прибыль		-	-	-	(6,9)	(5,9)	(6,1)	(6,3)	(6,5)	(6,7)	(6,9)	(7,1)	(7,4)	(7,6)	(7,8)	(8,1)	(8,3)	(8,5)	(8,8)	(9,0)	
Δ Чистая прибыль	\$m	-	-	-	27,7	23,8	24,5	25,3	26,0	26,8	27,6	28,5	29,4	30,3	31,3	32,2	33,2	34,2	35,2	36,2	
Рост	%		n/a	n/a	n/a	-14,1%	3,1%	3,0%	3,0%	2,9%	3,3%	3,2%	3,2%	3,1%	3,1%	3,0%	3,0%	3,0%	2,9%	2,9%	
Сарех (Кап. затраты)	\$m	(0,1)	(19,4)	(120,5)	(28,1)	-	-	-	-	-	-	-	-	-	-	-	-	-	(50,4)	(5,0)	
Инвестиционные затраты		(0,1)	(19,4)	(120,5)	(28,1)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
в т.ч. в составе орех		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Δ Прочие инв. затраты		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(50,4)	(5,0)	
Δ NWC (Δ Чистый рабочий капитал)	\$m	-	3,9	22,7	0,6	(1,4)	(0,1)	(0,1)	(0,1)	(0,1)	(0,1)	(0,1)	(0,1)	(0,1)	(0,1)	(0,1)	(0,1)	(0,1)	(0,1)	(0,1)	
Своб. ден. поток (без фин. рычага)	\$m	(0,1)	(15,6)	(97,8)	0,2	31,5	33,5	34,3	35,0	35,8	36,6	37,5	38,4	39,3	40,3	41,2	42,2	43,2	(6,3)	40,1	413,1

Fig. 3 Analysis of the financial results of the project aimed at expanding the rolling capacity

The projected effect of the project in terms of EBITDA in the first full year of the effect is \$ 38.8 m.

Figure 4 shows the financial profile of the project aimed at expanding the rolling capacity.

The NPV of the project will be 132.4 m \$, IRR 24.1%.

IV. DISCUSSION

Figure 5 shows an analysis of the sensitivity of the project aimed at expanding the rolling capacity to a change in a number of parameters.

The project is sensitive to budget changes.

