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# THE MANAGEMENT INFORMATION SYSTEMS AREA: PROBLEMS, CHALLENGES AND OPPORTUNITIES

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**ABSTRACT**

Management Information Systems has evolved as an area in which teaching and research is common. In order to consolidate advances made to date in this area and to meet new and significant challenges, a number of problems must be overcome. This paper identifies and discusses the problems, suggests methods for their solution, and concludes by looking toward future opportunities for the area.

## INTRODUCTION

The most significant origins of the area termed "Information Systems" (IS) do not go back to a technical computer or analytic discipline but instead to the field usually termed "Management". The early management literature as exemplified by the works of Chester Barnard (3) and Herbert Simon (23) placed emphasis on the importance of decision making and information within the overall management process.

The conceptual foundations of IS as an area of practice and academic pursuit were first expressed in an article by Leavitt and Whisler (17) in which they forecast the coming of "Information Technology" and speculated as to the organizational impact of this new managerial concept. These authors described the combined use of computer technology, operations research techniques, and artificial intelligence to enhance the management of organizations. Following this early work, the next few years saw several efforts to describe this new "managerial phenomenon" and to predict its impact. The books springing from the University of Chicago seminar on "Management Organization and the Computer" (21) and the Los Angeles symposium on "Management Information and Control Systems" (9) are examples of this focus. The Theory and Management of Systems (13) also provided a framework in which management, systems, information and control were stressed.

Other disciplines which can readily be shown to have also contributed to the early development of the information systems area are computer science, economics, operations research and behavioral science. Information systems, as an area of study, is clearly eclectic in nature and much material from other areas must be integrated together if it is to be successfully practiced and taught.

Formal academic programs that were heavily oriented to the integration of these various disciplines in an overall management context began to appear in the late 1960's (5, 10, 14). Throughout the decade of the 70's major expansion occurred in academic programs in the information systems area and in its supporting mechanisms, e.g., professional societies and journals.

Looking ahead to the 1980's, the academics working in the IS area are dissatisfied, but optimistic. We look back over the past ten or so years and see the tremendous progress that has been made, yet are concerned about where we are and about meeting the challenges that we see ahead. Despite our concerns, many of us see our future as one filled with promise and opportunity if these challenges are identified and addressed.

In the next section of this paper, we will highlight some of the challenges that we face. We will also identify some of the symptoms of the problems that, if not

overcome, will preclude meeting the challenges. Then, the paper will address some of the causes underlying the problems. The remainder of the paper will deal with suggestions as to what the IS community should do to meet the challenges.

## THE OVERALL CHALLENGES

Money magazine lists the occupation of "computer system analyst" as the best of "sunny" occupations for the 1980's based on job growth and salaries (20). It is significant for information systems programs that the article, in its summary comment about the occupation, says, "Add management skills and you write your own program for advancement" (20, p. 76). We believe that these analysts will generally require those skills that are provided in an information systems program rather than in a computer science program. Recently conducted surveys support the position that, in addition to technical skills, information analysts will be in demand requiring managerial and organizational training (4). Thus, the basic IS challenge is that of providing rigorous and effective academic programs that will produce people who will fill these forecasted needs.

A second major challenge is evidenced by those suggesting that the United States is faced with a crisis in its business prowess. A recent meeting of businessmen, academics, and Congressmen concluded that, "America stands at the verge of becoming a second-rate economic power" (24, p. 62). At this meeting, the blame for the decline was placed on reduced productivity brought on by too little research and development.

IS must play a major role in addressing this national challenge because so many modern workers deal with information that productivity improvements, even in jobs previously considered to be "blue collar", will be information and control oriented. C. Jackson Grayson has said:

> "We're undergoing a new industrial revolution, and one estimate is that 50 percent of our workforce now deal, not with hard goods and tools, but with information. The United States has a tremendous opportunity to lead the world in productivity improvement in this area" (7, p. 4).

The IS role in this effort will affect "direct labor" productivity through the application of robotics and artificial intelligence to the planning and control of processes (8) in both "information intensive" and more traditional production contexts. It will also importantly affect "indirect labor" productivity through the development of more effective computerized support systems for both managers and staff analysts (16).

