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COMPUTER TECHNOLOGY FOR EXECUTIVE DECISION MAKING IN URBAN PUBLIC EDUCATION DIVISIONS IN VIRGINIA

A DISSERTATION SUBMITTED TO THE FACULTY OF
OLD DOMINION UNIVERSITY IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

URBAN SERVICES

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ABSTRACT

PLANNING PRACTICES FOR EXECUTIVE DECISION MAKING SUPPORT IN URBAN EDUCATION DIVISIONS IN VIRGINIA

Richard Kenneth Byrd

Old Dominion University, 1989

Director: Dr. Petra Elizabeth Snowden

The purpose of this study was twofold. First, the study determines if Virginia urban public school executive leadership used automated informational systems to support policy, goal setting, and decision making typical of its job requirements. Secondly, the study describes the planning techniques specific to automated system development used by the school division where such automated executive support occurs.

The personal interview method was selected because it helps to insure 100 percent of the desired sample to participate. The interview technique insures responses to direct questions, to narrative responses sought, and to follow-up discussions necessary to insure clarification.

The instrument follows a general to specific pattern of inquiry. First, all division-level administrative computer support functions are identified. Next, the

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functions are examined related to the collecting and reporting of data. Each reported function was classified as either executive or non-executive, based on the function's use in regard to policy or goal formation. Finally, additional questions requiring "yes" or "no" responses and a series of questions requiring narrative responses were used to describe the planning techniques employed in the implementation of these computer functions.

Results of the study presented in Chapter Four include:

1. The identification of seventeen additional administrative computer functions not identified in either the 1984 American Association of School Administrators study or the 1986 Virginia Department of Education study.
2. Preliminary indications of practices of data utilization that suggest the potential of automated executive decision-making support.

In addition to these results, the study presents in Chapter Five two major conclusions. First, there is evidence that computer technology has advanced to such a level of operational ease that a non-technically trained public school division executive should be able to operate and gain valuable support from the computer or terminal. The executive will realize this benefit only if the programming to deliver information related to the executive level of decision making, as well as the operational requirements, are reduced to a level

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of difficulty which does not require specialized training. Both of these requirements should be incorporated into an executive support system. Secondly, the review of literature reveals five techniques of needs assessment typically used in the planning and development of automated informational systems. Of these five, the Critical Success Factor (CSF) method best meets the planning needs for developing the type of automated decision-making system necessary for the executive level of management for large urban school division leadership.

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DEDICATION

This paper is dedicated to Elizabeth Kilgore Byrd, who has encouraged, helped and supported my completion of this project.

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CHAPTER I

Introduction

In 1967 John Naisbitt reported a significant change in the gross national product (GNP) in his book, Megatrends. He writes that 46 percent of the GNP was a result of the information economy which accounted for 53 percent of income earned and 90 percent of new jobs created in the areas of information, knowledge, or service. During the same period, the total labor force grew only 18 percent while the number of managers increased 58 percent. The number of administrators more than doubled, growing by 118 percent, the number of public officials expanded 76 percent, bankers were increased by 83 percent, systems analysts gained 84 percent, while, in contrast, engineers increased only one percent.[1] This trend of new jobs in the information category demonstrates the conversion from a society whose economy is based on manufactured goods to one whose primary economic unit has become information. Unlike manufacturing, which exhausts a specific raw material, information is its own raw material and, therefore, perpetuates itself.

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In an effort to meet the demands for rapid, orderly, and accurate manipulation of data and information, the field of management has readily accepted the computer as its major tool of use. The computer has allowed managers to cope with the flood of data and information that is characteristic of the Information Age in which we live.[2] Educational administration is a part of this culture and reflects the same Information Age concerns, needs, and interests as does business. Educational administrative leaders experience the same flood of information as their business counterparts. The availability of information systems technology, including software, has made the computer as adaptable to the educational executive as it has been to the business manager. As the educational manager attempts to plan for informational systems, the logical source to investigate is the business community. The assumption can be made that business experiences hold valuable direction for the planning of educational information systems.

Drucker notes that the qualities of good information systems are not determined alone by the technology that delivers the information but, instead, are determined by the needs of the organization as it tries to accomplish its mission. He cites an historical example where

> "approximately one-thousand Britons, most barely out of their teens, and considered lower middle level management efficiently ruled the sub-continent of India for over two hundred years with no more

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> technology than paper and a quill pen, but with an information system that rigidly focused on who needs what information, when, and where."[3]

Drucker's historical example is persuasive. He notes that an organization's needs should also determine the type of managerial control used by the organization. Traditionally, managerial control has been defined as the number of subordinates who can report to one supervisor. Typically, this number has been limited to five or six subordinates per supervisor, a theory that has become outmoded in the Information Age. Drucker identifies its replacement as the "span of communication." In Drucker's new expectation of managerial control, the number of subordinates who can be controlled by one supervisor is limited only by the subordinate's willingness to accept responsibility for their own communications and relationships with all other personnel in the organization. In the information society's organizations, then, control becomes the ability to obtain information.[4]

This principle has implications for today's management practices. It reveals that, for any executive to manage or control an organization, that manager must be able to obtain information and handle it effectively. Thus, the meaning which Drucker's principle holds for business is no less powerful for the public educational manager.

Since the computer is accepted as the proper tool to handle large quantities of data and information in

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a rapid and accurate manner, the next concern must be to insure that the computer is coupled with the correct software programs. These programs should be specifically designed to provide the manager with, as Drucker noted, "that right information needed, at the right time and in the right place."[5]

In an article focusing on school operations and management, Jones and Dukes note the value of systematic arrangement of data.[6] A systematic approach, provided by the appropriate software, allows the data to be used for a variety of purposes even though it is only collected once. The computer and appropriate software becomes, then, extremely useful to the educational manager.

All managers, including educational managers, should be deliberate in their attempts to make application of the available information and data management technology necessitated by the conditions of our culture and the challenge of managing their organizations within that culture. The examination of educational systems to determine if they are, indeed, taking advantage of the technology available from the field of information and data systems management becomes increasingly important.

Educational management, unfortunately, has not moved its applications of technology past the fundamental levels of the managerial decision-making hierarchy. The 1984 American Association of School Administrators (AASA) Critical Issues Report states that, of the

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one-thousand-five-hundred school districts surveyed nationwide, 90 percent reported using computers for managerial purposes. All of the reported uses, however, correspond to qualities of transactional inquiry or operational control levels only as reported by Robert V. Head in his decision support hierarchy.[7] None of the managerial uses listed by AASA are in direct support of the development of district goals or policies; therefore, they do not support executive decision making.

A statewide survey conducted by the Virginia Department of Education reported division level administrative computer uses that reflect similar frequency and type of use as the AASA study demonstrated. Of the one-hundred-twenty Virginia school divisions surveyed, one-hundred of them reported use of computers for tasks of budget preparation, financial accounting, and payroll. Additional administrative computer applications which are reported on the survey, but with less frequency, were test scoring, record management for teacher endorsements, transportation management, food service management, inventory control, and facility management.[8] As in the computer applications cited in the AASA study, the Virginia study failed to find any tasks beyond the operational control level of Head's hierarchy and no use of the computer for executive decision making support.

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Head's hierarchy of decision making support has been recognized as a proper tool of qualification to judge these computer functions. He describes four levels of possible decision making support, which, when compared to managerial function, can be used to distinguish executive from non-executive decision making support. Head's levels of support are transactional processing - inquiry response, operational control, tactical, and strategic support.[9]

Head's lowest level of informational system support of decision making is transactional processing - inquiry response. A practical application of this first level can be illustrated by an inventory process. Transactional processing corresponds with the entering of an inventory item into the record. Inquiry response is the function of causing the computer to report what material or how much material is on hand.

Head's next highest level is operational control. The inventory example can again provide an illustration. The decision maker might go to the computer for a report of materials on hand as before when the function was considered as an inquiry response. However, at the operational control level, the computer has been programmed to indicate a value as well as to report the number of items on hand. This value could be reflected by a signal to reorder this material when the inventory

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reached a predetermined level or a market price. The significant difference with this level is that a value has been built into the process.

The third level of Head's hierarchy is that of tactical decision making and support. Tactics imply goals and objectives. Tactical management focuses on the specific goals and its subordinate objectives that lead to the organization's accomplishment of its mission. Objectives describe and require specific behaviors which cumulatively support the more generally conceived goals, and, in turn, the mission. Tactical decision making support in education can be illustrated by continuing the inventory example. Certain events affecting the goals and objectives of the school division can be predicted or observed by examining the amounts of materials on hand. For example, it might be determined that a particular level of the reading series textbook is frequently out of stock in each of the division's elementary schools. Further examination of this shortage reveals that the book contains more mastery skills than other texts in the series. A school division goal is to teach all students to read effectively, while the supporting objective is to have each student complete all of the texts designated by the publisher as being on level for each grade. The information indicated by the inventory problem alerts the curriculum planners that the objective of maintaining on grade level reading performance is blocked by a piece

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of instructional material. With this understanding, planners can now reconsider their objective. They can begin to determine if they wish to allocate additional time and instructional resources at this grade level or if they need to redefine what they consider to be on level performance. Information which was first reported as an inventory shortage has now begun to impact the objectives of the division. By affecting the objectives, the information has impacted the tactical level of decision making.

Common to both the tactical and the next highest level of decision making support, strategic decision making is a change in the quality of the data typically used. The inventory shortage is a specific fact or a piece of hard data. As it is applied to a higher level of decision making, it is affected by the information or knowledge that there are more mastery skills required at this level than is typical at other levels of the texts. The result is a blending of facts that produce information which could have meaning for those planners who need to use it. This blending of information is typical of higher level decision making. The valuing of data converts it to soft data; that is, data that reflects values of importance to the mission of the organization. This study considers such conversion as the necessary quality to rename data as information. A further illustration of why information, not hard

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data, is important in making decisions at the higher levels of Head's hierarchy can be seen by continuing this same example. The choice of directions that the curriculum planners take will require them to know what the division, its executive leadership, and its community value.

This necessary interest in the values of the total environment of the school division becomes an illustration of Head's fourth and highest level of decision making and support, the strategic level. This level addresses the development of policies by which the division attempts to provide an operational environment that is congruent with the community it serves. This congruency is one of values. If the community has recently confronted issues that have generated a consensus of concern over matching national academic norms, then the textbook publisher's designation of what is on grade level will most likely be valued. However, if recent budget shortages did not allow for additional personnel or additional instructional resources, then the local division may be able to redefine the standards required to be on grade level.

The cited examples of decision making support have been presented in an order from the lowest to the highest level of the hierarchy. In common practice the effect of these levels would flow in the opposite direction.

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Typically, the overall mission of the organization determines what will be valued. Values, then, establish a framework within which goals and objectives are developed. Goals and objectives, in turn, dictate how the organization must operate and be controlled. Finally, operation and control suggest and demonstrate what inquiry responses and transactional processing needs to be accomplished.

By considering the level of Head's hierarchy of decision making and by comparing actual work to these categories, one can classify the work being done. Additional comparisons to what type of work are typically considered to be executive or non-executive allows further qualification of these levels into the two categories. The hierarchy also provides a means of systematically examining any system currently in place or any system being planned. By including consideration of data or informational needs for all four levels of decision making, an informational system can be either evaluated or future systems planned. Such systems would include procedures for data collection, storage, valuing, and distribution that insure the delivery, as Drucker values, of information to the person who needs it when and where it is needed. Successful information systems found in business reflect a similar thoroughness of planning. Also vital to the success of those systems is an appreciation that each organization has its own unique mission. Each mission, in turn, dictates certain

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things that must be valued. These valued factors become indicators of success as a result of their relationship to the mission. Information systems that are structured to monitor the factors that indicate success of the mission become valuable to those trying to manage the organization's accomplishment of that unique mission. According to Morton, facts and figures are useless for tactical and strategic planning until organizational values have been used to transform them into useful and applicable information.[10]

The values and mission of any business in particular, and all business in general, are different from those found in public education. However, the relationship of an organization's unique mission to those values related to that mission is constant, regardless of the type of organization. This consistency allows for the transfer and application of those things learned from the business community to the public school environment. Within any organization values are used to translate or convert large quantities of hard facts into information usable for decision making support at the highest levels of management. In traditional management settings, middle managers are often used for this purpose of conversion. Drucker refers to this as an informational passing function.[11] Informational systems have the potential to automatically treat data by application of properly designed software

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that incorporates the values unique to the organization being served by the information system. This traditional conversion of hard data to information prior to its use for higher level decision making done by the executive management demonstrates both that executives typically deal with tactical and strategic decisions and that the type of information they need to support their function is specific to those levels.[12] This study defines executive management as management limited to the tactical and strategic levels of decision making. Functions that are related to the formation of goals, objectives, and or the policies are considered to be executive.

PURPOSE

There is a need to examine what educational managerial computer applications are in place in Virginia urban public schools, to describe the effects of these computer applications on the formation of school division goals and policies, and to examine the planning techniques for any administrative computer applications currently supporting the executive leadership of Virginia's urban public school divisions.

Head has provided a hierarchy of decision making that can be supported from the Management of Information System perspective while Morton examines managerial functions and practices. Morton labels as executive those functions and practices which relate to goal and

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policy formation.[13] Rockart describes what types of information are used by executives.[14] In doing so, he supports the findings of Head and Morton. Rockart specifies that executives want and use data that has been modified by the values of the organization and that they use this information to address the formation of goals and policies that allow their organizations to accomplish their intended missions. Further elaboration of these writings is presented later on in this study. The authors' works complement one another and all agree that executive function relates to higher levels of decision making. Head, Morton, and Rockart are convincing in their definition of executive function. Consequently, this study uses the qualities of tactical and strategic function to discriminate between executive and non-executive decision making.

A second need for this study is to describe the planning for, or development of, applications of automated support for administrative function and, in particular, functions which support the executive leadership decision-making in Virginia's public school divisions. Bumsted's findings show that failure to have information systems in place in public school management is due to a lack of planning for it.[15] In writing about successful applications of informational systems for management in the private sector, Rockart and Bullen illustrate the importance

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of specific analysis of informational needs prior to the development of an informational system if that system is expected to serve the purposes for which it was intended.[16] While both the AASA and the Virginia DOE studies indicate that there is now considerable use of computers for educational administrative purposes, neither study documents applications at the executive level nor offers any description of how these administrative support functions became operational. It is significant then, to examine carefully administrative functions to determine if any are executive in nature and to describe what events contributed to their development. Whether the description of this development reveals specific analysis of informational needs or only short range decisions to attempt to gain help from hardware and software available to the school division, the description of the developmental process may well have valuable direction for future attempts to implement quality information systems and to extend their effective support to the executive levels of public school management. The purpose of this study then is to examine large urban Virginia public school divisions in order to determine what automated administrative executive decision making support is currently being used and what planning procedures and processes were used to implement this decision making support.

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THE PROBLEM STATEMENT

This study addresses the following questions:

1. What are the current educational computer applications, inclusive of and in addition to those described by the AASA national study of 1984 and the Virginia DOE study of 1986? Can any previously identified functions, or new functions reported in this study, be qualified as executive by being directly related to the formation of policies, goals, or objectives of the school division?

2. What was the process of development and adaptation to the school division for those automated administrative functions to be identified? Here the degree of specific planning may range from highly specific to casual attempts to make use of computers and software available to the school division.

ASSUMPTIONS

This study makes two assumptions.

1. The ability to manage or lead a large organization relates directly to the ability to collect, process, and communicate information that relates to success of that organization. Drucker states that in information society's organizations, control becomes the ability to obtain information.[17] The need to effectively collect, process and communicate information is necessary for urban public school divisions as well as to business organizations.

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2. The relationship between the unique mission of an organization and the certain values that are integral parts of the mission, is a constant for any organization having a mission.[18] Any organization trying to develop or improve its system of information must begin with an analysis of the mission, its values, and a plan to deliver that information.

DELIMITATIONS

The first limitation of this study is its focus at the executive level of leadership and decision making. In order to restrict the study's target to the executive functions, the hierarchy of information system support of managerial decision making presented by Head is used. The two highest levels of this hierarchy deal with the consideration, formation and application of goals, the specific objectives for those goals and policies. Head's top two levels of decision making support correspond with managerial functions of executive leadership which are typically found in the literature and specifically noted by Mintzberg.[19]

A second limitation of this study is that only those school divisions in the state of Virginia whose communities are listed as urban and whose public school enrollments are 25,000 students or more are sampled.

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TERMINOLOGY

A presentation of terms, unique or of specific value to this study, is provided to assist the reader in focusing on the intended meanings. The following terms are presented for that purpose.

Data Based Management System (DBMS): a generalized set of computer programs which control the creation, maintenance, and utilization of the data files of an organization.

Decision Support System (DSS): a management information system which utilizes rules, decision models, a comprehensive data base, and a decision maker's own insight in an interactive computer-based process leading to specific decisions by a decision maker.

