The Integrated Knowledge Space - the Foundation for Enhancing the Effectiveness of the University's Innovative Activity

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The paper examines the implementation of Integrated Knowledge Space as an effective method for knowledge management in a global university network which will integrate all interested parties of the educational space: the faculty, scholars and business people within the framework of distributed departments on the basis of Information Centre of Disciplines (ICD). ICD enables higher education institutions to accumulate and make on-line renewal of knowledge for teaching and learning processes and for enhancing innovation potential. ICD facilitates the development of human and relational capital of integrated and interconnected educational, research and business communities.
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1 Introduction

The globalization of education implies the joint endeavors of universities within the framework of international educational networks, consortiums and higher education associations as well as the integration of science, education and business via the development of technology and knowledge parks, collaborative competence centers and other forms of effective interaction. These circumstances foster the knowledge management which proposes to dynamically and intensively accrue and use the intellectual capital in enhancing the education and research quality in maintaining the updated content in providing the conditions for academic mobility of learners, scholars and the faculty.

In compliance with the knowledge parks conception [4] the parks are created on the basis of universities and they facilitate the following processes:

- Joint research by universities and research institution according to business orders;
- Searching and generating new knowledge with its reflection in a real - time format;
- Technology transfer from universities to organizations;
- Transfer of knowledge to small, medium and corporative business.

The organizational bases for knowledge parks are competence centers, research laboratories, centers for technology transfer.

The virtual environment for collaborative activities of participants in the scientific and educational process can rest upon the Integrated Knowledge Space (IKS). The Integrated Knowledge Space unites the knowledge of scientific schools generated in grants, dissertations, innovative projects within the competence centers and laboratories, it embraces educational and methodological materials for educational courses as well.

2 The Information Center of Disciplines as Base of Integrated Knowledge Space

The IKS combines the scientific and educational content of contiguous disciplines within the framework of a specialty and can be understood as a constituent unit of the Information Center of Disciplines (ICD).

The Integrated Knowledge Space facilitates the integration, accumulation and support of knowledge as well as the access to scientific and educational content that enables:

- to unite various sources of information on different disciplines, specialties and educational process participant (teachers, scholars, representatives of business,

postgraduate students, students) within the same system;

- to encourage a continuous development of the system due to the renewal of academic theoretical knowledge and new experience obtained by the faculty and students in the course of the educational process;
- to provide relevant information to each participant of the scientific educational process in compliance with his/her knowledge, needs and preferences;
- to provide a distributed access of the participants to the content in a virtual environment.

The Information Center of Disciplines as a component of IKS is an information resource that aims at making the interconnections of the faculty and the designers of learning and methodological content within the framework of separate disciplines. The goal of ICD is to facilitate a continuous process of collaborative, joint professional designing, developing and using the educational materials for all the disciplines embedded in the curricula by the interested participants. It includes and maintains a wide set of learning and methodological materials, integrated references to the research publications of teachers, postgraduate students and students, open educational recourses.

The objectives of ICD are the following:

- To create the integrated platform for the collaborative work of all the teachers of the distributed chairs;
- To accumulate educational, methodological and research materials for all the courses;
- To provide a continuous process of making the materials and content updated;
- To create the base data of references to open educational resources, conferences, seminars etc;
- To attract business people for the development of the content;
- To create special service units.

ICD can be considered as a centre for integrating experience and intellectual capital of professors, teachers, assistants, within the

framework of the Integrated Knowledge Space.

The ICD helps the teachers to store and accumulate the learning and methodological materials, to share ideas and information with the colleagues, to collaborate each other by using technological instruments, WEB 2.0.

Above every course (discipline) stays a professor or associate professor who is responsible for the distribution of the materials by files, for taking into account the remarks of the users, for editing the materials, for making the final version after receiving the internal and external expertise. The assessment of the work in the ICD is being done with the help of E-metrics. The latter includes the total number of users and applications, the volume of the information received, the number of references to open educational resources, the frequency of updating the materials and so on.

In comparison to traditional e-learning the Information Center of Disciplines and the Integrated Knowledge Space can be referred to a new generation of the systems of innovative learning.

