Journal of International Information Management

Volume 3 | Issue 2 Article 4

1994

Perceived usefulness of expert systems for MBA advisement: A discriminant model

John K. S. Chong
University of North Dakota

Steven B. Moser
University of North Dakota

Perceived usefulness of expert systems for MBA advisement: A discriminant model

John K. S. Chong
Steven B. Moser
University of North Dakota

ABSTRACT

Based on questionnaire data collected from 123 AACSB-accredited business schools, a discriminant model was developed to generate a descriptive profile of MBA Advisors in regard to their perceived usefulness of expert systems (ESs) for advising MBA students. Characteristics related to organization, advisee, advisor, and job/task structures were considered in formulating the model. Stepwise discriminant analysis resulted in 8 out of 15 independent variables entering the model.

INTRODUCTION

The United States is widely regarded as the mecca for management education. It is the world's largest producer of advanced management degrees. The Master of Business Administration (MBA) degree, often touted as a passport to the board room, is particularly popular and accounts for approximately one quarter of the total U. S. production of master level degrees. Recent statistics released by the U. S. Department of Education, as reported in the Chronicle of Higher Education ("Earned degrees," 1993), show that 78,681 business and management master's degrees, the majority of which being MBAs, were conferred in the U. S. during 1990-1991. This figure represents a five-year growth rate of 17%. Many expect that the trend of growth will continue unabated in the years to come, especially in light of a large influx of students from abroad, notably China and other Pacific-Rim countries where accelerating economic development spurs more demand for managers with advanced management preparation.

With MBA enrollment on the rise, increasing pressure will be felt by those in advising positions. In most American business schools, the MBA student advising task is performed by an MBA Advisor, who is typically the MBA program director or coordinator himself/herself. In some cases, the MBA Advisor may also be a faculty member, apart from serving as an administrator of the graduate business program. There is little disagreement that the job of an MBA Advisor requires a substantial amount of human skills because of the necessity to interact with students. Thus, the general perception is that both expertise on MBA curriculum and superior ability in dealing with the needs of students are essential to being an effective MBA Advisor.

This is certainly true. In this paper, our purpose is to focus on another type of experts, namely the non-human experts or expert systems (ESs) which are computer softwares designed to function like human experts, for advising MBA students. We feel that expert systems may be a potentially useful tool for alleviating some of the workload of the MBA Advisor. This paper is about an empirical study that was conducted to examine the perceived usefulness of expert systems for MBA advisement, through the development of a discriminant model. In what follows, we shall first provide a brief review of previous research on expert systems for student advising, followed by a description of the research design and method. Next, we shall report the empirical findings and present a discussion and implications of results.

PREVIOUS RESEARCH ON EXPERT SYSTEMS FOR STUDENT ADVISING

Simply put, expert systems are computer programs developed to replicate the thought and reasoning processes of human experts within a well-defined, specific domain. In recent years, expert systems have increasingly captured the interest of researchers in education. Research on the applications of expert systems in liberal arts education (Lopez, 1988), tutoring systems (Park & Seidel, 1986), special education (Parry & Hofmeister, 1986), teaching methods (Berliner, 1986), and enrollment management (Diffenbach, 1987) has been reported in the literature. Several studies on developing an expert system prototype for student advising are also noted in the disciplines of computer science (Kowalski, 1992; Valtorta, Smith, & Loveland, 1984), mathematics (Rao, Coleman, & Hollenbeck, 1987), and industrial engineering (Chan & Cochran, 1988; Fernandez, Biegel, & Earhart, 1992). In a management department at a state university in Wisconsin, an expert system named ESAU (Expert System for Advising Undergraduates) was implemented to assist faculty in advising undergraduates on the selection of courses to take (Wehrs, 1992). ESAU was developed using the expert system shell VP-EXPERT, and could run on IBM-compatible personal computers (Wehrs, 1992, p. 551). Scant expert systems-related research, however, has been undertaken in the area of MBA education or other types of comparable programs. Finlay and King (1989) have researched the utilization of an expert system for evaluating applicants for admission to a part-time MBA program in the United Kingdom. Our review of the literature reveals only one study involving the building of an expert system prototype for MBA advisement (Chong et al., 1992). The prototype, referred to as the Masters of Business Administration Advisor (MBAA), was modeled after the design proposed by Valtorta, Smith, and Loveland (1984) and consisted of four separate 'experts' working together to emulate a human MBA Advisor. Within the broad framework of university policy and program requirements, the MBAA system was able to advise students on what and how many courses to take each semester/quarter based on course availability, and an assessment of the student's own academic/career interests and target program completion date.

