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INTEGRAL CRITERIA FOR EVALUATION OF SCIENTIFIC AND TECHNICAL RESEARCH

Abstract: *In the paper, we develop approaches to the estimation of production enterprises based on the criteria of classification of products, goods and services to innovative products. Developed their qualitative scale for interpreting the results of the evaluation, blind spots, which were not included in the intervals, are compensated by the use of fuzzy sets. In the presented method uses integral criterion based on fuzzy accessory products specific form. The obtained numerical values of the integral criterion reflect the adequacy of the technical characteristics to determine the form of new products, as well as identifying the characteristics of the gap to peers and benchmarks. The technique is applicable to the assessment processes of innovation and competitiveness of new and current products, as well as in dealing with the definition of the innovative features of the new products.*

Keywords: *innovation, new products, quality, scientific activity*

1. Introduction

Today's enterprises who wish to obtain profits from the "innovations" are based on the strategy of "cream-skimming", introduces a new type of product at a high price and a certain time get a monopoly in the target market segment. New product is in demand, as long as the manufacturers and competitors will not produce the same product at a lower price. The consequences of this tactical move such that the enterprise - the innovator has to generate new ideas and solutions to break the deadlock. The problem lies in the rapid assessment of the potential of innovation, where innovation: in-house development, created and formed on the basis of the offer by a third party, or in the case of the development of practical experience in the production of a new type of product from the partner companies. Therefore, cooperation with business incubators through innovation, research institutes in research activities, and the development of their own development in the company in engineering and production (rationalization) activities should be considered when shaping the strategy of development of industrial enterprises. There remains the question of how to assess the capacity of innovation of the proposed groups of authors, inventors, innovators and engineers, innovators, with respect to the leading competitor in the market and recognized standards prevailing in the industry in question. The improvement is characterized by a slight change in the structure of the object, with development

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impact of its functional characteristics. Quite often there is an effect of misperception of new products as an innovation for local novelty of its technical characteristics, but a detailed analysis of the form of new products will meet the upgrade to the best competitive designs. Innovations generate new qualitative breakthrough, leading to a change in the entire production technology, organization, or the creation of new technical characteristics of the object.

Questions differences of new products and to identify the factors of innovation based on an assessment of the capacity of existing products at the stage of pre-production, as well as the development of tools of assessment tools to monitor the prospects of scientific and manufacturing processes in accordance with market conditions. (Semenova and Smirnova, 2008)

Currently, there is a serious problem of assessing the quality of products on the pre-production stages of the life cycle. When considering the development process and putting into production of high technology products, a high proportion of the cost falls on R&D. The problem is to assess the desirability of a serial production of new products for release on the results of research and development. Conformity Assessment inner being developed products content items technical and economic parameters (TEP) in the specifications based on the results of preliminary and acceptance tests of the developed products and often at the end of the test turns out that the potential of the TEP is not sufficient to achieve the desired competitive level. Corporate customer can completely prevent digress level TEP developed products from the competitive level counterparts, but considering factors tenfold the cost of the quality and pace of development of scientific and technical progress, the products at the time of release to the market test batch will be obsolete.

GOST 15.101-98 "System development and launch of new products". The order of execution of scientific research "establishes milestones of research, which include the processes of evaluation of the effectiveness of the results in comparison with the modern scientific and technical level, including assessment of the creation of competitive products and services. Identification of potential failure to complete TEP studies will lead to increase in terms of the order and hence cost. Thus, the terms of reference will have to be repeated consultation. It is necessary to assess the prospects of TEP products in the early, pre-production stages of the product life cycle

Depending on the type of customer and product development program forms are several initial conditions at launch of new products, which sets the GOST R 15.201-2000 "System development and launch of new products. Products for industrial purposes":

- Creation products by the state order, financed from the federal budget and the budgets of the Russian Federation;
- Creating products for specific customer order;
- The initiative to develop products without a specific customer in the commercial risk of the developer and manufacturer.

Items GOST R 15.201-2000 imply several types of products for putting into production: production and technical purpose and national economic production.

