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Formation of an innovative concept of management on the basis of reconstruction of genetic algorithm of management technology

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ABSTRACT

Is proposed a new concept of enterprise management, which is based on the theory of innovation dynamics. The theory of innovation dynamics for the study of enterprises determines that there are always cyclical fluctuations of equilibrium also allows you to determine the genetic features and the ability to follow the options for enterprise development. The authors think that it is possible to regulate vectors of strategic development of the enterprise and to bring it closer to a state of dynamic development by means of the use of adaptive complex of innovative technologies of enterprise management. To form an adaptive innovation technologies complex for the enterprise, the authors propose to determine the genotype of management technology, with pointed out of the gene X - innovation and to form the genome of technology based on the R-dependent components. The reconstruction of genetic algorithm of technology management the authors propose to carry out using quantitative and qualitative indicators of financial, economic, investment and innovative range of the company activity. The analysis of the effectiveness of the formation and transformation of the genetic algorithm took place on the basis of the research of PJSC "Bashtanskiy Cheese Plant" from the period of 2008-2017. According to the results of modeling, was formed a matrix of values for modeling the gene "Innovation", based on the reconstruction of genetic algorithm of technology management.

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1. Introduction

Rapid variability of the external environment requires to study the company as an open dynamic system, for the development of which there is a need to combine the technology of management by the enterprise of a strategic nature with technologies of tactical direction to ensure the effective operation of the enterprise. In order to trace the prerequisites, first of all, it is necessary to form a canvas of conceptual approaches of transformational changes of enterprise management technologies, to those that will help to regulate activity, and in some cases, to manage the development of the whole economic system.

Modern conditions of functioning of enterprises require to abandon the use of chaotic and intuitive approaches to research. Conceptual approach to the formation of innovative management technologies must be balanced combination of iterative, heuristic, cognitive and other approaches, it is theirs synthesis taking into account the variety of problems solved by the enterprise under the conditions of the business environment.

In this article is made an attempt to determine how management technologies transform into innovative and, through the stages of management-technological level of maturity, encourage the transition to a higher level of development or to another level of management and technological maturity. There was also a task to find out how on the base of the genotype of innovation is made a phenotype of management technology, which enables to establish an adaptive, universal system of management by the dynamic development of the enterprise. Is be made an attempt to create an innovation as an adjustable attractor of the transition from the pool of choice attractors, after the company inevitably passes the cycles of innovative dynamics and gets into the field of bifurcation. The outlined problems need to be systematized into a single concept of selection and transformation of management technologies to ensure the dynamic development of the enterprise.

2. Literature Review

The fundamentals of the theory of innovation and its modern concepts are based on research on business cycles, technological practices, and innovation processes at macro and micro levels. Studies of the cyclical dynamics of the development of society were carried out by such scientists as: Kondratiev [14], [1] E. Akca [1], Babenko [2], Goncharenko [10], Korchevskaya [15], Martynyuk [17], Myasnikov [18], Sapa [19]. Their researches in the overwhelming majority are devoted to issues of synergetic, entropy influences on economic processes, the formation of concepts of enterprise management and macroeconomic systems from the standpoint of chaos theories, systems theory, and theories of system dynamics, which will not be considered within the framework of a particular study. Their research has allowed us to start the foundation of a new theory - the innovative dynamics for enterprise management. Its main hypotheses, paradigms and laws.

A new direction in the development of innovation dynamics in the context of genetic cyclic theories became possible through researches of scientific achievements of such prominent scientists as: Boldov [4], Bushuyev [5], Martynyuk [16], Sadi Fadda [20] and many others. Which formed a new vision of the laws of the development of the uneven universe, the theory of systems development, the theory of genetic-cyclic development of social, economic and social phenomena from analytical-structural statics to cyclical dynamics and the formation of the basis of the genetic structure of economic and social processes outside and inside the system.

Investigations of applied aspects of creation of innovative managerial technologies are in the works of well-known Western scientists Kerzner [13], B. Durakovic [8] and Ukrainian scholars Demchenko [6], Gutsalyuk [11], Didyk [7], Verba [21] and others. Their researches allowed to develop theoretical and applied aspects of the formation of management technology, the classification of enterprise technologies, and to determine the relationships between the effectiveness of enterprise development and technologies used by the enterprise. And also to determine how management technologies affect the managerial and technological maturity of the enterprise and allowed to form a system for determining the level of managerial and technological maturity and a system of indicators for determining the genotype of technology. Undoubtedly, the theory of a new concept of management includes and combines the elements of theories, paradigms, hypotheses, and researches of the above-mentioned authors.

The purpose - is the formation of a new innovative approach to the enterprise management through the definition of the genotype of the technology management and the use of genetic algorithms for its reconstruction and adaptation under the conditions of each enterprise, for the most effective management of the enterprise.

3. Materials and Methods

A new stage in the evolution of economic science requires the emergence of a new idea, concept and theory that would generalize the patterns and unevenness of the cyclical dynamics of enterprise development, genetic imitation of signs, formation of the genotype and phenotype of the enterprise and the introduction of transformational mechanisms with the help of which it is possible to regulate such development.

