In order for enterprises not to suffer significant losses by repurposing their activities for the manufacture of products attractive at certain points in time, it is necessary to take into account the compatibility of resource mutual support of the business processes they perform when forming the product range. Such compatibility and interaction should ensure the long-term efficiency of the enterprise and the strategic attractiveness of its products on the market.

Accordingly, the object of this study is the process that forms a rational resource base for effective long-term competitive development of the enterprise through the formation of an additional effect. Within the framework of the formed approach, the expediency to use the coefficient of managerial efficiency to choose the necessary source of resource provision (own production or alternative attraction of the necessary resources from an attractive stakeholder) has been proven.

The proposed recommendations should be applied to enterprises that use a significant number of parts, assemblies, and components for production; therefore, they have been tested on the activities of a machine-building enterprise. The results confirmed the feasibility of independent production by the studied enterprise of the relevant types of raw materials and the provision of certain services. This made it possible, by rationalizing the assortment policy of the enterprise, to create a closed production cycle and reduce, thereby, its dependence on third-party enterprises, which is extremely relevant under wartime conditions. In addition, the implemented measures made it possible to increase the volume of production of a particular type of product (vacuum pumps) by 10 %, reduce the reserve of production capacity, and ensure the stability of competitive advantages by increasing the service life and quality of individual components of the existing goods of the studied enterprise

Keywords: cumulative effect, additional effect, management innovations, resource provision, related results

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ORGANIZING EFFECTIVE COMPETITIVE DEVELOPMENT OF ENTERPRISES THROUGH THE FORMATION OF A RATIONAL BASE OF RESOURCE PROVISION: METHODOLOGICAL ASPECT

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1. Introduction

Under conditions of limited materials, when the need to optimize all types of resources comes to the fore, it is necessary to make timely decisions on their rational use. One of the directions of rationalization of resource support for the activities of a particular enterprise is the decision on the independent production of certain goods or their procurements from the outside. In this case, we are talking about goods that act as a necessary type of resource for ensuring the efficient production of the remaining promising products of the enterprise, components, etc. This requires the use of appropriate management measures to maximize the results (effects) of various activities of the enterprise through the optimization of their resource provision. In this case, the optimization of resource provision is understood as the rationalization of the ratio of the possibilities of own satisfaction of the necessary resource needs of production to those attracted on favorable terms.

Scientific research into this area is important since the rationalization of resource provision, taking into account the relationship and relationships between business processes, as well as the results that arise in this case, make it possible to ensure the stability of the enterprise to the external environment. Such adaptability is associated with a decrease in the number of points of contact of aspects of the enterprise with elements of the external environment.

The results of research on the process of forming a rational resource base are necessary in practice since the inaccessibility and limited nature of certain types of resources caused by the conduct of hostilities reduces profitability, and sometimes leads to the liquidation of enterprises. And the rationalization of the product range through the resource mutual security of the im-

plementation of business processes necessary for its production will avoid dependence on the activities of unattractive stakeholders. Moreover, depending on the availability and efficiency of resource provision of individual enterprises, they can make decisions on the use of sources of raw materials, which reduce the current but provide stable long-term performance.

2. Literature review and problem statement

Work [1] presents the theoretical foundations of the resource provision of enterprises through the disclosure of the essence, structure, and content of this concept. However, the author did not pay enough attention to the study of the problems of the formation and use of resource support in the activities of enterprises.

This problem was partially solved by scientists in [2] where they described the features of the processes of formation and use of resource potential. However, part of the possible resource provision, which is able to create potential reserves for the development of new products or activities, remained unattended. This is due to the emphasis only on the part of the resource provision that forms the necessary available or optimal resource potential of the enterprise.

Improving the efficiency of the use of attracted resources of the enterprise is considered in [3], which describes ways to improve the effectiveness of the use of certain types of resources through the use of certain management measures. However, the recommendations presented concerned only the optimization of the resources available at the enterprise in the process of their use and did not affect the features of resource management in the process of their involvement. And this, accordingly, contributes to improving the efficiency of only the current activities of the enterprise.

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The justification of management measures aimed at the formation of resource support is considered in work [4], which, accordingly, made it possible to outline possible measures for its optimization to ensure the strategic development of the enterprise.

However, in works [1–4] most attention is focused on the theoretical aspect of the issue under study, there are no clear practical foundations for the formation of an optimal resource base.

Practical recommendations on the effectiveness of resource support are considered in [5] on the example of the proposed measures to increase the efficiency of the use of production resources of an industrial enterprise. However, the proposed recommendations apply only to production resources, which can lead to the complexity of their adaptation to optimize other types of resources, taking into account their different features.

A wider range of practical recommendations for resource support of the enterprise is reported in [6], which presents the mechanism for managing the formation and use of various types of resources of coal mining enterprises. However, in that work, the recommendations have current time limits, which complicates their use for the formation of strategic development of the enterprise.

The peculiarity of the resource support of the enterprise at the strategic level is the programs of preliminary and timely response to the needs of business process resources within the chosen strategy in accordance with its overall goal at the strategic level proposed in [7]. However, the proposed recommendations are subjective in nature since they do not imply the use of certain mathematical and statistical tools in their formation.

The construction of mathematical models and methods for estimating the size of the optimal order is addressed in [8]. The practical recommendations for the implementation of resource support presented in the work are highly specialized since their value is justified only in a particular industry. Accordingly, there is a difficulty in the case of adapting individual recommendations to solve a specific problem in another area.

The mathematical model of the multicriterial problem of distribution of limited resources of the project as an optimization problem of placing geometric objects with variable metric characteristics and spatial form, built in [9], is characterized by the mathematical model of the multicriterial problem of distribution of limited resources of the project as an optimization problem, where a method of its solution is also proposed. The research results presented in that paper make it possible to determine the optimal size of orders but make it impossible to compare alternative options for attracting resources from different sources. It is possible to solve the highlighted problems by research on the justification of the capabilities, proposals, and algorithms of interaction of enterprises during the resource provision of each other [10, 11]. However, scientists in the conducted research do not take into account the possibilities and needs of combining business processes with each other due to their resource interoperability and the formation on the basis of this set of promising product range of the enterprise, which is proposed in work [12]. These recommendations will allow the company to form effective stable areas of development. However, measures to increase the effectiveness of the implementation of interrelated resource support business processes due to the increase in the associated effects that arise as a result of such interaction remained unattended. The formation of such effects will make it possible to form sustainable long-term competitive advantages and limit the dependence of enterprises on a significant number of suppliers, which is relevant especially under the conditions of hostilities and limited availability of certain types of resources.