The planned production of products is analyzed for viability and economic feasibility of its internal capacity in relation to the needs of the target market. Production potential is assessed during the relevant market research, including laboratory tests at the stage of technical assignment, which uses secondary information about the market reaction to the closest analogues competitors. And field studies of the problem, including a trial run a small batch of products on the market and recording changes in demand for the products of competitors, already at the stage of entering

the production capacity.

Thus the processes of change in TEP production at the stage of entering the production capacity would entail high costs in material and moral terms. Thus, the rationale for the development of approaches to preliminary assessment of TEP new products is to reduce the costs of new product development, direct evaluation of research results, identify promising technological level of production, and the measurement of the potential of researchers involved for research, as well as clarification of potential market requirements content of technical assignment at the stage of formation.

2. Relevance

Conformity Assessment developed products content of technical specifications based on the results of preliminary and acceptance testing of new products and quite often due to stretching of the timing of production and testing program moral characteristics of the products are losing relevance. Evaluation of innovative and promising new products takes place on the basis of an unstructured set of criteria that do not fully reflect the properties of the object, nor does it take into account the contribution of intellectual and professional qualities of staff of the enterprise. The development of new models and techniques for assessing the effectiveness and future activities of scientific, innovation and industrial enterprises is an urgent task at the present stage of development of the world economy; their use would solve the problem of industrial management in terms of the development of competitive products in terms of economic and technical risks. (Semenova and Smirnova, 2008). The main provisions. As a result of the analysis of the regulatory framework governing documents innovation, science and engineering, revealed characteristic differences of criteria imposed on the functional characteristics of new products in various activities. The analysis included a study of the most common methods of assessing the effectiveness of research and production activities and patterns of development of innovative processes.

Based on the analysis refined elements of scientific and production activities (SPA):

$$SPA = F (ND, ID, SDI)$$

where ND - research (fundamental and applied research, experimental development, inventions, utility models, industrial designs), ID - innovation activities (basic, improvers and quasi innovation), SDI - engineering and manufacturing activities (modernization, improvement, modification). (Nazarevich and Semenova, 2014)

Each element of the SPA describes the different results of the group defines the peculiar form of innovation. To assess and describe the results of the SPA developed a model of the life cycle of innovation (Figure 1), based on the experiences presented in models of innovation processes of different generations. The developed model belongs to the sixth generation. Disadvantages of previously reported model are not the fullness of the description of the various activities, leading to the formation of innovation. In accordance with current trends there is a need classification innovation as a key point in determining the potential result of the SPA.

Investigation of models of innovation processes five generations showed no distinctions on research, innovation, and innovation, and in some cases does not provide feedback between the stages model, the lack of clear concepts about the results of taking final shape in the form of products.

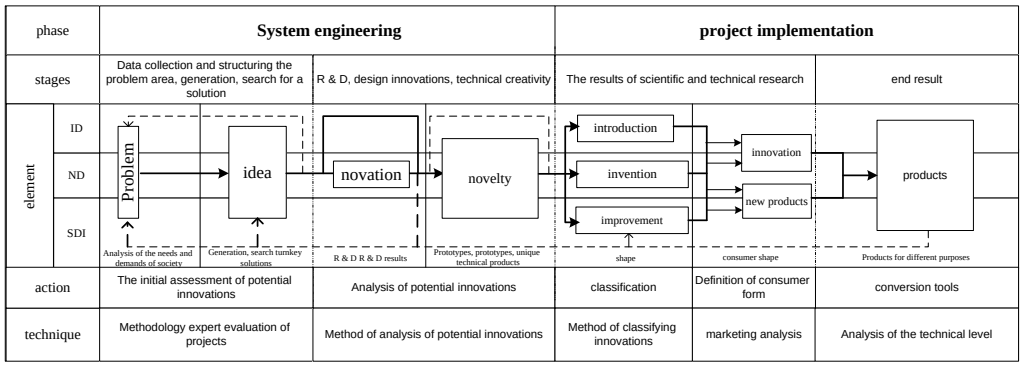

Figure 1. The life cycle model novelty

Proposed and developed model belongs to the sixth generation models of innovation development on the basis of the content of elements relating to research, innovation, engineering and production activities, with which it is possible to identify the shape of the result of certain activities aimed at creating new products.

