Advanced Development Cost Planning Technologies for Development Work by Industry Enterprises

Igor E. Mizikovsky, Ekaterina P. Garina, Alexander P. Garin, Natalia S. Andryashina, and Elena V. Romanovskaya

Abstract

The increase in crisis phenomena catalyzed industry producers to conduct active measures to reduce the resources spent, primarily, not directly related to the production process. The pool of such resources includes design costs associated with the prospect of long-term ensuring the competitive advantages of business entities. Decisions to reduce them should be based on a highly validated information base, which should be formed by effective methods and methods of planning, accounting for costs, and calculating them. The aim of the paper is to structure a high-quality information field for managing the costs produced for the development work of machine-building enterprises. Achieving the goal involves solving a number of problems, including those related to the formation of the optimal nomenclature of cost items; justification of an adequate accounting and costing model for their processing and presentation of the results; institutionalization of the proposed information and tools in accounting practices of the researched enterprises. The research is based on methods related to the application of a systematic approach to techniques and methods for reflecting the costs of development work at a number of industrial enterprises in the Nizhny Novgorod region: monitoring, identification, measurement, description, decomposition, classification, and analysis. The nomenclature of development costs items proposed by the authors; justification of point-oriented accounting and costing model of their processing; updating the presentation forms of estimates and calculations; digital transformation of control planning and accounting function; identification of ways to institutionalize the proposed funds in accounting practices of the researched enterprises.

Keywords

Development costs • Cost accounting technologies • Resource savings • Mechanical engineering

JEL Code

O2 • O3

1 Introduction

The growth of crisis phenomena is noticeable in the economy of machine-building enterprises. So, at the studied enterprises engaged in the production of machinery and equipment in the Nizhny Novgorod region, the decline in production since the beginning of 2020, compared to the same period in 2019, exceeded more than 35%, which led to the implementation of an austerity policy, primarily aimed at reducing the volume of resources, the consumption process of which is not directly related to the production of final products., such as: for development work. The authors do not deny the need to optimize the costs of this class (Garin & Aiplatova, 2016; Garina et al., 2016; Mizikovsky, 2016). However, this involves many requirements, including measuring the visibility of the product design process; generating a transparent, maximally visualized information environment. Unfortunately, these requirements are often not met: accounting is carried out by imperfect "boiler" technology; costs are reflected in the composition of general economic or other production costs, minimizing the need for economically sound, approved items of development work costs and

I. E. Mizikovsky (✉)
Lobachevsky State University of Nizhni Novgorod, Nizhny Novgorod, Russia

E. P. Garina · A. P. Garin · N. S. Andryashina · E. V. Romanovskaya
Minin Nizhny Novgorod State Pedagogical University, Nizhny Novgorod, Russia
e-mail: natali_andr@bk.ru

E. V. Romanovskaya
e-mail: alenarom@list.ru

E. G. Popkova (ed.), *Business 4.0 as a Subject of the Digital Economy*,
Advances in Science, Technology & Innovation, https://doi.org/10.1007/978-3-030-90324-4_4

technologies for their accounting and costing processing (Kuznetsov et al., 2018). Meanwhile, this approach is contrary to the Regulation on Accounting "Accounting for expenses for research, development, and technological Works" (Order of the Ministry of Finance of Russia, 2020), which provides for the decomposition of costs for development work in the following articles:

- material costs and services of third-party organizations and people used in the execution of the specified works;
- costs of wages and other payments to employees directly employed in the performance of these works under the employment contract;
- social contributions;
- the cost of special equipment and special equipment intended for use as test and research objects;
- objects' amortization of fixed assets and intangible assets used in execution of specified works;
- costs of maintenance and operation of research equipment, installations and facilities, other fixed assets and other property;
- general economic expenses, if they are directly related to the execution of these works;
- other expenses.

The list items allow to keep a record of development costs and calculate the production cost of the product being made using two technologies—complete and reduced. The first consists of direct and indirect costs; the second can be structurally implemented by two options (Tolstykh & Shkarupeta, 2020):

1. By including direct costs.
2. Direct costs with a portion of the indirect costs (usually less the total business costs included in the period costs) (Total cost traditionally includes production and commercial costs, and production costs can be considered as reduced cost).

Direct cost accounting and calculation based on their cost of production is carried out by direct costing technology. Direct costs in the activity under consideration include "materials,… pay… experts …; costs of work performed by third-party organizations and enterprises, including experimental (experimental) enterprises on their own balance sheet and other costs associated with the fulfillment of specific contracts (orders)" (Osipov & Gorina, 2019).

