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Management science is defined as the basic process or function of rational decision making. The concept of educational research is expanded to include use of new management techniques developed by the private sector which are adaptable to decision making in the total educational context. Four trends in the field of educational research are briefly reviewed: (1) Increasing use of scientific problem-solving methods, (2) increasing use of management information systems, (3) increasing emphasis on longrange planning to correlate the educational system with political, economic, and social subsystems for more effective human resource development, and (4) increasing use of systems concepts. (JK)

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AN OVERVIEW OF MANAGEMENT SCIENCE IN EDUCATIONAL RESEARCH

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An Overview of Management Science in Educational Research, 1968

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Introduction

The task of presenting or discussing an overview of the utilization of the knowledge developed in one discipline to that of another is fraught with many difficulties. One is immediately faced with such questions as how extensive such an overview should be? Should any such overview be in depth on a few selected topics or should broad brush strokes be made in painting the picture? Another question centers around the definition of terms involved. What is Management Science? Educational Research? Should such an overview be carefully documented with empirical evidence to show what is happening or should it be a presentation based largely upon the presenter's knowledge of what is happening in a particular field? These questions plus others confronted the author when undertaking the task of trying to present the current status of the applications of management science to the field of educational research.

The task is somewhat further complicated by the fact that the author is looked upon by many of his professional colleagues as an "educational researcher." It so happens, however, that due to a variety of circumstances and interest, the author has been drawn into the discipline of management science and acquired knowledge about this discipline on a bootstrap basis rather than through formal training. While this does have the

advantage of permitting one to look at both areas, it presents a complication in the sense that the knowledge developed in one area, that of management sciences, has been derived in a non-educational context. Direct transfer of such knowledge to the educational context is not always possible. Adjustments and modifications have to be made to fit our situation. It is quite similar to the utilization of Fisherian statistics in the field of the social and behavioral sciences. Such statistical methods were developed in the fields of agriculture and biology. Utilization of these methods in areas such as education have required some adjustments and modifications. I think the same thing could be said about the applications of management science to the field of educational research.

Returning to the set of questions noted earlier, let me establish a framework or parameters for this overview. I would like to start by first defining the terms Management Science and Educational Research for use in this paper. This will be followed by a brief discussion of four trends as I see them developing. I would like to conclude by presenting some problems with which both areas of management and education must work upon in the future.

Definitions

Looking first at the definitional problem, let me start by focusing upon how the concept Management Science will be used in this paper. It would seem somewhat presumptuous for me to define the concept at an international convention devoted to this topic. Yet, there must be a common basis for communication. For purpose of this paper, I want to define

Management Science as the basic process or function of rational decision-making. This definition somewhat follows the general idea of Simon in his book The New Science of Management Decision (9) where he largely equates management with decision-making. The prime purpose of decision-making is to make more effective and efficient utilization of scarce or limited resources in both the private and public sectors of the economy.

My choice in giving emphasis to decision-making as an operational definition of management science is rather deliberate for several reasons. It was chosen because there ARE in education at the present time many pressures such as societal concerns, technological advances, and community participation which are creating a focus on past, present, and future educational decisions. In one sense, the educational "establishment" is not going to be permitted to act in isolation from a paternalistic or authoritarian position. Coupled with such concerns, is an increase in accountability by the several agencies which support education. Questions are being asked as to whether or not decisions made in the past regarding public expenditures on education have been fruitful and what will be the return for future investments. In brief, educators are being asked more and more to expalin their decisions. This increased emphasis on participative decision-making is reflected very well in a recent paper by Williamson in the August issue of Research/Development (14)

> I see this revolt against the authoritarian establishment as powerful, new, and gaining momentum all the time ... ...
> This means that people will, more and more on their own initiative, seek involvement in the decisions that affect them and their work. We have too long assumed that people want to be told what to do and that they want others to do their thinking for them. This is not true for an increasing number of people. If we don't realize this, we are not going to be prepared for the future.