Executive Management: those functions of management addressing tactical and strategic planning, and decision making.

Executive Support Systems (ESS): a system designed to extract operational, control and tactical data/information and to convert it to information that can be used by the executive manager as a basis for planning and implementing strategy.

Management Information System (MIS): systematically planned and implemented arrangement of data collections, organized and programmed to allow transaction and inquiry data to be converted to information/knowledge usable by the end-user(s). An information system that provides the information required to support management decision making.

Non-executive Management: all managerial functions not addressing the tactical and strategic planning and decision making of an organization.

Operation and Control: the primary function of middle and lower level management. This deals with the carrying out of goals and objectives developed at the tactical level of planning and decision making.

Strategic Planning: managerial decision making that addresses the organization's relationship with its total environment. Policy decisions are

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typical of strategic planning. This is the highest level of managerial decision making.

Tactical Planning: once strategic planning has occurred, specific goals and objectives for the organization must be developed. These goals and objectives address the needed behaviors to both accomplish the mission of the organization and to reflect the values indicated by the policy framework of the strategic planning. This is the function of tactical planning.

Transaction and Inquiry: these are operational functions of anyone attempting to carry out the work of the organization. They are considered the lowest level of activity that can be supported by the automated process.

DIRECTION OF THE STUDY

It is significant, then, to examine carefully administrative functions to determine if any are executive in nature and to describe what events were a part of their development. Whether the description of this development reveals specific analysis of informational needs or merely short range decisions to attempt to gain help from hardware and software available to the school division, the description of the developmental process may have valuable direction for future attempts to implement quality information systems and to extend their effective support to the executive levels of educational management.

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CHAPTER I

END NOTES

[1]John Naisbitt, Megatrends (New York, N.Y., Warner Books, 1984), p. 13.

[2]Ibid.

[3]Peter F. Drucker, "Playing the Informational Orchestra," The Wall Street Journal (June 4, 1984), p. 4.

[4]Ibid.

[5]Ibid.

[6]Kenneth Jones and Robert Dukes, "Microcomputers in School Administrative Management," Educational Technology (March, 1983), pp. 38-39.

[7]Shirley Boise Neill, The High Tech for Schools, Problems and Solutions (Washington, D.C., American Association of School Administrators, 1984), pp. 74-75.

[8]Virginia Department of Education, Communication/ Automation Transitional Plan, Vol. 2 (Department of Information Technology, Richmond, Virginia, 1986), Chart #3.

[9]Robert V. Head, "Management Information Systems: A Critical Appraisal," Datamation (May, 1967), p. 23.

[10]Micheal S. Scott Morton, Management Decision Systems: Computer Based Support for Decision Making (Cambridge, MA., Division of Research, Harvard University, 1971), p. xiii-xv.

[11]Ibid., Drucker, p. 4.

[12]Ibid., Morton.

[13]Ibid.

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[14]John F. Rockart, "Chief Executives Define Their Own Data Needs," Harvard Business Review (March-April, 1979), pp. 81-82.

[15]Alec R. Bumsted, "The Concept of Systems Management in Educational Data Processing, A Professional Paper," Systems Development Corps (January 6, 1969), pp. 1-14.

[16]John F. Rockart and Christine V. Bullen, "The Rise of Managerial Computing" (Dow-Jones-Irwin, Homewood, Illinois 60430, 1986), pp. 283-418.

[17]Ibid., Drucker, p. 4.

[18]Ibid., Rockart and Bullen, pp. 283-284.

[19]Henry Mintzberg, "Planning on the Left Side and Managing on the Right," Harvard Business Review (July-August, 1976), p. 49.

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CHAPTER II

REVIEW OF THE LITERATURE

MANAGEMENT INFORMATION SYSTEMS (MIS) AND PLANNING PRACTICES IN EDUCATION

The first electronic computer to be marketed was the ENIAC in 1950.[1] It was not until 1966 that the effects of this innovation influenced the thinking of educators. Initial studies focused on the impact of automation on production once accomplished by people. To increase productivity was the motivation for computer use based on the assumption that when people and machines worked together, fewer people were needed per unit of output. While computer use reduces the labor force, managerial tasks are increased by automation. The mechanization of work, communication and control requires more management decision making and, consequently, more people to plan and implement the new technology.[2]

By 1968 educators had not only become concerned with automation and the computer, but they were asking why the computer was not applied to solving educational leadership problems. Bumsted reports that population growth and the subsequent changing role of education requires the implementation of data processing for leadership

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support. Good systematic data processing is effective for educational leaders, and trained personnel in data processing are appropriate resources to which educational leadership can turn for decision making assistance. He is convinced that MIS provide relevant, timely, and accurate data for decision makers.[3]

Bumsted's report refers to the term "data" as a product of an information system. Gorry and Morton later describe how much of what has been called "information systems" were actually only "data systems."[4] Their distinction between the two concepts is based on the difference in how data is used. They write that raw data can be modified by the values of those who will use it and, having been so treated, becomes information. Bumsted, on the other hand, did not discuss the necessity to apply the values of the manager or the organization to data in order to produce information useful for decision-making support.

Additionally, Bumsted is unconcerned with what Rockart and Bullen, eighteen years later, refer to as "end-user satisfaction."[5] This term is valued highly in the more current literature. The term suggests that if a person who is to use the data/information is not comfortable with it, does not understand its application, and does not feel as though it is helpful to him, then there will be no end-user saisfaction and, quite probably,

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no use of what is provided, regardless of how systematic the process is that produced it.

Bumsted concludes that educational administrators have been slow to implement MIS and offers two reasons for the lack of such technological support. First, the educational manager is unfamiliar with this technology, and, secondly, there is no specific planning for such technological applications by educational leadership.

In 1971 Witkin conducted a study of MIS applications in educational administration. Her study examined the status of MIS in the context of public education and concluded that:

1. Computers and other hardware are only components of information systems.
2. The administrator or manager should be sure that information systems are asked to sell the right products.
3. It should be recognized that technological changes in the information sciences have not altered the general nature of system development processes.
4. Information systenms, if they are well designed, can provide the needed responses to profound challenges of a contemporary era.

Witkin summarized her conclusion by stating that many of the problems and difficulties encountered in educational activities related to MIS, as well as to

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any system development, are traceable to the attitudes, customs and institutionalized inertia of the users. Good results in MIS occur when the management of an organization who is attempting to implement it is willing to rethink the problems of the entire operation in terms of the ultimate goals and desired final program output.[6] Witkin has found and presented very important concepts that relate to this issue of technological application. She warns against losing sight of the goals and objectives of the organization by getting too involved in the enthusiasm for the technology. And she clearly states that no new advance in the science of information has altered the fundamentals of system development. Drucker's requirements for an information system, "who needs what, when and where?," still holds true. Witkin is correctly hopeful that technology, when well designed, and properly planned, can be important to educational managers. Although Witkin gives us qualities to value, she does not report techniques of planning. Her study presented a framework for MIS which included PPBS (Planning, Programming, Budgeting System), PERT (Program Evaluation and Review Technique), CPM (Critical Path Method) decision trees, and fault tree analysis. The attention to these elements demonstrate the quality of Witkin's conception of MIS. However, she did not describe or investigate the specific planning practices necessary to implement such a system of decision support.

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Smith's study, on the other hand, surveyed the planning techniques used for implementation of computer applications. Her study involved a sample of fifty-seven school divisions, including school divisions from all sections of the nation. It is significant to note that this study examined selected school districts and that those districts made major efforts to use the computer for administrative support. This choice of school districts has affected her findings by showing a higher degree of computer utilization than if all school districts, even limited to an enrollment size restriction, would have produced.

She surveyed planning techniques by describing the staffing for computer installation. Her categories were "Inhouse," "Contractor," or "Combined" staffing. This limited attention given to planning methods is reasonable and reflects those sources typically used to make such an installation. Her results do not answer the conclusion of Bumsted that a failure to plan for such installations explained why educators had not had computer support earlier. Smith's approach would seem quite reasonable, as her study accurately describes the environment which included educational administrative computer activities. Her concern was that those computer applications did not incorporate the technological sophistication of the "third generation" computer technology

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as often as it should. She valued the attaining of this level of technology. Smith draws no conclusion about planning, the need for it, or a method for it. She simply describes what has occurred in this area.[7]

It is significant to note that the valuing of manager participation in the planning process was demonstrated in the literature prior to the publication of Smith's AEDS study. In a 1971 article of the Sloan Business Review, Gorry and Morton illustrate the value of considering how decisions are made and what knowledge or information is necessary for a manager to make a decision. They conclude that the best way to support the manager's decision-making process is to improve the information processing resources available to him; i.e., management information systems (MIS) that address the specific informational needs of the managers they are designed to serve, should be utilized.[8] Why Smith did not treat managerial planning participation in her examination of planning practices is not apparent, but the fact that she does not leaves a void in the description of planning practices and allows one to question whether the failure to fully utilize the third generation computer functions she observed would be related to a failure to adequately plan.

While Bumsted's study was not directly related to Smith's, they both describe a similar situation,

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where educational managers fail to maximize the potential technological support available. In the case of Bumsted, a lack of planning is listed as a finding, while Smith's study avoids the issue of the quality of planning by limiting her examination to simply listing which of the standard sources (inhouse, contracted, or combined) planning techniques were used.

By 1981 the concept of valuing management's informational needs in systems planning enters the field of education. Richard P. Vigilante concludes that educators do not appear to be capable of completely specifying their informational needs **a priori.**[9] This conclusion indicates two things: first, Vigilante, as a writer in education, recognizes the valuing of managerial information needs assessment as a part of developing an information system. Secondly, he does not think educational managers are capable of being specific enough to prioritize their needs. His solution is to propose informational systems which are process rather than product oriented.[10] He presents a description of this process orientation that includes a need for flexibility in the manner in which data can be manipulated. Also, Vigilante describes data being stored within a disaggregted but intergrated data base, so that future needs to use the data in ways not initially anticipated can be met.

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Furthermore, the data-handling capacity of the system should be large enough so that any information required to support future management needs can be stored.[11] The problem of failing to value managerial input as the system is being developed has been ignored in Vigilante's study. However, his process concept has two flaws. First, there is the practical matter of trying to persuade an urban public school superintendent, school board and/or municipal government that funding for an open-ended system with enough capacity to meet any future need is a budget item that the total community will accept and financially support for a significant period of time. Secondly, there will be a practical and technological problem in trying to persuade that same educational leadership that a process of information handling is more valuable than the specific informational products they receive. It is necessary for urban public school superintendents to be politically involved and practical. Therefore, they will question such a proposal. Technological consideration would also raise serious concerns with that proposal as end-user satisfaction is as valued as managerial participation in planning. Both Drucker's description of an information system, "who needs what information, when and where?"[12] and Brentley's end-user satisfaction become the test of any system. Bentley and Drucker imply that end users want, need,

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and deserve a product that they will use and that will help them to make better decisions than they could have made without it.[13] If they cannot expect that, it is unlikely that they would expend time, money, and energy to develop such a system.

Since Bumsted's 1969 study, consideration has been given to both planning and usage. Certainly, the technology of hardware, software and applications has expanded. Yet, in both the national AASA study of 1984 and the Virginia DOE study of 1986, educational management, particularly at the division level, fails to use the computer for the kinds of decision making support that is available in the technology of automated applications. The question that remains unanswered was first raised by Bumsted, but now must reflect the passing of time which includes change for the better in both utilization of computer technology by educational management and the increased sophistication of that technology and improvement in its ability to meet the informational needs of those managers. What current planning techniques are used which allow the educational manager to actualize the potential decision making support available from the technology of computer and information systems applications?

The fact that this question still remains unanswered is sufficient reason to describe current educational

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management techniques of planning for computer decision support applications.

PLANNING PRACTICES CURRENTLY AVAILABLE FOR THE DETERMINATION OF EXECUTIVE INFORMATIONAL NEEDS

By-Product Technique

In this method, little attention is actually paid to the real information needs of the chief executive. The organization's computer-based information process is centered on the development of operational systems that perform the required paperwork processing for the company. Attention is focused, therefore, on systems that process such things as payroll, accounts payable, billing, inventory, and accounts receivable.

The information by-product of these transaction-processing systems are often made available to all interested executives, and some of the data are passed on to top management. The by-products that reach the top are typically heavily aggregated, or they are exception reports of significant interest. All reports are essentially by-products of a particular system designed to perform routine paperwork processing.

Where the information subsystem is not computer-based, the reports which reach the top are often typed versions of what the lower level management feel is important. Alternatively, the reports may be on going, periodically, forthcoming results of a previous one-

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time request for information concerning a particular matter initiated by the CEO in the dim past.

The by-product method is the predominant method of determining informational need. It leads to an abundance of reports, and it is characterized as the "paper-processing tail" wagging the "informational dog."[14]

While the justification of this process is its provision of the necessary paper trail and records, it does not typically provide needed information for chief executive officers to use in the decisions they make.

Null Approach

This method is characterized by statements that might be paraphrased in the following way:

> "Top executives' activities are dynamic and ever changing, so one cannot predetermine exactly what information will be needed to deal with changing events at any point in time. These executives, therefore, are and must be dependent on future-oriented, rapidly assembled, most often subjective, and informal information delivered by word of mouth from trusted advisers."

It can be concluded that this approach/attitude might have developed from the by-product technique. Having experienced that the information produced by the by-product method was not useful and typically resulted in the CEO relying heavily on oral communication, the next logical approach would be to examine what reports might be eliminated from the process. Therefore, an

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attitude could develop that the computer generated report would be useless no matter how it was developed.

To some extent, this school of thought may have merit. There is a great deal of information used by top management that must be dynamically gathered as new situations arise. Non-computer-based data communicated in a conversational manner is often useful to the executive decision making process. There are, however, data that could and should be communicated regularly by the computer with its hard copy reports.[15]

The null approach acknowledges the qualities of executive work and function. It also proves responsive to the past experience of wasting of time with useless reports. However, it seems to go to an extreme in ignoring the total need the executive has for information. It also underestimates the potential to develop information systems that can provide the types of information that the executive needs and that can be computer generated.

Key Indicator System

The key indicator system is based on three concepts. The first concept is the selection of a set of key indicators about the health of the business or organization. Information is collected on each of these indicators. The second concept is exception reporting. This means that the executive receives reports when performance is significantly less than expected. The determining

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of what constitutes "significant difference" is part of the original planning. The third concept is the expanding availability of better, cheaper, and more flexible visual display techniques. The value here is that one can examine the comparisons of outcomes.[16]

This system is very attractive and, therefore, popular. It currently is primarily used to report financial data.

Total Study Process

In this system, a widespread sample of managers are queried about their total informational needs, and the results are compared with existing informational systems. The sub-systems currently unavailable are identified and then assigned priorities. This approach is clearly a reaction to two decades of data processing during which single systems have been developed for particular uses in relative isolation from each other and with little attention to management informational needs. In effect, this method was developed by IBM and others to counter the by-product method previously noted.[17]

This method is costly in both money and time of managers. It can be thorough, and it is a realistic approach considering the previous lack of attention given to informational needs typical of the previously cited methods of planning.

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Critical Success Factor Method

This method begins with those who will use the information to be generated. It requires top management to define their informational needs by leading them through a process of describing those factors critical to the successful operation of the organization. Critical Success Factors (CSF) are mechanisms and indicators of success consistent with the manager's goals. In an initial interview, the goals are listed and the CSF for each goal discussed. A second session is held to allow for clarification of goals and CSFs.[18]

This procedure focuses on informational needs of managers. It is less expensive than the full study approach, and it is as effective in focusing the informational system on the total informational needs of the organization.

Educational management's early attempts to implement and plan for MIS within school districts are typical of early attempts in the business community. There is a history of single system development resulting in both a limit of tasks expected to be automated and a low expectation of the potential for computer support of important decisions. Almost universally, the computer is viewed as a tool of accuracy, but seldom seen as a means for interaction with executive decision support.

The above review of related literature focuses primarily on the attempts to implement and study the application of computer systems in the educational setting.

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In addition, the planning techniques used generally by the computer industry and the business community to determine managerial informational needs were discussed. Finally, there are some specific procedures indicated for this study.

First, it is important to clearly define what is meant by executive decision making as opposed to non-executive decision making. This clarification will provide meaning to the reader and properly limit their investigation.

Once executive functions that have computer information system support are identified, their planning processes will be identified and described. This description will be accomplished by using information from two questions asked in the interview survey of this study. One of these questions is completely controlled by the interviewer. It involves the solicitation of "yes" or "no" responses to a series of questions drawn from the literature, and it addresses practices which are typical of implementation techniques. The second of these two questions is less controlled. It provides a list of issues to be addressed in conversation or in a written narrative description of the planning procedures. It also allows for open conversational description that may go well beyond the five standards requested within the question.

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Thus, by clearly defining what will be considered as executive function, by thoroughly describing planning techniques used, and by clearly describing the differences between data-based management systems, management of information systems, and decision support systems, this study will allow for such clarity of terms that further investigation and discussion of the topic will improve the probability of generalizability.

