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MANAGEMENT OF SIMULTANEOUS STRATEGIZING OF INNOVATIVE PROJECTS OF AGRICULTURAL ENTERPRISES RESPONSIVE TO RISKS, OUTSOURCING AND COMPETITION

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Abstract

Realization of sweeping innovative changes in the institutional space of agricultural enterprises is an important constituent of the national economic reform, the agricultural sector and systematic transition to the sixth technological mode of innovative economic subjects' development. Increasing globalized competition of agricultural producers, as well as risks, depletion of resources and supply fixity of land for agricultural activities tend to increase the complexity of effective cash flow strategizing, which, among other things, involves the necessity to take into account two simultaneously relative phenomena: search of financial receipts for the realization of risky innovation projects, and solving the problems of alteration, misrepresentation and low level of precision of external information, necessary for strengthening competitive advantages and objectification of the managerial decision-making process, as well as for the development of new innovative skills and functional authorities by the heads of agricultural enterprises. The purpose of this article is to build up a concept for the selection of effective innovative projects of agricultural enterprises through the management of simultaneous strategizing of cash flows based on the adaptive iterative-incremental approach Agile-mix, improved by the authors.

In the course of research the authors used abstract-logical method, for theoretical-methodological and practical generalizations and conclusions about the essence of the problem of implementation simultaneous strategizing of cash flows into risky innovative projects of agricultural enterprises, and optimization modeling to improve the simultaneous strategizing of cash flows in innovative projects of agricultural enterprises, responsive to risks, outsourcing and competition. This model is based on the use of principles developed by us, adapted to the Agile-mix approach.

In the article, it is proposed an economic and mathematical model of the simultaneous strategy of cash flows in innovative projects of agricultural enterprises taking into account risks, outsourcing, and competition, which allows making operational management decisions in a rapidly changing institutional environment by iterating innovative projects and their cash supply, that will help to maximize profits of all the concerned actors. At the same time, the implementation of the economic and mathematical modeling was based on the use of adaptive iterative-incremental approach Agile-mix to project management, which involves the systematic applying of the principles of differentiation and convergence, which were firstly introduced in this approach. The use of these principles in the process of modeling the simultaneous strategy of cash flows allowed taking into account the multivariate state of external factors influencing the implementation of innovative activities of agricultural enterprises.

The practical bearing of the proposed model is that it allows to optimize risky innovative activities of agricultural enterprises on the basis of gradual financial allotment and selection of optimal innovative projects aimed at harmonization and achieving balanced economic interests of business entities.

***Key words**: Agricultural enterprises, Innovative projects, Simultaneous strategizing, Management, Risk map, Outsourcing, Competition.*

1. Introduction

The existence of a strong theoretical and methodological basis and practical solutions to address the challenge of attracting financial resources innovative projects of agricultural enterprises slightly simplifies the solution of the research purpose. At the same time, there is a need to combine the latest achievements of modern management in the context of intensifying the development of the knowledge economy and the need to update the modeling of innovative management systems and technologies in open market economies and growing competition. Stimulating and supporting the development of innovative activities of agricultural enterprises is one of the main measures to strengthen the food security of national systems of most countries of the world, as the effective use of innovation ensures a high level of competitiveness of agricultural production, encourages agricultural producers to create new jobs, which contributes to increasing socio-economic guarantees of the population [1, 2]. At the same time, the success of agribusiness based on innovations, especially at the initial stages of its implementation, depends on the availability of sufficient financial resources and their uninterrupted flow throughout the entire life cycle of the enterprise's development. The difficulty of effective strategizing of cash flows in innovative projects of agricultural enterprises is the need to simultaneously take into account the available financial support for the implementation of innovative projects in conditions of risk, as well as solving the problems the problems of deformation, distortion and low level of accuracy of external information, affecting the objectivity of the management decision-making process. This problem can be solved with the proposed concept of selecting effective innovation projects in the process of simultaneous cash flow strategy, which allows coordinating different innovation projects and identifying appropriate sources of attracting investments according to each stage of implementing a certain innovative project, and also prevents the situation of exceeding limited funds over their receipt.

