





TEACHING THE CURRENT
OR
FUTURE GENERAL MANAGER:

A CRITICAL FUNCTION FOR THE MIS FACULTY

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ABSTRACT: For the past several years, information systems faculties have worked diligently to develop effective curriculums for students majoring in the field. Today, an increasingly important, and perhaps more important role for the information systems faculty is that of educating non-majors -- students who wish to be, or currently are, general managers. Increasingly, general managers are determining the extent or use of the computer and the effectiveness of the information systems function in their organizations. Systems design and programming is more and more being performed within end-user departments and by end-users themselves. Therefore, in the 80's, an increased degree of understanding of the information function by general management is vital.

However, "general management" students vary widely. In addition, the amount of material which might be taught is overwhelming. Finally, the amount of time available in general management curriculums for information systems material is limited. Three current approaches to these constraints, and some general conclusions concerning teaching information systems to general managers are presented.

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I. INTRODUCTION

At the present time a great deal of emphasis is being placed by MIS faculties in schools of management on educating students majoring in the MIS field. However, there is a teaching mission which we believe is even more important for the MIS faculty. This increasingly important mission is to teach non-MIS majors in the fundamentals and the managerial implications of our field.

The Need to Educate Non-MIS Majors in MIS Concepts

The increasing cost-effective availability of computer support for managers at all levels makes it imperative today that all MBA candidates be made aware of the way that computer-based support can be utilized in their field of specialty -- no matter what the specialty. Perhaps even more important, there is a need to educate middle and top executive managers to understand what can be done to support all functions in their companies. Today's executives -- as well as tomorrow's -- need at least a minimal understanding of the opportunities that are available to increase productivity for clerical workers, staff professionals, and line managers themselves.

Several evident trends make improved information systems understanding on the part of all managers vital. The time is fast coming when managerial access to information support will become not only a luxury but a necessity at almost all levels of management. Clearly, hardware technology is increasingly cost-effective. More importantly, the software technology is at a point today where managers can make use of the computer without huge financial investments. There is an ever-growing number of good, available "models" in the areas of

financial management, market analysis, production management, and so forth. In like manner, an increasing number of general purpose data storage and analysis systems such as RAMIS, FOCUS, NOMAD, and EXPRESS are available to allow managers to build data bases and to explore their contents with relative ease. The next generation of these languages should be even more facilitative.

Budding and current managers, therefore, must understand enough about this technology (both hardware and software) to understand how it can currently support their operations. In addition they must understand these trends so that they can understand the increasing value and cost-effectiveness of computer-based aid.

The United States faces a productivity crisis today and a labor shortage in coming years. In 1980 labor is increasingly costly. Equally increasingly costly are capital assets, such as inventories, which must be controlled today more than ever before. With international competition growing, and other countries having taken the lead in automating their manufacturing processes -- and therefore having gained a productivity lead on the United States -- it appears that the effective management and use of information is increasingly significant to managers on the North American continent.

A final significant reason to educate the non-MIS major in the MIS field is that the location of much of the systems development is rapidly changing from the "MIS shop" to the end-user himself. Today, user-based programming is growing because user-understandable languages like APL and EXPRESS are increasingly available and useful. In addition, the demand for systems has overwhelmed the capabilities of the MIS group. Therefore, users are picking up the slack themselves.

Additionally, as the emphasis in MIS is evolving from the installation of paperwork-oriented data processing systems to "decision support" it is logical that users are becoming more involved in systems design. Thus, non-MIS majors are increasingly system designers as well as users. They must be well educated to these responsibilities.

What Type of Education is Necessary?

In an era in which users are increasingly involved in the development of information systems, it would seem logical that the knowledge which must be transmitted to them is the basics of what can be done, as well as the rudiments of how it can be done. In addition, managers need to understand how to plan for and control the computer resource in their area. The knowledge needed here is similar to that required to understand and manage human resources. Just as one needs to know something about personnel, one needs to understand the technology and applications of the computer to be a good line manager today.

Whom Are We Educating?