IDENTIFICATION AND DEVELOPMENT OF MIS TECHNOLOGY FOR EXECUTIVE DECISION MAKING SUPPORT

An information system is, as Drucker notes, the delivery of valued information to the person who needs it, when it is needed, and where it is needed. Since this study will focus on computer supported information systems, it becomes necessary for this review of the related literature to examine the available technology as a part of the overall study. This examination of available technology will not only describe the technology for the reader who may not be familiar with it, but it will also assist the reader in developing an understanding of the values given to certain processes as the study attempts to analyze and draw conclusions pertaining to the data collected. The need to describe this technology and the findings of earlier studies that indicate a general lack of automated decision support systems for

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urban educational managers justifies the necessity to conduct a descriptive study. This study examines the condition of educational executives' application of computers and the plan for those applications.

Since this study is concerned with applications of automated information systems and planning techniques for their implementation, a brief and general explanation of computer technology will be provided below. Hussain and Hussain offer such a description by pointing out that the first electronic computer to reach the market was in 1950. That first computer, ENIAC, was able to perform calculations three hundred times faster than could be done prior to its use. Speed of operations has continued to increase even over this early speed. A second trend that has occurred over the same thirty-eight years has been the reduction in the size of the computer. The major factor in the decreasing in size, and in some cases, cost, has been the microchip. These silicon based micro-electrical circuits have provided for extremely smaller versions of a computer that can do more work, at a faster speed than their predecessor.[19]

The computer, itself, is typically described as having three components. The first, considered by most to be the computer itself, is the central processing unit or CPU. The CPU includes at least three parts. These are the arithmetic and logic unit, the control

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unit, and the internal memory unit, which is divided into read-only memory (ROM) and the random access memory (RAM). In addition to the CPU, the computer has an input device and an output device or unit. These last two parts allow the user to enter data and to receive some output product, such as an answer to a question, a report of information, or a result of a calculation.[20]

In order to allow the computer to do the jobs the user needs, software is provided. Software is a collection of electronic data, stored either in the ROM of the computer or loaded into the computer from a disc or other external data storage. This programmed data gives the computer directions for specific tasks desired by the user. Software is written in computer language which consists of symbols based on simple binary circuits.[21]

This brief description of software provides an introduction to the two areas that are vital to the development of the understandings that are a major goal of this literature review. These areas address programming and computer language. They will be treated as one component, since programming is, by definition, an application of language. Specifically, Hussain and Hussain defines programming as:

> "(1) a series of actions proposed in order to achieve a certain result; (2) an ordered set of computer instructions which cause a computer to perform a particular process; (3) the act of developing a program."[22]

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Harris and Davis provide an explanation of computer language adequate for this study. Programming is that function of providing instructions to the computer by means of electronic circuits. There are five different types of languages used to give these directions, and a variety of each type of language. The difference in the varieties of language are only syntactic variations (using different symbols to represent similar functions). This means that choices between them are primarily based on personal preferences and the user's comfort with one or another resulting from past experiences. However, the difference between the types of language are quite significant and make a great deal of difference in how difficult or technically demanding it is for the user to operate them. The five types or levels of language are called generations, with the first generation language directly applicable to the machine (the computer's CPU), and cumbersome for the operator to use. The other end of the spectrum is the fifth generation language where the language must be translated through internal compliers or translators for the computer to accept and follow its direction. However, it allows the user to give directions in normal, almost conversational language. Writers in the computer field refer to this use of near conversational language as "natural language."

First generation language is called machine language. Figure 1 taken from Harris and Davis,[23] is an example

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of a command or direction to the computer to examine the sales records for two different departments of a store and to compare the actual sales results for each department with the projected sales that had been predicted. The language used is machine language. There is only one machine language used universally. It is written in code known as ASCII (American Standard Code for Information Interchange).[24] This ASCII code can be compared to Morse code which is used in telegraphic systems. While the Morse code uses three place symbols made up of dots and dashes and is communicated by means of short and long sounds, the ASCII code uses seven bit (parts) signals to represent data parts of characters. An eighth bit character is used, but only to establish the parity between characters of otherwise similar form. Rather than the dot and dash of Morse code, the ASCII uses "1" or "0" to indicate the opening or closing of an electronic circuit.

1001 0000 0010 0100
0101 1000 0100 0001
0101 1000 0100 0100
0101 1000 0011 0001
0101 1000 0011 0011
0101 1000 0010 0001
0101 1000 0010 0010
0100 0001 0010 0010
1000 1000 0010 0000
0100 0100 0010 0000
0101 1000 0011 0001
0101 1000 0011 0011
1000 0100 0010 0000
1001 1000 0010 0100
0000 0111 1111 1110

1101 0000 0000 1100
0000 0000 0000 1000
0000 0000 0000 0000
0000 0000 0000 0000
0000 0000 0000 0000
0000 0000 0000 1100
0000 0000 0000 0000
0000 0000 0000 0111
0000 0000 0000 0011
1111 0000 0011 1010
0000 0000 0000 0100
0000 0000 0000 0000
1111 0000 0100 0000
1101 0000 0000 1100

0000 0000 0000 0000 1100
0000 0000 0000 0000 1000
0000 0000 0000 0000 0000
0000 0000 0000 0000 0000
0000 0000 0000 0000 0000
0000 0000 0000 0000 1100
0000 0000 0000 0000 0000
0000 0000 0000 0000 0111
0000 0000 0000 0000 0011
0000 0000 0000 0011 1010
0000 0000 0000 0000 0100
0000 0000 0000 0000 0000
0000 0000 0000 0100 0000
0000 0000 0000 0000 1100

Figure 1

Machine Language

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These circuits are the operational environment of the computer's function. This machine language was the first of all the languages, it remains the operational language of all computers, and is known as the first generation language.

The second generation language is commonly called an assembly language. This language uses English mnemonics (letters and/or numbers) to represent the same instructions that are provided in the ASCII code of the machine language. Figure 2 shows the same message presented previously in machine language as it would be programmed into the computer.[25] This assembly language requires that the CPU be able to translate the symbols of the second generation to the ASCII code to which it can respond. This translation requires time. Therefore, it can be stated as making the computer's task more difficult, while at the same time, allowing the programmer to originally write the programs in a language that is more compatible with his own. By the time assembly languages were developed market place, the computers had also made significant gains in processing speed. This growth and a continuation of this improvement allows the contemporary computers to do more and more complex functions in either similar or shorter times than did their predecessors. Advances in hardware technology allow for corresponding advances in software products.

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Name - BITOR

```
BITOR1   CSECT
         ENTRY    BITOR              COMMENTS
         USING    *, R15
BITOR    STM      R2, R4, 12(R13)
         L        R4, 9(R1)          GET PTR TO 3RD ARG
         L        R4, 0(R4)          POINT TO 3RD ARG
         L        R3, 0(R1)          GET PTR TO 1ST ARG
         L        R3, 0(R3)          POINT TO 1ST ARG
         L        R2, 12(R1)         POINT TO LENGTH
         L        R2, 0(R2)          GET LENGTH
         LA       R2, 7(R2)          ADD 7 FOR ROUNDING
         SRL      R2, 3              DIVIDE BY 8 (LENGTH IN BYTES)
         EX       R2, MVCINST        MOVE 1ST ARG INTO 3RD
         L        R3, 4(R1)          GET PTR TO 2ND ARG
         L        R3, 0(R3)          POINT TO 2ND ARG
         EX       R2, OCINST         AND 2ND ARG
         LM       R2, R4, 12(R13)
         BR       R14
         DS       OH
MVCINST  MBC      0(0, R4), 0(R3)
OCINST   NC       0(0, R4), 0(R3)
         REGEQU
         END
```

Figure 2

Assembly Language Equivalent to Figure 1

The next major step in programming/language development was that of third generation or procedural languages. The procedural language known as FORTRAN was the first of several third generation languages. It allowed one statement to direct the computer to carry out several hundred machine-language instructions. These third generation languages include several that are familiar to the home computer user. COBOL, BASIC, PL/1, Pascal, and C are all examples of third generation languages.

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Figure 3 provides an example of the same message presented in different languages in Figures 1 and 2. In this figure the message is displayed in the third generation, procedural language, PL/1, and one will recognize English words and phrases. While the second generation language "comments" were for the programmer only, this language allows similar comments, shown in parenthesis, to direct the computer. Again, the computer's task of translation is greater, while the programmer's job is simpler and more directly linked to understandable language.[26]

The fourth generation of programming languages follow the same sequence that has been described earlier. They require the computer to do more with its technological mechanics that are developed to do so, while the programmer is doing, if not less, at least simpler tasks. It is at this level of programming that it becomes apparent that the user does not necessarily have to be a trained computer technician. Third and fourth generation programming generally produces software that requires operational skills rather than programming skills on the part of the operator or user. In other words, a collection of programs has been written for the non-technically trained user where he uses a menu or a selection of tasks. For the non-technically trained users to operate menu driven software, they are required to be able, only, to translate menu labels into those tasks that they need to perform.

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```
On Endfile (Employee - File)  Go to Wrap-Up;
Put Skip List ("1986 May Act Sales",
               "1986 May Est Sales",
               "Difference, % Change");

Do While ('1' B);
   Read File (Employee - File)
   Into (Employee - Record)
   If Employee - Record Dept = "Men"
   /Employee - Record Dept = "Women"
   Then Do;
   Difference = Y1986 - May - Act - Sales
   Y1986 - May - Est - Sales;
   Change = 100 * Difference
   Y1986 - May
   Est - Sales;
   Put Skip List (Y1986 - May - Act Sales
   Y 1986 - May - Est - Sales, Difference, Change);
   End;

End;
Wrap-Up;
```

Figure 3

Third Generation Programming Language PL/1
Equivalent Message to Figures 1 & 2

Typically, these tasks are designed to fit the user's need(s) and, in the purchase of software, the user selects those that he needs. This assumes that the user knows and understands what his needs are and is aware of the capacities and limitations of the software. It is this writer's opinion based on computer experience, that the amount of user dissatisfaction with computer operations frequently results from these two assumptions not being met. However, these same assumptions provide a rationale for the development of menu-driven programming.

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While there are concerns about the application of computer systems, it has been the development of menu-driven operations of computers that has spawned their proliferation throughout the private and public sector.

Harris and Davis state the significant difference that sets fourth generation computer language apart from third generation as due to the departure from the rigid use of algorithms. Algorithms are sets of well defined rules or processes for the solution of a problem in a finite number of steps.[27] Examples of algorithms include mathematical relations; i.e., "1 + 2 = 3," or specific statements of fact; i.e., "The price/earnings ratio is a stock's market price divided by the firm's latest retained earnings per share." Though different in form, each of these statements describes a clear and precise fact. If appropriate values are provided, the computer will solve for a correct answer based on these statements. Fourth generation languages depart from these procedural qualities. Logically, they are called non-procedural languages. The programmer who uses these languages takes the approach of specifying the task to be done and allowing the computer to use its built-in knowledge to select the way the task is to be accomplished.[28] This new generation requires faster and more efficient computers. Since the computer's built-in knowledge has more ROM (read only memory) or memory filled with pre-programmed instructions and

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translators to convert the incoming directions back to understandable machine language, the memory capacity of a computer capable of using fourth generation software will be considerably larger than before. Examples given for fourth generation languages are FOCUS, RAMIS, and NOMAD. The success of these languages has been based on their capacity to allow programmers to work at a higher level of abstraction, closer to the problem being solved, and without concern for the low-level details which express the problem to the computer. Figure 4 demonstrates the same commands for comparing sales results, but this time they are expressed in fourth generation language.[29]

```
Print 1986 May  Act  Sales, 1986  May Est Sales

     (1986  May  Act  Sales  1986  May  Est  Sales),
     (100 * (1986 May Act Sales
      1986  May Est  Sales)  / May  Act  Sales)

