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Methodology Making Management Decisions Based on a Modified Ramsey Model

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Abstract

In order to select a management strategy it is offered by commercial phase portraits of the interaction of managers and employees. Under the conditions of uncertainty of customer orders control function is specified on the basis of decision-making by a modification of the Ramsey model. As specified algorithm generating an output indicator is proposed to use a probabilistic form of the utility function. In order to analyze the possibilities depending on the characteristics of employees of the business process and the nature of external influences used extreme distribution law of random evaluations of the effectiveness of information exchange managers and employees.

Keywords: market characteristics, optimal control, phase portraits, engagement strategy, Ramsey's model, decision-making, the utility function, the possibility of the company's employees, business process, external influences

1. Introduction

Modern intensification technology development is largely determined by the trend of production organization focused on meeting the individual requirements of each customer. However, due to the uncertainty characteristics of incoming orders, a problem of constructing the control algorithm by taking into account the reactions of its employees to random customers' requirements. Supposed to solve this problem by providing the functional reliability of business processes.

In this presentation the functional reliability characteristics of the organization of the company, determine an estimate of the risks of failures in achieving its objective function. Consequently, the analysis of the characteristics of the interaction of managers and employees (hereinafter - just employees) should identify the conditions under which the maximum result of management actions affect the company's business development, helping to achieve the goal. In summary, called the problem is defined as the optimization of a commercial company in terms of possible failures that occur due to internal and external perturbations, in the form of random, time and intensity.

We consider an example of a commercial company, but in a more general form of the proposed methodology can be used for algorithmization impacts both on structural subdivisions of enterprises and on industry or regions. Existing approaches to the management of traditionally based on the recognition of hazards in typical situations (Orlov, 2003; Aaker & Tyebjee, 1978, Dudin et al., 2014).

Criticality assessment in achieving the accepted paradigm determines the choice of management to the best way to generate a given situation in the time allowed. Thus, the optimal control problem is traditionally confined to the choice of algorithm targeted production and changes in the state of the economic system in a previously defined circumstances.

Modern discrepancy rate of development of production and market relations often reveals insufficient information available. At the same time limit the formation of the control response in the presence of random noise causes uncertainty in the economy of business processes. To ensure the functional reliability of the company in an uncertain situation is invited to consider the possibility of solving the inverse problem of optimal control. In this case, the task of constructing methodology of forming parameters of the control functions, depending on the state of the company management system, defining the nature of information interactions between its managers and employees.

Formulation of the problem can be classified as incorrect (Aaker & Tyebjee, 1978), since it involves determining the control function depending on the nature of random influences on the business process at a fixed time.

2. Analysis of Possibilities of Finding Management Decisions under Uncertainty Situation

Currently it is known a number of mechanisms to improve the adequacy and efficiency of management of production - economic systems under uncertainty. We say that three of them, the most useful for our problem. Widely used analytical methods, management formed using a combination of operational decisions made on the basis of the analysis of the combination of indicators of current production situation and the statistical analysis of historical data (Trahtengerts et al., 2007).

Information support for such decisions analyzes production management experience, preceding the current situation, and transfer the results to the projected scenario. Using data mining techniques can detect hidden patterns and predict the behavior of the studied system.

However, the problem of forecasting are costly time, financial and human resources. Moreover, without formalization characteristics emerging situations forecast can be the basis for making inefficient decisions.

Another approach is the analysis of known precedents. In this case, the impact of adapting to the situation on the basis of recognition of states of the control object, and the accuracy of decisions is enhanced by the use of an inference engine (CASE - Based Reasoning) (Tormos & Lova, 2001). This approach reduces the risk of making decisions by constructing functions consequences of their decisions. However, the construction of proactive behavior in uncertain situations associated with labor intensive knowledge base, formalizes a generalized expertise for a particular domain.

The third approach is based on finding solutions using contingency management model (Pospelov, 1996; Yurkevich & Kryukova, 2013) In this case, all the predictable and unpredictable situations are classified in the feature space, complex situations are decomposed on a set of situations with one-step solutions, and selects the optimal solution. Approach links specific ways to manage certain situations to best achieve the goals of the business process (Baker).

In general, the known approaches to building management systems show that their effectiveness largely depends on the nature of their situations and information effects. In this paper, we assume that the optimality of doing business processes provided by specifying a criterion for determining the effectiveness of decisions (Hartmann, 1998). In this case the error feedback depends on the adequacy of the business process model, the rigor of the definition of the objective function, as well as the completeness of the restrictions imposed on its set of admissible states and input actions.

