Pakistan Journal of Applied Sciences 1(1): 03-05, 2001

BUADVIS – a Decision Support System for Student Advising

Meltem Özturan[1] and Zeynep Ayan[2]
[1]Management Information Systems Department, Boğaziçi University, İstanbul, Turkey
[2]Human Resources Consultant, Arthur Andersen, İstanbul, Turkey

Abstract: The most important stage of registration procedure in Boğaziçi University is student advising process since it is very time consuming and is very sensitive to advisor errors. BUADVIS, the decision support system for student advising, is developed to make this registration stage easy and reliable. System takes the necessary information and related rules and regulations into consideration while running up the analytic model to end up with a semistructured decision support system for advisors where course assignment alternatives are listed. The system is found to be time saving, intelligent enough to minimize advisory errors and replaceable of registration paper work.

Key words: Decision support system, analytic decision making, student advising

Introduction

The student advising stage of the registration procedure for students at Boğaziçi University (BU) has been a very time consuming task both for advisors and students. Each semester approximately 9000 students are registered to courses by approximately 300 advisors which means 30 students per each advisor. During the registration day students must first decide, together with their advisor, which courses they should take to be able to proceed with the rest of the registration process. Each semester this process becomes a cumbersome one for the advisor because of the followings:

* Advisor should update the student's file of courses taken
* Advisor should follow up all curriculum changes
* Advisor should know every aspect of the academic regulations for students and follow up all the updates related to it and
* Advisor should follow up all the courses offered and the course schedule in current semester.

To provide a consistent, qualified and time saving student advising Decision Support System (DSS) for students of BU, Boğaziçi University Advising System (BUADVIS), the study presented in this paper, has been developed.
The expected benefits from this system can be listed as follows:

* time saving for advisors for pre-registration tasks
* speeding of the registration procedure
* minimization of advisory errors
* permanent storage of students' files
* availability of updated curriculum, regulations, courses offered and course schedules and
* possibility of preliminary course-advising without an advisor.

Literature Survey on Academic Advising Systems: Student advising is one of the Academic Advising Systems (AAS) and may be affected by course scheduling and may affect exam scheduling where both are also considered as AAS. For this reason, literature survey is focused on these three systems.

Course Scheduling: Course scheduling is important for student advising systems since advisory systems should be free of scheduling conflicts and the way the scheduling system is prepared sometimes determines the algorithm to be used for the student advisory system. For the problem of course scheduling there are two kinds of approaches; one of them assumes that course schedule is prepared before students are assigned to courses [Dinkel, Mote and Venkataramanan 1989] [Laporte and Desroches 1986] and the other assumes that students are assigned to courses first and then accordingly course schedule is prepared [Sampson, Freeland and Weiss 1995] [Kiaer and Yellen 1992]. Ways of solution can be grouped as expert systems [Martinsons and Kong 1993], heuristic approaches Aubin and Ferland 1989], network-based models Dinkel, Mote and Venkataramanan 1989 and integer programming McClure and Wells 1984.

Student Advising: There are very few studies on the topic of student advising. APE is a knowledge-based system for the advising and assistance of university students in the planning of their studies towards an academic degree [Golumbic, Markovich, Tsur and Schild 1986]. System has been implemented for and tested at the Bar Han University. It has the capability of planning a program of courses which meets the student's remaining degree requirements and is sensitive to his preferences and strengths where it is also able to give correct advice on prerequisites, exemptions, and the like. ADVICE is a system for evaluating the study plans of the Industrial Engineering graduate students of the University of Arizona and was developed to check for inconsistencies in their study plans with knowledge obtained from professors, a department handbook and the university catalogue [Shen and Bahill 1988]. It was successful in reporting some mistakes of the students.
IEADVISE is an undergraduate student advising system developed and used by the Department of Industrial Engineering at the University of Missouri [Occena and Miller 1993]. It specifies a set of eligible courses for the student to take taking the expert knowledge into consideration. Validation check on this system showed that accuracy of IEADVISE was high and sample population of students found it to be easy, helpful, timely and accurate.

Exam Scheduling: Exam scheduling is usually dependent on the course assignments made to students, i.e. student advising systems and ways of solution are similar to course scheduling systems [Carter, Laporte and Chinneck 1994] [Johnson 1990].