This suggests that it is expedient to conduct a study on the formation of an optimal resource base as a basis for ensuring the rationalization of individual business processes of an enterprise in order to increase their effectiveness and/or competitiveness of the enterprise. Providing a condition for the effectiveness of the proposed measures is the need to form an additional effect from the interaction of specific business processes under the influence of certain management innovations.

3. The aim and objectives of the study

The aim of this study is to clarify the theoretical and methodological aspects (principles) of the decision-making process for the formation of an optimal resource base (suppliers) for the rationalization of business processes according to the criteria of maximum performance, minimum costs, long-term effects of interaction. This will enable enterprises

to form an optimal base of partners and increase the strategic competitiveness of products through the possibility of effectively attracting specific types of resources according to certain performance indicators relevant at the appropriate time.

To accomplish the aim, the following tasks have been set:

– to substantiate the stages of the process of forming a rational resource base as the basis for organizing effective long-term relationships with attractive stakeholders;

– to characterize the criterion (indicator) of decision-making of the choice of the option of resource support for the competitive development of the enterprise;

– to outline measures to increase the effectiveness of the chosen option of resource support for the competitive development of the enterprise in the strategic perspective;

– to determine the effectiveness of using the coefficient of managerial efficiency to rationalize the resource provision on the example of a particular company.

4. The study materials and methods

The object of research is the process of forming a rational resource base for effective long-term competitive development of the enterprise through the formation of an additional effect.

The hypothesis of the study was that the formation of a rational resource base through the effective organization of resource mutual provision of individual areas and business processes of the enterprise will contribute to the formation of their specialized complexes, the effective management of which will make it possible to obtain stable competitive advantages in the strategic period.

The assumptions adopted in the study necessitated the use of certain methods that can be divided into separate components depending on the areas of our study: theoretical; analytical; research; practically pragmatic.

The theoretical group of methods used in the study includes formalization, grouping, and graphic – when developing and presenting a scientific and methodological approach to the formation of a rational base for resource support for effective long-term competitive development of the enterprise. A special place in this group belongs to the component analysis, which is used in the presentation of the calculation of the coefficient of managerial efficiency;

Among the analytical methods are abstraction, which was used to study the activities of the enterprise, in particular, in the analysis of its production program; retrospective analysis, which was useful in determining the level of implementation of the production plan for certain types of products. No less important compared to other methods of this block is the method of generalization, which was used in the study of the justification of the production program, its relationship with other plans of the enterprise, and identifying ways of improvement.

The research group includes the method of expert survey, which was used in determining the motives for buying the products of the studied enterprise.

The basis of the practical-pragmatic group of methods is modeling, which is used in the formation of a spatial-dynamic model of building a system of management innovations; comparison – calculation of the coefficient of management efficiency of the enterprise; modeling – for defining ways of forming the base of resource support of activities.

To verify the results in terms of determining the possibilities of organizing effective relationships with certain stakeholders in the process of forming a rational resource base using the coefficient of managerial efficiency, we used data on TzDV "Lviv Milling Machine Plant" (Ukraine).

5. Results of studying the theoretical and methodological aspects of decision-making on the formation of an optimal resource base

5. 1. Justification of the stages of the process of forming a rational resource base as the basis for organizing effective long-term relationships with attractive stakeholders

Under the conditions of functioning of enterprises, when the basis of the world economy is resource saving, the decision on the expediency of attracting certain types of resources from third-party enterprises or their independent production should be carried out subject to the efficiency of such production. For the effective post-war resumption of production of specific enterprises, the decision on their relationship with stakeholders at first glance will be based on the conditions of the possibility of obtaining by each of them of the maximum value of the main effect. However, such a decision can ensure short-term performance of the enterprise. In order to increase the strategic efficiency of the enterprise, when choosing options for the formation of its resource base, it is advisable, in addition to maximizing the effectiveness of the proposed options for attracting resources, to take into account possible potential reserves for creating an additional effect. This additional effect should contribute to the strategic competitive development of the enterprise. Therefore, it must be thoroughly defined and economically confirmed.

Therefore, the production of certain types of resources is effective in the case when the total effect of the implementation of certain business processes necessary for the release of these resources is higher than the cost of their acquisition from the relevant suppliers.

The total effect in this case consists of the main effect obtained from the production of a certain resource plus an additional effect. An additional effect, in this case, is formed as a result of the use of certain managerial innovations aimed at the creative formation and use of side benefits. Moreover, side benefits are formed by the interaction of business processes that are involved in the production of some resources with the business processes of the enterprise, the implementation of which ensures the creation of its other goods. When assessing potential reserves for the formation of an additional effect of interaction with certain stakeholders, their main characteristics should be taken into account. Such characteristics should include the level of innovation of certain stakeholders, the creativity of direct employees involved in cooperation, the possibility of using and types of management innovations used by stakeholders, their prospects and susceptibility to the market, etc.

A positive decision on the expediency of manufacturing a certain resource under the above-mentioned conditions (taking into account the main and additional effects) will also be in case of the possibility of enhancing the synergy effect not very effective but strategically promising areas of activity of the enterprise.

The scientific and methodological approach to the formation of a rational base of resource support for effective current and competitive strategic development of the enterprise is shown in Fig. 1.

