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INNOVATIVE STRATEGY OF RAILWAY TRANSPORT ENTERPRISES: DECISION-MAKING MODEL AND CHOICE ALGORITHM

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The article argues that railway transport enterprises, which are generators of national economic development, are currently in a difficult state and require innovative changes through the effective use of existing potential, taking into account the requirements of the present. It is determined that in order to maintain adequate adaptability of railway transport enterprises to the radical changes in the external environment caused by the development of digitalization, globalization, greening and intellectualization processes, as well as to create a temporary advantage necessary for restructuring operational activities and stimulating the development of the transport and logistics market, it is extremely important to choose an effective innovation strategy that will allow transforming their activities in accordance with the challenges of the environment. The content of the concept of "innovation strategy" and existing methods for performing portfolio analysis are analyzed. It is concluded that the existing list of models for forming strategies is not able to create an effective basis for developing an innovative strategy for railway transport enterprises, because: it is mainly oriented towards the general corporate strategy, and the innovative strategy is seen only as functional and does not take into account the peculiarities of the management of railway transport enterprises. It is proposed to use a model for making decisions on the general corporate innovative strategy by railway transport enterprises, built on the principles of scaling. This model is based on the choice of strategic alternatives depending on such criteria as the "level of innovative potential" possessed by the railway transport enterprise (because it is the basis for carrying out innovative changes), and the "long-term attractiveness of the transport and logistics market" (determines the expediency of carrying out innovative changes by the enterprise). Given the imbalance of the components of the innovative potential of railway transport enterprises, an algorithm for choosing an innovative strategy in a promising market for railway transport enterprises has been developed, taking into account the level of the components of the innovative potential, the implementation of which will allow improving the quality of strategic management decisions in the field of innovative activity of railway enterprises.

***Keywords**: railway transport enterprises, innovation strategy, model, algorithm, scaling, innovation.*

ІННОВАЦІЙНА СТРАТЕГІЯ ПІДПРИЄМСТВ ЗАЛІЗНИЧНОГО ТРАНСПОРТУ: МОДЕЛЬ ПРИЙНЯТТЯ РІШЕНЬ ТА АЛГОРИТМ ВИБОРУ

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В статті аргументовано, що для підтримки адекватної адаптивності підприємств залізничного транспорту до кардинальних змін зовнішнього середовища, обумовленого розвитком процесів цифровізації, глобалізації, екологізації та інтелектуалізації, а також створення тимчасової переваги, необхідної для перебудови експлуатаційної діяльності та стимулювання розвитку транспортно-логістичного ринку, вкрай важливим стає вибір дієвої інноваційної стратегії, що дозволить трансформувати їх діяльність відповідно до викликів оточення. Проаналізовано зміст поняття «інноваційна стратегія» та наявних методик виконання портфельного аналізу. Запропоновано використання моделі прийняття рішення щодо загальнокорпоративної інноваційної стратегії підприємствами залізничного транспорту, побудованої на засадах масштабування. В основу даної моделі покладено вибір стратегічних альтернатив залежно від таких критеріїв, як «рівень інноваційного потенціалу», яким володіє підприємство залізничного транспорту (адже є основою для проведення інноваційних змін), і «довготривала привабливість транспортно-логістичного ринку» (визначає доцільність проведення інноваційних зрушень підприємством). Зважаючи на розбалансованість складових інноваційного потенціалу підприємств залізничного транспорту, розроблено алгоритм вибору інноваційної стратегії на перспективному ринку для підприємств залізничного транспорту з урахуванням рівня складових інноваційного потенціалу.

Ключові слова: підприємства залізничного транспорту, інноваційна стратегія, модель, алгоритм, масштабування, інновація.

Introduction. Strategy is a complex, dynamic and flexible economic phenomenon, the presence of which is the key to the success of the enterprise, its obtaining competitive advantages. However, the strategy is constantly changing, changes occur in accordance with fluctuations in economic thought, caused by the emergence of new methodologies, theories, concepts in accordance with transformations in the world. That is, any well-developed strategy is the basis of the success of the enterprise, especially if its essence is unique, takes into account the peculiarities of the enterprise's management and contains effective proposals. This is also characteristic of the innovation strategy.

