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Predicting Academic Performance in Management Education: An Empirical Investigation of MBA Success

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Graduate study for a master's in business administration (MBA) is one of the major approaches to management education (DeSimone & Harris, 1998). The benefits of developing managerial skills through MBA programs have been well documented. Sunoo (1999) commented that an MBA degree allows human resource professionals to enhance their competencies and boost their chances for career development. Messmer (1998) suggested that certified management accountants can benefit significantly from an MBA that offers expertise in growing areas outside of the accounting department. Perry (1995) observed that many food scientists cannot advance to management positions because they have received mainly technical, and very little management, education. He advised food scientists to take up MBA degrees in reputable universities to advance professionally in the food industry toward executive and management positions. Recent technology development has increased greatly the demand for MBAs with a technology concentration. Techno-MBA graduates not only have excellent technology skills but also understand the strategic business application of technology. *Computerworld* ("Techno-MBA top dogs," 1999) surveyed 63 techno-MBA programs and found that graduates of the best techno-MBA programs normal-

ABSTRACT. The master's of business administration (MBA) program is one of the most popular approaches to management education. This study investigates the impacts of several precedent variables on the academic performance in an accredited MBA program. A prediction model was developed with multiple regression, and results showed that undergraduate grade point average and scores on the Graduate Management Admissions Test had significant impacts. Implications for management education are discussed.

ly received multiple job offers and landed positions paying \$80,000 to \$100,000 per year or more and offering perks such as lucrative stock options. Although graduate study no longer guarantees prestige, the MBA degree seems to have retained its glamorous reputation (Shelley, 1997).

On the other hand, though demand for admission to the top MBA programs has been particularly strong, the cost of this type of management education is high. During the academic year 1996–1997, American universities awarded more than 96,000 master's degrees in business management and administrative services, with that figure accounting for nearly one quarter of all master's degrees conferred (Morgan, 1999). The total cost for the top executive MBA program reached \$87,500 ("Top 25," 1999). Admission to the top

MBA programs is very competitive. In 1999, the acceptance rate for Stanford University's MBA program was 7% with 6,606 applicants, and the acceptance rate for Columbia University's MBA program was 11% with 6,406 applicants ("Best B-schools," 2000). Given the highly competitive nature of MBA admission, one cannot help asking whether the criteria commonly used in the admission decisions can be used to predict the applicant's success in graduate management education.

Similarly, management educators and administrators also may want to understand the factors that determine MBA students' academic performance. First, a good understanding of the factors influencing students' academic performance will help responsible parties to design appropriate academic programs and supporting activities. Further, a good knowledge of MBA students' academic performance and its relation to major precedent variables will enhance decision making in the admission process.

We designed this study to investigate the MBA students' academic performance with a relatively large sample. The two-fold purpose of our study was to (a) investigate the major precedent variables that significantly influence MBA students' academic performance and (b) determine the extent to which a group of precedent variables can predict

MBA students' academic performance successfully.

Theoretical Framework

The theoretical framework guiding this study was based on an evaluation model of human resource development interventions—specifically, Holton's (1996) conceptual model of evaluation outline factors that determine individual performance and organizational results. Holton (1996) proposed that, on the basis of existing evaluation models and research, causal relationships arise among motivational elements, environmental elements, ability/enabling elements, and outcomes. He posited that individual performance is a function of learning outcome, which, in turn, is influenced by motivation to learn and individual ability. In the context of management education, academic performance can be viewed as an immediate learning outcome and thus can be predicted by several precedent variables such as prior academic performance, motivation, and ability to learn.

Related Literature

Most graduate schools of management use some type of formula score that combines undergraduate grade point average (GPA), Graduate Management Admission Test (GMAT) scores, and other quantifiable factors for admission (Carver & King, 1994). Underlying such common practice is the assumption that MBA students' academic performance can be well explained by the precedent variables such as undergraduate academic performance and standardized test scores (e.g., GMAT and MAT). Consequently, there has always been a concern whether such a practice is theoretically justifiable and empirically valid (Carver & King, 1994; Schwan, 1988). A literature review suggests that many studies have investigated the relationship between MBA students' academic performance (usually defined and measured by GPA) and certain precedent variables. However, the literature on the prediction of academic performance in graduate management education is not conclusive and the empirical evidence is conflicting. Hecht and Powers (1982) reported

that the multiple correlation of undergraduate GPA and GMAT scores with 1st-year MBA grade ranged from .12 to .67. Wright and Palmer (1994) used a sample of 86 MBA students at a small midwestern university to determine whether GMAT scores and undergraduate GPA were better predictors of graduate performance for some groups of students than for others. They hypothesized that these precedent measures were adequate predictors of low graduate performance. Their results indicated that, although undergraduate GPA and GMAT scores were modestly associated with graduate performance across the full range of students, those scores did not discriminate between moderately low and very low performers in the program. Multiple *R*-square was estimated to be .212.

