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## Conceptual foundations of the organisation of innovative activities at agro-industrial enterprise based on outsourcing and The Business Process Model and Notation program

### Abstract

In changing market environment, success of agro-industrial enterprise directly depends on innovations and business processes improvement. This research is aimed to define the way to regulate innovative activities at agro-industrial enterprise. It has been investigated that the effective distribution of functions and tasks, their positioning to performers, information exchange, budgeting, and resource distribution are the main stages of effective innovative activities at agro-industrial enterprise.

The implementation of innovations at agro-industrial enterprise is often supported by outsourcing. The software Business Process Model and Notation (BPMN) is presented as a method of control over the process of organizing innovations at agro-industrial enterprise. It is meant to address extensive use of outsourcing, allowing to process large amounts of information during a short period of time, work out conclusions, and develop clear recommendations for optimization of innovations management. The software has been tested at the private enterprise of Ukraine «Granit-Agro» which is oriented at exporting of organic agri-production to EU and Canada. In 2015-2016, administrative expenditures and spendings on managerial grown significantly. That is why, considering the current state of the enterprise and challenges it is facing, we proposed to use BPMN software to improve effectiveness of its activities and management. According to our estimates, the automated management system introducing will reduce time spent on management by 1.7%. The economic effectiveness of the proposed approach in 2017-2020 has been proved.

**Keywords:** Innovative Activity; Organization; Agro-industrial Enterprise; Agrarian Sector; Global Innovation Index; Outsourcing; Business Process Model and Notation (BPMN)

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**Розробка концептуальних основ процесу організації інноваційної діяльності агропромислового підприємства на базі аутсорсингу та програми Business Process Model and Notation**

### Анотація

У статті досліджено світовий досвід управління інноваційним розвитком на основі аутсорсингу. Запропоновано впровадження програми Business Process Model and Notation у діяльність підприємства для підвищення ефективності управління та контролю за бізнес-процесами, які передано на аутсорсинг. Запропоновані в дослідженні впровадження дозволяють досягти економічного ефекту, зменшити тривалість технологічного циклу та розробити чіткі рекомендації щодо управління бізнес-процесами, які пов'язані з організацією інноваційної діяльності на агропромисловому підприємстві.

**Ключові слова:** інноваційна діяльність; агропромислове підприємство; Global Innovation Index; аутсорсинг; Business Process Model and Notation (BPMN).

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**Разработка концептуальных основ процесса организации инновационной деятельности агропромышленного предприятия на базе аутсорсинга и программы Business Process Model and Notation**

**Аннотация**

В статье проанализирован мировой опыт управления инновационным развитием на основе аутсорсинга. Предложено внедрение программы Business Process Model and Notation в деятельность предприятия для повышения эффективности управления и контроля над бизнес-процессами, переданными на аутсорсинг. Предложены рекомендации по достижению экономического эффекта, уменьшению продолжительности технологического цикла и разработке четких рекомендаций по управлению бизнес-процессами, связанными с организацией инновационной деятельности на агропромышленном предприятии.

**Ключевые слова:** инновационная деятельность; агропромышленное предприятие; Global Innovation Index; аутсорсинг; Business Process Model and Notation (BPMN)

**1. Introduction**

Market transformations push Ukrainian economic entities to innovations as a principal mean of their competitiveness. Latest surveys support the claim that number of innovative enterprises in Ukraine is steadily growing.

For example, during 2015, the share of enterprises with innovations was 17.3%, while in 2010 it was only 13.8%. Yet, the real volume of sold innovation products at agro-industrial enterprises has decreased by 1.3% [1]. That means that innovative activities at agro-industrial enterprises in Ukraine are mostly non-technological.

In 2016, Ukraine was 12<sup>th</sup> in Innovation Efficiency Ratio (in 2015 - 15<sup>th</sup>) out of 128 countries according to innovation effectiveness. This fact promotes the trend for further improvement in Ukraine's investment attractiveness, as well as proves the boost in innovations, promising even better results in the future [2].

The country's innovation potential in general is also growing. During the recent years, positive dynamics of the indices of innovation productivity at Ukrainian agro-industrial enterprises has been observed. The position of Ukraine in the Global Innovation Index international rating rose from the 64<sup>th</sup> place in 2015 to the 56<sup>th</sup> in the end of 2016.