An innovation strategy should reflect the implementation of innovations and, thus, create a new way of looking at the effective development of each enterprise, regardless of its size, market position or range of action, because the goal of innovation is a creative and long-term solution to existing problems in a new way using modern technological solutions, which requires planned actions, that is, a strategy.

This is especially true for railway transport enterprises, which are generators of national economic development, but are currently in a difficult state and require innovative changes through the effective use of existing potential, taking into account the requirements of today. To maintain adequate adaptability of railway transport enterprises to radical changes in the external environment caused by the development of digitalization, globalization, greening and intellectualization processes, as well as creating a temporary advantage necessary for

restructuring operational activities and stimulating the development of the transport and logistics market, it is extremely important to choose an effective innovation strategy that will allow transforming their activities in accordance with the challenges of the environment.

Analysis of recent research and publications. The issue of developing innovative strategies for enterprises, including railway transport enterprises, has been the subject of research by such scientists as Dykan V. L., Kalinichenko L. L., Kirdina O. G., Kovtun O. I., Korin M. V., Obruch G. V., Ovchinnikova V. O., Prushkivska E. V., Tokmakova I. V., Shulgina L. M., Yukhymenko V. V. [1-6]. Despite the important achievements of these researchers in the field of forming a theoretical and methodological toolkit for developing innovative strategies for railway transport enterprises, the change in the operating environment of the railway industry requires the transformation of innovative strategies that would take into account the level of innovative potential and long-term attractiveness of the transport and logistics market.

The purpose **of the article** is to study the content of the innovation strategy and develop a model and algorithm for choosing an innovation strategy in a promising market for railway transport enterprises, taking into account the level of components of innovation potential.

Presentation of the main material. Innovations have their own life cycle, and therefore the current innovation will slow down after some time and cease to provide a competitive advantage to the business. In this situation, it becomes necessary to form comprehensive conceptual provisions regarding the innovative activity of business entities, that is, in the context of not only individual inventions, but also ensuring a continuous process of improving strategic management in all its aspects.

An innovative strategy, which is correlated with a development strategy, can take on different levels of aggregation, which means the possibility of its creation for the implementation of innovative changes at the level of departments that manage a product, a business unit, an enterprise, an entire corporation or even the state. In addition, an innovative strategy can be independent or be a component of the enterprise strategy, which in its field belongs to the processes of innovative activity at the enterprise and in its environment.

The study of scientific works on the general theory of strategic management of the enterprise [7] allows us to conclude that there are many additional criteria that the authors do not directly refer to innovative strategies, but their detailed analysis confirms their belonging to such. Examples include the proposals of P. Drucker, R. Miles, C. Snow, B. Twiss and C. Freeman. In many ways, the strategies proposed by them are an adequate innovative response to the conditions of doing business and are relevant to today's conditions, which are characterized by variability and transformation of the external environment. That is why these types of strategies are appropriate for use by both large enterprises that have an extensive system of research and development and design departments, as well as medium-sized, small and micro-enterprises that mainly base their innovative potential on the creativity of the entrepreneur and employees.

The classical strategies that have innovative features include the proposals of four authors. First of all, this is the approach proposed by P. Drucker [8].

According to his theory, four types of strategies can be distinguished, the entrepreneurial nature of which fits perfectly into innovative actions. These strategies require innovative management actions from the company's management, because they are related to market requirements and risks, and can also be implemented to a certain extent simultaneously.

Thus, the first three strategies are characterized by the fact that their goal is the introduction of innovations, and the last one

is an innovation in itself, because it involves creating value for the client as the ultimate goal of the enterprise.

According to the classical classification of strategies proposed by R. Miles and C. Snow [9-10], we can distinguish four types of them, because when developing an innovative strategy, the authors took into account the propensity of enterprises to risk and use. Special attention deserves the precise characterization of these strategies, which is given taking into account the possibilities of their use for solving managerial, engineering and administrative problems by the enterprise that arise due to changes in external and internal factors, and determine the final choice of the enterprise's strategy.

