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MIVAR TECHNOLOGIES MODELLING OF ENTERPRISE'S TECHNICAL AND TECHNOLOGICAL POTENTIAL

The article suggests an approach to the creation of the semantic and ontological model of knowledge of technical and technological potential of economic security of an enterprise. It is offered to use MIVAR technologies to design technical and technological potential of economic security. Ontology has been used for conceptualization of this constituent.

Keywords: *semantic model; knowledge representation; model; ontology; economic safety; Protege; multidimensional informational variable adaptive reality.*

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МІВАРНІ ТЕХНОЛОГІЇ МОДЕЛЮВАННЯ ТЕХНІКО-ТЕХНОЛОГІЧНОГО ПОТЕНЦІАЛУ ПІДПРИЄМСТВА

У статті представлено підхід до побудови семантико-онтологічної моделі знань техніко-технологічної складової економічної безпеки підприємства. Запропоновано використовувати міварні технології для моделювання техніко-технологічного потенціалу економічної безпеки. Для концептуалізації цієї складової використано онтологію.

Ключові слова: *семантична модель, представлення знань, модель, онтологія, економічна безпека, Protege, багатовимірна інформаційна варіююча адаптивна реальність.*
Рис. 2. Літ. 11.

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МИВАРНЫЕ ТЕХНОЛОГИИ МОДЕЛИРОВАНИЯ ТЕХНИКО-ТЕХНОЛОГИЧЕСКОГО ПОТЕНЦИАЛА ПРЕДПРИЯТИЯ

В статье представлен подход к построению семантико-онтологической модели знаний технико-технологической составляющей экономической безопасности предприятия. Предложено использовать миварные технологии для моделирования технико-технологического потенциала экономической безопасности. Для концептуализации этой составляющей использована онтология.

Ключевые слова: *семантическая модель, представление знаний, модель, онтология, экономическая безопасность, Protege, многомерная информационная варьирующая адаптивная реальность.*

Introduction. ***MIVAR*** (Multidimensional Informational Variable Adaptive Reality) approach unites and develops the achievements in such scientific fields as databases, calculable tasks of logical treatment and includes the two basic technologies:

1) ***MIVAR*** technology of information accumulation is the method of global evolutional databases and rules (knowledge) with a changeable structure creation in terms of adaptive discrete ***MIVAR*** informative space of the unified data and rules presentation based on the 3 basic concepts – "thing", "property", "relation".

2) ***MIVAR*** technology of information treatment is the method of the logical conclusion system or "automatic constructing of algorithms creation out of the modules, services or procedures" on the basis of the active taught ***MIVAR*** network of rules with linear calculable complication.

MIVAR information accumulation technology serves for storage of any information with the possible evolutional change of its structure and without limitations of its volume and forms of presentation.

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Latest research and publications analysis. The issues of knowledge modelling and economic security of enterprises have drawn the attention of many foreign and national scholars, such as O. Varlamov (2002), G. Ivanchenko (2011), A. Kleshchev and I. Artemjeva (2001) and others.

The object of this research is the semantic model of technical and technological potential of an enterprise.

The research objective is to reveal the potential of economic security of enterprises.

The permanent change of external environment where people, enterprises, organizations and countries work, adapt and survive is one of the specific features of the present times. In the conditions of competition the market of many enterprises is determined in a great deal by the speed and exactness of reactions to external environment changes, therefore it requires application of new unconventional conceptions, techniques and tools in management.

Development of computer technologies enabled the planning of knowledge bases (KB), which will organize the activity in subject industries of economic safety of the enterprise (ESE). Technical and technological potential is the component of ESE. It is closely associated with financial, innovative and other constituents and, at the same time, possesses its own specific features. Therefore, the solution of intellectual tasks in the industry of technical and technological potential requires the processing of large volumes of information.

The semantic and ontological model of knowledge is necessary for the KB creation.

The ontology of ESE is a formal specification of concepts and indices of technical and technological potential which describes different properties and attributes of concepts (slots) and limitations encapsulated in slots. Ontology together with the set of individual copies of classes forms the semantic model of KB.

Visual models like the ontological ones possess a special cognitive force. Visualization of ontology allows specialists on *knowledge engineering* to directly design, formulate and explain both the nature and the structure of economic processes.

Description of the subject domain. The principal reason of cyclic crises of economic systems is the general production funds wearing-out. This rule operates both for separate subject of the system and a separate economic player. In this regard the estimation of the technical state and capital assets becomes an indispensable condition. It is also needed for planning and creation of the enterprises' reserve for depreciation, which is formed with the purpose of financial resources accumulation necessary for the basic facilities renewal.

