METHOD OF STRUCTURING THE SELF-ORGANIZED INTELLECTUAL SYSTEM ON THE BASIS OF REQUIREMENTS OF THE ISO/IEC 15288 STANDARD IN THE FORM OF THE CARTESIAN CLOSED CATEGORY. (ON THE EXAMPLE OF DESIGN OF INFORMATION AND ANALYTICAL SYSTEM)

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Abstract *In article approach to formation of structure of the self-organized system is considered. The method of transition to the quantitative multiple description of information processes and application of requirements of the ISO/IEC 15288 standard is shown. The rule of synthesis of the self-organized structure of models of process is offered. The possibility of parametrical control of a condition of processes is shown.*

1. Introduction

Today, a particular interest is given to analytical information systems with elements of intellectual management, capable to generate not only strictly regulated reports, but also inquiries upon the demand of the persons, making decisions (P.M.D).

Таким образом, становится актуальным проектирование аналитических информационных систем, которые могут быть использованы большими компаниями, решающие задачи управления персоналом, кадровым резервом, талантами, показатели, которых, являются критериями эффективности.

Thus, there is relevant a design of analytical information systems which can be used by the big companies, the solving human resource management problems, a personnel pool, talents, indicators which, are criteria of efficiency.

Compliance of traceability of information objects, traceability of real objects, parameters for the knowledge base and design of information and analytical system. At the abstract level of the studied educational production systems we will apply to definition of real objects and compliance to their information objects and traceability concepts and rules of the ISO/IEC 15288 standard "System engineering". We will note that the concept of this standard completely answers concepts to rules Cartesian the closed system.

The main objective of design of information and analytical system at decomposition of abstract level naturally consists in ensuring isolation at the lower levels. It will correspond to laws according to logic of a statement of Aristotle and formal logic of the first order. In this case, logical contradictions at the solution of problems of identifiability and traceability of information objects will be excluded. It is system model of formal system.

$$FS = < M_n, P(M_n), O >$$, where

FS – formal system;

M_n – set of carriers;

P – predicates on M_n;

O – set of operations (algebra).

If O – the empty set, formal system degenerates system model (SM). If $P(M_n)$ is an empty set, the algebra turns out. Predicates are the statements expressed by sizes the truth or a lie. If predicates aren't certain, then they can't be expressed.

We will understand the organized system including a set of components as system model: in structural, information, semantic, linguistic, mathematical and other representations [1].

If the predicate set is defined by logic of a statement or formal logic of the first order if it Cartesian is closed, then this model will be consistent on structure, but it is consistent concerning logic of the first order since it besides formal logic goes the logician of the second order or the logician Hegel. Here identifiers of the first order during time don't change. And at logic of the second order information objects can change.

Processes of life cycle of the ISO/IEC 15288 standard of "System engineering" such as, processes of the enterprise, processes of the project and technical processes help effective formation and use of systems, promoting achievement of the goals of the enterprise. And processes of the agreement represent working relationship, by the conclusion of the agreements which are of the greatest interest to us [3].

Use of this standard will allow to provide compatibility various a component among themselves (components – objects of the real world which are a part of PS).

ISO/IEC 15288 "The system engineering" represents a stock of knowledge and the integrated system of thinking about intellectual content, allowing to create a technical basis for combination of requirements of the market [1].

For structuring a program system, we will consider stages of ZhTs of a program system, having described each stage as the separate module of the program, taking into account requirements of the standard ISO/IEC 15288:

1. Concept (plan);
2. Development;
3. Manufacture;
4. Application;
5. Application support;
6. Phase-out and write-off.

We will consider this theory on the example of management of a personnel pool.

We will consider the main business process from the point of view of system approach, having applied idef0 methodology, to further formation of model of a personnel pool [4].

Methodology – set of the methods which are eaten around by common goals and tasks.

This model submits a set of hierarchical charts, each of which describes function and is divided into subfunctions. The system can be presented in the form of a set of processes And, carrying out transformation of elements of system (entrances, exits, management, mechanisms of management) (Fig 1).

Present I_i – set $\{j_1..., j_K\}$ process entrances A_j, O_i – set $\{o_1..., o_\kappa\}$ process exits A_j, C_i – set $\{c_1..., c_N\}$ managements of process A_j, M_i – set $\{m_1..., m_P\}$ mechanisms of management of processes A_j.