From the same point of view, strategies were proposed by C. Freeman [179], indicating that these are strategies that depend on the level of business and on the sphere of activity of the research and development enterprise. In his opinion, the field of research and development should be considered the highest priority for the creation and implementation of innovative ideas, which indicates that innovative strategies cannot go beyond this sphere of activity, and accordingly, the enterprise cannot implement several strategies in different spheres of its activity for a certain period. The system of strategies proposed by C. Freeman has a scientific and research character and is directly related to innovations. They can be divided into six types, but, applying the criterion of originality, we can systematize them into two groups: strategies of an innovative leader (management) and strategies of imitating a market leader (reactions to the actions of an innovative leader), which include other types of strategies (except for offensive strategies). All of the listed strategies of C. Freeman are also related to specific functions of the enterprise that determine its innovative development and must be taken into account when developing such strategies. Among the mentioned functions, C. Freeman indicates: fundamental and applied research, innovative developments, design work, work on the implementation of quality control, technological services, patent and licensing work, collection of scientific and technical information, science and drawing up long-term forecasts and plans. At the same time, the fact is emphasized that if the listed functions have a great impact on the strategy, then they must be very carefully analyzed and detailed within the framework of this strategy, otherwise such analysis is of less importance.

In addition to the above types of innovation strategies, it is also worth noting that market and technological niche strategies and network innovation strategies are also emerging. The first of these are a consequence of the growth in the share and significance of small and medium-sized enterprises in the economy as a result of technological changes that limit the dominance of large enterprises, the growth of customer loyalty to individual and personalized products offered by small and medium-sized enterprises, which allowed the latter to reorient themselves to niche markets. Strategies of this kind assume that, first of all, such a market niche should be found (the benchmark is a unique niche, it will eliminate direct competition from other entities and at the same time limit the possibility of other enterprises entering it). Research conducted in this area [12-13] has allowed us to identify several subtypes of market niche strategies: regional, target group, product, brand, etc.

Technological niche strategies, in turn, are designed for enterprises that offer innovative products that are adapted to the individual needs of customers, but using modern technologies, which often requires their own research and development and design work.

These strategies are typical for active innovative small and medium-sized enterprises. Mainly for businesses of the start-up type, launched on the initiative of employees working in high-tech industries, by separating from parent organizations in

the form of separate companies. Often they are assigned to work through parent companies.

In the case of using network innovation strategies, it is necessary to remember that their emergence is the result of cooperation with external partners in the field of innovation development on a global scale. This cooperation has led to the creation of a global network economy based on the dissemination of knowledge, the development of information technologies, increasing spending on research and development and a high degree of their technological development. Within the framework of network innovation strategies related to virtual organization, the following should be highlighted [13]:

- global innovation strategies - are used in cases where no partner enterprise can independently introduce new products globally, and only cooperation and network connections provide such an opportunity due to the growth of innovation potential;

- innovation strategies based on the advantages of information resources - are used in cases where virtual cooperation is developed (the basis is knowledge about innovations and information) together with all cooperating companies (business partners), provided that more economical and efficient use is ensured than for a single company.

Summing up, it should be noted that the potential for implementing innovation in a broader and strategic dimension is more often possessed by enterprises that can be attributed to innovative ones, that is, those that offer new technologies and products continuously and consistently. Large business entities have an advantage to a greater extent, because they operate in many markets, have appropriate research centers and budgets, and also have a clearly defined innovation development strategy.

For large railway transport enterprises, such as JSC "Ukrzaliznytsia", the most effective are innovative strategies in the field of products or processes, which are of the nature of gradual or radical innovation activity. It should also be noted that over time, enterprises begin to use adaptive and innovative strategies that create opportunities to be a market leader. In turn, small railway transport enterprises (and in Ukraine, due to the restructuring of the industry, they are only emerging now) are more focused on such strategies that allow using the experience of pioneer enterprises that create new markets, but are not able to fully master and satisfy them.