Further analysis of Ukraine's rating by Global Innovation Index sub-indices shows that country has positive indices of innovation development, which characterize human capital, knowledge, and research and development. These indices are higher than the average. The weakest points for innovations in Ukraine relate to underdevelopment of infrastructure, instability of political, business, and legal environments, issues in state regulation: all these factors do not favour the development of innovations and innovative activities in agro-industrial complex. Inconsistency of main indicators in innovations and practical state of implementation of innovative activities gives evidence of inadequate use of the country's innovation potential.

We witness trend to develop global innovation networks, to promote cooperation between scholars aimed to increasing the share of technological innovations' transfer to developing countries [3]. For Ukraine these trends not only give the opportunities, but also pose threats for steady and balanced development. That is why constant search for new technologies and innovative models of business organisation is necessary precondition for success of innovative activities in agro-industrial complex.

**2. Brief Literature Review**

Theoretical foundations of innovations and innovation management are developed in the works by such scholars, as Brian Twiss, Joseph Alois Schumpeter, Maria Barbera, Paul Trott, Tony Davila, Peter Drucker, Ravi Jain, Richard Milhous Nixon, Shlomo Maital, Walter Eversheim.

The majority of scholars identify the category of «organizing of innovative activities» with «organizing of innovations» [4, 16-17]. For example, organizing innovations as a structural

and strategic component of innovation management forms the frames for planning and control of innovative activities.

Foreign scholars approach the organization of enterprise's innovative activities from the standpoint of its main components, such as People, Ideas, Funds, and Culture [5]. For example, People of the innovative enterprise are characterized by high level of education and personal mental abilities, ability to creative and unconventional thinking, professional knowledge and skills, independent decision-making. Ideas are generated by networks, built within scientific community. Funds are considered as a financial support of enterprise's innovative activities by the central government [5].

Obviously, creative people are the most important element of organizing innovation activities. Such people show creative thinking, they are able to find unconventional approaches to solve problems. These individuals bear breakthrough ideas, and they are able to apply those ideas to production of new, innovative products. But it is necessary to promote such organizational culture, which will assist in development of the personnel creativity and innovations [6].

To ensure interaction between employees is also important; it is necessary to structure personnel to ensure effective cooperation between its members.

Latest publications by such Ukrainian scholars, as V. H. Andrichuk, I. M. Boichyk, O. I. Volkov, T. H. Duhar, O. Yu. Yermakov, B. F. Zablotsky, V. I. Zakharchenko, S. M. Illiashenko, P. P. Mykytiuk, and A. V. Shumsky are devoted to organizational-economic aspects of innovative activities at agro-industrial enterprises in Ukraine.

Ukrainian scholars pay much attention to the nature and impact of the notion «organization» as a mean to understand rational and effective interplay of material, energy, labour, finances, and informational resources in the production process [7, 114]. The pivotal aspects of organizing innovative activities are organizational structure and innovation process regulation.

The activities of agro-industrial enterprises are based on combination of the manufacturing of agricultural products, their industrial processing, and storing; these elements of production process have unified system of management, organization, and effective coordination of activities [8]. That is why the effectiveness of their innovative activities depends directly on the organization of the innovation process [9].

Nevertheless, to address specifically agro-industrial enterprises activities, the organization of innovative activities must involve the processes of integration and diversification. Still, integration precludes acceleration of scientific-research and production processes, while diversification aims to eliminate the mishaps of internal and inter-company integration, and to mobilise new technologies into production process [10].

Thus, under current state of economy, and considering the state of scientific and technical progress, the organization of innovative activities at agro-industrial enterprises is to

be based on decentralization and independence of subdivisions to provide higher efficiency and flexibility of organizational forms and diversity of products, instruments, technologies, and management approaches.

**3. Purpose**

The article is addressing following issues: to investigate theoretical and methodological foundations of innovative activities organization at agro-industrial enterprises; to analyse both in international and Ukrainian experience in the area; to develop future model of the management of innovative activities at agro-industrial enterprises; to conclude on the effect of introduction of the Business Process Model and Notation program on the enterprise; to determine the level of influence of proposed measures on the effectiveness of innovation activities.

**4. Results**

Globalization and integration trends in the world economy contributed to the spread of modern business model of outsourcing to the management of innovative activities. To many accounts, the need for services of companies-outsourcers globally is USD 80 bln per year. The major markets for outsourcing are established in USA, Western Europe, and Japan; while leading suppliers of outsourcing are India, China, Canada, Philippines, and Ireland.