Technical and technological potential of ESE of a separate economic player depends on the technical and technological level of production and determines the level of products, its competitiveness and expenditures. This potential is foremost estimated by the level of technical perfection of labour facilities and production technology.

The technical and technological potential of ESE includes several successive stages:

1) the market analysis of technologies in production of goods similar to the type of a certain enterprise or a system designer organization: the collection and analysis of information about the specific features of technological processes at enterprises

that make similar products; the analysis of scientific and technical information on new developments in a certain industry, and also the technologies able to carry out intervention at the industrial technological market; forming of KB technical and technological potential of ESE;

2) the analysis of particular technological processes and the deployment of internal reserves for the improvement of the used technologies. The calculation of indicators is to be made;

3) the estimation of prospects of the market development of enterprises' products and the forecast of possible specifications of necessary technological processes for the issue of competitive innovative commodities;

4) the design of a technological strategy of an enterprise development using the accumulated knowledge of KB technical and technological potential of ESE, in order:

- to identify perspective commodities;
- to plan the complex of technology for production of perspective commodities positions;
- to finance technological development of an enterprise through the charges optimization program of technological development;
- to design the general plan of an enterprise's technological development;
- to make the plan of own corporate resources in accordance with the plan of an enterprise's technological development;

5) the timely realization of enterprise's technological development plans in the process of production and economic activities;

6) the analysis of the results of the practical actions used for providing the technical and technological potential of ESE on the basis of the special card of efficiency calculations;

In addition to the abovementioned indicators, technical and technological potential of ESE is also characterized by the following indicators:

- the level of technology progressiveness;
- the level of products' progressiveness;
- the level of technological potential.

Model creation. It is expedient to use a network model for knowledge representation of ESE.

Semantics determines the sense of signs and the relations between characters and objects, which they determine.

Semantic network of ESE is a graphic system of denotations for knowledge representation in the templates of linked knots and arcs. In other words: a semantic network is the oriented graph with its tops denoting concept, and arcs denoting the relations between them.

Network models of ESE formally can be set as $H = <I, C_1, C_2, \ldots, C_n, G>$, where I is the number of informative units; $C_1, C_2, \ldots, C_n$ are the number of types of links between informative units; G is the reflections between informative units that belong to I, links out of a set of links types.

Declarative graphic representation is general for all semantic networks of ESE. It can be used for representation of knowledge or creation of the automated systems of decision-making representation on the basis of knowledge.

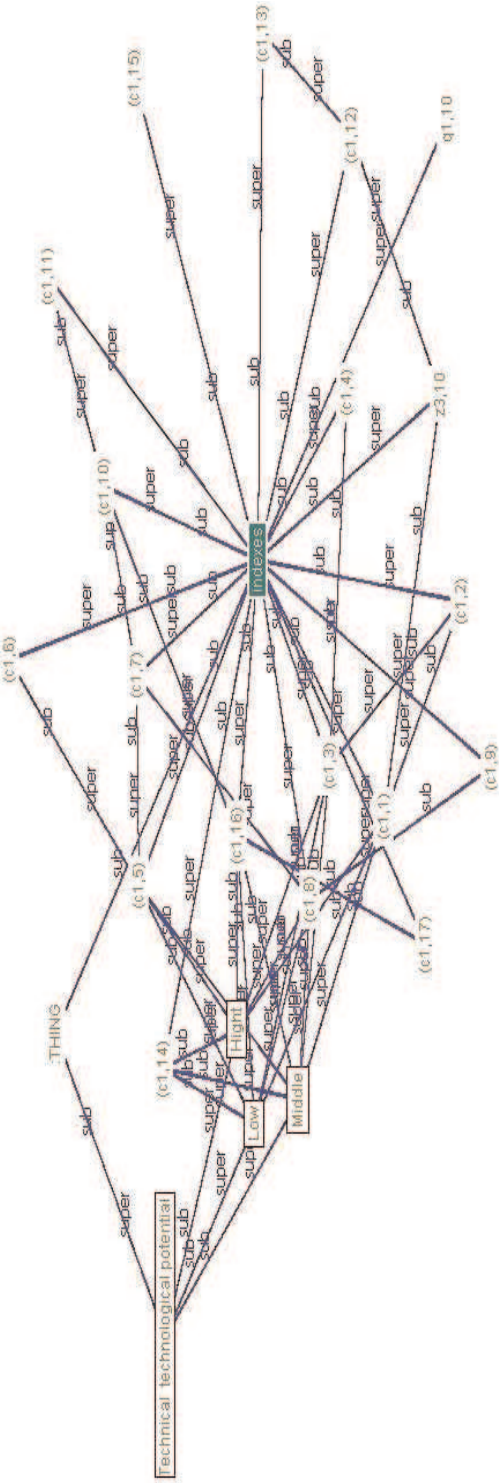

Figure 1. **Semantic and ontological model of technical and technological potential of ESE,** *developed by the author*

