

IT APPLICATION IN TEACHING PROCESS ASSESSMENT AT THE FACULTY OF MEDICINE IN NIŠ

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There are numerous heterogenic IT solutions representing the IT support for the improvement of the teaching process, scientific-research work and management of academic institutions both worldwide and in Europe. This paper presents the software for the assessment and control of higher education institution work quality implemented at the Faculty of Medicine in Niš. The adapted programme solution contains a series of modules required for every day functioning and related data exchange through the Internet adjusted to the needs of higher education institutions, that is to the needs of faculties of medicine, first of all in the Republic of Serbia. *Acta Medica Medianae* 2010;49(2):39-43.

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Introduction

The goal of all educational institutions in Serbia is to achieve and maintain the higher possible level of education quality (1). In order to integrate into the European educational system, higher education institutions are obliged to satisfy particular quality standards. The European Association for Quality Assurance in Higher Education (ENQA), QMS, TQE, ECA, EQAR has defined the set of standards and recommendations for the quality assurance in the area of higher education (2). The term "quality of study programme and teaching process" encompasses the coordination of higher education (results, processes and systems) and users' needs, aims, norms and standards. The quality is achieved through assessment and evaluation of the faculty goals, permanent data collection referring to programme and teaching process quality, content improvement and taking adequate measures.

The achievement and maintenance of high standards require the constant reevaluation and two-directional communication of all participants. The teaching process of educational institutions should be particularly directed towards students and their needs in the educational process, because the results and achievements of the Faculty depend on the students' success and satisfaction. Besides, the teaching process largely depends on the readiness and potentials of teaching staff to create and perform adequate study programmes. One of the most important indicators of the level of achieved teaching process quality is the regular assessment of both

students' and teachers' satisfaction with the teaching process quality. A large number of variables is considered in order to provide more adequate assessment of the teaching process. Students as participants in the teaching process directly assess the quality of the teaching process. The data obtained from the students serve as an indicator of the quality of particular elements of the teaching process on the basis of which adequate corrective measures may be introduced. All the employees at the Faculty in their own work domain contribute to the realization of the determined strategy.

In accordance with the new Law of Higher Education in Serbia, Academic Council of the Faculty of Medicine passed a decision to form the Centre for the assessment, assurance, improvement and development of study programmes, teaching process and scientific-research work quality (in further text, Centre for quality control). The major goal of this Centre is to increase the quality level of all activities performed at the Faculty (4).

The questionnaire in paper form for students, teaching and non-teaching staff was introduced at the Faculty of Medicine in 2006.

Anonymous surveying of teachers and associates was performed several times a year on the basis of the activity plan proposed by the Centre for quality control. Students of all study years and study programmes were included in the survey. They evaluated teachers and associates whose classes they attended. The number of questionnaires for teaching staff in a survey term was up to the 32.000.

Surveying of non-teaching staff was conducted by teaching staff several times a year. The number of questionnaires for the non-teaching staff in a survey was approximately 4.000.

The process was rather large and could not be conducted in a top quality way (5).

The major problems that occurred were those referring to paper documentation, slow document search, input of one and the same

information for several times and to several places and impossibility for right and accurate creation of statistical reports. Lost paper documentation as well as its storage led to numerous errors as well. Printing expenses are not to be neglected either. Multiple inputs of identical data made by the Faculty services brought about high percentage of errors, especially those relating to different data about students, Faculty staff and classroom occupation.

It was necessary to engage the teaching staff and associates who distributed, collected and submitted questionnaires. The whole faculty staff was engaged in a period of at least two weeks to conduct survey, do printing, data collecting and processing of questionnaires.

Data collaboration and integration actually did not exist in IT domain.

Implementation of adequate software support was necessary in the survey system, analysis of collected data and forwarding of questionnaire results to the Faculty management.

At the request of the Centre for quality control, the project was launched in November 2008, whereby the technical solution completely oriented to the solution of these problems.

Applied technology

Since the Faculty had the software for administrative and students' needs that was changed and modified over the years, the need arose for the software integration of quality control with the existing software. The implementation of this system demanded flexibility and possibility of adaptation to the existing solutions. The integration of this software led to the unique information system at the Faculty of Medicine.

The integration of application to the existing information system at the Faculty of Medicine was accomplished by multi-layer architecture of the Web application.

The layer of validation of input data and interaction with the user at the client side in Web reader makes up the presentation layer consisting of dynamic Web pages.

The layer of business logic separates the user's interface from functionality for data access and makes it independent from the implementation way of the database. This layer serves for the processing of survey results, protection from unauthorized access to sensitive data, protection from multiple filling in the questionnaire, logic for report generation, etc.