The second version of the reduced cost model, implemented using the "Absorption costing" technology, involves a procedure for distributing indirect costs based on a measure that maximally affects their accumulation in the reporting period. The main approaches to solving the problem of choosing such an indicator suggest (Ministry of Science of the Russian Federation, 2020):

- In conditions where labor-intensive processes (manual labor) prevail in the production activity—direct labor costs should be chosen as the distribution base.
- With the dominance of material-intensive processes—direct material costs.
- For those industries where labor intensity and material intensity are equal—the total amount of direct expenses.
- With a significant share of overhead in total costs—revenue.

The cost of development work is written off to the products developed and launched into production, in a linear way or in proportion to the volume of its production (Garina et al., 2016). The first method "involves an even write-off of expenses… for development work within the time period established by the organization"; the second "provides that expenses are determined based on the quantitative indicator of the volume of production in the reporting period and the ratio of the total amount of expenses for specific development work and the entire estimated volume of products (services)" (Yu, 2018). "The period of write-off of expenses for the investigated works is determined by the organization independently based on the expected period of use of the obtained work results, during which the organization can receive economic benefits (income), but not more than 5 years" (Mizikovsky, et al., 2014). Write-off is possible when the work product could be demonstrated and/or put into production; otherwise the costs are related to other expenses.

The aim of the paper is to structure high-quality technologies for managing costs produced for the development work of machine-building enterprises, which achievement involves solving problems related to the formation of cost items; implementing of accounting and calculation technology of their processing and results presentation; institutionalization of funds in accounting practices of enterprises.

2 Materials and Method

The research outlined in this article is based on a systematic approach to the study of techniques and methods for reflecting the costs of development work at a number of industrial enterprises of mechanical engineering in the Nizhny Novgorod region; monitoring of expenditure dynamics, identification and description of their states, measurement of quantitative parameters, decomposition and classification; analysis of application in practice of the method developed by the author to generate information on expenses.

The fundamental foundations of the scientific issues studied in this article are laid in publications of Mizikovsky (2016), Garin and Aiplatova (2016), Garina et al. (2016, 2018), and Gorlova (Gorlova, 2012).

Practical comment on the main changes in tax legislation (Practical comment on the main changes in tax legislation, 2020) also helped to solve the main problem of this article.

3 Results

In the accounting practices of the enterprises under study, there is an assignment to the design costs of operations related to changes in the design, operational properties of products, with the improvement of individual consumer properties (Romanovskaya et al., 2020). This approach is contrary to paragraph 4 of Accounting Regulations 17/02 and should be excluded from accounting and costing practice. Structuring the nomenclature of development costs items at the studied enterprises involves the allocation of direct labor costs from general economic expenses: "Wages of structural engineers" and "Social contributions". At the studied enterprises, the work of designers is not normalized, which reduces the quality of its measurement, leads to errors in the management of this resource. The introduction of working time rationing for the development of design documentation, based on the Intersectoral enlarged time standards for the development of design documentation, will increase the effectiveness of work management, detail them, and strengthen control (Intersectoral aggregated time standards for the development of design documentation, 2020).

It is necessary to include the items of direct material expenses in the generated range of expenses:

- "Energy for technological needs" the item should reflect the costs of operating processes of technological equipment directly involved in the flow of value creation by designers of computer equipment; heating and lighting of premises used for development;
- "Consumables" reflect the cost of materials stipulated by the operating regulations of the development equipment.

Direct costs are included in the pool of the main (process) costs of the value creation flow, along with part of the indirect costs related to the item "Maintenance and operation of equipment and other objects of fixed assets", including the cost of replaceable parts and spare parts for process equipment; planned-preventive and current types of repairs; remuneration of technical personnel; depreciation of process equipment; premises where design works, intangible assets, etc. are directly implemented.

Some indirect costs form a pool of management costs, which include items of general economic and other overhead costs. The first of these should include the cost of maintaining the administrative and management personnel responsible for the organization and implementation of development work; Depreciation less amounts charged to "Maintenance and operation of equipment and other fixed assets"; Costs of consulting with engineering specialists the use of specialized databases; advanced training of designers and support personnel, etc.

For other overhead costs, it is advisable to write off the costs of materials for the economic needs of the design department; minor repairs, labor protection, and safety equipment, etc. Table 1 presents the cost estimate based on the cost item nomenclature proposed by the authors and the procedure for their costing processing.