About 60% of enterprises in the United States and 45% in the EU countries use services of outsourcing companies. Leading experts in the field predict further growth of the outsourcing services' market till 2020 by 27% in USA and almost by 35% in the Eastern Europe [11].

Research conducted by the international consulting company CIBER showed that 157 companies from Forbes 2000 rating consider outsourcing as a strategic direction of their development and business growth [2].

Ukrainian market of outsourcing services is developing in line with global trends, and lately we saw significant increase of use of these services Among Ukrainian companies. For instance, according to the data of the Global Services Location Index international rating, in 2016 Ukraine ranked 24<sup>th</sup> on the market of outsourcing services (Figure 1).

The results of the research have shown that the services of outsourcing in Ukraine are used in the following fields: IT services (40.5%), logistics (35.1%), resource provision of production processes (27%), marketing services (21.6%), recruitment (18.9%), accounting (13.5%), processing and systematizing information (8.1%), personnel recording (5.4%), administrative functions (2.7%) [13].

International and Ukrainian experiences prove introduction the outsourcing into the activities of enterprise to be key advantage in business competition and key asset for considerable decrease of expenditures and rise of the effectiveness.

Majority of scholars consider outsourcing a modern business model of transferring secondary functions of the enterprise and the assets related to them to the professional contractor (outsourcer) [14]. Management of the enterprise by outsourcing is a complex activity, directed at achieving operative result at minimal cost.

Amid use of outsourcing in innovation development at agro-industrial enterprise, the main challenge is to look for the balance between the functions performed by the outsourcer and those carried out by the company, as well as constant monitoring of performance of the outsourcing agreement. That is why, the authors have suggested to use the Business Process Model and Notation (BPMN) software to model, analyse, and rearrange business processes. This approach provides better access to information describing business processes to every potential user: analysts, who develop the process structure; managers responsible for introduction of the new business processes; executives who run business processes and oversee their outcomes [15].

The specification of BPMN uses the basic choice of elements perceived by intuition, which allows defining complex semantic constructions. Besides, the BPMN specification determines the way diagrams depicting business processes can be transformed into the models in the BPEL language [16].

Modelling the business process is the initial stage of running innovative activities at agro-industrial enterprise based on outsourcing. Its main aim is to define distinct scheme designation for each stage (task) of innovation activities, which is a component of the modelled process.

While modelling the business process of innovative activities at agro-industrial enterprise based on outsourcing, it is necessary to split the two processes: private (internal) process and the processes of interaction (global) with the outsourcing company.

The process of modelling innovative activities at agro-industrial enterprise should be visualized with the following scheme (see Figure 2).

At the next stage of the process modelling we are considering resource accumulation and team building for organisation of the innovation process, followed by identifying the tasks for separate executors (separate employees, subdivisions of the enterprise, and so on) in the general cycle of the innovation project (see Figure 3).

The demonstrated business process of innovative activities at the agro-industrial enterprise describes its internal structure. That is why the management flow is inside one pool, and does not cross its borders. And the process of interaction of the agro-industrial enterprise with the outsourcing company describes the interaction of associations across the actions.

There is the possibility to define specific technical aspects of the process at the stage of modelling the process, for example, to set the terms of tasks' execution, to create extended transactions, messages in the framework of the process, and to design interfaces of interaction with other sub-systems (see Figure 4).

Each task set not only contains information on the process, but automatically generates the report data, for example, the number of the task, the date of creation, and reference to the author, etc. The BIZAGI system stores the registered activities of the user, where the executive or the person

