Informative Support of Acceptance of Administrative Decisions is on the Basis of Integration of Productive Data

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Abstract — **In materials description of mathematical design of productive data is presented and conceptual determinations of design of process of integration of data are offered. It is set that the use of associate models of semantic nets of productive data will allow to carry out integration of productive processes on the stages of technical preproduction and production of wares, that provides informative support of processes of acceptance of reliable administrative decisions.**

Keywords — productive data, integration of data, integrated automated systems, semantic design, integrated data.

I. INTRODUCTION

Historically on every enterprise there are different information CASS that mostly function independently one from other and decide the class of tasks. Productive tasks are certain decide ineffective or not decide in general without the general use of data at once a few CASS, that and does actual the task of integration of CASS for to data. Undoubtedly, that actuality of task of integration the higher, than higher level of her users is in control system by data (for making decision in the scale of enterprise with the large fate of authenticity the necessary are given from different subdivisions, different subject domains and, accordingly, different CASS). Informative CASS from different developers use the own formats of presentation of data. Thus, from one side, information about wares is duplicated and not always actual, that results in her un authenticity and incompleteness. On the other hand, for support of acceptance of administrative.

II. ANALYSIS OF LITERARY DATA AND RAISING OF PROBLEM

There are different approaches to the decision of the indicated tasks. In works [1-4] the different methods of forming of the integrated informative environment are offered: from creation of the systems on the basis of only structure of data to the use of large arrays (depositories) of data, and also universal platform of business-integration, that would unite different technologies in an only software product that will decide the tasks of integration of corporate additions. Going is perspective near server powers, facilities of storage, to computer services and additions, as to the universal resources. For the decision of separate tasks of integration of CASS and data integration brokers, facilities of design of productive processes, are used, servers of additions and other However, at such approach complication of project – plenty of various tools grows it will be to use for development, and after introduction it will be needed to support the separate components of integration decision [5, 6]. In force of this complication most projects of integration of CASS and data did not attain all it aims. Nevertheless the only going near realization of process of integration of the systems and data is absent.

In opinion of authors of the article, a successful alternative to the considered approaches is creation of branch integration platforms that combine in itself flexibility and powerful possibilities of universal platforms with the productivity and subject oriented of partial decisions. Understanding it, the developers of software for integration create the certain templates of integration decisions, that are based on universal platforms. However, these templates of integration are accessible only for a limit amount of CASS after a functional (mainly unproductive spheres, financial) and does not solve problem additional cost of introduction and service.

A research object are processes of integration of informative CASS of the productive setting. The aim of work is presentation of results of researches from the mathematical design of processes of integration of data at the level of development and use of models of semantic nets of productive data on the stages of technical preproduction. For the put aim it was necessary to decide next tasks:

- to work out the mathematical model of integration of productive data;

- to offer the mechanism of integration of CASS of the productive assigning for the stages of technical preparation.

III. OBJECT, AIM AND RESEARCH TASKS

Analysis of problem tasks of research, design aims, and also discrete nature of processes of technical preproduction, showed efficiency of the use at high level of abstraction of set-theoretic vehicle for the construction of mathematical model of integration of data [7].

The universal format of exchange of data is used, that is worked out on the basis of methodology of XML. He allows in an only kind to describe the structure of data operate that in the only consolidated environment enterprises. The choice of XML

as a basic definition of data language allows to for man present the general chart of any package of data. The uses of modern facilities of programming (for example, Microsoft.Net or Sun Microsystems Java) here allow to create the real objects that is built from XML- of description (the so-called procedure in-memory.

The worked out mathematical model of processes of integration of productive data must provide an exposure and formalization of relations between objects and systems. The base concept of the offered model is a concept of information holding object. As a rule, objects answer entities of subject domain, every object is characterized by the values of the set set of attributes. Possibly an information holding object is determined as a great number of or derpairs of kind:

$$x = \{< a_1, d_1 >, < a_2, d_2 >, \ldots, < a_n, d_n >\},$$

$a_i \neq a_j$, $i \neq j$, $i, j \in [1 \ldots n]$,

where a – the name of attribute; d – avalue of attribute.