Therefore, process can be presented in the set form:

$$Aj = < I_i, O_i, C_i, M_i >.$$

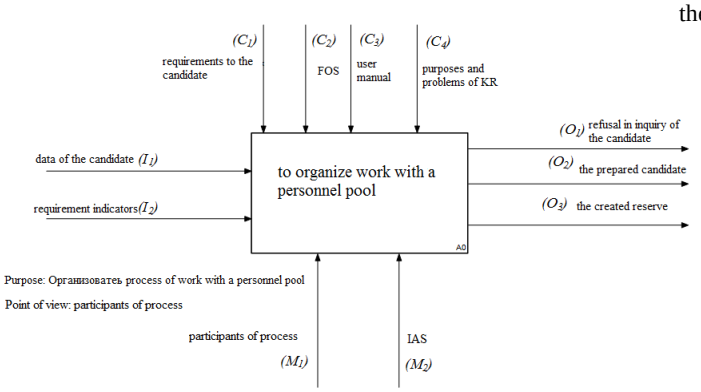

Fig 1. *– Contextual chart of process of work with a personnel pool*

With use of set-theoretic modeling, this process it is possible to present sets in the form A_0= {A_1, A_2, A_3, A_4} subprocesses [5].

We will consider separately each process of work with a personnel pool:

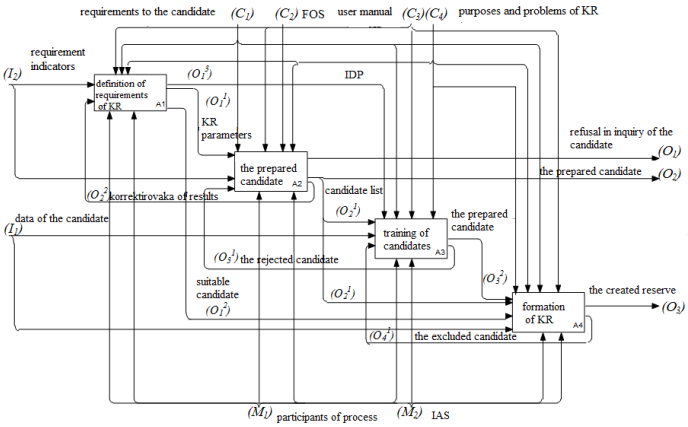

Fig 2. – Decomposition of the contextual chart of process of work with a personnel pool

A_1 – Definition of needs for a personnel pool. This process is characterized in definition of requirement of number of reservists and official structure: internal resources of the enterprise are analyzed. Upon termination of decisions are made: to attract candidates "from the outside", to partially retrain the working experts, to reduce personnel, the suitable candidate (Fig 2.).

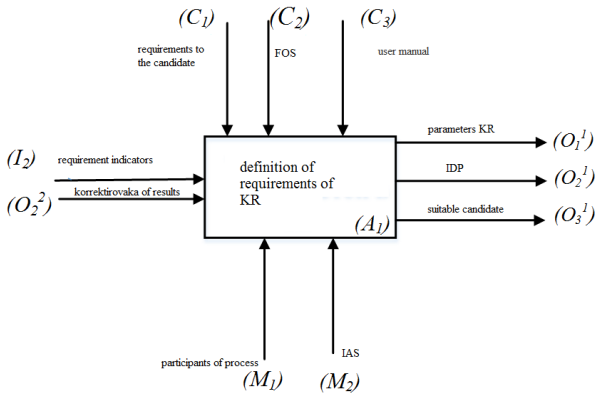

Fig 3. *– Process of definition of needs for KR*

With use of set-theoretic modeling, this process can be presented in the form (Fig 3.**)**:

$$A_1 = (I_2, O_2^2, C_1, C_2, C_3, M_1, M_2, O_1^1, O_2^1, O_3^1)$$

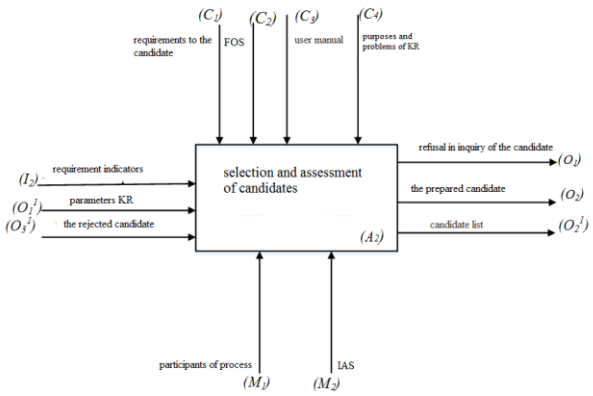

Fig 4. *– Process of selection and assessment of candidates*

A_2 – Selection and assessment of candidates. This process represents, selection of candidates for different types of a reserve and also their assessment for requirements, the purposes and problems of a personnel pool of the enterprise (Fig 4).

This process can be presented in the form:

$$A_2 = (I_2, O_1^1, O_3^1, C_1, C_2, C_3, C_4, M1, M_2, O_1, O_2, O_2^1)$$

A_3 – Training of candidates. After selection and assessment of candidates is carried out, the individual development plan (IDP) which has included training of candidates is formed. Following the results of training the analysis of efficiency of training of candidates is carried out and the decision on inclusion in a reserve, or carrying out additional training is made (Fig 5).

