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BUSINESS DATA PROCESSING BASED ON ALGEBRA-LOGICAL MODELS

Issues of business information processing, which are necessary for management decision- making, are considered in the article. Algebraic-logical models, which allows to process heterogeneous information obtained from various sources are presented. In the case study the reference model of business information processing on the stage of project plan elaboration is presented. Correspondence between an artifact and associated with it requirement is performed by comparator identification.

Keywords: *business data processing, model, decision making, predicates algebra, comparator identification.*

Research Problem

For efficient business performance it is necessary to work with large amounts of data from different sources. The process of decision-making requires processing of big volumes of heterogeneous, non-formalized, fuzzy and conflicting data. This is demonstrated the need to make research directed on the improvement of existing systems and the development of new information technologies of data processing for management goals.

The existing approaches are focused on the information that is collected inside the system. In this case data retrieved from external sources are used only for description of the external environment. This causes the need to explore the possibilities of using the external information for management purposes.

The existing management methods are based on the usage of expert information. This confirms the relevance of the research in the direction of the further development of expert methods, namely the issues of forming, processing and combination of scales used by experts for estimation.

The above conclusions result in the necessity not only to improve existing models and methods of management but to search for the new data sources for management and new ways of solving the problems of business performance and business management.

Besides nowadays large and middle-scale enterprises face with the problems of processing of data stored in their repositories. The competitiveness of companies and their role in the global business environment directly depends on the up-to-date data used for decision-making. Enterprise's management is interested in timely data analysis related to both financial and non-financial aspects of business processes. Therefore the problems of relevant data sources search, data extraction and processing are essential for enterprises.

Analysis of Recent Research and Publications

Processing of business data is considered from different points of view [1; 2]. One of the common problems of business information analysis is fusion of data from various sources. Data fusion is a multifaceted process dealing with the automatic detection, association, correlation, estimation, and combination of data and information from single and multiple sources [3]. We can distinguish many levels of information fusion: starting from the fusing of low level sensor signals to fusion of complex knowledge structures [4]. In any case the reason for data fusion is the existence of multiple sources of data in different formats.

There are two basic purposes of business data fusion and analysis - diagnostics and situation monitoring. Making a business conclusion requires necessary and sufficient amount of information related to all observed indicators. Fusion of this information and its usage for decision-making is considered in [5]. Monitoring of a company business situation presumes continuous collection of data on vital indicators and its processing in order to estimate the current state of business situation and its changes in time. The problems of data fusion on different indicators during business situation monitoring are discussed in [2; 6; 7].

In the context of business information integration we can discuss several kinds of data to be fused. There are financial reports, resources usage and market analysis. Resources usage data fusion is widely researched in [8–11]. Fusion of financial reports obtained from multiple report forms is considered in [5; 12]. Merging of market information from various sources of business records is described in [2; 6]. Depending of the type of data to be fused authors use different algorithms and models to get the results.

The Article goal

So the goal of this work is the improvement of business data processing by means of algebra-logical models.

We suggest using methods of finite predicates algebra and comparator identification for business data processing gathered from both internal and external data sources and combines them in order to obtain a broad picture and fully evaluate management efforts. We are oriented on the improvement of business data processing of information used for decision-making in business performance.

Methods

The most promising today is using of models and methods of information technology, based on the results obtained in solving problems of artificial intelligence. The science that studies the mechanisms of natural intelligence in order to use the knowledge gained to create artificial intelligence systems is called the Theory of Intelligence [15].

The existence of finite predicates algebra discovers an opportunity for transition from the algorithmic description of information processes to their description as equations which set the relationship between variables. All variables in the equation are equal, any of them can act as independent and as a dependent one. This equation gives the advantage over algorithms that can calculate the system response even with incomplete certainty inputs, while algorithm is fully disabled. It was established that under changes of knowledge about the object of equations assigned to the structure of the system is always ready for use, and the algorithm often requires a radical change in its structure.

Every subset T of space U^m is called m-local relationship which is given on space U^m. We use explicit case for setting a finite alphabet operator for formula record of such relationships, which is the basic for hardware method of solution the equalities of finite predicates [16]. The algebra of predicates over M is called the set T with basic elements x_i^a ($i=\overline{1,m}$, $a \in U$) and basic operations: disjunction, conjunction, negation. Excluding the operation of negation from basics of given algebra gives us a possibility to obtain disjunctive-conjunctive algebra.