The explanatory and predictive power of certain precedent variables commonly used in graduate admission practice has been studied, but different results were obtained. Carver and King (1994) investigated the MBA admission criteria for nontraditional students. The researchers explored a number of precedent variables including age, gender, undergraduate major, work experience, duration of formal education, competitiveness of undergraduate institution, undergraduate GPA, and GMAT verbal (GMATV) and GMAT quantitative (GMATQ) scores. Nevertheless, they found that only three variables best predicted success for the nontraditional students: GMAT score, undergraduate GPA, and work experience ($R^2 = .220$). Paolillo (1982) reported that undergraduate GPAs and GMAT scores explained slightly less than 17% of variance in graduate GPA. Likewise, Deckro and Woundenberg (1977) reported that GMAT score and undergraduate GPAs accounted for less than 15% of the variance in academic performance of graduate management education. Hancock (1999) confirmed previous findings of no gender difference in MBA academic performance; he also found that males achieved higher scores on the GMAT.

Although it has been recognized that both undergraduate GPA and GMAT scores are needed as key admission criteria, previous studies have revealed mixed results regarding the relative

impacts of these two variables on graduate academic performance. Zwick (1993) studied 90 schools in the United States and Canada to investigate the validity of the GMAT for the prediction of grades in doctoral study in business and management. Zwick found that undergraduate GPA alone tended to be a more accurate predictor than GMATV and GMATQ together. Including all three predictors was more effective than using only undergraduate GPA. In a series of bivariate regression analyses for the data set collected from a southeast university, Ahmadi, Raiszadeh, and Helms (1997) reported that undergraduate GPA accounted for more than 27% of the variability in graduate GPA and that GMAT scores explained only 18% of the variability. In a recent study of predicting MBA academic performance, Hoefer and Gould (2000) revealed a finding similar to that of Zwick—that GMATV, GMATQ, and undergraduate GPA were strong predictors. Moreover, GMAT scores had a higher correlation with graduate GPA than did undergraduate GPA. Carver and King (1994) reported that GMAT was a stronger predictor than undergraduate GPA in predicting MBA academic performance (standardized regression coefficients were .354 and .256, respectively, for these two predictors).

Research Questions

Because the literature on the predictive power of those variables commonly used in graduate management admission is not conclusive, we designed this study to answer the following research questions:

1. What is the extent to which the academic performance in a graduate management program can be explained by certain precedent variables?
2. What is the relative importance of a group of precedent variables in explaining and predicting the academic performance?

Method

Sample and Data Collection

We sought files of all MBA graduates at Auburn University and collected a

total number of 543 for our study sample. The MBA program is accredited by the American Assembly of Collegiate Schools of Business (AACSB). Out of the 543, 148 graduates had missing information on at least one variable (27.3%) and thus could not be entered into the data analysis. Consequently, we used the remaining 395 participants as the valid sample.

Variable Selection

It has been a common practice to use GPA as an indicator of students' academic performance. Following this tradition, in our study we used MBA students' overall GPA (on a 4.0 scale), treating it as the dependent variable. We included several precedent factors to determine their influence on the dependent variable; these factors are termed generally as independent variables or predictors. Because there might be a gender gap in academic performance and standardized tests such as the GMAT (Hirschfeld, 1995; Johnson & McLaughlin, 1993), we included students' gender to see if it had a significant impact on students' academic performance. Also, because previous studies have shown that foreign students' English fluency and country of origin affect academic performance (Stolzenberg & Relles, 1991), we included students' native language as another independent variable. Students' undergraduate GPA was included because prior academic performance might hold continuous impact on academic performance at the graduate level. Finally, GMAT total score, GMATQ, and GMATV were used because they are important admission criteria in most graduate management education programs. The GMAT is designed to measure the student's general ability and knowledge. Because the data was sought from historical records, some important predictors such as work experience and motivation were not included in the current study.

Data Analysis

We used multiple regression analysis to examine the multiple correlation between the dependent variable and the

set of independent variables. We progressed through several analysis stages in the data analysis to build a robust prediction model and determine the generalizability of the model (Stevens, 1996). First, the whole sample was split randomly into two approximately equal number groups. One group served as a model-building sample for establishing a prediction model for academic performance, and the other group served as a holding sample for validating the model established for the model-building sample. Second, we conducted a series of multiple regression analyses for the model-building sample to establish a prediction model with the best predictors. We examined the regression assumptions to see if they were met. Third, after validating the regression model established for the holding sample in the second stage, we built the final model when seeking validation evidence. Fourth, we applied the final model to the whole sample to estimate relevant parameters in the model.