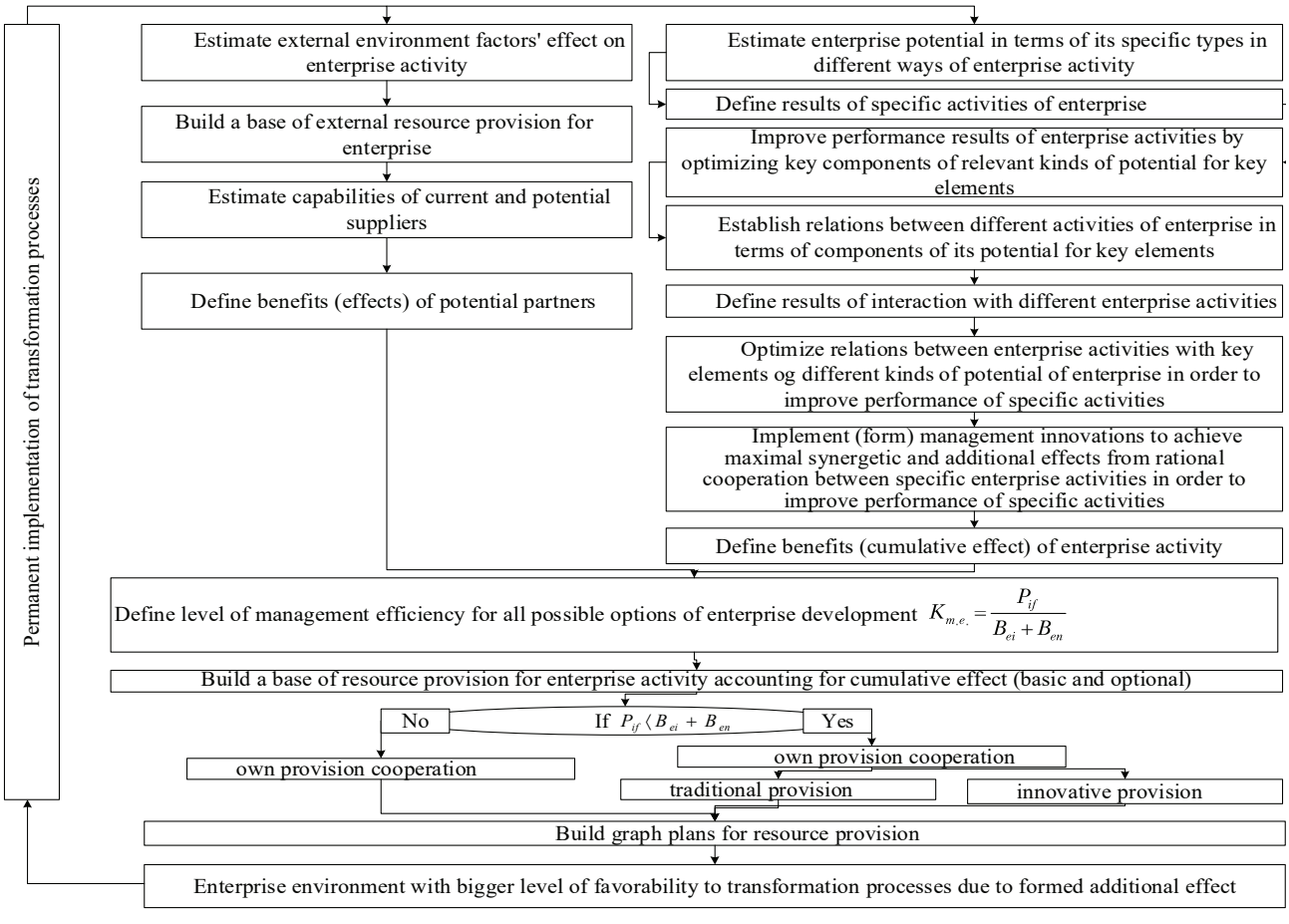

Fig. 1. Block diagram of the scientific and methodological approach to the formation of a rational base of resource support for effective long-term competitive development of the enterprise

The approach offered in Fig. 1 contributes to the prompt decision-making on the choice of the option of resource support for the enterprise. In addition, the resource base formed in this way increases the stability of the enterprise in the external environment since through the established resource security of individual business processes it makes it possible to clearly track in which cases it is necessary to use specific management innovations.

5. 2. The coefficient of managerial efficiency – the criterion for determining alternative sources of resource provision

To what extent the manufacture of a product, which acts as a raw material for a particular type of activity of an enterprise, provides a higher level of cumulative effect compared to the alternative use of raw materials of an attractive stakeholder, it is advisable to determine by the coefficient of managerial efficiency. The coefficient of management efficiency is calculated by (1):

$$K_{m.e.} = \frac{P_{if}}{B_{ei} + B_{en}}, \quad (1)$$

where P_{if} is the effectiveness of the independent functioning of the enterprise with the available potential (assortment), which is calculated by (2);

B_{ei} – the effects formed as a result of the alternative attraction (as opposed to the possibility of their independent production) of the necessary types of raw materials for the implementation of the i-th business process aimed at the manufacture of a certain type of product;

B_{en} – excessive effect as a result of the interaction of the enterprise with a specific stakeholder of alternative resource support for the effective implementation of a certain area of activity;

$$P_{if} = \sum_{i=1}^{n} Eo_i + Ed_i, \quad (2)$$

where P_{if} is the effectiveness of the independent functioning of the enterprise with the existing potential (assortment);

E_{Oi} – the value of the main effect of the implementation of the i-th business process of the enterprise aimed at ensuring the effectiveness of a separate direction of its activities;

n – the number of business processes of a certain direction of activity (or the number of business processes of a certain cycle of manufacturing a particular product of the corresponding activity).

The calculation of the value of the main effect E_o is carried out from (3):

$$Eo = \sum_{j=1}^{s} Pp_j \cdot Pn_j \cdot Prm_j \cdot Psc_j, \quad (3)$$

where s is the number of activities (full cycles of manufacturing products in one area of activity);

Pp_j – profit that the company receives from the sale of the j-th type of product in a certain area of activity;

Pn_j – the level of attractiveness of the j-th type of product of a certain direction of activity for consumers;

Prm_j – the level of the relative share of the j-th type of product in the activities of the enterprise;

Psc_j – the level of satisfaction of the needs of stakeholders with the j-th type of product.

The magnitude of the additional effect is the accompanying (side) results obtained from the implementation of business processes of a separate cycle of manufacturing a certain product of the corresponding activity. An additional effect may also include side effects of the interaction of individual elements of different business processes within a certain area of activity under the influence of the introduction of specific types of management innovations. In this case, related results are taken into account as an additional effect only if they constitute or are able to provide a separate existing or potential value for the activities of the enterprise in both current and strategic periods. An additional effect may include certain innovations, substitute products, rationalization proposal, etc.

The excess effect B_{en} is calculated by (4):

$$B_{en}=E_{di}-B_{ci}, \tag{4}$$

where E_{di} is the additional effect from the use of the remaining potential of the business entity, with which the possibility of interaction or more rational implementation of the relevant business processes of the studied enterprise and stakeholder under the influence of certain types of management innovations is considered;

B_{ci} – the costs necessary for the independent provision of services or the manufacture of products by the enterprise (costs associated with the creation of these benefits) (independent benefit).

Thus, the coefficient of managerial efficiency shows the level of benefit from possible integration with a particular stakeholder. According to the value of the coefficient, appropriate management decisions are made regarding the expediency (necessity) of the participation of a certain stakeholder in the activities of the enterprise. Cooperation with a particular stakeholder is taken into account in case of joint implementation of specific business processes with maximum efficiency, which will ensure the efficiency (success) of the enterprise both in the current and in the strategic perspective.

In cooperation of the enterprise with a potential stakeholder in the form of:

– traditional provision focuses on the formation of the main effect and the application of management innovations aimed at saving costs, improving product quality, increasing the value of the synergistic effect, etc.;

– innovative provision is the priority is the maximum use of the possibilities of forming an additional effect to ensure the strategic development of the enterprise through the formation of unique competitive advantages.

To attract and retain attractive stakeholders, it is necessary to use certain measures of the appropriate motivational system proposed in work [13].

The choice of one of the considered forms of resource provision by a particular enterprise depends on the purpose of their activities: a simple gradual increase in the capabilities of the enterprise (own or traditional support); gaining and consolidating significant long-term positions in the market is innovative support.