Figure 2. **Frame model of technical and technological potential of ESE,** *developed by the author*

Tops may represent: concepts, events and properties. The marks of tops have a reference character and represent some entities identifiers. The arcs mark the elements of multitude of relations.

The classification of objects types and selection of some fundamental types of links between objects are important when using the semantic network for knowledge representation. Regardless the features of an environment being designed, it is possible to assume that any more or less difficult model represents some generalized, particular and aggregate objects.

The particular object of ESE is the specially selected single unit.

The aggregate object of ESE is the object of a problem environment made of other objects which are its components. Both the generalized and the particular objects can be aggregated there.

Links between the objects are determined in the described typology of problem environment objects.

Generic links can exist between the two generalized objects. The use of inheritance provides the effective method of knowledge simplification and volume reduction of information needed to be memorized for a particular knot. It considerably enables both acceleration of knowledge processing and information retrieval by means of the requests of a general nature.

Link "is a representative" and can exist between the generalized and particular objects. It occurs in that case, when a particular object belongs to the class with the proper generalized object.

For the creation of a semantic and ontological as well as a frame model of technical and technological potential of ESE the ontology editor *Protege* was used, which allows designing the ontology opening out the hierarchical structure of abstract and discrete classes and slots. The results of the creation of semantic and ontological and frame models of technical and technological potential of ESE are represented in Figures 1 and 2.

Conclusions. Thus, it is expedient to use the semantic and ontological models as the conceptual facilities helping to design and create semantic and ontological technical and technological potential of economic security of an enterprise which gives possibility to develop the reliable semantic base in determination of content of technical and technological potential, general logical model of rules, consisting of a dictionary and a set of assertions in logical language, creating the basis for communication between KB and computer agents with the purpose of creating the management information system of economic security of an enterprise.

References:

Варламов О.О. Эволюционные базы данных и знаний для адаптивного синтеза интеллектуальных систем. Миварное информационное пространство. – М.: Радио и связь, 2002. – 288 с.

Гаврилова Т.А., Хорошевский В.Ф. Базы знаний интеллектуальных систем. – СПб: Питер, 2001. – 384 с.

Зацеркляний М.М., Мельников О.Ф. Основи економічної безпеки: Навч. посібник. – К.: КНТ, 2009. – 337 с.

Іванченко Г.Ф. Системи штучного інтелекту: Навч. посібник. – К.: КНЕУ, 2011. – 382 с.

Клещев А.С., Артемьева И.Л. Математические модели онтологий предметных областей (Ч. 1. Существующие подходы к определению понятия «онтология») // Научно-техническая информация.– Серия 2: Информационные процессы и системы.– 2001.– №2. – С. 20–27.

Клещев А.С., Артемьева И.Л. Математические модели онтологии предметной области (Ч. 2. Компоненты модели) // Научно-техническая информация.– Серия 2: Информационные процессы и системы.– 2001.– №3. – С. 19–28.

Кучеренко Е.И., Павлов Д.А. Некоторые аспекты анализа развития нечетких онтологий // Искусственный интеллект. – Донецк, 2005. – С. 162–169.

Олейников Е.А. Экономическая и национальная безопасность: Учебник для вузов. – М.: Экзамен, 2005. – 768 с.

Основи економічної безпеки: Підручник / О.М. Бурка, В.Є. Духов, К.Я. Петровка, Ї.М. Червяков. – Харків: Нац. ун-т внутрішніх справ, 2003. – 236 с.

Ясницкий Л.Н. Введение в искусственный интеллект. – М.: Академия, 2005. – 176 с.

Kleshchev, A.S., Artemjeva, I.L. (2001). A structure of domain ontologies and their mathematical models. In: The Proceeding of The Pacific Asian Conference on Intelligent systems 2001 (PAIS 2001). Korea Intelligent Information Systems Society (pp. 410–420).

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