This process can be presented in the form:

$$A_3 = (I_1, O_2^1, O_4^1, O_1^3, C_1, C_3, C_4, M1, M_2, O_3^1, O_3^2)$$

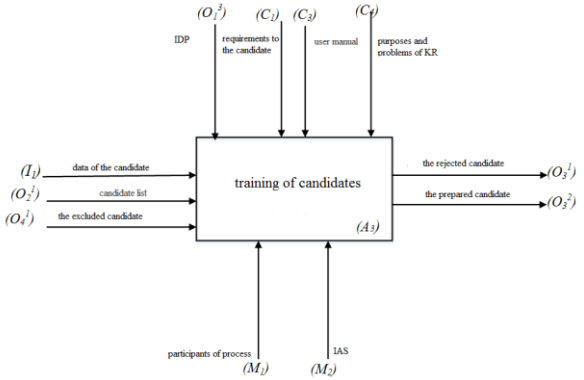

Fig 5. *– Training of candidates*

A_4 – Formation of a personnel pool. When forming a personnel pool in an information system the following operations are performed:

– coordination of the list of candidates for a personnel pool;
– inclusion of employees in a personnel pool;
– movement of the employees consisting in a reserve of other position in a reserve;
– exception of employees of a personnel pool;
– approval of structure of a personnel pool (Fig 6).

This process can be presented in the form:

$$A_4 = (I_1, O_2^1, O_1^2, O_3, O^1_4, C_1, C_2, C_3, C_4, M1, M_2)$$

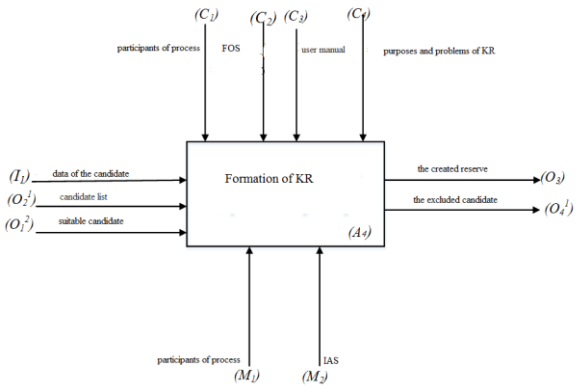

Fig 6. *– Formation of a personnel pool*

This process consists of a set $A_0 = \{A_1, \ldots, A_4\}$ подпроцессов.

With use of set-theoretic modeling, this process can be presented in the form:

$A_1 = (I_2, O_2^2, C_1, C_2, C_3, M1, M_2, O_1^1, O_2^1, O_3^1);$

$A_2 = (I_2, O_1^1, O_3^1, C_1, C_2, C_3, C_4, M1, M_2, O_1, O_2, O_2^1);$
$A_3 = (I_1, O_2^1, O_4^1, O_1^3, C_1, C_3, C_4, M1, M_2, O_3^1, O_3^2);$
$A_4 = (I_1, O_2^1, O_1^2, O_3, O^1_4, C_1, C_2, C_3, C_4, M1, M_2)$

For this purpose we will determine external parameters and modules which will be rather independent. As a result, if it is necessary to replace some stage, we replace only this module. Considering the relations which can be formalized, i.e. to exclude these relations from the text of the module, and to use them as the knowledge base i.e. as the table on which he will work.

Communication between these modules, can be defined according to the ISO/IEC 15288 standard "System engineering", namely in the form of categories of sets.

At design of information and analytical system, the theory of categories allows to describe the relations of objects in a program system, having left for later the description of properties of objects. eventually it allows to exclude the semantic description from a program code, entering elements of formalization and writing down in the form of rules in knowledge bases. Considering that IAS modules can be used as objects, it allows to construct adaptive system which will be considered as universal to change of external data.

Such mechanism allows to study subject domain on the other hand and to develop a compact and universal program system. Since the program works on the set algorithm and it can be changed, adding only other parameters to KB.

For design of the IS database the object and relational database management system with the open PostgreSQL code was used. Unlike other databases, for example, of MySQL, MariaDB and Firebird which aren't object and relational, PostgreSQL provide more powerful functionality. The choice of a DB is caused by presence of the following advantages at her, PostgreSQL:

- the reliable, integrated and scalable DBMS;
- it is started on all main platforms, including Windows;
- supports a set of types of data;
- provides the expanded capacity of data;
- have API for C/C++, Java, Perl, Python, Ruby and others;
- being DBMS of a class of the enterprise, provides such features as restoration on a point in time, preservation points, anticipatory journalizing on a breakage case;
- can process many data;
- careful attitude to integrity of data.

Thus, application of the given method allows to use PostgreSQL not only as the powerful database management system allowing to provide activity of the organization, but also as the platform of applications programming, demanding use of relational DBMS.

Conclusion

By the conducted researches it is established that this method can be used for many business processes of the organizations, and the parameters determined by this method form category, can be reduced in a multidimensional matrix (an analog of a matrix of J. Zakhman) and finally are used at the description of the specification on development or reengineering of IAS.

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