An additional incentive for the implementation of such strategic decisions is the opportunity to avoid the costs and risks that pioneer enterprises have already incurred. Thus, small enterprises can fill niches in these markets, competing, for example, with the quality of transport and logistics services or more efficient service. In addition, when implementing innovation strategies, small businesses should use other tools to compete with large business entities, including marketing strategies to interest potential customers in all new products and take it to a higher level.

Regarding innovation strategies and technical development of small businesses, the studies of I. Mykhasiuk, A. Hukalyuk, B. Kosovich [14] are interesting. They note that such enterprises show a greater tendency to radical innovations, often produce a new generation of technologies, while large transport enterprises are focused on improving existing technical solutions, and therefore systematically conduct research aimed at implementing minor incremental innovations. In this regard, it is worth paying attention once again to the fact that these are, first of all, large transport enterprises that have the appropriate capabilities and means to finance scientific research, support research centers or are able to withstand the risks associated with the implementation of innovations. It should also be remembered that small enterprises are the most common innovative masters of idea generation, given their number and the presence of simple and decentralized, in terms of management,

organizational structures. In general, structures that facilitate innovation should be flexible, hierarchically flat, with a rapid flow of information, allowing for the delegation of proposals and competencies, encouraging inventiveness and entrepreneurship, and providing freedom of action and support for creative solutions.

Therefore, regardless of the size of enterprises or the type of innovation strategies they use, the key question remains regarding the projected directions of technological progress and market phenomena in the long term, including within the framework of the chosen corporate strategy.

It is worth noting that the modern concept of strategic management considers strategy not only as a process of achieving strategic goals, but also as a process of finding alternative ways to implement such target guidelines. Issues that require the development of different solutions relate to the direction of choosing a field of activity, the development of the enterprise and its business, methods and forms of organizing entrepreneurial activity, and the interaction of the enterprise with other business entities.

With this approach, alternativeness acts as a basic principle of choosing a strategy, and the process of forming a specific strategy itself is reduced to choosing one or more strategic alternatives from a certain set of them. Thus, on the basis of the formulated mission and goal (goals) of the enterprise, as well as data from external and internal analysis, various possible options for the development of the enterprise are formulated (developed), that is, probable ways to achieve goals are determined when implementing the identified opportunities. These options cover various views on this enterprise and form strategic alternatives for its activities in the future [7].

According to the conducted analysis of theoretical achievements in the field of strategic management, it can be argued that the use of portfolio analysis in the aspect of achieving this goal is advisable, because it is it that allows you to effectively form a strategy for corporate-type enterprises that carry out multi-business activities.

The most popular method of conducting portfolio analysis is the use of matrix methods. They mainly consist of constructing two-dimensional matrices (they can also be with a larger number of dimensions). On one of the axes of the two-dimensional matrix, indicators of assessing the state or prospects for the development of the market, strategic business areas are plotted (more often on the vertical), and on the second (more often on the horizontal) - indicators of assessing the competitiveness of the corresponding strategic business units of the enterprise. At the intersection, appropriate strategies are sought [7]. The classic list of factors that provide the basis for building matrices is given in Table. 1.

The specified list of models of strategy formation is not able to create an effective basis for building an innovation strategy of railway transport enterprises, because: it is mainly oriented towards the general corporate strategy, and innovation is seen only as functional; it does not take into account the key aspects of the progressive approach to ensuring innovation activity, based on the principles of scaling, substantiated in the previous section of the work; it does not take into account the peculiarities of the management of railway transport enterprises that operate today (such as JSC "Ukrzaliznytsia"). That is why in the work, to solve this problem, it was proposed to use a model of decision-making regarding the general corporate innovation strategy of railway transport enterprises, built on the principles of scaling (Fig. 1).

Table 1.