## HOW ARE WE MEETING THE CHALLENGES?

The question must now be asked, what is the current postion of academic programs in information systems to address these challenges -- to educate needed personnel, to retrain existing workers and managers, and to do the required information systems research and development that will be required to improve organizational productivity. There are a number of conditions which indicate that we currently fall far short of meeting the challenges.

1. Existing IS programs will not be capable of producing personnel with the proper skills in the required quantity. Even counting computer science programs, there will be a shortfall and, we argue, these programs will produce an output that will contain far too many technical, in contrast to organizational, analysts.

2. The information systems programs themselves will produce very diverse products. These will vary from "programmer" to computer oriented management scientists, to "information analysts", the latter having training in computer technology, organizational functions, behavioral science, and quantitative methods (See 2).

3. The quality researchers are far too few in number and too dispersed to do the kind of research and development that is needed. Further hindering research is the fact that financial resources are more widely available to research and develop technology than to further the use of technology.

The situation may be getting worse rather than better. Greater financial suport for more information systems resources are not likely to be available, and even if they were one necessary resource, the information systems academic, who conducts research and trains others is not available in needed quantities. On this point:

Universities usually support new requirements, e.g., information systems programs, during periods of expansion. They do not do as well at reallocating resources to meet shifting demands. This is not a period of expansion for our colleges and universities. As a result, new information systems programs are not growing rapidly enough to meet the demand.

According to the one major placement source for our area, The American Institute for Decision Sciences, there are about 115 academic positions unfilled in information systems/data processing in 1980 (1). This undoubtedly understates the total as it is but one source. We estimate that it is optimistic to suggest that 25 academics with the proper training are entering the job market annually.*

Over the past few years, a number of institutions have dropped information systems programs after beginning programs several years previously.

A number of the more junior information systems academics are having difficulty getting promoted and being granted tenure. Thus, they are forced out of one institution and must suffer the startup cost at another or leave academia entirely.

Many information systems programs are "paper programs" in that they have inadequate faculty, course offerings, and in some cases, students. We aslo have a number of information systems programs based upon one person and/or part-time faculty.

Earlier, the uneasiness that many of us feel regarding the current state of affairs was mentioned. We also see the opportunity to make a significant contribution to meeting these challenges in the years ahead. Despite this, we feel an overall frustration with an existing situation which appears to indicate that the information systems area is not coming close to contributing as it should.

**SOME CASUAL SPECULATIONS**

In addition to the lack of resources within the higher educational system and a severe shortage of information systems faculty, we believe that the potential of the IS area to meet these challenges is hampered by a number of subtle factors. We would like to speculate about them and propose approaches to addressing them.

A major causal factor may be characterized as the "image" of the area. The image of the IS academic among academic colleagues, management practitioners and IS practitioners is best described as "unclear". This unclear image translates int "lack of clout" and inadequate resource allocations. There are a variety of factors that we may identify as contributing to this "image problem".

IDENTITY CRISIS

Up until about 1965, the area with which we are associated was generally called Information Technology. Then the term MIS became popular. Dissatisfaction with progress led to a solution that was simple: change the name but do the same thing. Thus, some claimed to be associated with Computer Based Information Systems (CBIS) rather than MIS. More recently, Decision Support Systems (DSS) has come onto the scene (see Couger (9) for a discussion of DDS vs. MIS). By calling ourselves by various names and titles, we do ourselves a disservice. If we do not know who we are, imagine the image we portray to our academic colleagues! Even if we could agree on what we call ourselves, a more serious problem exists: what it is that we're about.

DEFINITIONAL UNCERTAINTY

Since the early days of activity in our area, academics and practitioners alike have argued about what constitutes the area and where are the priorities. The well known (some would say infamous) report issued by the Society for Management Information Systems, "What is MIS," is an early example of this type of concern (22). We still have not settled on what shoud be included or excluded from our area. Some give greatest weight to technical concerns, whereas other programs are behaviorally strong or have a quantitative emphasis. We are not suggesting that everyone adopt one model, but so much variation exists that it blurs the image of the entire field. Certainly we should be able to agree on the basics of our area. Output (either students or research) from programs in Computer Science or Accounting is relatively predictable and homogeneous. We are producing apples and oranges with perhaps a few pears thrown in for good measure.