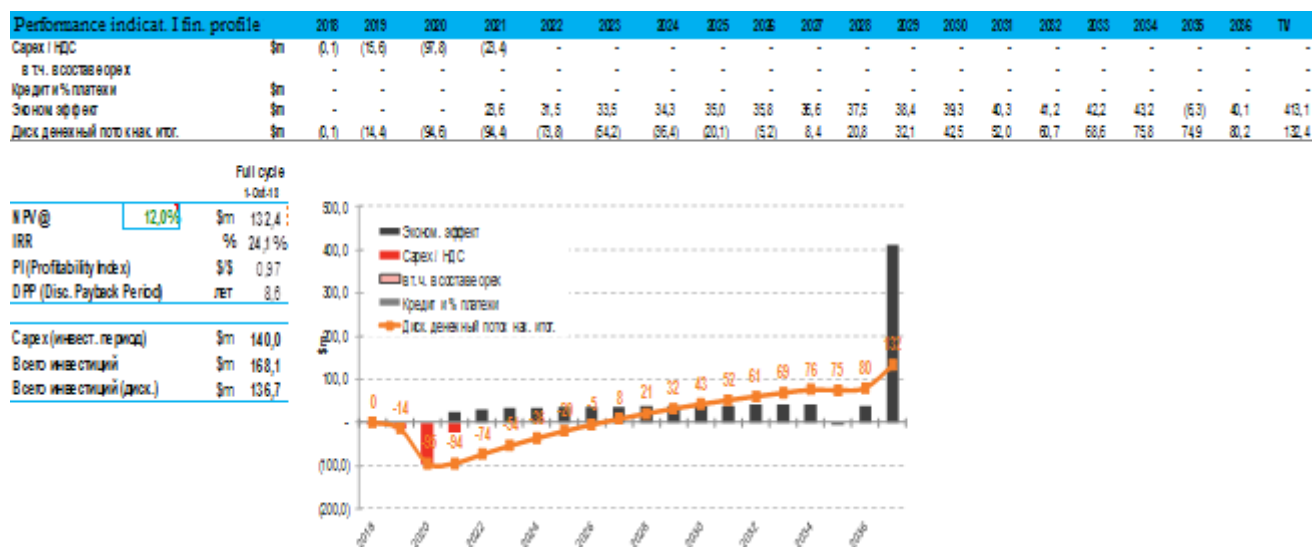


Fig. 4. Financial profile of the project aimed at expanding rolling facilities

Indicator	Deviation of Investments from the plan					
	-25,5%	-10,0%	0,0%	4,6%	50,0%	91,6%
NPV@ 12% \$m	180,2	143,3	132,4	127,4	77,8	32,8
IRR, %	31,6%	28,6%	24,1%	23,2%	18,8%	13,8%
PI, \$/\$	1,57	1,16	0,97	0,89	0,38	0,12
DPP, лет	6,7	7,8	8,6	9,0	13,7	23,4
Инв., \$m	126,3	161,3	188,1	176,8	262,2	322,1

Indicator	P cost deviation					
	-100,0%	-10,0%	0,0%	10,0%	164,2%	231,4%
NPV@ 12% \$m	181,8	137,3	132,4	127,4	61,0	17,7
IRR, %	28,0%	24,6%	24,1%	23,7%	17,1%	13,8%
PI, \$/\$	1,33	1,00	0,97	0,93	0,37	0,13
DPP, лет	7,5	8,5	8,6	8,7	12,9	21,7
П.затраты	-	7,3	8,1	8,8	21,4	28,8

Fig. 5. Sensitivity analysis of an expansion project aimed at rolling facilities. The project is sensitive to budget changes.

Figure 6 shows an analysis of the financial results of the project aimed at expanding steelmaking capacities.

The projected projected effect in terms of EBITDA in the first full year of the effect is \$ 31.8

Figure 7 shows the financial profile of the project aimed at

Financial result		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	TV
Δ Выручка	\$m	-	-	-	-	-	(9,8)	41,3	54,6	82,4	84,0	85,6	87,1	88,7	90,4	92,0	93,7	95,4	97,2	99,0	
Δ Себестоимость	\$m	-	-	-	-	-	6,8	25,0	25,0	23,4	23,1	22,9	22,6	22,4	22,2	21,9	21,7	21,5	21,2	7,4	
EBITDA эффект	\$m	-	-	-	-	-	(16,6)	31,8	45,1	74,6	76,4	78,2	80,0	81,8	83,7	85,6	87,5	89,5	91,5	91,6	
Рост	%	-	n/a	n/a	n/a	n/a	n/a	-291,2%	41,8%	65,4%	2,4%	2,3%	2,3%	2,3%	2,3%	2,3%	2,3%	2,2%	2,2%	0,2%	
EBIT эффект	\$m	-	-	-	-	-	(16,6)	16,3	28,6	59,1	60,9	62,7	64,5	66,3	68,2	70,1	72,0	74,0	76,0	91,6	
Проценты к уплате	\$m	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Налог на прибыль	\$m	-	-	-	-	-	3,3	(3,3)	(5,9)	(11,8)	(12,2)	(12,5)	(12,9)	(13,3)	(13,6)	(14,0)	(14,4)	(14,8)	(15,2)	(18,3)	
Δ Чистая прибыль	\$m	-	-	-	-	-	(13,3)	13,0	23,7	47,3	48,7	50,1	51,6	53,1	54,5	56,1	57,6	59,2	60,8	73,3	
Рост	%	-	n/a	n/a	n/a	n/a	n/a	-197,9%	81,8%	99,6%	3,1%	2,9%	2,9%	2,9%	2,8%	2,8%	2,7%	2,7%	2,7%	20,6%	
Сверх (Кап. затраты)	\$m	(0,0)	(0,1)	(8,3)	(26,4)	(133,3)	(43,1)	(11,5)	-	-	-	-	-	-	-	-	-	-	(18,6)	(3,7)	
Инвестиционные затраты в т.ч. в составе охр.	\$m	(0,0)	(0,1)	(8,3)	(26,4)	(133,3)	(43,1)	(11,5)	-	-	-	-	-	-	-	-	-	-	-	-	
Δ Прочие инв. затраты	\$m	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(18,6)	(3,7)	
Δ NWC (Δ Чистый рабочий капитал)	\$m	-	0,0	0,5	3,6	31,6	4,1	(4,3)	(1,3)	(2,8)	(0,2)	(0,2)	(0,2)	(0,2)	(0,2)	(0,2)	(0,2)	(0,2)	(0,2)	(0,2)	
Своб. ден. поток (без фин. рычагов)	\$m	(0,0)	(0,1)	(8,7)	(22,8)	(103,7)	(52,3)	12,7	37,8	60,0	64,0	65,5	66,9	68,4	69,9	71,4	72,9	74,5	76,1	69,4	748,3