The approach developed in the article, based on a description of the dynamics characteristics of the business process as a system of nonlinear differential equations:

$$\dot{x} = f(x,u), \tag{1}$$

Where: $x = [x_1,\dots x_n]^T$ - n - dimensional state vector of the business process in the time interval T; $x \in R^n$, R^n - Set of possible states of the business process; $u = [u_1,\dots u_m]^T$ - m - dimensional control vector belonging to a closed area $x \in U \subseteq R^m$, R^m - the set of admissible states, $m \leq n$, U - a limited set of controls; $f(x,u)$ - known nonlinear vector function.

The optimality criterion is proposed functional,

$$G_i = g_i(x(t_f)) + \int_{t_0}^{t_f} f_i(x(t),u(t))dt, \quad i = \overline{1,M}, \tag{2}$$

Where: t_f - the duration of the management; M - the number of partitions (steps) management process performed at intervals $(t_0,t_1),(t_1,t_2),\dots,(t_{f-1},t_f)$.

The first term $g_i(x(t_f))$ in equation (2) as the terminal component, which depends only on the state $x(t_f)$ and management efficiency characterizing the final time interval observed.

The second term $\int_{t_0}^{t_f} f_i(x(t),u(t))dt$ is an integral characteristic of quality control in the transition of the business process from state $x(t_0)$ to state $x(t_f)$. In this case, we assume that given the characteristics of the initial state of the business process at each step $x(0)=[x_0^1,\ldots,x_0^M]^T$ to the values and requirements of its characteristics $G_i \subseteq R^m$, ensuring the implementation of the global criterion $G \subseteq R^m$.

Management $u(t)$ will be considered as optimal if the objective functional G_i expression (2) takes extreme value. Thus, we seek the optimal control as a function $u(x,t)$.

In general, the optimal control problem will be considered in the form of construction management $u = u(x)$, called synthesized function and represents the value of the optimal control under the condition that at time t the control system (1) is located $x = x(t)$ at a fixed point in time.

3. Phase Portrait of Informational Interaction of Managers with Employees of the Company

The formation of the boundary of transition from one qualitative state to another is an important (often - determining) factor of affecting the stability in the production - the economic system in uncertain situations. Concept of the managers and employees of the company (in the simplest case - one manager and one employee) will be constructed based on the fact that the information interaction of each of them decides to implement the chosen strategy of behavior or change it in connection with the transition of the business process in new state.

Let the information characteristics of the transmitted by the control system, is determined: the results of business (process), processes, manager and the employee, external conditions.

In this paper, an important characteristic of this interaction is to control the formation of the conditions under which the value of a message sent from the manager to the employee corresponds to the value of the message from the employee to the manager. We assume that the regularity of such conditions depends on the culture of interpersonal communication in the company. We assume that *a culture of communication - a characteristic of the source of information, for it determines the importance of knowledge of the reaction of the receiver to the transmitted message to them* (Yurkevich, 2008).

In terms of this paper the culture of communication is proposed as characteristic of the feedback system, which determines the effectiveness of the company's management.

Based on the proposed regulations define what decision-making requires consideration (Yurkevich, 2011): G - parametric characteristics that define the organization in control of the company;

W - information characteristics that determine the number and value of information transmitted under management conditions;

ρ - coordinate characteristics that define the external environment of the system, help or hinder the perception of information.

For clarity, the system business process management show in block diagram form, the manager and employee interaction (Yurkevich, 2011): "The control unit management" - managers develop a methodology and a system of management of the company as a production - economic system, "Power management technology" - employees develop methods and organization of the manufacturing operations, "Block implementation of business processes" - managers and employees are involved (Fig. 1).

