

# Management of the investment project structure in the field of manufacturing innovative building materials

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**Abstract.** In the current economic situation for many domestic enterprises, the problems of development of investment activity are of the utmost importance. The range of issues solved in the field of investment management is wide enough and connected with the main activities of the enterprise. The fact of the shortage of investment resources for the creation of high-tech manufacturing facilities in advanced fields of industry requires a special approach to the formation and management of private resources of large industrial enterprises. The existing problems together with the complexity and high degree of uncertainty of investment results have created demand for improving management of investment process of an enterprise.

## 1 Introduction

The development of nuclear energy, the necessity of solving the tasks of engineering protection of the population, equipment, buildings and structures, including storage of highly toxic and radioactive waste, has significantly increased the need to create construction materials with special properties [1]. This gives grounds to consider construction materials with special properties with innovative products or new construction materials. Thus, there is a need in the creation and management of investment projects in the field of production of new building materials. Special relevance has the question to create a synergistic effect that increases the efficiency of use of investment resources of a construction organization in comparison with a group of private industrial enterprises through a single centralized management and efficient redistribution of different types of industries by geographical area and territorial entities [2]. With the aim of increasing the efficiency of the management structure of the investment project construction of the enterprise at all stages of its implementation there is a need to create a unified system of management of investment flows [3].

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## **2 Materials and methods**

Theoretical and methodological basis of the research were the fundamental works of Russian and foreign economists in the sphere of theory and practice of investment activity, the theory of estimation of efficiency of innovative activity, the theory of decision making management and the theory of project management. The research was conducted with the use of economic statistics method, and general scientific contrastive comparative methods (analysis, synthesis, analogy, classification) based on the system approach. The information base included the data published in the statistical compilations of the Federal service for state statistics, Ministry of economic development of Russian legal information database "Consultant Plus".

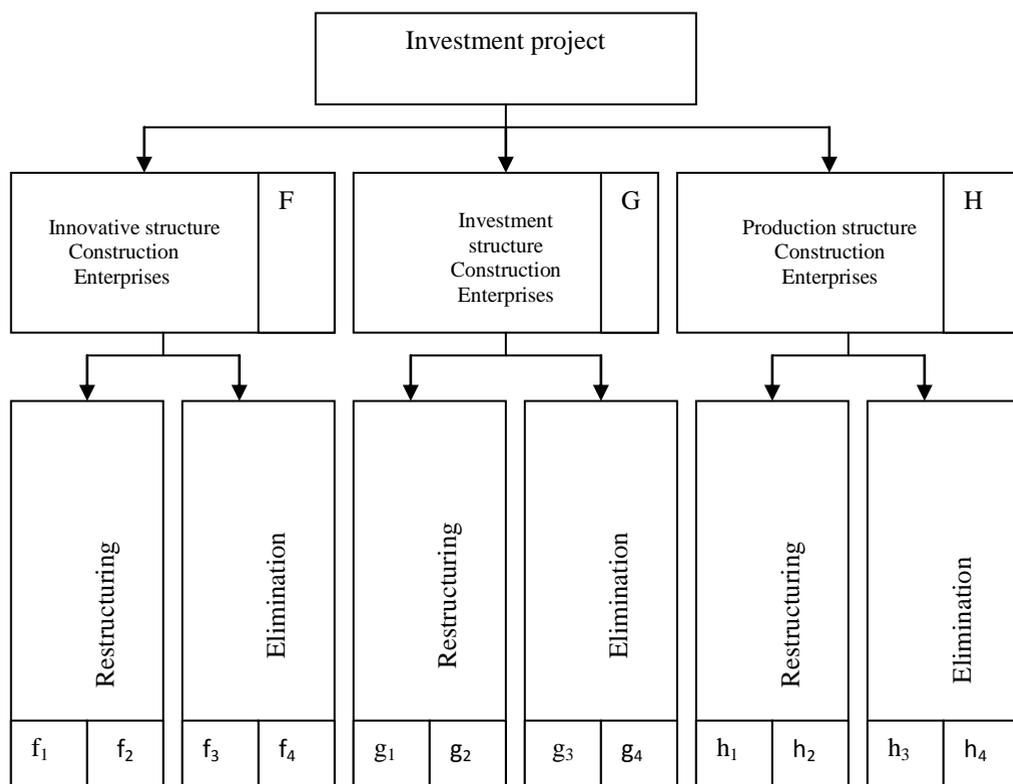
### **3.1 Describing the domain**

In the process of investment activity realization, there are situations when the investment potential of the construction company is not sufficient to cover the current costs for the production of new building materials projects. If such a situation is systematic in nature, there is a need for a restructuring investment project in order to facilitate innovative solutions [4,5]. These management actions allow you to continue investment activity of a construction company until its successful completion.