The work of many scientists is devoted to the study of methods for determining financial solvency, distribution of funds in the process of implementing risky innovative projects during the strategizing and designing entrepreneurial activity. Therefore, Wang *et al.*, [3], used three schemes to limit investments in the operation of an integrated energy system in their scientific work, modeling its operation at different times of the year to develop an optimal model of capacity distribution of integrated energy and strategizing investment support for their operation. Xu *et al.*, [4], presented a model of interregional energy system optimization to assess the potential economic benefits of infrastructure investment for the national interregional power grid in China. Ji *et al.*, [5], in their scientific article built an input-output model for assessing the economic impact of innovative projects in the field of transport infrastructure construction in China during 2016 - 2018. However, the above-mentioned scientists focused on the chronological planning of finance and innovation, but simultaneous strategizing was not considered in their work. It is worth noting that there are a number of scientific papers aimed at modeling the processes of simultaneous strategizing, but they do not take into account its features with the risks, outsourcing and competition in innovation. Thus, Laux and Ray, [6], studied the impact of bias in the formation of financial statements on the incentive of managers to develop construction projects and their subsequent informed and reasoned investment decisions to implement the latter. Salvado *et al.*, [7], proposed a model aimed at making promising decisions on monitoring and optimization of long-term innovative projects for building systems, subsystems and elements. He *et al.*, [8], developed an algorithm for optimizing decision-making on investing in the retrofit of energy efficiency of buildings in the USA under budget constraints and reflected it in

their article. Features of modeling the process of simultaneous innovation and financial strategizing were considered by Stevanato *et al.*, [9], Martins, [10], and Arani, Torabi, [11]. Stevanato *et al.*, [9], formulated a mathematical model of long-term optimization, able to take into account the increase in the load on rural micro-networks and make appropriate management decisions to expand capacity. Martins, [10], proposed a mixed integer model of linear programming to solve the problem of determining the necessary actions aimed at maximizing cash flow at the end of the strategizing horizon in the implementation of innovative projects. Arani and Torabi, [11], developed a mixed stochastic model to solve the complex problem of investment and financial supply chain strategizing. However, the models developed by these scientists do not allow taking into account the relationship between different innovation projects and the peculiarities of their financial support when choosing the optimal project or set of projects for further implementation.

Commending to the above mentioned scientific works, it should be noted the need for further research of strategizing the process of making informed and reasoned management decisions in the activities of agribusinesses, taking into account risks, outsourcing and competition. In this regard, the purpose of the article is to build up a selection of effective innovative projects of agricultural enterprises through the management of simultaneous strategizing of cash flows based on the improved adaptive iterative-incremental Agile-mix approach, improved by the authors.

2. Materials and Methods

According to the authors' opinion, simultaneous strategizing - is a synchronized process of managing innovative projects of agricultural enterprises in the conditions of increased risks and competition, aimed at implementing a set of measures, tools and principles to ensure continuous cash flow in innovative projects with the possibility of attracting third parties (outsourcing). We propose to implement simultaneous strategizing of innovative project on the basis of improved adaptive iterative-incremental Agile-mix approach. The need to use of the approach is to form an optimal set of profitable innovative projects of agricultural enterprises based on the effective determination of the required amount of financial resources which in the process of their implementation enables to maximize the profits of all the stakeholders [12]. It should be noted, that the main condition of the mentioned strategizing should be: confirmed information on the set of the desired innovative and investment projects with the deadlines between the investors (venture enterprises) and consumers; these projects in the process of economic activity could be implemented independently of each other and have different terms of production process, completion or commercialization; each stage of the innovative project implementation should be ensured by the continuous cash flow which provides a high level of solvency (financial responsibility) of a venture enterprise and liquidity of assets; the determining criteria of the managerial decision making by the investors ad consumers on the implementation of innovative projects is the presence of a high level of social utility (usefulness), and for the investment projects - receiving without delay interest payments for the use of funds or venture capital [13, 14]. The step by step implementation of the tools of simultaneous strategizing involves the use of outsourcing in the agricultural enterprises activity, which enables attracting human resources to manage innovative projects in an imperfect internal personnel policy, increased risks and competition.

In order to solve the problem of deformation, distortion and low level of accuracy of external information which affects the objectiveness and credibility of the managerial decision making process, and the fact of a risky functioning of innovative agricultural enterprises in the rapidly changing institutional conditions of the market economy, we consider it necessary in the process of forming of the economic and mathematical model of simultaneous strategizing of cash flow in innovative projects of agricultural enterprises to implement in the project management the adaptive iterative-incremental Agile-mix approach improved by the authors. The methodology, functions, principles and goals of this approach are fundamentally based on Agile Manifesto theory of project management in a risky fast-paced environment and limited information, developed by a group of programmers in 2001. At the same time the improved by the authors Agile-mix approach consists of the invariant segmentation of the project implementation by separate parts using the author's mix-principles in the project management. Segmentation of projects involves their further combination into one single unit, which provides a logical end to the project by investors and entrepreneurs. This allows the manager responsible for project implementation in the process of its segment distribution to quickly obtain, accumulate, critically analyze and use information at each stage of the project life cycle. Besides, the implementation of mix-principles allows the manager of the agricultural enterprise to make effective decisions on the need to adjust production programs, attract additional resources on outsourcing, and improve marketing policy, change performers, and the need to diversify production for projects to be implemented. The use of the author's Agile-mix approach in the activities of

