ADMISSIONS ADVISOR:  
A MICRO-BASED EXPERT SYSTEM  
USING CERTAINTY FACTORS

Clive C. Sanford  
University of Maine  

and  

Thomas Marshall  
University of North Texas  

Decision makers are often confronted with the task of organizing and grouping available data in order to narrow the scope of a problem and make effective choices. This type of expertise often requires many years to perfect, and expert systems are an evolution of information technology that provide potential users the ability to draw from this expertise. In order for an expert system to accurately emulate an expert, there must be a disciplined approach to its design such that the data is organized into logically consistent sets that can interact and arrive at acceptable conclusions. This paper presents the theoretical background and design of the microcomputer-based expert system, Admissions Advisor, which emulates the decision-making process of an admissions director in regard to the acceptance or rejection of applicants to a master of business administration program. The validation of this system indicates it can arrive at conclusions that agree with 96% of the admissions director’s decisions.

Introduction  
Decision makers often have multiple issues to assess in order to facilitate an action. The available data must be evaluated to determine the information most relevant to a decision situation and must be given various degrees of prominence in making choices (Szewczak and King, 1987). If the data is tightly coupled, a mechanism must be established to create minimal criteria sets of weighted information so that more clear-cut decisions can be made quickly without getting bogged down in unnecessary detail. When the components of the sets of data change, the impact of the information on the final decision varies. In order to quantify the nature of this impact, algebraic formulations can be applied to the data. Since environmental influences affect the construct of these algebraic formulations, we employ the inference engine of an expert system to apply these formulations to the sets of data. This allows
for flexibility in specifying the minimal criteria sets and their influence on the final decision.

This study addresses the major issues involved when considering the admission of a student to a master of business administration (MBA) program. Competition for positions in MBA programs can be intensive primarily because an increase in demand for available jobs allows prospective employers to be more selective about the applicant’s educational background. In many cases, prospective candidates submit applications to more than one institution, hoping to receive at least one acceptance. For this reason, it is not unusual for many applicants to receive more than one acceptance. As a result, admission officials are often under pressure to accept a statistically large enough pool of applicants in order to compensate for declined offers.

At the same time, a general goal of many educational institutions is to maintain and improve the quality of the student population. The performance of the program graduates is often reflected in the perceived status of the educational institution. Acceptance decisions, therefore, must be carefully balanced in order to maintain quality and, at the same time, a manageable student population size.

A large number of conditional offers can result in a small number of students. In England, McVitie and Wilson (1970) noted that a large range in variations can occur. A department can make 500 offers in each of two consecutive years, and generate 15 and 40 student acceptances in each of the respective years. In order to balance the student enrollments in different university programs, McVitie and Wilson used the Stable Marriage Assignment algorithm (Gale & Shapely, 1962) to make the assignments based on a list of six ordered preferences from the applicant. The algorithm assigns the students to university programs and does not make acceptance decisions.

Strategies for accepting applicants are probably as diverse as the number of academic programs in existence. Van-Breda (1986) developed an interactive decision support system to aid decision makers at the group level in evaluating undergraduate scholarship candidates. Edwards and Bader (1988) constructed an expert system to help the admissions tutor (director) in formulating the admissions decision for the MAS degree at Aston University in England. They recognized that ethical and practical considerations dictated that some questions involving judgment could not be delegated by the admissions tutor to the clerical staff. Edwards and Bader addressed this problem by developing two versions of the expert system, one that admitted candidates unconditionally, and the other that handled the borderline cases and referred the more abstract decisions to the human expert.

The major emphasis of this paper is to describe the structured approach taken in the design of the minimal criteria sets and the algebraic formulations applied to them. We restrict our attention to a discussion of the knowledge acquisition, the organization of the data, and the implementation of the program. We begin with a presentation of a broad overview of the admissions process and the role that the expert has in this process. This is followed with a description of how the data is grouped and coupled with the algebraic formulations. We then describe the knowledge acquisition process, the creation of the minimal subsets of the data, and the relative importance of these subsets and their components. A short example session is then followed by an explanation of how the facts are integrated with the inferencing logic. We list the results of a series of system tests against historical facts, and suggest several potential enhancements to the system. We then conclude with a brief summary and some final remarks.

The Admissions Process

The admissions decisions to the MBA program are made by the director of the graduate division, whose time constraints make it difficult to effectively evaluate each applicant. Increasing
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