Learning Support Systems for Management Education: Screening for Success

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Abstract

Working adults are entering MBA programs in increasing numbers. Some matriculating professionals have difficulty meeting the competitive rigors of business school life for a variety of reasons. One solution to these challenges is to provide learning support systems geared toward individual student backgrounds and interests. The purpose of this paper is to illustrate a screening process for delivering content in a non-residential MBA program for two diverse academic disciplines: organizational management and accounting. The results show that analytical-based classification techniques can effectively identify marginal students for the purpose of providing additional learning resources. The analysis further shows that intelligent tutors can deliver customized Web-based content at a time convenient to the working professional.

Keywords: Working adults, learning support systems, management education, student screening, Internet, distance learning, intelligent agents, non-residential MBA

Introduction

Many working professionals enrolling into MBA programs are often challenged with the competitive rigors of graduate school. This situation can be attributed to a number of factors including 1) time elapsed since completing undergraduate degree, 2) lack of an undergraduate business degree, and 3) lack of familiarity with modern learning resources such as digital libraries. In response many business schools provide a variety of support systems to help transition the student back to academic life. Schools of business also recognize that the complexities and interrelated nature of modern business call for an integrated as well as results-oriented learning framework for management education (Camuffo, 2004). This approach is particularly appropriate for working professionals as many already possess a rich work-related experiential capability that can contribute to the collective learning environment in an andragogical context (Hynes, 2002). In an integrated learning environment the focus is on understanding how basic management functions such as operations, finance, and marketing are linked. Furthermore, it has been long recognized that active, participatory and systematic learning is more effective than passive learning and that learners need feedback early and often (Atwater, 2006).

One learning stratagem that supports this perspective is the Instructional Management System (IMS) cooperative initiative (Graves, 1999). This initiative is designed to promote systematic thinking regarding the delivery of higher education, to improve learning outcomes and to increase return on instruction investments. Web-based learning support systems are the embodiment of the IMS initiative. These systems are receiving increased attention because they provide the capability to deliver customized content at a time convenient to the student (Kathawala, 2002).

In the screening process outlined in this paper entering MBA students are identified as requiring additional preparation. Internet-based artificial agents are then used to provide these students with the appropriate learning support resources. The objective of this support process is to assist struggling students to succeed. The same process also can be used for students that require a refresher during their course of studies. This paper consists of three parts: 1) a review of the relevant literature; 2) a

statistical analysis of an MBA program involving fully employed students, and 3) an application of the screening paradigm to the diverse disciplines of management organization and accounting.

Background and Literature

Today, the general pedagogical direction in management education is moving increasingly towards a learning-centric perspective (Driver, 2002). Accordingly, the roadmap to effective learning for working professionals is a flexible and customized curriculum. This perspective is predicated on the fact that many students do not enter MBA programs with the same technical or work experience background. Therefore, providing self-paced customized content as part of the overall curriculum design can further enhance the learning experience. Generally speaking, students tend to participate more in learning systems that are content-rich and that feature extensive variety (Neo, 2004).

The literature is replete with studies on estimating MBA student performance (Hancock, 1999; Clayton, 2004). The primary focus of these studies has been on admissions screening. The Graduate Management Aptitude Test (GMAT) and undergraduate GPA (grade point average) have been found to be correlated with successful performance in residential MBA programs (Hedlund, 2006; Sireci, 2006). These factors, plus work experience, were found to be significant for working professionals enrolled in evening or weekend non-residential MBA programs (Carver, 1994). Many of the analytical admission studies have used classical regression techniques where the R-squares tend to be small often in the 0.20 to 0.40 range (Yang, 2001). Classification analysis which provides for a more direct identification of student performance potential has been shown to be somewhat more efficient than classical regression forecasting techniques (Wilson, 1995).