Further let's look on the notions of algebra predicates. Let's take some non-empty set U, elements of which we will call subjects. The set U is called universum of subjects. Now we take m some non-empty, not obligatory different subsets $A_1, A_2, A_т$ of universum U. Cartesian product $S = A_1 \times A_2 \times ... \times A_т$ of sets $A_1, A_2, A_т$ is called the subject space S with coordinate subject axes $A_1, A_2, A_т$ over universum U. Number of axes т is called the space dimension S. Let's introduce set $V = \{õ_1, õ_2, ..., õ_{o'}\}$ of different variables $x_1, x_2, ..., x_т$, which are called subject variables of space S. Set V is called universum of variables on space S. The values of variable x_i ($i=\overline{1,m}$) are the elements of set A_i, that $x_1 \in A_1$, $x_2 \in A_2$, ..., $x_т \in A_т$. Sets $A_1, A_2, A_т$ are called the range of variables $x_1, x_2, ..., x_т$.

If $a_1 \in A_1$, $a_2 \in A_2$, ..., $a_т \in A_т$ and $x_1 = a_1$, $x_2 = a_2$, ..., $x_т = a_т$, it will be written as $(a_1, a_2, ..., a_т) \in S$ and we say that subject vector $(a_1, a_2, ..., a_т)$ belongs to space $S = A_1 \times A_2 \times ... \times A_т$. Elements $a_1, a_2, ..., a_т$ of vector $(a_1, a_2, ..., a_т)$ are its components (first, second, ..., т-th). Subject space S can be regarded as totality of all vectors $(x_1, x_2, ..., x_т)$, which components satisfy the condition $x_1 \in A_1$, $x_2 \in A_2$, ..., $x_т \in A_т$. Any of subsets P of space S is called the relationship, which is given on the space S. Relationship has the dimension т, i.e. it is т-dimensional. Relationships which are given on the same space S are called uniform. Type of relationship is defined by the set of variables $x_1, x_2, ..., x_т$ and the set of sets $A_1, A_2, A_т$. Relationship $\varnothing$, which has no vector, is called empty; relationship S, which has different vectors – is full.

Predicate which is given by Cartesian product of $A_1, A_2, A_т$ is any function $P(x_1, x_2, ..., x_т) = \xi$, which describes Cartesian product of $A_1 \times A_2 \times ... \times A_т$ of sets $A_1, A_2, A_т$ into set $\Sigma = \{0,1\}$. Symbols 0 and 1 are Boolean elements, Σ – set of all Boolean elements. Variable $\xi = \{0,1\}$, which is the value of predicate P, is Boolean. Predicate $P(x_1, x_2, ..., x_т)$ on $A_1 \times A_2 \times ... \times A_т$ is called finite, if all sets $A_1, A_2,…, A_т$ are finite, and non-finite – otherwise. Such terminology can be used also on relationships corresponded to predicates. Variables $x_1, x_2, ..., x_т$ are called arguments of predicate P.

Suppose that L is a set of all relationships on space S, M is a set of all predicates on S. There is a mutual unique correspondence among all of the relationships of set L and all predicates of set M, given on S. Relationship P with L and predicate P with M are called correspondent to each other, if for every $x_1 \in A_1$, $x_2 \in A_2$, ..., $x_т \in A_т$:

$$P(x_1, x_2, ..., x_m) = \begin{cases} 1, \text{if } (x_1, x_2, ..., x_m) \in P, \\ 0, \text{if } (x_1, x_2, ..., x_m) \notin P. \end{cases}$$

Reverse transition from predicate P to relationship P implements by the rule:

If $P(x_1, x_2, ..., x_m) = 1$, then $(x_1, x_2, ..., x_m) \in P$;

if $P(x_1, x_2, ..., x_m) = 0$, then $(x_1, x_2, ..., x_m) \notin P$.

