A STUDY OF JOB-RELATED COMPETENCIES USED

BY INFORMATION SYSTEMS ANALYSTS

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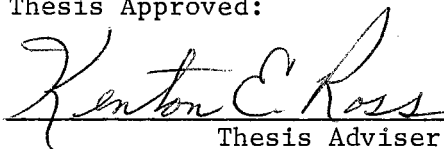
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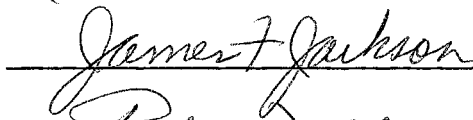
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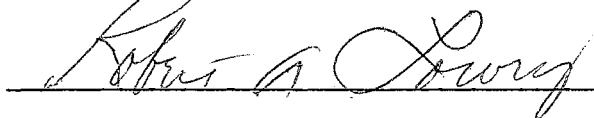Thesis Approved:
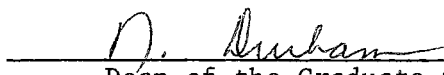
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CHAPTER I

THE NATURE OF THE PROBLEM

Background of the Study

The introduction of the computer shortly after World War II may

be looked at in retrospect as the beginning of the Second Industrial

Revolution--a revolution that affects every segment of the business

organization from the very structure of the organization itself to

the factory production line and to the office. Simon (1967), in an

address given in December 1966 to the Industrial Relations Research

Association meeting in San Francisco, California, stated:

> Now that we have perhaps achieved some understanding of
> the First Industrial Revolution--the revolution of power--
> we are already in the midst of the Second--the revolution
> in the processing of information (p. 21).

The electronic "monster" with an insatiable appetite for raw

data has caused the business organization to take a closer look at

the way its various functional areas work together to use the potential

of this "monster." Equally significant in prompting the business

organization to take a more careful look at its traditionally func-

tional way of processing information has been a development in manage-

ment science.

Forrester (1958), in a study supported by the Sloan Research

Fund of the School of Industrial Management at Massachusetts Institute

of Technology and the Ford Foundation, expressed the relationship

between management science and data processing when he wrote:

> The new management concepts will rest in part on recent
> advances in the data-processing industry, in part on
> military research (which has given us an improved under-
> standing of decision making and experience in analyzing
> and simulating the characteristics of complex systems),
> and largely on 20 years of research in information-
> feedback systems (p. 38).

Forrester is referring to the science of management that conceives of the business organization as a social system with many subsystems all interrelated and interacting in order to best attain the objectives of the organization. This concept of the business organization as a system together with the computer as a tool has created a new technology in the processing of information. The new technology conceives of a network or flow of information from which ". . . each level of management in each function will obtain all the pertinent information necessary at the time when it is needed" (Cisler, 1965, p. 19).

Again and again management reiterates that one of the biggest problems it must deal with is that of information--or lack of information. The comments of Cisler (1965) are typical of those made in numerous firms: "One of our most difficult problems is to obtain enough appropriate information, at the time, for the right people, and in an efficient format, so that effective decisions can be made" (p. 17). Many companies, realizing the importance of information flow technology, have created special departments such as the one at Detroit Edison in which "the department has a staff function in the planning, designing, coordinating and follow-up on administrative systems and procedures" (Cisler, 1965, p. 18).

As might be expected, there has been a great deal of interest and activity in many organizations concerning the function of this new

kind of department. In 1956, the National Board of the Systems and

Procedures Association released a statement which described the range

of the systems department as follows:

> Systems work is defined as a professional type of staff
> work concerning the research, analysis, development,
> problem solving, and assistance to management in the
> following areas:
>
> 1. Organizational analysis and planning
>
> 2. Analysis, simplification, or establishment
>   of operating systems and procedures
>
> 3. Work simplification
>
> 4. Time and motion study and incentives, usually
>   in the clerical or "office" areas
>
> 5. Procedure and manual writing
>
> 6. Records management
>
> 7. Space and facility planning and control of
>   utilization
>
> 8. Report analysis and control
>
> 9. Equipment evaluation and selection; standardi-
>   zation (Systems and Procedures Association,
>   1956, p. 1).

The new staff departments which have been created to carry out

such functions are known by various titles such as Systems and Proce-

dures, Administrative Systems, Management Information Services, Methods

and Data Processing, Information Systems Development, and others. The

creation of these new departments was an evolutionary process that

developed as the need for avoiding duplication of effort in the various

parts of the organization became more apparent with increased use of

the computer.