Where (Dept = "Men" or Dept = "Women");
```

Figure 4

Fourth Generation Language Equivalent to Message in Figures 1, 2, & 3

In 1984, the literature was still debating whether fourth generation language was in place, could be accomplished, and could be marketed. In an article in the computer industry journal, Infosystems, Jan Snyder, senior editor for software, raises just these issues. With the value of hindsight, we can see that, although

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these questions were legitimate ones at the time, the article already provides the definitions for what will become Harris' and Davis' description of fourth generation language two years later. Richard Cobb, president of Mathematics Product Group, Princeton, New Jersey, is quoted as saying, "A fourth generation language is basically any computer language that is nonprocedural." Chuck Riegel, senior marketing representative of Software AG of North America, Reston, Virginia, describes fourth generation language as "a language that increases the productivity over another language such as Cobol or Fortran." Donald Wszolek, Director of Marketing Information Builders, New York City, comments, "The cardinal hallmark is that with a fourth generation language, a user specifies what to do, not how to do it."[30] While Snyder attempts to suggest diverse opinions of what a fourth generation language ought to be and, therefore, questions the concept, the opposite has occurred over time. These earlier assumed diverse opinions have proven to be three characteristics which are fundamental to fourth generation language.

The rapidity of development in this industry, as well as diversity of thinking becomes evident in the following examples. While Snyder at Infosystems was questioning the existence of fourth generation language, Scott Mace, the next month, in InfoWorld, was questioning whether fifth generation languages would sell in the

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marketplace. This article not only notes the existence of a fifth generation language software package, "Clout," a program offered by the software company, Microrim, but it also discusses what its marketing impact will be on the industry.[31] Figure 5, again taken from Harris and Davis, illustrates the "nature" of natural language used in the fifth generation. This is the same program presented in Figures 1-5. The difference which allows for such simple and direct inputting of the computer is the development of rule-based programming to amplify the computer's selection and how to follow a command found in the fourth generation. No sequence of steps of operation is discussed by the programmer. Instead, ROM contains the necessary variety of potential functions with all of the appropriate translators and, in addition, the rules that indicate sequences of operations.[32] Fifth generation language obviously put the greatest demand on the machine operations of the computer. They require significant amounts of memory storage, and they demand that storage be filled with translators and directions.

For the Men's and Women's
Departments, Compare the Actual and
Forecasted Sales for Last Month

Figure 5

Fifth Generation Language Request Equivalent
to Figures 1, 2, 3 & 4

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Therefore, we could expect them to be expensive. If they evidently earn the status of being cost effective, it will be due to the fact that they are simple to use, their language is natural (see Figure 5), and they encourage non-technically trained people to use them with comfort and confidence. By their nature, they must be specific to a particular task or set of tasks, and they must be planned, designed, and implemented to fit their user's need(s).

Three conclusions can be drawn from the information presented here about computer languages, their characteristics, and their levels of sophistication. Each of these influence this study:

1. Menu-driven programs, typical of third and fourth generation computer languages, allow non-technically skilled users to apply, as a daily function, operation of computers to help accomplish their daily tasks with an increase of speed and accuracy. Though limited to specific problems or tasks, these programs have become the backbone of computer applications in both the private and public sector. The term "user friendly" found in the sales literature for computers and their programs are derived from the perceived need to allow non-technicians to operate computers. The common awareness of what that term means indicates

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the appropriateness of that concept as a goal and the effectiveness of how well menu driven programming has allowed computers to be used in a very wide and diverse environment.

2. The variety of diverse software packages that have been and can be developed from the many languages and the variety of generations allows for an optimistic outlook towards meeting educational executive managerial needs for decision making support. This same variety of available resources also suggests, and just as strongly, that high quality planning and detailed analysis of needs are necessary in order to properly fit educational executives with exactly what they need to provide high quality decision support.

3. The fifth generation movement towards natural language usage encourages the practicality of non-technically trained people successfully using elaborate and sophisticated decision support systems in ways that might well be judged to be unrealistic today, but totally reasonable in the very near future. It should be noted that the ways in which these decision support systems may be used may well be as surprising and valuable as the fact that they are used at all.

These three conclusions support the fact that executive educational managers can be reasonably expected to utilize

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both available technology and that which is developed in the near future. Doing so will enable executives to meet the needs for high quality information to support the decisions they will make to lead large urban school divisions in continuously improving delivery of high quality educational programs.

AVAILABLE TECHNOLOGY

The focus in this section will be on specific applications of computer technology. The purpose in describing these technological applications is to develop the reader's awareness of what is available to the educational executive manager from the field of automation technology. The reason for the specific limitation chosen relates to the overall focus of this study. As in the earlier limited description of computers and their operations, it would be of no value to this study to repeat readily available information about unlimited types of programs and applications. Instead, the areas of Data Based Management Systems (DBMS), Management of Information Systems (MIS), and Decision Support Systems (DSS) will be discussed. These are the specific technological applications that would be considered in the development of managerial support for the urban educational executive leader.

It is meaningful to establish a frame of reference prior to describing the technological applications,

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because there is something truly unique about the development of the entire computer industry that must be kept in mind. Otherwise, one might form judgments based on a distorted sense of value. The unique trait in computer development is that it has been incredibly rapid. Compared to the time it took civilized man to progress from the first forms of boat building, through the development of rowing, sailing, steam, internal combustion, diesel power, to nuclear powered ships, the thirty-eight years that have passed since the introduction of ENIAC has been relatively short. Yet, in those thirty-eight years, the computer, itself, has been refined over and over again, producing machines that can process huge quantities of data in fractions of seconds. Even more phenomenal than the acceleration of speed is the common availability of a diverse proliferation of types of computers made to do a wide variety of jobs. Some of the most sophisticated technology available answers telephones for us, assists us with our banking, and allows our children's dolls to carry on near-spontaneous conversations. The difficulty in trying to make a chronicle of such a history is that the events are less like a sequential progression of developments and more like an explosion of events, each affecting whole new areas of research and development. The examination of languages is a case in point. Within thirty days, one credible journal article reported serious

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questions as to determining what a fourth generation language is, while a second article is reporting the marketing concerns of a fifth generation language application. Given this nature of the industry, and therefore, the literature, it becomes difficult to make credible judgments as to who is expert and who is obsolete. The intent of this study's effort will be to do neither. Instead, it will limit itself to the consideration of those system applications that appear to relate to the support of managerial decision making.

Hussain and Hussain provide a starting point with their definition of a system: (1) A group of interacting or interrelated elements; (2) A group of interrelated components that seeks the attainment of a common goal by accepting inputs and producing outputs in an organized process; (3) An assembly of methods, procedures, or techniques united by regulated interaction to form an organized whole. An organized collection of people, machines, and methods required to accomplish a set of specific functions.[33] While the Hussains give no indication of the intent to do so, the components of this definition are illustrative of the development mentioned earlier. The first definition might have been sufficient to describe a system until it began to be perceived as part of the greater whole of an organization's total operation. If an organization's mission is to be accomplished,

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it requires all of its parts to function within it as opposed to being only one of the necessary components to mission accomplishment. No individual part should be valued for its own virtue(s), whatever they may be. Computers are to be a tool of the organization they serve, and not just some status symbol. This view is not always the view of otherwise reasonable managers. The temptation to maintain the image of an organization or a school division as one that is modern has sold more than a few computers to groups who later face the problem of their cost effectiveness. Hindsight is always the clearer vision, and the intent is not to criticize past error but to substantiate the value of viewing systems as tools of support.

Data Based Management Systems, then, are those systems that handle data for the organization in a systematic way. James Martin defines a data base as a collection of data which are shared and used for multiple purposes. Data is further defined as representations of fact, concepts or instructions in a formalized manner suitable for communication, interpretation or processing by people or machine.[34] Data Base Management Systems (DBMS) have been developed to high levels of competence. Three models for DBMS based on qualities developed for them are described by Armond Inselburg.

The model of DBMS defines its nature. The qualities that distinguish one DBMS model from another are the

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type of relationships in a data base, methods of developing applications, the amount of storage required to store data elements, and the performance level of the system. The three prevailing data base models are herarchical, network, and relational.

The hierarchical model is the oldest. It uses the simple tree relationship to sort or arrange files of data. The tree reference compares the original data to the trunk of the tree with additional data stored in subordinate files compared to the tree's branches. When a user desires to use a subordinate file, he must know the main topic in order to locate the correct place to begin the search. If the main record or "parent" record is deleted from the data base, all of its components will also be lost. This system is logical and can be easily adapted to a situation (school system or business), but it has some limitations. While many data elements are hierarchical in nature, many important ones are not. This leads to either a large memory requirement to store large numbers of short main files or a definite limitation requirement in its focus. Additionally, data retrieval routes must be programmed, rather than developed, by the typical user.

In 1971 the network model for data base was introduced. The structures of networking data bases are more flexible and can accommodate more complex data structures than

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can the hierarchical model. A record in a networking data base can be allowed to have multiple "parent" records. "Parenting" of records allows for cross referencing, deletion of parent records without the deletion of all of their components and requires the use of pointers to define the relationships between data. These pointers are the records' field whose contents are the location on the data storage device of another record. This allows the computer to read the data after selecting from its locations rather than to select it from its relationship to any one of its parent records.

The relational model for data base was actually developed in 1970, but not applied commercially until the early 1980's. The relationship between data elements are programmed as charts of data that allow the data to be examined by value. Specifically, this means that data placement on the chart associates it with other data, as there are line and column relationships. This is referred to as associative memory. While hierarchical data was addressable via parent files, and networking data was addressable via physical location on or in the memory device, relational data is addressable by its content.

What allows a person to use data bases, however, is not how they work, but that they do work. The term transactional-processing describes the function of the

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DBMS. Accessing data bases refers to the ability to receive from the computer, in some form, that data that has been entered (input).[35]

Myles E. Walsh's definition of DBMS condenses Inselburg's explanation of how they work. Walsh calls them "facilities that contain the mechanisms with which information can be stored, manipulated, and retrieved from databases."[36] Walsh's definition has one problem, in that he uses the word "information". By discussing that word choice, the next technological application can be introduced.

When a system user approaches a computer albeit a mainframe, mini or terminal of a networking system, that user is seeking a result. He will make a transaction, probably inputting some data that has just been collected and, either at that time or in the near future, will ask that computer system to respond in some way to the new data. This activity is classified by Head as transactional-inquiry. The nature of that response will be the basis for determining the classification of the application being used. As illustrated earlier, the rapid development of the computer industry has caused difficulty in recording all of the advances in the technology in a clearly sequential manner. While comfortable to historians, and typical of the expectations of many

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scholars, sequential development is not always the order that history nor technology follows. As a result, this study will not criticize those writers who appear at odds with one another but will, instead, draw some lines of demarcation using analysis and synthesis of the literature. The outcomes should be one which controls the variables being discussed in this study. Such a synthesis follows.

When Walsh uses "information" rather than "data" to describe the output of a data based management system, he fails to draw a distinction important to clarifying the difference bweeen an information system and a data system. Davis and Olsen clarify and separate the two words by calling information data that has been made meaningful and useful to the user. Data is then considered the raw material for information.[37] While Walsh is not incorrect in his use of the word, his choice of the word "information" suggests that he considers DBMS as capable of converting data to information. In this study, the use of DBMS will be limited to those that address data only, and report data in one of three forms. The types of reports available from DBMS are individual reports of data, aggregated reports of data, and total reports of data. The intention here is to make a delineation for consideration purposes. The individual report provides the user with a data item referring

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to a specific fact. A school division example of an individual report might be to determine if a particular student is in attendance today. Extending the example further, an aggregate report could tell you how many students are in attendance in the fourth grade. The total report could list all fourth graders enrolled, giving each student's name, school, grade level, and teacher assignment. Assuming this was all the registration data collected by the division, it would represent the total data available. These data type reports are excellent sources for assistance in operation and control of an organization. They are typical of what is necessary to do inventory and financial accounting. They are, therefore, useful, helpful, and common. DBMS are more likely to support the levels of management described by Head as operational planning and control.[38]

Davis and Olsen's attribution of meaningful and useful qualities which separate information from data requires clarification. Data is useful and meaningful because it helps someone do something or decide to do something. A simple example of a school division's application of this might be to query the data base for inventory control to determine that "x" number of student desks appropriate for kindergarten students are available. An aggregate report showing the number of registered kindergarten students that is equal to

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less than the number of chairs would reassure the purchasing agent that no action was necessary. However, in real world school management, there are numerous circumstances that could render this decision incorrect. Such circumstances consider questions such as: What are the conditions of those desks? Is the kindergarten enrollment likely to grow? These questions are enough to invalidate the dependability of the decision. Therefore, while data reports are satisfactory for some operations, planning, and control functions, they do not satisfy all requirements of this level of management.

What makes information more meaningful and useful to managerial decision making? In Rockart and Bullen's presentation of Critical Success Factors (CSF), they discuss the relationships between strategies, objectives, goals, CSFs, measures, and problems. They conclude that the CSFs are those things that must be accomplished if the organization's overall mission is to be accomplished. These CSFs will be discussed at length in a later portion of this review of literature. At this point, it is important to note the linkage between the mission of an organization and what it values. The CSFs are those things valued, and they vary according to the organization and its mission.[39] An army must value having adequate numbers of trocps, proper equipment, correct training, excellent communications, and discipline if it is going

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to win a battle. Those qualities become the things that are valued. A grocery store must maintain a variety of inventory, a correct display of goods, competitive pricing, and effective advertising if it is to make enough sales to continue in business. Again, those things would become valued. Any organization would value those things necessary to its operational success. In the same way as organizations function and people gain experience operating them, those people develop understandings of how to do things in the best way for the success of the organization and for their personal success within it. This linkage between values and mission at both the personal and organizational level provide the knowledge form which we can conclude that values will be essential in converting data to information. The school superintendent's experience that allows him to value the effect of potential rising enrollment on the number of chairs he needs will cause him to want to plan beyond the simple data report. He wants the appropriate people in the school division to anticipate enrollment trends and to order those chairs before the students are in class. Decisions, then, require data to be converted to useful information by conditioning data with the values of the organization. Rockart's CSFs provide a reference for such a conclusion, but personal experience in all of life's situations reinforce

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the concept. Raw facts must be treated with values before they are useful. This, then, is what this study will qualify as information.

Davis and Olsen provide a definition for the Management Information System (MIS).

> "A MIS is an integrated user-machine system, for providing information, to support the operations, management, analysis and decision making functions in an organization. The MIS utilizes computer hardware and software, manual procedures, models for analysis, planning, control, and decision making, and a data base."[40]

As early efforts to process data in data processing environments were leading users and technicians to consider having data converted to information in the sense suggested by this study, it is little wonder that information systems were the target of criticism. Early attempts to apply informational system management fell short of attaining outcomes that would have fit the total description of Davis and Olsen. Also, marketing claims for hardware and software have frequently exceeded product performance. As late as 1972, John Dearden was raising valid and vital questions about MIS. Dearden was skeptical of the planner's ability to develop systems comprehensive enough to meet the decision maker's needs. He also recognized the problem of early systems planners working ill-defined, judgmental models.[41]

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The attempts to develop MIS are not always successful. Many systems are systems in name only, and user satisfaction may have become a popular emphasis as much as a result of many system failures to deliver it, as it was a result of planners valuing it as a result of theoretical analysis. Departments of data processing in organizations have picked up the title of MIS without changing anything that relates to planning, operating, or producing products of any significant differences from those produced when they were called data processing. Despite these real world problems with MIS development and with Dearden's challenges, MIS are accomplished and can be accomplished. The failures to achieve end-user satisfaction and the attempts to simply rename a department are valid reasons for this study's attempt to distinguish between the two systems.

If MIS is distinguished from DBMS by its use of values to convert data to information, then one must consider what needs to occur before an MIS can be "graduated" to the status of Decision Support System (DSS). Decision Support Systems (DSS) represents a concept of the role of computers within the decision-making process. For some writers, the term DSS simply refers to interactive systems for use by managers. For others, the key issue is support rather than system. Researchers who view DSS as a sub-field to MIS define

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decision support as providing managers with access to data. Others regard DDS as an extension to management science techniques and view it as providing managers with analytic models.

Four concepts are used to examine DSS: It is defined in terms of the structure of the task. It requires a distinctive design strategy based on evolution and "middle out" techniques. As decision research, it supports the cognitive processes by providing descriptive insights into management problem solving and normative theories for defining how to improve its effectiveness. It provides an implementation strategy for making computers useful to managers.

A 1980 article by Keen describes seventeen DSS applications as subjects of case studies. The author concludes that DSS are both independent disciplines within the field of computer technology applications, as well as an independent field of study.[42]

Henderson and Schilling report a case study conducted where DSS serves in the public sector. Specifically, the case study reports the findings from a DSS which is implemented with the Franklin County Mental Health and Retardation Board, Franklin, Ohio. This case study is of particular interest to this study, as it demonstrates the types of concerns and interests unique to the public sector, since its mission focuses on services as opposed to private sector concerns with profit.