For formal presentation in a general view under the integrated CAS will understand such pattern of information, that describes descriptions of objects, that is included in the system and great numbers of information holding objects and their intercommunications that satisfy this chart. Determination 1. Name a great number the pattern of information:

$$S =< A, D, T, \varphi, \delta >,$$

where $A = \{a_1, a_2, .., a_k\}$ great number of attributes of information holding objects;

$D = \{D_1, D, \ldots, D_m\}$ – totality of great numbers of possible values of attributes;

$T = \{t_1, t_2, \ldots, t_l\}$ – great number of types of objects;

$\varphi : A \to D$ – inter communications that put in accordance to every attribute great number of him possible values;

$\delta : T \to 2^A$ – reflection that sets the great number of attributes for every object.

Determination 2. In the general view of IAS, built on the chart of S name the great number of elements:

$$U^S =< S, U, \gamma >,$$

where $S =< A, D, T, \varphi, \delta >$ – pattern of information;

$U = \{x_1, x_2, \ldots, x_n\}$ – great number of information holding objects;

$\gamma : U \to T$ – reflection that puts in accordance of object his type and for any information holding object $x \in U$ executed terms:

1 Great number of attributes answers as $\{a :< a, d >\in x\} = \delta(\gamma(x))$

2 For any pair $< a, d > \in x$ have $d \in \varphi(a)$

The changes of IAS will set are flection $F : W^S \to W^S$, where W^S – great number of all IAS, that satisfy a chart S.

$$U^S = \{U_1^{S^1}, U_2^{S^2}, \ldots, U_N^{S^N}\},$$

where $U_i^S =< S_i, U_i, \gamma_i >$, $S_i =< A_i, D_i, T_i, \varphi_i, \delta_i >$,

$$\bar{S} = \{S_1, S_2, \ldots, S_N\}, \quad \bar{A} = Y_{1 \le i \le N} A_i, \quad \bar{D} = Y_{1 \le i \le N} D_i, \quad \bar{T} = Y_{1 \le i \le N} T_i, \quad \bar{U} = Y_{1 \le i \le N} U_i. \qquad (1)$$

Great number of IAS $U^{\bar{S}}$ is faithful, if exist $\bar{\varphi} : \bar{A} \to \bar{D}$, $\bar{\delta} : T \to 2^{\bar{A}}$, $\bar{\gamma} : \bar{U} \to \bar{T}$, what are expansion of corresponding inter communications $\varphi_i, \delta_i, \gamma_i (1 \le i \le N)$.

Determination 3. If great number of IAS $U^{\bar{S}}$ is faithful, then IAS:

$$U =< \bar{S}, \bar{U}, \bar{\gamma} >,$$

where $\bar{S} =< \bar{A}, \bar{D}, \bar{T}, \bar{\delta}, \bar{\varphi} >$ is name integrated on $U^{\bar{S}}$ (figure 1).

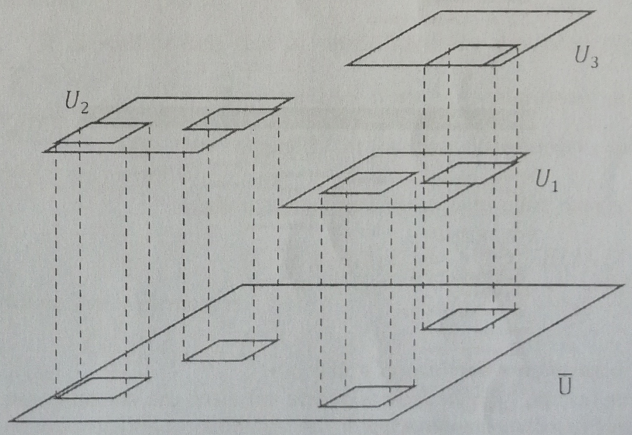

Fig. 1. Distribution of objects is in the system

As a rule, the systems must satisfy to more severe requirements, than accordance to the certain chart [8]. Such requirements are laid on by different semantic dependences that determine, what states of informative systems is possible, and use for the concerted change of data in IAS. Thus, the aim of integration consists in maintenance of accordance of great numbers of IAS to the set of semantic dependences [9].