agricultural enterprises allows the manager to react reactively to external and internal changes in the implementation of innovative projects and quickly adapt the branched components of projects to these changes.

3. Results and Discussion

In terms of ambiguity, challenges and variety of consequences of operational process of directing the funds to the creation, implementation and commercialization of innovative goods (work, services) it is impossible to describe their incrimination as a single value chain management activities in the traditional concept of project management. It would be more correct to implement in project management the improved by the authors iterative-incremental Agile-mix approach, which provides the systematic application of the principles introduced in this approach for the first time: differentiation (cash flow segmentation convergence (approximation of the logic of distribution of cash flows by managers in innovative projects, taking into account institutional changes in a certain state of the environment of agricultural enterprises activity). In this regard, in the process of forming of economic-mathematical model of implementation of iterative-incremental Agile-mix approach based on the principles of differentiation and convergence, we propose to consider the polyvariance of external factors influencing the innovation activity of agricultural enterprises. In this case, during the life cycle of the innovative project, each source of cash flow directed to innovation is calculated as the balance of income and operating expenses for the planned production or non-production do, necessary for the planned innovation.

After the managers determine the state of external factors influencing the implementation of innovative activities of agricultural enterprises (implementation of the principle of convergence), there is a need to determine the set of innovative projects and their simultaneous provision of funds throughout the period. These actions allow implementing innovative projects with minimal risks by specifying the impact on projects of different scenarios in the institutional environment of agricultural enterprises and by calculating alternative sources of funding or cash for each innovative project under different scenarios of changes in the external environment that may occur during the project implementation. In this context it is necessary for the managers to think over all possible scenarios of the innovative projects implementation considering external factors of influence, competition and risks. The next stage means that for each scenario of transformation of the external environment to reduce risks; it is necessary to determine at the micro level strategies for the implementation of each innovative project and change its cash flows if necessary. Thus, based on the possible consequences for business activities due to certain events it is necessary to foresee the distribution of financial risks for all business projects by calculating the amount of funds that will be used as input data to build an economic-mathematical model of simultaneous cash flow strategy in innovation projects of agricultural enterprises. Architectonics of the process of simultaneous strategizing of cash flows in innovative projects of agricultural enterprises within the iterative-incremental Agile-mix approach is shown in Figure 1.

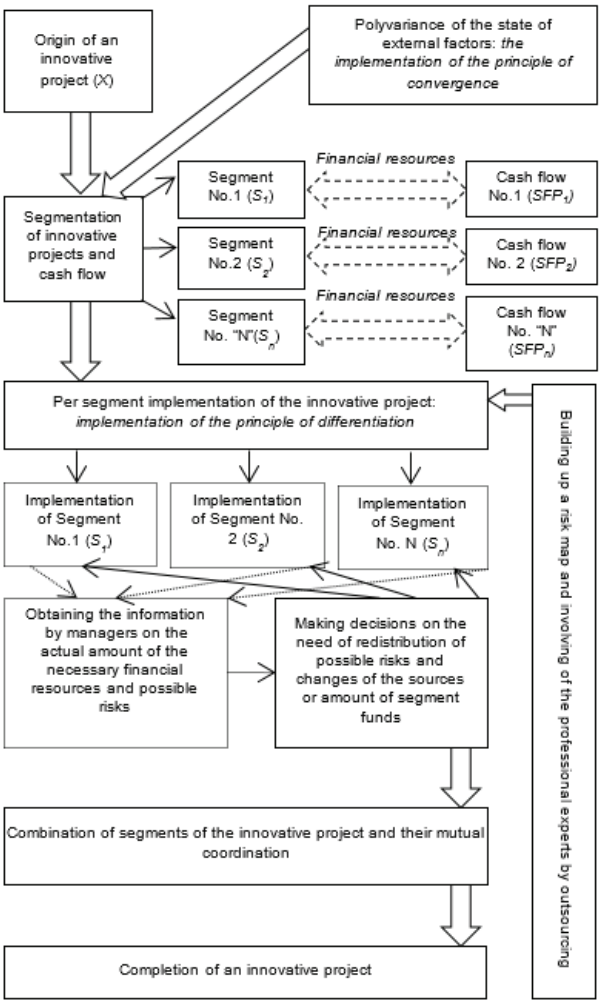

Figure 1. Architectonics of the process of simultaneous strategizing of cash flows in innovative projects of agricultural enterprises within the iterative-incremental Agile-mix approach