The process of enterprise activity - is a continuous process of flowing from one state to another, in which transforms the structure of the company's life cycle, the openness and complementarity of the system of external and internal environment, and the peculiarities of the formation of business processes. Intentional nature of the enterprise is expressed in the immanent situational movement of the enterprise, so there is a need to form a new modern concept of the enterprise development.

The authors propose a transformational model of a complex of management technologies, where the main component is the management technology, and the reconstruction of its genetic algorithm till the state of innovation. The process of transformation the genotype of management technology is realized through passing successive stages, detailing of individual procedures and creating the necessary business processes, from the point of view of system technique; definition of the genotype of management technology, the isolation of the gene X - innovation, and formation of a mechanism of transforming of the genetic algorithm to optimal for the enterprise.

Undoubtedly, each enterprise is a unique system, it contains a certain list of parameters, individual characteristics and, despite the defined standard indicators, has unique, individual indicators that determine its phenotype and ontogeny. Frame model of the phenotype has a nucleus containing the genotype of a certain technology, so the process of controlled ontogenesis should take into account two key parameters: the level of professional-cognitive competence, the level of information and communication potential.

To calculate the indicator of the transformation of management technology into an innovative one all indicators should be lead to one type of aggregate [5], [8], [11] end other. In the article is formed the genotype of innovative management technology, which contains a certain set of genes – elements. The model consists of a DNA code, which is built on the bases of genome, gene X and structural genes. Gene is the unit of hereditary material responsible for forming of a certain elemental feature. The gen X is the unit that creates the uniqueness of the genome. Structural genes carry information about the structure of certain signs of heredity, they interact in the field of the gene X in the DNA MT code. Regulatory genes carry out the regulation actions of structural genes: inhibition, stimulation, increasing of activity, etc. Genes operators code the synthesis of other genes and determine the sequence of actions for structural genes. The genome of a certain management technology is built on the basis of R-dependent components. The proposed conversion map for the formation of a complex of innovative management technologies on the base of the genotype of innovative technologies defines a single space in which strategic vectors under the influence of vibrations create a controlled pool for attractor, which tends to form a new system with new economic characteristics, that is, regulation is carried out at the nanoscale (Figure 1).

The model of transformation of the technology management genotype to the state of the innovation management technology is formed from the R_1-R_9 interdependent components. R_1 – a concept of management technology; R_2 - approaches (define the basic approaches to the formation of management technologies); R_3 - the stage of the enterprise's life cycle; R_4 - concept of the use of management technology; R_5 - Models (determine the current level of management and technological maturity (LMTM) of the enterprise); R_6 - Methods (determined by a set of methods and management tools); R_7 - Processes (presence and character of business processes); R_8 - Organization (type of organization); R_9 -Effect / Context; RX- Uniqueness Gene - Innovation.

The model of the formation of a complex of innovative management technologies contains a set of technologies from the base group of primary technologies identified by the instrumental identification: corporate management technologies, production management technologies, SSDM technologies (systems of support and decision making); information technology.

A compulsory component of ensuring the dynamic development of the enterprise is undoubtedly the activation of the innovative component in the company's activity, which is provided through the use of a complex of innovative technologies. In this case, there is always a manifestation of synergistic, emergent effects, which can have both amplifying and weakening effects. It should be noted that the intellectual component itself influences the quality of the generation of new procedures, technologies, control systems, the creation of technical software, the formation of innovative organizational support, the modernization of the organizational structure, the quantitative and qualitative increase of patents, trademarks, the improvement of the organization's culture and relations with customers.

Let’s define the analytical dimension of the innovative management technology for which the gene was proposed. To form a system for evaluating the efficiency of a complex of technologies of food industry enterprises, depending on the level of managerial and technological maturity, it is necessary to develop a system of assessment the genotype of the innovation technology itself. The assessment of IMT is carried out with the aim of analyzing the effectiveness of using, managing, controlling, locating and eliminating of week places for getting the desired results as of separate business directions as the enterprise activity in a whole.