Innovative e-learning within the framework of the Information Center of Disciplines has the following specific features:

- learning process is being integrated into the organizational and social processes of knowledge transformation within the framework of the networking interconnection of educational, scientific and business entities;
- new knowledge is being generated within the real-time regime thus allowing to switch from annual content updating to updating it when it is required;
- several professional communities and partnerships are being created – "student-tutor", "student-student", "tutor-tutor", "department-enterprise", "department-scientific organization";
- the quality of learning based on research and innovations becomes a leading factor in learning development;

- the scientific - methodological development of each discipline allows to speed up tutors' scientific research;
- some new technological, pedagogical and organizational innovations are being formed during the scientific and educational process.

The integration of the Information Center of Disciplines within the framework of the Integrated Knowledge Space reconsiders the learning process in a way of self-learning. The theoretical materials and performing practical tasks, using of common kits and lab base, highlighting the descriptions of common subject fields and of particular situations in order to complete terminal-, lab- and term papers, projects and diplomas. Internship program's role is also being transformed to a state when some general information for the whole set of learning courses is being gathered.

The Moscow State University of Economics, Statistics and Informatics is shaping the Integrated Knowledge Space and Informational Centers of Disciplines within the framework described in this paper.

3 Technological Aspects in Shaping the Integrated Knowledge Space

The traditional and conventional process of creating the learning courses is implemented in accordance with the set of qualifying characteristics of specialties. The set of learning courses (disciplines), relevant to the qualifying characteristics of specialties, forms the general curriculum of a specialty. The following development of learning programs (syllabuses) by some departments necessitates overlaps in some items; such overlaps are hard to be determined due to the specifics of terminology used in certain disciplines. At the level of general curriculum it is hard to fully unify the whole volume of terminology used in particular disciplines. As a result we are getting some rigid methodological and educational complexes that are hard to adapt to a particular education institution as well as to an individual's practices.

The Integrated Knowledge Space is a system of knowledge management with a three-level architecture which at the outer level presents an array of the Information Center of Disciplines, at the conceptual level – an ontology system and at the storage level – an object-oriented repository of various knowledge sources (figure 1).

To improve the quality of the educational process, it is viewed as necessary to integrate Informational Center of Disciplines at a department's level as well as at an interdepartmental level. This can be performed by coordinating the parallel-type work on the bases of knowledge management methodology, which rests on the object-oriented approach with ontological description of the conceptual model of knowledge used.

In the object-oriented presentation of knowledge every learning object is a complete semantic piece of knowledge of self-importance. Separate objects there could be formed into certain learning sequences corresponding to the specifics of learners in respect with regional and industrial needs of learning. As a result there is a shift from small rigid courses to an array of Reusable Learning Objects (RLO) available for retrieval and involvement into certain learning sequence [8]. Object oriented methodology of learning courses has found its development in the activities of IMS Global Learning Consortium, which develops the system of basic standards in this field.