According to Figure 1, when implementing simultaneous strategizing of cash flows into innovative projects of agricultural enterprises based on the principles of differentiation and convergence within iterative-incremental Agile-mix approach, we propose segment-to-segment implementation of

innovative projects, which should be done separately with their subsequent combination and application of outsourcing. In this case, each segment of the distributed innovative project should correspond to a certain amount of financial resources, which is aimed, first of all, primarily at reducing the financial risks of agricultural enterprises or their redistribution in the process of this segment of the project and, second of all, to ensure profits for investors (ventures) due to the effective implementation of the innovative project in general. The intermediate stage of financial support of the innovative project involves the need to evaluate the effectiveness of its implementation, after which the results will be used by the project manager or other responsible persons to make management decisions and further develop a strategy to review selected operational actions or change sources and amounts of funding. The implementation of the Agile-mix approach at the stage of project completion involves the combination of its segments and the results calculated for them into a single one and substantiation of the final conclusion on the feasibility of the innovation project in general. In addition, an important condition for ensuring the Agile-mix approach during the life cycle of the innovative project is to preserve the solvency and liquidity of the venture enterprise and in case of bankruptcy - search for additional financial sources, i.e. the cost of each project segment should not exceed revenues.

We propose to determine the level of economic efficiency of segments of innovative projects by calculating the indicator of net discounted income for each of them by the formula (1):

$$NPV_{S_n} = SFP_n^{Inc} * (1 + r_n)^{-t} - SFP_{n_{PLAN}}^{Cost} * (1 + r_n)^{-t} \quad (1)$$

Where: - the planned amount of income from the implementation of the n segment of the innovative project; - the planned amount of operational costs on implementation for the *n* segment of the innovative project; *t* - time fence (life cycle or its stages), during which the implementation for the *n* segment of the innovative project takes place.

- discounting rate taking into account inflation over time fence *t* (life cycle or its stages), which is calculated by the formula (2):

$$r = r_{nom} - I_t \quad (2)$$

Where: - nominal interest rate over the time fence *t* (life cycle or its stages); – expected over the time fence *t* (life cycle or its stages) inflation rate.

The implementation of the principle of differentiation within the framework of the iterative-incremental Agile-mix approach in simultaneous strategizing requires per segment realization of the innovative project applying a risk map and outsourcing (Figure 1). Due to the changes in the enterprise management strategy in response to the external environment of the planned amount of cash flow, there may be the need to increase or decrease the planned amount of operation costs ( ) at the expense of the related managerial decisions made by the project managers based on the incoming data obtained at intermediate stages on the changes during time fence t (life cycle or its stages) structure and/or degree of influence of financial, production, and legal risks or other factors of change of external environment of agricultural enterprises (3):

$$\Delta SFP_n^{Cost} = SFP_{n_{FACT}}^{Cost} - SFP_{n_{PLAN}}^{Cost} \quad (3)$$

Where: - the actual level of operational costs for *n* segment of the implementation of the innovation project.

It is calculated by the formula (4):

$$SFP_{n_{FACT}}^{Cost} = SFP_{n_{PLAN}}^{Cost} * \left(1 + \left(1 - \sum_{i=1} \Delta R_i^{Fin} * \sum_{i=1} \Delta R_i^{Prod} * \sum_{i=1} \Delta R_i^{Law}\right) * K_{res}^{Cost}\right) \quad (4)$$

Where: - variable limit (in relative terms) of the *t* period of the probability of occurrence of financial risks of *i*-type, which is determined by developing a map of financial risks and in case of need to attract or invite experts on the outsourcing conditions.

This limit is calculated as a ratio of the actual indicator to the baseline:

$$\Delta R_i^{Fin} = R_{i_{fact}}^{Fin} / R_{i_b}^{Fin}$$

Where: - variable limit (in relative terms) of the *t* period of the probability of occurrence of production risks of *i*-type, which is determined by developing a map of production risks and in case of need to attract or invite experts on the outsourcing conditions.

