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GAME-THEORETIC INTERPRETATION OF PROBLEMS OF ADOPTION OF ADMINISTRATIVE DECISIONS AT THE LEVEL OF THE REGION

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ABSTRACT

In article it is revealed that at the solution of problems of management of economy of territorial education – the region, some of them don't give in to formalization because of existence of hardly measured qualitative factors and "a human factor", having essential impact on quality of decisions. Need of the accounting of these factors arises especially sharply in a problem of forecasting and perspective scientific and technical development of the region and the regional industrial is connected - diversified systems i.e. where are most often used scientific and technical and economic information. The value of information received in the course of preparation of administrative decisions and influencing change of degree of confidence of the subject of an industrial network of the validity of any event is estimated by means of Bayes's theorem.

Keywords: region, industrial complex, logistic schemes, marketing, management, Bayes's theorem, manager, game-theoretic interpretation

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1. INTRODUCTION

Game models in practice of management are used rather often. "business games", models of competitive balance, model of scenario modeling, etc. are an example of it. According to basic provisions of game theory, any model of process of adoption of management decisions includes:

1) Set of possible courses of actions (strategy) of D;
2) Set of conditions of realization (conditions of the nature) of S

$$D = \{d\}, S = \{s\} \quad (1)$$

The choice of a certain course of actions depends on value of some variable S characterizing this set, but the manager does not know about its real value and assumes that it is distributed under some law *P (s)*;

3) Set of results = *{z}*. It is supposed that to each of courses of actions di at some variable value of *Sj* there corresponds a certain *zij* value.

Preferences of the manager concerning courses of actions and their results are according to the theory of usefulness, i.e. each three of d, s corresponds a unique value of function *I (d, s, z)*, the theory of usefulness satisfying to postulates. The formal criterion used for optimization of solutions is defined by presence at the manager of information on all elements of a payment matrix. Level of knowledge of the manager in case of the complete information is determined and the optimality of a solution is defined by extreme value of target function. The extremeness is the only principle which is the cornerstone of decision-making in the conditions of the complete information.

In the conditions of partial or full uncertainty knowledge of the manager much lower and changes in process of filling of lines and columns of a payment matrix. There are two levels: stochastic and not stochastic uncertainty.

Stochastic uncertainty is characterized by higher value of knowledge. Decisions are made in the conditions of risk, and the optimality is defined by extreme value of population mean of criterion function. The main mathematical apparatus is the probability theory.

At the level of not stochastic uncertainty of the manager the set of options (alternatives), but without any prior information on probability from outcomes is known usually. Uncertainty can be here result of insufficient knowledge of an object concerning which the decision, or a consequence of conscious activity of other person (group of persons) pursuing other aims is made. In problems of advance planning by the competing party the management of the foreign firms holding a leading position in this industry can be considered.

2. LITERATURE REVIEW

The game theory establishes criteria of decision-making in the conditions of uncertainty, assuming that players have identical information on the competitor (full knowledge, partial or total absence of information). In the majority of practical situations competitors have various

information, do other rates, and sometimes even play various games. Therefore, very perspective should consider approach in which the conflict situation is represented as intellectual interaction of two parties. At the same time imitation of processes of a reasoning allows to force the competitor to make the course, favorable to us, to make the decision favorable to us. To forcing of the competitor to make such course transfer of information, favorable to us, to it precedes. This information promotes formation at the competitor of a "false" payment matrix and gives the grounds for adoption of the relevant decision by it. Such games are called reflexive, and a way of impact on the competitor by means of misinformation — reflexive management. As in Russia control of organizational systems is exercised in conditions, the deprived lines of antagonism, the majority of tasks of management can be presented in the form of games with the nature. However, games with the nature on the level of informational content of the manager stand much below than antagonistic games where main objectives of the competitor are known. Therefore, the main objective of formalization of such games — receiving that part of information which though does not eliminate completely uncertainty, but promotes more objective choice of strategy, i.e. optimizes decision-making. The problem of optimization in a general view is solved by splitting a set of conditions of the nature into territorial areas.