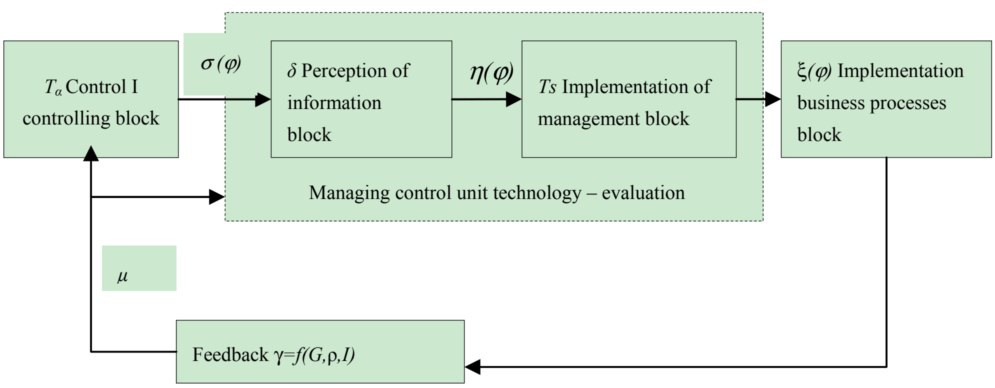

Fig.1 Block diagram of business process management

Where: - φ - culture of communication between managers and employees as an indicator of the effectiveness of business management at the company. In this model, it should is a characteristic of the source, and the rate of changing the φ be noted that culture of relationships that determine the intensity of perception - a characteristic of the receiver.

Information management features (W):

σ*(φ)* - amount of information that is used for manufacturing operations;

η*(φ)* - the amount of information perceived control unit implementation;

ξ*(φ)* - the amount of information that is used as the control action;

Characteristics of the control unit:

Tα - lag in the reaction of the control unit management;

Ts - delay in the reaction block implementation management;

δ - control unit technology assessment values manipulated transferred to this unit;

γ - evaluation control unit control the value of information received from the control unit realization.

In the information schema reliability of its work provides a feedback channel. The signal transmitted by him to the control unit controls, determines the impact on employees parametric specifications manager. So, to get the results expected from the activity manager employee, consider the possibility of minimizing the distortion in the perception of information transmitted over the lines of communication and feedback between the control units and directly control the implementation process technologies.

Note the property business participants to adapt to changes in external conditions. Suppose we have statistics values of parameters characteristic (G), determining the status of some members of the business process. This process is determined by the strategy of his organization in the company in question. Due to the fact that the staff needs and experience of the manager is constantly changing, the system in Figure 1 can be represented as a dynamic.

The peculiarity of the problem is the inability to imagine characteristics implement the business process defined function blocks only using strictly measured quantities. It is therefore proposed to consider the state space of sources and receivers of information in the form of the phase portrait, having a geometrical evidence (Yurkevich, Kolosov 2011). In our model, for each transmission of information involves two elements, therefore, the information model business process organization will be formed in the form of two differential equations. Of the many characteristics distinguish the G: *x* - response of the source, and *y* - characteristic of the data receiver.

Given the nonlinearity of the psychological characteristics of the manager and the employee, their interpersonal relations system will describe the second order differential equation. Let the characteristics of the available statistics by least squares regression found $y = F(x)$. At its base the phase space is proposed as a two-dimensional. Represent it in the form of the phase plane.

$$\dot{x} = P(x, y); \qquad \dot{y} = Q(x, y) \cdot$$

Features included in the set *G,* are interdependent. Therefore, in accordance with the dimension $g_i \in G$, with i = 1,2, ... n in the range of possible variable values requires consideration of a set of analytic functions $y = F_i(x)$ with i = 1,2,3, ... n.

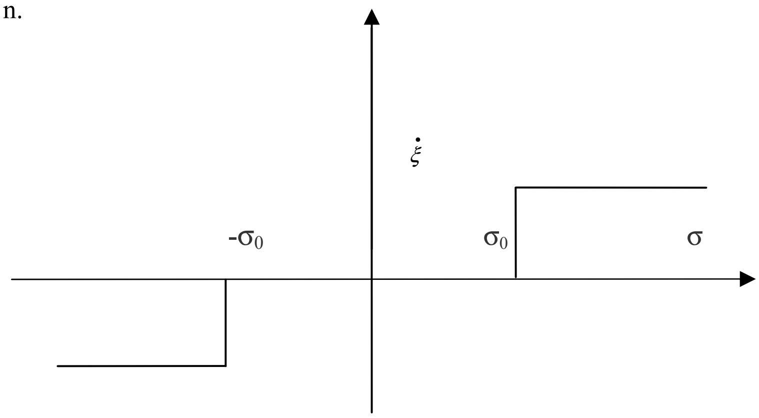

Figure 2. Characteristics of the Implementation of management block

Feature of each of the functional blocks of the system in Figure 1 is the presence of a delay in the reaction zone to messages during (or in preparation) process step (or administrative action). The size of this zone is determined by the level of training of managers and employees. By a theorem of AN Kolmogorov, limit the amount of information transmitted from A to B is equal to the limit of the amount of information transmitted from B to A.