5. 3. Management innovations are the driving force for improving the effectiveness of the chosen resource provision option in the strategic perspective

Increasing the effectiveness of the chosen resource provision option is possible by reducing waste resources (the possibility of reuse), optimizing them in the process of use, obtaining additional benefits from their use in the main production, mutually beneficial replacement of individual results of the implementation of various business processes among themselves, etc. Effective implementation of such measures requires the use of appropriate management innovations that will ensure timely tracking by enterprises of the possibility of obtaining an additional effect, the direction of its expansion, operational-effective growth, and rational distribution of the existing effect for the competitive functioning of the entire enterprise and its individual structures.

In order to optimize tactical actions in the framework of the formation of management innovations, it is proposed to use a spatial-dynamic model of their construction [14], shown in Fig. 2. The influence of management innovations formed in this way on the adoption of management decisions on the implementation of individual business processes provide the enterprise with resistance to reproduction conditions, as they affect the transformation processes in the economic system. It is management innovations that affect the level of the effect obtained in the interaction of various business processes, which makes it possible, in addition to increasing their effectiveness, to provide a certain additional efficiency of business processes, which reflects new or modified properties (characteristics) of existing effects.

In this case, the formation of the effect with the use of managerial innovations occurs by (5):

$$E_{Ai}=\left\{\begin{matrix} M_e\left(M_{inf},M_f,M_i\right)\left|P_{b.p.1.1}\cap P_{b.p.1.2}\cap\right.\right\}, \\ \cap P_{b.p.2.1}\cap P_{b.p.2.2}\cap P_{b.p.N.N}\end{matrix}\right\}, \tag{5}$$

where M_e – management effects;

M_{inf} – managerial influences;

M_f – management functions;

$P_{b.p.1.1}$ – implementation of the business process of the 1st first business unit;

M_i – management innovation;

E_A – effect A with additional characteristics that exceed the basic need (goal) and are necessary for effective development under the conditions of post-war reproduction.

Moreover, in the content of this article, a business unit means a separate division of a company that covers one or more products (activities) that meet similar needs, has its own capabilities for future production growth and profitability; the business process is a process (set of actions) that has an input product, adds value to it, and provides the resulting product for the internal or external consumer.

In this case, the interpenetrating effectiveness of the implementation of business processes among themselves using management innovations ensures the addition of the overall performance of the enterprise with a certain level of efficiency necessary for its successful development under the conditions of post-war reproduction, showed by equality (6):

$$E_{Ai}\cap E_B\cap E_C\cap E_{Di}=M_p\cup M_{ef}, \tag{6}$$

where M_{ef} – managerial efficiency;

M_p – managerial performance.

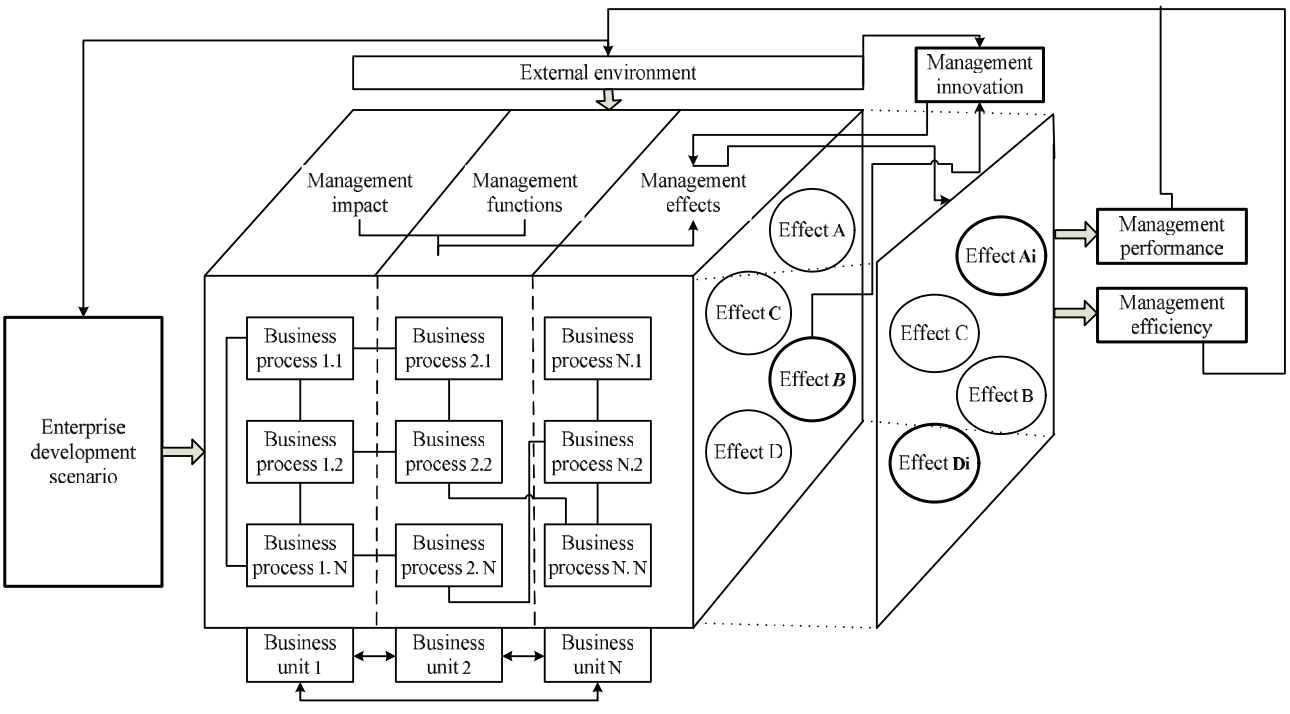

Fig. 2. Spatial-dynamic model of management innovation formation

The effect in the case of using managerial innovations increases, depending on their orientation, acquiring certain features of manufacturability, creativity, uniqueness, etc. The emergence of a new effect is due to rational ideas that arise as a result of reengineering business processes to enhance a certain managerial effect. A prerequisite for business process reengineering is certain managerial influences, taking into account the relevant management functions, due to obvious and promising offers in the market, new public views on certain things, etc. That is, management innovation is a set of forced and creative ideas for the implementation of relevant business processes to achieve a certain innovative effect and solve specific problems in the process of enterprise activity under the conditions of post-war reproduction.

5. 4. The effectiveness of using the coefficient of management efficiency to rationalize the resource provision on the example of a particular company

An important prerequisite for the formation of a rational resource base according to the methodological approach presented in Fig. 1 is the need to analyze the external and internal environment of the enterprise. Such an analysis is necessary to specify the basic processes that should be carried out at the enterprise, and auxiliary, the results of which are more profitable to attract from the outside.