Functionally, the model describes the trajectory of the developer, inventor, innovator or group of authors in the creation and design of new products and processes of transformation of existing products. Model innovation process consists of two phases, each of which includes two phases. Each part consists of the use of different valuation techniques inner essence of the object with an innovative, scientific, engineering and production activities.

Due to the increasing relevance of innovation in the production environment, clearly identify the problems, an adequate assessment of the potential outcome of intellectual labor researcher or working group, whose actions are focused on the necessary changes. In the life cycle model of formation of scientific and technological research are four stages in which there is a transformation of scientific and technological knowledge in the innovation:

- data collection, structuring the problem area, and the generation of possible solutions;
- conduct scientific research, the development of rationalization proposals, technical creativity;
- acquisition and analysis of the results of scientific and technical research, classification;
- expansion of sales, product differentiation.

The first stage of the life cycle is the identification and analysis of the subject area to assess the complexity and magnitude of the problem. As a result of the first stage of developing the terms of reference, which should clearly define the further movement in the direction of the solution process. The second step is the generation of ideas, find solutions or best practices for the problem under investigation. The third stage in the framework of scientific and technical research depends on the choice of the type of activity: innovation, science, or engineering and production orientation. For each of the activities characteristic of certain processes that result in the conversion of different resources in innovation.

The third stage for engineering and manufacturing activities begins with the formation and development of proposals on the basis of the previous generation process base of ideas and solutions. In the case of the successful creation of engineering solutions, offering becomes an innovation that the process of compliance with the requirements laid down on the stage of the terms of reference for innovations.

For basic innovation is necessary presence of the results of basic research. Scientific activity also begins with the selection direction and generate ideas and solutions database, if the selected direction is recognized perspective, the process of making a decision about the initialization of scientific research in this area. In the course of research formed "novation" - new knowledge, method or principle obtained as a result of R & D. After conducting research to evaluate the impact of research, in the case of achieving the objectives of the work, the results of R & D innovations take the form of a certain scientific potential. Innovation goes conformity assessment requirements specification, and then proceeds to the next stage.

In conclusion, the first stage may assess the scientific and technological level of development. In this case, the main purpose of assessment - Definition of investment attractiveness and feasibility of the project (research), as well as identifying the nature of the potential innovations and Related Properties of the essence of the needs of stakeholders. The evaluation is based on the analysis of scientific and technological content of the project management capacity of the qualification group of authors and market demand for the product of the project. The next stage, provided sufficient utility of the project is to identify the nature of the results of different activities.

The result is innovation - innovation, or various forms of innovation that contain several distinctive features, such as: the level of innovation, scientific and technological innovation, industrial applicability, and commercialization. In the absence or deficiency of any of the properties of innovation can not take shape as an innovation.

The results of scientific activities are characterized by the following properties: the scientific and technological innovation, industrial applicability, inventive originality.

The results of engineering and production activities have the following properties: the scientific and technological innovation, tradability, industrial applicability, originality, but to a lesser extent than other forms.

In order to distinguish the above results for the SPA and adequate treatment of a particular group, followed by forecasting potential objects and presenting them as inventions, innovations, improvements, it is necessary to develop a system of criteria for the evaluation of the SPA. System of criteria for assessing the SPA also includes criteria that are used during the examination of innovation for the right to obtain a patent. To analyze the potential of innovation in accordance with the model of the life cycle of the formation of scientific and technical research, the technique of calculation, based on six criteria for assessing the potential of innovation. Evaluation criteria presented in the table, and perhaps for use in evaluating the results: ND, ID, SDI.

Evaluation of the results of the SPA includes a number of criteria: the level of innovation, inventive step, the scientific and technological innovation, tradability, industrial applicability, originality.

For the characteristic of innovation output is innovation, classified, for example, the degree of novelty: basic innovations, improving innovation psevdoinnovatsiya. Innovation is characterized by a specific set of attributes such as: novelty, industrial applicability, commercialization, innovative level.

The results of scientific and technological activities in its highest form - the invention is characterized by the following properties: novelty, industrial applicability, an inventive step. As can be seen from the list of properties is observed absence of reducible commercialization invention scientific orientation due to this form. In the evaluation of the principle of innovation commercialization has a key role. If the invention is the promotion of scientific and technological progress as the application of

scientific potential of the unit, with a base to expand the horizons of scientific knowledge, the innovation is aimed at the diffusion of scientific knowledge in the consumer sector, thus creating new markets offer to existing needs and creating new ones.