This limit is calculated as a ratio of the actual indicator to the baseline:

$$\Delta R_i^{Prod} = R_{i_{fact}}^{Prod} / R_{i_b}^{Prod;}$$

- variable limit (in relative terms) of the *t* period of the probability of occurrence of legal risks of *i*-type, which is determined by developing a map of legal risks and in case of need to attract or invite experts on the outsourcing conditions. This limit is calculated as a ratio of the actual indicator to the baseline and equals:

$$\Delta R_i^{Law} = R_{i_{fact}}^{Law} / R_{i_b}^{Law;}$$

is the coefficient of the value of fixed assets of the agricultural enterprise, which remains after negative impact of financial, production and legal risks and factors of the institutional environment and equals to the difference between the initial value of the fixed assets () and their actual value: (): .

Considering the mathematical expressions (3) and (4) the calculation of the net discounted income for the n segment of the innovative project applying the differentiation principle would be the following (5):

$$NPV_{S_n} = SFP_n^{Inc} * (1+r_n)^{-t} - \left(SFP_{n_{PLAN}}^{Cost} - \Delta SFP_n^{Cost}\right) * (1+r_n)^{-t} = SFP_n^{Inc} * (1+r_n)^{-t} - \left(SFP_{n_{PLAN}}^{Cost} - SFP_{n_{PLAN}}^{Cost} * \left(1 + \left(1 - \sum_{i=1} \Delta R_i^{Fin} * \sum_{i=1} \Delta R_i^{Prod} * \sum_{i=1} \Delta R_i^{Law}\right) * K_{res}^{Cost}\right)\right) * (1+r_n)^{-t} \quad (5)$$

The implementation of the iterative-incremental Agile-mix approach in simultaneous strategy implies the need to calculate the net discounted income for each segment of the project under the conditions of using the principle of differentiation. Moreover, there is a need to compare them and to further converge to the most appropriate investment projects represented in the enterprise, in order to reduce risk, increase profitability from operating activities within the project management implemented by the agricultural enterprise. Thus, the mentioned indicator for the innovative project in general () could be calculated by the formula (6):

$$NPV_X = SFP_1^{Inc} * (1+r_1)^{-1} - \left(SFP_{1_{PLAN}}^{Cost} - \Delta SFP_1^{Cost}\right) * (1+r_1)^{-1} + SFP_2^{Inc} * (1+r_2)^{-2} - \left(SFP_{2_{PLAN}}^{Cost} - \Delta SFP_2^{Cost}\right) * (1+r_2)^{-2} + \cdots + SFP_n^{Inc} * (1+r_n)^{-t} - \left(SFP_{n_{PLAN}}^{Cost} - \Delta SFP_n^{Cost}\right) * (1+r_n)^{-t} \quad (6)$$

Thus, considering the implementation of the proposed economic and mathematical model of simultaneous strategizing of cash flows in innovative business projects within the iterative-incremental Agile-mix approach, a further strategy of developing promising and profitable innovative goods (works, services) of agricultural enterprises is being formed taking into account environmental factors, changes in institutional environment. And such a program consists of the most profitable and least risky innovative projects and sources of funding.

4. Conclusions

- As a result of the research the concept of management of simultaneous strategizing of cash flows based on the improved adaptive iterative-incremental Agile-mix approach is built up and offered. This model is the basis for the selection of the optimal set of cost-effective innovative projects, based on the effective determination of the required amount of money, allows maximizing the profits of all stakeholders in the process of the projects implementation. In addition, the proposed model serves as a tool for redistribution of financial, industrial and legal risks and negative environmental factors by monitoring them at intermediate stages of the segments of the innovation project of the agricultural enterprise, as it performs selection functions within the framework of strategizing having the lowest degree of risk of execution.

- It should be noted that iterative-incremental approach to construction allows taking into account the influence of uncertainty and variability of the institutional environment, when evaluating the economic-mathematical model of simultaneous strategizing of cash flows in the process of innovative activities of agricultural enterprises. This allows the following in the process of making managerial decisions by project managers: to determine the need for outsourcing in innovation, to adapt the developed scenarios for project implementation and on-time decision-making process depending on how environmental factors change. Consideration of the indicator of net discounted income by segments of the innovation project provides space for managing internal changes of the enterprise and increases its adaptive capacity due to the ability to adjust operating costs and determine the feasibility of already implemented and planned future segments in the intermediate stages of the innovation project.

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