Customized asynchronous learning systems provide a practical environment for competency development. Once the screening system has classified the student as potentially marginal, the specific resource learning package can be identified and delivered via the Internet. Using customized content and tutorials, which also can be delivered via the Internet, students can control the learning pace which in turn should help ameliorate the frustration of falling behind. This is particularly important for preparatory type courses such as organizational behavior and accounting that typically provide the foundation for MBA core courses. Figure 1 illustrates how the screening paradigm could be used for providing learning support resources. This system would be part of the overall blended (hybrid) learning environment, which combines the best practices in both traditional and Web-based instruction (Hwang, 2006). In a similar way classification screening models can also be used for identifying learning support resources for matriculating students.

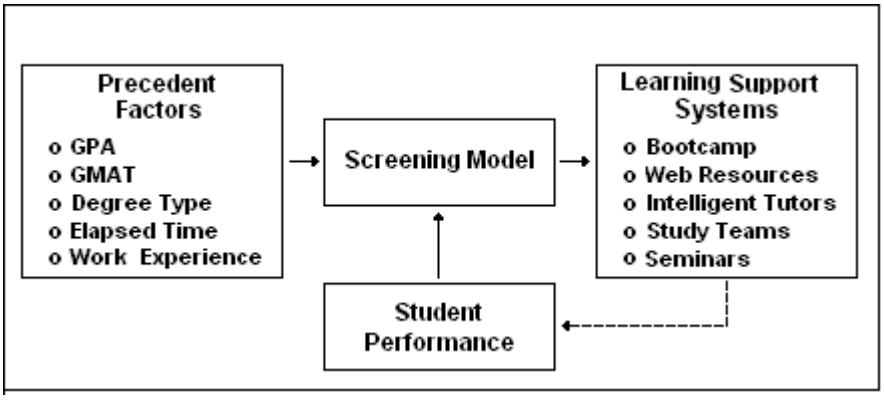


Figure 1. Learning Support System Design Concept

This learning support system consists of the following three basic components:

- Predictor variables including GMAT score, GPA, type of undergraduate degree, elapsed time since graduation and work related experience.
- Screening model (e.g., neural nets) for identifying students requiring additional academic support.

- Learning support systems comprising discipline specific seminars, bootcamps, and Web-based resources supported by intelligent tutors.

Web-based learning support systems have been found to be increasingly effective in providing management education to working adults (Lundgren, 2003; Shih, 2003; H. Huang, 2002). The 24/7 capability of the Web supports the challenges associated with non-traditional MBA programs. For example, a working student on travel status can remain current with the course material and the lesson plan. Furthermore, students can engage in remedial learning at a convenient time. Some characteristics of Web-based learning support systems are highlighted below:

- Provide a high degree of interaction and collaboration that supports working professionals.
- Present a long sought solution to the ongoing problems associated with working adult students. Students can now have a dynamic and personal experience for continuous learning.
- Offer learners a purposeful entry to the Internet and online resources, and to a new era of learning technologies.
- Underpin new patterns of relationships between education and business that directly impact the learning process.

The delivery of customized remedial content via the Internet can be facilitated though the use of intelligent tutors. These artificial intelligence based systems are defined as purposeful autonomous entities capable of adapting to changing demands such as found in many unstructured and semi-structured educational applications. Intelligent agents allow the active reconfiguration of the learning presentation according to current requirements and the availability of information sources (Li, 2007).

Typically, intelligent tutors should possess the following four basic characteristics: autonomous, proactive, flexible, and user-friendly. The social interface between the agent and the student should be highly visual with limited user required inputs. It is within this design context that the learning objectives can be best achieved. For example, if a student is having difficulty as detected by testing, simulation or self-assessment, then the synthetic agent would identify and provide specific additional learning content to the student via the Internet. The content delivery modes could include streaming videos, virtual seminars and simulations. To be effective, the agent must include such functionalities as personalized content management, learner model, learner plan, and adaptive interaction (Xu, 2006). The use of intelligent tutors is on the rise throughout academe with particular emphasis on adult education (Ghaoui**,** 2003; Cheung**,** 2003).

A database was developed based on the above literature review and an assessment of the available student records. The primary target variable was student GPA at time of graduation from the MBA program. An overview of the developed database along with some preliminary statistical findings is presented in the following section.