The administration of data access is accomplished by the layer of data access in the local database and access from the information system database of the Faculty. Data about users of applications and data about student questionnaire content and results are placed in the local database. All the data about students, courses, teaching staff and engagement of the teaching staff in the courses in the current academic year or semester are taken from IS database.

Special care was taken that the technology used be flexible and adaptive, as well as not to depend on the platform where it is performed. Since there are not so many show-stopping problems in the project, the priority is fast

construction and easy installation of the system. Standard solution stack for such situations is PHP, MySQL. Thus, both lower expenses and possibility for adjusting to close technologies such as SQL are provided. In order to obtain the solution that is adjustable to technical requirements of the Centre for quality control, the technologies with small limitations are used. This selection caused performances to be put lower on the priority list. The nature of examination system is such that the performances represent no problem, and system limitation to the institution where it is installed guarantees that there will be not so many simultaneous demands. Construction of adapter layer for the integration with other parts of the Faculty IS is simple, because there are interfaces for the communication between PHPa and Windows platform solutions. This adapter layer enables the analysis of research results using visualization and providing context to the collected data by means of OLAP.

Data collected by means of questionnaires are difficult to present in more than one dimension they support. In order to get more intuitive insight into dependence of several factors affecting the teaching process, data from questionnaires are connected with the existing data from the Faculty services. OLAP databases are divided into one or more cubes organized by an administrator who organizes and designs each cube so that they match the way the data are downloaded and analyzed. In this way, it is easier to create reports of the obtained tables and graphs.

OLAP analysis releases physical data processing, but it requires establishing the relations between data collection that are to be observed in the OLAP cubes (6). The information collected by the survey may not present the base of OLAP cube, but rather yield new dimensions to fact tables. In accordance with new demands, this system had multi-step evolution and development. Therefore, data that we want to visualize are kept in different parts of this information system. Thus, data collection about students and teaching staff, as well as tables with surveyed courses, grades or enrolled semesters, may serve as fact tables.

BI/DW (Business Intelligence/Data Warehouse) may be very useful for data analysis (7). Apart from the speed of performance, flexibility in report building represents additional advantage of these systems.

One of the basic reasons for the implementation of BI/DW system in higher education institutions is report making of the faculty work quality. Figure 1 shows data course in DW/BI system. The final result of DW/BI system is report or data analysis on the basis of which certain conclusions could be made. These data are usually observed by the Faculty management and the Centre for quality control that together bring strategic decisions.

Database mainly consisting of students' base was used in the application of this software. This base is located on the DBMS Microsoft SQL Server 2003 and has been keeping data about students, grades and teaching staff since academic year 1999/2000. At present, the base contains about 7.800 active students of the basic and integrated academic studies

people with special privileges have the right to access the system and thus make such changes. They have a complete insight into the state of the survey period, how many students were polled, and about which subjects.

Anonymity of the survey can be achieved by remembering the students' answers on the relevant subjects in separate tables of data, however, without any relation among them. In this way, it can be seen which mark was given to any of the subjects, without seeing the name of the student polled, that is, it is impossible to identify which student filled in any of these questionnaires.

Data from the data base with results are automatically processed and completed reports ready to be printed and obtained.

The study programmes at the Faculty of Medicine have different types of teaching, so different types of questionnaires have to be created.

Modularity and adjustability of software enables software application in the majority of educational institutions, depending on the condition of information resource.

It is very important to conduct surveys appropriately, for they represent a very valid instrument for the teaching process quality improvement and elimination of drawbacks and irregularities.

Besides, by using this application it is much easier to obtain accurate information during particular teaching activities. Constant quality assessment is enabled through review and analysis of quality indicators of some of the elements in the teaching process. By comparing the results of the current academic year with those from the previous academic year, it might be concluded whether the activities directed towards quality assurance yield any results.

Data review

Classic way of data processing and analysis is tiresome, while digital processing enables fast insight into results and immediate report making. Reports may be fixed and variable. Fixed reports are automatically created for each questionnaire that is filled in. For each question, it is possible to generate report with statistically processed data. The course that was surveyed occupies the last position in the course list, the link is disconnected and new access is put out of action.

It is possible to interrupt filling in the questionnaire at each moment. Also, it is possible to perform surveying of the particular courses in several iterations. Filling in the questionnaire for any course is over the moment all required spaces have been filled in and the input has been confirmed. The questionnaires for courses that are to be evaluated may be immediately filled afterwards or by repeated log on.