The development of objects could be done by different authors in various environments. All knowledge objects are placed into special base – repositories, while at Informational Center of Disciplines only object references are being kept. Accordingly, results of scientific researches, innovative projects, open educational resources are presented through object type and getting linked with Informational Center of Disciplines via reference mechanism.
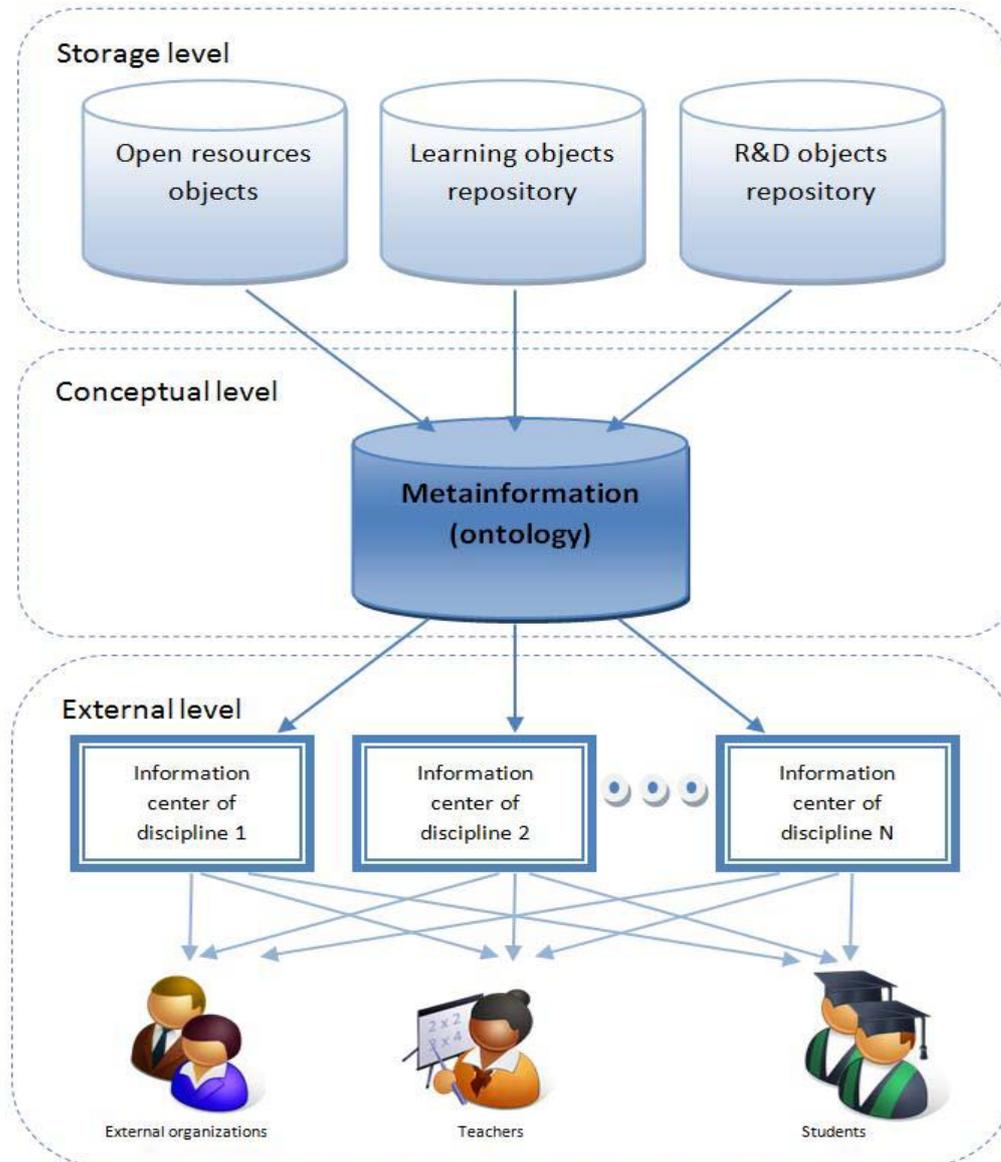
Fig. 1. The Architecture of Integrated Knowledge Space

The integration of knowledge in the unified space and the decomposition of learning courses and there components (learning objects) require a unified conceptual description of knowledge with the help of ontology [1], [5]. In order to organize the Integrated Knowledge Space there are several things that are being created:

- subject ontology, reflecting subject field regardless of whom and how it's been taught;
- learning ontology, that formalizes the structure of learning process with the respect of competences of particular specialties and forms of study;
- learning objects' repository;

- objects of scientific, research and projects findings and outcomes;
- objects of open educational resources.

Thus, the Integrated Knowledge Space is a system of knowledge management with a three-level architecture which at the outer level presents an array of the Information Center of Disciplines, at the conceptual level – an ontology system and at the storage level – an object-oriented repository of various knowledge sources (figure 1).

Therefore the creation of the Integrated Knowledge Space information facilitates to increase the cooperation of tutors of the distributed departments and organizations interested in developing and presenting the

courses, in organizing an exchange of developed educational methodological and research materials toward the creation of electronic courses. The Integrated Knowledge Space can actually provide effective pedagogical scenarios for teaching in electronic environment.

4 Conclusions

The enhance of the quality of educational content on the basis of the Integrated Knowledge Space allows higher institutions to achieve the following goals in the development of their intellectual capital:

- to provide the aligning with the Russian and international learning standards to facilitate academic mobility in on-line environment;
- to raise professional competences on the basis of synergetic integration of educational, research and innovative process;
- to update the learning and methodological content in a real-time regime to meet the requirements of today's development of science and practice;
- to provide a flexible educational process with the respect of concrete needs and problems to be solved;
- to enhance and leverage the effectiveness of scientific research and its innovation.

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