

**Task of analysis of level of satisfaction by life**

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**Mathematical description of analysis of the state of level of satisfaction of man life is executed in the set time domains. End-point is the program allowing to decide the task of analysis of level of satisfaction of man life. For the decision of this task on the entrance of the program numerical information is given in points: initial level of satisfaction, personality index, managing influence in points, time on that an analysis is conducted domain. On the exit of the program the function of level of satisfaction hatches depending on time on the set interval. Analysing behavior of this function, in particular, it is possible to define, through what time domain by a man the set level of satisfaction will be attained.**

**Keywords: time domain, level of satisfaction, points, analysis, personality index, managing influence, algorithm, program.**

**Introduction**

A research object is a man that have initial conditions of life, personality properties and an environment influences on that. Article of research: formalization of the indicated descriptions with the purpose of implementation of mathematical description, draftings of algorithm and development of the program for an analysis and prognosis of the state of satisfaction of man life in the set time domains. The results of these researches after their adaptation to the real terms can be drawn on as it applies to indicated to the analysis and prognosis of the states of satisfaction of both man above-ground in ordinary terms and man above-ground in the conditions of limitations. Thus everybody possesses the individuality characterized by own personality properties, by character and on it reacts on positive and negative influences, id est the level of satisfaction from influence of these influences depends yet and on the personality index of man. Thus, a man is subject to consideration with the personality properties: by morality, line-up of psyche (by leadership and subordination), intellect, temperament and health. He lives in some terms of material and spiritual environment and bound by relationships with family (or by other relatives), friends (by enemies), labour collective. He has a certain level of satisfaction the existent terms of life. And from some moment of time as a result of certain influence of condition of life of this man change and this change proceeds during some time domain. How will this change influence on the state of man, on his level of satisfaction by life? It is a question of analysis. Question of synthesis : what must be influence from the side of environment on a man, to translate him from the initial state of satisfaction in the set eventual state of satisfaction for a certain time domain? And such changes can take place several times during life of man. Analogical questions can be put for the collective (communities) of people and society (republic, state, civilization, world). Answers for the put questions will give an opportunity to manage the state of man, collective, society on the set criteria. Thus, a man,

collective, society, is management objects. And a man, public structure or state organization, can come forward as a subject of management.

It should be noted that management criteria for the indicated subjects can be both resulting in the improvement of the states of management objects and resulting in their worsening. Thus worsening can take place both due to misunderstanding as a result of bad quality of management and on the specially worked out bad motive with the good value of management. If a management results in the stable positive state of management object, then it is actual for the subject of management : leader of collective or society. It is necessary also to notice that both a management subject and management object can live and on identical and on different criteria, that can be both moral and immoral. In particular, concepts "An improvement is worsening" can not coincide at an object and management subject.

Management subjects in the activity use knowledge of theory, own practical experience, intellect and intuition. However it is difficult quickly to collect and структурировать necessary information about the object of management and her quickly to process for making of the most effective decision (on the criteria of management subject) in regard to the object of management. In these cases a management subject is very desirable to "have at the informative system of support of acceptance of administrative decision, based on the mathematical model of analysis and prognosis of the state of management object on some time domain, and also infobase of data, necessary and sufficient for the decision of tasks of analysis and synthesis, a hand". And therefore implementation of mathematical description, drafting of algorithm and development of the program of the indicated process (and the this triuneness is mathematical model of process), is an actual task. What be more, the adequate mathematical model of analysis and synthesis of the state of management object must объективизировать subjective administrative decisions, id est to provide such support of making decision, during realization of that the states of management objects will be objectively improved. The decisions of the indicated tasks are actual can be and for a man, for his purposeful self-government, or for a management by the state. A man in this case comes forward person and object of management and management subject, because will realize a management by a soba. In other words, it is possible to set the problem of translation of the initial state in the desired state during the set time domain: or by means of the managing affecting itself, or by means of change of the personality properties. By control of management quality by a soba implementation or non-fulfillment during the set time domain of conceptual criterion can serve: "God speaks with people in language of their vital circumstances" [2].