Changes in technology or processes in the enterprises are the results of engineering and production activities include modernization, modification and improvement. Separately, there is the know-how, as a unit of scientific and technological progress and the reference product.

At this stage, the classification results of scientific and technical research, thus completing the phase of system design as part of the life cycle model of formation of scientific and technical research.

The result of system design phase of the project is ready prototype, prototype or unique technical products, with appropriate design documentation.

The purpose of the phase of system design is the formation of new equipment and technology for the transmission of a batch or small-scale production.

Through the production of small batches of new products and the subsequent trial extension to the market, we investigate the market potential of innovations. From the market's reaction to the emergence of a new product depends on the further marketing strategy and tools to achieve the desired goals. At the final stage of system design phase creates a quotation or business plan. The main task of managers is to find funding sources for the project and presentation of the project (research) in an attractive form of investment.

As a result of the passage of the object on the life cycle stages of formation of scientific and technical studies for the cycle phases characterized by specific problems, such as technical, organizational and financial-economic nature. Implementation of the proposed approaches to the formation of the rating of the project based on an assessment of key factors, taking into account its nature allows us to estimate the potential of innovation and conduct effective multistage selection in the selection of promising projects and to evaluate their usefulness in the early stages of the life cycle.

The next stage of identification of innovations based on the integral evaluation criterion SPA and relating it to a class on the basis of internal distinguishing characteristics.

Depending on the class of the state innovation becomes: innovation, invention and update.

At this stage, the assessment of the consumer forms of innovation through market research, there is the collection, analysis and evaluation of primary, secondary information on the subject of consumer activity in the area where innovation enters the market. On the basis of the study is a form of consumer innovation: innovation or new products.

At the last stage of innovation is converted into products that are also in need of modernization, improvement in mind fleeting moral and physical deterioration.

Based on the analysis of criteria (Table 1) for each form of innovation concept was formed base criteria for assessing novelty and competitiveness, entry to which the inventive, innovative and technological levels.

Group competitiveness criteria form industrial applicability, commercialization and originality.

In assessing the weight coefficients for calculating partial indicators used the survey results of the expert group, which includes in its membership highly qualified specialists in the field of manufacturing, marketing, Innovation and protection of intellectual property.

Table 1. Components of the scientific and industrial activities

Groups of criteria	Criteria (I_i)			
Criteria reflecting the novelty products	Innovative level	Groups SPA	Results ND	New products
				Invention
				Utility model
	Scientific and technological level			Design
	Inventive step		Results ID	Basic innovation
Criteria reflecting the competitiveness of products	Commercial Feasibility			Improving innovations
	Industrial Applicability			Quasi innovation
	Originality		Results SDI	Modernization
				Modification
				Improvement

Integral evaluation of the SPA includes a number of generalized criteria: innovative level, inventive step, the scientific and technological innovation, tradability, industrial applicability, originality. Forming an integral criterion for evaluating potential innovations I_E is performed by aggregating generalized criteria.

Integral evaluation of the SPA describes the structural decomposition presented in generalized criteria:

$$I_E = F(I_1, I_2, I_3, I_4, I_5, I_6)$$

integral criterion - function of the generalized criteria.

$$I_i : I_1, I_2, I_3, I_4, I_{5,}, I_6$$

forming a mathematical model for evaluating innovations:

$$I_i = F\left(I_{i1}, ... I_{i6}\right) : \sum_{i=1}^{6} I_i = I_E \in (ID), (ND), (SDI)$$

where I_i - the set of generalized criteria, i - the serial number of criteria, F - functional generalized criteria I_E - integral criterion for assessing the potential of innovation.

For the classification of the identified characteristics are compared with intervals assess the levels of innovation, each of which determines the adequacy of the test building. To assess the potential of innovation integral criterion is used, based on the numerical value of which is determined by the interval estimation of innovation that characterizes the desired shape innovation.