RESEARCH DESIGN AND METHOD

We designed an empirical study to examine the discriminating effect of 15 variables on MBA Advisors' perceived usefulness of applying expert systems for advising MBA students.

It is part of a larger research project on the process of MBA advisement and its relationship to new computer technology and other attitudinal factors.

Data Collection and Sample

Data were collected via a mail survey of student advisors of the 239 AACSB-accredited U.S. MBA Programs listed in the Graduate Management Admission Council's 1990-1992 Official Guide to MBA Programs. These advisors usually carry the title of either MBA Program Director or Coordinator. The survey instrument was a four-page questionnaire. The first mailing produced 74 returns (30.96%), while a second mailing brought in an additional 49 responses (20.5%), generating a total response rate of 51.46%. According to Warwick and Lininger (1975), a response rate such as this is considered high for any kind of mail survey research.

Among the respondents, 72% represented public-supported institutions, and the rest came from independent colleges/universities. Fifty-three percent of the respondents were male while 47% were female. Taken as a whole, their average age was 43.6 years. When asked if they currently used any computer systems for MBA advisement, nearly half of the respondents (49%) answered "yes." The majority of the respondents (97%) reported having heard of the term Artificial Intelligence (AI) before. However, while 74% of the respondents said they were aware of the existence of expert systems (ESs), no one indicated using them currently in MBA advisement.

Independent Variables and Measures

The 15 independent variables considered in developing the discriminant model were related to 4 broad categories of characteristics. They are described as follows:

Organization characteristics. Age of the MBA program in years (PROGAGE), number of full-time students (NUMFULL), and number of part-time students (NUMPART) constituted three variables that fell into this category.

Advisee characteristics. Two variables pertaining to advisee characteristics were MBA students' level of exposure to computer (STDCOMP) and the frequency at which they sought advice from the MBA Advisor (FREADV). STDCOMP was measured by a single-item 5-point scale ranging from 1, very little exposure, to 5, substantial exposure. Due to the multifaceted nature of advice sought by MBA students in completing their programs, we developed a 9-item 5-point scale (1=Never, 2=Seldom, . . . 5=Always) for measuring FREADV. The types of advice covered included evaluation of transfer credits/waivers, course offerings/recommendations, schedule planning, and financial aid/assistantship, etc.

Advisor characteristics. This category comprised a total of six variables, including advising experience in years (ADVIEXP), perceived likelihood of expert systems' threat to the legitimacy of the MBA Advisor position (THREAT), student-oriented advising style (STORIENT), system-oriented advising style (SYSORIENT), computer anxiety (COMPANXI), and favorableness of attitude toward nonhuman experts, or expert systems (NHFAVOR). A single-item

5-point scale (very unlikely = 1, unlikely-2, . . . very likely=5) was used to measure THREAT. Two single-item 7-point scales (1=to a small extent . . . 4=to some extent . . . 7=to a great extent), based on Cottone's work (1991), were developed to gauge STORIENT and SYSORIENT. Advisors operating with a STORIENT style treat their advisees' problems as unique and strive to give personal attention to each advisee in an individually-oriented fashion. On the other hand, those operating with a SYSORIENT style tend to focus on the role requirements of the student in the university/college system, and provide advice to their advisees with an awareness of the impact of the system on the probability of success. The two styles are not mutually exclusive, nor are they necessarily inversely proportional to each other. COMPANXI was measured by a 10-item Likert scale developed by Raub (1981). Another 10-item Likert-scale designed by Chong and Park (1993) was applied to assess NHFAVOR.