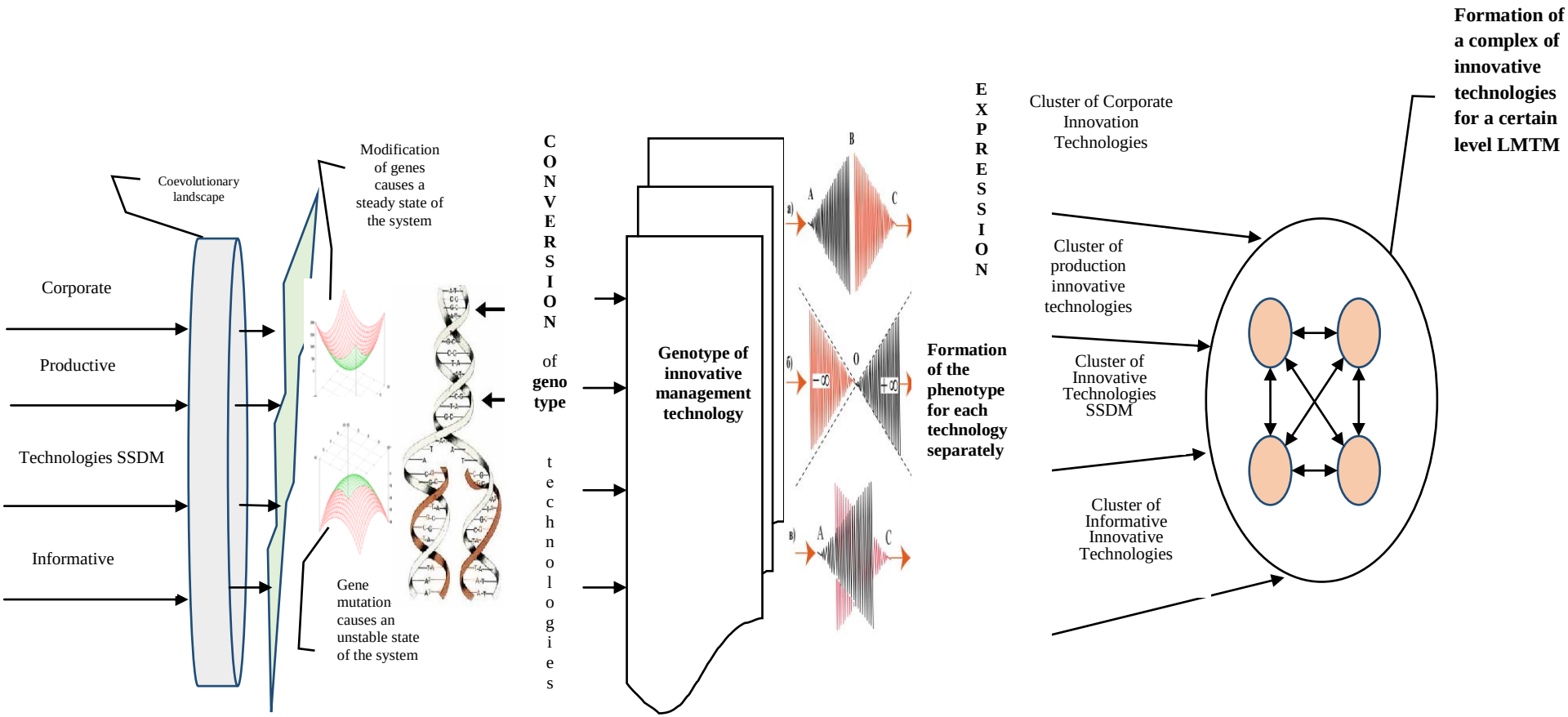

Figure. 1. Concept of introduction of innovative technologies of enterprise management on the basis of the theory of innovation dynamics (developed by the authors on the basis of [4], [10], [16], [18], [19].

That is why it is proposed to use a single complex indicator, which in quantitative measure will characterize the level of the development of IMT functioning and its components, which have quantitative and qualitative indicators of measurement.

As it was already noted earlier, the most optimal is forming of a synthesized indicator, taking into account weight coefficients, which integrates all elements with the help of the sum (weighted factors are chosen with the involvement of experts and reflect the importance of each partial indicator and its contribution into the integral indicator), but while applying this approach, were aroused some difficulties in determining of weight coefficients in one system between quantitative and qualitative indicators, and the use of fuzzy logic model has allowed to remove obstacles.

The use of fuzzy logic model for solving problems of a given class allows to maximally approximate the mathematical model of quality evaluation to the logic thinking of qualified specialists who make managerial decisions. The proposed method of the integral estimation of IMT genotype is based on the theory of fuzzy sets and has the stages.

Stage 1. Determination of indicators of impact upon the IMT and formation of a network scheme for analyzing the IMT genotype. For a comprehensive evaluation of the IMT genotype, was developed an integral index, which synthesizes partial indicators that characterize the IMT structure, that is, all its elements. The developed model of complex evaluation on the base of the use of logic rules is used for the analysis of expert information. For modeling the multidimensional "input-output" dependencies, was taken a hierarchical system of fuzzy sets. In the system, the output of one knowledge base is submitted to the input of another one, of higher hierarchy level. The use of hierarchical fuzzy knowledge bases allows you to overcome the "discrepancy of dimension." Another advantage of the hierarchical knowledge base is compactness. With the help of small number of fuzzy rules in the hierarchical knowledge bases you can adequately describe the multidimensional "input-output" dependences [6].

The interconnection between the indicators that determine the IMT level of the enterprise is presented as a hierarchical network schema of the genotype of the innovation management technology (Figure 2).