To identify promising potential characteristics of innovations used fuzzy logic, the refinement of forms of innovation applied fuzzy intervals evaluation (Table 2). Integral criterion is defined as the sum of the results of the six methods of evaluation capacity. A certain point value of the integral criterion is compared with the scale interval estimates thus determined by the shape of innovation. Numerical characteristics of IE compared with intervals grading scale. At sufficiently assessed value set object belongs to a particular class research. (Nazarevich, 2013)

Table 2. Interval values of the results of the SPA

Intervals assessment innovations	Form new products	Fuzzy intervals
$0.00 < I_E < 19.9$	L1 - Modification	$0.00 < I_E < 21.0$
$20.0 < I_E < 26.9$	L2 - Quasi innovation	$19.9 < I_E < 26.0$
$27.9 < I_E < 30.0$	L3 - Design	$25.0 < I_E < 32.0$
$30.0 < I_E < 38.0$	L4 - Improvement	$30.0 < I_E < 40.0$
$39.9 < I_E < 44.0$	L5 - Modernization	$38.9 < I_E < 45.0$
$44.0 < I_E < 49.9$	L6 - Utility model	$44.0 < I_E < 50.0$
$49.9 < I_E < 59.9$	L7 - Improving innovations	$49.9 < I_E < 60.0$
$60.0 < I_E < 70.0$	L8 - Invention	$59.9 < I_E < 71.0$
$77.9 < I_E < 90.0$	L9 - Basic innovation	$70.0 < I_E < 90.0$

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To automate the procedure of assessment of the capacity of innovation used programming language *R*, working environment *RStudio*. (Semenova et al., 2014)

The domain of the set of six methods for evaluation and output values:

$U_1 \in [0;10]$- The interval for innovative and inventive step, commercial feasibility, originality;

$U_2 \in [0;30]$- Interval for the scientific and technical level;

$U_3 \in [0;25]$- Range of industrial applicability;

$U_4 \in [0;90]$- Displays the final interval assess the potential of innovation.

For each of the developed techniques derived membership function, and given the final schedule showing innovation potential. Received the membership functions for different forms of innovation

$$\mu_{L1} = \begin{cases} y = 1, если \;\; 0 < x < 19 \\ \dfrac{19 - x}{21 - 19} \;\; если \;\; 19 < x < 21 \\ y = 0 \;\; если \;\; x > 21 \end{cases} \quad \mu_{L2} = \begin{cases} y = 0, если \;\; x < 19 \\ \dfrac{x - 19}{20 - 19} \;\; если \;\; 19 < x < 20 \\ y = 1, если \;\; 20 < x < 25 \\ \dfrac{26 - x}{26 - 25} \;\; если \;\; 25 < x < 26 \\ y = 0 \;\; если \;\; x > 26 \end{cases} \quad \mu_{L3} = \begin{cases} y = 0, если \;\; x < 25 \\ \dfrac{x - 25}{27 - 25} \;\; если \;\; 25 < x < 27 \\ y = 1, если \;\; 27 < x < 30 \\ \dfrac{32 - x}{32 - 30} \;\; если \;\; 30 < x < 32 \\ y = 0 \;\; если \;\; x > 32 \end{cases}$$

$$\mu_{L4}=\begin{cases} y=0, если\ x<30 \\ \dfrac{x-30}{32-30}\ если\ 30<x<32 \\ y=1, если\ 32<x<38 \\ \dfrac{40-x}{40-38}\ если\ 38<x<40 \\ y=0\ если\ x>40 \end{cases} \quad \mu_{L5}=\begin{cases} y=0, если\ x<38 \\ \dfrac{x-38}{40-38}\ если\ 38<x<40 \\ y=1, если\ 40<x<44 \\ \dfrac{45-x}{45-44}\ если\ 44<x<45 \\ y=0\ если\ x>45 \end{cases} \quad \mu_{L6}=\begin{cases} y=0, если\ x<44 \\ \dfrac{x-44}{45-44}\ если\ 44<x<45 \\ y=1, если\ 45<x<49 \\ \dfrac{50-x}{50-49}\ если\ 49<x<50 \\ y=0\ если\ x>50 \end{cases}$$