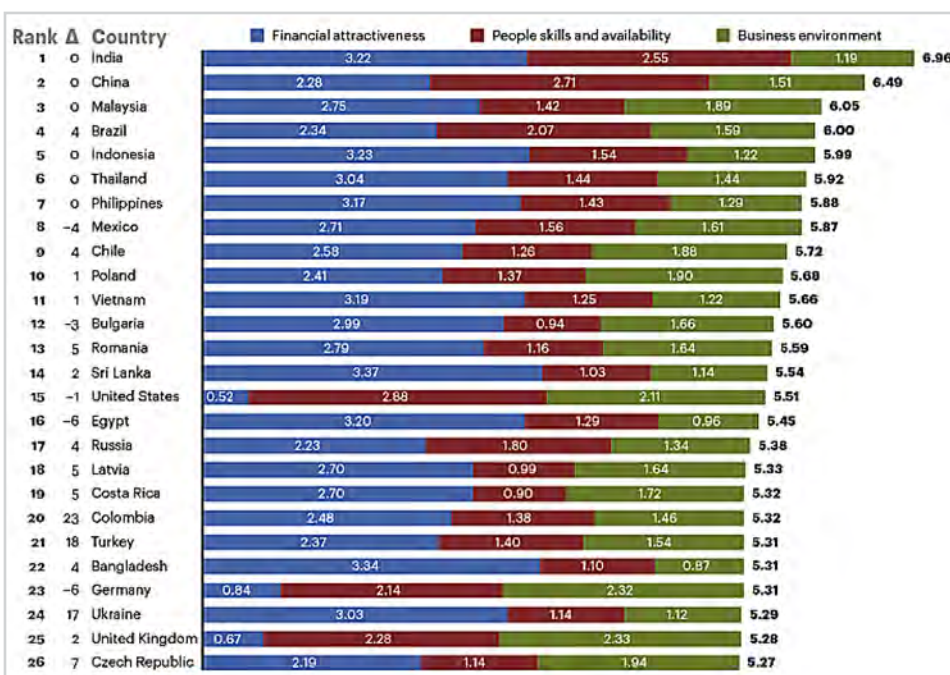


Fig. 1: Global rating of outsourcing attractiveness during 2016  
Source: [12]



responsible for the process can control the history of the users' work with the process. Besides, you will be able to see the graphic reflection of the state of the process on the scheme.

During modelling the business process of organizing innovative activities based on outsourcing, the BIZAGI Process Modeller add-on also allows to adjust the documentation workflow in the system. Detailed information on task execution, and schedule of execution terms for each stage of the business process is included, which allows to either push the process to the next stage or to rerun it until final completion, if necessary. It is important to keep in mind that any document included into the system should be clear to the other performers (see Figure 5).

Depending on the role by the user in execution of the tasks, the level of access to the system is identified. For example, users involved in information analysis, have the access to the Process Analysis and Business Information Analysis modules.

Such an approach provide the possibility to automatically monitor performance and to control execution terms by every performer, in compliance with set time frames, policy, aims, and rules of the agro-industrial enterprise.

When representation of the business process through the scheme is completed, and documentation handling is ready, results received could be further issued as a report in Microsoft Word, PDF, Share Point, or Web format. Report may

contain detailed information on every stage of the process and performers responsible for their execution.

We tested reliability and effectiveness of the Business Process Model and Notation software for the activities of agro-industrial enterprises at the private enterprise «Granit-Agro». The chosen subject is implementing the growth strategy. To increase its competitiveness, this enterprise is aimed to enter new markets, pursue diversification, and introduce innovations. Company is looking to hire highly qualified personnel, and its personnel policy is standing on motivation, career growth, and constant professional development.

The private enterprise «Granit-Agro» is a part of the business group «Arnika», one of the most effective producers of agricultural products in Poltava region of Ukraine. Its core businesses are organic soybean, hemp, and corn cultivation. The immediate goals are export of the certified organic products to the EU and Canada (company already has the certificate of the LLC «Organic Standard», confirming compliance of its organic production and processing with requirements of the EU Council Regulation (EC) No. 834/2007 and the European Commission Regulation (EC) No. 889/2008 on manufacturing of organic corn, soybean, hemp, and alfalfa).

The enterprise shows positive profitability dynamics, and has all necessary resources for effective production. In 2015-2016,