* In the 1979 AIDS placement directory, two qualified MIS job applicants are listed.

## MOVING TARGET

Our area, perhaps as no other in history, is dynamic. Almost weekly, events occur in the technological sector with which we must become familiar. Similarly, the use of the technology is rapidly changing. New managerial practices and procedures are developed almost as fast as technological enhancements (systems design methodologies and structured processes are examples). Finally, and associated with the previous point, is the fact that we must cover so much ground. We are responsible for material from physical data structures to implementation theory to mathematical programming and on to the functional areas of business. As a result, we're all spread terrifically thin and are constantly running just to keep up. On this point, some comments by Professor Couger on the subject of his sabbatical are relevant. He observed that he spent his time updating himself in an area of specialization in his doctoral work, "management", and was struck by how little new had occurred despite the passage of time. He contrasted this to the area in which we work.

## COMMUNICATION/INTEGRATION

We have made much progress since 1975 in developing academic journals through which we can communicate. Prior to that time, information systems material appeared in a wide variety of sources and much good material "fell through the cracks." Now we have the MIS Quarterly, Information and Management, plus the new journal that is forthcoming from NYU, Systems, Objectives, Solutions. Because there is too little high quality material for a large number of MIS journals, we should stop more proliferation of journals at this point and strengthen the ones we now have. We are too small a group to support more journals. At this stage quality research and publications are vital to enhancing our image.

In another area, that of professional societies, we are much less well off. If we count the number of professional society memberships presented at this meeting and where people place primary emphasis, the variety would be notable. The fact of the matter is that there is no single professional society that contains even a majority of information systems academics. It is crucial that a single forum exist such that, at least periodically, a large percentage of our group can meet together. We are not unsupportive of existing professional societies. It is simply that their foci are special purpose enough that not enough of us communicate through this mechanism. We probably do not need another professional society, perhaps a conference on "Information Systems" held annually or every other year will suffice.

## PRACTITIONERS VS. ACADEMICS

In general, data processing/information systems practitioners are anti-academic. It seems that they are guilty of biting the hand that (or can potentially) feeds them. Certainly this is true with regard to student output. If anything is desperately needed by the IS practitioner, it is a theory or underlying base of knowledge to support their practice. Yet, there seems to be a carryover, perhaps from management science, that academics are worthless and theory is not needed. On this point, we academics are not especially to blame. First, we know of many IS academics that can be practical when practicality is warranted. Second, when we do theoretical work we're pretty good about classifying it as such. Thus, one of the factors that is hurting us and ultimately (already is) hurting the practitioners is this attitude. Again, attention is called to the state of affairs in other areas, Accounting for example, where the situation is considerably more supportive for academics.

## RESEARCH QUALITY/FRAGMENTATION

In contrast to more well established areas, information systems does not have a track record of high quality research output. Thus, when we are asked to point to definitive research in our area, we have difficulty responding. Too many of us continue to work at the conceptual level well beyond the point when such work is required. We have enough conceptual frameworks. It is time to test, enhance, and embellish these frameworks with empirical research results.

Another problem is the one of a lack of a cohesive research approach for our area. We seem to randomly generate research projects with the outcome that we have a scattering of results which presents a severe problem of pattern recognition. We also suffer, of course, from being an eclectic area and, as a result, often are accused of doing research that is "computer science," "management" or "organizational pyschology." As a final point here, we would like to call for a better grounding of our research on a theoretical base, either our own or from an outside discipline. In our view, we have far too much exploratory research evidenced by top of the head hypotheses which seem logical at the time of statement. It is quality research perhaps more than any other which can lead to our respectability and acceptance.

THE NEW KID ON THE BLOCK

We must face the fact that IS is, in most cases, the newest organizational subcomponent in its unit. Thus, in terms of sheer numbers and power, we suffer. Also, being new, there is general lack of understanding as to what information systems academics do. The general opinion seems to be that we teach programming!

Information systems academics also tend to be younger and more junior in the aggregate when contrasted with those in other areas. A general lack of power is one result. Being new (and frequently alone) the information systems academic is often swamped with curriculum development and computer related activities (especially committees). When promotion time comes, though, the issue is always whether or not the "column inch" publication quota has been met and if at least one item represents definitive research.

