

Chapter 5

Institutional Research Using Data Mining: A Case Study in Online Programs

Constanta-Nicoleta Bodea

Academy of Economic Studies, Romania

Vasile Bodea

Academy of Economic Studies, Romania

Radu Ioan Mogos

Academy of Economic Studies, Romania

ABSTRACT

The aim of this chapter is to explore the application of data mining for analyzing academic performance in connection with the participatory behavior of the students enrolled in an online two-year Master degree program in project management. The main data sources were the operational database with the students' records and the log files and statistics provided by the e-learning platform. One hundred eighty-one enrolled students, and more than 150 distinct characteristics/ variables per student were used. Due to the large number of variables, an exploratory data analysis through data mining was chosen, and a model-based discovery approach was designed and executed in Weka environment. The association rules, clustering, and classification were applied in order to identify the factors explaining the students' performance and the relationship between academic performance and behavior in the virtual learning environment. Data mining has revealed interesting patterns in data. These patterns indicate that academic performance is related to the intensity of the student activities in virtual environment. If the student understands how to work and she/he is motivated to communicate with others, then he might have a good academic performance. Based on clustering analysis, different student profiles were discovered, explaining the academic performance. The results are very encouraging and suggest several future developments.

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BACKGROUND

The case study refers to a national university in Romania, called as the *Federal University*. The education and training programs of this university are delivered based on a public budget, coming from the Education and Research Ministry, and also on its own resources, such as: micro-budget activities and services, introduction of fees, scientific research, foreign loans, and so on. The university autonomy, along with its major components: the financial autonomy, the administration flexibility and the implementation of a high economic motivation are the key levers of the general strategy for improving the efficiency of the university management.

The *Federal University* is considered a remarkable representative of higher education in Romania. The university has 10 faculties or colleges. In 2009-2010, the *Federal University* has delivered more than 192 education and training programs, 26 of them being delivered as online programs (see Table 1). There are more than 49,000 enrolled students (35,500 students enrolled in bachelor degree programs, 9400 students in master programs, 2500 PhD students and over 1600 students enrolled in academic schools and post-graduate courses). The National University of Economic Studies has 2000 didactical staff and technical and administrative personnel, all together. The *Federal University* delivers online programs using several e-learning platforms, the most popular one being Moodle, which was adopted by the majority of programs organizers. Moodle (<http://moodle.org/>) is a course management system, also known as a learning management system or a virtual learning environment.

One of the online master degree programs is the *Computerized Project Management* program, known as MIP (*Managementul Informatizat al-Proiectelor*; which is the program's name in the Romanian language). In 2009-2010, 181 students were enrolled in the MIP online program. As e-learning infrastructure, the Moodle platform is

Table 1. The education and training portfolio 2009-2010 of the Federal University

The National University of Economic Studies Education & Training Programs	Total Number	Online Programs
Bachelor's degree in Economics	13	0
Continuing education (Trainings)	75	16
Scientific Master's degree	29	0
Professional Master's degree	56	10
International Master's degree	9	0
Doctor's degree	10	0
Total	192	26

used. Figure 1 shows the screenshots of program's home page, students' profile, course page and forums.

Most of the MIP students are young, being below 30 years old (26% of them are between 22-24, 33% are between 25-26, 22% are between 27-30 and just 19% are above 31 years old). Considering the practical experience in project management, 66% of the students do not have any experience in project management, 30% are juniors (between 1 and 4 years of experience), and only 4% of them have more than 4 years experience in project management. According to the students' background, the collectivity is highly heterogeneous. They earned the bachelor degree in engineering, economics, business administration or science (such as mathematics). Only 14% of students previously attended online trainings or courses, the majority of them do not have any experience in these kinds of educational activities.

Most of the students work in IT (64%). Other domains are: telecommunications, banking, research, education, commercial, logistics, financial consulting, and civil engineering. The most frequent jobs of the students are: software developer, IT analyst, business analyst, consultant, engineer, researcher, team leader, and project manager. The students' distribution, according to these characteristics is shown in Figure 2.

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