The preparation of information to be processed by a computer

calls for very detailed analysis of the systems and procedures being

used. This type of analysis means that incoming information, input, is traced through the firm as it is used by the various departments and is followed to its disposal. The careful scrutiny necessitated by the computer adaptation has such beneficial effects in helping to show up areas of duplication, gaps in information, and similarity of information needs that the value of systems analysis is recognized for reasons other than adaptation to a computer.

The person who does systems analysis is identified by many different titles just as the department he works in is known by a variety of titles. Zubryd (1966), a management consultant, uses a general term, "systems man," and describes him alternately as ". . . an analyst, salesman, innovator, someone with the ability to express his ideas orally and in writing" (p. 18).

Whatever he is called, management considers the systems specialist a top-level staff man who is much in demand. James (1963), indicates the nature of the demand thus:

> The essential problem today is to develop professionals
> in the field of systems and data processing who can
> recognize the capabilities of the latest electronic
> equipment and of the techniques which they make possible
> and can translate these capabilities into programs which
> a company can use to improve the management of human and
> materials resources (p. 41).

Some idea of the shortage of such people is suggested by a letter written to the Systems and Procedures Association by Hayes (1967) who notes that in 1965 he thought "piracy" would be the answer for the next three to five years since industry could not wait for the campus "education" process; and that even now, two and one-half years later, the lack of systems educated personnel is one of the most restrictive factors in the development of modern management.

The Problem

The problem with which this study is concerned is the identification of the competencies which the information systems analyst uses in the performance of his job. The competencies which are identified are the task-related skills and knowledges thought to be important by the systems specialist actively engaged in systems analysis. The study also seeks to determine the essentiality of the competencies to the job performance now and five years in the future.

The study is further concerned with the way in which the competencies are affected by organizational variables and individual attributes. The organizational variables investigated are the size of the organization and the position assigned by the organization. The individual attributes investigated are the formal education of the information systems analyst and his years of experience in systems work.

Significance of the Study

It is believed that this research has significance for the educational community as it seeks to be responsive to the need of its citizens for preparation for useful work. The reports by Gordon-Howell (1959) and Pierson (1959) support the idea that higher education should prepare a man to do useful and remunerative work; however, they attack narrow vocational objectives as failing to prepare young people to do the most useful, or the most remunerative work of which they are capable (Silk, 1960).

If education for business is to serve both its students and the

business community, there is need for research to increase empirical knowledge of prevailing business behavior and needs in order to reach some fruitful generalizations and to avoid overspecialization and over-fragmentation of the curriculum.

Sample, Scope, and Method

A ten percent random sample was drawn from the national membership of the Association for Systems Management (formerly Systems and Procedures Association). The Association selected the sample in accordance with the researcher's suggestions since the Association's policy does not permit release of such a membership list. A large sample was drawn because it was not known how many persons would fit the requirement of the study that at least half or more of the job assignment be devoted to systems activities as defined in the study instrument. Seven hundred seventeen persons were mailed the materials used in this investigation.

The data-gathering instrument for this study was a four-page questionnaire developed as an outgrowth of examination of other questionnaires, suggestions from employed systems analysts, and original ideas. The cooperation accorded the inquiry demonstrates wide interest and professional courtesy among the respondents.

Statistical analyses, described in Chapter III, were made of the data collected by the study instrument and were used to test the hypotheses. Measurements involving percentages and frequency counts were used to highlight the descriptive data.

Limitations of the Study

It is to be expected that a study of persons who are actually carrying out the functions of information systems analysts may show some bias. Nevertheless, those persons who are actually performing systems analysis work are better able than anyone else to know the scope of their work and to assess the competencies needed to satisfactorily perform the job.

This study may be limited because the sample, drawn from the national membership list of the Association for Systems Management, does not directly represent information systems analysts who are not members of this Association. Certain generalizations and implications of the study should be considered in relation to any influence that may have resulted from this restriction in the source of the sample.

Reporting the Study

This study is designed to identify the competencies which the information systems analyst uses in the performance of his job and to determine those competencies which are thought to be most important. Two parallel complex hypotheses will be tested relating to organizational variables and individual attributes.

Chapter II reviews the literature related to the study to provide background information and a basis for comparative data in interpreting the findings.

Chapter III elaborates on the design of the study, describing the instrument developed for gathering data and the procedures used in analyzing data and testing hypotheses.