Set of all vectors $(x_1, x_2, ..., x_т)$, which satisfy equation $P(x_1, x_2, ..., x_т) = 1$, creates a relationship P, which is called the area of truth of predicate P. Predicate $P \in M$ is a characteristic function of relationship $P \in L$. The algebra of predicates is any algebra given by bearer M. Operations of disjunction, conjunction and negation on predicates are defined by the following equations: for any $x_1 \in A_1$, $x_2 \in A_2$, ..., $x_т \in A_т$:

$$(P \vee Q)(x_1, x_2, ..., x_m) = P(x_1, x_2, ..., x_m) \vee Q(x_1, x_2, ..., x_m);$$

$$(P \wedge Q)(x_1, x_2, ..., x_m) = P(x_1, x_2, ..., x_m) \wedge Q(x_1, x_2, ..., x_m);$$

$$(\neg P)(x_1, x_2, ..., x_m) = \neg(P(x_1, x_2, ..., x_m)).$$

Symbols $\vee$, $\wedge$, $\neg$ which are located by the left hand from the sign of equality, define operations on predicates, by the right hand – operations on predicate values, i.e. on Boolean elements.

The predicates of any type can be written in the form of formulas. The type of finite predicates is defined, pointing the sets $V = \{\tilde{o}_1, \tilde{o}_2, ..., \tilde{o}_{o'}\}$ and $A_i = \{a_{1i}, a_{2i}, ..., a_{k_i i}\}$, $i = \overline{1, m}$, k_i – number of elements in a set A_i. Over bearer M we introduce disjunctive-conjunctive algebra of predicates. In the role of basic elements of this algebra we use predicates 0 and 1, and also predicates x_i^a of subject identification a by the variable x_i, $i = \overline{1, m}$, $a \in A_i$:

$$x_i^a = \begin{cases} 1, \text{if } x_i = a; \\ 0, \text{if } x_i \neq a. \end{cases}$$

Symbol a in the record of predicate x_i^a is called its indicator. As the role of basic operations in disjunctive-conjunctive algebra of predicates we use disjunction and conjunction of predicates. It was proved, that disjunctive-conjunctive algebra of predicates is full, so by the formulas of this algebra we can write any predicate, thus we can analytically express any relationship of random type.

For any predicate $F(x, y)$ defined in $M \times N$, the reflection f corresponds, which acts with M into N. If for $x \in M$ there exists $y \in N$ such that xFy, then we say that reflection f corresponds the subject x to the subject y, and write $y = f(x)$ or $y = f\,x$. In other words: $F(x, y) \Leftrightarrow f(x) = y$. Correct definition of reflection: $f(x) = S_x$, where $S_x = \{y \mid F(x, y) = 1\}$.

A totality S_a of all images $y \in N$ of subject $a \in M$ related to the reflection $y = f(x)$ is called full image of subject a related to the reflection f. In other words, $S_a = \{y \mid F(a, y) = 1\}$. The last record by the language of logics formally can be written in a such way: $S_a(y) = F(a, y)$. Let's find full image of some subject related to some reflection. Totality R_b of all prototypes $x \in M$ of subject $b \in N$ related to the reflection $y = f(x)$ is called a full prototype of the subject b related to the reflection f. In other words, $R_b = \{x \mid F(x, b) = 1\}$; $R_b(x) = F(x, b)$.

Image of set $A \subseteq M$ related to the reflection f is called set $B \subseteq N$, created from all images of subjects which belong to set A.

$$B = \{y \mid \exists x \in M(F(x, y) \wedge A(x)) = 1\},$$
$$B(y) = \exists x \in M(F(x, y) \wedge A(x)).$$

Transformation (5) is called linear logical operator $B = F(A)$ (otherwise – Haloi correspondence). It is characterized by the additivity $F(A_1 \vee A_2) = F(A_1) \vee F(A_1)$ and homogeneity $F(\alpha A) = \alpha F(A), \alpha \in \{0,1\}$. Expression (5) is the common view of linear logical operator. Prototype of set $B \subseteq N$ related to the reflection f is called set $A' \subseteq M$, created from all prototypes of subjects which belong to the set B:

$$A'(x) = \exists y \in N(F(x, y) \wedge B(y)).$$

Let's assume that $M = \{a_1, a_2, ..., a_k\}$ is a fixed set, which is composed from k elements; A – some from its subsets, $A \subseteq M$. For set A we create a set (α_1, α_2, ..., α_k) of logical elements α_1, α_2, ..., α_k by the following rule: if $a_1 \in A$, then $\alpha_i = 1$; if $a_1 \notin A$, then $\alpha_i = 0$, then $i = \overline{1, k}$. Set ((α_1, α_2, ..., α_k) is called the characteristics of set A. Let's find the characteristics of some subset of the given set. Predicate A(x) on M, which corresponds to set A with characteristics (α_1, α_2, ..., α_k), can be written by the formula:

$$A(x) = \alpha_1 x^{\alpha_1} \vee \alpha_2 x^{\alpha_2} \vee ... \vee \alpha_k x^{\alpha_k} = \bigvee_{i=1}^{k} \alpha_i x^{\alpha_i}.$$

Set (α_1, α_2, ..., α_k) is called also coordinate representation of set A. It can be written as: $A = (\alpha_1, \alpha_2, ..., \alpha_k)$.