The examined task in some measure behaves to the problem of construction of model of personality, about that an academician, surgeon and cybernetic engineer, doctor of medical sciences and doctor of engineering sciences Nikolay Mikhajlovich Amosov, reflected yet in the sixtiess of

the last century. He expressed opinion [1] that it is possible to build the model of personality of certain man, and then on the basis of this model or to recommend him, how to live with the most level of heartfelt comfort, and in a limit - how to become happy, or to recommend something to change in itself with the same aim - to become happy. The task of the real work is consideration of one of variants of construction of mathematical model of level of satisfaction of man the terms of life. For the decision of this task it is necessary: to execute mathematical description, make an algorithm and work out the program of analysis and synthesis of the state of satisfaction of man the terms of life that can be in future finished off taking into account the specific of problems of one or another subject of management with the purpose of the use of this model for the decision of tasks of support of acceptance of administrative decisions this subject of management.

### **Formalization of personality index**

For determination of descriptions of personality properties a man is tested on a few types of tests [3, 4, 5, 6, 7, 8, 9]. Then these tests are processed with the purpose of finding out of personality properties of man and determination of quantitative indexes of these properties. Some generalized quantitative index characterizing this personality can be certain in the end, that we will name a personality index. This index makes sense to do such, that than anymore his size, the higher level of personality properties of man, or, in other words: the "lighter" personality, id est the it more easily to forecast behavior of this man. It a short problem of analysis of personality algorithm is described. It is possible to set the problem of synthesis of personality, id est rule-making to the man on realization of certain prosecution of itself on purpose to take the generalized personality index to the required value.

For determination of personality index of man we will enter such his next components: a 1) level of morality, 2) level of leadership and subordination (building psyches), 3) level (amount) of intellect, 4) level of temperament, 5) health level. Every description is presented by five levels [10] and certain accordingly numbers from 5 to 1: than more number, the higher personality properties of man, id est the higher morality, line-up of psyche, intellect, better temperament, better health.

On the basis of the indicated components we will enter a personality index for a man as work [8] sizes of levels on every component, id est on a formula:

$$q = \prod_{k=1}^5 (Q_k),$$

where  $Q_k$  is a size of level on the component of  $k$ . Personality index of  $q$ , and also his separate components of  $Q_k$  can be, in particular, used as parameters in the model of prognosis of level of satisfaction of man the terms of his life.

Thus, for determination of personality index it is necessary to do the following: 0) to choose the investigated man; 1) to choose worked out or to work out tests for every component of own properties of man is the most labour intensive and especially meaningful procedure; 2) to conduct testing on every component of personality properties of this man, as a result to appropriate on every component a corresponding value  $Q_k$  - size of level on a component for some man; to calculate a personality index on the indicated formula. A personality index is description of personality showing up in *character* of man [6], as totalities of properties of personality, qualificatory the model methods of her reacting on *vital circumstances*.

### **Mathematical description of the state of satisfaction**

It is further necessary to execute mathematical description of change of level of satisfaction in time, id est procedure of drafting of such equalizations that most adequately would describe the real process of change of level of satisfaction in time, and, the decision of that would give the most adequate prognosis of change of level of satisfaction a man by the terms of his life on the set time domain.

For the construction of mathematical model of level of satisfaction hypothetical approach, in that as a hypothesis on a precedent from engineering sciences we use dependences, reflecting time-history of level of satisfaction of man taking into account the size of personality index, initial state and sizes of external influences, is applicable life. To make sure in adequacy of the worked out mathematical model the real process must conduct a correct experiment: to carry out a numeral design on the worked out model, and then to compare his results to the results of experiment. Instead of experiment at certain terms information can be used about the estimations of experts - experience specialists - psychologists-forecast, that on the basis of the set entrance information about the personality index of man, revolting influence and managing affecting him can give practically a reliable prediction about the level of satisfaction of this man the terms of his life.