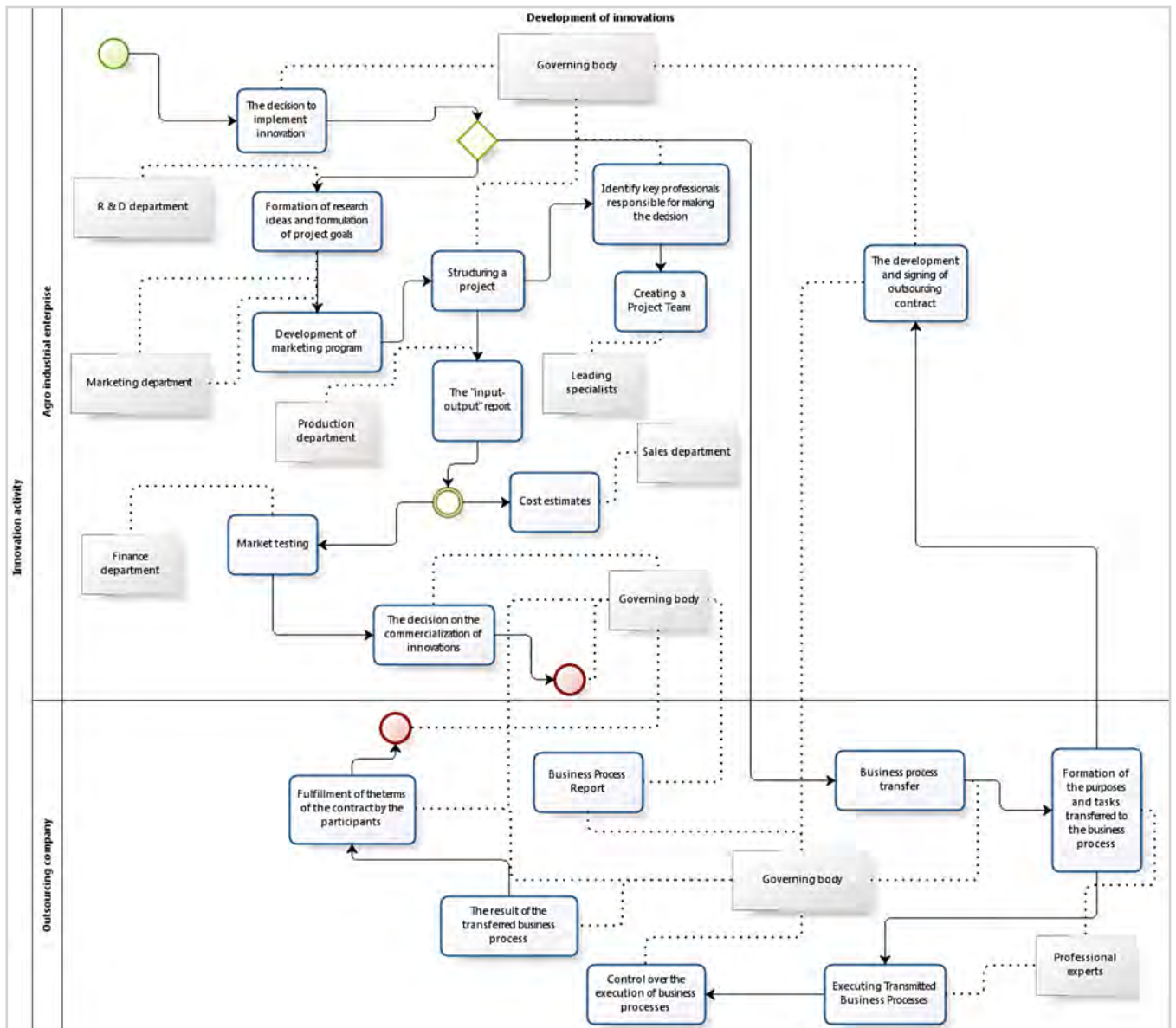


Fig. 2: Module work window of organizing innovative activities at agro-industrial enterprise on the basis of outsourcing business model of innovative activities  
Source: Elaborated by the authors

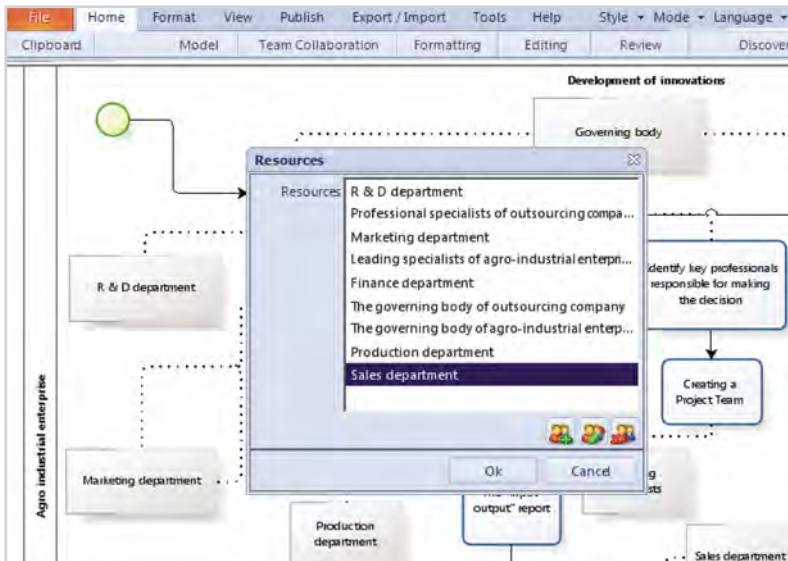


Fig. 3: Module work window of team formation for organizing innovation process on the basis of outsourcing  
Source: Elaborated by the authors