In general, we would submit that we are educating two different types of non-majors. First, we are educating people who will be able to "do it themselves." These are the younger managers who will start by actually using computer systems to assist themselves, solve problems and manage in major functional areas. The second group that must be educated are those managers who, although they will not use computers directly, will influence the use of the computer resource throughout their organizations. This second population is perhaps even more

important. Composed of middle managers and senior executives, this set of managers heavily influences the general atmosphere in an organization with regard to computers and the resources that are devoted to information systems. In short, we are educating not only people who will program but those who will decide how much programming should be done.

Looked at from the university's viewpoint, there are three groups of non-major prospective students who are of interest. These groups are: (1) MBA candidates who are relatively young, (2) MBA candidates with managerial experience (e.g., "executive MBA programs"), and (3) senior executives. As each of these groups has different proportions of the two populations noted in the previous paragraph, the courses designed for them should and do differ.

II. INFORMATION SYSTEMS TOPICS FOR THE TRADITIONAL MBA CANDIDATE

The increasing importance of timely and accurate information for all managers and the increasing availability of computer and telecommunication technology seemingly demand that all MBA candidates be instructed in various aspects of computer systems and information systems. Practicing business managers and a growing number of business school faculty support the need for formal instruction in the area. Deans of business schools, through the American Assembly of Collegiate Schools of Business (AACSB), support the need for such instruction by including the following statement as one of the "common body of knowledge" areas: "a basic understanding of the concepts and application of accounting, of quantitative methods, and management information systems including computer applications."

The purpose of this section is to discuss the issue of information systems topics and courses for the general MBA candidate. First, we will discuss the current status of required information systems courses in leading business schools. Second, we will present some of the content and/or pedagogical issues that are or will be addressed by faculty teaching these courses. Lastly, we will discuss the need for and characteristics of intermediate and advanced information systems courses for the non-MIS major.

Current Course Status

In some business schools there are two introductory courses in information systems, one for information systems majors and one for non-majors. No attempt will be made in this paper to distinguish between the content of those two courses. A review of the curriculum of the business schools with two courses indicates that the difference between the courses is often one of emphasis and depth, not necessarily of the topics addressed.

A review of the core curriculum of most of the leading business schools leads one to the conclusion that there are probably as many interpretations of the AACSB requirements as there are business schools. However, these schools all offer one or more courses that, to varying degrees, instruct students in the following three areas:

- 1) information systems theory and concepts;
- 2) computer technology including high-level programming languages;
and
- 3) the computing resources of the university and/or business school.

These topics may be concentrated in courses specifically labelled as information systems, management science, or computer systems, or may be included in courses such as management accounting or management. In some cases, required programming language courses may be taught by the computer science or computer engineering departments or by the computing center. In general, however, the information systems course for the general MBA covers a variety of topics. The specific topics vary greatly from school to school and, in some cases, within a school depending on who is teaching the course. Tables 1 and 2, respectively, contain composite lists of the information systems and computing technology topics that may be covered. Even the classification of a topic as either information systems or computing technology is subject to debate. In many cases, the topic could be placed in both categories, indicating that the topic may include a discussion of a set of tools as well as the methods and impact of applying those tools within an organization.

The information systems topics shown in Table 1 highlight both the reason for the diversity in the courses offered in this area and the difficulty of teaching introductory courses for the general MBA. The major topic areas appear to be as follows:

- A) Theory;
- B) Environment of the information systems;
- C) Information systems classes;
- D) Installation of computer-based information systems; and
- E) Organization and systems issues.

TABLE 1

Information Systems Topics in a Course for the General MBA Candidate

- A. Theory
 - 1. Systems concepts and systems theory
 - 2. Information theory
 - 3. Organization theory
 - 4. Decision theory
- B. Environment of the information systems
 - 1. Legal and societal issues
 - 2. Impact of computer-based information systems on the organization
 - 3. Impact of computer-based information systems on the individual
- C. Information systems classes
 - 1. Characteristics of various application systems
 - 2. Computer-based modelling and decision support systems
- D. Installation of computer-based information systems
 - 1. Stages of EDP growth within organizations
 - 2. Systems Life Cycle
 - 3. Systems Analysis and Design (Activities and Techniques)
 - 4. Control and audit of information systems
- E. Organizational and systems issues
 - 1. Information systems planning and policies
 - 2. Management of data as an organizational resource
 - 3. Evaluation and selection of information systems services and facilities