The continuity of the process of investment of a construction company eliminates the need to change the innovation project or the preliminary refusal of it, which will lead to unnecessary financial and material losses while implementing innovative solutions. Counter restructuring and investment management solutions provide sufficient conditions to obtain a unique solution, regardless of its nature: the successful completion of an innovative project, or vice versa [6].

### **3.2 Tools and procedures**

The hierarchy of managing the structure of the investment project of the construction enterprise is shown in **Figure 1**.



**Fig. 1.** The hierarchy of the management structure of the investment project construction companies

The main goal of the management is to bring the structure of the investment project to the kind that corresponds to the investment opportunities of the construction enterprise sufficient to continue investment activities for the production of new construction materials. The control function can be written in the following form:

$$P = \varphi_3(F(f_i); G(g_j); H(h_k)), \text{ где } i=1, n, j=1, m, k=1, l \quad (1)$$

$P$  – structure of the investment project;

$\varphi_3$  – function of investment project restructuring management;

$F(f_i)$  – function to manage the restructuring of the innovation solution. If the current investment requirements for the project exceed the investment opportunities of the construction company, there is a need to restructure or simplify the technical innovation solution in order to match its parameters to the investment potential of the construction enterprise. The planning and technical parameters of the innovation project and the function of curtailing the innovative solution in the event of unfavorable systematic changes in the external environment, with the aim of preserving the production structure of the construction enterprise [7].

$G(g_j)$  – function of management of restructuring of the investment structure of a construction company with the aim of reconciling the investment needs of the project and

the investment potential of the enterprise [8]. The arguments of management are the characteristics of internal and external investment structures, as well as the sequence of curtailment of the investment structure in the event of a decrease in the investment potential of the construction enterprise in the circumstances of continuing unfavorable external influences.

H (hk) - the function of managing the restructuring of the production structure of a construction enterprise with the aim of merging its production potential with an innovative project at the final stages of investment activity, or in the case of a company sale if its shares are quoted on the stock market in order to replenish resources for the timely completion of the project with Given characteristics [9,10]. As arguments of management, the characteristics of the production facilities of the construction enterprise, external production enterprises, service companies, warranty and post-warranty service companies, as well as the sequence of the curtailment of production structures, the sales proceeds of which will complete the investment project in full.

The management of the argument (f1) makes it possible to administratively simplify the innovative solution in terms of changing the timing of putting the facility into operation, which allows you to stretch the flow of resources through investment channels in time, and allows you to significantly reduce the investment flow at the current time.

The management of the argument (f2) allows for the technical restructuring of the innovative solution in the direction of reducing the nomenclature of building materials and, as a result, simplification of technological processes and production lines [11]. Such restructuring will lead to more economic construction of industrial buildings and facilities, to reduction of the costs attributed to their maintenance. Technical simplification produced innovative solutions while maintaining the competitiveness of the remaining spectrum of manufactured building materials.

The management of the argument (f3) allows reducing the cost of innovation activities produced outside the construction companies. Such external structures are subnational funds operating at the regional level, as well as collections of royalty, being the property of the shareholders of their respective companies.

The management of the argument (f4) enables consistent implementation of fixed assets relating to land acquisition, industrial buildings and constructions, technological lines, erected by the time of the decision on the conclusion of the innovative structure of construction companies in favor of maintaining its production capacity.

The management of the argument (g1) allows you to withdraw outside the investment activities of external credit institutions and investment institutions whose financial resources have a value that reduces the investment potential of the construction company. These actions are carried out in parallel with the restructuring of the innovation solution [12].

The management (g2) allows you to withdraw outside the construction company external specialized investment funds, the proceeds from the sale of which can be directed to an innovative project. At the level of the innovative structure of the construction company, the subnational and licensed funds cease financing venture activity, the argument (f3), and at the level of investment activity, are removed from the construction enterprise or sold as administrative units, argument (g2) [13,14].

Argument management (g3) allows withdrawing funds outside the investment structure of a construction company that took over the functions of leasing and factoring agents. In this case, these agents are external to the construction company.