For example, the characterization of the block management implementation represented as Fig. 2.

Zone right axis $\dot{\mu}$ is a reflection on the impact of management personnel, and the area to the left of the axis $\dot{\mu}$ is a reflection of the feedback in the form of exposure to personnel manager.

Until the reaction block implementation of control is within range of tuning ($-\sigma_0 < \sigma < \sigma_0$), perceptual speed information received in preparation for the implementation of control (ξ) is minimal. We assume it is approximately equal to zero.

If the amount of information perceived as an employee of a controllable element $\sigma \geq \sigma_0$, the velocity $\dot{\xi} = \frac{1}{T_s}$, if the employee is considered as a source of information as well as a receiver manager, we can write $\sigma \leq -\sigma_0$, in this case the rate $\dot{\xi} = -\frac{1}{T_s}$.

Mapping implementation of such a system on the phase plane (Fig. 3) can be written:

- control unit control equation:

$$T_\alpha \dot{\varphi} + \rho\varphi = -\xi \tag{3}$$

1. Equation block the perception of information:

$$\dot{x} = f(x, u)$$

2. - equation block implementation of control

$$\dot{\xi} = \begin{Bmatrix} \frac{1}{T_s}; \sigma \geq \sigma_0 \\ -\frac{1}{T_s}; \sigma \leq -\sigma_0 \\ 0, |\sigma| < \sigma_0 \end{Bmatrix} \tag{4}$$

- feedback equation: $\sigma = \eta - \gamma\xi$

Note that a rigorous examination of symmetry of information transmission (Fig. 2) implies the existence of feedback from each of the blocks presented in Figure 1.

$$T_a \ddot{\varphi} + \rho\dot{\varphi} = -\dot{\xi} = \begin{Bmatrix} -\frac{1}{T_s}; \sigma \geq \sigma_0 \\ +\frac{1}{T_s}; \sigma \leq -\sigma_0 \\ 0, |\sigma| < \sigma_0 \end{Bmatrix}$$

However, so as not to obscure the drawing schematically leave one channel, meaning that each of them is described by an equation similar to presented for feedback. Eliminating the variables of equations reaction to the messages we get from equation (3) we have $\sigma = \eta - \gamma\xi = \frac{\varphi}{\delta} - \gamma(T_a\dot{\varphi} + \rho\varphi)$.

Therefore, the condition $\sigma \geq \sigma_0$ can be writte*n in the form $\frac{\varphi}{\delta} - \gamma(T_a\dot{\varphi} + \rho\varphi)$, or

$$\dot{\varphi} \geq \frac{\delta\sigma_0 - \varphi(\delta\gamma\rho + 1)}{\delta\gamma T_a} \tag{5}$$

Similarly, if $\sigma \leq -\sigma_0$ and $-\sigma_0 < \sigma < \sigma_0$, then respectively,

$$\dot{\varphi} \le \frac{-\delta\sigma_0 - \varphi(\delta\gamma p + 1)}{\delta\gamma T_\alpha}. \tag{6}$$

$$\frac{-\delta\sigma_0 - \varphi(\delta\gamma p + 1)}{\delta\gamma T_\alpha} < \dot{\varphi} < \frac{\delta\sigma_0 - \varphi(\delta\gamma p + 1)}{\delta\gamma T_a}. \tag{7}$$

In this equation that determines the mechanism to implement business process takes the form

$$T_a \ddot{\varphi} + \rho\dot{\varphi} = \begin{cases} -\frac{1}{T_s}; \delta\gamma T_a \dot{\varphi} \ge \delta\sigma_0 - \varphi(\delta\gamma p + 1); \\ +\frac{1}{T_s}; \delta\gamma T_a \dot{\varphi} \le -\delta\sigma_0 - \varphi(\delta\gamma p + 1) \\ 0; \left|\varphi(\delta\gamma p + 1) + \dot{\varphi}\delta\gamma T_a\right| < \delta\sigma_0. \end{cases} \tag{8}$$