Job/Task characteristics. Four variables related to the job/task characteristics of MBA Advisors were identified and included in the analysis. These were job analyzability (TASKSTR), technical aspect of the expertise of an MBA Advisor (EXPTECH), creative aspect of the expertise of an MBA Advisor (EXPCREAT), and nature of problems associated with the MBA advising process (PROBLEM). TASKSTR was measured by using a 4-item 7-point scale (1=to a small extent . . . 4=to some extent . . . 7=to a great extent) adapted from previous work done by Withey, Daft, and Cooper (1983). Slatter's seminal research on the cognitive emulation approach to building expert systems (1987) provided the basis for developing a 3-item Likert-scale for measuring EXPTECH, and another 6-item Likert-scale for determining the level of EXPCREAT. Finally, we developed an 8-item 4-point scale (1=not a problem at all, 2=a minor concern, 3=a major concern, and 4=a large obstacle) to evaluate the severity of problems encountered by MBA Advisors in the process of advisement (PROBLEM), including such areas as not knowing students' special interests, changes in MBA curriculum/course offerings, difficulty of scheduling mutually convenient appointments with advisees, and difficulty of keeping up with the MBA job markets, etc.

Dependent Variable and Measure

MBA Advisors' perceived usefulness of expert systems for MBA student advisement (USEFUL) was used as the dependent variable in this study. The respondents were asked to indicate on a 5-point scale (1=useless . . . 3=moderately useful . . . 5=extremely useful) how useful an expert system might be in reducing the burden of their work in advising MBA students in 9 different areas, similar to those covered in the FREADV scale. Based on Hair et al.'s recommendations (1979, p. 93) in regard to converting ordinal or interval data into categorical data for the purpose of performing discriminant analysis, we computed an average index of the responses obtained through the USEFUL scale and created a dichotomized variable (USEFLCAT) by using the median as the cutoff point. Consequently, USEFLCAT consisted of two groups of respondents in terms of their perceived level of usefulness of expert systems in advising MBA students. These two groups were labeled "More Useful" and "Less Useful" respectively. As the names imply, the "More Useful" group of respondents represented MBA Advisors who saw expert systems as potentially more useful in lessening their workload than those represented by the "Less Useful" group.

Reliability of Multi-item Scales

Internal reliability estimates (Cronbach's alphas) for all the multi-item scales are shown in Table 1. As indicated in Table 1, all of these reliability values are above what Nunnally (1978) considered to be the lower limits of acceptability (i.e., 0.50 to 0.60).

Table 1. Reliability of Multi-item Scales

Variable Name	Variable Type	Characteristics Type	# of Items in Scale	Cronbach's Alpha: This Study	Cronbach's Alpha: Previous Study
USEFUL	Dependent	---	9	0.84	--
FREADV	Independent	Advisee	9	0.70	--
COMPANXI	Independent	Advisor	10	0.87	0.87 (a)
NHFAVOR	Independent	Advisor	10	0.74	0.71 (b)
TASKSTR	Independent	Job/Task	4	0.87	0.85 (c)
EXPTECH	Independent	Job/Task	3	0.78	--
EXPCREAT	Independent	Job/Task	6	0.86	--
PROBLEM	Independent	Job/Task	8	0.65	--

(a) Howard, G. S. (1986). Computer anxiety and the use of microcomputers in management. Ann Arbor, Michigan: UMI Research Press.

(b) Chong, J. K. S. & Park, J. (1993). Perceptions of expert advice: An exploratory study of small exporters. In B. S. Kang & J. U. Choi (Ed.), *Proceedings of the DSI Second International Meeting in Seoul, Korea* (pp. 46-49).

(c) Withey, M., Daft, R. L. & Cooper, W. H. (1983). Measures of Perrow's work unit technology: An empirical assessment and a new scale. *Academy of Management Journal, 26,*45-63.