Determination 4. By the semantic dependence set on U^S, will understand c-predicate that is set on W^S.

Great number of semantic dependences $C=\{c_1,c_2,\ldots,c_p\}$ is just, if there is such IAS U^S, what $c_i(U^S)$ for all $1\le i\le p$.

In practice dependence between the systems must be erected to dependences between the types of component in them objects. Let great number of all possible information holding objects X_{t_i} satisfies to the chart and has a set of attributes corresponding as t_i:

$$X_{t_i}=\left\{\begin{array}{l} x: x=\{<a_1,d_1>,<a_2,d_2>,\ldots,<a_n,d_n>\}\ \& \\ \&\left(A^x=\delta(t_i)\right)\&\left(\forall a_i\in A^x, a_i(x)\in\varphi(a_i)\right)\end{array}\right\}.$$

To further a few types of dependences, characteristic for the real connections between information holding objects, will be driven. Semantic dependence will name T-dependence, if for objects $x_i\in X_{t_i}$, $x_j\in X_{t_j}$ it is determined by the predicate of kind $\alpha(x_i,x_j),\beta(x_i,x_j)$.

Such dependence allows to check only a presence orabsence of violations of dependence and does not offer themechanism of correction of great number of IAC inaccordance with the set limitations. T- dependence is between types $t_i,t_j\in T$ will name V-dependence $(t_i\overset{V,\alpha,\beta}{\leftrightarrow}t_j)$, if there is a reflection $V: X_{t_i}\times X_{t_j}\to X_{t_j}$ such that executes a condition :

$$\alpha(x_i,x_j),\beta(x_i,V(x_i,x_j)).$$

There is a reflection of V, that allows to get, going out values as t_i and t_j, new value as t_j, what will satisfy to the set predicate . A basic problem that arises up at the reflection of V is a presence of cyclic sequence of dependences that can result in an unfinished recursion in accordance to adjustment of dependent objects. It is set that the use of V-dependences does not guarantee the presence of automatic procedure of concerted adjustment great number of IAS [8, 9]. Great number of attributes $K(t_i)\subseteq\delta(t_i)$ will name the key as $t_i\in T$, if $\forall x^{\cdot}\in U$ is executed $\{x: x\in U, a(x)=a(x^{\cdot}),\forall a\in K(t_i)\}=\{x^{\cdot}\}$.

Key attributes $a\in K(t_i)$ determine any information holding object from the great number of U.

A-dependence $(t_i\overset{A^{\cdot},A^{\cdot\cdot}}{\leftrightarrow}t_j)$ will name V- dependence of the special kind: $A\subset K(t_i)$, $K(t_j)=\varnothing$, than:

$$\alpha(x,y)\equiv\forall a\in A^{\cdot}, a(x)=a(y),$$

$$\beta(x,y)\equiv\forall a\in A^{\cdot\cdot}, a(x)=a(y),$$

$$V(x,y)=\{<a_1,d_1>,<a_2,d_2>,\ldots,<a_p,d_p>\},$$

For any faithful great number of A-dependences $C=\{c_1,c_2,\ldots,c_p\}$ is procedure, that allows to correct IAS U^S, using the eventual sequence of reflections V_i, corresponding T-dependences from C, so that U^S will satisfy C.

Key attribute $a\in\delta(t_j)$ will name dependent (adopted) for t_j, if exist $A^{\cdot},A^{\cdot\cdot}$ are such, that $a\in A^{\cdot\cdot}$ and $(t_i\overset{A^{\cdot},A^{\cdot\cdot}}{\leftrightarrow}t_j)$. In opposite case, attribute $a\in\delta(t_j)$ name a free(own) attribute. Attributes of information holding objects $x\in U^S$ can be attributed to one of 3th groups: key, free and dependent attributes. In practice during integration of data in IAS does a question appear: "How to minimize intercommunication between IAS without the loss of integrity, correctness and availability of information"? For the decision of this task it is necessary to estimate the degree of intercommunication between IAS. Degree of intercommunication as $t_i\in\overline{T}$ from IAS U_j will name $R(t_i,U_j)$ – amount of connections $c\in C$ of kind $t_i\leftrightarrow t$, where $t\in T_j$.