Analysis of the internal environment of the studied enterprise is focused on the assessment of the production program for the possibility of rationalizing the assortment policy of the enterprise and more accurately outlining the sources of attracting specific types of resources. The results of the evaluation of the production program of TzDV "Lviv Milling Machine Plant" for 2019–2020 are given in Table 1.

The results of the evaluation of the production program of the studied enterprise given in Table 1 indicate a decrease in its efficiency. Confirmation of the above is a decrease in the volume in 2020 compared to 2019: marketable products by 57.3 % or UAH 1946.1; products sold for the year by 31.67 %; book profit by 94.43 %; current assets of about 1 %.

Table 1

Value of the indicators of the production program of TzDV "Lviv Milling Machine Plant" for 2019–2020

Name of indicators	Measurement unit	The value of indicators					Relative deviation 2020/2019, %
		2019, actually	2020				
			according to the plan	actually	Deviation		
					+/–	%	
The volume of marketable products (work performed) in current prices	UAH	3397.6	4452.2	1451.5	–3000.7	reduction by 3 times	2-fold reduction
The level of utilization of production capacities	%	81	95	88	–7	–7.95	8.64
Volume of products sold	UAH	6145.6	6216.8	4199.5	–2017.3	–48.04	–31.67
Balance sheet profit (loss)	UAH	718	720	40	–680	decrease by 18 times	decrease by 18 times
Financial result from ordinary activities	UAH	876	879	51	–828	decrease by 17 times	decrease by 17 times
Finished products in the warehouse	UAH	2941	2000	2596	596	22.9	–11.73
Current assets (funds)	UAH	5623.1	5600.2	5569.1	–31.1	–0.56	–0.96

Note: USD purchase/sale rate at the time of settlement was in 2019 – UAH 23.7/24.6; in 2020 – UAH 27.8/28.1

In addition, in 2020, there is also an increase in the balances of finished products in warehouses by 22.9 % compared to the plan, which also reduces the efficiency of the enterprise.

In order to clarify the reasons for the decline in sales volumes, we shall analyze the differences between planned and actual production volumes for the main types of products of TzDV "Lviv Milling Machine Plant" for 2019–2020 (Table 2).

As for the actual values of production, in 2020, compared to the plan, on the contrary, there is a decrease in their decline in all types of products, except for the machining of parts, where the actual implementation of the plan is 115.8 %. Similarly, there was a decrease in production volumes for all types of products of the studied enterprise in 2020 compared to 2019, the only exception is an increase in the volume of machining of parts by 9.3 % or 143.50 thousand UAH, which the company did not take into account when planning.

In general, TzDV "Lviv Milling Machine Plant" planned to produce products for 6216.80 thousand UAH, and actually released – by 4200 thousand UAH, which is only 64 % of the plan implementation. The implementation of the plan for the production of certain types of products of the studied enterprise for 2020 (in %) is shown in Fig. 3.

The discrepancy between the planned and actual indicators of the studied enterprise indicates its inefficient activity, insufficiently qualified management personnel, and orientation only to past values of performance indicators. The presence of the above-mentioned problems that contribute to the irrational planning of the production of certain types of products is evidenced by the low level of utilization of production capacities of TzDV "Lviv Milling Machine Plant", which in 2020, was 88 %. Compared to 2019, the value of this indicator increased by 0.09 % but there are still significant reserves of production capacity, which indicates their irrational workload. The availability of reserve capacities allows the company to consider the option of cooperation with an attractive stakeholder in the form of exchanging excess opportunities or expanding the production of its own products. Accordingly, when building an effective version of the interaction of the enterprise with individual stakeholders, it is appropriate to take into account the magnitude of the possible types of effects of interaction of the relevant business processes of different enterprises. For example, TzDV "Lviv Milling Machine Plant" can produce certain products in its production areas necessary for the effective functioning of the partner enterprise, which will provide us with the necessary product (metal, metal structures, etc.) on mutually beneficial terms.

According to the results of the analysis of the external and internal environment of the enterprise under study, the factors that negatively influenced the formation of the inefficient production program of TzDV "Lviv Milling Machine Plant" were determined:

– failure to take into account external factors of influence, namely, inflation and insolvency of the population;

– lack of marketing justification of the production program of the enterprise since the production plan was formed on the basis of indicators of production of products of the last year;

– non-compliance of the product range with consumer demand;

– unsatisfactory work of the production unit of TzDV "Lviv Milling Machine Plant" in the direction of improving the quality and/or optimizing costs.

The inefficient production program is confirmed by the lack of response measures on the part of the enterprise (lack of proper managerial influence, failure to take into account the motives of consumers' appeal to the enterprise under study and the formation of certain rationalization proposals, creative ideas, etc.) to the problems outlined above. For example, according to the results of the analysis of activities at the enterprise, there is a decrease in physical wear of equipment by 0.82 % and obsolescence – by 8.78 %, and an increase in the level of progressiveness and equipment upgrades by 3.32 % and 28.43 %, respectively. Such a change in indicators indicates a decrease in the use of outdated equipment in the enterprise's activities and an increase in opportunities to improve quality or improve it, which contributes, subject to effective management, to better satisfaction of consumer needs and increased profits, especially the exchange of excess opportunities with certain stakeholders.

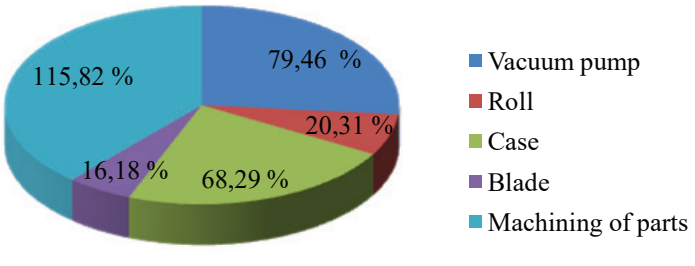

Fig. 3. The structure of the implementation of the plan for the main types of products of TzDV "Lviv Milling Machine Plant" for 2020

Table 2

The results of assessing the level of implementation of the production plan of the studied enterprise for 2019–2020

Type of product	Production volume, thousand UAH			Variance of planned release in 2020 to 2019		Deviation of the actual output in 2020			
	2019	2020				from the 2020 plan		from the fact of 2019	
		plan.	fact.	thousand UAH	%	thousand UAH	%	thousand UAH	%
Vacuum pump	1843.80	1850.0	1470.0	6.20	33.6	–380.0	–20.5	–373.8	–20.3
Roll	614.6	620.50	126.0	5.90	96.0	–494.5	–79.7	–488.6	–79.5
Case	921.9	1045.5	714.0	123.60	13.4	–331.5	–31.7	–207.9	–22.5
Blade	1229.20	1250.3	210.00	21.10	1.7	–1040.3	–83.2	–1019.2	–82.9
Machining of parts	1536.50	1450.5	1680.0	–86.00	–5.6	229.5	15.8	143.5	9.3
Total	6146.00	6216.8	4200.0	70.80	1.2	–2016.8	–32.4	–1946.0	–31.7

The failure to take into account these factors when planning the production program of the enterprise and the formation of tasks is concentrated on increasing the volume of production of core products and led to a decrease in the volume of its implementation.