$$\mu_{L7}=\begin{cases} y=0, если\ x<49 \\ \dfrac{x-50}{50-49}\ если\ 49<x<50 \\ y=1, если\ 50<x<59 \\ \dfrac{60-x}{60-59}\ если\ 59<x<60 \\ y=0\ если\ x>60 \end{cases} \quad \mu_{L8}=\begin{cases} y=0, если\ x<59 \\ \dfrac{x-59}{60-59}\ если\ 59<x<60 \\ y=1, если\ 60<x<70 \\ \dfrac{71-x}{71-70}\ если\ 70<x<71 \\ y=0\ если\ x>71 \end{cases} \quad \mu_{L9}=\begin{cases} y=0, если\ x<70 \\ \dfrac{x-70}{71-70}\ если\ 70<x<71 \\ y=1, если\ 71<x<90 \\ \dfrac{91-x}{91-80}\ если\ 90<x<91 \\ y=0\ если\ x>91 \end{cases}$$

Figure 2. Membership functions for forms of innovation (L1 - Modification, L2 - Quasi innovation, L3 - industrial design, L4 - Improvement, L5 - Modernization, L6 - utility model, L7 - improving innovations, L8 - invention, L9 - Basic innovation).

For easy description and analysis of selected forms of innovation trapezoidal membership function for the four parameter sets the position of the potential of innovation. Compliance with the internal characteristics of the studied innovations objects belonging to a set, determined on the basis of membership function.

For each of the developed techniques derived membership function in the form of graphs, as well as given a final schedule showing the potential of innovation.

The installation procedure of fuzzy intervals for assessment of innovation and display the graphical interpretation of the data was carried out in the working environment RStudio. (Tushavin, 2008)

For each form of new products defined membership function characterizing the potential of innovations in the form of a trapezoid (Figure 3). Thus, the potential is determined by innovation and its presentation. The study suggested approaches to the definition of membership functions of the object to the list of criteria, based on the sufficiency of which is the process of identification and relation to an existing class.

To implement procedures for assessing SPAs developed organizational and technical solutions is to create a working group of experts in the area of responsibility, which will include the following main features:

1) Monitoring of the department of planning and development of new products.
   - analysis of the innovation and competitiveness of new and current products;
   - analysis of innovation and competitiveness and import of products purchased;
   - monitoring of innovative products in the target market of the enterprise;
   - analysis of the prospects of innovative enterprise projects.