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Henderson and Schilling note in their introduction to the study:

> "the political process tends to promote those that survive or win, rather than those who seek truth;
>
> the essential benefit of a decision aid - a valid model is the very element that most threatens the survival of the public decision maker;
>
> it may not be sufficient to provide such decision aids unless explicit attention is given to how these aids support effective learning;
>
> the basic design of DSS begins with an analysis of the decision process and adaptively developing a tool for the user to learn about and cope with semi-structured decision;
>
> the user and the system developer must work together to grow in the understanding of what information is needed and how decisions are to be made."[43]

Once the development of the DSS has been accomplished by incorporating the ethical and political considerations which are appropriate, the system can be considered as objective in its process. This is a valuable claim of credibility for a decision maker in the public environment. Henderson and Schilling conclude that:

> "the process of making decisions, how an individual or organization makes its decision, is critical in the public sector;
>
> the principles of DSS planning and implementation were considered valid for this public sector environment;
>
> the model selection and adaptation for public sector environments will require careful development to fit the nique situation of each attempt implementation."[44]

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The authors demonstrate three very important facts for this study's theoretical background. They are as follows:

1. DSS is a practical function for the public sector.
2. Despite the necessity to carefully analyze the decision-making process for the planning of a DSS, it can and should be done.
3. Careful planning and decision-making process analysis may well be a major contribution to the field of public sector management. Public sector managers will be able to define how they are making their decisions, and to build into this process ethical, political and legal requirements that will insure the judicial, governmental and popular support necessary for the success of their programs and their own survival.

The material which describes computer technology applications is intended to familiarize the reader with those applications available to the educational executive. As the reader recognizes the attempts to draw distinct lines of demarcation between these applications, the question of the necessity for these delineations will arise. Describing these differences is necessary because, similar to the effect that rapid development has had on the development of computer languages, there has

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been an effect on technological applications as well. Both writers and practitioners have viewed the same application and have been willing to call it different things. Just as there are doubters of fourth generation language in a time frame when fifth generation language is actually on the market, there are those such as Walsh who choose to use language that can be confusing to the distinction between data and information systems. The attempts to separate these technologies within this study result from the need to clarify what will be observed in the examination of these applications and those implementation procedures used.

The same blurring of description in the literature and in practice provides the reasoning for conducting this study in a descriptive manner. It would be impossible to measure, in an experimental manner, any two systems for comparison, because systems labeled as similar might well be significantly different. Considering the nature of existing computer systems and their operations within urban school divisions call for description. In taking a descriptive approach, this study will apply its definitions to qualify the applications observed in a consistent, comparative manner and to use those same descriptive standards to evaluate the data collected.

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Summary

Although a wide variety of available technology has been effective in both the public and private sectors, nationally and within this state, educational administrative applications are limited. Early reports of this failure to utilize the technology concluded that a lack of understanding and a lack of planning were the causes of that failure. The literature provides no further explanations as to why educational application is so far behind the technology that is available. Henderson and Schilling have removed excuses such as ones that express that the technology cannot be adapted to the public sector. Planning, or a lack of planning, appears to be the obvious starting point to determine why the deficit exists. This leads to the study's questions:

What are the current educational managerial computer applications inclusive of and beyond those described in the Virginia and AASA studies that could be classified as executive in nature?

To what degree do these executive decision support systems affect the development of school division goals and policies?

What are the planning techniques used for automated executive decision making support?

This review of the related literature has provided the theoretical background for the rationale for conducting

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the study and conducting the study as a descriptive one. Furthermore, the information presented provides a reasonable and proper justification for addressing the three questions that are the study's hypothesis.

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CHAPTER II

END NOTES

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CHAPTER III

METHODOLOGY

POPULATION AND SAMPLE

As cited in the summary of the review of literature, this study examines the planning techniques for automated executive decision support, describes the effect of these automated systems on the development of divisional goals and policies, and provides a current description of which educational managerial computer applications are in place in Virginia urban public schools. In order to accomplish these tasks, this study conducted interviews with selected educational managers and specific educational executives.

These interviews took place with two specific groups of educators. One group included the educational managers of the sample school division who are responsible for the division level computer operations. These managers were designated by the same divisions as their most informed personnel regarding computer functions and managerial computer support. The second group of the sample division educators who were interviewed included the superintendents, or their designees. Inclusion of this latter group of educators insured the most accurate

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information regarding how a computer-generated report was actually applied within the school division. This was particularly important in determining what effect, if any, a computer function had on the development of school division goals and policies.

This study was limited to large urban public school divisions in Virginia for two reasons. These were, the availability of the Virginia DOE study that surveyed the state's public school divisions' administrative computer applications, and the necessity for in-depth interviews.[1]

The Virginia DOE study provides a current and general description of educational administrative computer applications on which the more specific descriptions of this study could be based. Recognizing that the Virginia DOE study had determined that eight specific administrative computer operations were in place in the state's school divisions, this study used those eight operations as base line data for its interview discussions describing which applications each of the participating school divisions had in place. Also, by limiting the study to only large urban public school divisions, the study was able to limit the sample size to nine school divisions. This size of sample limitation allowed for the in-depth discussion in its interviews that would not have been possible with the use of a multiple state or national survey.

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In the selection of Virginia school divisions to be included in the sample, the study considered the state's census reports and the school enrollment figures from the Department of Education as factors. In addition to these two specific qualifying factors for inclusion in the sample, the communities served by the selected school divisions were examined to determine if they had large business or industrial development, multi-ethnic or multi-cultural populations, and a diverse range of family income. These qualities are generally associated with the urban setting.

Of the one-hundred-thirty counties and cities of Virginia, the state census labels forty-one of its cities and forty-seven of its counties as urban.[2] These numbers include all centers of population that total over 2,500 residents. The census applies the label of urban to a large number of communities that would not be considered urban if the qualities of business or industrial development, multi-ethnic or multi-cultural population, or economic diversity were not considered. From this group of eighty-eight communities labeled as urban, the specific public school enrollments were examined. This enrollment qualification process allowed for the selection of nine school divisions located in communities that reflected the qualities associated with the urban setting. This study sampled those Virginia school divisions which

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served communities that were listed as urban on the census report and also had enrollments of 25,000 or more. The following nine school divisions qualified and were used for the sample. The sample included Chesapeake Public Schools (26,360), Virginia Beach Public Schools (62,402), Norfolk Public Schools (36,084), Newport News Public Schools (26,578), Henrico County Public Schools (30,946), Richmond Public Schools (28,659), Prince William County Public Schools (37,600), Fairfax County Schools (127,169), and Chesterfield County Public Schools (38,776).[3]

The Virginia School Directory of 1987 provided the names, addresses, and telephone numbers for each of the participants.[4] The nine managers chosen for the interviews were those who were knowledgeable of the technical aspects of the division's computer operations and with titles including data processing director, data processing supervisor, director, coordinator, or assistant superintendent for research. These people were contacted by telephone to insure that they were, indeed, the person(s) in the school division who were most aware of the administrative computer applications. The nine superintendents of each designated division were invited to participate personally or to name a designee that would provide the best information relating to the application of computer generated reports intended to support the administrative process within the school

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division. The first group of participants insured that information about what computer functions were in place and how they were developed was addressed in the study. The second group insured that information regarding how those computer generated products are specifically applied within the division was collected.

The following list provides the names and titles of the respondents and their respective school divisions. The divisions are listed in the order of the interview schedule. The position assigned to each school division on this list will serve to identify each division throughout the data presentation. List of respondents:

1. Dr. Lenard Wright, Supervisor for Planning, Development and Research, Chesapeake Public Schools, Chesapeake, Virginia.

2. Dr. K. E. Brown, Director of Research, and Ms. Ann Woody, Systems Analyst and Data Processing Coordinator, Virginia Beach Public Schools, Virginia Beach, Virginia.

3. Mr. Jim Augustine, Assistant Director of Data Processing, Norfolk Public Schools, Norfolk, Virginia.

4. Mr. Wiley M. Waters, Assistant Superintendent for Personnel, and Mr. Gilmour A. Wylie, Director, Research-Data Processing, Newport News Public Schools, Newport News, Virginia.

5. Dr. Sanford D. Snider, Director of Research, Henrico County Public Schools, Henrico County, Virginia.

6. Dr. Bhagwan Singh, Director of Research, Richmond Public Schools, Richmond, Virginia.

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7. Mr. Robert A. Ferrebee, Associate Superintendent, Administration, Prince William County Public Schools, Prince William County, Virginia.

8. Mr. William Lang, Director of Data Processing, Division Planning and Technical Services, and Ms. Linda Gadd, Planning Coordinator, Fairfax County Public Schools, Fairfax County, Virginia.

9. Dr. Harold D. Gibson, Director of Administration, and Dr. Carl K. Chafin, Director of Pupil Personnel Services - Special Education Research, Chesterfield County Public Schools, Chesterfield County, Virginia.

Instrumentation

The instrument to be used (see Appendix 1) was first field tested in the Suffolk City Public School Division, Suffolk, Virginia. This field test resulted in the following conclusions and modifications:

1. The interviews for the collection of data required forty-five minutes.

2. The interview response sheets were best filled in by the interviewer rather than the respondents.

3. The organization of the interview materials and equipment were appropriate for the data collection.

4. A modification to the first interview question was necessary. Initially, the respondents were required to assign a percentage of time of total operation to each administrative function listed. This percentage of time was intended to demonstrate the value given to the function by the school division. This presented two problems for the study. First,

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percentage of time used for a function does not necessarily represent the importance or value of the function. Secondly, the respondents found it difficult to estimate the percentages.

The question was modified to require the respondents to use a numerical scale of one to five, with one indicating a very high frequency of use and importance to the division and five indicating no use of the function. This allowed the respondents to answer comfortably and provided a more reasonable rating of the division's valuing of the function.

Instrument

The instrument for this study was a focused and controlled interview. The major portion of the interview required direct responses to be marked on forms indicating either a "yes" or "no" answer to specific questions. The response forms listed the eight administrative computer functions described in the Virginia DOE study. Initially, the respondents were asked to list additional administrative computer functions used in their school divisions. Once a comprehensive list of functions was developed, each function listed was examined through a series of specific questions requiring either a "yes" or "no" response. Finally, the respondents were asked to provide a generalized narrative description of planning and implementation practices for these administrative computer functions.

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The instrument addressed four areas of interest. Each area of interest used question(s) that reflected qualities valued in current research and literature. These question(s) allowed the study to qualify the responses and provided for the drawing of reasonable and responsible conclusions from the collected data.

The following are the four areas of interest:

1. What are the administrative computer functions in place in each sampled school division? The eight administrative computer functions reported in the Virginia DOE study were provided as possible functions to consider. The respondents indicated if these were in place and then added any additional functions they considered appropriate. After listing all of the functions used by their divisions, the respondents were asked to assign a rating of frequency of use and importance.
2. How are the data or informational products provided by these computer functions used?
3. What administrative computer functions support the executive levels of management within the school division? The concepts synthesized from the writings of Head,[5] Mintzberg,[6] and Rockart[7] were used to qualify as executive, automated functions that closely relate to the formation of goals or policies.
4. What are the planning processes and procedures

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generally in use for needs assessing, system design and implementation of automated administrative support? Two approaches were used to accomplish this description. First, the interviewer asked eight direct questions, reflecting qualities of system assessing, planning, and development, valued in the literature and research. These questions, like previous ones, required a "yes" or "no" response. The resulting comparison between these responses and the research valued qualities allowed for a responsible evaluation of those practices. A second inquiry into the planning practices was provided by using a directed narrative. The respondents were asked to discuss the planning practices and procedures used by the division. They were asked to speak to at least five points that were directed by the study, but they were allowed to offer any additional information which they considered to be valuable to the effective implementation of their computer supported administrative functions.

This study included a description of current or past planning activities used to implement computer applications that directly supported decision making by urban educational leadership as that leadership addresses issues of a tactical or strategic nature. In order to provide a meaningful and useful description of such

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planning practices, it was necessary to collect data in the following four areas.

1. The study provided a general overview of the division's administrative computer functions and a rating of the frequency of use and importance of each. These data were used first to identify and describe the total picture of this phenomenon and secondly to draw inferences concerning the valuing of individual functions and the collection of functions in total. These tasks were accomplished by the two activities accomplished in the first area of interest.

The respondents were provided the right administrative computer functions identified by the Virginia DOE study. This list provided them with a starting point for their descriptions of their own school division's administrative computer functions. This listing of probable administrative functions also provided examples of what would be considered as administrative by this study. Respondents both identified which of the eight provided functions were in place in their division and made additions that represented a more complete description of their division's total administrative computer support. The assignment of ratings of frequency of use and importance allowed for valuing of each

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function reported. Figure 3.1, presented in Appendix 1, was used to record this collected data. Figure 4.1, found in Appendix 2, presents the total collected data.

2. A second area of necessary data collection examined how data or information products were used. The study used six questions to both collect data and evaluate the responses. The questions required either a "yes" or "no" response.

Question a. determined if the computer developed report was used locally, only, or if it was sent to higher levels.

Question b. determined if the data was used to make a decision or if it was only kept as a record of fact. It is noted that division leaders who fail to use data reports to support decisions are typical of chief executive officers of business organizations. Rockart's report of CEO's who shun hard data reports helps to make the ignoring of similar reports by school division leaders both believeable and understandable.[8]

Question c. examined the nature of the finished report. Data Based Management Systems (DBMS) produce reports only in the three forms listed. This question helped to distinguish between DBMS which produces reports in these suggested forms and Management Information Sytems (MIS) which would exceed these

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these three formats by converting data to information and thereby produce reports exceptional to these types. This discrimination is a reflection of the study's valuing of a distinction between data and information presented by Harris and Davis.[9] Question d. reinforces this distinction between DBMS and MIS as MIS produces informational products. To be considered informational rather than data products organizational values must be applied to data to qualify or weigh it. This valuing of data converts it to information.[10]

Question e. and f. tested the degree of automated decision. In question e. the study sought any suggested actions, while in question f. it looks for reports that included predetermined or directed actions to be taken.

3. The third data collection task examined the administrative computer support functions and cataloging them as either executive or non-executive. A single question in the third area of interest supplied this data need. The study asked, "Do administrative computer functions support the executive levels of management within the school division?" The respondents were asked to examine their listed adminsitrative computer functions and answer if any of those functions directly affected

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the formation of divisional goals or policies. Figure 3.3, found in Appendix 1, was used to record the responses. Figure 4.3, found in Appendix 2, displays the total presentation of positive responses. Those functions considered to directly impact the formation of goals and policies were considered to be executive in nature. The rationale for this value was extracted from the literature.

The work of both Robert V. Head and Henry Mintzberg was used in this study to qualify executive function. Head described the available support while Mintzberg provided descriptions of what executive work is like.

Head provided a hierarchy of managerial decision support that is available from a MIS.[11] He described the top two levels of this hierarchy, here presented in ascending order, as strategic decision making support, and tactical decision making support. Strategic decision making support is defined as relating to the formation of policies. Tactical decision making support is defined as relating to the formation of goals.

Mintzberg explained how executives spend their time and what methods of operation suit their purpose(s). His observations and descriptions placed executive function in the areas of tactical and strategic planning and operations. Top executives

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rely on lesser management to modify the lengthy hard data reports necessary at the operational and control level of the organization, so that the CEO can concentrate on structuring an environment in which the organization can be successful.[12] These writers, both highly regarded and often quoted in the management environment, qualify executive function as relating to the formation and delivery of the goals or policies of the organization.

4. The fourth and final necessary data collected described the planning processes used to implement computer supported administrative managerial functions. Again, this area of interest is presented in the Interview and Response Document. Under the heading, Fourth Area of Interest, the study asked the question, "What are the planning practices or procedures used to implement those division level administrator computer functions currently in place in your school division?"

The participants in the interview were asked to first respond to a set of qualifying questions relating to each of their listed computer supported managerial functions. They were then asked to provide a verbal description of their division's planning practices, being guided by a set of prompting questions. These questions sought to obtain reaction

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to qualities of planning for system development valued in the literature. The first part of this section provided a form presented in Appendix 1 (Figure 3.4 Planning Procedure Response), which called for the listing of all computer supported managerial functions and the yes and no responses typical of previous response forms of the study. There were eight qualifying questions for each function listed, and the questions are labeled a.-h.

Question a. addressed the issue of packaged software. This means that software is provided for a variety of jobs or tasks at one implementation. Such software usually uses one of the procedural languages; i.e., COBOL, FORTRAN, C, PL1, or BASIC. This is significant, as procedural languages all have the potential to apply weights or values to data as it is being manipulated. This is literally built into their structure, as they require the programmer to identify steps, rules, or procedures to follow with all data that will be entered.[13] The procedures would allow such valuing to be effectively installed in a decision support program.