Since questions are not hardcoded, it is easy to change them. Questions may be changed only by persons who are authorized to access the system. They have complete insight into the survey period state referring to the number of students who filled in the questionnaire as well as the anonymity of the questionnaire.

The anonymity of the questionnaire is accomplished in such a way that the data about a

student who fills in a questionnaire are saved in special data tables, without being interrelated. Thus, the grade of the course is known, whereas the name of the student remains unknown.

Results of the questionnaire are created in form of reports for each question in the following way: statistics for total number of surveyed students summed up in that survey period, reports created for each study group, reports for syllabi and curricula, reports for each course.

OLAP technology is used for the sake of teaching process quality improvement, data analysis and creation of variable reports. Data presentation from OLAP cube is possible via Microsoft Excel. The basic purpose of Microsoft Excel is table and graphic data presentation.

Microsoft OLE DB Provider for Analysis Services 9.0 is required in order for Excel to be connected to OLAP cube (that is on MSSQL Server 2005 or higher) (10).

An example of graphic presentation of data in Excel is shown on Figure 4.

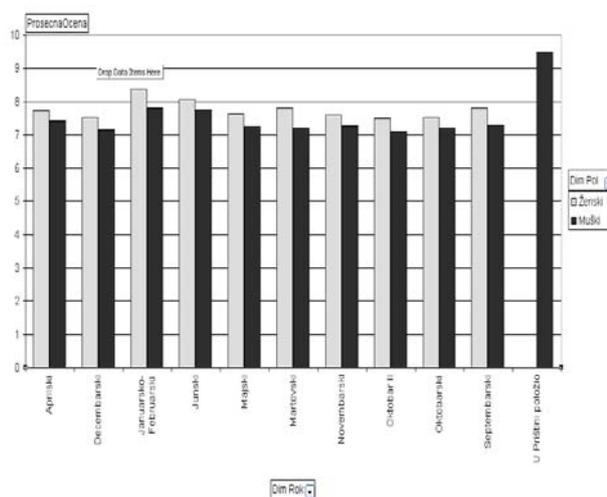


Figure 4. Graphic presentation of data in Excel from OLAP cube

Conclusion

Software is adapted as multi-layer web application. Large number of web services for communication with the database and other information systems has also been adapted.

Functionalities offered by this software are accessible to all users (students of all study years, teaching and non-teaching staff), depending on their privileges.

The high level of personalisation and implementation of complex methods of identification and authenticity has been achieved.

Modular approach to software solution projecting was applied in order to assess and analyse parameter values of the teaching process quality.

Reports are realized as fixed and variable, whereby B1 level is realised, too, for easier and more efficient insight into collected data.

XML format is used for the storage and exchange of structured data for the purpose of platform independence assurance.

The data required for the application are typical for the work of majority of higher education institutions (11), so the data created once may be used for many purposes.

This software is flexible and possible to integrate into already existing and future information systems of other higher education institutions for the purpose of using current data about students of basic studies, doctoral students, interneers, teaching and non-teaching staff, as

well as all study programme courses and independent application operation. The implementation of all systems requires flexibility and adaptation possibility to existing solutions.

Such a solution may certainly have positive effect on adequate decision making and implementation of necessary corrective measures that would lead to the improvement of the overall teaching process quality.

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PRIMENA IT ZA PRAĆENJE KVALITETA NASTAVE NA MEDICINSKOM FAKULTETU U NIŠU

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U svetu ali i u Evropskoj uniji postoji niz heterogenih IT rešenja koja predstavljaju IT podršku za unapređenje nastave, nastavno-istraživačkog rada i upravljanje akademskim institucijama koje se bave obrazovanjem. Međutim, ova rešenja su svuda prilagođena pravilima i propisima koje država propisuje. Zbog velike specifičnosti rada obrazovnih institucija puno se radi na rešavanju ovih problema. Takva rešenja trpe mnogo modifikacija za vreme svog postojanja. U ovom radu predstavljen je softver za praćenje i kontrolu kvaliteta rada visokoškolske ustanove, implementiran na Medicinskom fakultetu u Nišu. Realizovano programsko rešenje sadrži niz modula koji su potrebni za svakodnevno funkcionisanje i međusobnu razmenu podataka preko Interneta a koji su prilagođeni potrebama visokoškolskih ustanova u Republici Srbiji i to, pre svega, za grupaciju medicinskih fakulteta. *Acta Medica Medianae 2010;49(2):39-43.*

Ključne reči: kontrola kvaliteta, IT, informacione tehnologije, OLAP