Thus, we introduced necessary notions of algebra of predicates, which is proven mathematical tool for recording the relationships, appeared on a space of features [16].

Logical networks are universal, simple and natural means of visual representation of the structure of any objects, because any algebraic description of the object can be displayed graphically in a logical network. Also due to the fact that it is universal algebra predicates, we can formally describe the structure of an arbitrary object.

The result of description of any object by the language of algebra predicates is always some predicate $P(x_1, x_2, ..., x_т)$. It should express some defined relationship P, which is a set of all subject sets $x_1, x_2, ..., x_т$, which satisfy the equation $P(x_1, x_2, ..., x_т) = 1$. These relationships express the structure of described object. If for description of some subject space S it must be performed some relationships, it can lead to the conjunction of correspondent predicates.

Receiving of predicate P from predicates $P_1, P_2, \ldots, P_n$ of system $\{P_1, P_2, ..., P_n\}$ is called its composition. Reverse transformation of predicate P into system $\{P_1, P_2, ..., P_n\}$ of predicates $P_1, P_2, \ldots, P_n$ is called its decomposition. Composition and decomposition of predicates are interconnected. Operation of receiving the predicate P from predicates $P_1, P_2, \ldots, P_n$ is composition if and only if there exists the reverse operation, which allows to restore the same predicates $P_1, P_2, \ldots, P_n$ by the predicate P. By the same manner, operation of transformation from predicate P into system of predicates $P_1, P_2, \ldots, P_n$ can be the decomposition if and only if there exists the reverse operation, which restores the predicate P by the predicates $P_1, P_2, \ldots, P_n$.

Receiving the predicate P in the form of conjunction of predicates $P_1, P_2, \ldots, P_n$ is called its conjunctive composition. Decomposition of predicate P into the conjunction of the same predicates $P_1, P_2, \ldots, P_n$ is called its conjunctive decomposition. The important partial case of decomposition is binary decomposition of predicate P, which is characterized by the fact that every predicate in a system $\{P_1, P_2, ..., P_n\}$ has exactly 2 important arguments.

We can now give a formal definition of logical network. The logical network is a graphical representation of a binary outcome conjunctive decomposition of multiple predicates. In Theory of Intelligence predicates are universal means of formal description of the structure of any objects. The mind creates models of objects that are perceived by them, and gets useful information due to which its bearer – a person can live and operate effectively in the outside world. Predicates are such models. It is very important that under the formal definition of logical network, rather than anything else, it is a simple and natural universal means of graphical representation of the structure of any object. This is a strong argument in favor of a formal definition to identify a logical network with its meaningful definition.

In order to work with informational objects it is used comparator identification. Classical task of identification is that by input *x* and output *y* signals of objects it is necessary to define function $y = F(x)$ of transition the signal by this object. Such identification is called direct, because it is performed by the direct access of output signal of object. But in some cases there appears the necessity in the indirect identification of an object, when the researcher has no direct access to output signal. Many tasks of such kind can be solved by the method of comparator identification of an object. This method allows to give the basic notions of Theory of Intelligence in the deductive manner, using only those facts, which can be physically observed, it is introduced itself in processing of informational objects of different levels.

Objects which can be processed by the informational systems are discrete, finite and deterministic, which allows to use the method of comparator identification by processing of these objects.

By the input of system we give the set of signals $x_1, x_2, ..., x_n$. By the signal we understand conditional signs, which serve for information transition (texts of documents, key notions and so on). Input signals are received from finite sets $X_1, X_2, ..., X_n$, that is $x_1 \in X_1, x_2 \in X_2, \ldots, x_n \in X_n$. In the result of work of system, which carries out the processing of information, on the output signals we have the set of elements $y_1, y_2, ..., y_n$. In our case $y_1, y_2, ..., y_n$ we can understand as key notions, features and so on. That is $y_1 \in Y_1, y_2 \in Y_2, \ldots, y_n \in Y_n$.