Lines 1.5 and 1.7 show the results of the calculation of two versions of the reduced cost of development, in line 3—their production cost. Line 1.5 contains the result of direct cost accounting and costing based on the cost of direct costing; line 1.7—cost calculated by assigning the main costs to it by "Absorption costing" technology. According to the authors, it is advisable to attribute overhead costs to the financial result of the ordinary activities of the enterprise; "Maintenance and Operation of Equipment and Other Fixed Assets Objects—Main Indirect Costs"—to be distributed between the cost of the *i*-work performed according to the formula (1):

$$P_{\mathrm{i}} = \frac{C}{\Pi} * \Pi i, \tag{1}$$

where C is the total amount of the allocated costs; P-estimate of the indirect cost allocation base; Πi- indicator of i -work distribution base.

Table 2 shows the calculation of the planned cost of development work for the design of the product M397654-1 LLC "XXXXX", approved in April 2020.

The write-off of the calculated cost, according to the authors, should be carried out based on the planned production volumes during the 3rd quarter, 2020 according to formula (2):

$$\mathrm{CB_T} = \frac{C}{O} * O_{\mathrm{T}}, \tag{2}$$

where $\mathrm{CB_T}$—write-off of cost of development works during T period; C—cost of development works; O—The amount of production to be written off; O_{T}—volume of production in period T.

The plan of write-off of cost of design of product M397654-1 in the 3rd quarter, 2020 is presented in Table 3.

An effective tool to ensure the sustainability of development work is the creation of a reserve of upcoming costs for their implementation. The decision taken by management on the formation of such a reserve should be reflected in the accounting policy for tax purposes and in the relevant local acts. At the same time, the amount of contributions to the reserve should not exceed the limit L (Practical comment on the main changes in tax legislation), calculated according to the formula:

Table 1 Cost estimate of the department of the LLC "XXXXX" chief designer for April 2020, thousand rubles

№	Article title	Sum
1	Basic costs	
1.1	Salary of structural engineers	420
1.2	Social contributions	150
1.3	Consumables	2.5
1.4	Energy costs for technological needs	4.5
1.5	Total direct costs p.1.1 p.1.2 p.1.3 p.1.4	577
1.6	Maintenance and operation of equipment and other fixed assets facilities	200
1.7	Total core costs: p.1.5 p.1.6	777
2	Overhead costs	
2.1	General economic expenses	8.2
2.2	Other expenses	4.8
2.3	Total overhead costs: p. 2.1 p. 2.2	93
3	Total production cost p.1.7 2.3	790

Source Compiled by the Authors

Table 2 Calculation of planned cost of product design M397654-1 for April 2020, thousand rubles

№	Article title	Sum
1	Salary of structural engineers	92
2	Social contributions	27.6
3	Consumables	2.4
4	Energy costs for technological needs	1.5
5	Total direct costs p.1.1 p.1.2 p.1.3 p.1.4	123.5
6	Maintenance and operation of equipment and other objects of fixed assets (ratio p.1.6 to line 1.1 and multiplied by the value of article 1)	43.8
7	Total core costs	167.3

Source Compiled by the Authors

$$L = (B * 0.03) - P \quad (3)$$

where B—Sales revenue; P—expenses on formation of funds of support of scientific, scientific and technical and innovative activity.

All other tools of the development work accounting and costing space shall be reflected in the accounting policy for the purposes of enterprise accounting, in the regulations and instructions on planning, accounting, and calculation of the cost of products (works, services), as well as on management accounting. One of the important elements of this system is regulatory background information, which, among other things, includes an electronic directory developed by the author, which reflects the nomenclature and composition of resource expenditure (Table 4).

According to the authors, automation of the technology of accounting for development work should be focused on the situational-adapted formation of the information base for making management decisions on flexible regulation of costs; generation of operational, accounting and static reports relevant for form and content of management requests; Comprehensive economic analysis and current and forward-looking forecasts. It will allow qualitatively interpreting the data, ensuring the construction of an integrated information field of effective enterprise management.

Table 3 The plan of write-off of cost of design of product M397654-1 in the 3rd quarter, 2020

№	Month	Production volume (pcs.)	Sum (thousand rubles)
1	July	50	42
2	August	70	58.9
3	September	79	66.4
Total		199	167,3

Source Compiled by the Authors

Table 4 Nomenclature of R&D cost items (fragment)

№	Cost Item	Content
1	Consumables	Cartridges for printers, Multifunctional device, plotters and fax equipment; plotter ink; toners and drum cartridges for laser printers, plotters, Multifunctional device and wide-format Multifunctional device; block of transfer of the image (module of transfer of the image, knot of transfer of the image, transfer belt, wave of transfer of a charge, Transferbelt, Transferroll); image thermal attachment unit, etc
2	Energy for technological needs	Energy costs for the generation of design documentation and prototypes