Database

The database consisted of files on students that have graduated from an Association to Advance Collegiate Schools of Business (AACSB) accredited working professional MBA program for the period 2000 to 2006. The sample size was 1880. Table 1 provides descriptive statistics for the variables used in this study. The data show, for example, that slightly over one-third of the students had an undergraduate business or economics degree. The incoming GPA data was adjusted for grade inflation. Undergraduate grade inflation has been averaging approximately 0.015 per year over the past 30 years (Kezim, 2005). This adjustment was called for due to the fact that 15 percent of the students had been away from the classroom for more than 10 years. The average elapsed time since receiving their undergraduate degree was nearly six years. The difference between the average unadjusted and adjusted incoming GPA is 0.08. For the current study elapse time since completing the undergraduate degree is used as a proxy for work experience. The outgoing GPA was not adjusted since the average GPA over the study's timeframe had not changed.

The time to complete the MBA program, while not a precedent variable, was included in the database. The primary interest for including this variable was twofold: 1) to determine if any of the precedent variables are useful in estimating the time to compete the program, and 2) to determine the extent of the relationship between time to complete and outgoing GPA. The existence of such relationships could be used for class scheduling, in the first case, and for identifying students that could use additional learning resources, in the second case.

Table 1. Cohort Group Descriptive Statistics

Variable	Mnemonic	Mean	S. Dev.
Entering Age (yrs.)	Age	29.9	5.2
Gender (% female, F=1))	Gender	0.37	-
Undergraduate Business/Econ Degree (%, B/E=1)	BAE	0.38	-
Incoming GPA *	GPAI	3.05	0.41
Time Elapse since Undergraduate Degree (yrs.)	Period	5.77	4.5
GMAT Score	GMAT	528	78.8
Time to Complete MBA (mos.)	Time	34.3	12.7
Outgoing GPA	GPAO	3.53	0.23

* Adjusted for grade inflation.

Table 2 presents zero-order correlation coefficients for the database. The correlation data revealed the following statistically significant relationships with GPAO:

- Age (r = 0.09, p = 0.00)
- GPAI (r = 0.36, p = 0.00)
- Period (r = 0.21, p = 0.00)
- GMAT (r = 0.47, p = 0.00)

Table 2. Correlation Matrix (Pearson)

Variables	1	2	3	4	5	6
1. Age	1					
2. GPAI	0.06*	1				
3. Period	0.71*	0.08*	1			
4. GMAT	0.01	0.18*	0.12*	1		
5. Time	0.06*	- 0.01	0.03	- 0.11*	1	
6. GPAO	0.09*	0.36*	0.21*	0.47*	- 0.11*	1

*Significant at 0.05

These correlations are consistent with those found for non-traditional MBA programs (Carver, 1994). Specifically, GMAT score had the largest positive correlation with GPAO (r = 0.47, p=0.00). The correlation for the non-adjusted incoming GPA was 0.33 or 0.03 points lower than the adjusted GPA. Not

surprisingly, student age and the elapsed time since completing undergraduate training are highly correlated (r=0.77, p=0.00). The time to complete the program was found to be negatively correlated with GPAO (r = -0.11, p = 0.0). This suggests that students taking less than a full course load may also be candidates for additional learning support resources. Typically, a full course load for non-traditional MBA students is eight to ten units per term. The results of a more detailed analysis of the database are highlighted in the following section.

Results and Analysis

The database was more fully explored using a single hidden layer, feed-forward neural net model and a logistic regression model. The neural net model consisted of one input, one hidden and one output layer. Neural nets use complex network relationships to mimic the connections between sets of data. Among other things, neural nets have the advantage of not requiring prior assumptions about possible relations, as is the case with traditional analysis methods (Adya, 1998).

A dichotomous categorical variable based on student GPA at the time of graduation (GPAO) was used in the classification analysis. The two categories were marginal, defined as a student with a GPA less than 3.3, and successful, defined as a student with a GPA of 3.3 or greater (Hardgrave, 1994). The division yielded approximately 20 percent of the alumni records classified as marginal and the remaining 80 percent classified as successful. The large ratio between successful and marginal (i.e., 4:1) tends to complicate the analytical screening process. The results of the screening analysis are highlighted in Table 3. The overall accuracy rate of the neural net is 88 percent compared to 82 percent for the logistic regression. This statistic is defined as the proportion of correct classifications across all categories.