This approach the most suitable for optimization of management decisions. According to it the set of vectors of state of nature of *G* includes element x to which there corresponds the full range of independent basic data (full knowledge of conditions of the nature). If there is a partial ignorance, then to it there corresponds the task not of an element x, and some subset (the territorial area) containing this element. With increase in the sizes of this subset uncertainty increases. If there are two possible ways of actions *Ar* and *As*, then for any x *G* weak domination or *Ar* over *As*, or *as* over *Ar* has to take place. Generally, a case perhaps strict domination or equivalence of alternatives, but for the final choice sufficient is considered also existence of weak domination which allows to break a set of vectors of state of nature of *G* into two mutually supplementing subsets of g_{rs} and $g_{rs} = G — g_{rs}$. Borders of subsets are defined by equality of criterion function at two antagonistic actions. To such division there correspond those actions which at some vectors of state of nature can be optimum. The decision is considered steady while the point corresponding to it moves in the same subset (area). It allows to formalize the situations which are found quite often in administrative activity when new alternatives appear (for example, new processing methods) and realization conditions change (for example, resource opportunities of the industry). Division into districts allows to put zones of application of innovations in unambiguous compliance to realization conditions, to find out as far as outdated receptions and methods when it is expedient to pass to innovations have to move and when to allow their coexistence with "old" methods and receptions.

Using a game matrix as model, it is possible to track participation of information in decision-making process. Existence of at least two alternatives (the "zero" decision is excluded) since otherwise decision-making is impossible is obligatory.

From the formal point of view information used when forming alternatives has to display all range of possible actions irrespective of preferences of the manager. Process of search of alternatives can have purposeful or accidental character, at the same time the manager conducts preliminary estimate of the obtained information in terms of its importance for achievement of a goal. Except classification of data by the principle "it is suitable — is not suitable", consistently, more detailed analysis of the arriving messages is in parallel or consecutive in parallel kept. At the same time the algorithm of information can be completely determined, or change depending on contents of the arriving messages when the manager conducts self-training and can (an extreme case) even to refuse achievement of a goal. Information used for

definition of conditions of realization allows to define, for example, what resources are necessary for receiving the best (according to some criteria of preference) results. Messages about experience of other collectives which received the best results under other conditions of realization, for example, at big capital expenditure are of value for the manager. Such information can lead to increase in capital investments and, thereby, promote receiving more good results. Information used by the manager for definition of payments in a game matrix has significant effect on the final choice since promotes streamlining of alternatives on degree of their importance. It is necessary to pay attention to the messages confirming not existence of new ways of innovative and technical development, and about the first received results and their qualitative (in broad understanding) characteristics. When developing new knowledge-intensive products these characteristics are set by some set of indicators, apart from which is defining. These indicators are of the main interest from positions of information support as allow to define technological level of products according to the latest developments of science and technology, i.e. to define competitiveness of products.

According to game-theoretic approach information is used for: elaboration of marketing strategy (alternatives), accounting of conditions of realization, assessment of consequences of the choice of this or that strategy. Therefore, the game (payment) matrix can be used also for formalization of requirements to information support of the persons making crucial decisions.

In fig. 1. a set of payment matrixes is represented in an axonometry. The shaded part shows one of options of a degenerate matrix which in some cases turns into a usual cause and effect (causal) matrix.