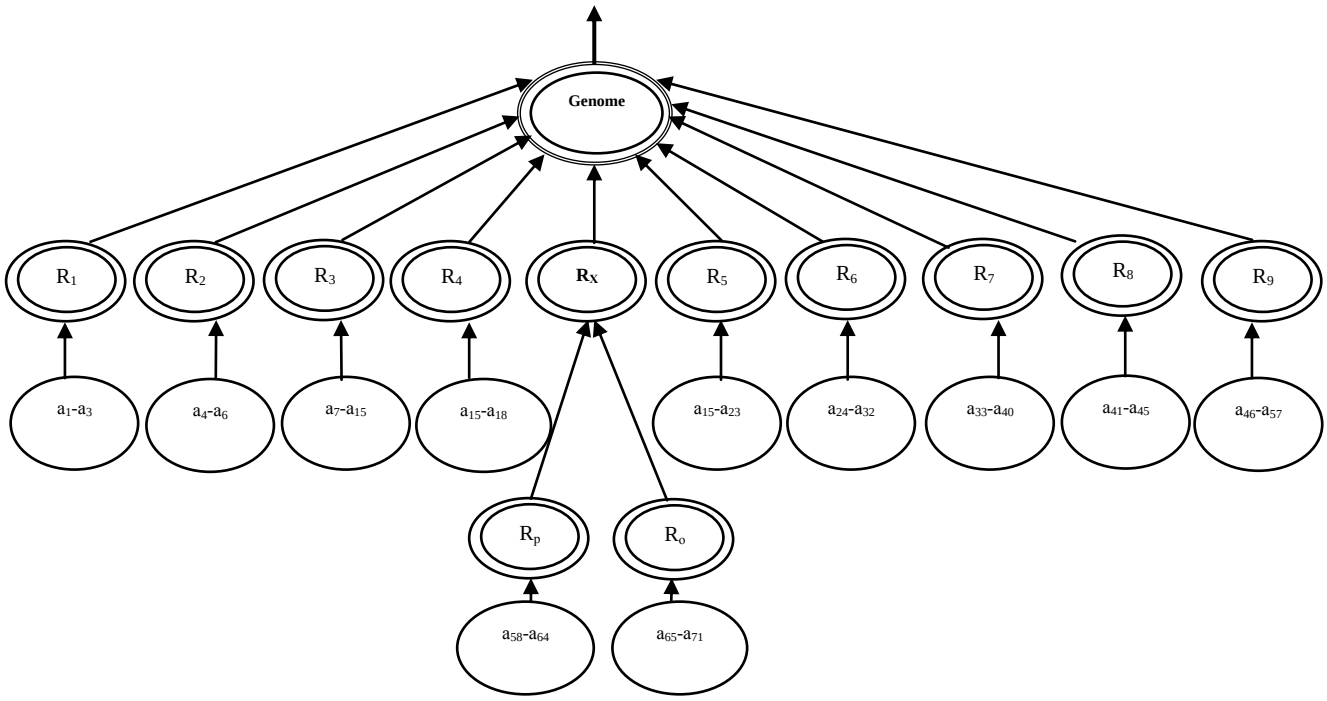

Figure. 2. Hierarchical network scheme of the analysis of the genome of innovative management technology (developed by the author)

To build the analysis model, was used the theory of graphs and was built the graph of the hierarchical system (network) of indicators. The highlighted top in the genotype network, which has no initial superlatives, is the kernel - genome and the integral index (IMT). The connection between the elements has the type "one to many". With the help of the graph theory, the structure of the genotype of the IMT is described. Terminal superlatives are separate elements that form the structural genes of the complex IMT (a_1 ... a_n). Non-terminal superlatives (double circles) reflect the structural genes of CIMT. The rolls were made with the help of a logical convolution according to the fuzzy knowledge bases (Demchenko [6], (Bushuyev [5], Gutsalyuk [11], Kerzner, [13], Babenko, et al, [3].

R_1 - is a concept of management technology, defines the functional characteristics and the essence of the technology according to the instrumental and procedural feature, reveals the basic essence of the technology and the necessary methods and tools of management.

$$R_1 = f(a_1; a_2; a_3) \quad (1)$$

where: a_1 – the basic essence of technology; a_2 – specific functionality; a_3 – necessary knowledge base.

R_2 – approaches that define the basic approaches for the formation and application of management technologies

$$R_2 = f(a_4; a_5; a_6) \quad (2)$$

where a_4 – the level of definition of the main values of the enterprise, mission and strategic goals;

where a_5 – the level of formation of a collective idea of the mission and strategic goals of the organization, the common goal, values, attitudes and beliefs of the Head of the enterprise;

a_6 – the level of formation of a collective idea of the mission and strategic goals of the organization, the common goal, values, attitudes and beliefs of the employees of the enterprise.

R_3 – life cycles. The methodology allows taking into account the whole set of stages in the life cycle which are passed by each technology.

$$R_3 = f(a_7; a_8; a_9; a_{10}; a_{11}; a_{12}; a_{13}; a_{14}; a_{15}) \quad (3)$$

a_7 – birth; a_8 – becoming, a_9 – growth; a_{10} – early maturity; a_{11} – maturity; a_{12} – the highest state of heyday; a_{13} – aging; a_{14} – restructuring; a_{15} – stopping of functioning.

R_4 – The concept of using of management technology is based on the defined concepts and approaches of management technology implementation.

$$R_4 = f(a_{16}; a_{17}; a_{18}) \quad (4)$$

where: a_{16} – an indicator that reflects the presence of a developed mission at the enterprise;

a_{17} – an indicator that reflects the presence of strategic goals at the enterprise;

a_{18} – an indicator that reflects the presence of common values, attitudes and beliefs.