Finally, in contrast to other areas, we have trouble pointing out the senior true scholars/researchers in our area. Administration and other tasks have siphoned off many persons who otherwise might be playing this role. It is our newness and lack of seniority that, to a large extent, contributes to the organizational power vacuum on the part of information systems faculty.

**SOME STRATEGIES TO BETTER ADDRESS THE CHALLENGES**

We believe that many of the problems facing us in the areas of research and education could be alleviated by adopting a number of strategies that are designed to address the overall challenges facing the IS field.

THE ADOPTION OF AN IS RESEARCH PARADIGM

For improving the quality of research, we recommend that Chervany's (6) prescription be adopted.

> "What is needed is a research framework that identifies variables (or propositions) to be examined and provides a structure for correlating and synthesizing independent research studies."

The use of common paradigms would serve an integrating mechanism for various outputs and would generate what Peter Keen calls a "cumulative tradition" in our field. The few examples we have of such paradigms are the laboratory studies labelled as the "Minnesota Experiments" (11), the implementation field studies of Lucas (18), and the DSS case studies of the MIT and Wharton schools. These studies have probably had a higher impact on our field than the many other fragmented research approaches.

THE USE OF THE STANDARDS OF THE SUPPORT DISCIPLINES

The information systems field is considered to be an eclectic discipline drawing from the knowledge base of the support disciplines such as management, psychology, economics and computer science. Given the lack of well established theories, research paradigms and methodologies in our field, an appropriate strategy would be to use the ones of the support disciplines. For example, a researcher working in the area of individual differences in the use of information systems should be able to draw upon the areas of psychology and human behavior to select theories and generate hypotheses, to develop standards for the validity and reliability of the instruments used, and to choose the appropriate data analysis techniques. We are thus proposing the use of the established research standards and the knowledge base of the support disciplines to guide our research, the research work of doctoral students, and to be used as a norm in the refereeing process for information systems journals. We think that such a strategy will not only improve the quality of our research, but will also allay the criticisms of our research raised by colleague in the other administrative disciplines.

THE STRENGTHENING OF RESEARCH METHODOLOGY TOPICS IN DOCTORAL CURRICULA

One way to assure the attainment of high quality research outputs in the future is improve the research methodology in our doctoral curricula. Many information systems programs do not go beyond teaching statistical methodology courses to their doctoral students. While this may assure the correct analysis of data after is is collected, it ignores the proper planning of experiments, data gathering and all prior empirical steps. In order to improve the research methodology sections of doctoral curricula, we suggest the following:

> Requiring courses in the philosophy of science, including topics in the construction of theories, scientific inquiry, tests of hypothesis and research design.
>
> Introducing the students to the various data collection

methodologies relevant to information systems research such as survey research, field studies, experimentation in the laboratory and the field, simulation studies and protocol analysis.

Establishing programs with strong "outside" areas in at least one support discipline.

Encouraging the students to take courses in other disciplines relating to information systems theory, for example, information economics and information retrieval.

Establishing an annual doctoral consortium to increase the research awareness of Ph.D. students.

## ENLARGING THE SCOPE OF THE LITERATURE SEARCH

Most academics in our area shoud regularly peruse the literature in the support disciplines related to their research interest in addition to keeping up to date with information systems publications. Additionally, there seems to be less of an awareness of the European theoretical and experimental research studies relevant to information systems. While journals such as Information and Management try to bridge the gap between North American and European academics, many of the European conference proceedings which are published in book form are less well known. In addition, non-traditional information systems journals such as the International Journal of Man-Machine Studies, Journal of the American Society for Information Science, IEEE Journal of Systems, Man and Cybernetics, Human Factors, and Ergonomics contain articles relevant to the study of information systems. We believe that enlarging the scope of our literature search will help researchers improve their studies and eliminate the costly problem of "re-inventing the wheel" by gaining access to the accumulated knowledge in those sources.