Fig. 6. Analysis of the financial results of the project aimed at expanding steelmaking capacities

Performance indicat. I fin. profile		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	TV
Сверх / НДС в т.ч. в составе охр.	\$m	(0,0)	(0,1)	(8,7)	(22,8)	(103,7)	(40,0)	(10,7)	-	-	-	-	-	-	-	-	-	-	-	-	-
Кредит и % платежи	\$m	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Эконом. эффект	\$m	-	-	-	-	-	(12,3)	23,4	37,8	60,0	64,0	65,5	66,9	68,4	69,9	71,4	72,9	74,5	76,1	69,4	748,3
Диск. денежный поток на к. итог.	\$m	(0,0)	(0,1)	(8,7)	(22,8)	(103,7)	(119,3)	(112,8)	95,6	171,3	148,1	136,9	127,6	119,0	110,4	101,8	93,2	84,6	76,0	67,4	176,1

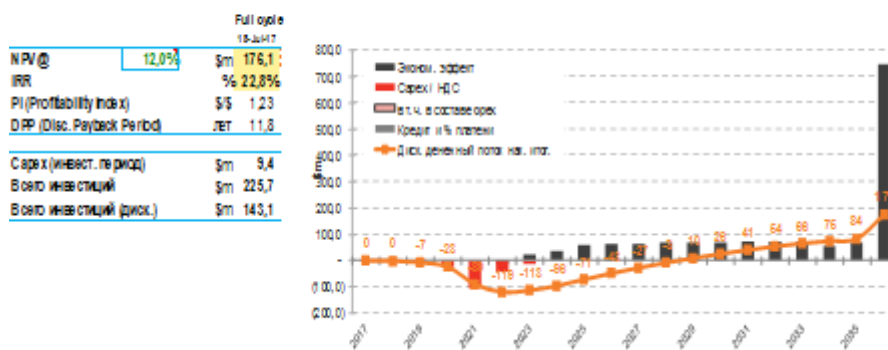


Fig. 7. Financial profile of the project aimed at expanding steelmaking capacities

The NPV of the project will be 176.1 m \$, IRR 22.8%.

Figure 8 shows an analysis of the sensitivity of a project

aimed at expanding steelmaking capacities to a number of parameters.

Indicator	Deviation of Investments from the plan					
	-10,0%	0,0%	10,0%	20,0%	30,0%	40,0%
NPV@12%, \$m	187,6	176,1	164,6	153,1	141,6	130,0
IRR, %	24,5%	22,8%	21,4%	20,2%	19,1%	18,1%
PI, \$/\$	1,46	1,23	1,05	0,89	0,76	0,65
DPP, лет	11,2	11,8	12,5	13,2	14,0	14,8
Инв., \$m	203,1	225,7	248,3	270,9	293,4	316,0

Indicator	The deviation of the timing of the commissioning of the plan					
	2024	2025	2026	2027	2028	2029
	0	1	2	3	4	5
NPV@12%, \$m	176,1	141,9	111,4	84,1	59,8	38,0

Fig. 8. Sensitivity analysis of a project aimed at expanding steelmaking capacities

The project is sensitive to budget changes.

Figure 9 shows an analysis of the financial results of the

project aimed at increasing its own electricity generation.

