Methodology of short-term planning of work indices in the university department on basis of the reference model using web-portal

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Abstract. Today, the departments of various universities have implemented databases in the form of Web sites. The information environment of the department is a huge data warehouse. Modern database management systems allow to effectively store and process data, but, unfortunately, these tasks implementation is not enough for personnel management. The trends in the higher education development in Russia indicate that it is necessary not only to store data, but also to control the department development in educational, scientific and other areas of activity. For this it is proposed to implement a system for calculating, maintaining and visualizing the department’s rating and introduce it into the existing Web portal of the department. This system will not only simplify the obtaining, calculation and storage of the required data on the department rating. It will also provide the required indices in a visual and understandable way.

1. Domain analysis
The subject field of this paper is the planning of the department activity indices, using the reference model, based on the information management system of the department. A formalized mapping of the proposed process is presented in figure 1.

The objectives of this study are:

- to determine the indices types with specified performers on the department rating formation for the current year;
- to develop an algorithm to calculate the current and planned performance indices for the department;
- to develop a reference model;
- to realize the current model as a part of the Web - portal of the department.
- to define and to compare the current rating indices of the department to the reference model via Web - portal to schedule the department activities.

The annual rating of the scientific activities of the university departments, as is, is necessary and should fulfill the following functions:
• information - specialized. To gather and to structure the information required to compile the official report on the scientific activities of the university according to the state structures requirements and the reports for other bodies of federal regional and local control;
• moral and material stimulation of scientific activity. The first places in the final rating should be provided for forms of moral and material stimulation;
• analytical and administrative - managerial.

Figure 1. Mimic diagram of the reference model.
A comparative analysis of the scientific activity results by the administration of the university, faculties, departments and other units included in the rating. Identification of "weak and strong" positions of scientific activity, negative and positive trends. Formulation and planning of correction measures. Development of a mechanism to implement the long-term plans. Administrative regulation of the competitive change of personnel and management structures of units (faculties, departments, research centers, laboratories, etc.) based on a comprehensive analysis of the scientific activities results within the corresponding period. Regulation of the process of the educational workload distribution depends on the scientific activity effectiveness [1] (faculty between departments and “intra-department” between employees of the corresponding unit).

The control loop is shown in figure 2.

![Figure 2. Control loop.](image)

1.1. *System project for the method development for the short-term planning of the department’s performance indices, based on the reference model using the Web - portal*

The basic principles to build and to develop a promising system are based on modern generally accepted ideas of information systems and networks design, as well as on the experience of creating and operating such systems in leader universities in the world.

The system project includes the development of a functional model referring to the IDEF0 methodology standards and an information model referring to the IDEF1X methodology standards [2].

1.2. *Functional Model*

To create any information system, it is necessary to survey the subject area. The survey was realized in accordance with the SADT methodology. The subject area is the methodology to determine and to obtain the rating indices and to introduce a reference model.

To build a functional model, we used the IDEF0 methodology implemented in the AllFusion Process Modeler software product of Computer Associates.

The development of a functional model according to the IDEF0 methodology begins with setting a goal to narrow the subject area under consideration and to choose the point of view from which we will consider it.

The objective is to determine and to obtain rating indices and to introduce a reference model, the point of view is the head of the department.
The context diagram "Defining indices and getting the department rating" is shown (figure 3). This diagram defines the boundary of the system and consists of one block and its arcs. Input arcs are - Current department data, rating data of university departments. Output arc is a common database with all indices, a single graph. Management are documents, orders, university contracts with teachers. The mechanisms are students, teachers, dean’s office, academic management, department staff.

As a result of the context diagram decomposition, the following blocks will be obtained:

- consideration of the qualitative composition of the department;
- consideration of scientific, educational and innovative activities;
- consideration of the department participation in organizing and realizing of various conferences, exhibitions;
- consideration of additional educational and other activities;
- entering all the information in the database, comparing to the reference model and building a single graph.

![Figure 3. Context diagram of a functional model.](image-url)

1.3. Information Model

Based on the functional model, an information model is built. It is realized according to IDEF1X [3] methodology using the AllFusion Erwin Data Modeler package of Computer Associates. In this case, the information model is an adequate reflection of the information structure of the existing process. The entities depicted in the database blocks are the tables interconnected by key fields. The information model presents two types of relationships between entities: identifying and non-identifying. According to the information model, a portal database has been developed.

2. Technology of model realization

The purpose of the development is to organize the process of the necessary data collection, to ensure a prompt information obtaining by all interested parties due to an access to a common database.

2.1. The functioning technology of the system to collect and to view the required information

The functioning of the system for collecting and viewing the required information occurs in the user dialogue mode with the interface screen form. For each dialogue step (press a button, load a screen...
form, prepare a print form), it is distinguished the procedures to work with a database, screen and reporting forms [4, 5]. The functioning of the method and its main steps are presented below in the form of a block diagram (figure 4).

2.2. Organization of the information system database
The main component of the system under consideration is the database. The database traditionally serves as a storage, processing and retrieval of the required information. The structure of the database is reflected in the information model built according to the rules of the IDEF1X methodology using the Erwin package of Platinum Technology.

![Figure 4. Block-diagram of the method functioning and its main steps.](image-url)

The database in the mentioned solution method is a group of tables. A table is a collection of columns called table fields and rows containing one element (field) of each column. Such rows are called table entries.
The designed database consists of various types of tables containing data to prepare the reporting forms and further analysis. Each table is characterized by a set of details (fields). Key attributes should accurately identify a specific entity.

3. The selection of a set of technical means
The process of creating a synergy of technologies (SOT) is a complex integration process. Currently, this process cannot be fully formalized due to the lack of a unified approach to the selection of technical means to automate the various processes. The implementation of all information processing procedures with minimal labor, material and financial resources of the control object is provided by the organization of the rational structure of the SOT. That is why the thorough performance validity and hardware composition is so important. The complexity of solving these problems is characterized by the diversity of existing technical systems, the similar functionality of some technical devices.

The problem of the technical means choice is to develop an such approach in a CCC building, which will allow to link individual methods for solving it for a mentioned system to the general principles to choose a rational technical complex.

4. Conclusion
This paper refers to a methodology for planning, maintaining and visualizing the department staff activity indices (using the example of rating indices) using the reference model and the department’s Web portal.

Each employee and student can realize an accounting and control of the implementation of all works, including their own, considering the group policy and job descriptions.

Organization and storage in the IS of the current and planned department activity indices, developed using the reference model, makes it easier to collect statistical information.

The introducing of a distributed automated system will allow a remote monitoring of the activities of department staff and students.

The possibility of a comparative analysis of current and planned rating indices makes it possible to improve the operational management of the department using the Web - portal.

The rating information system on the basis of the reference model makes available and transparent all information on the educational process quality for the department staff and students, what will help to increase the department competitiveness.

References
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