The production unit of TzDV "Lviv Milling Machine Plant" did not correctly develop a plan for the logistics of production and the calculation of the needs of the products to produce (marketing department).

For the effectiveness of the implementation of the stage of optimization of interrelations between the activities of the enterprise (Fig. 1): we have provided recommendations: when planning production volumes, take into account the commitment and needs of consumers in the products of the enterprise under study. Taking into account the commitment will increase the volume of sales of products and rationalize its production by individual types. In order to determine the level of consumer commitment to the products of the studied enterprise, a customer survey was conducted on the motives for their purchase of products of TzDV "Lviv Milling Machine Plant". The results of the survey are summarized in Table 3, and illustrated in Fig. 4.

Fig. 4 shows the structure of consumers in relation to their motives for purchasing products of TzDV "Lviv Milling Machine Plant".

As you can see from the data in Fig. 4, consumers of the enterprise are more inclined to receive machining services for parts since due to low solvency they preferred repairs, instead of buying a new part. Accordingly, when forming a production program, the main emphasis should be placed on consumer demands and their growing needs. It would be appropriate to provide an opportunity, along with the manufacture of specific types of products, to ensure their restoration, pre-operation, renovation, etc.

An important point when choosing alternative options for optimizing the production program is necessary to take into account the characteristics of the industry in which the enterprise operates. TzDV "Lviv Milling Machine Plant" operates in the field of agricultural engineering, which, due to significant changes in the environment of operation, in particular external, undergoes a significant reduction. The main factors for reducing the effectiveness of this industry are unsuccessful reform of agriculture; changes in property relations and forms of management; the economic structure of the agrarian sphere was practically destroyed, and large diversified agricultural enterprises were liquidated. For effective development, the studied enterprise should focus on those types of products that will contribute to the implementation of the full production cycle for the manufacture of a particular agricultural product. Or to focus on manufactured goods that have a wide not only agricultural purpose and are characterized by a significant level of demand. This development option will allow cooperation with large enterprises in the supply of high-quality components due to their specialization. This is especially true for machine-building enterprises, since the production uses a significant number of parts, assemblies, and components manufactured at various enterprises.

The studied enterprise belongs to material-intensive enterprises, so it is worth considering the possibility of attracting certain types of raw materials from stakeholders on attractive terms in order to reduce costs or improve the quality of the product. This is extremely relevant especially for the enterprise under study since the results of studying the enterprise's activities indicate the inefficient use by the enterprise of all its resources during 2020. As for material resources, namely material costs that fall on the production of a unit of production, there is a negative change in them – an increase of 5.59 %. Labor efficiency is also characterized by a negative trend. Labor costs per 1 UAH of production costs increase by 24.8 %, labor productivity decreases by 23.5 %.

Due to the availability of a reserve of production capacities, appropriate equipment, and skilled workers, TzDV "Lviv Milling Machine Plant" can introduce a new production. However, the company needs to determine what type of product will provide it with strategic competitiveness. Accordingly, the issue of prompt most accurate determination of the list of promising areas of activity, the basis for the effective implementation of which is the effective implementation of a rationally balanced set of business processes, is relevant. The definition of such a complex of interrelated business processes, taking into account the peculiarities of the world and domestic economies, namely, the need to take into account the principles of the circular economy and the peculiarities of the post-war recovery, should be carried out through maximizing the possibility of resource saving using the coefficient of managerial efficiency.

Table 5 gives the structure of costs for the manufacture of each type of product of TzDV "Lviv Milling Machine Plant" for 2020 in order to determine the feasibility of its manufacture or purchase from certain suppliers.

To simplify the calculations, we shall take as a supplier of certain types of resources one of its main stakeholders, the private enterprise "Favorit AM", with which TzDV "Lviv Milling Machine Plant" has a contract for the supply of metal, metal products, and metal structures, etc.

With the help of the coefficient of managerial efficiency, the expediency of independent production of individual products that act as raw materials for other goods of the enterprise, in particular, the machining of parts, is determined:

$$K_{m.e.m.p.} = \frac{1,799.3}{(88.82 + 2,759.85) - 1,484} = 1.32.$$

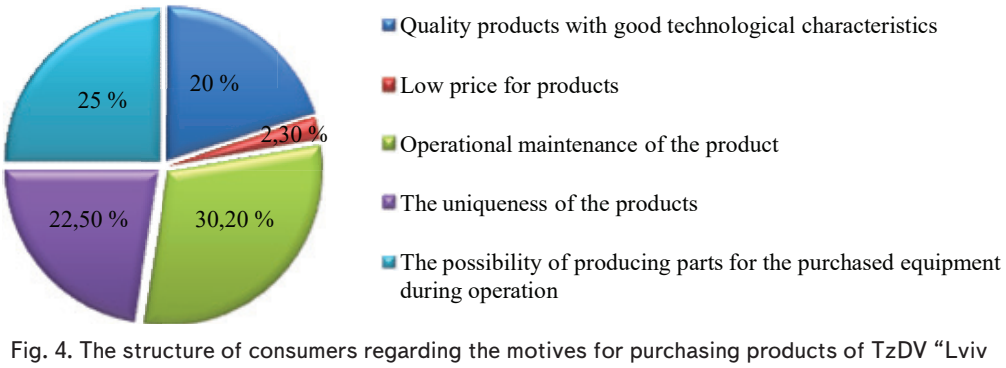

Fig. 4. The structure of consumers regarding the motives for purchasing products of TzDV "Lviv Milling Machine Plant"

Table 4

Results of consumer surveys on the motives for purchasing the products of the studied enterprise

Motives for buying	The share of consumers who have chosen the characteristic, %
Quality products with good technological characteristics	20
Low price for products	2.3
Operational maintenance of the product	30.2
The uniqueness of the products	22.5
The possibility of producing parts for the purchased equipment during operation	25

Note: by low price we mean the level of prices for products and their delivery acceptable to consumers compared to the products of competitors; calculated by Author

The calculation did not take into account the possible additional benefits of cooperation with the selected enterprise, for example, reducing the cost of other resources supplied by this supplier. The effects of alternative involvement of this type of activity were calculated as benefits associated with reducing the costs associated with the process of machining parts and the amount of funds for their purchase from third-party companies. When calculating the coefficient of managerial efficiency, the costs of third-party companies for machining parts were determined by the amount of payments for the machining work performed only by the products of TzDV "Lviv Milling Machine Plant". In the case of self-machining of parts, the studied enterprise performed such work for third-party enterprises (for a fee).