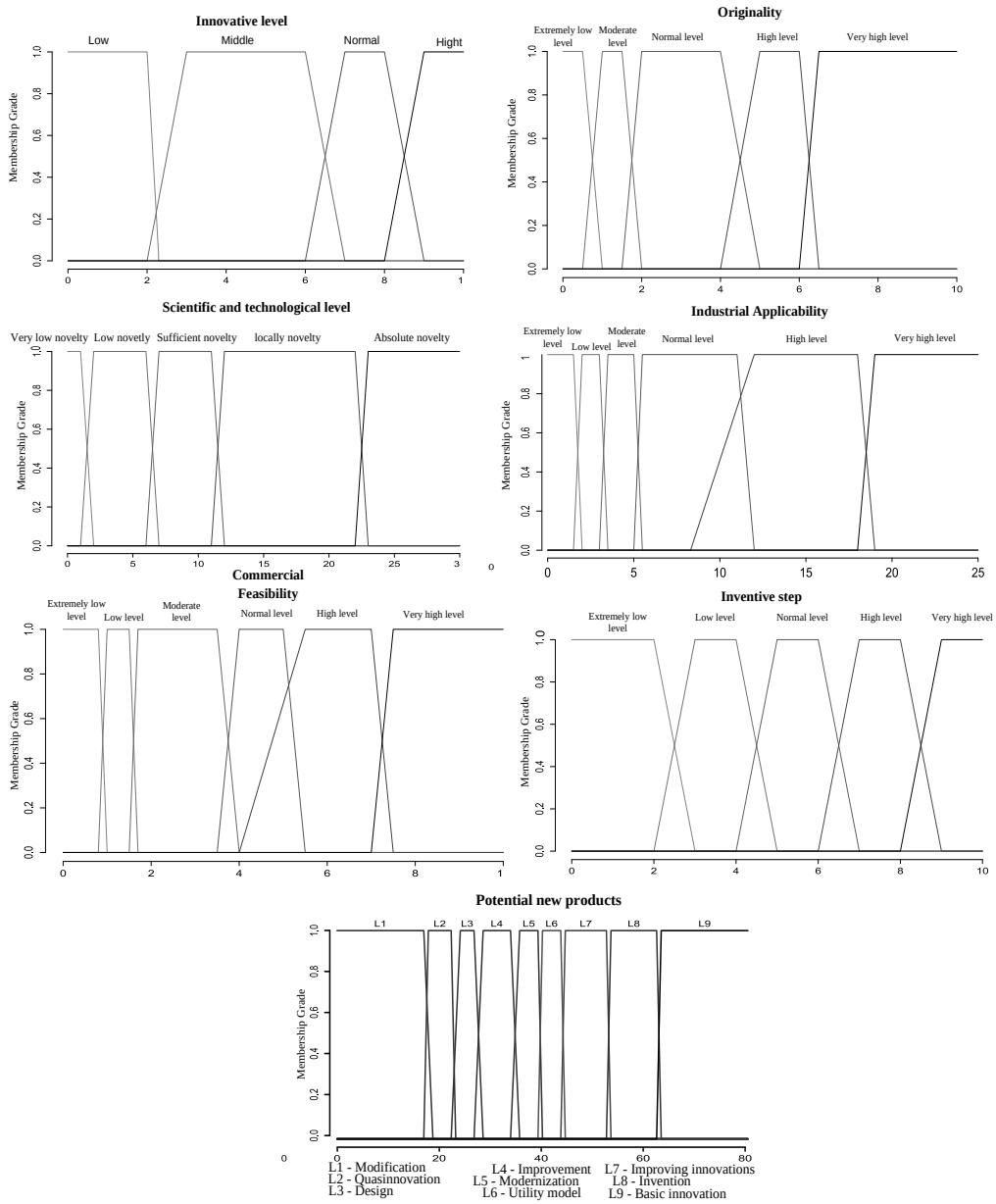


Figure 3. The graphs of membership functions for forms of innovation The graphs of membership functions for forms of innovation

2) Monitoring of the intellectual potential of personnel identification intellectual potential staff;
   - analysis and evaluation of business personnel;
   - analysis and evaluation of publication activity staff;
   - structuring and storage of the intellectual capital of the organization;

- the development and formation of the regulatory framework of technological and design solutions, knowledge of individual employees.

3) Data collection processes for certification of personnel;
   - conduct the survey personnel;
   - analysis and processing of the survey results;
   - report generation.
4) Working with the methodological reference documentation.
   - registration cards technological level of production;
   - form filling classification of innovation;
   - form filling assessment protocol development;
   - develop or supplement questionnaires;
   - development of TA to automated software tools to evaluate the potential of innovation.

The main functions of the working group supplemented with a documented procedure that establishes the procedure for the preparation of process management to assess the potential of innovation.

Create a group of experts to assess the potential of innovation involves a change in the organizational structure of the enterprise.

In the working group includes the processes of assessment of the capacity of innovation, as a result of the SPA structural units engaged in the development and preparation for the production of new products.

Also, the working group has the right to assess the intellectual capacity of the staff of the structural units of an enterprise engaged in planning, accounting, control, analysis, management, and responsible for carrying out the work on the launch of new products, the formation of the production plan and its implementation with a view to ensuring the specified requirements quality.

It is advisable to integrate the new unit into the structure of the company's quality of service.

The rationale for this decision is an appeal to the standards of the series ISO: 9000, regulating the functioning of the quality management system model, namely Section 8 Monitoring, analysis, improvement, section 9 improvement, innovation training.

Processes and basic functions of a new structural units correspond to a functional model of the QMS, in which flows the company's quality of service operations. Therefore, it is advisable to include in the service quality division, department assessing the prospects of production.

The structure of service quality are approved by the General Director of the company in accordance with the typical structure of the administrative staff and coordination with the Deputy General Director for Quality.

To carry out the results of the monitoring capacity of the SPA, the technique of integrated monitoring of innovative products which includes the following steps:

1) Collection of data about the object of research;
2) Conduct an interview with the author, or the development of the object:
   - the date of the physical implementation of the project or the first prototype;
   - main place of work;
   - place of work on the project.
3) Carrying out the survey using questionnaires author to sign the novelty of research:
   - filling questionnaires scientific novelty of research;
   - formation of research reports, design decisions about the future conduct of the study.
4) Conduct a survey on the sign of the competitiveness of research:
   - filling questionnaires competitiveness analysis of innovation;

- formation of research reports, design decisions about the future conduct of the study.