Financial result	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	TV
Δ Выручка	\$m	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Δ Себестоимость	\$m	-	-	-	(11,7)	(11,6)	(12,0)	(12,4)	(12,8)	(13,2)	(13,6)	(14,0)	(14,4)	(14,9)	(15,3)	(15,7)	(16,2)	(16,6)	(17,1)	(17,6)
EBITDA эффект	\$m	-	-	-	11,7	14,9	15,3	15,6	16,0	16,5	16,9	17,3	17,7	18,1	18,6	19,0	19,4	19,9	20,4	20,8
Рост	%	-	н/д	н/д	н/д	27,1%	2,0%	2,0%	2,5%	2,5%	2,5%	2,4%	2,4%	2,4%	2,4%	2,3%	2,3%	2,3%	2,3%	2,3%
EBIT эффект	\$m	-	-	-	11,7	11,6	12,0	12,4	12,8	13,2	13,6	14,0	14,4	14,9	15,3	15,7	16,2	16,6	17,1	17,6
Проценты к уплате	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Налоги на прибыль	-	-	-	-	(2,3)	(2,3)	(2,4)	(2,5)	(2,6)	(2,6)	(2,7)	(2,8)	(2,9)	(3,0)	(3,1)	(3,2)	(3,3)	(3,4)	(3,5)	(3,5)
Δ Чистая прибыль	\$m	-	-	-	9,4	9,3	9,6	9,9	10,2	10,6	10,9	11,2	11,6	11,9	12,2	12,6	13,0	13,3	13,7	14,1
Рост	%	-	н/д	н/д	н/д	-0,6%	3,3%	3,3%	3,2%	3,2%	3,1%	3,1%	3,0%	3,0%	2,9%	2,9%	2,9%	2,9%	2,9%	2,7%
Capex (Кап. затраты)	\$m	(0,1)	(9,6)	(30,9)	(16,5)	-	1,5	1,4	1,5	-	1,6	1,6	1,6	-	1,7	1,7	1,7	-	0,5	1,3
Инвестиционные затраты в т.ч. в состав факс	-	(0,1)	(9,6)	(30,9)	(16,1)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Δ Прочие инв. затраты	-	-	-	-	1,6	-	1,5	1,4	1,5	-	1,6	1,6	1,6	-	1,7	1,7	1,7	-	0,5	1,3
Δ NWC (Δ Чистый рабочий капитал)	\$m	0,0	1,2	5,1	3,5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Свободный поток (без фин. рычагов)	\$m	(0,1)	(8,5)	(25,8)	(4,6)	12,5	14,3	14,6	15,0	15,8	15,7	16,0	16,4	16,5	17,2	17,5	17,9	18,6	18,6	20,2

Fig. 9. Analysis of the financial results of the project aimed at increasing its own electricity generation

The projected effect of the project in terms of EBITDA in the first full year of the effect is \$ 14.9 m.

Figure 10 shows the financial profile of the project aimed at increasing its own electricity generation.

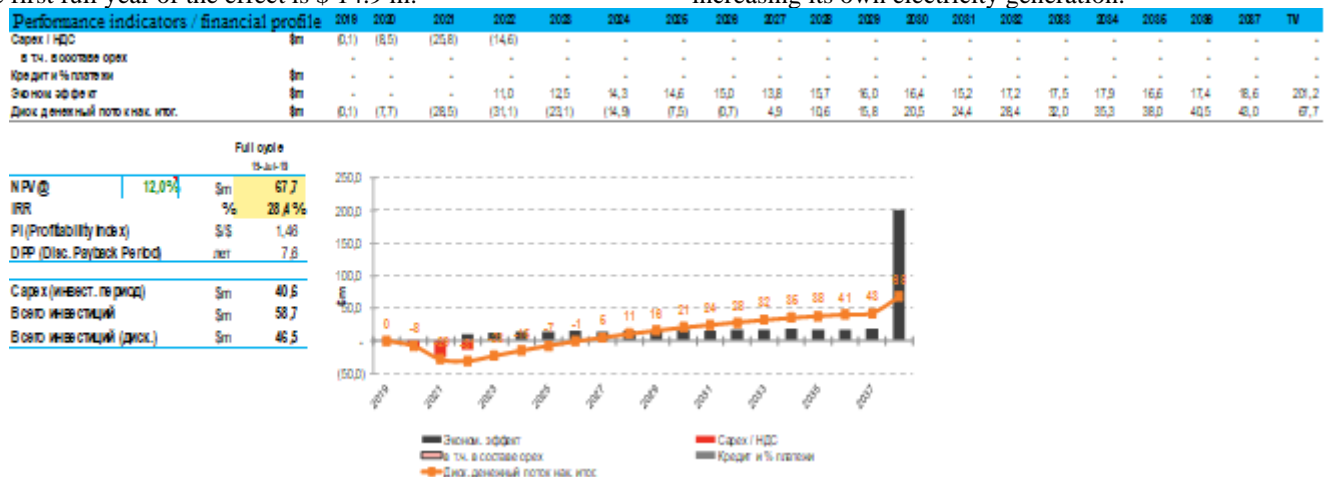


Fig. 10. The financial profile of the project aimed at increasing its own generation of electricity NPV project will be \$ 67.7 m, IRR 28.4%.

