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TOOLS OF PRODUCT PORTFOLIO FORMING FOR MANUFACTURING ENTERPRISE

The modern enterprise works in a highly competitive environment, which makes significant demands on the rapid response to market changes. Taking into account the needs of product users, the actions of competitors affect the product range of enterprises, as well as related production, financial, and investment aspects. According to the above, the formation of the product portfolio is an important aspect of the functioning of industrial enterprises.

Each product has its life cycle. Therefore, it is advisable to include those products in the portfolio that are at different stages of their life cycle as this will ensure a greater balance of the product portfolio. At the same time, a balanced product portfolio is a key to greater consistency in production and marketing operations, profit, and risk reduction in various areas of the enterprise.

The competitive market environment of the enterprise requires it to constantly invest in updating the product portfolio (implementation relevant research, development, reengineering the production process, creating a strategy to promote new products on the market), bringing the product range to the top.

There are many relevant publications in determining the product portfolio of the manufacturing enterprise [1–5].

The given developments are directed at the formation of the offers corresponding to market trends, dynamic and balanced formation of the product portfolio, and consideration of the processes of assortment determination in combination with issues of investment, innovation, and production policy.

In particular, researchers have been studying various aspects of the development of the financial and investment strategy of the enterprise during the formation of the assortment portfolio [6–7].

Despite the existing developments, there is a significant range of unresolved issues, in particular, the study of the impact of investment in the formation of relevant product portfolios of industrial enterprises on the final performance (for example, income). The problem concerns the consideration of the life cycle of products belonging to the product portfolio, the timely cessation of their production, the development of new products, their promotion, etc. Dynamic research is required, which would involve many stochastic factors of the internal and external environment of the enterprise, which, at the same time, requires the use of flexible mathematical methods and software platforms. As for the given problem, one of the ways to solve it may be to use general-purpose simulation software [8–11].

The computer simulation model of a product portfolio formation for a manufacturing enterprise is developed. Financial and investment

aspects of assortment policy are offered in this model. The multi-approach paradigm of modeling on the AnyLogic software platform is used.

The model reproduces various aspects in the processes of forming a balanced, efficient product portfolio. To do this, the life cycle of each nomenclature item is taken into account, starting from the preparation (design, product exploitation research) and launch into production to the gradual decline of market demand and withdrawal from production. According to the location of specific products at different stages of life cycles and taking into account the market situation and production opportunities, the most balanced range and, accordingly, the product portfolio is formed.

The selected simulation approach corresponds to the specifics of the task due to the possibility of reproducing the model of the dynamics of production processes and product promotion in commodity markets. The agent modeling paradigm has specific tools for simulating product life cycles. State diagrams and action diagrams allow building an «architecture of promotion» of specific assortment items by stages of their life cycle with parametric adjustment to the specifics of each stage of the cycle. Particular attention is paid to the processes of market reproduction demand for products, and thus the term «life» of the product on the market.

In the terminology of the agent approach, specific nomenclature positions are agents, i. e. the dynamic elements of the model that move in space and time; components of the product portfolio are represented as a population of agents.

Dynamic monitoring of the composition and structure of the product portfolio, carried out throughout the simulation period, contributes to the timely updating of the nomenclature line according to market requirements: thus the storage in the portfolio of this or that nomenclature position is quite justified. The model reproduces the financial and investment aspects of the main manufacturing processes and the decision-making in the assortment policy.

The model processes of extended reproduction are simulated using a system-dynamic paradigm with a higher level of aggregation. In

particular, one of the important advantages of simulation is the ability to reproduce different processes in one model, ensuring their full relationship.

The AnyLogic software platform allows to perform various types of simulation experiments, in particular, optimization, parameter variations, run comparisons, etc. This allows users to customize specific experiments without making any changes to the model.

For example, in the conducted complex of simulation experiments, the terms of the beginning of specific of a product life cycle varied, and so did the quotas of financial resources, which were directed directly to production (processes of expanded reproduction) and research, experimental purposes, and the prices for specific nomenclature items according to market fluctuations.

In fact, like any computer simulation model, this model is a simulator for testing the relevant operational and strategic management decisions related to the development and implementation of sound and balanced assortment policy of industrial enterprises.

The model is quite typical according to the composition and structure of implemented business processes. The sectoral focus is not crucial. However, in our opinion, it is advisable to use the model in companies with a short product life cycle. Using this model companies can quickly monitor the market situation in specific nomenclature positions and timely responses to changes. In addition, enterprises can constantly update the product range and adopt new products (for a change no longer corresponding to the current market demand). To do this companies should use innovative technologies, upgrade the raw material base, etc. Accordingly, there are issues with the financial support of these processes.

According to the above arguments, the model was tested in the pharmaceutical industry, which is relevant especially at the current stage of operation of the industry.

The obtained experimental results proved the viability of the model and the expediency of its use.

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