TABLE 2

Computing Technology Topics in a Course for the General MBA Candidate

- A. Computer Hardware
 - 1. Hardware components
 - 2. Architecture of computer systems
- B. Computer software
 - 1. Language translators
 - 2. Operations software
 - 3. Data and text management software
 - 4. Telecommunications software
- C. Programming and programming languages
- D. Information structures and file processing

Given the lack of any generally accepted information systems theory, the theory topics often are a combination of a "homegrown" theory of the instructor or a colleague, and the basic theory of one or more of the reference disciplines. The infancy of the information systems area is probably one of the major reasons for the lack of generally accepted textbooks in the area. Existing textbooks seem to be particularly lacking in the theory or foundations area.

The environment of the information systems topics are often directed toward presenting key issues from the behavioral sciences and organizational theory. The key question is "what is the impact of information systems on society, individuals, and organizations?"

In one form or another, the student is exposed to the wide variety of information systems classes. In some courses, this topic includes a detailed discussion of the operational and administrative activities of

the various business functions. Wide diversity exists in relative emphasis of traditional data processing functions and systems versus decision support systems.

Probably the most common element of courses in this area is the topic of installation of computer-based systems. Through a variety of techniques and approaches, the life cycle activities of a computer-based system are presented. Diversity exists with respect to the emphasis on this topic and the degree to which specific analysis and design techniques are taught.

Finally, the courses usually contain a set of topics on organizational and systems issues. These topics often include global organizational issues, such as information systems planning, as well as issues related more directly to the information systems resource, such as managing and organizing the information systems function.

Pedagogical Issues

What lessons have been or are being learned with respect to the information systems and computing technology topics presented to the general MBA candidate? The following paragraphs contain some of the authors' impressions.

It is obviously impossible to thoroughly cover all of the topics in Tables 1 and 2 in a one semester course. However, given that our objective is the education of someone who is interested in business, we are more responsive if we provide a brief overview of most of the topics as opposed to in-depth coverage of any particular area or areas. While we believe that the area is of sufficient importance to warrant a required course, we must recognize that for some MBA students the

topics may seem to be of very little importance. These people may be very bright but they feel that anything related to computer technology is of no or limited relevance to them. The challenge to the instructor is to stress the business relevance of all topics, both the technical and the non-technical.

While the computing technology topics may be easier to teach and more immediately motivating for most students, the information systems topics are probably much more important in the long run. Because most instructors probably have a technical background, the general tendency is to emphasize the computer technology topics. The instructor feels more comfortable, the topics are more structured, and the instructor often strives (knowingly or unknowingly) to educate the students in the manner in which he/she was educated.

The pedagogy of presenting material is often more a function of the skills of the instructor and the size of the class than it is of anything else. Course modules that can be based on a single or very few basic concepts which are then expanded and can be shown to describe past and current practice are very successful. Similarly, simple or complex taxonomies are helpful in developing concepts without the need for detail. Case studies can be helpful but we suffer from the lack of sufficient good case material and the need to often teach relatively large classes.

Programmed learning (self-study) materials and audio/visual instruction techniques can be very helpful especially in presenting computer technology topics and in teaching students how to use the computing facilities of the university and/or business school. When this type of material is used, regular class time can be more

effectively used for teaching information systems topics. The MBA required course at the University of Michigan utilizes self-study materials in the teaching of the local computing facility, elementary software and systems concepts, and the BASIC programming language. The materials include ten assignments which the students are required to submit at regular intervals throughout the semester. Little or no class time is spent on these subjects.

Systems design projects or even the smallest real systems development assignment is often a very time-consuming and frustrating experience. Unless well-designed, controlled, and justified, the general MBA student considers the activity a negative experience.

We feel that the two most important things to remember when designing or teaching this course are to, first, remember that the customer is an MBA student who is interested in and needs concepts relevant to the business environment and problems, and to, second, recognize that the course content and pedagogy will have to be in a state of change for the immediate future. The course is not for computer science or computer engineering students. In fact, it is probably less than ideal to allow computer science or engineering students to take the course as an elective. Given the state of development of information systems and the rapid change in computing technology, the content and format of the course will be in a state of constant evolution in the next few years.