Factors that form the basis of the matrix [7]

Matrix	Factors
I. Ansoff's matrix "goods-market"	- the company's products (existing and new); - the company's markets (existing and new);
BCG matrix	- growth rates of the enterprise's sales markets; - relative market share of the enterprise in target markets;
Multi-criteria matrices: - McKinsey matrix; - Shell matrix; - G. Day matrix; - D. Monieson matrix; - Mc Name matrix; - Hex-Majlaff matrix	- attractiveness of the enterprise's sales market; - competitiveness of the enterprise in target markets;
Matrix M. McDonald	- the degree of attractiveness of target markets for the enterprise; - the competitive advantages of the enterprise in target markets;
A.D.Little Matrix (ADL) Brownlay–Barth Matrix Hofer–Shandler Matrix	- stage of the enterprise's product life cycle; - competitive positions of the enterprise in target markets;
M. Porter's Competitive Strategy Matrix	- source of competitive advantage; - strategic orientation of the enterprise (the entire market or a separate segment);
A. Thompson Matrix – A. J. Strickland	- market growth rates; - competitive position of the company.

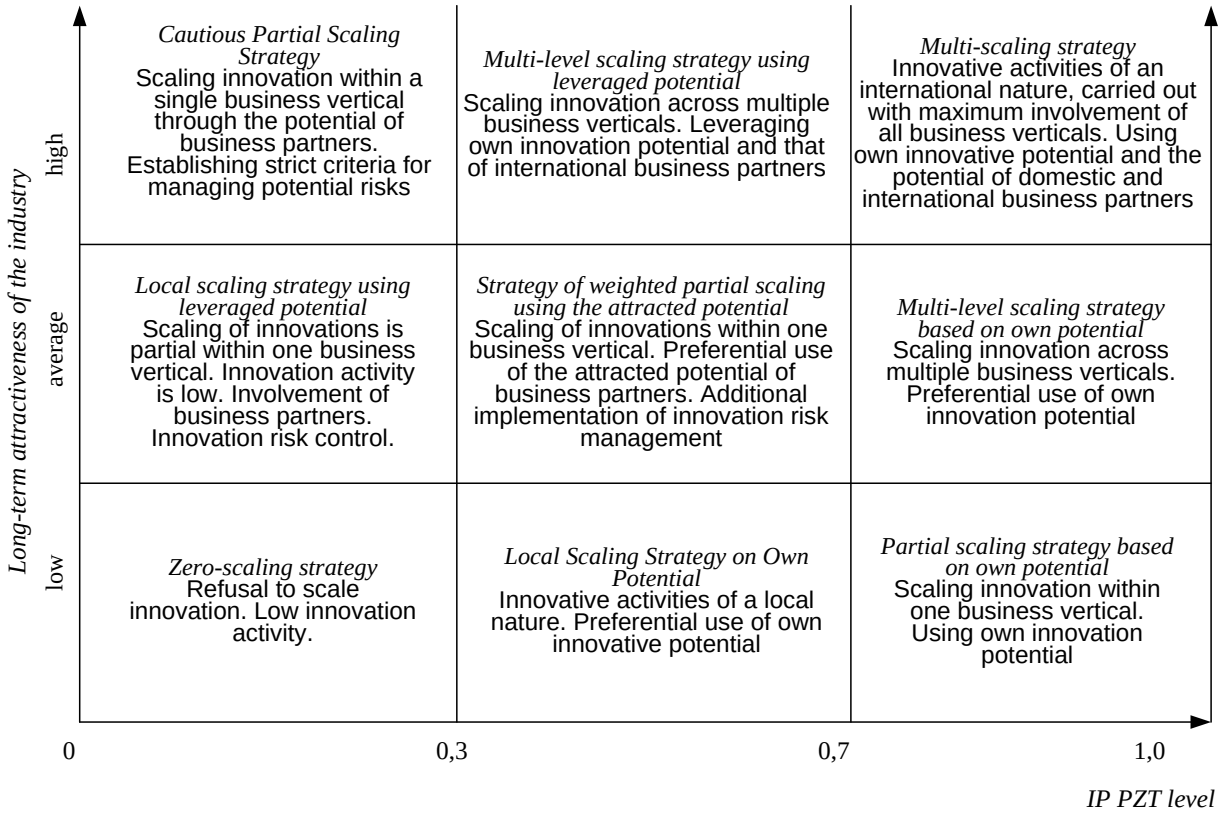

Fig. 1. Model of decision-making regarding corporate innovation strategy by railway transport enterprises on the basis of scaling

This model is based on the choice of strategic alternatives depending on such criteria as the "level of innovative potential" possessed by a railway transport enterprise (because it is the basis for implementing innovative changes) and the "long-term attractiveness of the transport and logistics market" (determines the feasibility of implementing innovative changes by the enterprise) [15].