Analytical Procedures

Besides descriptive statistics and internal reliability analysis, the main statistical technique we employed in this study was the stepwise method of discriminant analysis. The stepwise method was chosen because we saw no a priori rationale for including certain variables and excluding others. The most important advantage of this method is its ability to generate the most useful discriminating variables by minimizing Wilks' lambda, which considers both the extent of intra-group cohesiveness and inter-group differences (Klecka, 1980). To determine the validity of the discriminant model, we also performed a classification analysis to find out what percentage of the respondents were correctly classified into the two groups of MBA Advisors in terms of their perceived usefulness of expert systems, namely the "More Useful" group and the "Less Useful" group.

RESULTS

After controlling for missing data, 88 cases were used in the stepwise discriminant analysis. Results presented in Table 2 show that 8 out of the 15 variables entered the equation. Several of these 8 variables were significant at either the 0.05 or 0.01 level. The variable THREAT, despite entering the equation in step 1, did not make the 0.05 significance level. It also had the lowest discriminating weight among the 8 variables. On the other hand, PROBLEM, the variable reflecting the potential nature of difficulties in the MBA advising process, had the highest discriminating weight. MBA Advisors' advising experience, represented by the variable ADVIEXP, had the second highest discriminating weight. STDCOMP, or MBA students' exposure to computer, had the second lowest discriminating weight, only exceeding slightly that of THREAT. The remaining 4 variables, including EXPTECH, COMPANXI, TASKSTR, and NHFAVOR, had weights lying in between those mentioned above and were very close to each other. Among these 4 variables, however, computer anxiety (COMPANXI) carried a negative weight, indicating a negative contribution to the discriminant function.

The discriminant model as a whole was significant at the 0.01 level, which suggests that it is worthy of being tested for predictive validity. Results of classification analysis, displayed in Table 3, reveal a predictive accuracy of 72.8%.

Table 2. Results of Stepwise Discriminant Analysis

Step	Variable Entered	Standardized Coefficients	Wilks' Lambda	Significance
1	THREAT	0.26020	0.95875	0.0577
2	ADVIEXP	0.52451	0.92950	0.0447
3	PROBLEM	0.60884	0.89994	0.0305
4	EXPTECH	0.48423	0.86064	0.0134
5	COMPANXI	- 0.40691	0.83504	0.0102
6	TASKSTR	0.43434	0.81145	0.0081
7	NHFAVOR	0.46066	0.78248	0.0051
8	STDCOMP	0.30203	0.76825	0.0057

Summary Statistics:

Eigenvalue	0.30167		
Canonical Correlation	0.48141		
Wilks' Lambda	0.76825		
Chi Square	21.619		
Degrees of Freedom	8	Significance	0.0057

Table 3. Classification Results

		Predicted Group Membership	
Actual Group Membership	No. of Cases**	"Less Useful"	"More Useful"
"Less Useful"	47	31 (66.0%)	16 (34.0%)
"More Useful"	56	12 (21.4%)	44 (78.6%)

Percent of Cases Correctly Classified: 72.8%

** Total number of cases used in classification was 103 instead of 88 because the stepwise method resulted in 8 variables entering the equation, thereby reducing the number of missing cases due to the other 7 variables which did not enter the equation.

DISCUSSION

This study provides empirical evidence that the degree of seriousness of problems experienced by MBA Advisors in the process of advisement, a job/task characteristic, is the most salient variable in predicting their perception of usefulness of expert systems for advising MBA students. MBA Advisors who rate expert systems as more useful, therefore, appear to view them largely as a problem-solving tool or an aid to help reduce their advising workload. The second most important discriminating variable in predicting MBA Advisors' perceived usefulness of expert systems for advising MBA students has been found, in this study, to be MBA Advisors' advising experience. This result suggests that MBA Advisors who have been in their jobs longer and are more experienced tend to see expert systems as more useful in the performance of their jobs. Alternatively, it may be interpreted that less experienced MBA Advisors, probably due to a lack of insights about the nature of their jobs, tend to perceive less need for the use of expert systems as a problem-solving tool.