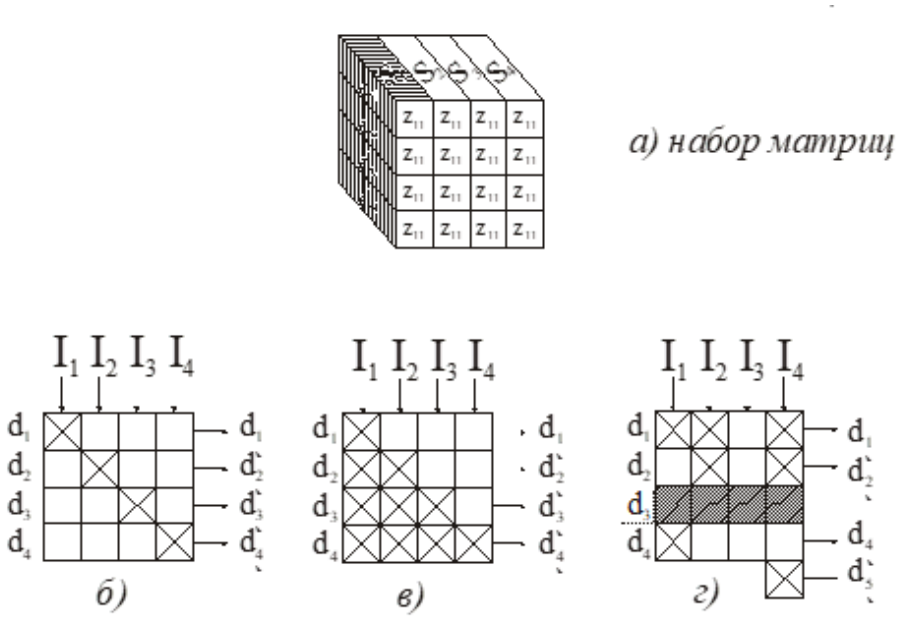

Fig. 1. Influence of information on change of strategy: d1-d4 is strategy; S1-S4 are realization conditions; Z1-Z4 are results (payments); I1-I4 is information.

Information necessary for formation of such matrixes is designed to display objectively a real situation in which the decision is made. In the course of formation lines and columns of matrixes change, new alternatives are added, or purposes change that leads to change of dimension of a payment matrix.

3. EMPIRICAL PREDICTIONS AND METHODOLOGY

Let's consider the most general cases of use of information according to this approach:

1. Information does not change an order in ranging of marketing strategy and demonstrates that the chosen sequence of actions corresponds to a real situation.
2. If to assume that the decision-maker before obtaining information had 4 courses of actions *d1, d2, d3, d4* which it had in decreasing order of the importance from *d1* to *d4*, then after obtaining information validating its judgments, the order of ranging does not change, and courses of actions will be located in the same order. In a number of administrative situations obtaining such information is extremely desirable since thanks to it the professional experience of the head and his authority increases.
3. Information changes an order of ranging of marketing strategy, i.e. demonstrates that the order of ranging chosen a priori was not the best. If the strategy approved to realization are ranged as it is shown in fig. 1., in, it is necessary to recognize the importance of information for the decision-maker as high. Let's notice that change of an order of ranging completely is defined by values of payments and conditions (ways) of realization.
4. Information changes dimension of a payment matrix, i.e. excludes unpromising strategy and adds new, as shown in fig. 1. At the same time information excluding an unpromising course of actions *d3* is of the undoubted value since allows to redistribute efforts in achievement of a goal for the decision-maker. Addition of new courses of actions to earlier known can be considered from positions of change of a purpose of the manager.

Let's assume now that the manager a priori did not give preference to any of 4 courses of actions, and information obtained by it contains data on a new (5th) way of achievement of a goal. Then, if they obtained information does not contain data on conditions of realization and the choice remains equiprobable, uncertainty of a situation sharply increases. Really, if the priori probability of the choice of each course Pi = ¼, then after obtaining information it is Pi = 1/5. What value of such information and whether there is a need for its receiving? It is quite possible that the new course will be the most effective and then, when obtaining additional information, the probability of its choice of P5 = 1, so initial data were valuable. The importance of information corresponds to the importance of results of the choice of strategy (alternatives), i.e. value of payments in a payment matrix). In the majority of tasks of organizational management of value of payments cannot be set by one okalyarny indicator as assessment of the importance of results of strategy for the manager is conducted by many contradictory criteria. Here it is possible to speak only about vector optimization. From the formal point of view of a task such come down to a superstructure of various relations of an order on a set of strategy D and a set of vector estimates of results of Z. Display of the relation of preference on a set of strategy in the preference relation on a set of estimates of results is at the same time homomorphism and correspondence.

As the manager has to have two rating scales — probabilistic and useful, their ratio which can be carried out in a matrix form as follows is of interest. Let two matrixes be set: probabilistic and useful. Let's assume that some line of a useful matrix has an appearance: [p, q, r]. Let's increase each element of a line by some positive number a and we will add some number b, then we will receive a line of a new matrix:

$$[ap + b\ aq + b\ ar + b] \quad (2)$$

If the corresponding line of a probabilistic matrix has an appearance [x, y, z], then the expected usefulness before its transformation of a useful matrix on this line is:

$$xp + yq + zr\ (A) \tag{3}$$

For the transformed line of a useful matrix the expected usefulness will be determined by this line as:

$$X\ (ap + b) + y\ (aq + b) + z\ (ar + b) = a\ (xp + yq + zr) + b\ (x + y + z) \tag{4}$$

As $(x + y + z) = 1$, we have: a $(xp + yq + zr) + b$ that represents expression *(A)* the repeated *a* of times and increased by *b*. Thus, the preference order from transformation of a useful matrix was not broken and the considered scales are equivalent. Such scales are used when in a matrix of poleznost it is necessary to attribute to extreme values the corresponding estimates 1 and 0 and thus to correlate useful and probabilistic matrixes.