Chapter IV sketches descriptive information about the population of respondents and develops a profile of the information systems analyst.

Chapter V reports the rankings of competencies thought to be important by the analysts and notes the changes of direction from the present to the future.

Chapter VI presents findings from testing the two parallel complex hypotheses.

Chapter VII summarizes major findings and conclusions. It also suggests implications and possibilities for further research.

CHAPTER II

A SURVEY OF THE LITERATURE

This study concerns the competencies important for organizational
personnel identified in this study as information systems analysts.
They are responsible for the function of supporting, facilitating, and
directing optimal flows of information in the organization. The review
of literature on areas pertinent to this inquiry concerns (1) changing
organizations and their adaptation to conflict through the development
of classical, neoclassical, and modern organization theories of manage-
ment and (2) changing personnel, as an adaptation to complexity, with
their functions delineated as the office or administrative specialist,
the computer or data processing specialist, and the information systems
generalist as a specialist.

Changing Organizations--Adaptation to Conflict

Over time, various forces have made it necessary for organiza-
tions to adapt to changes required for their survival and growth. A
review of these forces may help bring into sharper focus the emergence
of organizational personnel defined in this study as information systems
analysts.

The Social Science of Organizations

In recent years, organization theory has recognized the

commonality of organizations as social units or human groupings delib-
erately constructed and reconstructed to seek specific goals (Parsons,
1960). Etzioni (1964) notes that such a grouping includes corporations,
armies, schools, hospitals, churches, and prisons; while tribes,
classes, ethnic groups, friendship groups, and families are excluded.
Katz and Kahn (1966) state that

> . . . societies in their very nature represent organized
> groupings of people whose activities are institutionally
> channeled. . . .The individual in the modern western
> world spends the greater part of his waking hours in
> organizations and institutional settings (p. 1).

Organizations are not a modern contrivance; yet the deliberate
use of the categorical term, "organization," is modern--a part of an
organized approach to building a social science of organizations that
will emphasize similarities among disciplines such as economics,
psychology and others. Strother (1963) believes that the approach
should be "multidisciplinary, integrating what is appropriate from
each discipline" rather than interdisciplinary, which seems to imply
"something falling between the disciplines" (p. 35).

Leavitt (1963) feels that in a society where organizations play
such a large role, it is important to understand how organizations
operate so that their efficiency and productivity, as well as their
influence on values, ideals, and human personality, may be evaluated.
He further suggests:

> It is important that we do not fear to widen our reach
> in illuminating organizational processes; but it is
> equally important that we reach with sound methods
> and acquire reliable facts (p. 179).

The Concept of Management

Just as the organization is not a modern invention, neither is

the manager nor a plan for managing. It follows as a natural corollary

or assumption that if there is an organization, there is need for

managerial leadership to accomplish the organization's objectives.

This is true whether one refers to the tightly-knit, owner-dominated

small business enterprise or the huge monolithic corporation. In the

latter, however, the management job would necessarily be sliced

(Longenecker, 1969) into any number of vertical levels with differences

in activities and focus and corresponding differences in titles and

functions. Yet there are some similarities in the activities of all

types of managers as they seek to secure and to regulate the contribu-

tions of individuals toward achievement of the organization's objec-

tives. In all types of organizations--businesses, hospitals, schools,

government, and others--the need exists for management to synchronize

specialized activities.

The problems and complexities of management have greatly increased

during the centuries of its history, but not until the last century--

indeed the last few decades, and especially the last decade--has there

been a systematic analysis of management with its resultant theories,

practices and philosophies.

Overview of Management Theory

To develop a sense of perspective, attention is directed in this

section to three major "schools" of management theory or thought that

are pertinent to this study.

Classical Theory of Organization. Associated with the Industrial

Revolution and its new forms of shop and factory technology is a con-

comitant theory of management labeled rather arbitrarily by management

theorists as the classical school of organization theory (Scott, 1967; Koontz, 1964; Dale, 1967; and many others). The four pillars around which such a theory is built are well known to students of management: the division of labor; the scalar and functional processes; structure such as line and staff; and the span of control concept. Also associated with the classical school is the revolutionary concept of management fathered by Frederick W. Taylor and known as scientific management or "the analysis of work into its simplest elements and the systematic improvement of the worker's performance of each of these elements" (Drucker, 1954, p. 280). Taylor believed that enormous gains in efficiency could be achieved by substituting scientific for rule-of-thumb methods, thus "benefitting the worker with higher wages and the employer with lower labor costs" (Carzo and Yanouzas, 1967, p. 26). Despite the fact that "management was thus to a great extent ahuman, even it has been argued, inhuman," scientific management grew and prospered (Leavitt, 1965, p. 1149). Leavitt comments: "For in creating the separate planning specialist, it removed planning from its old location, the head of the doer of work, leaving him only the physical labor" (p. 1149).