Argument management (g4) allows curtailing the investment activity of a construction enterprise aimed at external investment projects, provided the innovation activity is maintained at the micro level. Here it is a question of stopping the forced growth of investment potential. Compulsory growth on the basis of temporary improvement of basic

economic indicators requires the costs of restoring the financial structure of the parent enterprise, and the increase in capacity based on the reduction of intra-company risks requires constant expenditure on marketing research of the regional, consumer and product sectors of the sales market. It is believed that in the presence of permanent adverse external influences, for example, such as an increase in the rate of inflation, the sales market is characterized by negative trends, such as the lack of demand associated with the low purchasing power of the customer.

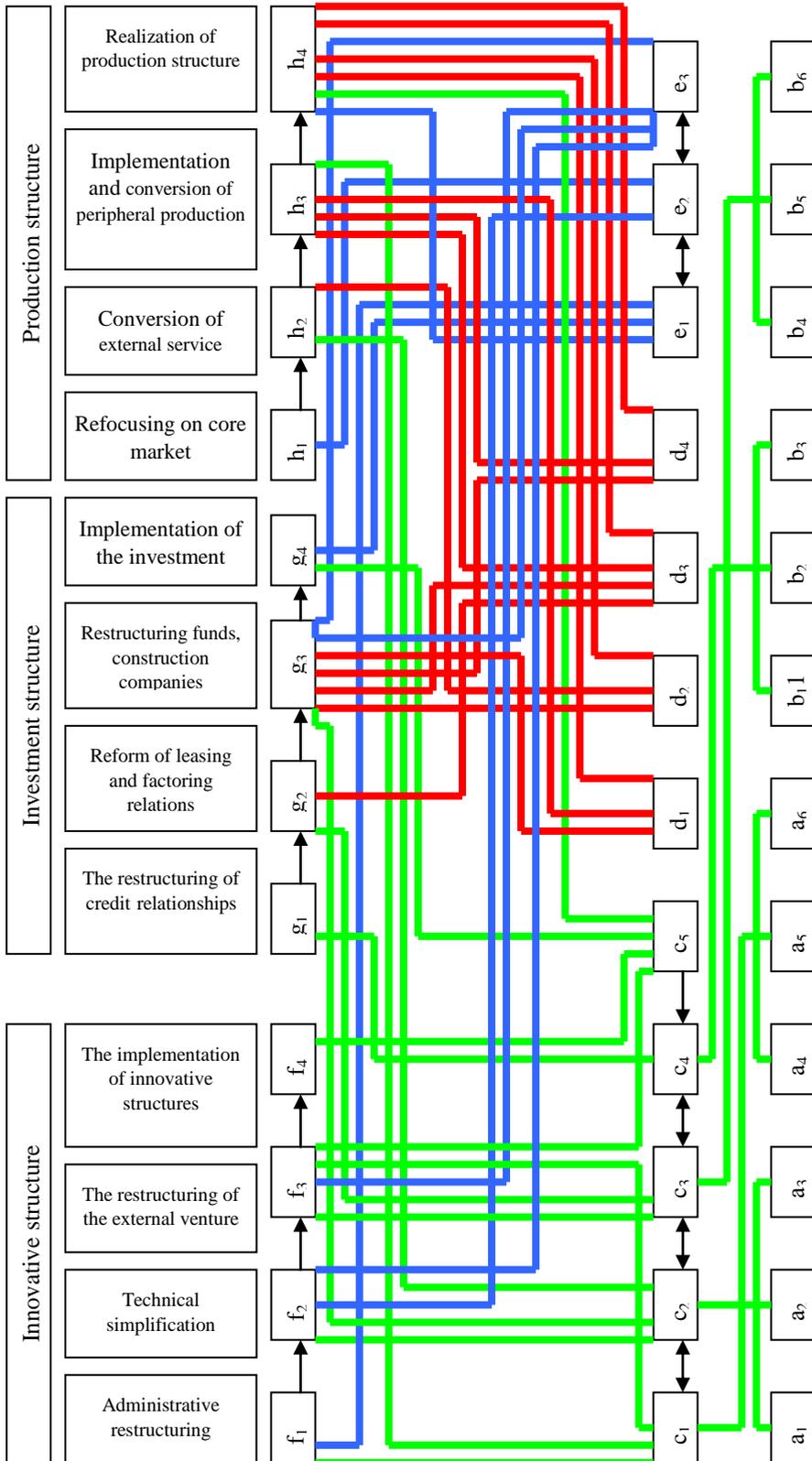
The management of the argument (h1) allows improving the commercial activities aimed at ensuring the sale of products. In this case, marketing and commercial activities are transferred to the established innovative enterprise and switch to the research of the target market for new generation building materials.

The management of the argument (h2) makes it possible to implement, or, in the case of a technical possibility, re-profile the external service enterprises for the maintenance of new building materials. The management of the argument (h3) is analogous to the argument management (h2) and allows the realization or re-profiling of regional production and service structures for new generation building materials.