The indicated mathematical description we will execute as follows. We will set the process of change of level of satisfaction as usual linear differential equalizations with variables in time by coefficients or parameters on three stages in time: 1) initial, 2) basic, 3) eventual. If these equalizations are written in the normalized form, then on the left a derivative will be written at times from a state variable, and in right part at all stages will be present composed, equal to work of the time of personality index attributed to the size of interval on a state variable. Except it, on the first stage the composed is present, equal to the relation of the dimensionless revolting affecting size of time of stay of man domain in the conditions of the initial stage - this stage characterizes influence case-insensitive personality properties. On the second stage elements are present, each of that is attitude of dimensionless managing influences toward the components of personality index and to the size of interval of stay of man in the conditions of the second stage - this stage

characterizes a management a man taking into account his personality properties. On the third stage elements are present, each of that is work of dimensionless influences of self-government on the components of personality index, attributed to the size of time of stay of man domain in the conditions of the third stage, - this stage characterizes self-government of man in accordance with his personality properties. We will notice that in general case on every time domain all can be present three from the above-stated influences, and also their different combinations.

Said we will describe in symbols. We will consider the process of analysis and synthesis of level of satisfaction on three time domains:

$$[t_{i-1}; t_i], i = \overline{1,3}.$$

As be indicated higher, for description of the state of satisfaction we will use usual linear differential equalization with variables in time by coefficients and arbitrary right part. This equalization the process of change of level of satisfaction corresponds that on a time of  $i$  domain, according to the verbal description that further we will name basic done higher, looks like:

$$dX_i/dt = a_i X_i + b_i, \quad X_i(t_{i-1}) = X_i^0, \quad t \in [t_{i-1}; t_i], i = \overline{1,3},$$

where denotations are entered:  $X_i$  is a state variable characterizing the level of satisfaction on a time domain number of  $i$ , changing in the set eventual interval  $X_i \in [X_i^L; X_i^B]$ , where lower and overhead borders and numbers into an interval must be set on sense of research, for example, as follows: +10 – primely, or perfectly with a plus, +8 – perfectly, +6 – well, +4 – well with minus, or "normally", +2 – satisfactorily, 0 – satisfactorily with minus, -2 – tolerantly, -4 – tolerantly with minus, -6 – badly, -8 – very badly, -10 – unbearably;  $X_i^0$  is an initial condition for the interval of  $i$ , that for  $i=1$  is set, and for  $i>1$  determined according to the condition of continuity of the examined process by dependence:

$$X_i^0 = X_{i-1}(t_{i-1}), i = \overline{2,3}.$$

In basic equalization the function of time, determined by a formula, marks the symbol of  $a_i$  in general case:

$$a_i = q_i/(t_i - t_{i-1}),$$

where  $q_i$  – in general case depending on time personality index on the stage of  $i$ , determined on the formula over, that in this consideration of signs kind, brought before:

$$q_i = \prod_{k=1}^N (Q_{ik}), i = \overline{1,3},$$

where  $N$  is an amount of personality properties (component of personality index),  $Q_{ik}$  – in general case depending on time index of personality property a number of  $k$  is a component of personality index number of  $k$  on a time of  $i$  domain.

In basic equalization the function of time, qualificatory affecting time of  $i$  domain and determined by dependence, marks the symbol of  $b_i$  in general case:

$$b_i = \sum_{j=1}^3 (p_{ij}k_j), j = \overline{1,3},$$

where  $p_{ij}$  – a size the time over of  $i$  influence of  $j$ , brought to the interval is determined on a formula:

$$p_{ij} = f_{ij}/(t_i - t_{i-1}),$$

where  $f_{ij}$  – the sizes of initial influences of  $j$  on a time of  $i$ , domain are determined according to verbal description on formulas:

$$f_{i1} = F_i, \quad f_{i2} = \sum_{k=1}^N (U_{ik}/Q_{ik}), \quad f_{i3} = \sum_{k=1}^N (Q_{ik}S_{ik}),$$

and we will name accordingly these initial *influences force, by a manager, and influence of self-government*; in these formulas denotations are entered:  $F_i$  – in general case function of time, qualificatory the size of a force affecting time of  $i$  domain;  $U_{ik}$  – in general case function of time, qualificatory the size of managing influence of  $k$  on a time of  $i$  domain;  $S_{ik}$  – in general case function of time, qualificatory affecting of self-government of  $k$  time of  $i$  domain; under a sign a sum in a formula for the  $b_i$  size of  $k_j$  are coefficients the rate fixing determined from terms:

$$k_j = \arg\{Y_i, i = \overline{1,3}\}, j = \overline{1,3},$$

where  $Y_i$  – is a middle level of satisfaction on a time domain  $[t_{i-1}; t_i]$ , determined on a formula:

$$Y_i = [1/(t_i - t_{i-1})] \int_{t_{i-1}}^{t_i} X_i(t) dt, \quad i = \overline{1,3},$$

where  $X_i(t)$  is decision of basic equalization.

Further letups we will do for the special case characterized by constancy in time of  $a_i$ ,  $b_i$  with the purpose of receipt of analytical decision of basic equalization with possibility of further research. For determination of coefficients of  $k_j$  we will find the decision of basic equalization, as a result we will get expression for a state of  $X_i$ , for that we will enter denotation, variable:

$$X_i^t = X_i(t) = X_i^0 \text{EXP}(a_i(t - t_{i-1})) + b_i[\text{EXP}(a_i(t - t_{i-1})) - 1]/a_i, \quad t \in [t_{i-1}; t_i], \quad i = \overline{1,3}.$$

At  $t=t_i$  this expression will assume an air:

$$X_i^i = X_i(t_i) = X_i^0 \text{EXP}(a_i(t_i - t_{i-1})) + b_i[\text{EXP}(a_i(t_i - t_{i-1})) - 1]/a_i, \quad i = \overline{1,3}.$$

We will enter denotations:

$$E_i^t = \text{EXP}(a_i(t - t_{i-1})), \quad G_i^t = (E_i^t - 1)/a_i, \quad X_i^i = X_i(t_i), \quad E_i^i = \text{EXP}(a_i(t_i - t_{i-1})), \\ G_i^i = (E_i^i - 1)/a_i.$$

Using these denotations, we will rewrite previous two expressions:

$$X_i^t = X_i^0 E_i^t + b_i G_i^t, \quad t \in [t_{i-1}; t_i], \quad i = \overline{1,3}, \quad X_i^i = X_i^0 E_i^i + b_i G_i^i, \quad i = \overline{1,3}.$$

Determining the mean value of function of  $X_i(t)$  on a time domain  $[t_{i-1}; t_i]$ , we get equalization for the middle level of satisfaction :

$$E_i^E X_i^0 + G_i^G b_i = Y_i, i = \overline{1,3},$$

where denotations are entered:

$$E_i^E = G_i^i / (t_i - t_{i-1}), \quad G_i^G = (E_i^E - 1) / a_i.$$

Deciding equalization for the middle level of satisfaction relatively  $b_i$ , we will get:

$$b_i = (Y_i - E_i^E X_i^0) / G_i^G.$$

Defining  $b_i$ , we will make and will find the decisions of the system of linear equalizations relatively  $k_j$ :

$$\sum_{j=1}^3 (p_{ij} k_j) = b_i, i = \overline{1,3}.$$

Defining the decisions of basic equalization for every time of  $i$  domain, it is further necessary to draw on these results for determination of sizes of coefficients of  $k_j$  in the real turn-downs of initial parameters of  $Q_{ik}, F_i, U_{ik}, S_{ik}$ :