Payment, degenerate and causal matrixes are models of a general view which during the analysis of a problem are transformed one to another or are transformed to chains of relationships of cause and effect. If, for example, the logical analysis of a problem allowed to present the global purpose in the form of the scheme of local goals ("the tree is more whole") and to compare them certain ways of realization, then the logic diagram of hierarchy of versions of decisions ("a tree of decisions") is formed. The scheme can consist of several levels where each subsequent level is subordinated to previous. Let's say for example, that we have a probabilistic matrix of a look:

	S_1	S_2	…	S_j	…	S_m	
	$P(S_1)$	$P(S_2)$	…	$P(S_j)$	…	$P(S_m)$	
d_1	$P(d_1/ S_1)$	$P(d_1/ S_2)$	…	$P(d_1/ S_j)$	…	$P(d_1/ S_m)$	
d_2	$P(d_2/ S_1)$	$P(d_2/ S_2)$	…	$P(d_2/ S_i)$	…	$P(d_2/ S_m)$	
…			…		…		(5)
d_i	$P(d_i/ S_1)$	$P(d_i/ S_2)$	…	$P(d_i/ S_j)$	…	$P(d_i/ S_m)$	
…			…		…		
d_n	$P(d_n/ S_1)$	$P(d_n/ S_2)$	…	$P(d_n/ S_j)$	…	$P(d_n/ S_m)$	

Probability of the choice of strategy of *di*, i.e. event which can happen to one of events of *S1, S2, Sj, Sm* is equal:

$$P(d_i) = \sum_{i=1}^{m} P(S_j) P(d_i / s_j) \tag{6}$$

where $i = 1, 2, \ldots n$.

Let's assume now that this strategy in turn is a consequence of the choice of some course of actions from *E1, E2, ... Et* of the possible, forming group incompatible events, then for this level the probabilistic matrix will have an appearance:

	d_1	d_2	…	d_i	…	d_n	
	$P(d_1)$	$P(d_2)$	…	$P(d_j)$	…	$P(d_n)$	
E_1	$P(E_1/ d_1)$	$P(E_1/ d_2)$	…	$P(E_1/ d_j)$	…	$P(E_1/ d_n)$	
E_2	$P(E_2/ d_1)$	$P(E_2/ d_2)$	…	$P(E_2/ d_i)$	…	$P(E_2/ d_n)$	
…			…		…		(7)
E_k	$P(E_k/ d_1)$	$P(E_k/ d_2)$	…	$P(E_k/ d_i)$	…	$P(E_k/ d_n)$	
…			…		…		
E_t	$P(E_t/ d_1)$	$P(E_t/ d_2)$	…	$P(E_t/ d_i)$	…	$P(E_t/ d_n)$	

From where probability of the choice of a course of actions of E_k

$$P(E_k) = \sum_{i=1}^{m} P(d_i) P(E_k / d_i) \tag{8}$$

where k =1, 2, …t.

Then we have:

$$P(E_k) = \sum_{i=1}^{n} P(E_k / d_i) \sum_{j=1}^{m} P(S_j) P(d_i / S_j) \tag{9}$$

For the subsequent levels (the 3rd, 4th, etc.) similar formulas can be received. Detailed consideration of methods of justification of block diagrams of treelike type goes beyond this work. Transformation of useful matrixes is based on operating with the valid values of the weight coefficients appropriated by consequences of the choice of this or that strategy.

From informatics positions the possibility of use of probabilistic and useful matrixes for creation of information model of decision-making process is of the greatest interest.

Information approach to decision-making is based on the assumption that the final act of the choice is carried out by the manager in the conditions of knowledge which level is always higher than initial. It means what in the course of decision-making of the decision-maker obtains information having for it a certain value. The models of decisions developed within these disciplines, having, unfortunately, specific character cannot be also used for the benefit of information support of governing bodies. Below the generalized model of process of information preparation and justification of management decisions which can be used at the level of regional government will be given.