R_5 – Models determine the current level of management and technological maturity (LMTM) of the enterprise

$$R_5 = f(a_{19}; a_{20}; a_{21} a_{22}; a_{23}) \quad (5)$$

a_{19} – initial; a_{20} – cyclic; a_{21} – process; a_{22} – progressive; a_{23} – dynamic.

R_6 – Methods are determined by a set of methods and tools that are used for a particular type of management technology

$$R_6 = f(a_{24}; a_{25}; a_{26}; a_{27}; a_{28}; a_{29}; a_{30}; a_{31}; a_{32}) \quad (6)$$

where a_{24} – the level of application in the development of the tasks of management of scientific management approaches;

a_{25} – the level of providing of a person who decides with high-quality information that characterizes the parameters of the "internal environment" and "external environment";

a_{26} – the degree of functioning of the system of responsibility and the motivation of making an effective decision; a_{27} – the degree of communications management in the process of innovation activity;

a_{28} – degree of achievement by the governing body of the planned results;

a_{29} – transparency of the mechanism of the solution implementation;

a_{30} – the degree of use by the head of individual indicators, databases, forms of enterprise documents;

a_{31} – the level of communication efficiency; a_{32} – the level of employee motivation.

R_7 – The processes determine the level and development of process planning and implementation of business process approaches in the enterprise:

$$R_7 = f(a_{33}; a_{34}; a_{35}; a_{36}; a_{37}; a_{38}; a_{39}; a_{40}) \quad (7)$$

a_{33} – the level of development of innovation policy;

a_{34} – the level of providing with qualitative information that characterizes the parameters of the "internal environment" and "external environment"; a_{35} – the degree of use of separate indicators of databases, forms of enterprise documents;

a_{36} – the level of formation of the field of innovation activity;

a_{37} – the level of development of the system of means, which determine the order and rules of actions to achieve the result of activity;

a_{38} – the degree of providing with information about the external environment of the enterprise;

a_{39} – the degree of providing with information about the internal environment of the enterprise;

a_{40} – the specific weight of investments for informatization in the total volume of investments.

R_8 –The organization allows revealing the dependence of the results of the implemented technologies on the quality of the designed organizational structure of the enterprise:

$$R_8 = f(a_{41}; a_{42}; a_{43}; a_{44}; a_{45}; a_{46}) \quad (8)$$

where a_{41} – the level of adaptability of the enterprise to changing conditions;
a_{42} – the level of flexibility of a strategy and tactics in the decision making process and the establishment of interconnections inside and outside;
a_{43} – the level of efficiency of the acceptance and implementation of decisions in the process of enterprise activity; a_{44} – the level of reliability, characterized by the absence of administrative, legal and technological violations; a_{45} – level of balance and coordination of management.
R_9 – Effect / Context determine the possible effectiveness of use of innovative technology or a set of technologies in the enterprise:

$$R_9 = f(a_{47}; a_{48}; a_{49}; a_{50}; a_{51}; a_{52}; a_{53}; a_{54}; a_{55}; a_{56}; a_{57}) \quad (9)$$

where: a_{46} – net profitability of sales; a_{47} – net return of assets;
a_{48} – profitability of equity capital; a_{49} – total liquidity ratio; a_{50} – Financial stability ratio; a_{51} – coefficient of financial autonomy; a_{52} – indicator of business activity; a_{53} – coefficient of financial leverage; a_{54} – coefficient of financial risk; a_{55} – stock return; a_{56} – capital stock;
a_{57} – the level of technical and technological support.
RX– Chromosome Gene – Innovation includes a gene-operator LPCC – level of professional-cognitive competence and the gene regulator LICP – the level of information and communication potential of the enterprise.

$$RX = f(R_0; R_p) \quad (10)$$

Ro – Gene-operator (LPCC) encodes the synthesis of structural genes and provides a scalar to the innovative movement of technology management, and through it and of the entire enterprise. It is determined by the functional dependence of the components Ro:

$$R_o = f(a_{58}; a_{59}; a_{60}; a_{61}; a_{62}; a_{63}; a_{64}) \quad (11)$$

Where: a_{58} – educational level of the employee;
a_{59} – coefficient of employee experience at the enterprise;
a_{60} – indicator of a staff qualification upgrading;
a_{61} – the level of the staff creative thinking;
a_{62} – coefficient of innovation quality management;
a_{63} – the level of encouragment of the employee for learning;
a_{64} – coefficient of microclimate quality of the enterprise.
Rp – Gene regulator (LICP) regulates the action of structural genes and creates a platform for the formation of the innovation genus. Structurally, Rp is composed:

$$R_p = f(a_{65}; a_{66}; a_{67}; a_{68}; a_{69}; a_{70}; a_{71}) \quad (12)$$

where: a_{65} – the degree of involvement of the staff into electronic interaction;
a_{66} – traffic of information flows and content; a_{67} – standard number of staff to perform the tasks;
a_{68} – the degree of relevant quality of information; a_{69} – availability of special information products and applications; a_{70} – the degree of informatization of managerial procedures;
a_{71} – the level of description of business processes of the enterprise.
So, the system for determining the effectiveness of the genotype of the innovation management technology for modeling and reconstructing the genetic algorithm of the enterprise is formed with n-inputs and one output. Criteria for the level of IMT [0, 100], the higher the level of efficiency of IMT in the enterprise, it is close to 100, the closer the enterprise to a new level of managerial and technological maturity.
The choice of the main factors that influence the genotype of the innovative technology of enterprise management in the model was based on a pre-made logical analysis. However, the proposed set of indicators can be formed individually, depending on the specifics of the enterprise.