Neoclassical Theory of Organization. The neoclassical school of organization is commonly identified with the human relations movement which very largely is a reaction to or a compensation for the deficiencies found in the classical doctrine or school--the deprivation of job satisfaction for the workers and the violation of their dignity. Scott (1961) believes that the Hawthorne studies, conceived by Mayo and his team, were the inspiration of the neoclassical school. These

studies reveal that social and human factors in the place of work were often much more important than physical factors in increasing productivity. Even though there have been certain extremes associated with the human relations movement, the work of Mayo and others has made it impossible to ignore the needs and motivations of men at work (Longenecker, 1969). Dale (1967) comments that research shows that organizations have tended to move away from the mechanistic point of view toward the view that the organization is a social system. Dale (1967) feels that:

> Overemphasis on the goals of the enterprise without
> sufficient attention to those of its individual
> members is believed to lead to a loss of morale and
> of motivation to produce that will, in the end,
> hamper efforts to reach the goals of the organization
> itself (p. 220).

Modern Theory of Organization. The rather arbitrary labeling of management theories as classical or neoclassical does not take into account the nuances of various writers and researchers. The same is true with the school labeled modern organization theory, where the prevailing emphasis seems to be concerned with systems theory. General systems theory is an interdisciplinary approach to understanding organization as a system of mutually dependent parts or variables (e.g., atoms, stars, switches, springs, wires, etc.) In similar fashion, modern organization theory, an element of general systems theory, considers a social organization as a system within a broader, more inclusive system--society itself. Both theories plan their study of organization around:

    (1)   the parts (individuals) in aggregates, and the
           movement of individuals into and out of the
           system.

(2) the interaction of individuals with the environment found in the system.

(3) the interactions among individuals in the system.

(4) general growth and stability problems of systems. (Scott, 1967, p. 28)

Fundamental to the successful functioning of the parts of the business organization as a system are the interrelated and coordinated linking concepts of (1) communication or information, (2) decision making, and (3) balance. Communication or information in its various forms--electronic impulses, written or spoken words, informal or formal reports--provides the basic ingredient for decision making (Johnson, Kast, and Rosenzweig, 1967). Katz and Kahn (1966) warn that communication

. . . needs to be seen not as a process occurring between any sender of messages and any potential recipient, but in relation to the social system in which it occurs and the particular function it performs in that system (p. 234).

The remaining linking concept, that of balance or cybernetics, is implied with communication and decision making. Cybernetics, with its principles of feedback and control, is the synthesizing term applied to the regulating or balancing process that preserves the integrity of the system, yet recognizes the various inputs or flows--information, energy (men and/or machines), and materials.

Thus, essentially, modern organization theory proposes that management's job is to understand the organization as a complex system composed of many diverse parts that must be brought together into an integrated whole working toward accomplishment of organizational goals.

Conclusions Concerning Organizations

This section has sought to give an overview of findings in the literature which reveal all types of organizations to be social systems organized for the attainment of certain goals. They are guided in the attainment of those goals by certain management concepts or theories, changing over time. The Industrial Revolution, in reality, spawned the traditional or classic theory of organization with its emphasis on the mechanical efficiency of the organization's separate tasks or operational units. Although many valuable techniques characterized the application of this theory and are still operative, its concept of man as a machine brought a reaction typified by the human relations or neoclassical theory of organization. This theory placed greater emphasis upon social and personal needs of organization members, thus bringing to the forefront the concept of the organization as a social system encompassing individuals, formal structure, and intergroup relationships. Over time, excessive emphasis on human relations--even to the sacrifice of efficiency and profitability--encouraged modern organization theory. This theory emphasizes that the organization is a system of mutually dependent parts or variables functioning as a subsystem within the larger system of society, and even the universe itself. Particular attention is accorded the coordinating or linking system of communication.