In the most general view decision-making in the conditions of uncertainty consists of three main stages: preparatory, analytical and final.

The preparatory stage includes a formulation of a problem, the choice of criteria and purpose of payments of a payment matrix. There is an understanding by the manager of need of decision-making, explanation of his being and those ultimate goals for the sake of which it is accepted. The problem can be formulated by higher decision-making body, arise at the expense of the experience accumulated earlier or follow from needs of the environment (the requirement of customers, action of competitors, etc.). Respectively, information used at this stage can be three types: directions "from above", prior information (the experience accumulated earlier) and the external information from the environment. Also external and internal stimuluses (a self-preservation instinct, prestige, personal aspirations, etc.) participate in a formulation of a problem.

On the basis of the prior information and information arriving to managers from the external environment the payment, degenerate or causal matrix is under construction and unknown elements or those which need specification and check are allocated.

At an analytical stage there is an explanation of the most difficult aspects of a problem and possible courses of actions are a priori estimated. In the analysis of a problem and development of alternatives prior information and information from the external environment which we will agree is also used to call "information on a problem". Here any data attracted during problem definition and development at managers of the initial concept belong. This information is already available at the disposal of the manager by the beginning of the solution of a task.

Unlike it information attracted to final assessment of strategy and conditions of their realization is called by us additional.

Here all types of messages relating to ways and conditions of realization of the planned action courses, the problems received by the manager during the analysis in process of filling of columns and lines of a payment matrix including those from them which change its dimension enter (for example, lead to emergence of additional alternatives). It is necessary to refer the quantitative restrictions and requirements of a qualitative order having significant effect on assessment of alternatives and the final choice to the special type of information. In a general view they have to be known to the manager during statement of a problem already in advance, and at an analytical stage only specification of restrictions, coordination and coordination of requirements which can act also in the form of compulsory communications can be made. In such cases assessment of alternatives includes consideration of degree of compliance and to these communications (factors of organizational, social, esthetic and other character).

For final assessment of alternatives and development of versions of decisions experts of the corresponding qualification (experts) can be attracted and also be used various formal receptions which application as it was already specified, depends on extent of filling of columns and lines of a payment matrix.

The final stage includes final assessment by the head of the alternative course of actions which is selected at an analytical stage: coordination if it is necessary, version of the decision with higher body and its statement. The approved option is the basis for implementation of the decision and in the form of a directive signal (the order, the order, the instruction) arrives to object of management.

Let's consider features of information support of decision-making process.

1. Aprioristic knowledge depends on professional standard of the manager (education, length of service, etc.) and also extent of its acquaintance to the main scientific and technical representations in that area to which the solved problem belongs. This knowledge can be various on the level when which determining use of a probabilistic scale is possible. At high aprioristic knowledge of the manager of need for obtaining other information, as a rule, does not arise that is characteristic of expert methods of decision-making. The formal device of justification of such decisions is developed now rather well.

However the objectivity of the decisions made on the basis of expert methods in many respects depends not only on quality of conducting examination, but also on those scientific and technical representations which dominate at the time of its carrying out. It is an essential factor at assessment of quality of strategic plans and forecasts. And if "tightly subjective" lines of scientific representations are erased at increase in number of experts (the law of large numbers takes place), then a component of "collective and subjective" character remains and completely is defined by the nature of a cumulative set of information which experts at a preparatory stage have. As at the beginning of this stage the problem still can be and is not formulated, the data increasing aprioristic knowledge have to display whenever possible all range of problems of this area (direction) of industrial output, and the main attention is paid to the problems, most significant for the manager. From here need of a task of priorities of the thematic directions in area of information interests of the manager follows.

Are prioritized proceeding from the tasks facing this industry or a regional industrial complex and have to correspond to the long-term program of their development. Level of knowledge of the experts participating in the solution of problems of this direction of industrial output can be determined so:

$$\alpha = \mu^{-1} \sum_{i} \beta_i \sum_{j} \alpha_{ij} \tag{10}$$

where μ — number of experts; β_i — importance of i-go of an element of information *i*–го элемента информации, используемой для решения проблемы; α_{ij} — knowledge of *j* of the expert in *i* to an element.

However application of this formula in practice is difficult as here unambiguous understanding of complexity of a problem by all experts and that is almost impracticable, unambiguity in purpose of estimates ("scales") of elements of information used for decision-making is required. Besides, the formula does not consider a possibility of transformation of a problem at its emergence due to receiving some element of information, i.e. the creative moment of problem situations is ignored.

