Database Structure of the Information System for Graduation Works Allocation in the Technology School "Electronic Systems"

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Abstract – **The goal of this paper is to analyze the database expansion in order to fit the requirements of the design and development of Information system for Graduation work allocation as a supplement to the Information system for learning process management in the Technology School "Electronic Systems" associated with the Technical University – Sofia and propose means for students ranking for graduation work topics..**

Keywords – **Information system, Database, Education**

I. Introduction

The recently used Information system for learning process management has been developed and implemented in the Technology School "Electronic Systems" associated with the Technical University – Sofia (TUES) before several years [1]. Its numerous advantages have led to further development of a system supporting the graduation process. TUES has at the moment three specialties – Computers systems, Programming and Networks.

The graduation process in TUES includes:

- announcement of topics for graduation works from lecturers;
- allocation of graduation works to students on base of their wishes and results;
- determination of reviewer for each graduation work;
- schedule for defense of graduation works;
- preparation of final protocols and papers for the results of the defense of graduation works for the students and for the lecturers.

The goal is to analyze the required data for the system and to determine the new data fields and their implantation in the recently used database. The implementation of such system will have a wide range of advantages [2] in the educational process for the students and for the lecturers.

II. Required Data for the Information System for Graduation Works Allocation

The data needed for the common features [3] of school administration have been developed and implemented in the Information system for learning process management.

The data required for the functioning of the Information system for graduation works allocation might be classified as data describing:

- Specialties of the TUES in which students have been educated and in which they should receive appropriate graduation work. These specialties concern the lecturers giving topics for graduation works and of course the lecturers – reviewers.
- List of topics for graduation works with appropriate instructors and specialties for the students to compete.
- Students with their identification data, achieved during the educational process results, wishes for graduation work topics, received work topic, final results.
- Lecturers having specialties, supplying topics for graduation works and being reviewers.
- Commissions for defenses of graduation works having date, time and place for the proceeding, members, students and final results.

On Fig. 1 the data relations in the system for graduation works allocation are presented.

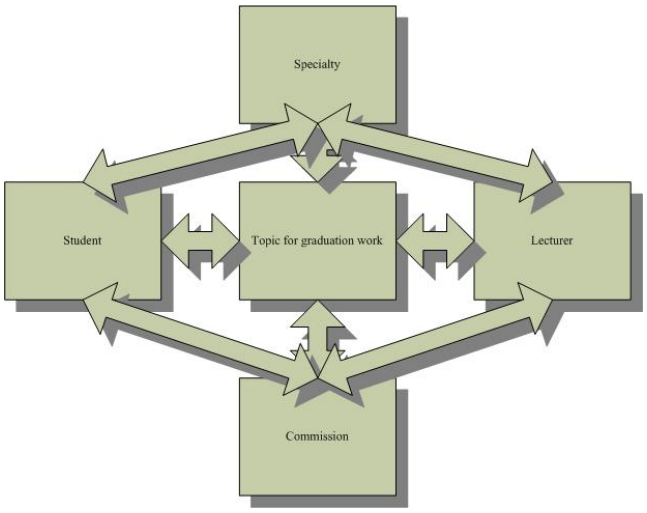

Fig. 1 Data relations in the system for graduation works allocation data

The specialty of the school has been defined for each student. It also describes the lecturer which might be an instructor giving topics for the graduating works or a reviewer. In this way the specialty concerns also the graduating works. Each specialty in TUES beside its name has an abbreviation widely used.

The student has to make his choice from the list of graduation works in the definite specialty. In this way he has an indirect connection to the instructor and the reviewer. Both are members of the set of lecturers. Conversely the lecturer receives a connection to the student through the list of graduating works.

Each student is identified by his name, class, class division, number in class and graduation year. He also

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holds a specialty description and results from his former education. Every student might declare wish for three topics from the announced topics of graduation works. In this way he also declares his desire to work together with the appropriate instructor.

On the base of the place of his wish (first, second or third) and the achieved marks during his former educational process in TUES classification can be made. Thus to the student a topic from the list with graduation work would be allocated and a connection with it created. Further for the student with his chosen topic a reviewer .with appropriate specialty can be appointed.

Finally the student receives an announcement for the date, time and place where the defense oh his graduation work will take place. The protocol description of the commission proceedings and the results of the defense should also be present in the data of the student.

Every lecturer has been described by his name, specialty and degree. The lecturers propose a number of topics in his specialty for graduation works. For all topics of each lecturer that have been chosen by some students and later associated with one of them he becomes the instructor. Later he receives some works for review and becomes the reviewer for the students of these works. For his participation in commissions he declares his preferred days and time.

Commissions besides the date, time and place attributes have members from the set of lecturers, students to defense their work from the list of graduation works. For each commission proceeding a protocol with the members of the commission, students to defense the appropriate graduation work and the received marks are required.

III. Database Structure for the Information System for Graduation Work Allocation

The database structure presented on Fig.2 has eight tables – Specialties, Lecturers, Lectimes, Students, Stuwishes, Topics, Commissions and Commembers.