Table 3. Comparison of Classification Analysis of Target Variable (%)

	Neural Net		Logistic	
	Classified Marginal	Classified Successful	Classified Marginal	Classified Successful
Actual Marginal	82	18	16	84
Actual Successful	4	96	3	97

Neural nets have previously been used for predicting MBA student success (Naik, 2004). This model included ten explanatory variables and a database consisting of 184 observations. The results indicated that the neural net model outperformed both the logit and probit models based on the same classification scheme used in the present study. The results reported in Table 3 are consistent with the Naik findings. The performance differences between the two modeling approaches in Table 3 are quite apparent when comparing the marginal classifications. Here the neural net model shows improved classification performance over the logistic model (82 percent versus 16 percent).

Table 4 shows the relative importance of the predictor variables for the two modeling approaches where GPAO is the classification variable (marginal and successful). The predictor variables are ranked based on the neural net (NN) model importance factors (IP). As can be seen the neural net classifier ranked GPAI as the most important factor followed by GMAT. The logistic model uses the odds ratio as an indication of the relative importance of the predictor variables. For example, GMAT has an odds ratio near one. This suggests that a 10-point increase in GMAT score (the minimum increment) indicates that the odds of being successful in the MBA program increase by a factor of ten percent.

Table 4. Analysis of Variable Relative Importance

Variable	NN(IP)	Logistic (Odds Ratio)*
GPAI	0.329	6.44
GMAT	0.219	1.01
Period	0.206	1.14
Age	0.200	0.95
Bus/Econ	0.045	1.30

*Statistically significant using Wald test @ 0.05

Applications

The learning support process outlined above will now be illustrated for two diverse MBA disciplines: organizational management and accounting. A similar approach can be followed for core courses such as finance, economics, marketing, and information systems. In many MBA programs, especially those geared towards working adults, some students have limited interpersonal, cognitive processing, and writing capabilities. Furthermore, many matriculating students will not have an undergraduate degree in business. Once a student has been identified via the screening process as marginal, the next step is to identify the appropriate learning support resources. Testing and simulations, for example, can be used to specify the content and delivery mode for each of these objectives. The evidence suggests that students engaged in simulations retain about 75 percent of the instructional content compared to five percent for lectures (Johne, 2003). Intelligent tutors can also play a constructive role in delivering content. Two key issues associated with the use of intelligent agents include (Harrer, 2006):

- What types of learning applications are most amenable to cognitive tutoring?
- At what pace should feedback be provided (instantaneous or lagged)?

Organizational Management Discipline

Effective communication is a fundamental prerequisite to modern management practice. Web-based simulations can be used to help develop basic writing skills for struggling students. For example, writing-based simulation models provide the student with the context to develop analytical thinking in a realistic business context (Rehling, 2005). In a simulation environment, students are able to work with writing and problem-solving situations that are linked to the larger business decision-making process. This construct allows students to develop higher order cognitive skills.

A major learning objective in graduate management education is to enhance decision-making skills, that is, the development of cognitive competencies such as problem solving, critical thinking, formulating questions, searching for relevant information, making informed judgments, conducting observations, inventing and creating new ideas, and analyzing and presenting data. Business decisions are invariably outcomes of multi-disciplinary discussions involving extensive interactions. A virtual learning environment provides an ideal platform for enhancing students experience in capturing inputs from a variety of sources (Martins, 2004). This process tends to mirror the professional work environment and thus serves as a reinforcing vehicle. In particular, these networks provide an efficient platform for enhancing students' experiences in understanding how to capture and process information from a variety of sources at a time and place of the students choosing.