Elements $y_1, y_2, ..., y_n$ uniquely depend on signal $x_1, x_2, ..., x_n$. That is, there are functions $y_1 = f_1(x_1)$, $y_2 = f_2(x_2)$, …, $y_n = f_n(x_n)$, which make a correspondence of every $x_1 \in X_1, x_2 \in X_2, \ldots, x_n \in X_n$ to element $y_1 \in Y_1, y_2 \in Y_2, \ldots, y_n \in Y_n$. This means that for the defined element $y_i \in Y_i$ corresponds signal $x_i \in X_i$. Thus, every function f_i is surraction, which reflects a set X_i into a set Y_i, $i \in \{1, 2, ..., n\}$. Functions f_i characterize the ability of the system to correspond to information which is transferred by the conditional sign – signal with an element which reflects its sense and corresponds to some classification.

During the work execution the existence of some relationship Q is checked, which connects elements $y_1, y_2, ..., y_n$ appearing on the system output after signals $x_1, x_2, ..., x_n$, which comes on system input. Thus, during the process comparator realizes the predicate $q = Q(y_1, y_2, ..., y_n)$, which corresponds to the relationship Q. Predicate q characterizes the mechanism of comparing the elements $y_1, y_2, ..., y_n$. This operation of comparing allows to name this method as the method of comparing.

Predicate $P(x_1, x_2,..., x_n) = Q(f_1(x_1), f_2(x_2),\ldots, f_n(x_n))$ characterizes the work of the system, which carries out the intellectual processing of information, which reacts on the signals $x_1, x_2, ..., x_n$ with the answer $q = P(x_1, x_2, ..., x_n)$. Modelling of any task of analytic-synthetic processing of information means that the predicate features P, which carries out comparator identification of informational objects, exclude internal structure of signals $x_1, x_2, ..., x_n$, of elements $y_1, y_2, ..., y_n$, function view $f_1, f_2, \ldots, f_n$ and predicate view Q.

In general case, system obtains k tasks, which are solved by the queue for different sets of input signals. Regularity of signal processing is recorded in the form of system of logical conditions:

$$\begin{cases} K_1(L_1, L_2, ..., L_k) = 1; \\ K_2(L_1, L_2, ..., L_k) = 1; \\ ... \\ K_j(L_1, L_2, ..., L_k) = 1. \end{cases}$$

These conditions link predicate variables $L_1, L_2, \ldots, L_k$ with each other. Here $K_1, K_2, \ldots, K_j$ are predicates from predicates $L_1, L_2, \ldots, L_k$. Predicate $L_i(x_1, x_2, ..., x_n)$, $i \in \{1, 2, ..., k\}$ given on Cartesian product $X_{1i} \times X_{2i} \times ... \times X_{ni}$. Solution $L_1 = P_1$, $L_2 = P_2$, …, $L_k = P_k$ satisfies the system of equations (8).

Results

Project design defines necessary human, computational, and organizational resources and the time required for tasks execution. Planning the project presupposes the fulfillment of several activities: requirements analysis, construction of the list of tasks, determination of dependencies among tasks, scheduling, assigning necessary resources, division of responsibilities among team members, risks assessment, identification of critical paths, creation of management infrastructure, and cost estimation.

Having the task list, project manager analyzes the existing intellectual assets stored in the repository with respect to their possible application in the project. This means that the new tasks may probably have had suitable solutions in the past. The past positive practices can provide an off-the-shelf solution or similar solution, or just useful information. As it was discussed, the enterprise repository contains big volumes of such information, so its extraction, classification, and analysis seem to be a complex problem for project manager.

Creation of a package of relevant information concerning a new project is an intelligent activity performed by a project manager on the project design stage. Such packages associated with different requirements have to be delivered to responsible persons in order to support tasks executions. This process is a part of requirements tracing problem. To improve this process we suggest to develop IT for extraction and analysis of business information, which stored in the repository, in order to support efficient decision-making.

Each artifact is placed into the repository together with its metadata, which are name, author, date, purpose, description, keywords, etc. These metadata are considered as features of different types of business information. We suggest to group different artifacts based on the set of their features and then to match these groups with formulated requirements.