Results

In Table 1, we present the demographic information for each of the samples. Both male and female MBAs were represented almost equally in the build-

ing and holding samples. Female MBAs represented about a fourth of the student body. Only about 5% of the sample came from foreign countries. Furthermore, international students were not quite equally represented in the building and holding samples (3.96% and 5.71%, respectively).

In Table 2, we report means and standard deviations of continuous variables across different samples. As the data show, all these continuous variables generally had the same means and standard deviations between the building and the holding samples. For the total sample, GMAT scores ranged from 340 to 770, GMAT verbal scores ranged from 11 to 65, and GMAT quantitative scores ranged from 14 to 49. GPA scores in the MBA program ranged from 2.43 to 4.0, and the undergraduate GPA ranged from 2.13 to 4.0.

First, all predictors were entered into regression analyses for the building sample. We examined different combinations of predictors to find the best multiple correlation with graduate GPA. We found that students' age and gender had no significant predictability for the academic performance. Language showed somewhat significant prediction power, and GMATQ, GMATV, and UGPA presented very strong prediction

TABLE 1. Demographic Distributions Across Samples

Variable	Building sample		Holding sample		Total sample	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Gender						
Male	149	73.76	143	74.10	292	73.92
Female	53	26.24	50	25.90	103	26.08
Language						
English	194	96.04	182	94.30	376	95.19
Foreign	8	3.96	11	5.70	19	4.81

TABLE 2. Means and Standard Deviations for the Variables in the Study

Variable	Building sample		Holding sample		Total sample	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
GPA@MBA	3.43	.30	3.42	.30	3.42	.30
GMAT	524	77	521	73	523	75
GMATV	31.00	6.77	30.72	6.49	30.86	6.63
GMATQ	31.20	6.91	30.91	6.20	31.06	6.56
UGPA	3.04	.40	3.11	.42	3.08	.41

power. Then we built a final model based on predictors of language, GMATQ, GMATV, and undergraduate GPA. The model explains nearly 25% of the variation of the academic performance for the building sample. We applied the model to the holding sample and found that it accounted for about 26% of the variation of the MBAs' GPA. We then compared all regression estimates from the two samples and found them to be very close. The cross-validated R (between the observed GPA scores for the holding sample and the predicted ones based on the model developed from the building sample) was .51 ($p < .001$). Thus, we concluded that the model built for the building sample was reasonably applicable to the holding sample.

We used the regression model for the whole sample in order to get the regression estimates. In Table 3, we report the estimated parameters and associated statistical tests. Our results show that language was somewhat significantly predictable for the MBA students' academic performance. GMAT quantitative and verbal scores and undergraduate GPA were very significant in the prediction. The R -square of the regression was .26; meaning that more than one quarter of the variation in the MBAs' academic performance could be explained by the regression model.

The relevant T s, p -values, and standardized regression coefficients in Table 3 provide information about the relative importance of the predictors. The larger the T and standardized regression coefficient and the smaller the p -value, the more important the predictor was. Our results show that undergraduate GPA was the most important predictor for the graduate academic performance, followed by GMATQ and GMATV, whereas language made little predictive contribution.

Conclusions and Limitations of the Study

Overall, this study confirms the findings revealed in the literature. The fact that about one fourth of the variation in the MBA graduates' academic performance could be explained by only four precedent variables is an encouraging

TABLE 3. Regression Equation Predicting MBAs' Academic Performance

Predictor	Estimate (B)	T	p value
Intercept	1.899	14.05	< .001
LANGUAGE	.056	1.75	.081
GMATQ	.011	5.23	< .001
GMATV	.001	4.33	< .001
UGPA	.267	8.16	< .001
$R^2 = .259$			
$R^2_{\text{adjusted}} = .252$			
$F(4, 390) = 34.008, p < .0001$			

result. This finding tends to support the usefulness of the GMAT and undergraduate GPA. Undergraduate performance apparently is the most important predictor of graduate academic performance. In this study, we discovered that age and gender had no predictive utility in explaining academic performance. Clearly, admissions decisions and any other selection process should not be based on age or gender.

Nevertheless, the predictive utility of precedent variables commonly used in graduate management education is limited. Our study's results call for further research in this area. Particularly, other important variables such as learning motivation and working experience must be investigated. Several authors have noted correctly that there are far more important variables in determining academic performance in an MBA program than those used regularly in admissions practices (Ahmadi, Raiszadeh, & Helms, 1997; Baldwin, Bedell, & Johnson, 1997; Wright & Palmer, 1994). It would be inaccurate to assume that prior academic performance is the single best predictor of performance in a management education program. This study showed that only one quarter of the variation in academic performance could be attributed to a few precedent variables. Baldwin et al. (1997) found that having a supportive network of friends, communication, and degree of social isolation affect both attitudes and grades of MBA students. Management educators should pay more attention to the learning contexts that determine learning. Admission decisions should be made incorporating other criteria such as writing samples, career statements, personal interviews, and references.