Organizational Management Support Systems

The nature of organizational management suggests that no one learning approach is optimal. Instead course content can be delivered via a variety of learning venues (DeSanctis, 2003). A number of these

venues are highlighted in Figure 2. This paradigm underscores ways in which traditional and Web-based learning methods can be used in combination to optimize content delivery and communication. Quadrant I (Asynchronous – Personal) represents personalized learning such as writing or planning. The focus of Quadrant II is on individual online learning such as taking a virtual facility tour or blogging. Quadrant III involves team interactive learning on the Internet such as simulations and linear chatrooms. In Quadrant IV the emphasis is on real time multi-student learning experiences such as team presentations and faculty lectures. Typically, asynchronous learning is geared more towards individual knowledge acquisition while synchronous learning tends to involve multiple student learning environments.

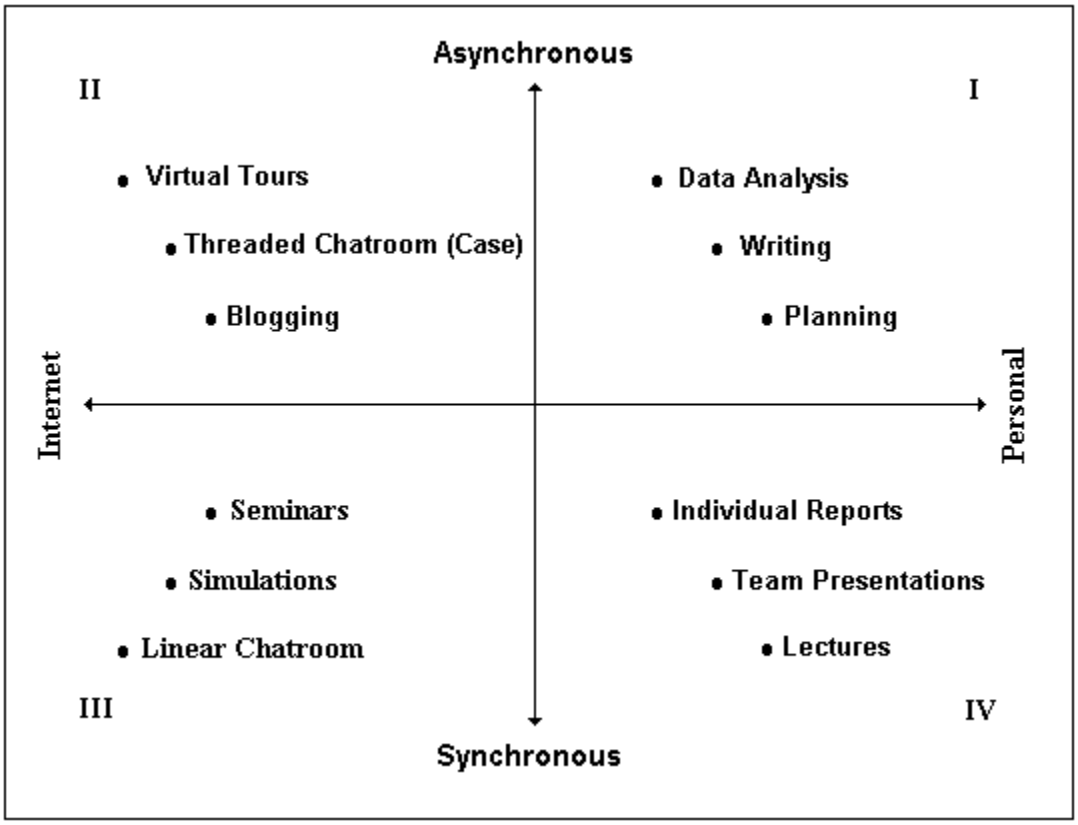


Figure 2. Learning Venues

The hybrid learning environment outlined in Figure 2 has many of the attributes of the collaborative learning process associated with virtual professional team structures. A core requirement in these organizational arrangements is the need for knowledge sharing. Virtual team learning expands the potential for cognitive, affective and action-learning outcomes (Clark, 2006). For example, many professional education courses rely heavily on case method teaching which requires class preparation through study group meetings. For students, the class environment is highly analogous to that of the emerging multi-disciplinary teams in today's organizations. Further analogies can be found in the nature of the case analysis task that requires preparation of a recommended intervention within a limited time frame. Students with expertise in the subject industry or discipline usually add a rich dimension to these analyses. Guest speakers, real or virtual, can also add a dynamic perspective to student discussions.