Another reason for giving emphasis to decision-making as the central focus has been pointed out by Crozier (3) in noting the gradual convergence of functions carried out by public administration (of which education is one example) and the private sector. As he states the situation, "... the role of administrators in the public sector now seems much nearer to that of managers in the private sector. The centrality of decision-making processes provides the meeting place for administration and management to come together. Crozier notes this centrality as follows:

> Comparative research on the decision-making processes in public sector and the private sector is therefore of crucial value in connection with the reform of administrative thinking and the training of new managers for the public sector.

It would seem to me, therefore, that any discussion of Management Science as it relates to education . 1968 should focus upon the procedures, processes, and techniques being employed for decision-making in the public education sector of our culture

There have been a wide variety of techniques developed over the past two decades which can be used to make educational decision-making more effective than ever before. Such techniques and concepts as Operations Research, Operations Analysis, PERT, PPBS, management information systems, long-range planning, systems theory, simulation, and mathematical models, while not the exclusive domain of management, are examples of the wide variety of tools developed in the private sector which have potential value to the educational manager in making his decisions. They are, however, only tools to be used by the manager and should not be confused with the basic function of management - that of decision-making.

Let me now turn to the definition of Educational Research. Even though being an educational researcher, I find some difficulty in trying to define the term. A few years ago, I thought I had a useful definition of Educational Research but my more recent experiences connected with the study of management as it relates to the field of education have caused me to question this previous definition. To many persons, Educational Research has meant the application of scientific methods (notably the experimental method) to the study of classroom methods, learning theory, development of curriculum, pupil characterisitics and behavior, and similar topics by persons professionally trained to do so. This conception of Educational Research can be seen in a statement made by Ben Bloom in his presidential address to the 1966 annual meeting of the American Educational Research Association (2). In talking about the substantive contributions during the previous 25 years, he reviews advances in such areas as development of the individual, effects of the environment, predictability and modifiability of human characteristics, teaching methods, and instructional strategies, individual differences in learners, and principles and sequence of learning.

To me, such a conception is rather restrictive and represents what educational research has grown up to be rather than what it perhaps ought to be. It is my personal feeling at the present time that this traditional conception of educational research needs to be expanded to incorporate research on the education process which involves many of the new utilizations of the wide variety of techniques and tools referred to earlier

which management in the private sector uses in its work. In those cases where such techniques are used, the relevant areas are labeled as institutional research, educational planning, or campus planning, but not educational research. I feel personally that this is an unfortunate categorization. It is my conviction that research relating to the study of community populations trends as they might possibly affect the educational enterprise, the mathematical modeling of school systems, or the establishment of an information system for institutional decision-making are just as much Educational Research as the study of how we reinforce the behavior of students in the learning situation. It seems more relevant therefore to our purpose today to talk about research on the <u>total education context</u>, regardless of <u>who</u> is doing the research or where it is done as the proper conception or definition of Educational Research.

<u>Trends</u>

With these two definitions in front of us, let us now turn to some trends regarding the applications of Management Science to educational research as based upon some empirical evidence

One major problem in collecting such evidence is the identification and location of information relative to the topic This is a real information storage and retrieval problem We examined such sources as the <u>Review of Educational Research</u>, Educational Resource Information Center (ERIC)[1] publications, issues of <u>Management Science</u>, <u>Education Index</u>, and even the

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[1] ERIC provides for education a service similar to that provided by the Defense Documentation Center and its monthly publication looks very similar to the TAB Index presented by DDC

annual AERA programs for the past two years. We did some checking on the contracts awarded under the several titles of the Elementary and Secondary Education Act of 1965 as amended. One of the problems encountered in consulting some Government educational references was the fact that the ERIC system, for example, uses the general term Administration to include the concept of what most of you refer to as Management. Within this search, several documented references were noted that when put together do reflect some current trends relative to the applications of Management Science to the field of research on education.