Stage 2. Description of linguistic variables.
Formally, a linguistic variable is described by a certain tuple of features (13):

$$\langle x; T; U; G; M \rangle \quad (13)$$

where x – the name of variable;
T – term set, each element of which is given by a fuzzy set on a universal plural U;
G – syntactic rules (often in the form of grammar) that give rise to the term names;

M –semantic rules that specify the functions of fuzzy terms membership, generated by syntactic rules with G. For incoming quantitative variables, as a universal set of U terms, you can accept the full possible range of meanings of the corresponding parameter (from minimum to maximum).
For qualitative parameters, a certain artificial scale (points) was adopted. (14).

$$U = (u; \bar{u}) \tag{14}$$

Where: u (ū) – minimum and maximum value of the indicator.

According to the results of the analysis, Table 1 was prepared, where is presented a fragment of the linguistic variables of the model of the efficiency of the complex assessment of IMT for the main indicator "Gene of Innovation", the table is developed and grounded on the basis of expert evaluation, requirements and provisions of the enterprise and current industry standards.

Table 1: A fragment of possible values of the linguistic variables of the fuzzy model of integrated assessment of IMT on the example of the gene "Innovations"

Parameter	The name of the linguistic variable (x)	Universal set (U)
Ro LPCC **- level of professional cognitive competence**		
a_{58}	educational level of employees	0-30% have special education 30-60% have special education 60-90% have special education
a_{59}	coefficient of employee experience at the enterprise	0-30% experience of 20 years 30-60% experience of 20 years 60-90% experience of 20 years
a_{60}	indicator of staff qualification upgrading	0-30% every 5 years 30-60% every 5 years 60-90% every 5 years
a_{61}	level of creativity thinking staff	0-30% low 30-60% medium 60-90% high
a_{62}	coefficient of innovation quality management;	0-30% low 30-60% medium 60-90% high
a_{63}	level of employee incentive to study;	0-30% low 30-60% medium 60-90% high
a_{64}	coefficient of microclimate quality of the enterprise	0-30% tense, 30-60% medium, 60-90% friendly
Rp LICP **– level of information and communication potential**		
a_{65}	the degree of engagement of staff into electronic interaction;	0-30% low 30-60% medium 60-90% high
a_{66}	traffic of information flows and content;	0-30% low 30-60% medium 60-90% high
a_{67}	standard number of staff to perform the tasks	0-30% low 30-60% medium 60-90% high
a_{68}	the degree of relevancy and quality of information	0-30% low 30-60% medium 60-90% high
a_{69}	availability of special information products and programs	0-30% low 30-60% medium 60-90% high
a_{70}	degree of information about management procedures	0-30% low 30-60% medium 60-90% high
a_{71}	level of description of business processes of the enterprise	0-30% low 30-60% medium 60-90% high

(developed by the author)

Output variable - IMT will get the value: Low, Low Medium, Medium, High Medium, and High on the universal plural (0-100 points). This allows us to examine in detail and analyze the effects of factors with a greater or lesser degree of influence.

Stage 3. Definition of the functions of the membership of linguistic terms.

Elements of the linguistic variable of a universal set are given in the interval [0; 1], they represent (reflect) the level of independence of each element in the volume of the whole plural to the fuzzy term. In some cases, were used the typical forms of membership functions (in parametric form), then the task of building was reduced to the determination of its parameters [5]. The most widespread were the triangular, trapezoid, Gaussian, and sigmoidal functions of membership. In this paper were used simple and obvious functions of membership in the considered fragment for qualitative variables were used triangular functions which reflected the data in the best form. The triangular function of membership in the general case is given analytically by the following expression (15):

$$\mu(x)=\begin{cases} 0, x \le a \\ 0, x \le a \\ \dfrac{x-a}{b-a}, a \le x \le b \\ \dfrac{c-x}{c-b}, b \le x \le c \\ 0, c \le x \end{cases} \quad (15)$$

where: a, b, c – some number parameters that accept free valid values and are ordered by the ratio: a≤b≤c;
(a, c) – carriers of fuzzy plural – pessimistic estimate of the fuzzy number;
b –coordinate of maximum - an optimistic estimate of the fuzzy number.

The typical structure of a fuzzy output system contains such modules: a phasicator that converts a fixed vector of factors influencing (X) into a vector of fuzzy sets X necessary for fuzzy output; fuzzy knowledge base, which contains information about the dependence of Y = f (X) in the form of linguistic rules: <If-then>; features of belonging that are used to represent the linguistic terms in the form of fuzzy sets; a fuzzy logic output machine that, which is on the knowledge base, determines the value of the output variable in the form of a fuzzy set (Y), which corresponds to a fuzzy value of the input variables (X); a dephaseizer, which converts the initial fuzzy set (Y) into a defined set (Y). The fuzzy logic base of knowledge is specified by the <If-then> parameters that define the rules and the connection between the inputs and outputs of the object.