Collaborative Learning

There are a variety of virtual collaborative formats including chatrooms, bulletin boards and blogs. There are two basic chatroom options: linear (synchronous) and threaded (asynchronous). In a linear chatroom environment students are encouraged to interact proactively in near real time to a specific case or problem. The primary focus is on the interactive process. Chatrooms and electronic bulletin boards have been successfully utilized in a variety of graduate level courses including organizational behavior (Brower, 2003). Some critics of distance learning suggest that virtual learners remain isolated from each

other, which reduces personal student and instructor interactions, thereby, diminishing opportunities for effective learning. However, recent evidence indicates that students engaged in virtual learning communities score higher on measures of interaction than do students in a traditional classroom setting (Hay, 2004).

Fully employed, non-residential students are often called away on work related assignments, including global travel which place additional burdens on students. Consequently, developing a sense of community is an essential ingredient for optimizing the learning experience in a fully employed, non-residential graduate management program. Shared emotional connection includes feelings of relationships, shared history, and community spirit. As students become more connected with other students through these virtual communities, they reap the benefits of both professional and social relationships (Oravec, 2003). Student participation in virtual communities can increase involvement within the traditional classroom environment (Bakardjieva, 2002). Furthermore, teams that communicate regularly and interact socially outside of class form more social capital which often translates into improved face-to-face communication (Aquino, 2005). Faculty can facilitate this dynamic learning process by constantly challenging assumptions and guiding the dialogue.

One approach for maintaining a sense of community in a virtual environment is through the process of blogging (Flatley, 2005). This is particularly the case in many fully employed business management programs (Clyde, 2005). Blogging has already found widespread acceptance in professional societies for maintaining a personal log in preparation for an accreditation examination (Naish, 2005). Professional applications where blogging is used include organizational development, human resources and law. Typically blogs are updated frequently, often daily, and are presented in reverse chronological order. Blogs can be individual or team-based (i.e., group blogs). The current state of the technology makes creating and maintaining weblogs extremely straightforward. Blogs can be used to share course or curriculum related information or to provide more personal views and feeling (Bar-llan, 2005). The posting of one's views do not necessarily have to be class-related. It is simply part of the overall process of developing a sense of community among classmates and teammates.

The virtual community systems as outlined in this paper can also help facilitate the use of students as course co-producers. In this context students and student teams can participate in the design and delivery of specific course and curriculum content. Working managers already possess extensive business expertise and in some areas may have detailed knowledge and expertise. This andragogical perspective further enhances the value of the virtual learning community.

Accounting Discipline

The Accounting Education Change Commission (AECC), among other bodies, has been active in calling for the incorporation of both innovative teaching as well as active learning paradigms into accounting courses (Saunders, 2003). In many MBA programs, especially those geared towards working adults, often, less than one-half of the students have taken an accounting course. Furthermore, many of the students with an undergraduate business degree have not taken an accounting course in many years or do not have job responsibilities that involve accounting or financial activities. Some typical learning objectives for an MBA-level accounting principles course include:

- Understanding the different emphases in managerial and financial accounting
- Preparing and analyzing income statements, balance sheets, and cash flows
- Evaluating the annual report of a public company
- Assessing emerging issues, such as revenue recognition and restructuring costs
- Appreciating the ethical, global and regulatory issues of accounting.
- Comprehending and using accounting information technology.

Again testing and simulations can be used to specify the supplemental content and delivery mode for each of these objectives. In this regard, early-on screening that directs marginal students to an accounting principles boot camp has been found to improve significantly overall grade performance in subsequent accounting related courses (J. Huang, 2005).

Delivering Customized Accounting Knowhow

The overall pedagogical approach for providing customized accounting content is illustrated in Table 5. For sake of clarity, this example, features the first content layer for each of the five candidate topical areas (e.g., accounting overview) and a single delivery mode (e.g., streaming video). In a fully deployed system there would be many more topics, three-to-four support levels and a comparable number of delivery modes.