$$Q_{ik} \in [Q_{ik}^L; Q_{ik}^B], F_i \in [F_i^L; F_i^B], U_{ik} \in [U_{ik}^L; U_{ik}^B], S_{ik} \in [S_{ik}^L; S_{ik}^B],$$

where the left and right border numbers in these ranges must be set. In particular, reasoning over, on the basis of that these border numbers are set for the array of  $Q_{ik}$ , were higher brought. And in general case it is necessary to execute separate description: 1) on accordance of border numeral values of arrays of  $F_i, U_{ik}, S_{ik}$ ; 2) on accordance of numeral values of arrays to the certain verbally described influence. It is possible for the array of  $F_i$ , for example, to enter the sizes of force influences from the side of environment on the ten-point system: 10 - primely step-up the level of satisfaction; 8 - perfectly step-up; 6 - well step-up; 4 - satisfactorily step-up; 2 - badly step-up; 0 is absence of influence; - 2 - a bit reducing the level of satisfaction; - 4 - middling reducing; - 6 - reducing higher than middle; - 8 - strongly reducing; - 10 - so much reducing. For the arrays of  $U_{ik}, S_{ik}$  can, for example, to enter the sizes of managing influences and influences of self-government on the analogical ten-point system given above for every component of personality index and rendering influences on every component of personality index.

## **Conclusion**

On the basis of the executed mathematical description an algorithm is made and the program of decision of the examined task is worked out [10]. For the analysis of level of satisfaction on the entrance of the program it is necessary to set numbers: a 1) initial level of satisfaction in the accepted points (from - 10 to +10), 2) personality index in the accepted numbers (from 5 to 1), 3) managing influence in the accepted points (from - 10 to +10), 4) time on that an analysis is conducted domain: initial and eventual values of time. On the exit of the program the level of satisfaction hatches depending on time on the set interval, Analysing behavior of this function, it is

possible to draw conclusion about that, through what time domain by a man some set level of satisfaction will be attained. Conducting such analysis for a group from a few persons, it is possible to draw conclusion about a time of achievement of the set level of satisfaction of this group domain. For the synthesis of level of satisfaction on the entrance of the program it is necessary to set: a 1) initial level of satisfaction in the accepted points (from - 10 to +10), 2) personality index in the accepted numbers (from 5 to 1), 3) the required level of satisfaction in the accepted numbers (from - 10 to +10), 4) initial and eventual moments of time of process of change of level of satisfaction. The size of managing influence at that the required level of satisfaction is arrived at for the set time domain hatches on the exit of the program. Calling to the price-list (to the list of accordance of managing influences in points to their material and moral values for a man), it is possible to specify, what material or moral values are necessary to be used for the achievement of the indicated required level of satisfaction. Deciding the task of synthesis for a few managers of influences and for a group from a few persons, it is possible to draw conclusion about necessary events for an increase or reduction of levels of satisfaction of this group.

### **References**

1. Amosov N.M. Algorithms of reason. – Kiev, 1979.
2. General enough theory of management // Raising materials of course of lectures on the faculty of the applied mathematics and processes of management of the Saint Petersburg state university. – Spb., 2003.
3. Kulikov L.V. Descriptions of satisfaction by life // Society and politician / Editor V.YU. Bolshakov. – Spb., 2000.
4. Mathematical methods are in sociology / Scientific editor F.M. Borodkin. – Novosibirsk, 1974.
5. Nasledov A.D. Mathematical methods of psychological research. Analysis and interpretation of data. – Spb., "Rech", 2004.
6. Nemov R.S. Psychology: Train aid. Book 1. General bases of psychology. – M.: VLADOS, 1997.
7. Sukhodolskiy G. V. Mathematical methods of psychology. – Spb., 2003.
8. Khell L., Zigler D. Theory of personality. – 3th international edition, 2003.
9. Shmelev A.G. Psychoactivator of personality lines. – Spb., 2002.
10. Shchipitsyn A.G. Program of analysis of level of satisfaction by life // Testifying to registration of electronic resource № 20330 from 12.08.2014.