Digital management system for the formation of a portfolio of innovative projects in the agro-industrial complex

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Abstract. The article describes the task of developing a management system for the formation of a portfolio of innovative projects for enterprises of the agro-industrial complex. The work in the field of managing the formation of a portfolio of innovative projects is analyzed and their shortcomings are identified. The essence of the problem is defined, the justification of the use of information technologies for its solution is given. The methodology of creating a digital management system for the formation of a portfolio of innovative projects is proposed. The functional and information model of the management system is presented, which consists of the following blocks: conducting marketing research, creating innovative projects, evaluating innovative potential, forming a portfolio of innovative projects, and evaluating the effectiveness of investments. Design decisions are justified, information support is developed and its software implementation is considered. The proposed management system can be used for any organizational structure of an agricultural enterprise. The system is designed to provide the management of the enterprise with the necessary and sufficient set of indicators for decision-making and is used by employees of advertising, production, marketing and sales departments, development of innovative projects.

1. Introduction

The relevance of the study is due to the need to develop a methodology that can be used to create a digital management system that can form a portfolio of innovative projects (IP) in the agro-industrial complex, assess the innovation potential, allowing you to choose an innovative development strategy and evaluate the effectiveness of investments.

This situation determined the choice of the research direction. The lack of known solutions in this direction makes the task relevant.

The article [1] presents an approach to the formation of IP based on the use of fuzzy parameters that allow us to overcome uncertainty about some data.

In [2], we consider the interdependencies between projects in the portfolio, which can disrupt the balance of the entire project portfolio system.

Project portfolio management, as an integrated system of portfolio balance and value maximization at the same time, is considered in the article [3], and in [4] it is considered as an integrated system of processes, including decisions on the continuation of the project with reduced funding.

The article [5] is devoted to the study of the problem of selecting project portfolios by creating a certain structure that divides the work into separate stages. Each stage achieves a specific goal and creates input data for the next one. The role of the hybrid approach is considered in the article [6].

For modeling and managing projects with shared corporate resources, [7] it was proposed to use strategic adaptation taking into account changes in human resources. In [8-9], it is proposed to apply a
system where for projects it is proposed to purchase resources in the dynamics of the entire life of the portfolio through an auction mechanism.

The article [10] describes a decision support system for selecting and predicting the effectiveness of a project based on a neural network. For the formation of investment portfolios of small innovative enterprises in [11], the use of the analytical segmentation method is proposed.

As a result of the analysis of the described works, we come to the conclusion that the existing management approaches focus only on material resources, without taking into account the intellectual ones necessary for creating innovations.

2. Materials and methods
The purpose of the study: to create a management system for the formation of a portfolio of innovative projects that reflects the real situation in the agro-industrial complex, capable of creating a portfolio of optimal individual entrepreneurs for a particular enterprise, taking into account its specifics and innovative potential.

An innovative enterprise implements innovative processes characterized by an increased share of intellectual labor and the use of organizational knowledge. They represent the integral knowledge of the entire enterprise and allow you to create unique products. The amount of organizational knowledge is greater than the knowledge of individual employees, although it is formed from individual knowledge. Through the circulation of knowledge, there is continuous learning and improvement of the volume and quality of knowledge, on the basis of which competitive advantages are achieved by a detailed understanding of all business processes.

As a result, organizational knowledge is formed into an ordered set of data and rules that informatively ensure the functioning of innovative production.

We need a digital management system that will allow us to: analyze market research, select a market segment, evaluate innovative potential, form a portfolio of individual entrepreneurs and reduce risks when introducing products to the market.

The methodology of digital control systems portfolio of innovation projects is such an organisation process development system, to satisfy the system requirements and the characteristics of the development process.

The methodology should provide a complete and accurate description of all business processes related to innovations in the enterprise and investment investments and the application of modern methods and technologies for creating a system.

The methodology considers the process of developing a system in the form of a sequence of stages, divided into stages, and stages into processes. For each process, the sequence of work, results, methods and means of performing work are allocated.

The process of developing such a control system is the process of forming and transforming functional information models using the IDEF0 structural modeling methodology. In it, using a graphical language, the system being created is shown as a set of interrelated functions.

The developed business process of forming a portfolio of innovative projects is considered within the framework of the management model of the entire agro-industrial complex, which shows the interaction of marketing, planning and implementation subsystems. The identification of such subsystems in the agro-industrial enterprise is an objective result of the development of the theory of digital management of economic systems.