Figure 11 shows an analysis of the sensitivity of the project, aimed at increasing its own generation of electricity, to a number of parameters.

generation

The project is sensitive to changes in the budget and is not sensitive to deviations of the forecast cost.

At the mining and processing plant, projects are being implemented to maintain the production of iron ore raw materials, to maintain the operability of the tailings, to improve the quality of the concentrate, energy efficiency projects, and projects aimed at reducing transaction costs. An example of an investment project is given in Table 3.

Indicator	Deviation of investments from the plan					
	-10,0%	0,0%	10,0%	25,0%	50,0%	125,6%
NPV@12% \$m	71,5	67,7	63,9	58,2	48,7	20,0
IRR, %	31,2%	28,4%	28,1%	23,3%	19,9%	14,2%
PI, \$/\$	1,71	1,46	1,25	1,00	0,70	0,19
DPP, лет	6,9	7,6	8,3	9,3	11,3	21,2
Инв., \$m	62,8	68,7	84,5	73,3	88,0	132,4
Инв. млн. руб.	3 687	4 108	4 619	5 135	5 182	9 288

Indicator	Deviation cost (with the real world. inv. project's)					
	-10,0%	-5,0%	0,0%	10,0%	20,0%	30,0%
NPV@12% \$m	68,0	82,8	87,7	77,5	87,3	87,0
IRR, %	28,1%	27,3%	28,4%	30,7%	33,1%	36,3%
PI, \$/\$	1,25	1,35	1,46	1,67	1,88	2,09
DPP, лет	8,3	7,9	7,6	7,0	6,6	6,3

Indicator	The deviation of the timing of the commissioning of the plan					
	2023	2024	2025	2026	2027	2028
NPV@12% \$m	0	1	2	3	4	5
	87,7	85,5	44,8	34,8	28,1	18,3

Fig. 11. Sensitivity analysis of a project aimed at increasing its own electricity

TABLE I III. MINING AND PROCESSING PLANT INVESTMENT PORTFOLIO

N o	Directivity	Phase	Budget, m \$ with VAT	IRR, %	NPV, m \$	Type of project
1	Increase in production	Implementation	110.6	44.5	170.4	development
2	Maintenance of the tailings	Engineering	34.1	-	-	maintaining
3	Improving the quality of the concentrate	Concept	5.7	34.4	7.2	development
4	Lower transaction costs 1	Concept	4.5	22.8	4.8	development
5	Lower transaction costs 2	Options	2.1	43.5	4.4	development
6	Increase energy efficiency	Options	19.3	22.7	7.2	development
Total			176.3		194.0	

As can be seen from Table 3, most investment projects at the mining and processing plant are development projects. Increased attention is paid to projects aimed at reducing the cost of production. The company's investment portfolio is effective.

The graphs below show the distribution of the budget in the investment portfolio by phase and the distribution of projects by phase:

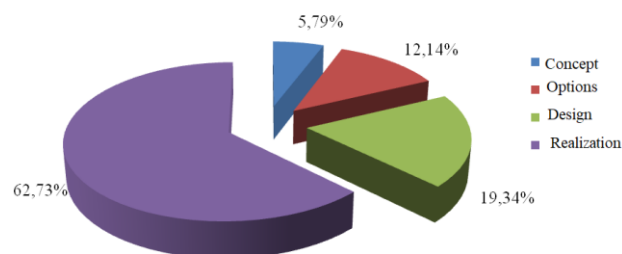


Fig. 12. Phase allocation of the total project portfolio budget

As can be seen from Figure 12, projects that are currently at the stage of implementation and design have a total budget of more than half of the entire portfolio of projects.

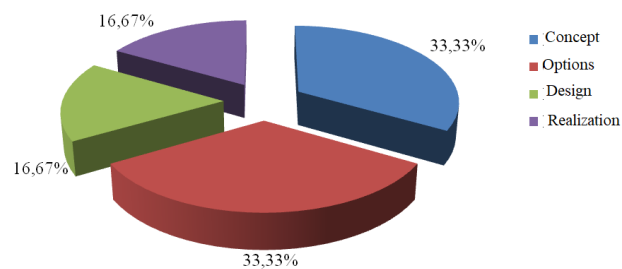


Fig. 13. Phase distribution of projects

As can be seen from Figure 13, most of the projects in the current investment portfolio of the mining and processing enterprise are in the phases of choosing implementation options and defining a concept.