The vast organizational modifications occurring since the turn of the century and summarized here have taken place within the bureaucratic form of organization, but a number of writers and researchers seem to feel that organizations are in ferment and that structural

changes in organization may occur (Bennis, 1966; Katz and Kahn, 1966; Leavitt, 1965; and McFarland, 1967).

The primary concern of this research is with organizational changes that have extended or strengthened the scope of management, calling for increased attention to the role of systems analysis.

Changing Personnel--Adaptation to Complexity

The growing complexity of organizations has resulted in concomitant changes in personnel. A useful way of looking at organizational change is delineated by Leavitt (1965) who posits four major interacting variables--task, structural, technological, and human. (See Figure 1). It is suggested that a change in any one of the variables causes a compensatory change in others. Accordingly, the Industrial Revolution, with its changing machine technology and scientific management theory brought a need for new organizational personnel--specialists and their "tools." Leavitt (1965) describes scientific management as spreading and flourishing

> . . . until no self-respecting manufacturing firm was
> without the paraphernalia of Scientific Management:
> time-study men, methods engineers, work standards,
> piece rates, job-classification schemes, and more (p. 1149).

Similarly, the neoclassical or human relations school, emphasizing small group interaction, brought new specialists--personnel managers, counselors, and others. McFarland (1967) notes that personnel managers "really went for a body of knowledge"--small group psychology, sensitivity training, and others--and sold their wares to top, middle, and supervisory management as the route to greater productivity and efficiency.

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                    │                 │
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                    │                 │
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         ↙↗                              ↖↘

┌─────────────────┐                      ┌─────────────────┐
│                 │                      │                 │
│      TASK       │                      │   TECHNOLOGY    │
│                 │                      │                 │
└─────────────────┘                      └─────────────────┘
         ↖↘                              ↙↗
                    ┌─────────────────┐
                    │                 │
                    │ PEOPLE (ACTORS) │
                    │                 │
                    └─────────────────┘
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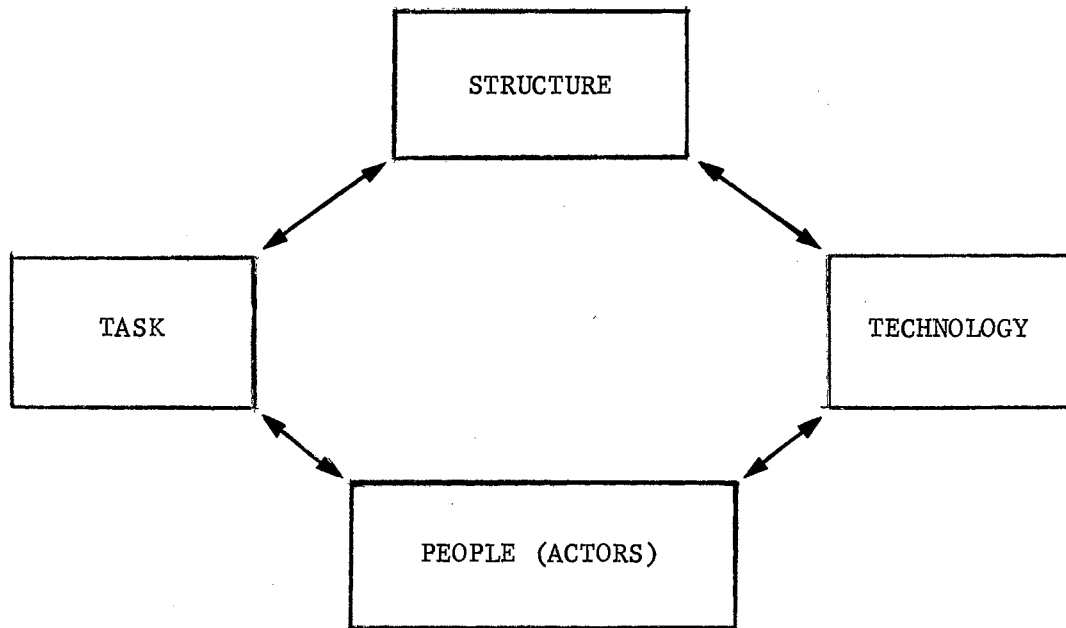
Figure 1.   Interacting Variables That Influence Change in
              Complex Business Organizations

Source: Leavitt, Harold J. "Applied Organizational Change in
            Industry: Structural, Technological and Humanistic
            Approaches." Handbook of Organizations. Edited by
            James G. March. Chicago: Rand McNally and Company,
            1965, p. 1145.

with its new technological tool, the computer, and based on systems

theory of organization and management, brought a need for new organi-

zational personnel and an extension or modification of duties for

others.