Labeling $\varphi = x; \dot{x} = y,$ we can go to a differential equation of the integral curves

$$\frac{dy}{dx} = -\frac{\rho}{T_a} - \frac{1}{T_a T_s y}; \delta\gamma T_a y \ge \delta\sigma_0 - x(\delta\gamma p + 1); \tag{9a}$$

$$\frac{dy}{dx} = -\frac{\rho}{T_a} + \frac{1}{T_a T_s y}; \delta\gamma T_a y \ge -\delta\sigma_0 - x(\delta\gamma p + 1); \tag{9b}$$

$$\frac{dy}{dx} = -\frac{\rho}{T_a}; \left|x(\delta\gamma p + 1) + y\delta\gamma T_a\right| < \delta\sigma_0; \tag{9c}$$

Divide the area on the phase plane, each of which has one of the equations of force (9). The lines will be called the partition boundaries change managerial influence when dealing with an employee (information receiver), because at the moment they go through the point

Representing the evaluation communications culture (*φ)* (hereinafter for simplicity, we call it simply the representative point) there is a change of algorithm block management implementation. .
In our discussion with an accuracy sufficient for methodological findings , we assume that the boundaries of regions are direct (Hartmann 1998) defined by (10a) and (10b). In Figure 3 are shown respectively by lines II and II-II.

$$y = -x\frac{\delta\gamma p + 1}{\delta\gamma T_a} + \frac{\sigma_0}{\gamma T_a} \tag{10a}$$

$$y = -x\frac{\delta\gamma p + 1}{\delta\gamma T_a} - \frac{\sigma_0}{\gamma T_a} \tag{10b}$$

Area to the right of the line II filled the integral curves, the position of which is determined by the business strategy (manager impacts on employee) and is described by the differential equation (9a) . In this case, the equation of these curves has the form (11a).

$$x = \frac{T_a}{T_s \rho^2}\ln(1 - T_s\rho y) - \frac{T_a}{\rho}y + G \tag{11a}$$

Area to the left of the line II-II is also filled with a family of integral curves (9b). They are the solution of the equation, which describes the impact on the employee's manager, according to (9b).

$$x = -\frac{T_a}{T_s \rho^2}\ln(1 - T_s\rho y) - \frac{T_a}{\rho}y + G \tag{11b}$$

The area between the lines II and II-II family of lines filled, the equation of which (11c) determined by the characteristics of preparedness manager and employee to conduct the business

Process, ie combination of personality traits of participants with the characteristics of its organization (G) and coordinate characteristics (ρ).

$$y = \frac{\rho}{T_a}x + G \tag{11c}$$

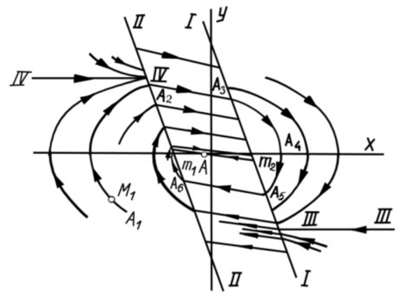

Figure 3. The phase portrait of the system business process management

Consider an example. In Figure 3 showing the point denoted m_1. The left pane is a characteristic of the impact on the employee's manager, then on the basis of their knowledge worker chooses a strategy that goes to the integral curve A_1.

If, in accordance with the characteristics of his professionalism and psychological image point falls on the line A_2A_3 , in which case it can organize their work on the policy defined by the integral curve $A_3A_4A_5$ (acting on the manager). If the characteristics of knowledge and psychological state manager harmonious same employee characteristics (area below the x-axis) , the representative point falls on the line A_5A_6. Consequently, the harmony of the reaction of this manager will determine the output of the phase trajectory at point A on the line m_1m_2. In our model, a direct hit on m_1m_2 performance condition is expected from consideration of the business process.

Analysis of families of the representative point trajectory in the phase plane shows that each of the families of curves (11a) and (11b) comprises a straight line parallel to the abscissa (direct III-III and IV-IV). Representative point, which determines the impact of the manager, the right of the boundary change management actions II and below the line III-III, can not get into the area above the line III-III.

Ie it describes the state of the manager, which is impossible to reach an understanding to work with the staff member. An analogous situation holds for the image point to the left of the line II-II and above the line IV-IV. This point describes the state employee, in which it is impossible to reach an understanding with the manager.

Direct III-III and IV-IV are considered reliable business boundaries. Therefore, our task is reduced to create the conditions that determine the choice of strategies in the organization of company management, which correspond to the curves in the zone between the lines III-III and IV-IV. So, to ensure the stability of the relationship manager and the employee is required to assess the adequacy of their culture (choice of strategy above the line and below the line IV- IV).