Consider the results of financial modeling of two investment projects from the portfolio of the mining and processing plant: a project aimed at increasing production volumes, a project aimed at improving energy efficiency.

Figure 14 shows an analysis of the financial results of the project aimed at increasing the production of iron ore.

Financial result	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	Tv
Δ Выручка	\$m	-	-	31.9	80.7	101.8	132.3	130.7	151.2	153.0	135.5	138.2	141.0	143.8	146.7	149.6	152.6	
Δ Себестоимость	\$m	4.5	6.4	23.5	43.6	55.6	88.1	71.7	74.0	77.1	78.7	82.9	85.2	88.1	84.0	83.1	84.8	86.5
Δ SGCA (Финанс. и адм. расходы)		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EBITDA эффект	\$m	(4.5)	(5.8)	11.8	42.2	52.1	70.0	64.7	62.2	61.4	60.7	61.0	61.0	62.3	63.5	64.8	66.1	
Рост	%		28.1%	-305.2%	257.1%	23.4%	34.4%	-7.0%	0.1%	-4.0%	-1.2%	0.0%	-0.1%	2.1%	2.0%	2.0%	2.0%	
EBIT эффект	\$m	(4.5)	(6.4)	8.4	37.1	45.3	60.2	55.6	54.1	53.3	52.6	53.0	52.9	53.8	53.5	54.8	56.1	
Проценты к уплате																		
Налог на прибыль		0.9	1.3	(1.7)	(7.4)	(8.3)	(12.8)	(11.3)	(11.3)	(10.8)	(10.7)	(10.5)	(10.6)	(10.6)	(12.0)	(12.7)	(13.0)	(13.2)
Δ Чистая прибыль	\$m	(3.6)	(5.1)	6.7	29.7	37.0	50.5	45.3	43.3	42.7	42.1	42.4	42.3	47.8	50.8	51.8	52.9	
Рост	%		-41.8%	-332.2%	340.1%	24.7%	35.5%	-10.4%	0.1%	-4.5%	-1.4%	-1.4%	0.7%	1.1%	0.3%	0.3%	2.0%	
Средств (Нач. затраты)	\$m	(11.9)	(39.0)	(22.1)	(8.8)	(13.2)	(15.5)	-	(0.2)	(13.8)	(4.4)	(13.8)	-	-	-	-	(5.8)	
Инвестиционные затраты		(11.9)	(39.0)	(22.1)	(8.8)	(13.2)	(15.5)	-	-	-	-	-	-	-	-	-	-	
в том, в составе средств		(4.5)	(5.8)	(1.6)	(0.4)	(0.6)	(0.7)	-	-	-	-	-	-	-	-	-	-	
Δ Прочие инв. затраты		-	-	-	-	-	-	-	(0.2)	(13.8)	(4.4)	(13.8)	-	-	-	-	(5.8)	
Δ NWC (Δ Чистый рабочий капитал)	\$m	1.2	5.6	0.2	(0.5)	(0.0)	(0.9)	0.5	(0.2)	(0.0)	(0.2)	(0.3)	-	(0.3)	(0.3)	(0.3)	(0.3)	15.26
Свобод. денеж. поток (без фин. рычагов)	\$m	(9.8)	(32.2)	(10.1)	22.8	30.2	42.0	38.9	38.2	48.1	36.7	45.5	36.6	50.1	50.0	50.5	47.0	15.26

Fig.14. Analysis of the financial results of the project aimed at increasing production volumes