Source Compiled by the authors

4 Conclusion

Economically unreasonable volumes of costs reduction of the studied class adversely affect the prospects of technological development of economic entities, lead in the long term to a noticeable reduction of economic benefits. Among the reasons there is a low level of awareness among decision makers on cost management of the current and prospective status of product design costs; insufficient use of planning, accounting, and costing technologies; lack of detail in the accounts of expenditure. The basis for making decisions on cost management involves the rejection of the applied technologies for calculating the cost of a complex of development work. The nomenclature of cost development articles proposed by the authors; justification of point-oriented accounting and costing model of their processing; Updating the presentation forms of estimates and calculations; digital transformation of control planning and accounting function; identification of ways to institutionalize the proposed funds in accounting practices of the studied enterprises allows to bring the process of development of technology for development expenses management to a qualitatively new level and significantly reduce risks of unbalanced solutions.

References

Garin, A. P., & Aiplatova, I. I. (2016). Application of life cycle support systems in the practice of domestic enterprises. *Scientific Review, 16*, 199–201.

Garina, E. P., Kozlova, E. P., & Sevryukova, A. A. (2016). Study of alternative strategies and methodological tools for the development of complex systems in the context of the product being created. *Azimuth of Scientific Research: Economics and Administration, 5*(2), 58–62.

Garina, E. P., Garin, A. P., Kuznetsov, V. P., Popkova, E. G., & PotashnikY, S. (2018). Comparison of approaches to development of industrial production in the context of the development of a complex product. *Advances in Intelligent Systems and Computing, 622*, 422–431.

Gorlova, E. I. (2012). Cost management tools in the enterprise management system. *ECONOMINFO, Publishing House: Voronezh State Technical University, Voronezh, 17*, 30–34.

Intersectoral aggregated time standards for the development of design documentation. http://docs.cntd.ru/document/902124631. Data Accessed: June 14, 2020.

Kuznetsov, V. P., Garina, E. P., Andryashina, N. S., & Romanovskaya, E. V. (2018). Models of modern information economy conceptual contradictions and practical examples. *Young Consumers*, 361 p.

Standard methodological recommendations for planning, accounting, and calculation of the cost of scientific and technical products (adopted by Ministry of Science of the Russian Federation 15.06.1994 No. OP-22–2–46). http://www.consultant.ru/document/cons_doc_LAW_4855/5766cdbf844aae235038414e6b45db18ae79849a. Data Accessed: June 01, 2020.

Mizikovsky, I. E. (2016). *Accounting management accounting*. (2nd edn, 144p). Publishing House Master: Infra-M.

Mizikovsky, I. E., Antonets, V. A., Nechaeva, N. V., & Abubakirova, K. N. (2014). Fundamentals of Accounting in the Scientific and Technical Field. Nizniy Novgorod, Electronic Managed Course on the website of e-learning Nizniy Novgorod State University. Identification number in the electronic catalog of the NNSU Educational Resources Fund 833E.14.20.

Order of the Ministry of Finance of Russia dated 19.11.2002 No. 115N (as amended by 16.05.2016). On Approval of the Regulation on Accounting of Expenses for Research, Development, and Technological Works "PBU 17/02" (Registered with the Ministry of Justice of Russia 11.12.2002 No. 4022). https://base.garant.ru/12129182/. Data Accessed: June 01, 2020.

Osipov, V. I., & Gorina, A. A. (2019). Characteristics and directions for the development of management accounting systems. *University Bulletin, 5*, 40–47.

Practical comment on the main changes in tax legislation. http://www.consultant.ru/document/cons_doc_LAW_123554/6c7f669bb7328c111bcf43e34920e347561daa4e/. Data accessed: June 01, 2020.

Romanovskaya, E. V., Kuznetsov, V. P., & Andryashina, N. S., et al. (2020). Development of the system of operational and production planning in the conditions of complex industrial production. In E. Popkova, & B. Sergi (Eds.), *Digital economy: Complexity and variety vs. rationality. ISC 2019. Lecture notes in networks and systems* (Vol. 87). Springer, Cham.

Tolstykh, T. O., Shkarupeta, E. V., et al. (2020). Algorithm for Assessing the Efficiency of Innovational Technologies of Industrial Enterprises. Emergence, Changes, and Future Perspectives. *Lecture Notes in Networks and Systems, 73*, 463–471.

Yu, K. G. (2018). *Cost of products, works, services: Accounting and tax* (3rd edn, 424 p). ABAK.