The management of the argument (h4) allows the restructuring of production capacities and fixed assets of the construction enterprise. Morally outdated and physically worn out technological lines, industrial buildings and structures can be leased or sold. The advanced, untapped technological lines are introduced into the created innovative enterprise, reducing the cost and timing of the commissioning of the innovative project.

The process of managing investment flows is based on the interaction of the arguments of functions of one or different levels for the purpose of orderly and directed receipt of resources of various types in an innovative project in accordance with its needs at the current time. In Fig. 2 shows the interaction scheme of the arguments of the control functions [15]. The lower level is a set of arguments of the internal contour of the investment flow management system (IFMS), designed to increase the investment potential of the construction enterprise. They include groups of arguments that increase the profitability of sales (a1-a3), reducing the costs (a4-a6), decreasing the concentration (b1-b3) and eliminating the correlation (b4-b6). These arguments are grouped together. Have a general purpose and can be used both jointly and separately, depending on the required magnitude of the investment potential increase.

The average level of (IFMS) is a number of arguments for managing investment flows of various types, such as financial (c1-c5), material (d1-d4) and non-material (e1-e3). The external contour of the MISP contains a number of arguments for restructuring the main, functional entities of the construction enterprise, namely: innovative (f1-f4), investment (g1-g4) and production (h1-h4) structures.



**Fig. 2.** The scheme of interaction of function arguments control the investment flows of various types

## 4 Results

The group of arguments for raising profitability due to the low inertia of attracting additional resources, for example, along the line (c2; a3) feeds the peak investment flow associated with advance and estimated expenses. The group of arguments for cost reduction, which has an inertness to attract up to the quarter, feeds a constant investment flow, for example along the line (d1; a5). The group of arguments of function B (bj), having inertness of attraction not less half a year, supports investment financial flows connected with occurrence of unforeseen situations. The group of concentration reduction arguments (b1-b3), as the most capital-intensive of the argument group of function B (bj), feeds the reserve investment flow, for example, along the line (c4; b3) associated with servicing of bank credit lines [16]. The group of arguments for eliminating the correlation component (b4-b6), as the least capital-intensive of the arguments of function B (bj), feeds a risky investment flow, for example along the line (c3; b4).

Consistently (from left to right), a series of arguments for the average level of the (IFMS), responsible for managing investment flows of various types for an innovative project for the production of building materials, in terms of a shortage of resources at each of them. Direct financial investment flow (c1) in the conditions of resource deficit is supported at the expense of the funds received due to the strengthening of the investment potential of the construction enterprise due to the reduction of costs along the line (d1; a5). At the same time, this flow can be strengthened by actions of the top level: prolongation of the commissioning of the innovation facility (f1; c1), reduction of external venture costs, for example, within the framework of subvention funds (f3, c1).

Maximum financial investment flow (C2) as part of the deficit of the resource is supported by funds received from increased investment potential of the construction companies due to increased yield, (C2, A3). At the same time this flow is supported by the upper level due to the release of funds due to technical simplification and innovative solutions (f2;S2), as a result of the implementation of the domestic investment funds (g3;S2), as well as by simplifying or sale of elements of the external service included in the production structure of the enterprise (h2;C2).

The risk financial investment flow (c3) within the resource deficit is supported by means received from the strengthening of the investment potential of the construction enterprise due to the weakening of the correlation coefficient, for example along the line (c3; b4). At the same time, this flow can be fueled by means of the external contour of the IFMS, obtained as a result of transferring the functions of leasing and factoring agents, external to the enterprise to specialized organizations (g2; c3).

The reserve financial investment flow (c4) within the limits of the resource deficit is supported by means received from the strengthening of the investment potential of the construction enterprise due to the weakening of the concentration coefficient, for example along the line (c4; b2). At the same time, this flow can be strengthened by means of the expensive bank credit lines that have been freed up due to the completion of service, or when debt is restructured to external credit institutions (g1; c4).

Flow replenishment of financial investment resources (C5) is financed by external funds subvention action, and in the case of the lack of resources, supplemented by funds received from the sale of the innovative structure of construction companies (f4;C5), investment structure (g4;C5) or industrial structure (h4;C5). In the future, the funds received are used in accordance with the chosen strategy of continuing investment activity of construction enterprises. Investment flows from (C1) to (C5) have a horizontal relationship, talking about the possibility of reallocation of resources between threads, due to their similar financial nature due to the control functions of internal investment funds.