To attempt to meet these challenges, the course at one of the authors' institutions (Michigan) has been divided into three major topic areas. The first topic area is information systems and computing technology concepts and fundamentals. The second major topic addresses

how systems and technology affect the organization. The third topic addresses how systems and technology affect the individual from the graduating MBA to the senior executive. The topics in each major area will change from year-to-year but hopefully the structure will endure.

Intermediate and Advanced IS Courses For the General MBA

What information systems topics and/or courses should be available to the general MBA beyond the introductory or required courses? To our knowledge, no general trend has developed in leading business schools. The most common model is to provide a set of intermediate and advanced courses for MBA students, where the "information systems major" may elect most or all of these courses while other students may elect only one or two beyond the required course. Another approach for subsequent courses for non-majors is a set of functional area application courses which survey, in detail, the most important features and development issues of specific functional information systems, e.g., marketing information systems, operations management systems, and financial modelling systems. We believe that the following issues will have to be addressed by information systems faculty with respect to courses for the general MBA:

- 1) Should incremental teaching resources be dedicated to teaching the information systems major or the general MBA candidate?
- 2) Do we need to develop separate advanced courses related to the role of information systems in each of the business functional areas? Do we need a marketing information systems course, a personnel information systems course, etc., or can the topics be generalized in these second and third level courses?

3) In business schools where the operation of organizational functions is not taught in the functional area required courses, should these organizational functions be taught by information systems faculty?

Our experience in these second-level courses is very limited. However, we believe that in the future more of our time will be dedicated to them. The incentives will be the student demand for such courses and the natural follow-on of joint research efforts with our colleagues in other functional areas.

The purpose of this section is to reflect on the state-of-the-art in the area of information systems courses for the general MBA. We hope that information systems faculty in Business Schools will look at these courses as significantly more than "service courses," with all the negative academic connotations associated with that phrase. We believe that the rate of acceptance and utilization of computer-based information systems, and the effectiveness of these systems, in the next twenty years may be highly dependent on what we teach the general MBA about our area. The cost of failure appears to be very high.

III. EXECUTIVE LEVEL MBA INFORMATION SYSTEMS EDUCATION

Introduction

Executive level management education for experienced managers has been an important "product" of graduate schools of management. Workshops, seminars, and specialty track programs of relatively short length are well established continuing education opportunities for

"life-long learning." The content, structure, and purpose of these educational vehicles are very specialized and no attempt is made here to generalize on all these executive programs. Rather, executive level information systems education will be discussed here within the context of one accredited, lengthy, and comprehensive vehicle: The Executive Masters in Business Administration (EMBA) program. In particular, experience with one such program will be used as an empirical, evaluation base for a discussion of a required information systems course for an EMBA program.

The EMBA Program

Typically, an EMBA program

focuses sharply on the functions and perspectives of top-level management, including strategic and corporate planning, industry and opportunity analysis, risk assuming decisions and corporate policy formulation

The emphasis is on semi-structured decision making. The operational aspects of data input and output are not of concern rather, the effective location and processing of information (both transaction and model-based) is of primary importance.

The EMBA students are "self-made" managers; they come from a variety of private, public, profit, and not-for-profit organizations; some are technicians with advanced degrees. Most significant, their prior exposure to information systems (IS) is heterogeneous and necessitates early experience leveling activities in the IS class. Many students, however, are rich sources of experience on organizational "muddling through" IS issues. This can effectively be used pedagogically to raise issues, possible solutions, and their

consequences.

Executive IS Knowledge

Table 3 addresses five major purposes designed into one EMBA course and how one empirical sample base evaluated the perceived achievement of these purposes [1]. Note that all of these suggested purposes for the EMBA IS course deal with the user view of IS and with

Table 3

MIS Course Purpose Achievement

<u>Purpose</u>	Perceptual Achievement Level			Sample Size
	Very High	Moderate	Low	
Understand general role of MIS in an organization	13 (81.25%)	3 (18.57%)	-	16
Understand the effect MIS can have on an organization	9 (56.25%)	7 (43.75%)	-	16
Understand major MIS technologies which help to set MIS direction	7 (43.75%)	8 (50.00%)	1 (6.25%)	16
Understand role of user in MIS	10 (62.50%)	6 (37.50%)	-	16
Understand MIS is not just computers and computing but, more importantly, the way business policy is implemented	12 (75.00%)	4 (25.00%)	-	16

the organizational consequences of IS. (Note also that it is most difficult to teach MIS technology as effectively as might be desired in the minimal time available in a short course.) Whatever purposes are chosen, it is likely that due to the nature of the EMBA student, the purposes should be planning and policy oriented and emphasize economic and organization (socio-technical) evaluations of IS technologies. Further, it is necessary to use some integrating framework to relate the vast variety of IS topics that can be addressed.