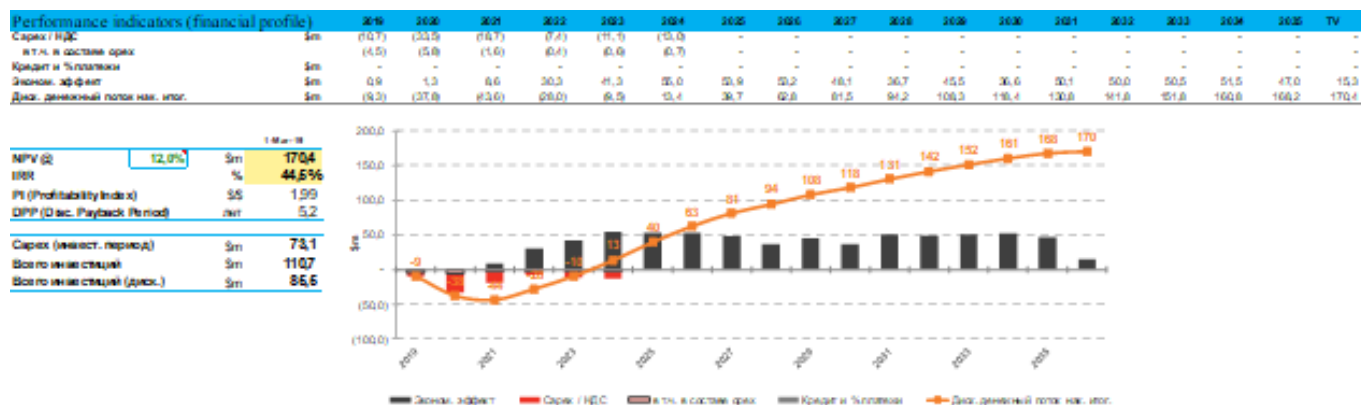


Fig. 15. Financial profile of the project aimed at increasing production volumes

The NPV of the project will be \$ 170.4 m, IRR 44.5%.

Figure 16 shows an analysis of the sensitivity of the project, aimed at increasing the production of iron ore.

Indicator	Deviation of investment from the plan					
	-10.0%	0.0%	10.0%	20.0%	30.0%	251.7%
NPV@12% \$	177,2	170,4	183,7	168,8	150,1	0,0
IRR, %	48,8%	44,5%	41,1%	38,1%	35,6%	12,0%
PI, \$/\$	2,30	1,99	1,74	1,53	1,35	0,00
DPP, лет	4,9	5,2	5,5	5,8	6,1	16,8
Инв., \$m	98,8	110,7	121,7	132,8	143,8	388,2

Indicator	Deviation cost (with the real world. inv. project's)					
себестоимос руб. тн	2 620	1 861	1 692	1 522	1 438	1 353
	54,9%	10,0%	0,0%	-10,0%	-15,0%	-20,0%
NPV@12% \$	(0,0)	138,4	170,4	201,6	217,0	232,8
IRR, %	12,0%	38,6%	44,5%	48,6%	52,0%	54,4%
PI, \$/\$	(0,00)	1,63	1,99	2,36	2,54	2,72
DPP, лет	16,8	5,6	5,2	4,9	4,7	4,6

Indicator	Deviation cost (with the real world. inv. project's)					
	2026	2028	2027	2028	2029	2030
NPV@12% \$	0	1	2	3	4	6
	170,4	143,0	118,6	88,7	77,2	68,7

Fig. 16. Sensitivity analysis of a project aimed at increasing production volumes

The project is sensitive to changes in the budget and deviations in the estimated cost.

Figure 17 shows an analysis of the financial results of the project aimed at improving the energy efficiency of the enterprise.

Financial result	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	TV
Δ Выручка	\$m	-	-	-	1,9	5,5	7,1	8,7	8,9	9,1	9,3	9,5	9,7	9,9
Δ Себестоимость	\$m	-	-	-	1,2	4,0	4,1	4,1	4,1	4,1	4,1	4,1	4,1	4,1
Δ SGA(Комм. и адм. расходы)		-	-	-	-	-	-	-	-	-	-	-	-	-
EBITDA эффект	\$m	-	-	-	0,7	3,3	4,8	6,4	6,8	6,8	6,9	7,1	7,3	7,5
Рост	%		н/д	н/д	н/д	377,8%	45,3%	34,5%	2,7%	2,0%	2,0%	2,0%	2,0%	2,5%
EBIT эффект	\$m	-	-	-	0,7	1,5	3,0	4,6	4,8	5,0	5,2	5,3	5,5	5,7
Проценты к уплате		-	-	-	-	-	-	-	-	-	-	-	-	-
Налог на прибыль		-	-	-	(0,1)	(0,3)	(0,8)	(0,9)	(1,0)	(1,0)	(1,0)	(1,1)	(1,1)	(1,1)
Δ Чистая прибыль	\$m	-	-	-	0,6	1,2	2,4	3,7	3,8	4,0	4,1	4,3	4,4	4,6
Рост	%		н/д	н/д	н/д	117,0%	90,3%	55,1%	3,7%	3,0%	3,0%	3,5%	3,4%	3,4%
Средств (Кап. затраты)	\$m	(0,0)	(0,1)	(11,3)	(7,9)	-	-	-	-	-	-	-	-	-
Инвестиционные затраты в т.ч. в составе орок		(0,0)	(0,1)	(11,3)	(7,9)	-	-	-	-	-	-	-	-	-
Δ Прочие инв. затраты		-	-	-	-	-	-	-	-	-	-	-	-	-
Δ NWC (Δ Чистый рабочий капитал)	\$m	0,0	0,0	0,5	2,5	(0,4)	(0,2)	(0,2)	(0,0)	(0,0)	(0,0)	(0,0)	(0,0)	(0,0)
Своб. ден. поток (без фин. рычага)	\$m	(0,0)	(0,1)	(10,7)	(4,9)	2,6	4,0	5,3	5,6	5,8	5,9	6,0	6,2	6,3