It would appear that there are at least four trends which have significance for a paper which purports to be an overview. It should be recognized that these four trends have perhaps been somewhat arbitrarily separated from each other for discussion purposes whereas in reality they probably have strong interrelationships with each other. The four trends that I should like briefly to review are (a) an increase in research and development activities with regard to the applications of techniques such as operations research, operations analysis, simulation, and modeling; (b) an increase in the development and utilization of management information systems for operational decisions in the present and for long-range planning; (c) an increase in role and function of educational planning in its largest sense accompanied by increased applications of the Planning-Programming-Budgeting System and (d) an increase in the use of systems concepts as they relate to education being a sub-system of a total national enterprise. I would like to discuss briefly each of the above trends

indicating some of the significant publications and/or actions which have relevancy to the particular trend.

Educational Operations. One major trend has been in the increasing employment of such problem-solving approaches as those represented by operations research, operations analysis, simulation, cost-effectiveness, and mathematical modeling of schools in the study and research on educational problems. One of the better summaries of applications in this area was the Symposium on Operations Analysis in Education sponsored by the U.S. Office of Education in November, 1967 The stimulus provided by this symposium has had a significant response in 1968. At first, it was anticipated that this symposium might attract approximately 400 to 500 participants if fortunate A total of 1,000 persons largely drawn from the field of education actually attended It would appear to this writer that such an attendance is indicative of perhaps both the interest in and the need to be informed about the application of operation techniques to the field of education at the present time A survey of the papers presented reveals discussions on operations analysis, simulation, network-based management systems, mathematical modeling, cost-effectiveness and similar topics Originally intended by the Office of Education as a means of "up-dating" the educational community, it was pointed out by the program chairman in a personal conversation with the author that it appeared that the field was ahead of the agency sponsoring the conference and perhaps the tables were actually turned

As particular examples of activities in this area, let me cite two on-going operations. Roger Sisson, working with the Philadelphia public school system, has been developing mathematical models which relate an index of school performance (e.g., changes in achievement test scores) to selected pertinent and relevent resource input factors (10). It is hoped that such models will eventually be able to predict student performance from management policy as reflected in resource allocation functions. A second example would be the current efforts regarding a national assessment of educational output or products. Time does not permit here a full discussion of educator's reactions to this proposal. It is sufficient to say that it has not always been met with eagerness. The basic purpose of such an assessment, however, is relevant to our discussion. The question being asked is what kind of output are we securing for the inputs and processes employed in education at the present time? It is rather surprising to me that educators should show resistance to such an idea but they have been very vocal about the proposal in many instances. Fears of a national curriculum, increased federal control, and other "demons" have been raised. Yet from a management point of view, the question is a very relevant one to effective decision-making. What is my product like and how can I best allocate my resources, both from an input and process point of view, to improve the output, are legitimate questions to be asked.

The applications cited above have been largely in the elementary and secondary schools level. I would certainly remiss in my duty if your attention was not called to the excellent article by Gustave Rath in

Management Science for February, 1968 which summarizes some of the current work going on with regard to educational operations at the university level (8). Particular emphasis is given by Rath to the role of automation in such activities as administration, testing, cost analysis, computer system instruction, and similar topics.

The employment of such techniques (e.g. cost-effectiveness) associated with this trend place an emphasis upon the economics of education. Crozier points out that a major difference between administrative and management actions lies in the ability of each area to develop measurements of cost and effectiveness.

> ... a characteristic of the majority of administrative activities is that it is very difficult to measure their results, and still more difficult to evaluate these results in the light of expenditure which has been necessary to produce them. The reason why the social system formed by an administration can develop much more freely as an autonomous "body politic" is that to a great extent it escapes the constraint of result. Measures of costs and measurements of efficiency... have naturally no direct repercussion because they never enable ends and means to be evaluated simultaneously in terms of tangible results.