From the obtained value of the coefficient of managerial efficiency for the product of machining one can see the expediency of its implementation independently by the TzDV "Lviv Milling Machine Plant".

Using the coefficient of managerial efficiency, the feasibility of producing a vacuum pump is determined:

$$K_{m.e.v.p.} = \frac{98.7}{(830.94+315.36)-1,245} = -1.$$

According to the data obtained, it can be concluded that the company can buy this product or manufacture it independently. However, if you buy this product from suppliers, its price will be higher since, for TzDV "Lviv Milling Machine Plant", the cost of manufacturing a vacuum pump is lower due to self-processing of parts. This confirms the value of the coefficient of management efficiency calculated taking into account the cost of machining parts to third-party enterprises:

$$K_{m.e.v.p.} = \frac{98.7}{(830.94+315.36+220)-1,245} = 0.81.$$

The value of the management efficiency coefficient of 0.81 indicates the feasibility of producing vacuum pumps by other companies.

Using the coefficient of managerial efficiency, the feasibility of producing the roll is determined:

$$K_{m.e.r.} = \frac{372.26}{(3,428.67+821.18)-4,700} = -0.83.$$

From the calculations carried out, it can be seen that it is advisable to produce a roll at TzDV "Lviv Milling Machine Plant" since its price at the enterprise under study is acceptable to consumers due to lower costs for its manufacture due to self-processing of individual parts.

In addition, self-processing of parts improves the quality and duration of operation of certain types of products, which is a significant advantage of TzDV "Lviv Milling Machine Plant" from the point of view of consumers according to the motives for their purchase of products of the studied enterprise (Table 4).

To increase the efficiency of the studied enterprise and reduce the reserves of existing production facilities, it is appropriate to increase the volume of goods manufactured at the enterprise, which will not require additional costs for their implementation.

Table 5

Cost structure required for the manufacture of various types of products of TzDV "Lviv Milling Machine Plant"

Products	Vacuum pump	Roll	Case	Blade	Machining of parts
Production volume, pcs.	95	1	10	10	33
Unit price, UAH.	1,245	4,622.11	1718	100	4,648
Fixed costs per unit of output, UAH					
Administrative expenses	159.27	527.21	201.7	9.81	576.83
Overhead costs	347.57	1,481.48	603.65	22.88	1,304.59
Technological fuel and energy	156.6	757.02	318.43	16.37	383.94
Basic salary	133.68	529.10	205.44	11.44	390.04
Deductions for social funds	35.23	133.86	51.97	2.89	104.45
The total amount of expenses per unit	830.94	3,428.67	1,381.19	63.39	2,759.85
Variable costs per unit of output, UAH					
Materials	75.00	720.00	158	26	0.00
Purchased products	213.33	0.00	0.00	0.00	0.00
Returned waste	1.04	9.94	2.18	0.00	0.00
Additional salary	20.05	79.37	30.85	1.72	64.04
Tools and tooling	8.02	31.75	12.32	0.69	24.78
The total amount of expenses per unit	315.36	821.18	198.99	28.41	88.82
Profit per unit of product, UAH	98.70	372.26	137.82	8.20	1,799.33

The possibility of increasing the number of vacuum pumps by 10 % was determined, which made it possible to increase the coefficient of managerial efficiency and obtain a higher level of production efficiency of this product. In this case, the coefficient of managerial efficiency was:

$$K_{m.e.v.p.} = \frac{98.7 + 87.46}{(830.94 + 315.36) - 1,245} = 1.88.$$

The increase in the production of vacuum pumps by 10 % made it possible to increase the efficiency of production of this product due to its own machining of parts, which is confirmed by the corresponding value of the coefficient of managerial efficiency of machining parts:

$$K_{m.e.m.p.} = \frac{1,619.37}{1,569.3} = 1.03.$$

With an increase in the number of vacuum pumps, respectively, the cost of machining parts will also increase, however, having calculated the coefficient of managerial efficiency of machining parts with such an increase, we obtain a value that confirms the feasibility of its independent implementation.

It is possible to increase the efficiency of individual activities by increasing the effectiveness of their implementation by, for example, increasing the supply of machining parts to third-party enterprises, or increasing the number of other types of products by obtaining additional effects from integration with attractive stakeholders.

According to the results obtained, the coefficient of managerial efficiency and methodological recommendations presented in Fig. 1, an effective resource base for TzDV "Lviv Milling Machine Plant" will be cooperation in the form of innovative support. The long-term effectiveness of this cooperation should be strengthened by certain managerial innovations aimed at finding effective options for realizing the possibility of supplying existing goods to specific stakeholders on favorable terms. Such managerial innovations will be: maintaining infrastructure at the proper level; motivational work with consumers; total management of auxiliary services to find opportunities for longer-term satisfaction of the needs of consumers who have purchased the company's products.

The measures described above will help TzDV "Lviv Milling Machine Plant" to form a cost-effective structure of the product range, in which the largest share will be occupied by products that are at the stage of maturity and growth and bring the highest profit.

Since each type of product manufactured by TzDV "Lviv Milling Machine Plant" includes metal and metal structures, the company gives a significant part of its capital to suppliers for raw materials, regardless of product sales. Therefore, it is worth considering by the studied enterprise the possibility of independent production of the main resource of "metal and metal structures". This will make it possible:

– to reduce the cost of raw materials and materials for the production of products;

– to expand the range of products by introducing metal parts into production and satisfy the need of consumers to repair certain products or their cheaper manufacture at the expense of their own raw material base.

6. Discussion of results of studying the features of the formation of the optimal resource base

A scientific and methodological approach to the formation of a rational base of resource support of the enterprise is proposed, which will contribute to the prompt decision-making of the choice of effective options for attracting the necessary types of resources that will contribute to the stable strategic development of the enterprise. This is possible, as can be seen from Fig. 1, due to the formation of a balanced basis for the strategic development of the enterprise by the effective compatibility of individual business processes of the enterprise itself and/or attractive offers from partners.

The proposed approach, in contrast to those reported in [12–14], implies determining a more effective option for attracting the necessary types of resources (due to their own production or attraction on favorable terms from attractive stakeholders) for the competitive development of the enterprise using the coefficient of managerial efficiency.