Each type of documents (fig. 1) is described by the set of its features characterizing its type and assignment. These features are defined as a result of identification problem solving via active or passive experiment. The more features we identify – the more precise description of a document we get. Hence, we can find the information necessary for the current project in more effective way. In practice the space of features is big enough, which causes the following problems: 1) identification of the features of informational content of project documentation; 2) dimension reduction of the feature space for big data processing; 3) partitioning of the documents set into the equivalence classes; 4) extraction of relevant information from these classes which is associated with particular requirement.

We suggest to use methods of Theory of Intelligence for the purposes of modeling of the above mentioned processes.

In this work we represent the reference model of business information processing on the stage of project plan elaboration. It defines the models to be realized in order to develop the IT of project design based on various types of data from the enterprise repository (fig. 1).

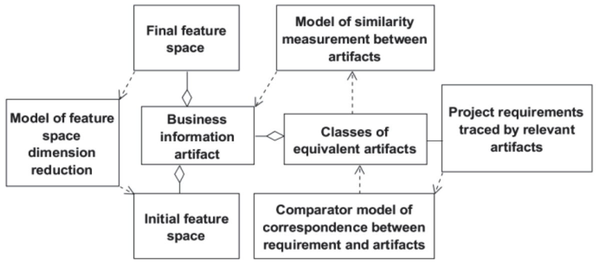

Fig. 1. Reference model

Firstly, we need to reduce the dimension of feature space of business information artifacts. The number of features of different types of business information is quite big, and they have a hierarchical nature. We suggest the following aggregation procedure of features into the space of the lower dimension. Formally the problem of dimension reduction has the following form:

$$X_1 \times ... \times X_m \rightarrow Y_1 \times ... \times Y_n ,$$

where $X_1, ..., X_m$ is an initial set of features;

$Y_1, ..., Y_n$ is a new set of features; m is a dimension of the initial space of features; n is the dimension of the new set of features. Each feature has its scale $X_i = \{x_i^1, ..., x_i^{g_i}\}$, $i = 1, ..., m$, $Y_j = \{y_j^1, ..., y_j^{h_j}\}$, $j = 1, ..., n$ of the ordered qualitative estimates.

The problem of reduction of features' space is solved in this paper with the help of multicriteria classification (fig. 2). In this classification different combinations of initial features are consequently aggregated into groups.

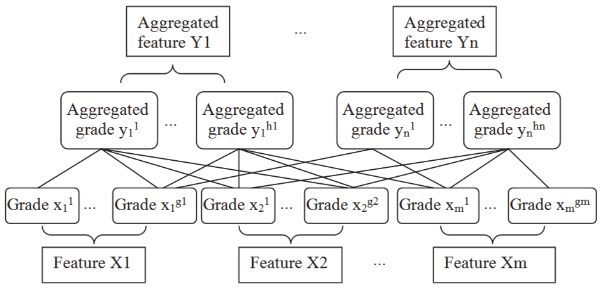

Fig. 2. Multicriteria classification of features

The process of dimension reduction of initial features' set is represented in the form of similar blocks. Each block of classification of the i-th level of hierarchy consists of the group of features and a single aggregated feature. Each block of the i-th level is a connected bipartite graph $G_i = \langle U, E \rangle$, where U is a set of vertices and E is a set of arcs. The set of vertices $U = X \cup Y$ is a set of values of initial features $X = X_1 \cup ... \cup X_m$ and a set of grades of scale of the aggregated features $Y_1 \cup ... \cup Y_n$. The arcs E represent a collection of rules based on which we build the tuples of estimates that form the grades of scales of the aggregated indicators. The multicriteria classification with the consequent reduction of features' space requires the following steps (fig. 3).

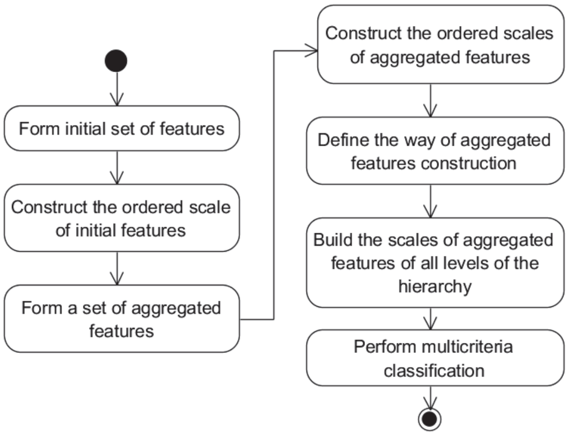

Fig. 3. Method of dimension reduction of artifacts' features

The last step of this procedure implies the classification of features into definite classes which allows to build the groups of information artifacts and to compare them with project requirements. On the next stage it is necessary to identify those classes which are related to particular requirement, so that a team member could obtain the relevant information for task execution. Such process is similar to intellectual activity of a project manager who decides what artifacts can be useful for execution of definite tasks.