As a consequence of this situation, Crozier goes to state that decisions in administrative activities are made largely on the basis of power relationships and the proportion of rationality is much less than that in management activities where the measurements are more readily available. A major problem, therefore, associated with using many of the new techniques for researching operations developed in the private sector for decision-making in the administrative activities of educators is the degree of success the latter can achieve in securing measurements of cost and effectiveness.

To summarize, it appears that there is a definite increase in the utilization of what might be called operations analysis techniques at all levels of education. Their purpose is to increase rational decision-making but how far this goal can be accomplished will depend upon how successful we are securing measurements of our efforts so that the degree of rationality in decision-making can be increased.

Management Information Systems. A second trend relates to the increasing development and use of management information systems in education. According to Yovits and Ernst, an information system is a system which provides data having utility for decision-making (15). The application of this particular concept in education takes many different forms. Several illustrations can be cited which provide documentation for this trend.

Under the provisions of Title III of the Elementary and Secondary Education Act of 1965, there were, by the end of October, 1967, a total of 112 projects with total funds of nearly 14 million dollars approved which have as their primary goal the development of computer-based information systems for administrative and guidance purposes (5). Approximately half of these projects were in the form of planning grants while the other half were devoted to operational projects. In some cases, the projects focused primarily upon information storage, acquisition, and dissemination. Others were designed to develop working information systems. The principal point to be made here is that recognition is being given by these efforts to the need for quick availability of relevant data for those decisions which have to be made by administrative and instructional personnel.

Another example of this trend has been the operation during the past several years of the Midwestern States Educational Information Center located at the University of Iowa. Seven states are combining together to test out the feasibility of establishing a common data base regarding students, faculty, curriculum, plant, and facilities, and financial information.

A third example of this trend is a recent announcement from the Office of Education of a project to develop a regional management information center for colleges and universities (13). This project is to last five years and represents the cooperative effort of 14 states to develop management information systems for their colleges and universities. One aim of this project is to provide cost-effectiveness data on university programs so that better resource allocations can be made. Among the problems to be investigated are the information needs for local, state, and federal reports, the establishment of a computer-based system for collecting and reporting compatible information among the 14 states, and developing means for exchanging data. The project will be administered by the Western Interstate Commission for Higher Education.

In addition to the above types of management information systems utilization, there has been an increased use of such techniques as networking systems (e.g. PERT, CPM) for the planning and control of various types of projects going on at all educational levels. The author has been directly involved in helping educational institutions gain competence in using these types of information systems. When this work was started

in 1964, applications of such techniques were not widespread if published reports were used as the criterion. At the last count, over 50 published references were available in 1968 on the use of network systems in education. From my own knowledge, many applications are not documented so that the degree of application is probably understated by resorting to document counts as evidence.

The increased use of management information systems will, however, present some interesting problems. Referring again to Crozier's discussion cited earlier, he notes that one benefit of such systems is that they will permit analysis of costs and gains associated with many activities. While cost-effectiveness is valuable in its own right, Crozier points out the possible real value for the employment of such systems.

> It is mainly in the functioning of the organization system and especially in the decision-making processes that its revolutionary impact will be increasingly felt. It makes it necessary, in fact, to re-think administrative activities as a whole by bringing out the real nature of one of its essential components, information, the rationalization of which it makes possible. In consequence, the production of information can be freed from the caprice of hierarchial relationships and subjected to the rules of scientific reasoning. A principle of organization appears, independent of the tradition and needs of the social system or of the administrative "body politic", impossing new and exacting constraints and thus exposing to broad daylight the absurdity of the old-established channels.

One effect of such information systems, according to Crozier, will be to bring administration and management much closer together in terms of their behavior.

On the basis of the types of activities cited above, it would appear that there is a rather definite trend toward increased use of information

systems which can provide necessary data for decisions not only in the immediate situation but also for decisions over the long-range.