Fig. 17. Analysis of the financial results of the project aimed at improving energy efficiency

The projected effect of the project in terms of EBITDA in the first full year of the effect is \$ 3.3 m.

Figure 18 shows the financial profile of the project aimed at improving the energy efficiency of the enterprise.

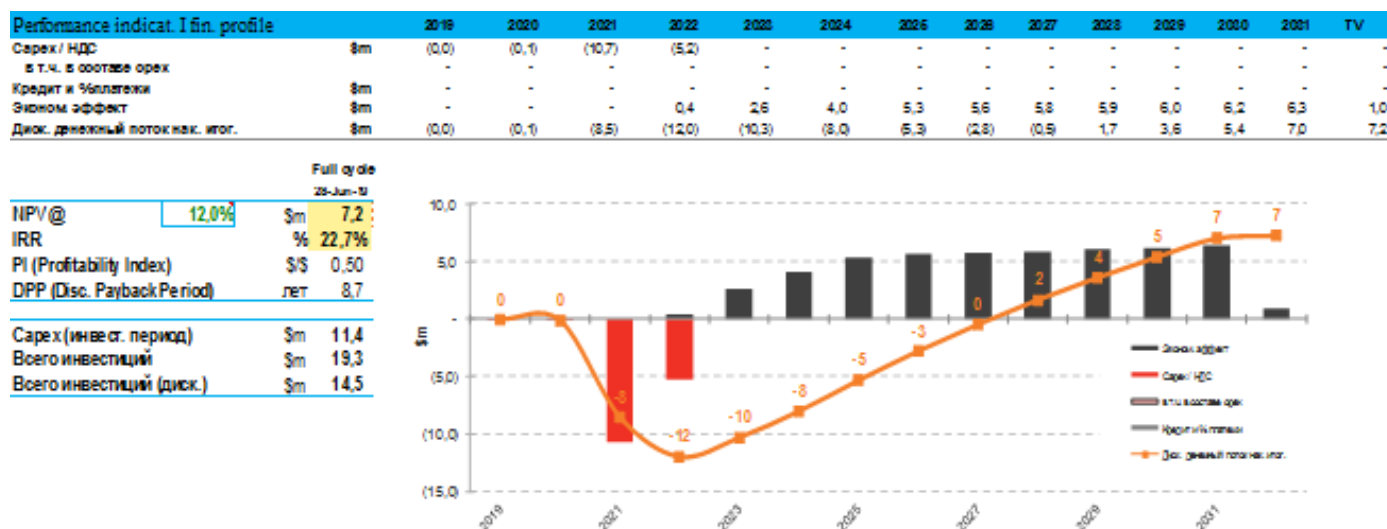


Fig. 18. Financial profile of the project aimed at improving energy efficiency

The NPV of the project will be 7.2 m \$, IRR 22.7%.

V. CONCLUSION

The scientific article analyzes the project management system used and the investment portfolio of the company. It is noted that the company uses modern management practices in its activities, however, there are ways to improve the efficiency of investment activities that are not currently in use. The classification of investment projects taking into account industry specifics is given, the project management tools are named, as well as tools for assessing the effectiveness of investments. Based on the analysis results, the following conclusions can be drawn:

- 1) at the enterprises modern management practices of the western type are used;
- 2) in many cases, the actual period for the implementation of projects exceeds the forecast when it is approved;
- 3) in projects aimed at the market, there is a decrease in the actual volume of sales relative to the forecast values;
- 4) in general, the investment portfolio of enterprises is effective, as it meets the requirements of shareholders for minimum returns.

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