Lets write the rules of fuzzy logic. The fuzzy output algorithms differ mainly in the form of the rule of fuzzy implication that is used. If, for example, the knowledge base is organized by two fuzzy rules of the tipe (16) [15]:

$$\begin{aligned} &\Pi_1 : if.x.is.A_1.and.y.is.B_1, \text{then.z.is.C}_1; \\ &\Pi_2 : if.x.is.A_2.and.y.is.B_2, \text{then.z.is.C}_2; \end{aligned} \quad (16)$$

where x and y – the names of the input variables; z – the name of the output variable;
A_1, A_2, B_1, B_2, C_1, C_2 – some fuzzy sets given by membership functions $\mu_{A1}(x)$, $\mu_{A2}(x)$, $\mu_{B1}(y)$, $\mu_{B2}(y)$, $\mu_{C1}(z)$, $\mu_{C2}(z)$, herewith distinct meaning z0 should be determined on the basis of the information that is provided and the exact values x0, y0. Let's use fuzzy logical output Mamdani, which gives an opportunity to determine transparently the meaning of variables by fuzzy terms and to interpret them better. Results of the fuzzy expression Mamdani are traditionally defused by the method of the center of gravity[4]. The conclusions in the form of the Momdani algorithm mathematically can be in such a way [5], [20]:

1. Finding the degree of truth of fuzziness is determined by the rules: $\mu_{A1}(x0)$, $\mu_{A2}(x0)$, $\mu_{B1}(y0)$, $\mu_{B2}(y0)$.
2. Forming of constraints, fuzzy sets for preconditions is held according to the rules of using of min (formula 16):

$$a_2 = A2(x0) \wedge B2(y0) \mu(x) \quad (17)$$

$$a_1 = A1(x0) \wedge B1(y0) \mu(x) \quad (18)$$

where – ∧ operation of logical minimum (min).
3. Synthetic integration occurs by combining truncated functions using the MAXIMUM operation. (max, with a mark «v»). For getting a final fuzzy subset of the calculation of a meeting of a derivative of a variable with a membership function (19):

$$\mu\sum(z) = \mu C(z) = \mu C'1(z) \vee \mu C'2(z) = (a_1 \wedge \mu C1(z)) \wedge (a_2 \wedge \mu C2(z)) \quad (19)$$

The mathematical expression of the fuzzy Mamdani set will be executed on the basis of knowledge, which is presented in Table 2-3. All meanings of the input and output variables of the base are given by fuzzy sets.

4. Results and Discussion

In result of modeling we've got, that the effectiveness of the "Innovation" process is equal to (50), which is the average level of the value of the indicator (according to the given linguistic terms and functions of belonging). The data analyzed by the specified method indicate that the value of High Medium, High to the gene operator LPCC (the level of professional-cognitive competence) creates a high speed of building of a platform for the introduction of new innovative management technologies and innovative potential of the enterprise on the basis of the renewal of managerial functions significantly accelerates the qualitative and

quantitative indicators of work. Even on the platform of existing management technologies has positive effects in certain strategic directions of development of business directions of the enterprise. It also shows a qualitative change in the complex of corporate technologies and SSDM technologies. Such changes lead to the reductions of cost and optimization of production - due to the innovations in management and minimization of production technology costs - at the expense of economic optimization.

Obtained values Medium, High for gene regulator "The level of information and communication potential" indicates a rapid updating of technological lines, reducing of the technological cycle, modernization of production. Were occurred rapid qualitative shifts in the complexes of production and information technologies.

If the gene operator LICP is getting essential characteristics High Medium and High, then this leads to a rapid change in the state of equilibrium of the enterprise, the rapid change of strategic priorities, the active introduction of corporate management technologies and the improvement of the SSDM, which exist at the enterprise. Is determined periodically, accidental and chronic instability resistance, which leads to a transition from a normal equilibrium to a critical one.

Stage 4. Testing of Models for Adequacy.

Tables 2 and 3 show the combinatorics of the determination of the multispecific nature of the processes of dynamic development for PJSC «Bashtanka Cheese plant" to the LPCC gene operator and the LICP gene regulator. At different phases of LCE, a specific group of triggers is formed and a set of innovative management technologies is created that form the firstly the bifurcation field, and then allow to form the pool of attractors, allocating the necessary channel for the development of the enterprise. Gene tours of multi-causality of LPCC gene indicate that significant changes start to occur in the environment of corporate technologies. Gene tours occur in the cluster of SSDM technologies and, resonating, create a point of bifurcation in the desired channel attractor. High index of the LPCC gene-operator shows that with the introduction of SSDM technologies changes the equilibrium state, but does not change the state of management and technological maturity (LMTM). For the enterprise PJSC «Bashtanka Cheese plant" introduction of SSDM technologies affected with approaching of the third level of managerial and technological maturity[6].