The problems we previously mentioned in the educational domain relate to the lack of adequate numbers of faculty and students, heterogeneous outputs from the programs, and the time spent by the junior academics in curriculum development. In order to cope with some of these problems, we suggest the following:

## DISCUSSION OF INFORMATION SYSTEMS PROGRAMS

There is a need to agree on a core knowledge for information systems programs. The ACM Curriculum Report (2) is the only major proposal available which addresses this issue. However, except for a few published studies (4, 12), there have been no reports concerning the validity of the ACM report recommendations nor data on its implementation in academic institutions. In the last ten yers the emphasis in curriculum seems to be shifting from the technical to the managerial aspects of information systems and this change in emphasis has been encouraged by some authors (15, p.52-53). We think that a renewed dialogue on what constitutes the "basics" of an information systems curriculum is necessary and research to investigate how this curriculum will match the changing need of the practitioners should be encouraged.

## DISSEMINATION OF CURRICULUM INFORMATION

In order to reduce the time and effort spent on curriculum development, a network to disseminate course outlines and syllabi would be helpful. The MIS Interrupt published by the University of Calgary, Faculty of Management, has indicated a willingness to perform such a clearing house service (see the April 1980 issue, p. 4).

## SHARING THE RESOURCES OF COMPUTER SCIENCE AND INFORMATION SCIENCE DEPARTMENTS

To alleviate the shortage of information system faculty, we could rely on the resources of computer science and/or information science departments to teach some courses such as the more technical courses in our curriculum such as programming, software and operating systems, telecommunications, files and databases. This approach may be criticized based on the difference in emphasis between business faculties and these faculties. However, the experience in some schools has shown that our colleagues in computer science may be willing to accommodate our viewpoint in teaching such courses if the number of business students taking them are large enough, the students good enough, and if they are well prepared to take these courses.

## RECRUITING STUDENTS

There are some academic fields such as accounting , management science, and computer science which contain knowledge bases closely related to the study of information systems. Students coming from these areas into our graduate programs would cause less of a strain on our educational resources since they already would be exposed to some of the prerequisite knowledge for information

systems. It would be therefore advantageous to concentrate on recruiting these types of students for our programs. Another strategy we could use is to encourage doctoral students in other areas of business to take a Ph.D. minor in information systems to increase the number of academics capable of teaching in our area.

CONCENTRATE ON OUTSIDE FUNDING FOR FACULTY AND STUDENTS

While this is an obvious idea most of us have been working on for a long time (some unfortunately without success), we would like to make notes of the recent accomplishments such as IBM fellowship for graduate students in information systems, and the Honeywell Chair in MIS obtained by the University of Minnesota, and the IBM grant to NYU. These are encouraging signs which indicate that our efforts are finally succeeding and government, industry, and vendors may be more willing to provide funds for graduate students and faculty in the future. We believe MIS areas and MIS faculty have much to offer and, we would like to see more efforts made on the part of industry and government to support both general and specific MIS research and educational programs. We believe that in the long run, it is of the best interests of our nation and its economy to develop our MIS resources.

ORGANIZATIONAL INNOVATIONS

There would seem to be great potential benefit in drawing together those discipline based faculty who have interests in IS into an organizational entity such as a research center, institute or joint academic program. This would provide a vehicle for focusing their IS interests, give an IS identity to all who participate and serve as a mechanism for integrating the diverse disciplines that make up modern IS.

The MIS Research Center at the University of Minnesota is one prototype and the Center for Information Systems Research at M.I.T. is another. Inter-disciplinary research centers at other universities in non-IS areas offer other interesting structural possibilities that might be adopted by IS.

## CONCLUSIONS

The challenges of the 80's for the IS field are not the mere cliches of which speeches are made. They are real and they are important to the field and to the nation. The current problems of the field are serious, but not insurmountable. However, they will probably not be solved if those of us who are the field take a stance that is reactive and primarily reflects our own uncertainties.

In a very real sense, we have the responsibility to address these problems since they are national and world-wide in scope. There is no one else with the capability to do so. We are in a very unusual situation in which that which is good for us as individuals is also good for the IS field and for the nation. To ignore this situation would be both irresponsible and dangerous. To let the opportunity pass would be foolhardy.

It is our hope that we can surmount our individual differences and uncertainties and develop a proactive strategy for addressing these challenges. In this paper we have attempted to provide some basis for doing so.

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