The proposed model involves the formation of 9 innovation strategies:

1) for enterprises with a critical level of innovation potential (from 0 to 0.3), depending on the market situation, the following is proposed:

- - zero scaling strategy - refusal to scale innovations. Low innovation activity;
- - local scaling strategy using attracted potential - partial scaling of innovations within one business vertical. Low innovation activity. Attracting business partners. Controlling innovation risk;
- - cautious partial scaling strategy - scaling of innovations within one business vertical at the expense of the potential of business partners. Establishing strict criteria for managing possible risks;

2) for enterprises with a low level of innovation potential (from 0 to 0.3), depending on the market situation, the following is proposed:

- local scaling strategy based on own potential – local innovation activities. Preferential use of own innovation potential;
- weighted partial scaling strategy using attracted potential – scaling of innovations within one business vertical. Preferential use of attracted potential of business partners. Additional implementation of innovative risk management;
- multi-level scaling strategy using attracted potential – scaling of innovations within several business verticals. Use of own innovation potential and potential of international business partners;

3) for enterprises with a sufficient level of innovative potential (from 0.7 to 1.0), depending on the market situation, the following is proposed:

- a strategy of partial scaling on one's own potential - scaling innovations within one business vertical. Using one's own innovative potential;
- strategy of multi-level scaling on own potential – scaling of innovations within several business verticals. Preferential use of own innovative potential;
- strategy of multi-scaling – innovation activity of international character, carried out with maximum involvement of all business verticals. Use of own innovative potential and potential of domestic and international business partners.

These innovation strategies are corporate-wide, i.e. outline the direction of innovation activity for the entire enterprise. Such a strategy should be supported by supporting strategies [15].

When forming and implementing an innovation strategy, one should remember about the imbalance of components of innovation potential of the railway transport enterprise. This is a negative factor that will create significant threats to ensuring further innovation activity of these business entities. That is why when developing an innovation strategy, tactical and strategic directions should be formed in parallel to overcome this phenomenon. For this purpose, the work proposes an algorithm for choosing an innovation strategy in a promising market for railway transport enterprises, taking into account the level of components of innovation potential (Fig. 2). According to the algorithm, we have five key strategic directions of action:

- development and implementation of an innovation strategy with a concentration of management efforts on the development of components of innovation potential that are of least importance. Maximum involvement of domestic and international business partners in innovation activities, with mandatory maximum control of the level of risk;