It is well-proven that at up-diffused the unrelated types $T^{\cdot}=\{t_1,t_2,\ldots,t_k\}\subseteq\overline{T}$ for IAS from $U^{\overline{S}}$ minimum value $R(U^{\overline{S}})$ will be attained at their distribution after $U^S_{i_1},U^S_{i_2},\ldots,U^S_{i_k}$ such, that maximal value k-measure matrix G,

$$G[i_1,i_2,\ldots,i_k]=\sum_{j=1}^{k}\sum_{U_{i_j}\in U^S}R(t_j,U_{i_j})$$

where every element is $G[i_1,i_2,\ldots,i_k]$, is . The considered mathematical presentations are basis for semantic dependences and creation of information technology of integration of data of select subject domain (figure 2).

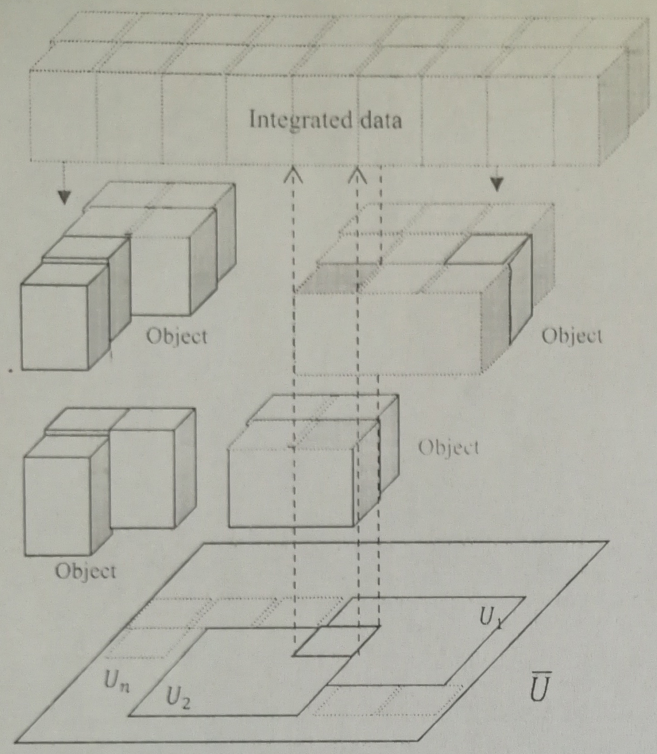

Fig. 2. Chart of co-operation of information holding objects

The level of model abstraction falls down on the next stage of design, the basic classes of objects of the integrated in formative environment, for that a structure is determined, are distinguished: properties, behavior and intercommunications of data. The multilevel objective chart of IAS, in that a base class for objects is a class the "Information holding object" basic elements: key attributes, state and methods that change the state), is built

The descendants of class the "Information holding object" is classes and element of classes ("Real object", "Virtual object", "Classifier" and other), that peculiar static elements, that characterize the semantic features of class, and dynamic elements for maintenance of history of changes of corresponding parameters. Further expansion of objective chart takes place depending on the specific of select subject domain [10].

For presentation of all information holding objects the language of marking of XML is used. Transformation of the informative systems, description of pattern of information of the system, is set corresponding XSLT-by transformers, that allows to set difficult transformations of documents on the basis of the compact declarative programs.

ACKNOWLEDGMENT

As a result of undertaken studies:

1. The mathematical design of process of integration of productive data is conducted, that provides an exposure and formalization of relations between objects and integrated CASS.

2. The set basic determinations are for the construction of models of semantic nets of productive data, that allow to structure the process of semantic design of data and formalize intercommunications of productive data.

3. Offered approach to integration of processes of technical preproduction, that is based on transformation of logic of intercommunication of base objects of "good", "resource" and "process" from informative and functional models in the semantic model of data. Such formalized presentation of base objects and their intercommunications is offered for the complex design of processes of technical preparation of order production with the aim of their automation and integration.

4. It is set that uniting data and knowledge in semantic models it is possible to create the intellectual informative environment of IAS productive.

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