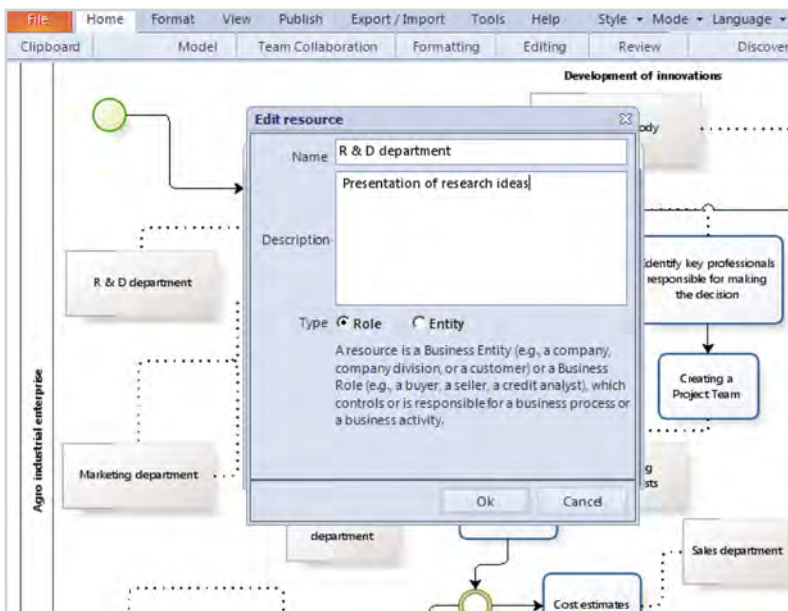


Fig. 4: Module work window of fixing the tasks for separate executors  
Source: Elaborated by the authors

substantial growth of administrative expenditures and spendings on managerial staff took place. That is why, considering the current state of the enterprise and challenges it is facing, we proposed to use BPMN software to improve effectiveness of its activities and management.

To illustrate the effectiveness of the BPMN software to evaluate the enterprise's activities, we are going to apply further approach in seven:

1. The analysis of the effectiveness of the core business processes with determining the cycle time (T) and stock circulation (O<sub>3</sub>) of the enterprise according to Little law:

$$T = \frac{\text{Unfinished production}}{\text{Cost of sales}} \times 365 \text{ days ,}$$

$$T = \frac{1,052}{22,929} \times 365 = 17 \text{ days .}$$

$$O_3 = \frac{1}{\text{cycle times}} \times 365 \text{ days ,}$$

$$O_3 = \frac{1}{17} \times 365 = 21 \text{ times per year .}$$

2. The calculation of the aggregate expenditures to buy and introduce the BPMN software are represented in Table 1.

According to the expert estimates, introduction of the automated management system will reduce time spent on management by 1.7%.

3. The evaluation of the achieved level of labour productivity, and determining of the additional volume of products' sales after implementation of the BPMN at the enterprise.

Labour productivity at the private enterprise «Granit-Agro» is:

$$\Pi = \frac{\text{The amount of the sold products}}{365 \text{ days}} ,$$

$$\Pi = \frac{61,100}{365} = 167.39 ,$$

before introducing the BPMN software.

$$\Pi = 167.39 + \left( \frac{167.39 \times 1.7\%}{100} \right) = 170.23 ,$$

after introducing the BPMN software.

The volume of the sold products by the private enterprise «Granit-Agro» after implementation of the BPMN software is:

$$\text{UAH } 170.23 \times 365 \text{ days} = \text{UAH } 62,133.95$$

4. The evaluation of the economic efficiency of the BPMN software implementation:

$$E_k = \frac{\Pi(O_p^i - O_p^a)}{O_p^a} ,$$

$$E_k = \frac{26,045(62,133.95 - 61,100)}{61,100} = 440.74$$

5. The determination of changes in cash flow as a result of the innovation project (introduction of the BPMN software) is shown in Table 2.