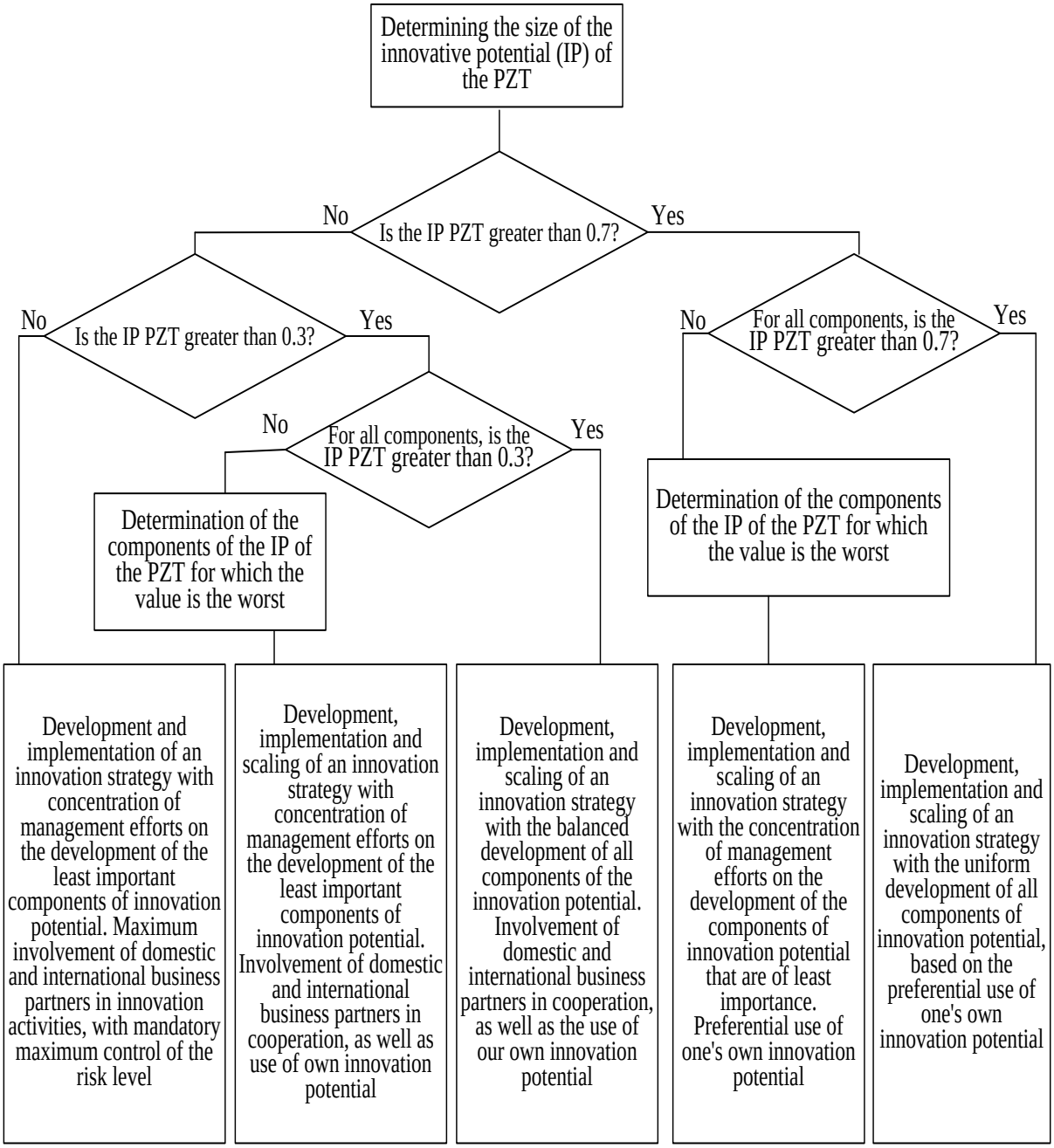

Fig. 2. Algorithm for choosing an innovative strategy in a promising market for railway transport enterprises taking into account the level of components of innovative potential

- development, implementation and scaling of an innovation strategy with a concentration of management efforts on the development of components of innovation potential that are of least importance. Involvement of domestic and international business partners in cooperation, as well as use of own innovation potential;

- development, implementation and scaling of an innovation strategy with the uniform development of all components of the innovation potential. Involvement of domestic and international business partners in cooperation, as well as the use of own innovation potential;

- development, implementation and scaling of an innovation strategy with the concentration of management efforts on the development of the components of the innovation potential that are of the least importance. Preferential use of own innovation potential;

- development, implementation and scaling of an innovation strategy with the uniform development of all components of the innovation potential, which is based on the preferential use of own innovation potential.

Conclusions. Thus, a system for forming an innovation strategy for railway transport enterprises has been formed, which includes a matrix for choosing alternative scaling scenarios, the types of which are determined depending on the level of innovation potential and long-term attractiveness of the transport and logistics market. This will allow to improve the quality of strategic management decisions in the field of innovation activity of railway transport enterprises.

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