Question b. exceeded the provision of the apparent opposite condition from question a. It identified a computer function that might have been installed

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for a predetermined, specific purpose. Rockart reported that the most commonly used needs assessment technique is the full study method.[14]

Question c. identified the use of that method. This method requires the use of assistance of outside technical consultants.

Question d. focused the respondent on the specifics of the planning procedures. This assisted his response for the narrative question which followed.

Question e., f., and g. described the extent of outside versus in-house technical support for the planning implementation process that was used.

Question h. addressed the issue of user participation. This is vital to the effectiveness of any system planned and to the probability that the system, once in place, will be used.[15]

The second section of needed data collection for the fourth area of interest was accomplished by the audio recorded discussion of the question. "In what way(s) and to what degree(s) did the executive supported by this computer function participate in its planning and implementation?" In order to both stimulate the discussion and to assure that specific issues valued in the literature were considered, the following five questions were asked as prompts for the discussion.

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a. Did the executive participate in the needs assessment? If so, to what extent?
b. Did the executive meet with planner(s) to express his perceived interests in or needs for information?
c. During the time that software was being developed, was the executive consulted to discuss progress or problems with meeting his informational needs?
d. Since implementation, has the executive been asked to express his level of satisfaction with the computer support?
e. Does the executive regularly use the support provided by the computer application?

These five questions reflect valued criteria of the Critical Success Factor (CSF) method of needs assessment/planning endorsed by the Center for Information Systems Research, Sloan School of Management, Massachusetts Institute of Technology.[16] These criteria were also valued by this study.

Data Analysis

The data analysis described those planning procedures used to implement computer functions that support executive decision making in Virginia urban public school divisions.

The data collection instrument was designed to progress from an overview of computer function within

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the sample school divisions, through a series of qualifying questions, to a specific description of any planning techniques used for computer applications that support the executive decisions being made in those divisions.

In summary, the first area of interest has provided a general overview of the division's total computer operations. Comparisons may be drawn from this data that allow insight into commitments toward administrative utilization for each division, as well as for comparisons between the divisions who were interviewed.

The second area of interest allowed the respondent freedom to use his own as well as the division's interpretation of the definition of administrative use. The intentional emphasis is on completeness. Subsequent qualifying questions prevented any confounding of results caused by initial disagreement over the labeling of administrative functions by different respondents.

The third area of interest addressed the qualities of executive function derived from the writings of Head and Mintzberg. This area provided a categorization of administrative functions as either executive or non-executive.

The fourth area of data collection, labeled the fourth area of interest, examined the planning practices used to implement current administrative computer functions within the division. It was divided into two parts.

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The first addressed issues of software selection, planning procedures and involvement of end-users. Figure 3.4, presented in Appendix 1, was used to record the required yes or no responses to this portion of the fourth area of concern. The second part of this fourth area of interest focused on the specifics of end-user participation in the planning phase and examined the critical issue of end-user satisfaction. The literature strongly supports the view that end-user satisfaction and end use of the system is directly linked to involvement in both the informational needs assessment and the system planning phases.[17]

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CHAPTER THREE

END NOTES

[1]Jerome Kirk and Marc L. Miller, Reliability and Validity in Qualitative Research (Sage Publications, Beverly Hills, London, New Delhi, 1986), pp. 60-62.

[2]Characteristics of the Population Number of Inhabitants Virginia, 1980 Census of Populations (U.S. Department of Commerce, Bureau of Census), Table 3, Appendix A-2.

[3]Fall Membership - Division Summary, Virginia Department of Education (Richmond, Virginia 23216, 1986-87), pp. 1-2.

[4]Department of Education, Virginia Educational Directory 1987 (Richmond, Virginia 23216-2060, 1987), pp. 43, 50, 73, 99, 130, 144, 158, 167.

[5]Robert V. Head, "Management Information Systems: A Critical Appraisal," Datamation (May, 1967), p. 23.

[6]Henry Mintzberg, "Planning on the Left Side and Managing on the Right," Harvard Business Review (July-August, 1976), p. 49.

[7]John F. Rockart, "Chief Executives Define their Own Data Needs," Harvard Business Review (March-April, 1979), p. 81.

[8]Ibid.

[9]Larry R. Harris and Dwight B. Davis, Artificial Intelligence Enters the Marketplace (Bantam Books, Toronto, New York, London, Sydney, Auchland, 1986), pp. 7-8.

[10]Ibid., p. 8.

[11]Robert V. Head, Ibid.

[12]Henry Mintzberg, Ibid.

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[13]Harris and Davis, Ibid., pp. 27-29.

[14]Rockart, Ibid., p. 84.

[15]Ibid., pp. 84-87.

[16]Ibid.

[17]Ibid.

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CHAPTER IV

ANALYSIS AND FINDINGS

All nine interviews were conducted. As planned, each of the nine school divisions provided the person(s) that could best describe the division level operations of the computer and how the resulting reports were applied in the division's decision making process. Since these requirements of the study were presented to each division superintendent and these representatives were recommended and provided in good faith, it was concluded that these representatives were the correct and sufficient respondents for each of the divisions. This conclusion was substantiated by their understanding of their division and their knowledgeable responses during the interviews. It is important to note that discussions during the interviews revealed that the phrase "division level computer function" must include functions performed on school division owned and operated mainframe computers, individual personal computers used by central office staff, and computers operated by the local municipality for the support of the school division. The focus of this study was not on these various forms of hardware but was, instead, on the function of these operations,

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how each of these functions impacted the decision making process, and what planning was involved in the implementation of each of these operations.

Initially, each respondent was asked to examine a list of division level automated administrative functions identified in the 1986 Virginia DOE study. These were used to prompt the respondent's thinking, provide examples of the type of functions that this study would consider as both division level and administrative, and to allow each division to indicate if this function was a part of the division's automated operation. As demonstrated by the report of the data composite sheet, Figure 4.1 found in Appendix 2, most of the functions listed by the state study were common to the divisions interviewed. This result was not unexpected, but since all of the state reported functions were confirmed in at least some of the divisions examined in this study, the functions presented as adminsitrative, division level automated support by the Virginia DOE study can be considered valid ones.

More important to this study's interest was the next interview activity. Respondents were asked to list additional functions in place in their divisions. Every division interviewed made additions to the list provided from the state study. The following list indicates those functions not provided by the state study, but

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reported during the nine personal interviews of this study. List of additional unduplicated computer functions:

1. Teacher endorsements and personnel data
2. Attendance and membership
3. Word processing
4. Electronic mail and messages to schools
5. Chapter I records
6. Grading for secondary
7. Scheduling for secondary
8. Special education and gifted
9. Student data
10. Pupil assignment, zoning, and membership projections
11. Standardized transcripts
12. Purchasing, warehouse catalog, and automated requisition processing
13. Integration of financial, payroll, and personnel data
14. Facility management to include long range planning
15. General education research
16. Publishing, public informational documents, and reports
17. Decision support system (DSS) software in place
18. Information surveying, school climate monitoring

Eight individual notes are necessary to explain this list more fully.

1. The Virginia DOE study provided the item, teacher endorsement. However, all of the respondents stated that while they had automated records for teacher endorsements, they all had expanded this operation to include personnel data. Therefore, this study has modified that label to read as teacher endorsement and personnel data.

2. Both grading and scheduling were automated at the secondary level. Even though these activities are primarily secondary school functions, they are provided as assistance to all secondary schools

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in those divisions using them. They are, therefore, considered to be a division level function by this study.

3. Student data files automated by the sample school divisions, included a variety of records kept. The distribution of the items automated was not significant to this study, therefore, they will not be reported separately. They did include student registration, health records, attendance, individual educational plans, category I and category II records, rank in class, scheduling, daily assignments, test scoring, grading, transcripts, withdrawals, and re-entries.

4. Pupil assignment, zoning, and membership projections are closely related to functions of busing and long range planning. Some of the divisions included those functions under this heading, while others had a separate and individual function for those operations.

5. Facility management, expanded to include long range planning, was reported as a function that linked the facilities management, common to other divisions, with a projection of building needs, to provide an automated indication of future construction needs.

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6. The recording of a Decision Support System (DSS) was unexpected. The technical research reviewed for this study only identified seventeen examples of DSS. This would indicate the rarity of such a system being in place. This study's limits restrict it from an in-depth examination of this software, but it might well be an appropriate interest of future related research.

7. Word Processing is commonly found in all of the school divisions. However, all of the divisions were not cited for having it in place due to the study's requirements that a function be developed at the division level. Those word processing operations not cited were those that occurred without division organization and implementation.

8. The reader of Figure 4.1, found in Appendix 2, should not judge the level of accomplishment of automated process or the level of sophistication of the automated system by valuing the number of functions rated highly by the school divisions.

The identification of seventeen functions and one modification, additional to those reported by the Virginia DOE study, and the ability to discriminate between these functions as they were discussed, indicates the value of the direct interview technique over the written survey approach in descriptive research methodology. While

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the size of this study's sample was limited compared to the earlier state study, the detailed data revealed is more complete.

The rating of each identified administrative computer function was accomplished by assigning a numerical value of one to five to each function. The reported rating scale was assigned the following values:

1. very high frequency of use and importance
2. high frequency of use and importance
3. moderate frequency of use and importance
4. low frequency of use and importance
5. not used at the division level in the school division

The interview technique allowed for the examiner and the respondent to clarify what was being sought in each question. In the case of the first question, it was explained that the target was to indicate if a provided function was used, if additional functions were in place and report them, and, finally, by the use of the valued rating scale, to distinguish what value the division placed on that particular function. Sometimes, but not always, the frequency of use would relate to the importance. Through discussion, it was possible to clarify the difference.

Identified Computer Functions and Ratings

The responses verified that all eight of the administrative computer functions reported by the Virginia DOE study were in place in seven of the nine sampled

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school divisions. One of the divisions did not report having an automated transportation management program, and a second division did not report having automated programs to support food services nor facility management.

This area of interest did reveal a total of seventeen additional administrative computer support functions and one modification of a label for one of those reported in the state study. These additions and the one modification support two values of this study. First, current data is valuable in providing improved understanding of this phenomenon. Second, the personal interview allowed for better communication with the specific people in the field of interest of this study. The improved communication then resulted in more complete data and, therefore, better information.

This collected data has addressed the first of the three research questions considered by this study, "What are the current educational managerial computer applications inclusive of and beyond those described in the Virginia and AASA studies that could be classified as executive in nature?" The number of additional reported functions supports the interview method and the need for current information to best describe the condition of the large urban school division's use of comptuer support for executive decision making. However, reported functions, nor the inteviews that described them, were

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able to identify specific computer support for executive decision making. In limiting executive decisions to those that relate to the levels of management function identified by Head[1] and Mintzberg[2] as executive in nature, this study provided a degree of specificity that was not demonstrated by the respondents.

Evaluation of the Divisional Use of Data Generated by Adminsitrative Computer Functions

Generally, divisions are providing hard data reports to their administrative leaders. Responses indicate that the school divisions sampled expected their administrators to use these hard data reports to influence their decisions. However, information previously cited in this study's review of literature indicates that top management does not use hard data in its decision making and even middle management must apply specific organizational values to convert hard data to usable information. When the sampled school division's expectation of use is compared with the expert opinions of how management functions, some logical questions arise. First, do these school division managers use the computer support to the degree expected by their division? Second, how helpful are reports to the administrator when they must be interpreted based on current values before they render any information for their intended user? Third, is the automated support cost-effective when viewed

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in regard to the percentage of administrators who actually use and value it? It is significant to notice that the most confident responses about end-user satisfaction and usage were addressing computer-generated products that served as reports of data required to meet an obligation for either a report sent on to the state or to a higher ranking official within the school division.

The apparent decrease in positive responses and the clarifying discussion indicate that computer prepared reports are primarily structured as either individual, aggregate, or total reports. Reports of this nature are reports of hard data rather than informational products.

Questions d., e., and f., used in the second area of interest of the interview, was used to qualify responses that might indicate the actual achievement of a MIS. Responses of these three questions, reported on Figure 4.2, in Appendix 2, and discussion of the responses as they were being collected, indicated that those qualities required by this study to identify a MIS were not observed in any of the sampled school divisions. Positive responses were given to these questions indicating initially that valuing or weighting of data was occurring thus producing information from data. However, in each case, discussion revealed that such conversions were not comprehensive enough to be valued by the study. While answers were honest replies, they failed to qualify

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as examples of using divisional determined values to specific data to make it usable for decision support by converting that data to information. The school divisions, like the business organizations discussed by Head, still rely on people to manipulate these value laden questions. Without an automated data conversion process based on school division values, this study could not assign the label of MIS.

Since this interview process sought confident positive responses that exemplified the qualities expected of DBMS, MIS, and DSS extracted from the literature, respondents were allowed to fail to answer specific questions for specific functions when discussion revealed that they were not describing a specific example of any one of the expected qualities. This accounts for the variance in the number of total responses presented in the figures. This poses no threat to the validity of either descriptions or final conclusions of this study because this represents only the inability to describe a non-existent phenomenon.

Identified Executive Functions

No executive support was identified. Despite the reporting of "yes" responses, which was supposed to indicate that computer functions being discussed were supporting the formation of policies and goals, and therefore, indicated executive support, discussion of

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these responses showed them to be less directly influencing policy and goal formation than was intended. For example, several respondents claimed that the automated budget preparation process directly impacted the formation of goals. Their point was that due to the requirements of funding to carry out any goal, it was reasonable to claim that all goals were impacted by automated budget preparation. The problem in accepting this point of view as indicating that executive decision making was indeed impacted by automated budget preparation is that, in this case, only the availability of financial resources is impacting executive decision making, and not the use of and automation of budgetary record keeping and reporting.

Test scoring was another instance of respondents answering "yes" to the question of does this computer function impact the formation of divisional policies and goals. Initially, the respondents assumed that since generalized reports of test scores were used to set instructional goals that they, under the requirements of the study, would be impacting the executive level of decision making. However, again there is a problem with this initial thought. The automated process of test scoring does not include any interpretation, valuing or weighting of these results. All of the appraisal and interpretation of what collected scores indicate

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for the school division are done by subject supervisors, instructional directors, principals, and teachers. The evaluation of test scores is a function of managers not automation. Therefore, it too fails to impact in a manner that this study will label as executive in nature. Similar experiences occurred with each of the functions examined for a linkage to executive function. Only two of the twenty-five functions produced no positive response to this question. However, in every case, as in the two examples cited, the automation of the process cited failed to impact the formation of either goals or policies.

While there were issues addressed in the first and second areas of interest of this study that relate to the sanctioning as executive of reported computer functions, this third area of interest directly responds to that quality. The second research question of this study asks, "To what degree do these executive decision support systems affect the development of school division goals and policies?" The defining of executive management or executive decision support as decision making that determines goals and policies, is well documented throughout this study. While Head has classified MIS support of decision making into four levels with tactical (goals) and strategic (policies) being the highest levels of management,[3] it is Mintzberg who ties those areas of operation to the executive manager.[4] The study's valuing

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of this linkage is logical and useful. It is logical because there is a relationship demonstrated in the literature and useful because as a description is developed, it must have specificity in its terminology if it is to be understood or generalized to other similar populations. Given this degree of specificity, the collected data cannot label as executive support any of the reported automated functions reported.

Analysis of Planning for the Administrative Use of Computers at the Divisional Level

This study has synthesized definitions of DBMS, MIS, and DSS from the literature. The examination of data applications indicated that none of the administrative computer functions described meet the criteria for either MIS or DSS.

In order to have been labeled as a DSS, the function(s) would have had to demonstrate that certain specifically important questions had been indicated by an assessment of informational needs. Further, an automated informational system, a MIS, would have been developed to provide the leadership with information pertaining to these questions. The system may have either prescribed specific or suggested actions based on the conditions indicated by the flow of information. The DSS software indicates that it was not a result of systematic planning intended to coordinate either

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current or planned collections of data and build these into information addressing predetermined needs for decision support. It was instead, a software package, purchased to apply to whatever situations the school division might deem important and for which the software might be adapted. Two points are clearly exemplified in this observation. First, this application was not a comprehensively planned, systematically developed program, intended to meet informational needs deemed important to the school division. It, therefore, does not qualify as a DSS. Second, it does exemplify the typical results of technology marketing, in that it uses the terminology of sophisticated technology, but fails to deliver the total support that its marketing label suggests. Each of the technologies described in this study, DBMS,[5] MIS,[6] and DSS[7] are distinctly different, in that they deliver products of different types, require differing degrees of comprehensive planning, and possess qualities that set them uniquely apart from one another. The marketing is necessary for the industry to develop the technology. It, therefore, should not be considered as a negative factor. It must be recognized that the marketing terminology can cause confusion when it is regarded as objective in nature. Requiring objectivity in the definitions of these technologies is one of the accomplishments of this study. This is

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why the study does not label the software as a Decision Support System, although it was marketed as such.