3. Results
The digital management system for the formation of the IP portfolio in the agro-industrial complex provides the solution of the following tasks:

- Conducting marketing research,
- Choosing an innovative product and market segment,
- Assessment of the innovative potential of the organization,
• Formation of the IP portfolio,
• Evaluation of the effectiveness of investments.

The functional and information model of the control system is presented in figure 1.

Figure 1. Functional and information model of the management system.

1. Conducting marketing research.
   The input data of the task are questionnaires and surveys for market analysis and identification of a suitable market segment. Management - external scientific sources.
   Objective: to analyze the market, identify the necessary qualities of the selected segment and select an innovative product for further research.

2. Creation of innovative projects.
   The input of the received selected product and market segments. Management - internal scientific sources.
   Purpose: formation of innovative projects for a new product for the market segment.

3. Assessment of innovation potential.
   The task input receives a product selected as a result of marketing research, which is not available on the market and which should be in demand (figure 2). At the same time, documents are received: accounting for materials, fixed assets, the company's work schedule and the product's technological map.
   Objective: to form criteria for evaluating innovative projects that will allow you to choose those projects that can only slightly modernize the production process.

   Consider the detail of the task:
   • Assessment of the resource component.
     Entrance. Accounting documents for materials, products, and financial resources. Financial resources are characterized by a variety of sources and reserves of financial opportunities that currently exist and can be used to achieve specific goals.
Exit. The result from the resource estimate.

Figure 2. Assessment of innovation potential.

- Evaluation of the internal component.
  Entrance. Documents for accounting for fixed assets, the company's work schedule. The internal component ensures the efficiency of the enterprise's functioning and characterizes the possibility of innovative activity, determines the ability to attract resources for this purpose.
  Exit. Results of evaluation of the internal component.
- Evaluation of the effective component.
  Entrance. Technological map of the product. The effective component reflects the result from the implementation of existing opportunities in the enterprise and acts as a characteristic of the innovative potential.
  Exit. The effect of the effective component.
- Assessment of organizational knowledge.
  Entrance. Individual knowledge of employees. Information infrastructure of the enterprise.
  Exit. The results of the evaluation of organizational knowledge.
- Formation of criteria for evaluating innovative projects of the Company. The estimates calculated above. Due to the relationship between resource, internal and effective components, it is necessary to choose the criteria for evaluating the IP.
  Exit. List of criteria for selecting sole proprietors.
4. Formation of a portfolio of innovative projects.
  The input is a list of created individual entrepreneurs and their selection criteria for creating a portfolio (figure 3). Management - quality standard and product requirements.
  Objective: A portfolio of sole proprietors suitable for the enterprise in question.
5. Evaluation of investment efficiency.
  The input data is the production plan and the formed IP portfolio. Evaluating the effectiveness of investments allows you to choose the individual entrepreneur with the highest return on investment.
  Exit. Report on the effectiveness of investment in each of the innovative projects.
4. Discussion
The importance of digitalization for the successful operation of the modern agro-industrial complex is increasing, since none of the main areas of its activity can do without the appropriate infrastructure. The considered system performs a larger range of functions, makes a portfolio of optimal individual entrepreneurs for a particular enterprise, taking into account its specifics and innovative potential, evaluates the effectiveness of investments and returns on them.

The management system covers all business processes related to innovations in the enterprise and investment investments. You can enter primary information and view the data stored in the database. You can get both regulated reports and create custom ones. Integration with a top-level management system is possible.

For the implementation of this control system, an object-oriented model is chosen, since the model is detailed into classes and the interaction of classes is described using various diagrams. In object-oriented model examines the relationship between classes that specify the use of classes, in addition to the object model described using class diagrams, interaction diagram, which allows to comprehensively describe the system, and to specify not only the schema of the logical implementation and physical realization diagram.

To describe the structure of the software according to the precedents of the subject area supplied function prototypes, objects subject area objects of the appropriate classes of software. The interaction of the control system components with each other is described and the database structure is ordered.

5. Conclusion
1. The analysis of ways to manage the formation of a portfolio of innovative projects is carried out, from which it follows that there are very few known ones focused on agro-industrial complexes.

2. A scientifically based methodology for building management systems for the formation of a portfolio of innovative projects is proposed, which differs from the known ones in that it uses the specifics of a particular agro-industrial complex and its innovative potential.

3. Of practical value are:
An approach to the development of management systems for the formation of a portfolio of innovative projects in the agro-industrial complex, which consists in providing a complete and accurate description of all business processes related to innovation and investment;

Functional and information model of the management system, which is the basis for the development of the database.

4. The provisions obtained in the work can be used in further theoretical and practical research and are aimed at specialists involved in the development and implementation of management systems for the formation of a portfolio of innovative projects.

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