BUADVIS, the subject of this paper, is a student advising system and it is assumed that the course scheduling system related to it is prepared before and exam scheduling related to it is going to be prepared afterwards depending on the course assignments made.

Materials and Methods: DSS's are known as computer based information systems that support semistructured or structured decisions [Liang 1988] and are often characterized as being either analytic or heuristic from the point of view of decision making style [Kendall and Kendall 1988]. Semistructured decision; which is partially programmable, but still requires human judgement, and analytic decision making; which relies on information that is systematically acquired and systematically evaluated to narrow alternatives and make a choice that is information based, are the main concerns of this study. Intelligence, design and choice stages of decision making [Kendall and Kendall 1988] are followed up to prepare database, model base and a dialogue module components of DSS [Hoffer, George and Valacich 1996] through the following steps:

Step 1: After analyzing the existing regulations for students [Boðaziçi University 1995] and interviewing with advisors and the registrar, types of information needed for student advising are found to be as follows:

* Courses and the grades that the student has already taken
* Semester Points Average (SPA) and General Points Average (GPA) of the student
* Curriculum of the department of the student
* Prerequisites of the courses
* Course schedule of the current semester
* Regulations related to course assignments

Step 2: Under the guidance of the analysis done in Step 1, the following database is designed:

File Name	Content
STUDENT	General information of students (student no,name,surname,department,etc.)
STUSEM	Term based information of students (credits attempted and completed,GPA, etc.)
STUCOUR	Courses and grades taken by students (semester,course,grade,etc.)
PREREQ	Prerequisites of courses (AND and OR combinations,etc.)
CURRIC	Curriculum of each department (required courses,electives,etc.)
COURSCH	Schedule of the courses offered each semester (course,day of the week,etc.)
DEPT	General information about a department (name,degree offered,total credits,etc.)

Step 3: Under the guidance of the analysis done in Step 1, the following rules and parameters are defined:

* Students can take a course only if there is no prerequisite for it or prerequisite(s) of the course has (have) been already completed.
* Students can take only the courses offered in the current semester.
* Students can't take new courses if they are on repeating status (if a student's current GPA and SPA for two consecutive semesters are all less than 2.00, then the student is said to be on repeating status). They can only repeat the courses with grades F, DD or DC till their GPA reaches 2.00.
* When students are not on repeating status, they can repeat the courses they have failed and may repeat only one course per semester with grade DD or DC where number of such courses can not exceed 6 in total.
* Students can't overload if their GPA is less than 2.00.

Step 4: Before setting up the model, the following assumptions are made related to the model development :

* Only the required courses of the curriculum are going to be followed for prerequisite checks, elective courses are going to be free of this check and are going to be left to the user as semistructured decision since it differs from one advisor to another.
* While preparing the decision alternatives for course assignments, course schedule is going to be ignored but related conflicts are going to be marked so that the user can decide accordingly.
* Quotas of the offered courses are not going to be taken into consideration.

Step 5: An analytic decision model is developed using the already designed database, the rules and parameters defined and the assumptions made. The model consists of the following steps:

* Check if the student is on repeating status or not.
* If the student is on repeating status, then filter out the courses and elective groups of the curriculum to the ones that the student has taken the grades F, DD or DC.
* If the student is not on repeating status then filter out the courses and elective groups of the curriculum to the ones that the student;
  - has failed
  - has not taken yet and prerequisite check is OK if it is a required course
  - has taken the grades DD or DC and repeat limitations related to those types of courses or elective groups have not been exceeded
* Using the filtered out required courses and elective groups either from Step 2 or Step 3, check if the required courses are offered in the current semester or not and then eliminate the ones that are not offered.
* Prepare a decision set for the student advising system from the required courses and elective groups left after completion of Step 4.
* To guide the decision maker, check each required course with the other ones in the decision set for schedule conflict and indicate if such conflict exists.
* Let the decision maker choose a required course or an elective group from the decision set
* If an elective group is chosen then ask for the related course and then make the necessary validation checks for this course that have been applied to the required courses before, except the prerequisite check.
* If GPA of the student is less than 2.00 and if the student is in the position of overloading, stop the advising system else continue till the user ends it or till no course or elective group is left in the decision set.