Table 5. Examples of Accounting Content Support

Topic	Content Focus (1st level)	Example Delivery Mode
Accounting Overview	Present main accounting concepts and how they form the basis for GAAP	Streaming Video
Financial Statements	Illustrate how to prepare a trial balance and to develop income/balance sheets	Computing Template
Accounting Process	Introduce formal record keeping and the steps involved in the process.	PowerPoint Presentation
Ethics	Demonstrate the importance of ethics in the accounting profession.	Simulation
Information Technology	Show how technology is used to enhance the accounting process.	Virtual Tour

Web-based simulation can be used to illustrate the basic principles of many accounting topics at a time and place convenient to the student. For example, the use of simulation in teaching ethics and professional responsibilities in accounting has been found to be an effective alternative to the traditional classroom lecture (Haywood, 2003). Accounting simulation models also provide the student with the context to develop analytical thinking in a realistic problem-solving environment (Marriott, 2004). In a simulation environment students are able to work with accounting spreadsheets that are linked to the larger business decision-making process. This construct allows students to develop higher order cognitive skills. The content delivery mode components outlined in Table 5 are not mutually exclusive and can be used in combination. If after participating in a simulation the student is still having difficulties additional resources like an ethics video or a case as part of a study team exercise can be provided (Dowling, 2003).

Another benefit of the screening process is that students with the appropriate capabilities could opt out of preparatory and core accounting classes, thereby allowing for more specialization. This approach was applied to a core MBA accounting course (Chewing, 1999). The results, based on a logit model, showed that prior accounting work, quantitative GMAT scores and grade point averages in undergraduate accounting courses were most significant in classifying students. The call for accounting assessment plans by both AACSB and the accounting education community has resulted in the development of a multi-dimensional framework consisting of broad-based involvement, multi-trait analysis, and follow-up assessment (Stout, 2005). This plan includes multiple assessment measures and provides feedback regarding both academic (curriculum-related) and administrative (operational) dimensions of performance. One way to manage the process of content identification and delivery is through the use of intelligent tutors.

Intelligent Tutors for Accounting

The use of intelligent tutors in accounting courses is on the rise. For example, an expert system (AUDPORT) has been used to assist accounting students to better understand the audit reporting process (McDuffie, 2006). This knowledge-based system uses the criteria contained in the *Statement on Auditing Standards No. 58* to determine the type of audit opinion (unqualified, qualified, adverse

disclaimer) that should be rendered by the student after conducting a financial audit under generally accepted auditing standards (GAAS). Presented in the following are some selected AUDPORT questions.

- Did the client consistently apply generally accepted accounting principles from year-to-year in the financial statements that were audited?
- Did the auditor discover any matters pertaining to the financial statements, such as a subsequent event or related party transaction, that are significant enough to be referenced in the audit opinion?
- Did the auditor discover a lack of adequate disclosure in the financial statements or the footnotes?

This learning system was tested in a first-level, hybrid-based auditing class. The results, as measured by grade performance and student preferences, compared favorably with a traditional course covering the same material. Intelligent tutors have also been applied to courses in accounting internal controls (Changchit, 2003). The American Institute of Certified Public Accountants (AICPA) defines internal controls as:

> *"A process - affected by an entity's board of directors, management, and other personnel - designed to provide reasonable assurance regarding the achievement of objectives in the following categories: reliability of financial reporting, effectiveness and efficiency of operations, and compliance with applicable laws and regulations."*

The expert learning system used in this investigation was based on extensive interviews with an internal control specialist. The specialist characterized 126 internal control weaknesses and the processes used to identify each weakness. The results of this experiment showed that students using the intelligent tutor package outperformed the control group in detecting control violations. More specifically, this study demonstrated that business students using an expert system tutor detected significantly more internal control weaknesses than students who were exposed to traditional instruction on detecting control violations.

An Application of Intelligent Tutors for Continuing MBA Students

The expert system approach outlined above was used in providing specialized accounting content for continuing students enrolled in a fully employed MBA program. The particular application involved cost-based accounting (ABC). Figure 3 shows a sample case and consultation system used in this learning application. The student is guided through a series of prompts regarding the case. Explanations or clues are provided for each prompt. The consultation can be taken more than once since, among other things, some of the prompts are randomized.