The same difficulty of marketing terminology impacts the MIS. MIS differs primarily from DSS by being the informational base for the DSS. While the DSS focuses on either a decision or a collection of decisions, MIS must be used to address the issues and factors that relate to these decisions. The MIS differs from the DBMS in that the MIS applies the value(s) of the organization using them, to convert data to information. If the MIS is to be an automated system, then the conversion must have a degree of automatic conversion. That is why the format of an information system's report will differ from the individual, aggregate, or total formats found in data reports. Confusion can result between aggregation of data and information. In conversations during the interviews, some of the technically expert participants had difficulty with this confusion. The managerial participants were better able to understand and accept what valuing means to this process and how it is different from the simple arithmetic regroupings of data conducted during data aggregation.

Understandings of DBMS are not immune from this type of confused market labeling either. Problems do not come from the quality of DBMS's fundamental component, data. Confusion in the understanding of DBMS typically

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results from inconsistency of stating the requirements for the degree of comprehensiveness of the system of data management. The popularity of the full case study approach, presented and cited earlier, supports this conclusion. The full case study attempts to interview or survey all the potential users in a system to determine their data or informational needs. It then builds hierarchial, networking, and or relational data bases to connect these users with what they thought they required. That is persuasive because these needs assessments are typically done after an organization has some automated data processing in place. In short, they are typically used as a correctional device. Their popularity, reported by Rockart and cited earlier, is an indication of the need to correct data processing operations. Again the example of the DSS labeled software serves to illustrate this difficulty typical of automated systems of all levels of sophistication. In a rush to implement, computer users have failed to adequately analyze their needs and to plan and design appropriate systems to support even what they somewhat casually think they need.

The marketing of computer software is such that packages of programs are typically the initial experience for most organizations who implement this technology. These packages can be modified to adapt to the organization's specific needs. This process is also

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typical of the divisions interviewed. However, respondents clearly demonstrated that their school divisions had evolved to do needs assessing with their department heads and building administrators. These assessments were the driving force in the development of new programs of support. Although this assessing was sometimes informal, they collectively mark a higher level of planning sophistication than the initial activities previously referred to and common amongst many technology users.

Partnerships for technological support between the school divisions and local municipal governments were common. Such partnerships were not the original organizational arrangements. They have the apparent advantage to the division of sparing it the direct expense for technological development. They also have the disadvantage of placing the division's technological support development in the hands of an external department that competes with the school division for the same municipal funds.

An awareness of the importance of future users being involved with the planning of computer support functions is clearly demonstrated by the collected data and the discussions. The formal routine requirement to have users give feedback regularly regarding their satisfaction with the automated support was rare. Only in one of the nine divisions did it appear to be a part of the implementation process.

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Limitations are an expected part of all research. Descriptive studies in social science require not only limitations relating to the population and sample, but also to focus on the study on the content of interest. Willower points out this necessity. His limitation considers the level of meaningful integration of particular data to the whole of the research.[8] This study attempts to identify and describe planning techniques for implementing automated support for the executive level of leadership in large urban public school divisions. It required that the technologies available for such support be described in a specific manner. Further, executive leadership had to be qualified with a definition consistently applied within this study. While Willower's value restricts the amount of data that can be collected in descriptive research, Ary, Jacobs and Razavieh present a second concept, also incorporated in this study, that insures the proper amount of data will be included. In discussing content validity, these three authors state that both the topics of interest and the cognitive processes must be sampled appropriately if the study is to possess content validity.[9] Topic validity refers to knowledge of the events being observed. Cognitive process validity relates to an understanding of the meaning of these events. This study has addressed topic and cognitive process validity by selecting respondents

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who were qualified know what events had occurred (topics) and how the computer operations were being applied to decision making and management (cognitive process).

When the values of this study, developed from the review of the literature, were applied to the collected data, it became clear that no automated support for executive decision making is currently in place. Planning for an automated system of executive decision making support is also not in place at this time. However, much has been learned, and reasonable and responsible direction for such planning can be gleaned from this study.

The twenty-five automated data processing functions that were identified previously have increased by seventeen. These functions and their distribution suggest that school divisions are, and have been, selective in implementing the data processing each division believes will best serve its own needs. This is a reasonable practice and should be applauded.

Additionally, the qualities of good planning presented in current literature are appreciated by data processing and school division leadership, although they are not yet thoroughly applied. Where data processing departments are instituting new administrative support programs, use of needs assessments and future user participation is considered valuable. While the degree of regularity

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and formality varies for these techniques of planning and implementation, it is apparent that the data processing leaders interviewed were all aware of the need for this approach to planning and implementation.

The findings clearly demonstrate three practical steps to be taken that will improve the automated support available to school division leaders. These are:

1. Short and long range goals for data processing departments need to target the increase in systematic approach to data collection, conversion, manipulation, storage and retrieval. Use of computers has developed over time and, over that span of time, planning techniques have improved, new software and hardware have allowed for different ways of doing old tasks, commitment to the use of computers for division level administrative tasks has varied, and personnel planning for data processing has changed. For all of these reasons, we can assume an array of data processing practices and programs that have produced procedures and support that are less systematic and, therefore, less efficient than current technology can deliver. Specific short range goals should target efficiency improvements by linking databases from old systems in order to make data aggregations and retrievals more accessible to school division leaders. Long range

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goals of efficiency should include further linkages and planning techniques that emphasize top-down planning. Informational needs of executive leadership should be assessed, values recorded, and data bases and value conversions built into the system(s) as they are planned and implemented.

2. When individual computer functions, already in place, are valuable to the users specifically and the division generally, they should be maintained.

3. Future planning of computer support systems, including the very immediate future, needs to rigorously incorporate the use of expected end-users in the planning, design, and implementation phases of system development. This study reveals that respondents understood the value of this approach to planning. They displayed mixed opinions as to whether or not their school division's top executive leadership would be willing to give time to these planning and development activities.

There is a commonality of need for improving the degree to which data processing functions are systematically carried out. The history of variances in available technology, leadership interest and available resources is a common one; therefore, the need, while not identical in every school division, will, in general, be common to most. What makes the recommendations understandable

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and, therefore, useful is the specificity of terms used to discuss and describe the available technologies, the language generations, the needs assessment techniques and the qualification for executive leadership.

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CHAPTER FOUR

END NOTES

[1]Robert V. Head, "Management Information Systems: A Critical Appraisal," Datamation (May, 1967), p. 23.

[2]Henry Mintzberg, "Planning on the Left Side and Managing on the Right," Harvard Business Review (July-August, 1976), p. 49.

[3]Robert V. Head, Ibid.

[4]Henry Mintzberg, Ibid.

[5]James Martin, An End User's Guide to Data Base (Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1981), p. 2.

[6]Gordon Davis and Margarethe H. Olson, Management Information Systems Conceptual Foundations, Structure and Development (McGraw Hill, New York, 1985), pp. 5-6.

[7]Peter G. W. Keen, "Decision Support Systems: A Research Prospective" (Center for Information Systems Research Working Paper, No. 54, Sloan School of Management, MIT, Cambridge, Massachusetts, March, 1980), pp. 1-25.

[8]Donald J. Willower, "The Teacher Subculture and Curriculum Change," Samplings (April, 1986), pp. 45-60.

[9]Donald Ary, Lucy Cheser Jacobs and Asghar Razaviah, Introduction to Research in Education (Holt Rhinehart and Winston, New York, Chicago, San Francisco, Dallas, Montreal, Toronto, London, Sydney, 1979), pp. 196-197.

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CHAPTER V

CONCLUSIONS

Analysis of the collected data indicates that the sampled school divisions are using data processing systems to support the operational and control level of their division's management process. The first research question of this study assessed the current data processing practices used to support school division administration. Findings identified twenty-five such computer functions, representing an increase of seventeen functions over those reported in the Virginia DOE study of 1986.[1] This finding supports the conclusion that large urban school divisions are using computers to support their administrative functions. Of particular note was the systematic level of these automated supportive operations. The examination of the literature revealed that many computer support funcitons fall short of delivering the levels of support hoped for during the planning and implementation phases of their development. The reason frequently given for this failure to meet expectations was that computer functions were frequently implemented in a rather reactionary manner, motivated as much by a desire to have the technology as a

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demonstrated need for it. These sampled school divisions appear to have either overcome those shortcomings, if they began this way, or their methods of implementation have generally avoided these problems. If these were improved systems, then they possibly owed their improved status to either benefiting from the technology provided by the municipal partnerships or from simply improving their planning and implementation practices through trial and error experiences.

A major confusing factor blocking the understanding of what is written in the literature concerning automated technological support of managerial decision making, is the lack of firm definitions that distinguish between the types of systems used to provide this support. This study attempted to avoid this confusion by describing Data Based Management Systems (DBMS), Management Information Systems (MIS), and Decision Support Systems (DSS). Within these descriptions were qualities associated with each type of system and the assumption that the different systems were unique. Key to distinguishing between the DBMS and the MIS would have been to observe qualities:

1. valuing collected data according to divisional needs and interests
2. reports produced in a format that would include data manipulated to reflect those values
3. have that applied valuing distributed throughout the division's automated system.

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If the observed function or system demonstrated all three of these qualities, it would have been considered a Management Information System rather than a Databased Management System. While numerous positive responses indicated the possibility of the MIS, follow-up discussion revealed each time that the function did not fulfill the total requirement.

DSS was distinguished from MIS by the DSS having the qualities of:

1. providing suggested actions to be considered by the decision maker receiving the report;
2. providing specific directions for actions to be taken by the decision maker receiving the report;
3. the suggested or required actions being based on values determined for the division and applied throughout the division's automated system, rather than being specific only to a certain program.

Again, positive responses relating to the interview questions that suggested the possibility of a DSS, fell short when follow-up discussions revealed that all of the possible functions lacked the qualities that would demonstrate either a comprehensiveness to the specific value, when one was apparent, or that the function lacked linkage to any other data or information base other than its own software. An example typical of others, was the automated scheduling process used by many of the school divisions. This process assigns students to classes and can both recognize an overload and provide

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a conflict resolution. Its short fall is that the values used and even the resolutions suggested are products of only this software package and not divisionally developed values.

However, there were activities reported by the sample divisions that have the potential to be developed into either MIS or DSS. Programs of facilities management, including long range planning and informational surveying, determining and monitoring school climate, both have this potential. They related to data that could be converted to information. The values necessary for this conversion are readily apparent to managers who have led programs of facilities management and public relations without the availability of automated informational support. These programs relate to decisions that are readily quantified. With proper planning, they show great potential to be developed to the sophisticated levels of these technologies. It is not assumed that to develop an MIS or a DSS would automatically accomplish executive level automated decision support. However, it is significant to note that, as Mintzberg points out,

> "decisional roles involve the manager in the strategy making process of the organization . . . the manager can best insure that significant decisions reflect current knowledge and organizational values . . ."[2]

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The need for management, in this case executive management, to recognize values in its decision making strongly suggests that if an area of automated activity shows a potential to be developed to the level of an MIS which requires the conversion of data to information based on organizational values,[3] then it has an improved chance of truly supporting executive management as defined in this study. The second research question of this study examined the degree to which any identified computer function might support executive decision making. While current data demonstrates no such current support, the potential to develop a process into an MIS or DSS represents a potential to provide executive support.

The third research question examined the planning practices used by the school divisions to implement automated systems for support of executive decision making. Since the findings revealed that no automated executive decision making support systems were in place, it is obvious that no planning for these systems were recorded. However, it was demonstrated that end-user participation[4] was valued by the data processing personnel representing their school divisions as interview respondents even though respondents generally expressed concern that their top leader(s) would commit to the required time for them to participate in the planning phases of an automated system.

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Respondents consistently expressed the importance their divisions placed on the participation of the future user of an automated system in that system's planning and implementation. Valuing of end-user planning participation is also constant in the literature. However, sample school divisions, like other organizations cited in the literature, fall short of attaining this goal. Evidence of this shortfall is found in this study's responses regarding the dependence on informal assessment of both informational needs and evaluation of the end product. Informality is not a problem in itself, but, when there is little to no formal needs assessment and similar systematic assessment of user satisfaction, then it is apparent that this generally valued goal is far less attained than valued. The responses of those interviewed revealed that, even though there were exceptions, generally, the level of user participation in the establishing of needs for information, input in the design phase of planning, and evaluation of the finished product were frequently missing altogether and seldom in place to a degree that would support such procedures being systematically applied.

There are five conclusions drawn from this study:

1. The methodology of the study proved to be robust, providing for both reasonably valid and reliable procedures and resulting in improvement in the

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results reported in previous studies. The focus was limited in the sampling of large urban school divisions in the state of Virginia. This specificity in sampling allowed the study to examine in depth those situations likely to evidence examples of the technology that the study intended to describe. Additionally, results could be compared with a recent study of the same general area that had surveyed these same people. That comparison demonstrated seventeen additional administrative computer functions that had been recorded in the previous study. These additional functions are described and evaluated by this study. This supports the claim of valid methodology and demonstrates an improvement over the general survey method used in the previous study.

The focus was also directed to the planning practices and procedures with a higher degree of specificity than the previous studies attempting to describe the same phenomenon. The results were a more concise description of what occurs in the sample school divisions and a literature and research-based description of high quality planning techniques.

2. A confounder to non-technician use of computer support has long been the assumed requirements for users to become technically expert. This study

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clearly demonstrates two alternatives to this expectation. First, the description and explanation of the five generations of progamming languages clearly demonstrates that fifth generation natural programming language is available to urban school divisions and would require little technological skill to implement.[5]

Second, give the complexity of development of the fifth generation natural language and its probable higher cost, this study has validated that third generation procedural language, with its accompaying menus for task selection, are fully capable of including the type of valuing of hard data necessary to convert it to information and, therefore, tailor it for use to support even the executive level of decision making. The key to applying effectively either of these approaches is to begin with the executive need to know. Drucker's information system qualities of identifying who needs to know what, when, and where are the necessary starting points for any data, information, or decision support system.[6] The technology is available, but the planning must be appropriate.

3. Objectivity of the study and usefulness of its reported results were enhanced by the research-based discriminations between the technologies

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of Data Based Management Systems (DBMS), Management Information Systems (MIS), and Decision Support Systems (DSS). Information sources pertaining to the real qualities of these technologies are available in the research literature; however, those people likely to be selecting hardware and software for systems development are unlikely to search for it. Typically, the marketing techniques for technology providers include consultation, advertisement, and sales. What is offered to the buyer is more intended to persuade him than to inform him. This description of the technologies provides for a base of understanding that will allow readers an objective starting point to determine the type and extent of the technology that best suits their informational needs.

4. Conducting this study has revealed four factors commonly occurring in the area of planning, design, and implementation of automated systems which relate more to the decision process of the organization purchasing the technology. The literature exposed them, and they were also apparent in the interview process. First, influences of imagining, whether it is called "keeping up with the Jones'" or projecting a "state of the art" image, selecting and attempting to implement an automated support system to

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demonstrate a status of achievement is a distraction from the objective process necessary to obtain a cost effective result. Planning must begin with the objective determination of needs and a knowledge of available technology.

Second, attempting to substitute reactionary planning for objective informational-based planning is common practice but does not solve the problem of ineffective systems. The historical evidence indicates that automated systems are frequently initially implemented with less than adequate thought given to total system development. Once in this situation, the user is faced with the problem of trying to correct the inadequacy. This has resulted in the popularity of the full case study needs assessment technique reported and discussed by Rockart and Bullen.[7]

Third, the explosive growth pattern of the technology has confounded even systems that began with quality initial planning. The best defense against this threat is to make the initial planning as comprehensive as time and resources will allow and to recognize that once data, informational, and decision support needs have been identified, the currently available technology that can be

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considered cost effective for the application will, most likely, be the best solution for the need.

Finally, the greatest threat to satisfaction of the user with the end product of an implementation is the lack of knowledge of and appreciation for the importance of being able to visualize total data, informational, and decision support need and the awareness of which of the available technologies are designed to meet those needs. If large urban school division leadership is to effectively address this problem, it will first need to determine what its needs are and then examine the technologies to meet those needs.

5. There is a planning system available now that overcomes all of the typical confounders to quality comprehensive system development. It will allow its user to thoroughly assess his needs in this field, and it is a top-down system that insures that decision makers who guide the school division have vital information they need to make the decisions required to deliver high quality instruction to students in the urban environment. That method is the Critical Success Factor (CSF) method of needs assessment.[8] This method should be attempted in the urban school division setting.

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CHAPTER FIVE

END NOTES