In our case, the level of culture is proposed to estimate as (1- P_j , j = 1,2,3, ...), where P_j - the probability of occurrence of events : incorrect requirements imposed on the organization of relations between the manager and the employee; omissions in defining the requirements for employees; casual employees misunderstanding advantages offered to them technologies; systematic rejection employees technologies offered to them by managers; errors in management; clerical errors; environmental effects. Each of the features included in the set G is proposed to estimate the expert (on weightings appointed organizer of expertise) (Yurkevich 2008). Using such estimates can be selected business strategy services ranging between lines IV and S. It is possible to implement a data transfer algorithm (I) according to the methodology of (Butkovskiy 1985), taking into account constraints in the form of fiducial features (ρ).

Feature direct m_1m_2 is allocating points determined by estimates of psychological characteristics and professional training of managers and employees. Therefore, raises the problem: the constraints in the form of delay in the reaction of the control unit control (T_a), is required to develop the mechanism of selection of such a combination of values of characteristics of the organization control (G) and conditions of this business (ρ) in (11) that there is a phase trajectory passing through a given point of the corresponding region of the phase plane.

4. Inverse Model Control Strategy for the Formation of Relations Manager – Employee

Reliability of business processes is largely determined by the correctness of forming a plurality of (G), which characterizes the manager and employee. Each of them is to choose a coherent, but the most effective solution for the realization of a particular business process.

In our analysis, such a choice is offered to carry out on the basis of the most appropriate formulation of the problem of interaction. Due to the uncertainty of formalization decision each of the subjects, consider a modification of the Ramsey model as applied to the solution of the inverse problem of control (Sidel'nikov 2005).

In the traditional sense of using the Ramsey model as a functional criterion adopted maximized total (integral) an efficiency of the economic system , which is calculated by finding the control function , the time-dependent (Milyutin, Osmolovskii 1998). The time interval $[0,T]$, where T - the planning horizon , usually considered business processes within the company using linear - homogeneous production function $Y(t)=F(K(t),L(t))$ (abbreviated $Y(t)=F(K,L)$) , where $Y(t)$- output of productions, $K(t)$- changes in the amount of investments in time, $L(t)$ - the dynamics of the labor force over time.

The assumption of linear homogeneity in the practical solution of the problem determines the performance ratios for. Characterization of factors affecting the issue Y at time t. C divide consumption and investment (capital) I: $Y(t)=C(t)+I(t)=(1-s(t))Y(t)+s(t)Y(t)$, where $0 \le s(t) \le 1$ $s(t)$ - the savings rate is a control parameter $\exists t_1, t_2 : s(t_1) \neq 0, s(t_2) \neq 1$.

Production assets amortize in the tempo $\mu > 0$. This means that per unit time t becomes inoperable μ- part of fixed assets. Thus, the condition $\dot{K}(t)=s(t)F(K(t),L(t))-\mu K(t)$.

It is implicitly assumed that the fixed assets are homogeneous throughout the considered period of time and technological changes of the production function does not occur. The volume of workforce (number of employees) increases with the rate of n $\dot{L}(t)=nL(t)$.

In our problem as a criterion to be maximizing in the planning period $[0,T]$, we assume that the total specific energy consumption per employee with discounting can be written :

$$G(s)=\int_0^T \frac{C(t)}{L(t)}e^{-\delta t}dt=\int_0^T \frac{(1-s(t))F(K(t),L(t))}{L(t)}e^{-\delta t}dt \to \max_{s(t)} \qquad (12)$$

where $\delta > 0$- the discount rate that reflects the degree of preference for current consumption of the future. Now the task of selecting the control action, determining the optimal path between the lines I and II in Figure 3, can be formulated as a demand management choices $s(t)$, transforming the business process from the initial state of capital intensit $k_0=\frac{K(0)}{L(0)}$ (capital-k_T) in the desired time $T\left[k_T=k(T)=\frac{K(T)}{L(T)}\right]$ and maximizes the functional (12).

Thus, the problem of managerial decision-making has been reduced to the statement: The input control system receives the current values of the arguments of the production function, which are considered as the costs of organizing production and labor costs of employees (managers and employees).

In accordance with the Ramsey model production function is expressed through the savings rate as a control parameter. As a criterion to be maximizing in the planning period, the total specific energy consumption is taken per employee discounting. As part of solving this problem is required to choose the path between the lines I and II in Figure 3, defined control taking the capital-labor ratio of the business process from the beginning of the planning period, state to state, maximizing the functional (12) at the end of the planning period.