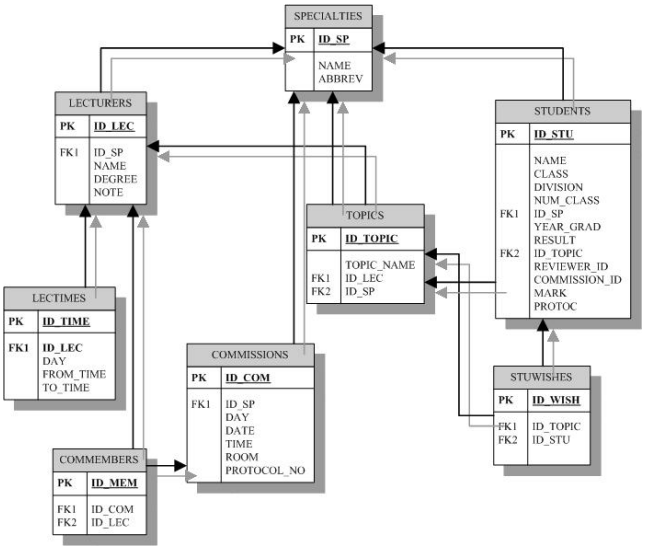

Fig. 2 Database structure of the Information system for Graduation works allocation

The connections between tables are as follows:

- Tables Lecturers, Students, Topics and Commissions have connection to the table Specialties using its primary key ID_SP field.
- Tables Lectimes, Commembers and Topics have connection to the table Lecturers using its primary key ID_LEC field.
- Table Stuwishes has connection to the table Students using its primary key ID_STU field.
- Tables Students and Stuwishes has connection to the table Commissions using its primary key ID_TOPIC field
- Table Commembers has connection to the table Students using its primary key ID_COM field.

In table 1 the fields, their type and size as also the description of the contents of table Specialties is presented.

TABLE 1. TABLE SPECIALTIES

FIELD	TYPE	SIZE	DESCRIPTION
ID_SP	int(auto inc)		Identification number
NAME	varchar	20	Name of the specialty
ABBREV	varchar	3	Abbreviation

In table 2 the data for the lecturers in the appropriate table is shown.

TABLE 2. TABLE LECTURERS

FIELD	TYPE	SIZE	DESCRIPTION
ID_LEC	int(auto inc)		Identification number
ID_SP	int		Foreign key to table Specialties
NAME	varchar	20	Lecturer's name
DEGREE	varchar	15	Titles to be used for the lecturer
NOTE	varchar	50	Used on user's discretion

The ID_SP field allows the filtering of lecturers for the set up of commissions, for the choice of reviewer for a topic in a definite specialty etc.

In table 3 the graduation work topics attributes are listed showing the keys for relation to tables Lecturers and Specialties.

TABLE 3. TABLE TOPICS

FIELD	TYPE	SIZE	DESCRIPTION
ID_TOPIC	int(auto inc)		Identification number of the topic
TOPIC_NAME	varchar	150	Name of the graduation work topic
ID_LEC	int	20	Foreign key to table Lecturers
ID_SP	int	15	Foreign key to table Specialties

In table 4 the data for the students in the appropriate table is shown.

TABLE 4. TABLE STUDENTS

FIELD	TYPE	SIZE	DESCRIPTION
ID_STU	int(auto inc)		Identification number
NAME	varchar	30	Student's name
CLASS	varchar	2	Class of the student
DIVISION	char	1	Division of the class
NUMCLASS	int		Number in class
ID_SP	int		Foreign key to table Specialties
YEAR_GRAD	year		The graduation year of the student
RESULT	int		Student's average of his marks in education
ID_TOPIC	int		Foreign key to table Topics
REVIEWER_ID	int		Foreign key to table Lecturers
COMMISSION_ID	int		Foreign key to table Commissions
MARK	int		Received at the defense of graduation work mark
PROTOC	char	10	Protocol description

Table 5 describes the data for the lecturer's time convenient for participation in commissions for defense of graduation works. Every lecturer has additional duties and the time and days differ. For establishing for a definite day and time the free from other obligations lectures in a definite specialty each has to declare his convenient for defenses day and time. It should be defined as weekday and time from to time to.

TABLE 5. TABLE LECTIMESS

FIELD	TYPE	SIZE	DESCRIPTION
ID_TIME	int(auto inc)		Identification number of the lecturer's time
ID_LEC	int	20	Foreign key to table Lecturers
DAY	varchar	10	Convenient day in the week for commission proceedings
FROM_TIME	time		Begin of convenient time for the day
TO_TIME	time		End of convenient time for the day

The last table 6 shows the fields containing the individual wishes of the students.

TABLE 6. TABLE STUWISHES

FIELD	TYPE	SIZE	DESCRIPTION
ID_WISH	int(auto inc)	10	Identification number
ID_TOPIC	int		Foreign key to table Topics
ID_STU	int		Foreign key to table Students

These wishes are up to three for each student and express the desire for work upon definite topic under the control of a definite instructor.