[1]Virginia Department of Education, Communication/ Automation Transitional Plan, Vol. 2 (Department of Information Technology, Richmond, Virginia, 1986), Chart #3.

[2]Henry Mintzberg, The Nature of Managerial Work (Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1980), p. 77.

[3]Gordon Davis and Margarethe H. Olson, Management Information Systems Conceptual Foundations, Structure, and Development (McGraw Hill, New York, 1985), p. 9.

[4]Trevor J. Brentley, Making Information Systems Work for You, A MIS Guide for Business and Professional People (Prentice-Hall, Inc., Englewood, New Jersey, 1983), pp. 113, 115, and 170-174.

[5]Larry R. Harris and Dwight B. Davis, Artificial Intelligence Enters the Marketplace (Bantam Books, Toronto, New York, London, Sydney, Auchland, 1986), pp. 25-28.

[6]Peter F. Drucker, "Playing the Informational Orchestra," The Wall Street Journal (June 4, 1984), p. 4.

[7]John F. Rockart and Christine V. Bullen, The Rise of Managerial Computing (Dow-Jones-Irwin, Homewood, Ill. 60430, 1986), p. 84.

[8]Ibid., pp. 84-85.

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APPENDIX 1

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Appendix 1 is the data collection instrument. It includes the questions for each area of interest, the sub-questions used to clarify those responses, instructions about the use of symbols for indicating responses, and the data recording or collection sheets.

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The Interview and Response Document

First Area of Interest:

What are the uses your school division makes of the computer at the division level? The General Computer Use Response form provides eight division level computer uses, all taken from the 1986 Virginia DOE statewide survey. These are offered as a starting point for your response. If your division has not implemented any one of these, use the number five (5) response to indicate, "not used at the division level in this school division." Add any other division level computer applications that your school division has implemented. Please rate the degree of usage or importance by indicating the appropriate number for each division level computer application listed on the response form:

1. very high frequency of use or importance
2. high frequency of use or importance
3. moderate frequency of use or importance
4. low frequency of use or importance
5. not used at the division level in this school division

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General Division Level Computer Use Response

Figure 3.1 School Division represented by

Computer Use:

1.	Budget preparation	
2.	Test scoring	
3.	Financial accounting/payroll	
4.	Teacher endorsements	
5.	Transportation management	
6.	Inventory control	
7.	Food services	
8.	Facility management	
9.	Other(s)	
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		

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Second Area of Interest:

What administrative computer functions are used by your school division? How is the data or information collected by these computer applications used in your school division? In order to respond to this area of interest, use the Data Description Response form. Use (X) for a "yes" or (O) for a "no" response. Include a response for each of the questions labeled a.-f. for each of the computer functions you consider to be administrative in nature and used at the division level. If a computer function is offered on the form, but it is not used at the division level, leave the response blank.

a. Does this administrative computer function provide hard data for reports sent to division leaders or others? (X/O)

b. Does it provide data from which someone within your school division will draw a conclusion? (X/O)

c. Are the reports derived from this process presented in a form other than total, aggregate, or individual? (X/OO

*If the answer to question c. is no, then there no need to respond to questions d., e., and f.

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d. Does the process manipulate collected data in a way that reflects a value held by your school division? (X/O)

e. Do reports generated by this process include possible action(s) to be taken by the person who receives them? (X/O)

f. Do reports, so generated, direct specific action(s) to be taken by the person who receives them? (X/O)

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Data Description Response

Figure 3.2

School Division represented by

Administrative Computer Applications	a	b	c	d	e	f
1. Budget preparation						
2. Test scoring						
3. Financial accounting/payroll						
4. Teacher endorsements						
5. Transportation management						
6. Inventory control						
7. Food services						
8. Facility management						
9. Other(s)						
10.						
11.						
12.						
13.						
14.						
15.						
16.						
17.						
18.						

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Third Area of Interest:

Do administrative computer functions support the executive levels of management within your school division? This study defines executive management as that part of the managerial function that relates to the tactical and strategic operations of divisional management. It further excepts the definition of tactical activities as being associated with goals for the division and strategic activities as relating to the division's policies. To respond to this area of interest, use the Executive Function Qualifying Response form. For each computer function considered to be in place in your division, respond with either (X) for "yes" or (O) for "no." If a computer function supports the formation of either division goals or division policies the positive symbol (X) should be placed in the correct column, goals or policies.

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Executive Function Qualifying Response

Figure 3.3

School Division represented by

Administrative Computer Tasks Supporting the formation of

		goals	policies
1.	Budget preparation		
2.	Test scoring		
3.	Financial accounting/payroll		
4.	Teacher endorsements		
5.	Transportation management		
6.	Inventory control		
7.	Food services		
8.	Facility management		
9.	Other(s)		
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			

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Fourth Area of Interest:

What are the planning procedures used to implement those computer functions currently in place in your school division? Two specific questions are used to describe the planning process for your division. The first uses a response form similar to those used in areas of interest, two and three. You are again asked to provide (X) for a "yes" response and (O) for a "no" response to a series of eight qualifying questions for each of those computer functions considered to be supportive to division level management. A blank will indicate no division level application.

To respond to the first part of this area of interest, use the Planning Procedure Response form.

a. Was the implementation of this managerial computer function accomplished as a part of a group or package of programs? (X/O)

b. Was its planning and implementation done as a single application implementation? (X/O)

c. Was the application identified as a need by a division level needs assessment prior to its implementation? (X/O)

d. Was the planning for this application done specifically for its implementation? (X/O)

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Questions e., f., and g. address the labels typically assigned to planning procedures in earlier research.

e. If specific individual planning was done, was it accomplished totally by staff of the school division, "in-house?" (X/O)

f. Did the specific planning include both "in-house" and out-of-division technical assistance? (X/O)

g. Was the total planning process done by outside technical professionals? (X/O)

h. Was the executive who is being supported by this specific process included in the planning activities? (X/O)

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Planning Procedure Response

Figure 3.4 School Division represented by

Computer Supported Managerial Functions

	a	b	c	d	e	f	g	h
1. Budget preparation								
2. Test scoring								
3. Financial accounting/payroll								
4. Teacher endorsements								
5. Transportation management								
6. Inventory control								
7. Food services								
8. Facility management								
9. Other(s)								
10.								
11.								
12.								
13.								
14.								
15.								
16.								
17.								
18.								

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The second question addressing this fourth area of interest is, in what ways and to what degree did the executive supported by this computer function participate in its planning and implementation? The following five questions are provided to stimulate your responses and to insure that you speak to issues considered important in the literature of information system planning. Your responses will be audio-recorded and transcribed later to insure the accuracy of the study's reporting your remarks. Please take a moment to review the five questions and request any qualifying information you might wish prior to beginning your response. As you respond to these questions, you are asked to generalize your answers rather than attempt to responding about one specific computer function.

a. Did the executive participate in the needs assessment? If so, to what extent?

b. Did the executive meet with planner(s) to express his perceived needs and interests for information?

c. During the time that software was being developed, was the executive consulted to discuss progress or problems with meeting his informational needs?

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d. Since implementation, has the executive been asked to express his level of satisfaction with the computer support?

e. Does the executive regularly use the support provided by the computer application?

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APPENDIX 2

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Appendix 2 presents summaries of the collected data for each of the four areas of interest. A listing of the twenty-five administrative computer functions identified in the study is provided with abbreviations used to report results on the data collection sheets. These abbreviations allow for a single sheet display of the collected data. They are listed on each data sheet in the same order and the abbreviations used are also consistent.

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Abbreviations for Reporting Administrative Computer Functions

Budget Preparation	Budg. Prep.
Test Scoring	Test Sc.
Financial Accounting and Payroll	Fin. Acct./Pay
Teacher Endorsements and Personnel Data	Te. End./Per. dt.
Transportation Management	Trans. Man.
Inventory Control	Inv. Con.
Food Services	Fd. Ser.
Facilities Management	Fac. Man.
Attendance/Membership	Att./Mem.
Word Processing	Wd. Pro.
Electronic Mail/Messages to School	El. Mail/Mess. Sch.
Chapter I Records	Ch. I Rec.
Grade Reporting - Secondary	Gr. Rep.-Sec.
Class Scheduling - Secondary	Cl. Sch.-Sec.
Special Education/Gifted	Sp. Edu./Gift.
Student Data	St. dt.
Pupil Assignment, Zoning, & Membership Projections	Pu.As.Z & Mem. Pro.
Standardized Transcripts	Stan. Trans.
Publishing, Warehouse Catalog, Automated Requisition and Processing	Pub. WH. Cat. At. Req.
Integrated Personnel Data and Payroll	Int. Per. dt. & Pay.

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Facility Management Data & Long Range Planning	Fac. Man. dt. & Lg. Ra. Pl.
General Educational Research	Gen. Edu. Res.
Publishing, Public Information Documents & General Reports	Pub. Pub. Info. Doc. & Gen. Rpt.
Decision Support Systems (DSS) Software Package	DSS-softw.
Informational Surveying, School Climate Determination and Monitoring	Info. Sur., Sch. Cl. D. & M

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First Area of Interest:

This question required the respondents to list the computer functions currently in place in their school division and to rate the importance of that function to the division's overall administrative process. The rating scale used numbers 1-5. An explanation of the values for this scale was presented in Chapter Three.

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Interview Response Composite

First Area of Interest

Figure 4.1

Functions	Respondents								
	1	2	3	4	5	6	7	8	9
Budg. Prep.	1	1	2	1	1	1	2	2	1
Test Sc.	4	3	1	1	2	1	3	2	3
Fin. Acct./Pay	1	1	1	1	1	1	1	1	1
Te. End./Per. dt.	1	3	3	3	1	1	2	2	1
Trans. Man.	2	3	4	3	3	1	4	5	4
Inv. Con.	1	1	2	1	2	1	3	3	2
Fd. Ser.	2	1	2	1	3	1	4	3	4
Fac. Man.	1	3	2	1	3	3	4	4	5
Att./Mem.	2	1	1	1	2	1	1	5	1
Wd. Pro.	1	5	5	5	5	1	3	5	5
El. Mail/Mess. Sch.	1	5	5	5	2	1	4	5	5
Ch. I Rec.	5	3	5	5	5	1	5	5	5
Gr. Rep.-Sec.	5	1	1	1	2	1	1	5	1
Cl. Sch.-Sec.	5	1	1	1	2	1	1	5	1
Sp. Edu./Gift	5	5	1	5	5	1	3	5	5
St. dt.	5	5	2	1	2	1	5	1	1
Pu.As.Z & Mem. Pro.	5	5	1	3	5	3	2	1	4
Stan. Trans.	5	5	5	1	3	1	5	5	5
Pub. WH. Cat. At. Req.	5	5	5	1	5	1	5	5	5
Int. Per. dt. & Pay.	5	5	5	5	5	1	5	5	5
Fac. Man. dt. & Lg. Ra. Pl.	5	5	5	5	2	1	5	5	5
Gen. Edu. Res.	5	5	5	5	2	1	5	5	5
Pub. Pub. Info. Doc. & Gen.	5	5	5	5	2	1	5	5	5
DSS-softw.	5	5	5	5	5	2	5	5	5
Info. Sur., Sch. Cl. D. & M.	5	5	5	5	5	5	5	5	3

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The second area of interest is reported on a series of figures beginning with Figure 4.2.a and ending with Figure 4.2.f. The a.-f. correspond with the qualifying questions asked to qualify the general area of interest, "how is collected data applied or used in each school division?"

Responses were either yes, indicated by "X", or no, indicated by "O". Since all functions indicated as being in place are listed on each of the figures used to report results, there will be functions with neither an "X" or "O" response. This blank space indicates that the respondents indicated that this function was not in use at the time of the interview. Figure 4.2.a-4.2.f, presented here, includes the total data collected for the second area of concern.

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Interview Response Composite

Second Area of Interest

Figure 4.2

Functions	# of yes responses to each of the six questions					
	a	b	c	d	e	f
Budg. Prep	9	9	5	4	2	1
Test Sc.	8	9	5	5	2	1
Fin. Acct./Pay	9	9	5	5	2	3
Te. End./Per. dt.	7	9	5	5	3	4
Trans. Man.	5	5	3	4	4	2
Inv. Con.	9	8	6	7	4	5
Fd. Ser.	9	8	4	5	3	4
Fac. Man.	4	5	4	3	3	3
Att./Mem.	4	5	4	3	3	3
Wd. Pro.	2	1	1	1	0	0
El. Mail/Mess. Sch.	3	1	1	1	0	0
Ch. I Rec.	2	2	0	0	0	0
Gr. Rep.-Sec.	7	7	6	7	4	3
Cl. Sch.-Sec.	6	7	6	7	6	4
Sp. Edu./Gift	2	2	1	1	0	1
St. dt.	6	6	4	4	3	2
Pu.As.Z & Mem. Pro.	4	4	2	3	1	1
Stan. Trans.	2	1	1	2	0	0
Pub. WH. Cat. At. Req.	2	2	1	2	1	1
Int. Per. dt. & Pay.	1	1	1	1	0	1
Fac. Man. dt. & Lg. Ra. Pl.	2	2	2	2	1	0
Gen. Edu. Res.	2	2	2	2	2	1
Pub. Pub. Info. Doc. & Gen.	1	1	1	1	1	0
DSS-softw.	1	1	1	1	1	0
Info. Sur., Sch. Cl. D. & M	1	1	1	1	0	0

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The third area of interest examined the computer's function to directly supporting decision making at the executive level. Based on literature and research previously cited in this study, executive activity was considered to be involved with the tactical operations (goal formation, monitoring, and completion) and strategic operations (policy formation, monitoring and enforcing). Figure 4.3 reports the yes, no, or not in use at the division level responses to this inquiry. Yes responses to impacting either tactical or strategic operations was enough to be counted as executive support.

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Interview Response Composite

Third Area of Interest

Figure 4.3

Functions	# of yes responses of nine possible
Budg. Prep.	8
Test. Sc.	6
Fin. Acct./Pay	7
Te. End./Per. dt.	7
Trans. Man.	4
Inv. Con.	4
Fd. Ser.	5
Fac. Man.	5
Att./Mem.	6
Wd. Pro.	1
El. Mail/Mess. Sch.	1
Ch. I Rec.	0
Gr. Rep.-Sec.	6
Cl. Sch.-Sec.	5
Sp. Edu./Gift.	1
St. dt.	4
Pu.As.Z & Mem. Pro.	3
Stan. Trans.	2
Pub. WH. Cat. At. Req.	2
Int. Per. dt. & Pay.	1
Fac. Man. dt. & Lg. Ra. Pl.	1
Gen. Edu. Res.	2
Pub. Pub. Info. Doc. & Gen.	1
DSS-softw.	1
Info. Sur., Sch. Cl. D. & M.	0

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The fourth area of interest, a description of planning techniques for the functions reported, is reported in both a series of figures, found at the end of this chapter, and labeled as Figures 4.4a-4.4.h, and in the summary of the narratives presented below. The figures divided into the series a.-h. follow the qualifying questions used in the interviews. The responses also allow for "yes", "no", or a blank to indicate no division level use.

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Interview Response Composite

Fourth Area of Interest

Part 1

Figure 4.4

Functions	# of yes responses							
	a	b	c	d	e	f	g	h
Budg. Prep.	5	5	8	7	6	3	0	8
Test. Sc.	4	6	8	7	6	2	1	7
Fin. Acct./Pay	4	6	8	7	3	5	1	8
Te. End./Per. dt.	4	6	8	7	6	3	0	7
Trans. Man.	3	4	7	5	5	3	0	7
Inv. Con.	5	4	8	7	5	4	0	8
Fd. Ser.	4	3	7	6	4	3	0	6
Fac. Man.	4	3	6	5	4	2	0	6
Att./Mem.	3	5	7	7	6	2	0	6
Wd. Pro.	1	2	2	2	2	0	1	2
El. Mail/Mess. Sch.	2	3	3	2	2	0	1	3
Ch. I Rec.	0	2	0	2	1	1	0	2
Gr. Rep.-Sec.	2	5	7	7	5	2	0	6
Cl. Sch.-Sec.	4	5	7	7	3	4	0	6
Sp. Edu./Gift	0	2	2	2	1	1	0	2
St. dt.	1	6	6	6	5	4	0	6
Pu.As.Z & Mem. Pro.	1	2	2	2	1	0	1	2
Stan. Trans.	1	3	4	3	3	0	0	3
Pub. WH. Cat. At. Req.	0	2	2	2	2	0	0	2
Int. Per. dt. & Pay.	0	1	1	1	2	0	0	1
Fac. Man. dt. & Lg. Ra. Pl.	0	2	2	2	0	1	0	2
Gen. Edu. Res.	0	2	2	2	1	1	0	2
Pub. Pub. Info. Doc. & Gen.	1	1	2	2	1	0	1	1
DSS-softw.	1	0	1	1	1	0	0	1
Info. Sur., Sch. Cl. D. & M.	0	1	1	1	0	1	0	1

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Responses to Part Two of the
Fourth Area of Interest
(narrative)

The narrative report allowed the respondent to speak freely and provide a less controlled response. In order to maintain the focus of the study, five questions, each addressing an issue valued in the literature for the planning and implementation of automated systems, were provided. These questions and the responses to each follow.

Question a. Did the executive participate in the needs assessment? If so, to what extent? You may wish to generalize your answer to indicate what typical planning practices would be at this time.

Respondent #1:

"My feeling is that in most cases the administrator who works with the area has participated. In some cases we did not have a wide ranging needs assessment. We sit down and discuss needs with the system analyst, informally. Only in the test scoring were they not included at all and this was because we bought a package of software to accomplish this job. But in most cases they were very actively expressing what they felt they needed."

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Respondent #2:

"In some cases, yes, but the variety of functions discussed and their implementation over time makes it difficult to be very specific."

Respondent #3:

"Basically our concept is to involve the executive. All of the applications we have discussed did so. The limitation to executive involvement relates to the executive's available time."

Respondent #4:

"In order to illustrate this, let me describe a recent implementation project. For the past twenty years, we have been doing our payroll in house and by hand. A year ago the school division began meeting with city data processing personnel. That period of time allowed for considerable exchange in the development of an automated payroll system proposal. Available software for doing this job was reviewed and time was spent to design a system that would fit the needs of the division, as well as matching the available resources from the city's and school division's staffs. Potential users of the system served on this committee and had ample opportunity to discuss their interests and perceived needs."

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Respondent #5:

"Generally, yes, however, in some systems, executives have assigned someone who is closer to the line responsibility for that system to develop and conduct the needs assessment."

Respondent #6:

"A standardized process requires future users to participate in the development of all systems."

Respondent #7:

"This is a working practice. It is a practice for systems that will be used by individuals or groups."

Respondent #8:

"Yes, a procedure is in place for executive participation."

Respondent #9:

"In almost every case the executive was involved in needs assessment, in some cases the need was identified by the executive requesting the automated support. Typically, a manager needs support with something and requests that data processing supports and assists him or her."

Question b. Did the executive meet with the planner(s) to express his preceived needs and interests for information?

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Respondent #1:

"Yes, the executive or administrator meets with the analysts."

Respondent #2:

"This has occurred, but it is inconsistent."

Respondent #3:

"A formal committee process insures that this takes place."

Respondent #4:

"The committee analyzes the needs of the potential users."

Respondent #5:

"An example of this would be the personnel payroll. The need was identified by that department, the specifications were designed by the department personnel that would be using the program."

Respondent #6:

"An extensive operational procedure includes this interaction as typical practice and actually goes beyond simply allowing it, it requries it."

Respondent #7:

"Yes, an ongoing data processing committee is used to screen all requests for new programs. This committee process includes interactions between users and planners."

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Respondent #8:

"Yes, this is done with a view towards total involvement."

Respondent #9:

"Generally, yes, the division's leadership is so structured that this is a coming trend."

Question c. During the time that software was being developed, was the executive consulted to discuss progress or problems with meeting his informational needs?

Respondent #1:

"During software development the analyst, provided by the city, and the school board personnel, continuously interact."

Respondent #2:

"This is a policy of our operations. We always do so."

Respondent #3:

"This is a part of our procedure and is consistently done."

Respondent #4:

"Continuous interactions assure this will take place."

Respondent #5:

"Regular communication is built into the process."

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Respondent #6:

"This exchange will happen several times during the process of development and includes the user trying out the proposed software prior to its final implementation."

Respondent #7:

"An ongoing process."

Respondent #8:

"A formal written report is produced with the potential user."

Respondent #9:

"Yes, there is feedback with the opportunity to indicate what is working and what is not."

Question d. Since implementation, has the executive/user been asked to express his level of satisfaction with the computer support?

Respondent #1:

"This is done informally, but with regularity. The city data processing department offers training classes for the operation of software that is generally used and preferred. This includes word processing programs."

Respondent #2:

"Yes, somewhat inconsistently. Informally reactions usually occur, formally, it is less frequent."

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Respondent #3:

"Not formally done, but we touch base informally. And often executives will be outspoken about the programs."

Respondent #4:

"Follow up evaluation is standard."

Respondent #5:

"Users frequently respond to show their level of satisfaction."

Respondent #6:

"Again, this is a part of a process that is structured to seek efficiency and valuing of the programs produced."

Respondent #7:

"Probably not."

Respondent #8:

"Users are required to produce a written report after implementation."

Respondent #9:

"At this time such follow up is informal, but formal planning is on the way."

Question e. Does the executive regularly use the support provided by the computer application?

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Respondent #1:

"Yes, there is good support and cooperation between the city and school division which insures usage."

Respondent #2:

"The trend is toward more executive demand for automated support."

Respondent #3:

"In most cases it is used. Data processing would like to increase the level of executive use. The report is required for the executive to complete his task."

Respondent #4:

"As long as a program is 'live', its regular use is assured."

Respondent #5:

"The County data processing department does the program's development. Many personal computers are coming into use and use is frequent."

Respondent #6:

"Generally use is high due to the match between need and available programs. If a program is not used, this is indicated by an automated monitoring of usage, it is noted, an updating process offered the intended user and either considered usable or discarded."

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Respondent #7:

"Yes, with the qualification that any unused 'stuff' is deleted. To this point no systematic approach is used to assess use."

Respondent #8:

"Yes, this is monitored by written reports produced by the user from data provided by the data based management system."

Respondent #9:

"For those functions that we rated as highly important/ highly used, we would say the usage is high. In fact they are so vital to the executive/user's job that they both use and depend on those reports. Newly developed programs requiring people to begin using automated support may result in less frequency of use."

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