Table 2: Combination of the definition of multicaseality of the processes of reconstruction of the genetic control algorithm for PJSC «Bashtanka Cheese plant" based on the LPCC gene operator

Complex of innovative management technologies	Low	Low Medium	Medium	High Medium	High	Definition of processes of dynamic development
Corporate Technologies	Temperate	Significant	Significant	Significant	Significant	Changing of strategic priorities
Production technologies	Insignificant	Insignificant	Temperate	Temperate	Significant	Technological breakthrough
Technologies SSDM	Temperate	Significant	Significant	Significant	Significant	Change of the cycle of enterprise development
Information Technologies	Insignificant	Insignificant	Temperate	Temperate	Significant	Change of the business model of the enterprise
The state of resistance	Insignificant Fluctuations	Change in the state of equilibrium		Change of the LMTM level		Stability/ Instability
The degree of resistance	Formation of a bifurcation field		Identifying of triggers	Allocation of the attractor and formation of the attractor channel		Equilibrium/ disequilibrium

(developed by the authors)

If a gene regulator LICP (level of information and communication potential) is getting essential characteristics High Medium and High, this leads to change of the level of managerial and technological maturity. So, the company moves to a new level of management and technological maturity, defined by technological breakthrough initiated by a complex of manufacturing technologies or by changes and the introduction of a new business model or business direction, initiated by a complex of information technologies. The enterprise is in the controlled channel by the attractor. Gene tours of multi-casuality of

LICP gene indicate a significant change in production and information technology. For the enterprise PJSC «Bashtanka Cheese plant" this has affected on the introduction of the new business model.

According to the results of forecasting on the basis of optimization, a three-vector management is determined, and the type of management is stabilizative, the value of the integral indicator of the "innovation" gene corresponds to the parity level of development. Thus, under these conditions will be executed all three criteria for increasing the effectiveness of management development.

Ensuring of the dynamic development of the enterprise requires the formation of such a complex of innovative management technologies, which, on the one hand, will be coherent to the current level of management and technological maturity, and on the other, initiates the development of the enterprise according to the desired level of maturity.

Table 3: Combinatorics definition of multi-casual processes of dynamic development for PJSC «Bashtanka Cheese plant" LICP gene regulator

Complex of innovative management technologies	Low	Low Medium	Medium	High Medium	High	Definition of processes of dynamic development
Corporate Technologies	Insignificant	Insignificant	Temperate	Temperate	Significant	Changing of strategic priorities
Production technologies	Temperate	Significant	Significant	Significant	Significant	Technological breakthrough
Technologies SSDM	Insignificant	Temperate	Temperate	Significant	Significant	Change of the cycle of enterprise development
Information Technologies	Temperate	Significant	Significant	Significant	Significant	Change of the business model of the enterprise
The state of resistance	Insignificant Fluctuations	Change in the state of equilibrium	Change of the LMTM level			Stability/ Instability
The degree of resistance	Formation of a bifurcation field	Identifying of triggers	Allocation of the attractor and formation of the attractor channel			Equilibrium/ disequilibrium

(developed by the authors)

The built optimization model with the target setting for maximizing of the integral indicator of the development, with certain constraints, allows predicting the observance of the proportions between the generalizing indicators of development.

5. Conclusions

The process of the enterprise's activity is considered as a continuous process of flowing from one state to another, in which is transformed the structure of the company's life cycle, of the openness and complementarities of the external and internal environment system, and of the peculiarities of business processes formation. The intentional essence of the enterprise is expressed in the immanent situational movement of the enterprise, therefore, there was a need to form a new modern concept of enterprise development.

The process of transformation of the genotype of management technology is realized through the successive stages, the destalinization of separate procedures and the creation of the necessary business processes, from a position of isolation of the X gene of innovation, and the formation of a mechanism for transforming the genetic algorithm to optimal for the enterprise. The genome of a certain management technology is built on the basis of R-dependent components. Model of transformation of the genotype of management technology to the state of innovative management technology, is formed by R_1-R_9 interdependent components.

The proposed conversion map for the formation of a complex of innovative management technologies based on the modeling of the genotype of innovative technologies defines a single space in which strategic vectors under the influence of vibrations create conditions for the formation of a new system with new economic characteristics, that is, the regulation of the enterprise at the nanoscale.

The analysis of the genome of innovative management technology was based on the determination of quantitative and qualitative indicators that were calculated for the enterprise PJSC «Bashtanka Cheese plant" for the period of 2007-2017 [9].

The choice of the main factors influencing the genotype of the innovative technology of enterprise management in the model was based on a pre-made logical analysis. However, the proposed set of indicators can be formed individually, depending on the specifics of the enterprise.

A fragment of possible values of the linguistic variables of the fuzzy model of integrated assessment of innovative management technologies by the example of the "Innovation" gene is presented in the table. Determination of the effectiveness of modeling of fuzzy knowledge base is calculated on the base of the Mamdani algorithm. In result of modeling we've got, that the effectiveness of the "Innovation" process is equal to (50), which is the average level of the value of the indicator (according to the given linguistic terms and functions of belonging).

According to the results of forecasting, on the base of the optimization, a three-vector control was determined, and the type of management was approached to stabilization, the value of the integral indicator of the "innovation" gene corresponds to the parity level of dynamic development. Under such conditions, the effectiveness of management has increased significantly, and the company has approached to the strategic goal - dynamic development.

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