One such integrating framework which has been used to tie together the multiple course topics evaluated in Table 4 is Nolan and Gibson's "IS Stages of Growth." Although there is legitimate debate on some of the economic suggestions of this model and on its generalization of results from limited data, this framework is quickly grasped by executive students and can be effectively used to introduce a variety of related topics. Table 4 contains an evaluation of the relevancy of the topics taught in one course to an EMBA student group.

One effective method of introducing individual topics to executive students is "dynamic case writing." With this method, students are asked if their organization has confronted a specific MIS issue (e.g., redundant and inconsistent data) and how they coped with it. A well prepared instructor can guide the discussion to point out related issues (e.g., data storage charge-out, data administration systems development methods, organization data politics, etc.) based upon a variety of actual experiences. Related to this, executive education and, in particular the EMBA program, provides an opportunity for personalized homework, where students are asked to design "their own" DSS or database or charge-out policy.

Table 4

Relevancy of EMBA MIS Topics

Personal Relevancy Perception

Topic	Relevancy			
	Very	Generally	Marginally	Not
Stages of Growth	8/15(53.3 %)	5/15(33.3 %)	2/15(13.3 %)	-
Information Resource	6/14(42.86%)	4/14(28.56%)	3/14(21.42%)	1/14(7.14%)
Office of the Future	4/15(26.7 %)	5/15(33.3 %)	6/15(40 %)	-
Minicomputers	3/14(21.42%)	7/14(50 %)	3/14(21.2 %)	1/14(7.14%)
Distributed Processing	3/15(20 %)	5/15(33.3 %)	7/15(46.7 %)	-
DSS Technology	5/15(33.3 %)	8/15(53.3 %)	2/15(13.3 %)	-
DSS Applications	7/14(50 %)	5/14(35.72%)	2/14(14.28%)	-
DSS Implementation/Design	7/14(50 %)	7/14(50 %)	-	-
Corporate Model Construction	5/14(35.72%)	5/14(35.72%)	4/14(28.56%)	-
Corporate Model Use	5/14(35.72%)	5/14(35.72%)	3/14(21.42%)	1/14(7.14%)

Finally, experience with teaching experienced managers also suggests that:

- 1) hands-on exposure (to, say, word processing or corporate modelling language programming) is greatly desired by managers; and
- 2) lectures, homeworks, and demonstrations which relate various topical areas (few policy/planning problems are uni-dimensional) are synergistic (e.g., classical financial analysis on a case study with subsequent modelling of the case via a corporate modelling package).

Conclusions

This section has argued for certain characteristics of experienced manager IS education, especially within an EMBA program. An integrating framework to provide insights into IS economic and organizational tradeoffs, to identify policy and planning issues, and to stimulate issue raising from experience, is essential. From an operational viewpoint, since experienced managers are often aggressive, high-achievers who tend to over analyze (especially on homework), care must be taken to control the workload. Finally, since effective semi-structured decision making is key to a successful top executive, understanding Decision Support Systems can be a final course objective which naturally evolves from addressing MIS technologies and theories that give direction to management use of information.

IV. SENIOR EXECUTIVE MIS EDUCATION

Senior executives are different. They are different in the amount of MIS exposure possible. The courses of interest here are those in which senior executives attend management schools for short courses, typically four to thirteen weeks in length. This allows little class time for the MIS function [2]. They are different in their importance. These are the people who set MIS policy in their corporations and who determine the share of corporate resources to be devoted to the IS function. They are also different in their understanding of IS both intellectually and emotionally. Most have had little technology training due to their age. And many have a visceral anti-IS emotional set due to a generation of unfulfilled or only partially-fulfilled promises.