The second group of arguments medium contour (IFMS) contains functions management of material investment flows. Material investment resources are part of a construction company or are purchased from external specialized organizations.

Material investment flow, which contains the human factor (d1), in the circumstances of the lack of resources can be funded within the resources of the relevant funds on the line (g3;d1), the restructuring of peripheral production organizations on line (h3;d1), as well as in the event of liquidation of the production structure along the line (h4;d1). The natural investment flow (d2) in the circumstances of the lack of resources, supplemented by relevant internal resource investment Fund line (g3, d2), in the restructuring of enterprises external service, which has contacts with suppliers of raw and packaging line (h2;d2), and also due to the elimination of the production structure of the enterprise lines (h4, d2). Production investment flow (d3) in the circumstances of the lack of resources, supplemented by involvement in an innovative project leasing agents lines (g2;d3), joining the relevant resource from internal funds lines (g3;d3), in the restructuring of peripheral production companies in line (h3;d3), and also due to the elimination of the production structure of a construction company on the line (h4;d3).

Investment information flow (d4) in the circumstances of the lack of resources updated by the resource profile of the investment Fund on the lines (g3;d4) and in the restructuring of external production infrastructure on the line (h3;d4) and in the implementation of the production structure along the line (h4;d4). Material investment flows do not have horizontal linkages due to the different nature of resources.

The third group of arguments of the middle contour of the (IFMS) includes the functions of managing intangible investment flows. Intangible investment resources permeate all structures of the construction company in the framework of providing information exchange supporting the functions of administrative management (U), research of the external target sales market (M) and innovation activity (R).

The management investment flow (e1) supports the function of managing the restructuring of the innovation project along the line (f1; e1). In the case of a resource deficit, the flow (e1) is replenished with administrative teams that are released as a result of liquidation of the enterprise's investment structure through the (g4; e1) line, and as a result of implementing the production structure of the enterprise along the line (h4; e1). The marketing investment flow (e2) regulates the directions of the innovation policy of the investment project during the time of the construction of innovative capacities along the line (f2; e2) and influences the technical solution of the innovation facility. In the event of a resource deficit, the flow (e2) is replenished through the dismantling of marketing departments and commercial structures occurring at the beginning of the reorganization of the production structures of the construction enterprise along the line (h1; e2). The intellectual investment flow (e3) supports the technical re-equipment of the innovative project in case of the beginning of its restructuring along the line (f2; e3). In the event of a resource deficit, the flow (e3) is replenished by the released intellectual resource as a result of the cessation of activities of external venture organizations along the line (f3; e3), and can also be fueled from the R & D of the domestic investment fund along the line (g3; e3). Intangible investment flows have bilateral horizontal connections in connection with the same nature of the medium of information exchange and necessary for mutual stimulation of managerial, marketing and innovation (intellectual) activities. Intangible investment flows, unlike material flows, are fueled not only by restructuring solutions to the functions of the external contour of the IFMS, but also largely determine the direction of reforming the structures of the construction enterprise in the process of investment activity.

The arguments of the external contour of the IFMS are divided into three groups that determine the restructuring of the innovation, investment and production structures of the construction enterprise. The presence of unilateral horizontal links determines the direction

of the sequence of restructuring management decisions [17]. Every fourth argument of the external contour of the MISI means the liquidation of the relevant structure of the enterprise, the released resource from the implementation of which goes to the disposal of the investment stream (c5) and is sent for the implementation of innovative activities within the remaining structures of the construction enterprise.

## 5 Conclusions

From the analysis of the above scheme, it is obvious that the main source of all types of resources for an innovative project is the middle contour of the IFMS, as a tool for organizing and managing investment flows. The internal contour of the SUIS fulfills the function of ensuring the growth of the investment potential. The external contour of the IFMS is designed to harmonize the budget parameters of the investment project and the investment flows of the construction enterprise through the release of additional resources due to the restructuring of the company's functional structures. Thus, the circuit in Fig. 2, reflects the processes of formation of investment flows on the middle contour of the IFMS due to the efforts of the internal and external contours.

The one shown in Fig. 2, the structure of investment flows of various types resembles the structure of a programmable microprocessor chip, which, in the presence of managerial algorithms in an automatic mode, can manage investment processes. The proposed scheme is the base for the implementation of activities to manage investment flows and is the main structure of the apparatus of the investment flow management system.

The arguments (fi), (gj) and (hk) are in fact the keys of the outer contour of the IFMS, which allow to manage the structure of the investment project for the production of new construction materials in such a way that the investment activity has its further continuation, despite the changed ones External and internal conditions.

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