Some of the changing organizational personnel needed for adapta-

tion to increasing complexities of organizations concern the roles of

the office or administrative specialist, the computer or data processing

specialist, and the information systems generalist as a specialist.

The Office or Administrative Specialist. The office, long recog-

nized as a place and a function that supplies information for management

decision making, has been described as the "fountainhead of information."

It is not surprising that the tremendous growth in the production of

goods and services, spurred by progressive mechanization in the fac-

tories, has brought a continuing increase in paper and office work.

Not surprising either is the application of Taylor's "scientific

methods" to the office as man has attempted to cope with the flood of

paper work. For several decades there has been a continuous parade of

new office machines designed to accomplish office work more effi-

ciently--and the pace is quickening. Computers are making deep modifi-

cations in office methodology, and it seems that they are destined to

cause even greater changes in the future. Because of the computer,

systems and procedures, closely linked in concept with scientific

management, have become increasingly vital to office methodology.

Although the use of systems and procedures in the office is not new,

recognition of their use and necessity through the systems viewpoint is

modern, inclusive, and extremely effective. It seems that the systems

concept, including systems and procedures, is a natural outgrowth of

having equipment available which can unify office operations among all

departments and integrate the data processing efforts among the tradi-

tionally functional divisions of an enterprise (Terry, 1966; Levin, 1956).

Thus, it appears that the role of the office is changing, prodded

by increasing technology in both the factory and the office. This

change is corroborated by Sims (1963), who examined the business litera-

ture of both the nineteenth and twentieth centuries and also interviewed

management personnel. He concludes that by the application of techno-

logical improvements--computers, integrated data processing, and systems

analysis--the office function has become the nerve center for giving

management the data and information it needs for closer control, better

planning, and better functional relationships. He also determined that

the organizational effect, in terms of both external and internal influ-

ences, gives the office function a much greater scope with correspond-

ingly greater opportunity, authority, and responsibility for the office

executive. Sims identifies these greater responsibilities as:

   (1) Establish the programs, practices and procedures,
        of the department in conformance with the company's
        general policy; direct the planning and subsequent
        operation of the data-processing system centers
        that may be established; and exercise functional
        activities in the branches.

   (2) Interpret, direct, and implement the company's
        general policy for office administration, building
        maintenance, printing and supplies, and general
        service operations.

   (3) Administer the staff responsibility for management
        improvement through systems and procedures and
        management research activities (p. 56-7).

The responsibilities identified by Sims seem to represent quite

a change from those found by Dvorak (1951), although there are, of

course, similarities. Dvorak was concerned with the abilities,

knowledges, skills, attitudes, and conditions that 58 office management executives used in performing their duties. Noticeably missing is any mention of data-processing systems, but included are items like "plan and schedule office work" and "foresee future developments."

More recently, Benson (1966) analyzed the role of the office manager in a group of Minnesota firms that were utilizing electronic data processing systems. He, too, found indications that the office is in transition and that in some firms the role of office management encompasses and directs, as an integrated whole, the total information and communications activity of the company. Benson found, however, that most firms do not generally consider the office manager as the one individual responsible for coordinating all data handling activities within the organization, nor is the office generally regarded as the integrating function for the total information system. Nevertheless, he concludes that administrative management, with its associated concept of centralization and consolidation of all information-handling activities within the enterprise (with the possible exception of accounting), has emerged as a top level functional position.

Other citations regarding transition in the role of office specialists include Kleinschrod (1964), who describes the administrative or office manager as

> . . . nearing the juncture of new technological tribu-
> taries . . . bringing an informational, communicational
> service rather different from what has gone before. He
> is developing it out of the very systems and machines he
> commands, with an eye on others to come (p. 25).

More recently, Lemasters and Stead (1968) have recognized the emergence of the area of administrative office management, noting that until the early 1950's, office administration was limited mainly to

manual and basic mechanical methods of communicating, accounting, and record keeping, with an office manager in charge in some cases. As computer technology prompted new dimensions for business information processing and the uses of the information, a new type of office management and office manager was needed. It appears that company organization charts have begun to show the importance of administrative office management by recognizing it as an area comparable to the sales, production, finance, and personnel areas rather than as an adjunct to finance. The authors also suggest that examples of positions lying within the realm of administrative office services are director of programming, systems analyst, director of office services, and records manager.