In addition, two other variables related to job/task structure show significant discriminating effect on MBA Advisors' perceived usefulness of expert systems for advisement. These are the MBA Advisor's own understanding of the level of technicality associated with the expertise required of his/her job, and the degree of analyzability of the job as gauged by clarity of task sequence and the existence of established procedures and practices. The inclusion of these two variables in the discriminant model resulting from our analysis is consistent with the general requirements for expert systems development. These requirements include the specificity of a well-defined area of expertise and the feasibility of breaking down the expert's job into discernible steps, which may be further converted to simple, clear-cut if-then rules. In general, the more technical (i.e., less conceptual and abstract) and analyzable (i.e., capable of being dissected into sequential job steps and procedures) a job is, the easier it is to extract the expertise from the expert system. Hence, MBA Advisors who have a better understanding of the technical aspect of his/her job and finds himself/herself in a highly structured work environment where student advising is mostly guided by rules and regulations, tend to attach more value to the use of expert systems.

As indicated by the results of this study, MBA Advisors' general attitude toward expertise provided by non-humans as opposed to humans, an advisor characteristic, is also an important discriminating variable in predicting their perceived usefulness of expert systems that are specifically designed for advising MBA students. Thus, those exhibiting a more favorable attitude toward using non-human than human expertise tend to place themselves in the "More Useful" group of MBA Advisors. Although this finding is not at all surprising, the implication is that one has to be at least not uncomfortable with the seemingly "strange" idea of non-human expertise, to recognize the usefulness of specially designed expert systems for advising MBA students. In contrast to the degree of favorable attitude toward non-human expertise, computer anxiety has a discriminating effect that moves in the opposite direction. This is evidenced in the negative standardized coefficient of COMPANXI, as presented earlier in Table 2. Despite the fact that computers have been widely utilized in human organizations over the past two decades, computer phobia still lingers in the minds of certain people. Expert systems, albeit different from

conventional computer programming, are likely to create a feeling of anxiety among some MBA Advisors because of its relatively new history of applications. This suggests that, if computer anxiety can be overcome, perhaps through computer literacy training, more MBA Advisors may be expected to fall into the "More Useful" group that sees expert systems as potentially more helpful in performing the advising job.

In this study, we also found MBA students' computer exposure, an advisee characteristic, to be a variable that impacts on MBA Advisors' difference in their perceptions about the usefulness of expert systems for advising. MBA students, being the principal users of such expert systems, are definitely not likely to be forgotten by their advisors who are asked to evaluate something that presumably will make the advising job easier. As such, MBA Advisors will most likely consider their advisees' computer exposure to be an important factor in assessing the usefulness of expert systems as a possible surrogate for themselves. The results of this study clearly confirm such expectation.

Surprisingly, none of the organization characteristics entered the discriminant model. In regard to MBA Advisors' perceived likelihood of expert systems' threat to their position, the results of this study indicate that it could be included as a discriminating variable in the model. However, its statistical insignificance and relatively low discriminating weight provide inadequate basis for any substantive interpretation. Future research should be undertaken to reexamine this factor. Additional work should also be done to validate the other seven variables that entered the discriminant model. Furthermore, extending our study to non-AACSB-accredited business schools may help generate a different profile of MBA Advisors for comparison purpose.

IMPLICATIONS

This research has served two primary purposes. First, it has contributed to the development of a descriptive profile of MBA Advisors in U. S. AACSB-accredited business schools with respect to their perceived usefulness of expert systems for MBA advisement. Although our survey data indicate no current users of expert systems among the responding schools of business for advising MBA students, the future holds promise for the utilization of this new computer technology. As suggested by Wehrs (1992), the nature of academic advisement as an advisor-advisee consultation process makes itself well-suited for the application of expert systems, which can be developed inexpensively using commercially available low-cost shells. The descriptive profile that emerged from the results of our analysis will provide insights for expert systems consultants or developers interested in locating potential clients in the business education sector. It will also be beneficial to administrators, such as academic deans of business schools, for determining the desirability of automating the process of MBA advisement.