Step 6: Dialogue module for the system is developed by using a relational database management system and the screen of the user interface designed for this purpose contains the followings:

* General information of the student
* Term based information of the student for all the semesters that has been attended
* Status of the student (on repeating or not)
* Courses and grades that the student has taken
* Window for course advising that is prepared by using the results obtained after the 6'th step of the model and includes required courses, elective groups, previous grades for the courses or for the elective groups if they have been taken before and the schedule conflicts for the required courses if any

Through the dialogue module, the user is expected to choose the desired required courses and/or elective groups from the course advising window to be assigned to the student and then all the necessary validation checks and warnings are made as described in the other steps of model development.

Results and Discussion

First version of BUADVIS, where prerequisite and offered courses checks were not included and regulations related to repeating status were not on progress, has been used and tested for 2 years in Civil Engineering, Tourism Management, Computer Programming, Electronics and Business Administration departments of BU. The followings are the summary of the comments related to first version of BUADVIS;

* It is a time saving system
* It minimizes the paper work during registration
* It reminds everything related to the student so it minimizes the advisory errors
* Prerequisite checks should also be in the system
* System should eliminate the courses not offered in the current semester

Taking the above comments into consideration, the second version of BUADVIS, as described in this paper, is developed. The new version is on test now and up to now, it is found to be a very time saving and a very helpful system for advisors with the facilities of prerequisite and offered courses checks and more adaptive to the new regulations such as repeating status than the advisors are. It is planned afterwards that, for the past semesters, the student advising system will be compared with the already assigned courses of those semesters for verification purposes. This paper has described BUADVIS : its database, model, dialogue and testing. The use of a DSS as an student advising system is seen to be very beneficial both for advisors and students from the point of view of time saving and minimization of advisory errors. For further studies, it is planned that BUADVIS is going to be expanded to include quota restriction of the courses, appropriate courses for elective groups and determination of the semesters left for graduation.

Acknowledgements

The authors wish to acknowledge the Faculty of Civil Engineering and Computer Programming departments and Registrar of BU for their valuable supports of providing information and of testing that have become part of BUADVIS and Boğaziçi University Research Fund for their financial support.

References

Aubin, J. and A. Ferland, 1989. A large scale timetabling problem, Computers and Operations Res., 16: 67-77

Boğaziçi University, 1995. Student Handbook of Boğaziçi University. Print Office of Boğaziçi University, İstanbul, Turkey.

Carter, M.W., G. Laporte and J.W. Chinneck, 1994. A general examination scheduling system, Interfaces, 24: 109-120

Dinkel, J.J., J. Mote and M.A. Venkataramanan, 1989. An efficient decision support system for course scheduling, Operations Res., 37: 853-864

Golumbic, M.C., M. Markovich, S. Tsur and U.J. Schild, 1986. A knowledge-based expert system for student advising, IEEE Transactions on Education E-29: 120-124

Hoffer, J.A., J.F. George And J.S. Valacic,. 1996. Modern Systems Analysis and Design. The Benjamin/Cummings Publishing Company, Inc., Menlo Park, USA.

Johnson, D., 1990. Timetabling university examinations, J. Operational Res. Soc., 41: 39-47

Kiaer, L. and J. Yellen, 1992. Weighted graphs and university course timetabling, Computers and Operations Res., 13: 387-394

Kendall, K.E. And J.E. Kendall. 1988. Systems Analysis and Design. Prentice-Hall International, Inc., Englewood, USA.

Laporte, G. and S. Desroches, 1986. The problem of assigning students to course sections in a large engineering school, Computers and Operations Res., 13: 387-394

Liang, T., 1988. Development of a knowledge-based model management system, Operations Res., 36: 849-863

Martinsons, M.G. and C.K. Kong, 1993. Intelligent timetabling using a microcomputer, Int. J. Educ. Manag. 7: 9-17

McClure, R.H. and C.E. Wells, 1984. A mathematical programming model for faculty course assignments, Decision Sci., 15: 409-420

Occena L.G. and S.L. Miller, 1993. IEADVISE - An undergraduate course-advising expert system in industrial engineering, Expert Systems 10: 139-149

Sampson, S.E., J.R. Freeland and E.N. Weiss, 1995. Class scheduling to maximize participant satisfaction, Interfaces 25: 30-41

Shen Y. and A.T. Bahill, 1988. An in-depth study of an expert system that helps evaluate graduate programs, and a statistical summary of 25 little expert systems, Proceedings IEEE International Conference on Systems, Man, and Cybernetics, 2: 249-251