6. The calculation of payback period after the project introduction (T) - implementation of the BPMN software:

$$T = \frac{\text{Investments}}{\text{Profit}} ,$$

$$T = \frac{84,494.62}{26,485.74} = 3.2 \text{ years .}$$

7. The determination of the profitability of the innovation project after introduction of the BPMN software at the private enterprise

«Granit-Agro»:

$$P = \left( \left( 26,485.74 + \frac{26,485.74}{1.218} + \frac{26,485.74}{1.218} + \frac{4,414.29}{1.218} \right) / 84,494.62 \right) - 1 = 0.128$$

The investments in innovation project to implement the BPMN software will pay off in 3 years and 2 months, and the estimated level of profitability of 0.128 proves its effectiveness. That is why, use of BIZAGI BPM system under the transfer of some business processes to outsourcing is one of the most swift and effective ways to raise the effectiveness of management of innovative activities at agro-industrial enterprise.

### 5. Conclusions

Amid the growing competition for markets, innovations and optimization of business processes are of vital importance for the agro-industrial enterprises.

The authors proposes an approach to regulate the processes of innovative activities at agro-industrial enterprise, which is oriented at decentralization and independence of elements within the innovation project, based on the outsourcing business model. The main functions of effective

innovative activities at agro-industrial enterprise are effective distribution of functions, positioning of the tasks to the performers, exchange of information, budgeting, and distribution of resources.

The process of innovative activities at agro-industrial enterprise based on the outsourcing model using the Business Process Model and Notation software products was introduced. The software products allow to process big array of information in short time lapse, to shorten the duration of technological cycle, and to develop clear recommendations on how to organize innovative business processes in innovation activities.

Thus, the main effects from BIZAGI Business Process Model and Notation for innovative activities at agro-industrial enterprise based on outsourcing are the following: growth of the effectiveness and productivity of the innovations; shortening of the innovation process technological cycle; levelling up the production system servicing; providing the flexibility into innovative production system; increasing the efficiency of the personnel's work

and avoiding work overload; scaling down labour intensity by decreasing its monotonousness; growing efficiency of receiving, trustworthiness, and accuracy of the information within the innovation project; overall improvement of the innovation process.

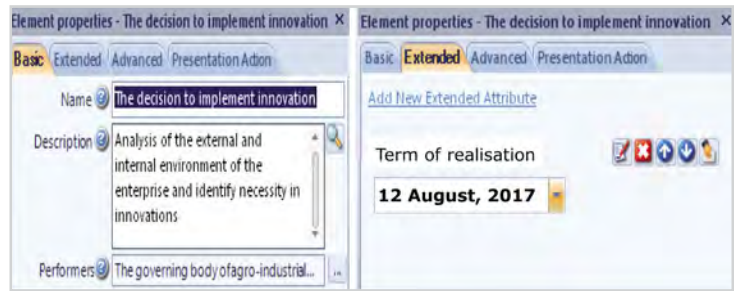


Fig. 5: Module work window of the informational provision of the process of innovative activities organizing at agro-industrial enterprise  
Source: Elaborated by the authors

Tab. 1: Aggregate expenditures to buy and introduce the BPMN software at «Granit-Agro» enterprise

Items of expenditure	Annual sum, hryvnas (UAH)
1. Price of the BPMN software for business	3,213.00
2. Salary for the programmer (according to the tariff scale by January 1, 2017)	64,431.62
Tax including (41.5%)	18,896.90
3. Basic training of personnel to use the BPMN software	16,560.00
4. Payment for the internet services	1,200.00
5. Additional resources for installation of the BPMN software at the enterprise's hardware	290.00
Total:	84,494.62

Source: Authors' calculations

Tab. 2: Changes in cash flow as a result of the innovation project (introduction of the BPMN software) at «Granit-Agro» enterprise

Indicators:	Expected cash flow (UAH)			
	2017	2018	2019	2020
1. Spendings on the BPMN software introduction	20,063.00	0	0	0
2. Capital expenditures	64,431.62	0	0	0
3. Economic effect (increased profit)	26,485.74	26,485.74	26,485.74	26,485.74
4. Balance	-58,008.88	26,485.74	26,485.74	26,485.74
5. Cumulative total	-58,008.88	-31,523.14	-5,037.4	21,448.34

Source: Authors' calculations

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