Second, the research has added empirical evidence to the literature on expert systems as a branch of Artificial Intelligence (AI). The knowledge gained from the findings contributes to an enhancement of understanding about the influence of job/task structures and advisor/advisee characteristics on the perceived usefulness of expert systems in an academic advising setting.

REFERENCES

Berliner, D. C. (1986). In pursuit of the expert pedagogue. *Educational Researcher, 15*(7), 5-13.

Chan, D. & Cochran, J. K. (1988, February). Using expert-system skills for graduate student advising. *Engineering Education,* 310-312.

Chong, J. K. S. & Park, J. (1993). Perceptions of expert advice: An exploratory study of small exporters. In B. S. Kang & J. U. Choi (Eds.), *Proceedings of the DSI Second International Meeting in Seoul, Korea* (pp. 46-49).

Chong, J. K.S., Yale, J. M., Park, J., Moser, S. B., & Wong, B. K. (1992). Developing an expert system for MBA advisement [Abstract]. *The Association of Management Proceedings, 10*(2), 80.

Cottone, R. R. (1991, May/June). Counselor roles according to two counseling world views. *Journal of Counseling and Development,* 398-401.

Diffenbach, J. (1987, Summer). Expert systems could be a valuable new tool for enrollment management. *College and University,* 306-317.

Earned degrees conferred by U. S. institutions, 1990-91. (1993, June 2). *The Chronicle of Higher Education*, p. A25.

Fernandez, A., Biegel, J. & Earhart, J. (1992). Expert systems for IE student advisement. *Computers and Industrial Engineering, 23,* 357-365.

Finlay, P. N. & King, M. (1989). Experiences in developing an expert system for MBA admissions. *Journal of the Operational Research Society, 40*(7), 625-635.

Hair, J. F. J., Anderson, R. E., Tatham, R. L. & Yrablowsky, B. J. (1979). *Multivariate data analysis*. Tulsa, Oklahoma: The Petroleum Publishing Company.

Howard, G.S. (1986). *Computer anxiety and the use of microcomputers in management.* Ann Arbor, Michigan: UMI Research Press.

Klecka, W. R. (1986). *Discriminant analysis.* Sage University Paper Series on Quantitative Applications in the Social Sciences, 07-019. Beverly Hills and London: Sage Publications.

Kowalski, K. (1992). Expert system skills in student advising. *Computer Educ., 19*(4), 359-368.

Lopez, A. M. J. (1988). Developing a low-cost expert system in a liberal arts environment. *Educational Technology, 28*(7), 33-36.

Nunnally, J. C. (1978). *Psychometric theory.* New York: McGraw-Hill.

Park, O. & Seidel, R. J. (1986, November). *ICAL: Intelligent applications of AI.* Paper presented at the 28th International Conference of ADCIS, the association for the development of computer-based instructional systems, Washington, DC.

Parry, J. D. & Hofmeister, A. M. (1986). Development and validation of an expert system for special educators. *Learning Disability Quarterly, 9*(2), 124-132.

Rao, T. M., Coleman, S. & Hollenbeck, C. (1987). Advisor—expert system for student advisement. *Proceedings of the Fifteenth Annual ACM Computer Science Conference*, pp. 32-35.

Raub, A. C. (1981). *Correlates of computer anxiety in college students.* Unpublished doctoral dissertation, University of Pennsylvania.

Slatter, P. E. (1987). *Building expert systems.* New York: John Wiley & Sons.

Warwick, D. P. & Lininger, C. A. (1975). *The sample survey: Theory and practice.* New York: McGraw-Hill.

Wehrs, W. E. (1992). Using an expert system to support academic advising. *Journal of Research on Computing in Education, 24*(4), 545-562.

Withey, M., Daft, R. L. & Cooper, W. H. (1983). Measures of Perrow's work unit technology: An empirical assessment and a new scale. *Academy of Management Journal, 26*, 45-63.

Voltorta, M. G., Smith, B. T. & Loveland, D. W. (1984). The graduate course advisor: A multiphase rule-based expert system. *Proceedings of the IEEE Workshop on Principles of Knowledge-based Systems,* pp. 53-57.