Solution of this problem is offered by integrating the functions to find the total specific consumption and the subsequent finding an extreme of the derivative obtained control function, ie determine the required index of production and economic system as a common specific consumption per employee discounting.

Under dynamic loading block implementation of business processes (Figure 1) choice of management strategy at any given time depends on the characteristics of the state of the system (G). When describing this situation of uncertainty function $\xi(\varphi)$, which determines the amount of information that is used as a control action may differ materially from those estimated.

Now function $\xi(\varphi)$ can be specified by solving the inverse problem is ill-posed by the definition of the state of the managed object (Butkovskiy 1985). The function $\xi(\varphi)$ will be considered unknown, and load (disturbance) and output rate of the system under study can be regarded as known, ie given or received as a result of the direct problem of optimal control , and presented in the form of a distribution law. Thus, the model feedback control problem can be reduced to solving an equation with one unknown.

In the face of uncertainty , in this paper , as the law specified for the output index was used as a utility function of the exponential law of probability distribution functions of the company to achieve the target . In this case, as the law changes the dynamic load on the most appropriate employee seems extreme distribution law (Sidel'nikov 2005), which simulates the power limit information transfer throughout the system (Figure 1). Thus, in general form, the model of the inverse problem of company management as productive and economic system can be written according to (Milyutin, Osmolovskii 1998; Leonard, Long 1992) as modified Ramsey model:

$$\psi_{\hat{n}}(n) = \int_0^\infty F^n_{\hat{u}}(x) F_{\hat{x}}(x)dx \quad (13)$$

where: $\psi_{\hat{n}}(n)$- the probability distribution of utility functions as a common unit consumption per employee with discounting ;

$\hat{u}$ - random greatest value of labor costs per employee in the same project when stationary (in a stochastic sense) loading;

$\hat{x}$- in this paper, a random variable that characterizes the company's capital ratio at the beginning of work on the implementation of a project;

n- number of jobs offered to employees in the implementation of a project;

$\hat{n}$- The total number of jobs held by the company (in this model - the random variable);

$F^n_{\hat{u}}(x)$- estimates of the distribution function of the load on the employee , the manager proposed in Block control after the completion of works;

$F_{\hat{x}}(x)$- function of the load on the employee in the work of the Control technology.

Computer experiment showed that the distribution function of the maximum load $F^n_{\hat{u}}(x)$ value to the employee after the work n obeys extreme distributions and has the form:

$F^n_{\hat{u}}(x) = \exp\left\{-\exp\left[-\beta\left(x - \mu\frac{\ln n}{\beta}\right)\right]\right\}$, where β and μ- the parameters of the distribution.

Thus, in our case, the inverse problem reduces to finding the control function of the load on the employee in the work of the Control technology $F_{\hat{x}}(x)$. as control functions of the state x from the known functions :

1. For the output parameter $\psi_{\hat{n}}(n)$- this utility function (Stockey 1993) in the form of probability , such as exponential , law ;

2. The distribution function of the largest value after the *n* work load $F^n_{\hat{u}}(x)$, which obeys the extreme distributions.

Example implementation of this approach is presented in (Babishin et al 2013a; Babishin et al 2013b).

5. Conclusion

By solving the inverse problem of finding the control function $F_{\hat{x}}(x)$ is offered in the form of a probability distribution law on employee data load. The numerical values of the parameters of this law are the basis for criteria for choosing the best strategy with the use of the analytic hierarchy (Phillips, 1962).

Through calculating the greatest value of information load the proposed approach makes it possible to choose a strategy to optimize the production and the transition of the economic system from one qualitative state to another. On the basis of the revealed law of perception employee (and manager) information effects, depending on the indicators of production and economic system, proposes a methodology to support decision-making to prevent critical situations. Using the law of formation of stationary effects allows you to define the limit load estimation for employee manager proposed that in the context of the dynamics parameters of the market increases the likelihood of preemption failures in business processes.

The proposed methodology allows to increase the effectiveness of decisions with the help clarify vital signs production - economic system, such as the stability of the company's management, the competitiveness of its products, etc. Application of the developed model allows to perform functional restructuring of the company, depending on the severity of their situations. Reducing the search for effective management decisions in a randomly changing environment will reduce the risk of forming such critical situations.

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