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ONTOLOGY-BASED APPROACH TO SCIENTIFIC INSTITUTIONS INFORMATION REPRESENTATION

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ОНТОЛОГІЧНИЙ ПІДХІД ДО ПРЕДСТАВЛЕННЯ ІНФОРМАЦІЇ НАУКОВИМИ УСТАНОВАМИ

У статті описується процес створення онтологічної моделі представлення інформації, накопиченої різними науковими та освітніми організаціями. Функціонування наукових та освітніх організацій пов’язано із накопиченням великої кількості інформації, яка в свою чергу використовується в процесі оцінки якості їх функціонування. В основу алгоритму процесу створення онтологічної моделі покладено вилучення змістовної інформації, яка зібрана з різних інтернет джерел, за рахунок її структуризації та систематизації для її подальшого аналізу та обробки. Описано елементи всіх компонентів загальної онтології. Практична розробка запропонованої онтологічної моделі була виконана з використанням платформи розробки онтологічних рішень TEDAOS.

Introduction. Today, there are a large number of public and private institutions providing services in various spheres of social life. The demand for such institutions depends on the efficiency of their functioning. It is for the organizations involved in the fields of science and education that the efficiency of functioning is of particular importance, because the quality of services they provide depends on the future level of the state development and the life of its citizens. That is why there are currently some general-ly accepted principles for evaluating such organizations. The process of such peer review is outlined and approved in the relevant regulatory documents [1, 2, 3].

Today there is a tendency to the development of artificial intelligence and their penetration into any sphere of human life. Specialized technologies based on artificial intelligence are used to develop information systems of various kinds and purposes. Artificial intelligence technologies also offer a wide range for the presentation of knowledge and data. Among the existing models of knowledge representation it is the ontological model that has acquired the greatest use. Presented study proposes to use the ontology as one of the models of knowledge representation to organize information of scientific institutions for its structuring and systematization, as well as for its further processing and use.

Ontology system of scientific institutions information representation. The functioning of scientific organizations is associated with certain specific features that

are not characteristic of other types of institutions. For example, the important indicators of the scientific process are as follows - the number of publications, citations, various scientific indexes and ratings, participation in international projects and programs, completed scientific topics, trained specialists of different qualification levels in different specialties and specializations, and more. That is why the information produced during the operation of such institutions also reflects all levels (aspects) of such functioning. This feature must be taken into account when developing an ontological model. Also, several basic processes are involved in the process of organization of scientific activity: organization of activity of institution; definition of indicators by which it is possible to identify the level of performance of a certain type of activity in an institution; the existence of criteria for evaluating such indicators by which it is possible to evaluate the achievements of the organization and to determine whether its activity meets the requirements; organization of the institution's evaluation process itself.

Thus ontology system is a collection of several components (Fig. 1).

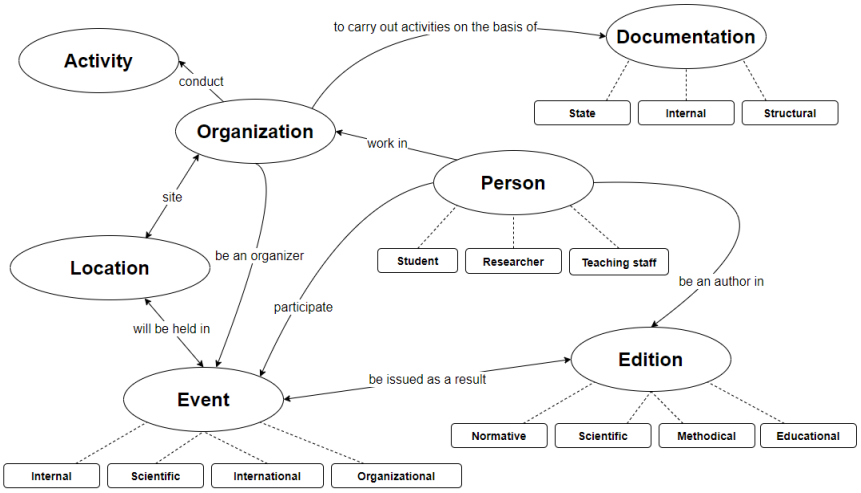

Fig. 1. Ontology system of scientific institutions information representation.

In the process of constructing an ontological model, there is a need to describe its elements. The ontological model includes the following elements [4]:

Ontological model = <classes, attributes, relations, types of attribute values, con-straints on attribute values, instances of classes>,

where classes are elements of an ontological model that describe the concepts of a particular subject or problem area;

attributes – are elements of the ontological model that describe the properties of concepts and relations;

relations – are defined on classes, and display either the relations of classes with each other or the relations of classes to data or attributes. There are relations of the following types:

• associative relations – allow to perform meaningful searches through the ontology information space,

• part-to-whole relations – allow you to establish relations between classes at the hierarchy level,

• inheritance relations – is used to pass attributes and relations from parent to daughter,

• class-data relations – allow to associate instances of concepts with class;

attribute value types - specify standard types for class attribute values (for example: string, integer, real, date);

restrictions on the values of the attributes of concepts and relations – is used not for all attributes, but only for those whose values must lie in a certain area, they can`t be less/more than a given value or they are determined by a certain rule. For example, the value of the attribute “start date” of some ontology class is constrained by T (date) = date F(T) > 0);

class instances – are an ontology element that displays specific domain data that obey the structure of the ontological model.