The calculation of the coefficient of managerial efficiency, the parameterization of which is represented by formulas (1) to (4), will make it possible to concentrate the activities of the enterprise on those types of products that will provide it with significant competitive advantages, the main of which will be the optimal resource base. The definition of a rational production program in this way will allow enterprises to gradually increase their own potential of high quality and strategic prospects with minimal costs, which is an integral prerequisite for the restoration of modern enterprises, especially in the post-war period.

The proposed developments will be relevant in the formation of Ukrainian-European programs for the revival of the Ukrainian economy when looking for ways of interaction of Ukrainian enterprises with enterprises of partner countries. The use of the proposed recommendations for optimizing the resource base as the basis for the gradual increase of a certain type of development potential by the enterprise under study is appropriate since its location is geographically close to European countries, which gives hope for a real assistance for revival when interacting with foreign stakeholders of a new type.

Improving the effectiveness of the created resource mutually providing complex of business processes depending on changes under the conditions of operation of the enterprise is possible through the use of appropriate types of management innovations. This is justified by the fact that management innovations in this case are intended to form a possible or desired additional effect through the creative use of the existing reserve or its increase, as follows from the one presented in Fig. 1 sequence of stages.

The approbation of the proposed scientific and methodological approach to determining the more effective option for attracting the necessary types of resources at the machine-building enterprise of TzDV "Lviv Milling Machine Plant" was carried out. The activity of the enterprise is analyzed with a detailed consideration of the level of implementation of its production program. The results of the analysis, presented in Tables 1, 2 and Fig. 3, indicate a decrease in production volume and the presence of deviations in the actual performance of the enterprise from the planned ones. Internal factors that influenced the identified deviations were determined: inconsistency of the product range of consumer demand; unsatisfactory work of the production

unit of TzDV "Lviv Milling Machine Plant" in the direction of cost optimization. Among the external factors is the failure to take into account external factors of influence, namely, inflation and insolvency of the population, the lack of marketing justification of the production program of the enterprise since the production plan was formed on the basis of production indicators of the previous year.

Recommendations have been developed to optimize the production program of TzDV "Lviv Milling Machine Plant" by rationalizing the resource supply in the context of the specificity of consumer demand, the production potential of the enterprise, and the predominant capabilities of certain suppliers. According to the results of a retrospective analysis of the enterprise's activities, it was determined that TzDV "Lviv Milling Machine Plant" has the opportunity to increase the production of goods available at the enterprise since it has an unused reserve of production capacity.

Using the coefficient of managerial efficiency, according to the recommendations of Fig. 1, it is determined that the effective resource base for TzDV "Lviv Milling Machine Plant" will be cooperation with attractive stakeholders in the form of innovative support. It is also proved that the effectiveness of such cooperation should be enhanced by certain management innovations aimed at finding effective options for realizing the possibility of supplying existing goods to specific stakeholders on favorable terms. It has been established that the implementation of these measures will lead the enterprise to increase the level of implementation of the production program and, unlike the basic activity, will ensure a gradual increase in the competitive potential of its strategic development.

However, in the studies on the formation of a rational resource base, the focus was on providing the enterprise with material resources. This, accordingly, limits the field of their practical use and outlines the scope of further research in the direction of rationalizing the resource provision of this enterprise for other types of resources and describing the possibilities for their coordination. This, accordingly, would clarify the composition of management innovations within each of the forms interaction of enterprises with stakeholders in the process of rationalization of their resource provision. This will allow the company to focus on certain aspects (personnel qualification, level of equipment and technology, effectiveness of marketing activities, etc.) of its activities and, if necessary, ensure their improvement to improve the efficiency of the proposed management innovations.

The disadvantage of the study is that the effectiveness of the proposed recommendations is confirmed by the appropriateness and practicality of their implementation in the activities of enterprises whose products consist of a significant number of parts and assemblies. That is, the submitted recommendations for the formation of the resource base are appropriate for multidisciplinary enterprises. Accordingly, for single business enterprises, the recommendations offered in the work may be unnecessarily costly.

7. Conclusions

1. Consistent implementation of the proposed stages in the approach to the formation of a rational resource base makes it possible to effectively organize the process of attracting resources from specific sources, while taking into account the maximum possible ability of the enterprise to strengthen or form long-term competitive advantages. In turn, the generated sources of resource attraction contribute to the creation of certain communication platforms with individual stakeholders, depending on the desired competitive advantages of the enterprise. Moreover, for the current period, this approach makes it possible to determine the feasibility of supplying resources from individual suppliers. In a strategic understanding, this makes it possible to organize an effective model of resource mutual supply of business processes, which reduces the dependence of the enterprise on the external environment and, accordingly, increases its stability. Focusing on key aspects of the enterprise's activities, determined by the results of assessing its potential, makes it possible to increase profitability, reduce costs, increase the number of consumers, etc., depending on the goals set.

2. The definition of the proposed coefficient of management efficiency contributes to a clear calculation of the benefits obtained from a certain option of resource support and provides an opportunity to build an effective communication platform with individual stakeholders for the effective organization of competitive activities of the enterprise in the strategic period. In addition, the value of the coefficient of managerial efficiency will make it possible, depending on the possibilities of interaction with the necessary stakeholders to form an effective resource base, to outline the measures of the motivational mechanism for potential and existing partners and clarify the directions of management innovations.

3. Improving the effectiveness of the created resource mutually providing complex of business processes of a particular enterprise, depending on changes under the conditions of its operation, is possible through the use of appropriate types of management innovations. The presented spatial-dynamic model of building a system of management innovations reflects the process of forming an additional effect under different options for the interaction of business processes of an enterprise depending on alternative sources of resource support for their implementation when using specific types of management innovations. The transfer of information data of the enterprise to this model will make it possible to build a coordinated scheme for the use of certain managerial influences and management functions when choosing appropriate management innovations aimed at enhancing the effectiveness of the interaction of various business processes depending on the specific option of resource support for their implementation. Or vice versa, it will outline the necessary managerial influences in the case of using individual management innovations to increase the competitiveness of the enterprise in the strategic period.

4. The use of the coefficient of managerial efficiency to rationalize the resource support for the activities of the enterprise under study confirmed the expediency of independently providing certain types of services and the manufacture of individual goods. Taking into account the value of the coefficient of managerial efficiency for certain types of goods, the possibility of increasing the volume of vacuum pumps manufactured at the enterprise by 10 % is determined. To increase the effectiveness of the release of

this product became possible due to its own machining of parts. The presence of machining of parts allowed for the studied enterprise, in addition to obtaining a certain level of economic effect, to provide the company with stable competitive advantages by increasing the service life and quality of individual components of its various products.

Conflicts of interest

The authors declare that they have no conflicts of interest in relation to the current study, including financial, personal, authorship, or any other, that could affect the study and the results reported in this paper.

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Data availability

All data are available in the main text of the manuscript.

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