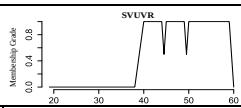
5) Analysis of the results of the survey, the result of calculations is related to the scale of evaluation of the SPA.
6) Classification of the SPA:
   - registration of the name of the object;
   - formation scenarios for the development of the object;
   - correlation object to a class based on the results of the survey;
   - formation scenarios for the development of the object.

As an example, an analysis of the evaluation result of the project "Light-vegetation system for growing plants" (Table 3). Defined all numeric values that characterize the properties of the products, based on the calculation of the integral criterion classified form of products and provide recommendations.

Table 3. Evaluation of the project "Technology of year-round production in the cultivation of high-quality environmentally friendly plants plant products"

Name of evaluation criteria	Value	Level
Inventive step	10,00	Sufficient
Scientific and technological level	19,79	Sufficient novelty
Innovative level	7,40	Normal level
Industry. Applicability	8,79	Normal level
Tech. The level of innovation	0,98	Moderate level
Tech. Enterprise level	7,8	High level
Originality	6,10	High
Tradability	4	Normal level

CLASSIFICATION LIST

Name	I_E	View the actual	Type base	SVUVR
SVUVR	56,6	ID	ID	
	49,9 < I_E < 60,0		Improving innovations	
I_E =56,6 (1,53), (0,7;62), $A_{improving\ innovations}$				

RECOMMENDATIONS

Scientific and technological level	Attract young professionals to increase the number of publications
Innovative level	Using a combination of technical solutions in the individual nodes
Tradability	Implement a regular system of marketing, private lobbying

$$\sum_{i=1}^{6} I_i = 56{,}6 \in \text{Improving innovations}$$

The result of the analysis is to evaluate the innovation I_E = 56,62, indicating membership of a technical solution in the form of improving innovations with the possibility of patent protection to the level of a utility model.

3. Conclusions

Justified and developed an integral criterion for evaluating potential innovations based on generalized additive quantify the criteria based on which a decision on further use of innovations at various stages of the life cycle of new products and adjusting the internal characteristics by applying the method of scenarios. Proposed and developed a multi-stage life cycle model of the dynamics of the state of innovation with regard to the criteria for monitoring and classifying innovations to improve the quality of new products and competitiveness of the development and planning

To calculate the integral criterion for evaluating potential innovations proposed methodology for assessing the innovative and inventive, scientific and technical novelty, originality, commercial feasibility and industrial applicability. Proposed new organizational and technical solutions in the field of personnel training of personnel, equipment and methodological materials on the subject of evaluation, the project company standard procedures to assess the potential of innovations, formed the base of technical standards for equipment methodical evaluation of processes and consulting authors and research groups on improving quality of new products. The developed techniques and procedures for evaluating innovative products developed based on the classification criteria and their qualitative scale, the order of evaluation is set in the flow diagram of the evaluation process innovations in selecting an appropriate scenario of internal performance integral criterion.

An evaluation of the potential for innovation of various products companies allowed to get comprehensive information about the scientific and technological novelty, innovation, industrial application, patentability, originality and commercial feasibility of production. Using techniques to minimize the analysis and substantiation of perspective innovations, to obtain quantitative estimates of production capacity, measured indices of publication and business staff of the structural unit, monitor the technical level and state of the art, both businesses and products in general.

The proposed approach is appropriate for monitoring, analysis and evaluation of existing or planned to produce innovations that will reduce the time to make a decision on the pre-production to the production of new products, as well as in the analysis of the prospects of the results of intellectual activity of groups of authors, inventors, innovators and innovators, embodied in the finished product - innovation.

Developed an integrated evaluation criterion of scientific and industrial activity, based on a comprehensive analysis of the potential methods of innovation, using the numerical value of the integral criterion, established group of scientific and production activities and determine the form of new products. The magnitude of potential innovations allows to develop recommendations for improving the inherent characteristics of new products in the planning of serial production.

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