In the course of the study, the described ontological model elements were identified for all ontologies. The process of detailing the elements of an ontology is an important step in designing a general onto-logical model that will allow you to set structures for further filling the ontology with domain information (instances of classes).

An ontology for scientific institutions information representation was developed using the IT- TEDAOS environment [5, 6]. During the construction of the ontological model, 895 objects and 2837 data elements (attributes) were created. In Fig. 2. shows the lower level ontology, which shows that the rating of each employee, which is divided into three areas of activity, and each area of work is divided into groups of work by type.

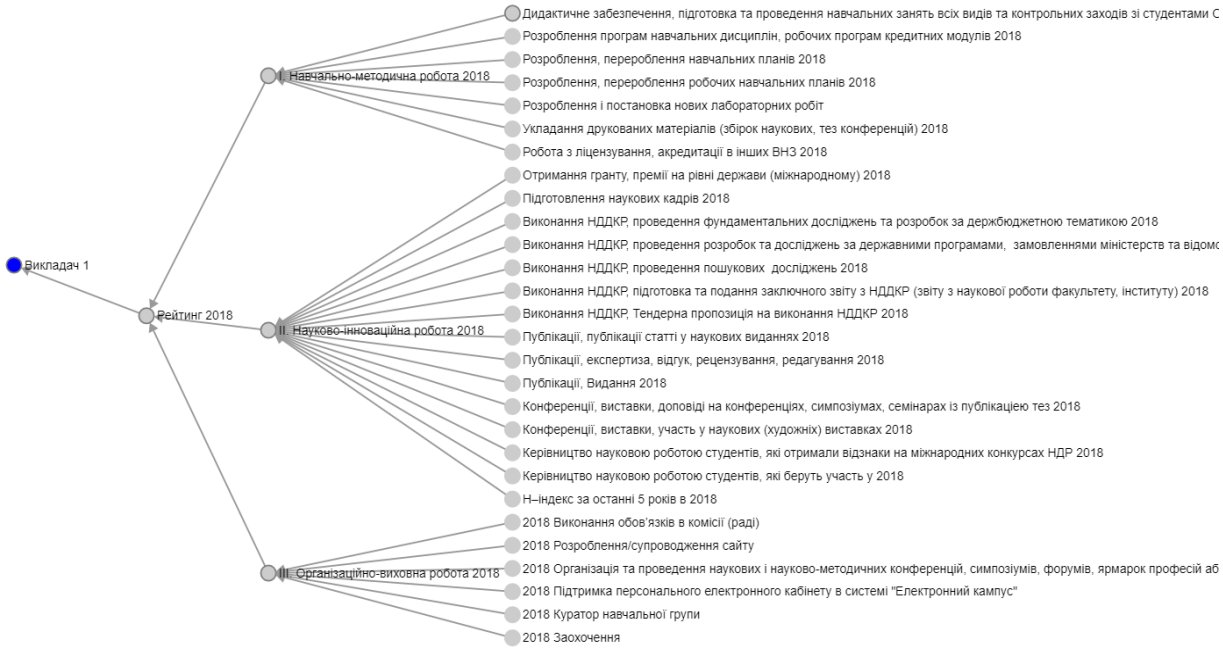

Fig. 2. Lower level ontology.

Each class of the developed ontology is described by attributes which are also set at the program level in the TEDAOS environment.

In Fig. 3. shows the attributes of the object Work №5. Attributes include the following data:

- Type of work,
- Points - the number of points that can be obtained for the work,
- Quantity (part made by the teacher) as a percentage,
- The result - the points received by the teacher for this work.

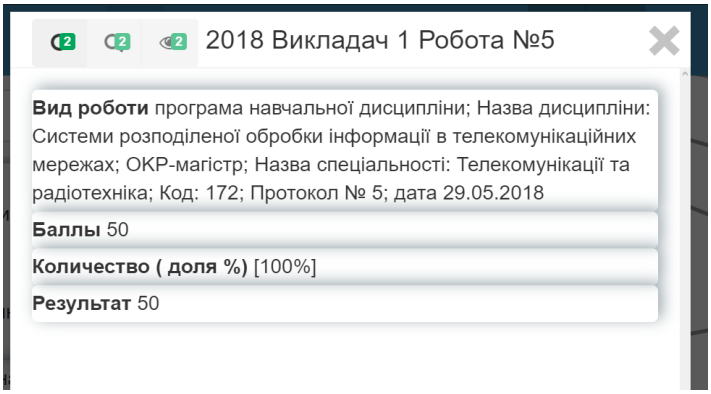

Fig. 3. Ontology object attribute.

Conclusions. The paper presents an approach to the representation of information accumulated in various scientific institutions on the basis of ontological model. The ontological representation allows to evaluate the quality of scientific institutions functioning on the basis of national principles for such assessment. The information how to organize the evaluation process as well as generally accepted evaluation criteria are also stored in the ontological model. The associative relations between objects that are determined in ontological model allow to link the institution activities indicators with the evaluation criteria for assessment process automation.

Future researches will focus on further ontology development and its filling with subject domain information, as well as on evaluation of proposed approach usage in comparison with other existing ones.

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