Taken together, these three factors suggest that it is critical for the MIS faculty to carefully determine what should be taught in senior executive courses as well as how to best communicate a limited set of messages.

In our view, senior executives should be "hit" with three major messages. The first is the rapidly growing importance of the MIS function in their organizations. The second is that a few conceptual frameworks, processes, tools, and techniques do exist which can, in a relatively straightforward way, aid them in understanding the IS area and in understanding the key IS issues which must be understood by top management. Finally, in 1980 in particular, they must understand the new role of IS as an information-provider (for decision support) -- thus weaning them from the traditional view of "DP" as a function concerned entirely with the accounting-oriented production of

paperwork. Where it is possible to solidify these messages by the provision of well-designed "hands-on" computer exercises or, at the very least, relevant cases or field visits, this conceptual senior executive education can be made even more meaningful.

At one of the authors' institutions (MIT), only six sessions can be devoted in a nine-week course to MIS education. The topics presented in these sessions, and their corresponding messages (as noted in the preceding paragraph), are as follows:

- 1) Technology trends and impacts (organizational importance)
- 2) Managers, critical success factors, and information needs (new role of IS)
- 3-4) Decision Support Systems (new role of IS)
- 5) Key IS issues (concepts for understanding)
- 6) The IS manager's viewpoint (concepts for understanding).

In addition, time is taken in the course to have the students visit a site where a major decision support system is in operation. Training in on-line interactive computer usage is given. And, perhaps most important, all the course content is brought together in a one-week management game at the end of the nine-weeks in which decision support packages (pro-forma financial forecasting, simulations, regression, etc.) are made available to the senior executives to use on-line as they play the game. In this way, we believe many of the MIS messages are fully imbedded.

V. CONCLUSION -- WHY DEVOTE MIS FACULTY TIME TO NON-MAJORS -- AND SOME FINAL THOUGHTS ON WHAT SHOULD BE TAUGHT

If the education of non-MIS majors is done well, the resulting managers and future managers will have a positive feeling toward MIS, they will understand it, and they will support a move toward further application of the computer in their organizations. If this education is done poorly or not at all, the computer will be viewed as dull, irrelevant and perhaps a bit scary by managers. At best it will be over-looked and, at worst, negative feelings toward the computer resource will render the information systems people impotent.

Equally significant today, more and more systems design, development, and programming is being done outside the MIS department -- in user areas. Therefore, these non-MIS people must understand how to use the computer resources effectively and efficiently.

The range of material that should be taught to non-MIS majors is broad; there is a very wide spectrum of knowledge which should be transmitted. In our view more MIS material should be included in general management curriculums at all levels than is today. Expanding the MIS segment of the curriculum to keep pace with the growing organizational significance of the MIS function is a very real strategic challenge for MIS faculty today.

However, as the preceeding sections have indicated, the present tactical challenge is to select the right material for each time-limited course. For each example course we have indicated the type of material which we believe should be emphasized and the logic underlying the particular choices.

We end with a generalization concerning the selection of course

material for the three student groups we have examined and two other groups -- IS undergraduates and IS graduate management majors. As Table 5 shows, the types of material we have discussed which needs to be taught can be arranged in a spectrum from essentially "technological material" to material aimed at "generalized management conceptual understanding." Almost all five student populations need some of each set of material. Undergraduate courses need a heavy emphasis on basic technology and the other concepts on the left hand side of Table 5. For Senior Executive programs, however, the primary emphasis must be on the material types on the right. Other Program emphases should take an intermediate position as noted.

Within this general framework, the exact material used and method(s) of presentation will vary widely. Still, information systems courses for general managers deserve significant MIS faculty emphasis today. They deserve at least as much attention as those for I/S majors, for all the reasons noted above. Information systems progress can be hugely affected in the next decade by this education.

Footnotes

- [1] The 1979-80 first year EMBA class at Case Western Reserve University's Weatherhead School of Management.
- [2] There are, of course, many information systems short courses (1-5 days) for senior executives. Although the material noted here may be actually used for these courses, we are concerned in this section with the IS material which must fit into a several-week senior executive course whose primary purpose is general management education.

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