Educational Planning. Let us now turn to the third trend, that of educational planning in its larger sense. Planning is generally recognized as a principal or major function of management at all levels. What appears significant to me with regard to planning in the management of education at the present time is the increase of trend in making this process more explicit than it has been in the past and a recognition by educational personnel that the educational system must be less in a reaction posture to events and more in an action posture. Concepts such as "planned change" and "innovation" are common place words in the educator's vocabulary today. such terms reflect the increased emphasis given to the role of planning in the educational process.

Educational planning refers primarily to developing long-range and short-range plans relative to how the educational system can correlate with the political, economic, and social subsystems in order to provide for more effective human resource development, not only in emerging nations but in developed nations, in order to accomplish national goals. It would be presumptious to state that this trend has had a single force operating to produce it. If one had to state any such single force, it would have to relate to the idea that the educational enterprise cannot be divorced from the rest of the nation and that the decisions made (albeit political) about the allocation of a nation's resources must consider all dimensions concurrently and not separately.

Illustrations of this increased emphasis can be seen in many ways. It was the author's good fortune to be an invited participant to a UNESCO sponsored conference in London this past January which was devoted to ways and means of implementing educational plans. The purpose of this conference was to develop a working paper for a larger conference held in August in Paris under the auspices of the International Institute for Educational Planning. The importance of this latter conference centers on the fact that it represents an international concern with the problem of planning in education.

The concern is not, however, just focused on such large-scale efforts. The importance of educational planning is reflected in several other activities. I would also cite the increasing development within state departments of education, of offices concerned primarily with educational planning. The U.S. Office of Education has made funds available under its several programs for states to secure and train personnel who will have the needed competencies for developing plans for education It was the author's priviledge to have participated in such a program during this past year involving seven states.

Recognition of this trend can also be seen in the establishment of departments, centers, and institutes of various kinds at the ~~university~~ UNIVERSITY level to improve the educational planning capability. As examples, I would cite the establishment of an Educational Planning Department at the Ontario Institute for Education, the Educational Development Faculty at my own institution, and the Educational Systems Development Center at Florida

State University as recent moves in this direction. In addition, the Office of Education has recently established two policy research centers, one at Stanford Research Institute and the other at Syracuse University, which have as their primary mission the providing to educational policy-makers at all levels the relevant information and techniques needed for decision-making (1) The task of such centers is to describe the basic issues, conceptualize possible alternative futures, analyze means for achieving the policy goals, and the consequences of alternative choices. In brief, the question of concern is what will the world be like in the future and how can education begin to plan for this future?

A discussion of educational planning would not be complete without reference to the increasing role being played by PPBS and its effect on educational institutions. The factor causing an increased interest in the use of this technique cannot always be determined. In some instances it would be safe to state that its inherent advantages were seen and adoption followed. In others, the use of PPBS in some form by education was ordained because of state-wide adoption of the system. It is my understanding that the states of Washington, California, New York, and Wisconsin are utilizing program budgeting within all state departments thereby necessitating its use by educators. Certainly the use of PPBS at the Federal level has caused to some degree the several states to employ the technique.

In addition to such agencies as state departments of education, we find an increasing use of the technique or its modifications at the university level My own institution has developed a procedure during the

past three years for implementing a type of PPBS procedure (12). The utilization of PPBS is still too young in the field of education however to judge its real worth. As Marvin Hoffenberg of UCLA has pointed out, its potential value might be in its helping to bring out for public discussion the issues around which budget decisions must be made at any level of education (6).

To summarize this trend, it would seem that many educators are becoming more aware than ever before of the need to act rather than react. A plan is an outline for future action. To the extent that we can engage in long-range educational planning, giving adequate recognition to the uncertainty of the future, the more likely we can have an educational system which contributes effectively to total national development on a foresighted basis rather than with 100 percent hindsight.