Using comparator identification, which was described above, we suggest to consider the defined groups of artifacts and project requirements as the input signals of comparator which defines their correspondence, i.e. whether an artifact is associated with a requirement (fig. 4).

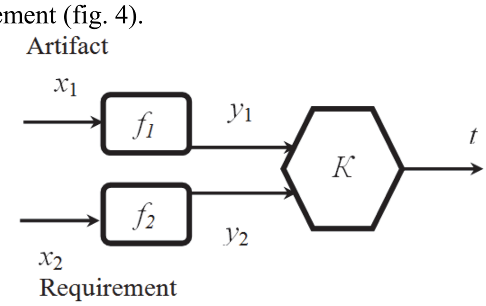

Fig. 4. Comparator identification of artifacts and requirements

This procedure allows to define information artifacts relevant for particular requirement implementation. Further these artifacts can be gathered into packages and delivered to responsible team members.

Conclusions

The given paper considers the problem of business data processing based on algebra-logical models using different types of business information stored in the enterprise repository. This presumes the development of models and methods of data fusion from different sources related to decision-making process requirements.

Future research in the area of business data processing determines for us a set of problems to be solved. Firstly, information gathered by monitoring system on the web has an unformalized, semi-structured character. It is stored in different formats and has a definite degree of incompleteness, inaccuracy, etc. This requires to solve the problem of integration of heterogeneous information taking into account its business value for management purposes.

Secondly, the conducted research allows us to claim that data for monitoring must be collected both inside and outside the system. Therefore the problem of the common data sharing occurs. In particular, the degree of confidence, priority and usefulness of data must be defined. Taking into account that indicators' measurement is usually performed in different scales, the problem of common usage of these scales arises. Also the further research will be directed on methods of transformation and interpretation of the obtained estimates of performance and quality indicators.

One of the open issues of the suggested approach is classification of information artifacts based on the reduced set of features. We need to define the similarity measures for the artifacts which will allow to build the classes of equivalence. Since often the features of artifacts are expressed in qualitative scales, the problem of similarity measure definition seems to be nontrivial and needs the further discussion.

Another problem is estimation the quality of collected business information. We can have several alternatives of packages with different artifacts related to one requirement. So, the problem is to choose the most relevant one. For this purpose we need to develop a model of business information value estimation.

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ОБРОБКА БІЗНЕС-ІНФОРМАЦІЇ НА ОСНОВІ АЛГЕБРО-ЛОГІЧНИХ МОДЕЛЕЙ

О.Ю. Чередніченко, Ю.М. Гонтар, А.В. Василенко, О.М. Матвєєв

У статті розглянуті питання обробки інформації, необхідної для прийняття управлінських рішень. Представлені алгебро-логічні моделі, які дозволяють обробляти неоднорідну інформацію, отриману з різних джерел. У практичному прикладі представлена еталонна модель обробки ділової інформації, отриманої зі сховищ підприємства, на етапі розробки плану проекту. Відповідність артефакта вимогам здійснюється за допомогою компараторної ідентифікації.

Ключові слова: *обробка бізнес-інформації, модель, прийняття рішень, алгебра предикатів, компараторна ідентифікація.*

ОБРАБОТКА БИЗНЕС ИНФОРМАЦИИ НА ОСНОВЕ АЛГЕБРО-ЛОГИЧЕСКИХ МОДЕЛЕЙ

О.Ю. Чередниченко, Ю.Н. Гонтарь, А.В. Василенко, А.Н. Матвеев

В статье рассмотрены вопросы обработки бизнес-информации, необходимой для принятия управленческих решений. Представлены алгебро-логические модели, позволяющие обрабатывать неоднородную информацию, полученную из разных источников. В практическом примере представлена эталонная модель обработки деловой информации, полученной из репозитория предприятия, на этапе разработки плана проекта. Соответствие артефакта требованиям осуществляется с помощью компараторной идентификации.

Ключевые слова: *обработка бизнес-информации, модель, принятие решений, алгебра предикатов, компараторная идентификация.*