Once the student has completed the consultation the expert system provides an overall learning assessment and a PowerPoint review presentation. The consultation can be taken more that once since, among other things, some of the prompts are randomized.

Conclusions

Working professionals are returning to the classroom in record numbers. Many working adults entering a non-residential MBA program have been away from the classroom for some time, or do not have an undergraduate degree in business, or both. These conditions suggest the need for specialized learning systems for assisting the student at the beginning and over the course of the program. The purpose of this paper is to illustrate a screening process for delivering content in a non-residential MBA for two diverse academic disciplines: organizational management and accounting. An analysis of 1,880 alumni records for the period 2000 to 2006 shows that GMAT scores, incoming GPA, and elapsed time since completing undergraduate degrees are useful in helping identify potentially marginal students entering a non-traditional MBA program. The developed neural net model yielded an overall classification record of 88 percent. Neural nets are only one of many analytical screening systems that can be used for this

purpose. The capability of identifying marginal students via analytical screening opens up the opportunity to provide specialized learning support material.

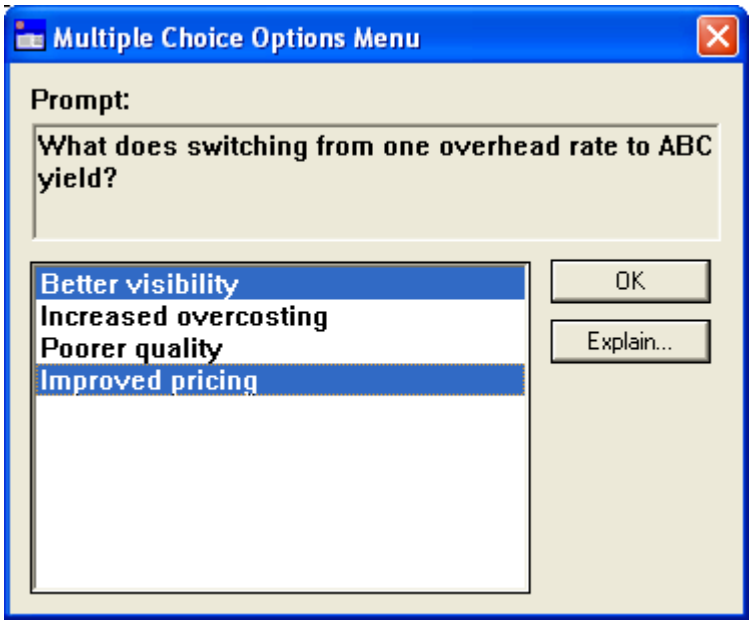
Activity Based Costing Overview	***Consultation Learning System***
The CFO at the Rubrics Corporation, a midsize hardware manufacturing firm, has become aware of the ongoing imbalance between product pricing and costing. Traditionally, companies like Rubrics allocate overhead to a product (or project or job) based on the relationship of one direct cost element - direct labor hours or direct labor dollars. The shortcoming of this process is that different products use different elements of overhead; however the overhead is "smoothed" over all products. Typically, this results in the total costs of a product not being compatible with the amount of overhead used.	

Figure 3. Sample Expert System Accounting Case and Consultation (ABC)

Web-based learning support systems provide a vehicle to enhanced learning and are particularly attractive for working adults engaged in an MBA program. Specifically, consultation systems, enhanced interactive simulations and virtual tours offer the student a customized learning experience at a convenient time and place. Intelligent agents are one promising technology to support the customization of the learning process in management education. These tutorial systems provide learning content based on student performance and background characteristics. Similar systems are being used throughout industry to improve both productivity and effectiveness and can play a role in enhancing student learning. The discussion shows that the two-stage screening and content delivery process does enhance student performance in a MBA fully employed program. The screening and tutorial processes should be integrated with an assessment system. Ongoing assessment is an essential ingredient in the delivery of graduate management education.

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