Systems Concepts in Education. The last trend that I would like to discuss deals with an increase in the utilization of systems concepts in the field of education. Systems theory is not the exclusive domain of management since it pervades almost all fields of human endeavor as well as natural phenomena. Nevertheless, managers have made increasing use of systems concepts and principles in dealing with problems that face them. It is not unusual, therefore, to find educators today talking about the utilization of systems concepts in their work. One major problem presented here centers around the meaning of such terms as "the systems approach" and "systems analysis," when they are used. Perhaps we can straighten out our vocabulary in the next few years but at the present time there is a communications problem.

To illustrate this concern with systems in education, I would call your attention to two symposia on this topic. One appeared in the Journal of Secondary Education for October 1967 and the other in the Nation's Schools for the same month. More recently, the publication of a small paperback titled New Look at Education by John Pfeifer carries as its subtitle Systems Analysis in Our Schools and Colleges. A stimulating article by Meals, titled "Heuristic Models for Systems Planning" appeared in a recent issue of Phi Delta Kappan, points out that educators have not recognized the value of systems concepts in developing new policies and practices (7).

Not only is the systems approach being talked about, some efforts are underway to provide educators with some substantive knowledge and competence in actually using the technique. I would cite as an example the work of Don Miller with Operation PEP, a statewide project to prepare educational planners for the state of California. This is a three-year project concerned with improving the skills of school administrators in the use of systems analysis for problem-solving.

As further example of this concern with the systems approach to education, I would call your attention to the work of Reisman and Taft (11). Their position is that the techniques developed in systems technology are applicable to the field of education, both in administration and curriculum, and that it is a question of securing cooperation on a multidisciplinary effort to put them into practice

In addition to the above, we find more discussions of systems approach to instruction, administration, and educational organization than we have in previous years. All of this evidence points up a trend toward increased interest in and the use of systems conception education

As earlier noted, it may well be that the four trends discussed cannot be truly isolated from each other. In fact, some writers have chosen to discuss all four under a more general term such as Operations Analysis. It is my considered opinion that regardless of their emergence as separate microtrends or one macrotrend, there is, in 1968, a definite trend toward increased utilization of new techniques and approaches to aid in providing the information needed for effective decision-making in the field of education. The fruits of current research and development activities with regard to the use of techniques in education will make a valuable contribution of the total education process

Some Problems

The increased utilization of these techniques and tools is, however, not without certain problems. I would like to take a few minutes to present what I see as some of the problems which will have to be dealt with in the immediate future by both Management Science and Educational Research

One of the major problems centers around the need for individuals trained in the understanding and implementation of the new techniques and procedures. Many of the traditional training programs in the field of educational research do not now provide such training The Office of Education has funded during the past several years a wide variety of

programs designed to fill this gap. Since the need for system analysists, planner, management information systems specialists, operations researchers, and related personnel will undoubtedly grow, attention must be given to devising the kinds of educational training and experiences which will produce these types of individuals. At the present time, the demand far exceeds the supply.

A second problem focuses upon the observation that educators receive these techniques with less than open arms. The reasons for this reception are not always readily apparent. A common reaction that comes to me is that such tools and techniques used by managers to make decisions are derived largely from the business-military complex and are oriented primarily either to the profit-motive or to hardware situation. Educationists state that they are neither in the profit-making business and certainly are not developing hardware. It is maintained, therefore, that application of these techniques are not appropriate to the educational context. This problem has not been helped by the entry of many business concerns in the field of education, particularly if time is not taken to have their representatives become familiar with the education process and how educators perceive their own role and function.

A third problem involves the fact that most of the approaches and techniques call for a great deal of quantification of variables in order to operate successfully. Again, we find a resistance because educators take the position that many of the variables of concern to them cannot be quantified. If they can be quantified, they are often not quite willing

to have that quantification represent what they are really trying to achieve. For those of us who have worked in education, this is not a new experience. It will appear here, however, for those unfamiliar with the education sub-culture to understand the resistance to this point.