2. Information on a problem including the data necessary for development of the initial concept is the most important in terms of information preparation of decisions. This information can belong to all elements of information matrix, i.e. includes data of 3 types: "result of action", "ways of obtaining result", "Conditions of realization of ways". Approximately the same division of information is offered in work of, A.M. Karminsky though they also do not connect it with game-theoretic approach to decision-making. In practice it is sometimes difficult to carry a documentary source to this or that type of information as in principle it may contain any data necessary for adoption of this decision. In these cases it makes sense to speak about the aspects or arguments relating to this element of information matrix and to consider the document as a certain set of such aspects (arguments).

Information on a problem, also as well as prior information, is used by the manager at a preparatory stage, but has more rigid purpose, i.e. includes the data intended only for the solution of a specific problem. Between the moment of its receiving the manager and the beginning of a solution can pass considerable time, however search and accumulation of such information are preceded surely by statement of a problem and determination of terms of its decision.

Additional information arrives to the manager after the priori analysis of a problem and can belong to all problem in general, to any its aspects or be beyond a problem (obtaining data on the same problems in the adjacent fields of science and technology. Need of obtaining such information has to be proved and compared with assessment of expenses (temporary and resource) on its acquisition. The data received by the manager from the sphere of realization can also be carried to additional information, however their receiving is always accompanied by carrying out trial implementation of the decision that it is most characteristic at selection of options by method of "tests and mistakes". Additional information can sharply change dimension of a decisive matrix, and to lead futility of its search to revision of a problem, alternative strategy by the manager or criteria of the decision. In some cases the lack of additional information does a problem unsolvable and leads to an exception it from consideration.

4. DATA AND SAMPLE DESCRIPTION

Division of information on problem and additional is conditional and is carried out to select the data arriving to the manager prior to the beginning of a solution (at a preparatory stage) in certain information "reserve" of purpose. This reserve can exclude need of obtaining additional information and allows to anticipate information need at the manager during a solution. The legitimacy of such approach to information support is proved by practice of some services of

the enterprises conducting information support on the basis of drafts of thematic plans of works of this organization. Features of work of an information system in such mode will be considered a little later. Here it should be noted some common features characteristic of information preparation of decisions. If to assume that information provides acceptance of an optimal solution unambiguously, then there is a problem of the best way of its receiving. In a general view it is a problem of search at which solution seek to minimize, on the one hand, total costs, and with anotherto increase reliability of the obtained information, i.e. to reduce an error of reception of the incorrect message. The situations arising in problems of search are divided by two classification signs:

1) qualitative and quantitative;
2) individual and mass situations.

The first sign estimates properties of elements of information from positions of the subject making decisions. For example, collecting arguments pro or contra some alternative (qualitative situation) or search of data of quantitative character (parameters of a technical system, technical and economic indicators of the device, quantitative characteristics of technological processes, etc.). The second characterizes further use of information by the subject. In case of individual approach each element of information is considered, and in a mass situation all set of elements (the best parameters of the samples released by various manufacturers) is considered. From informatics positions qualitative and quantitative situations correspond to the problems of dichotomic classification which are coming down to definition by the consumer of relevance (pertinentnost) of the documents submitted to it.

Need of obtaining information on each subsequent step of search can be revealed formally by means of a formula Bayesa.

Let's say that n of alternatives, data on which can contain in *k* information sources, is considered. Let's enter designations:

P ($D_i/I_1, \ldots I_{k-1}$) — probability of realization of an alternative of *Di* after studying of *k-1* of sources;

P ($Ik/ D_i, I_1, \ldots I_{k-1}$) — probability that *k* a source contains data on realization of an alternative of *Di*.

Then *Di* hypothesis probability after receiving *k* of sources it is possible, similarly */I-1/*, to define as:

$$P\ (D_i\ /\ I_1,\ \ldots\ Ik) = \frac{P(D_i)P(I_k/D_i, I_1, \ldots I_{k-1})}{\sum_{i=1}^{n} P(D_i)P(I_k/D_i, I_1, \ldots I_{k-1})} \tag{12}$$

where *P (Di)* is the priori probability of realization of a hypothesis.