Certainly, a number of limitations constrain the generalizability of this study and warrant caution in the interpretation of results. First, because of limited time and resources, we sought only a few predictors. Had other important variables been included, predictability might have been improved greatly. Second, because of the considerable amount of missing data, the valid sample size had to be reduced greatly. So far, we do not have enough information on the MBAs excluded from our study to know how they would have performed in relation to their backgrounds. Third, our study involved few international students, thus limiting the results' generalizability to a larger population with regard to the admission practice.

Implications for Management Education

DeSimone and Harris (1998) commented that management education is one of the most common human resource development activities. Keys and Wolfe (1988) defined management education as "the acquisition of a broad range of conceptual knowledge and skills in formal classroom situations in degree-granting institutions" (p. 205). The present study contributes to the literature by examining several precedent variables that significantly influence academic performance in popular MBA program. Although the predictive power of prior performance and standardized test scores is limited with regard to academic performance in graduate management education, several precedent variables can still explain a considerable amount of the variation in academic performance. Management educators

and administrators should examine carefully the effects of prior academic performance on the performance of graduate management students. They should work with test developers to ensure adequate validity and reliability of the standardized examination such as GMAT. Overall, this study supports the continuous use of undergraduate GPA and GMAT score in the admissions decisionmaking process. However, other factors should be taken into account, such as motivation to learn, work experience, and career plans.

In addition to the information from standardized tests and prior academic performance, other screening methods should be used in graduate management admission. Tarr (1986) observed that business schools have allowed concern for human skills to slip in their effort to strengthen technical scholarship. He emphasized leadership skills in screening applicants. Assessment on applicants' motivation to learn and communication and leadership skills can be obtained through personal interviews or other authentic assessment methods.

This study has implications for management education not only in admissions decisions but also in the areas of content and teaching methods. Given that a limited percentage of variance in academic performance was attributable to tangible previous learning outcomes such as undergraduate GPAs and GMAT scores, MBA graduates' management performance in practice and career success cannot be explained solely by their academic performance.

O'Reilly and Chatman (1994) studied the effects of motivation and ability on the early career success of a sample of MBA graduates in the early years of their careers. They found that the interaction of motivation and general cognitive ability most strongly predicted early career success. Nevertheless, the predictive power of those two variables was limited in terms of R^2 in multiple regression. After controlling for several demographic variables (e.g., age, sex, years of graduation) and working settings (e.g., types of working organization), O'Reilly and Chatman found that motivation and general ability accounted for only 4% of the variance in reported salary and 16% of the variance in

promotion. The results of the present study appear to concur with this finding, suggesting that formal learning is not the most important determinant for individual performance. Recent arguments have suggested that learning from practice or informal learning is as vital as learning of formal technical knowledge (Lave & Wenger, 1991; Yang, 1999). Traditional management education emphasizes theory rather than practice, and it normally values formal over informal learning. This type of management education focuses on rational, scientific, systematic, and formal knowledge. Raelin (1993) posited that advanced management education programs should include both theory and practice. Theory-based programs might cause students to think that management problems can be nestled into neat technical packages. In the light of holistic perspective of knowledge and learning, practice should be an essential component of management education.

Our study also demonstrates that business education needs to be enhanced with an international perspective. Because our findings show that students' native language had moderate influence on their academic performance, native language should be taken into account in graduate management education. While the world economy experiences rapid globalization and American firms face increasing international competition, universities are receiving more and more international students. According to the National Center for Education Statistics (Morgan, 1999), a total of 14,389 master's degrees in business management were conferred by American universities to "non-resident aliens"; this figure accounted for almost 15% of the degrees awarded in this field. The presence of foreign students can be a very positive force in graduate management education because they can share different cultural and social understandings about management and other areas. Kedia and Harveston (1998) posited that management education needs to change to produce business leaders with a worldview.

Obviously, international students can be a valuable asset for any graduate MBA program, as they can help faculty

members enhance awareness of international implications and global perspectives. However, they might have language barriers to overcome. As international students who have studied business management at two American universities, we found that few faculty members have paid special attention to international students. Most faculty members tend to treat international students and American students similarly and fail to consider either the special needs of international students or the valuable opportunities that they offer. Business educators should take a proactive role in increasing our international perspective and examine the global implications of their business area.

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