A fourth problem area is a general reaction that the application of many of the new approaches, such as mathematical modeling of school systems, will result in a dehumanization of the total process of education. To some extent, the current student unrest on the campus reflects this concern of educators. If we are to make progress with educators, it may be that we will have to demonstrate that rather than dehumanizing the educational process it will in the long run make it more humane by allowing for more effective decisions. As one writer put it, it may be more inhumane to continue as we have than to consider new approaches to allocation of our scarce resources.

The last problem is that the introduction of these new techniques has, by and large, not been by the professional educator himself but has come from persons outside of the field of professional education. In a recent program in which the author participated, at least four of the speakers could be considered as professional education persons while the others came from political science, industrial engineering, economics, and related areas. This in itself generates resistance. It is rather encouraging at the same time to note that the new breed of educator is both interested in and learning about these techniques. To me, it is a good thing that persons from non-education fields are entering the field of education. It

is my conviction that the problems facing education today are of such magnitude and immediacy that interdisciplinary efforts seem the only reasonable ways to go about dealing with them. Perhaps the tools and techniques developed for more effective decision-making are the common ground upon which the professional educator can meet with colleagues outside of the field and work to solve the many problems. It is very encouraging to me that this professional meeting has had the foresight to see possible interactions by having this particular session on your program. I hope that such interdisciplinary exchange could be made a permanent part of the programs in the field of education as well.

A Personal Note

I would like to take a few minutes to discuss with you the role and concern of the Educational Program Management Center of the Educational Development Faculty within the College of Education at my institution. The Educational Development Faculty as a group is concerned with the development of education as a system and the associated planning, management, and evaluative activities associated with such system development. The initial impetus for the Program Management Center came from the author's study of the applications of PERT to the field of education starting in 1962-63. It was not long before study of this technique lead to the more general concept of Management Sciences and a study of the various tools and techniques which might have possible utilization in the field of education. Our initial concern was with how such techniques might be useful in the management of research and development projects. Since then, the

focus of the Center has been expanded to a study of a wide variety of educational program and topics which are of concern to the manager or administrator of the educational enterprise. Included in such topics are long-range planning, PPBS, cost-effectiveness, and the role of systems concepts in education. It has been our good fortune to receive funding from the U.S. Office of Education to conduct, during the past two years, a series of management training programs for educational research personnel. The interest in our work as expressed by the field of education in general has been so encouraging that we are moving to develop as part of an overall doctoral program in Educational Development, a series of courses and experiences which would permit the education and training of educational personnel in the use of management science concepts to a wide variety of educational activities. Final approval of this program is yet to be granted but our outlook is optimistic.

Conclusion

My task of providing you with an overview of management science in educational research reaches a conclusion. I am sure that there have perhaps been some oversights which both my education and management colleagues will call to my attention. I apologize now for such oversights and can only assure you that they were not intentional.

I would like to close by referring to a term that is often heard today in both the fields of education and management - that of "third generation" computers. One recent publication used this idea to talk about "third generation" managers. As I perceive the situation in

education, perhaps we are only at the stage of "first generation" managers. If so, perhaps we can move rapidly to the later generation since we have the advantage that Management Science has given to us in the development of new techniques and approaches to making the vital and necessary decisions in the field of education. It will not be necessary for us to reinvent the wheel but simply modify it for our particular context.

Since the educational enterprise is vitally concerned with people, I would like to close with a warning regarding the use of many of the new managment techniques as given in the Williamson article cited earlier. He states the warning as follows:

> I think we are going to see some real conflicts in the application of a quantitative method to people, and I would predict that the exclusively technically oriented manager of the future will be faced with serious frustrations, and that he will be able to do little about them. If humans will not buy his solutions, it matters little what logic he uses. Let's use mathematical and computerized studies all we can, but let's be careful to keep them in a subsidiary place as an adjunct to our management functions.

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