As an example, we will consider a decision-making case in the conditions of the competition when consequences of the unsuccessful decision can be the most notable.

Let's say that at the enterprise there are two alternatives: development of product *A* and product *B*. At the same time it is supposed that competitors conduct development of the similar products *C* or *D* and probability of development of product *C* — *P (C) = 0.3*, and products *D* — *P (D) = 0, 7*. Losses and advantages of development of the products *A* and *B* (in the presence of the competition) are estimated on a 100-mark scale by a matrix:

	C	*D*
A	40	-100
B	-90	30

Let's assume that the decision on the beginning of own development can be postponed until obtaining information which cost is 10% of the greatest possible assessment (i.e. 10 points), and the probability of its receiving *P (I/C, D) = 0.8*. We will define need of obtaining information which can be potentially used for the solution of a task.

We will determine the probability of development of product C on condition of obtaining information on this product by a formula Bayesa:

$$P\,(C/I) \;=\; \frac{P\,(C)\cdot P\,(I/C)}{P\,(C)\cdot P\,(I/C) \;+\; P\,(D)\cdot P'\,(I/D)} \tag{13}$$

where P' (*I*/*D*) — probability of obtaining information on development of product *C* when the opponent realizes *D*.

Then

$$P\,(C/I) \;=\frac{0{,}3\cdot 0{,}8}{0{,}3\cdot 0{,}8 \;+\; 0{,}7\cdot 0{,}2} \;=\; 0{,}63 .$$

In this case probability of development of product *D*:

$$P'\ (D/I) = 1–0{,}63 = 0{,}37.$$

The same way we will determine the probability of development of product *D* on condition of obtaining information on this product:

$$P\,(D/I) \;=\frac{P\,(D)\cdot P\,(I/D)}{P\,(D)\cdot P\,(I/D) \;+\; P\,(C)\cdot P'(I/C)} = \;\frac{0{,}7\cdot 0{,}8}{0{,}7\cdot 0{,}8 \;+\; 0{,}3\cdot 0{,}2} = \;0{,}9 .$$

Откуда P' (*C*/*I*) = 1 – 0,9 = 0,1.

The decisive matrix taking into account a posteriori values of probabilities and costs of obtaining information will have an appearance:

	C	*D*
	P (*C*/*I*) = 0,63	*P* (*D*/*I*) = 0,9
	P' (*C*/*I*) = 0,1	P' (*D*/*I*) = 0,37
A	30	-110
B	-100	20

We will define expediency of obtaining information proceeding from aprioristic and a posteriori values of most expected usefulness.

Most expected usefulness before obtaining information

$$U_{max} = 0{,}3\ (-90) + 0{,}7\ 30 = -6,$$

and after its receiving

$$U'_{max} = 0{,}1\ (-100) + 0{,}9\cdot 20 = 8.$$

As $U'_{max} > U_{max}$,, obtaining information for this task is advisable.

Despite the difficulties connected with purpose of probabilistic and useful estimates, this approach can find broad application as here not the absolute, but relative importance of information is defined in relation to a specific objective of decision-making.

5. CONCLUSION

In conclusion we will list the main results received in the analysis of information party of decision-making processes.

1. Information used for decision-making of organizational management can be estimated from positions of the subjective logic considering influence of a subjective element in acts of the choice. At the same time two factors are essential: aprioristic uncertainty of a problem and importance of result of the decision.
2. Degree of compliance of information to tasks of management and need of attraction of additional information are estimated by probabilistic methods about use of Bayesian approach to decision-making.
3. For modeling of process of information preparation of decisions, it is possible to use a payment matrix of a game against the nature. Such model allows to order logical operations of process of preparation of decisions and to define structure of necessary information.
4. Information promoting the choice of the purposes and such ways of their achievement, on which success probability taking into account realization conditions the greatest is of the greatest value for governing bodies. From this need of high extent of synthesis of information follows (final, but not intermediate results are important); its high reliability (the mistake can cost much); educations – the region, some of them do not give in to formalization because of existence of the hardly measured qualitative factors and the "human factor" having significant effect on quality of decisions. Need of accounting of these factors arises especially sharply in a problem of forecasting and perspective scientific existence of conclusions and recommendations (for taking measures to implementation of decisions).

The received results are the theoretical base used in a regional industrial system by consideration of methodological and practical questions of preparation of management decisions of the regional level.

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