In table 7 the structure of the table containing data for the members of each commission is presented.

TABLE 7. TABLE COMMEMBERS

FIELD	TYPE	SIZE	DESCRIPTION
ID_MEM	int(auto inc)	10	Identification number
ID_COM	int		Foreign key to table Commissions
ID_LEC	varchar	20	Foreign key to table Lecturers

In table 8 the data for the set up of commissions is shown.

TABLE 8. TABLE COMMISSIONS

FIELD	TYPE	SIZE	DESCRIPTION
ID_COM	int(auto inc)		Identification number of the commission
ID_SP	int		Foreign key to table Specialties
DAY	varchar	10	Day in the week for commission proceedings
DATE	date	15	Date of commission proceedings
TIME	timer		Begin time
ROOM	varchar	3	Place of commission proceedings
PROTOCOL_NO	int		Number of the protocol for the date and time

The described in such way data has been designed for a separate information system for graduation works allocation.

The recently used Information system for learning process management has its own database. In order to escape from data repetition its database should expanse involving the newly described fields and tables.

The database of the recently used Information system for learning process management contains data that is used in the proposed system for graduation works allocation. That is the tables of Specialties and Lecturers and the fields in the Students table except Result, Id_Topic, Id-Reviewer, Commission_Id, Mark and Protoc fields which could be added to the table.

IV. CALCULATION OF RESULT FIELD

The field Result from the table Students (table 4) is very important [4] and contains the average performance of the student. The contents of the field Result can be entered by the user of the system having done several calculations in advance. Uniting the tables of the two systems – the recently used and the proposed one in one database would allow the calculation of this field within the system itself. It

could be done because the current database contains all former marks of the student during the years in all disciplines. In such way the final result can be received automatically.

For the competition of the students for a definite topic of graduation work not all but just the marks of the disciplines forming the specialty are important. So the Result will be as shown in Eq. 1.

$$Result = \frac{\sum_{i=1}^{i=n} M_i}{i} \quad (1)$$

where n is the number of the technical disciplines for the definite specialty (in practice 0< n <= 6) and M_i is the mark for a definite discipline.

The observation of the students wishes and the follow up allocation of graduation works has pointed that the disciplines of the definite lecturer carries weight with the final decision for the appropriation of a student to a topic. So it has become obvious that in the calculation of the Result the mark in the discipline of the lecturer who has declared the topic must have greater weight in the calculation than the other marks.

One lecturer presents the material in one up to three different but close disciplines. The marks in these disciplines are of greater importance because every lecturer declares topic concerning them.

Experimental calculations of the result for 102 students have shown that using weight 1 for six technical disciplines and the average mark for lecturer's own disciplines (one or max. three) with weight 1,5 compares to the human decision for graduation work topic allocation. It can be expressed in the proposed way in Eq. 2

$$Result = \frac{\sum_{i=1}^{n-k} Mi}{i} + \frac{\sum_{j=1}^{k} Mj}{j} * T \quad (2)$$

where n is the number of all technical disciplines for the definite specialty (in practice 0< n <= 6), k is the number of the disciplines of the lecturer who has declared the considered topic (in practice 0< k <= 3). M is the mark of the define student for the definite discipline and T is the discussed weight of the disciplines of the definite lecturer.

By receiving equal results of some students all of them are allocated to the same topic and it has to be obligation of the lecturer to give additional topics in the same field of scientific interest. When a lecturer receives more than a predefined number of graduates the system can direct the students to another instructor having fewer graduates. This is the way the allocation of graduates has been done manually. The proposed system is able do perform it automatically with a possibility for entering changes by the administrator of the system.

For fulfillment of such calculation the list of technical disciplines for the definite specialty exists in the currently used database. There is also data defining the disciplines of each lecturer. All what would be necessary is to insert the weight of the disciplines for the topic of a lecturer. The field containing this weight can be added in the Specialty table.

V. Conclusion

The development and implementation of the proposed system allows save a lot of time for announcement of topics, discussions and calculations of former received marks for allocation of graduation works and assigning reviewers to each topic.

It also possesses all data needed for preparation and print out of all required protocols.

The calculation of the Result might be used for several other purposes where competition of students takes place. Such are different additional courses led by the lecturers inside the school or by guest lecturers invited in the school.

References

[1] Стоянова Л., Структура на Web-базирана система за електронно обучение в технологическо училище "Електронни системи", Национална конференция ЕЛЕКТРОНИКА'2004, София, Май 2004

[2] Graham Attwell, Lone Dirckinck-Holmfeld, Peter Fabian, Andrea Kárpáti and Peter Littig "E-Learning in Europe – Results and Recommendations", Thematic Monitoring under the Leonardo da Vinci Programme, March 2004

[3] http://www.veracross.com/school-administration-system.aspx

[4] Price M., Rust C., The experience of introducing a common assessment grid across an academic department. Quality in Higher Education, 1999