Clearly, there is a transition in the role of the office manager--changing in the face of increasing technology--yet the extent of the change is muddled.

The Computer or Data Processing Specialist. Because computer technology in the office is causing so many changes in functions of office personnel, Frisbie (1961) recommends that colleges give broad training to students preparing to be office managers or accountants. She urges, however, that with changes still taking place in programming methods, double care be taken before changing the college curriculum to include forms of higher mathematics. Basic work in statistics in the use of assumptions is recommended to give office management and business students the opportunity to use quantitative data to promote proficiency in decision making and should be integrated into accounting, finance, marketing, reports, and various management areas.

Spaniol (1967) studied the functions and preparation of a particular group of electronic data processing personnel--business systems

analysts--and found them to be persons with at least some college train-

ing. He indicates that a college degree is a forthcoming requirement

for electronic data processing analysts and recommends that all business

students should be knowledgeable in the concepts of systems analysis as

they relate to management control and information systems. The most

appropriate undergraduate college major for future electronic data

processing systems analysts was determined to be business administration

with three areas of concentration implicated most strongly--a combina-

tion of office management and data processing, accounting, and manage-

ment. It is thought that accounting as an area of concentration would

better prepare the future analyst since accounting applications often

comprise a large share of computer work. Four courses in electronic

data processing are considered adequate for preparation in this area:

Fundamentals of Data Processing for Business, Digital Computer Program-

ming, Business Systems Analysis, and Applications of Operations Research.

In a study by Hallam (1965), great concern was expressed by

business educators for research in the field of automation and data

processing in order to determine curriculum and course content.

The Information Systems Generalist as a Specialist. The cross

fertilization that has taken place between the office specialist and

the computer specialist has resulted in a newly designated specialist

who seems to be a generalist in his preparation--the information

systems specialist. "Because the old order of office management was

not adequate to the needs and orientation of executive management

today," Bradburd (1964) presages its passing and the coming of a new

type of information processing management brought about by systems

changes--of electronics, integrated data processing, and the total

systems concept." The new manager of such a service is described as being "knowledgeable . . . in the older basic skills, including motivation and human relations . . . but with a greater depth of knowledge in technical and conceptual skills . . . rarely found in the office manager a decade ago." The technical skills are identified as complex quantitative analysis skills of statistics, operations research techniques and information theory. The conceptual skills are identified as the ability "to visualize and understand present and potential relationships . . . between the administrative and all operating functions of the business." One of these conceptual skills is concerned with the effective utilization of an increasing "array of hardware and techniques to process data more rapidly and more automatically." The new information function is especially significant because the way in which information is organized and processed provides "the key to the intelligence with which executives can manage their functions" (Bradburd, 1964, p. 14). The increasing importance of the new information function is noted by more impressive job titles, such as "Vice-President of Information," "Manager of Administrative Services," "Manager of Information and Communication," "Director of Intelligence Services," and others.

The divergence in job titles may represent a lack of agreement among firms as to the responsibilities of the new information processing departments and the nature of their function. This may account for the conflicting predictions and generalizations found in the readings about the far-reaching effects of information technology on the routinism or elimination of middle management positions, the flatter organization, and the recentralization of control. Whisler (1965) believes it is

too soon in most organizations to properly focus the picture. He asks, "How can you tell if jobs will be routine if people are still cutting, fitting, and trying to get the 'new' jobs effectively designed?" (p. 29)

Evidences of the cutting and fitting process regarding the information systems function are found in studying the literature. One early study was made by Thurston (1959) and concerned the new systems responsibilities in thirty-two completed projects from six companies. The range of systems work generally fell within the scope described by the Systems and Procedures Association (1956), presented in Chapter I, page 3 of this study. The most important qualifications for leadership responsibility for systems work were determined to be motivation; knowledge of goals, ability to interpret them and to judge prospective change within these goals; and ability to work with people to effect changes. The most effective approach to systems work is recommended as that in which specialists and operating people share both the planning and installation of the projects, "yet one in which leadership responsibility for execution rests with operating people" (p. 110).

A two-volume publication designed for use in a college curriculum for systems work was issued by the Systems and Procedures Association (1963). The publication, a culmination of a three-year research and development project, offers chapters written by various practicing systems personnel and stresses many phases, tools, and techniques of the systems field within an overall conceptual systems framework. Included are suggestions for performing a systems analysis, selling and installing the system, forms control, work simplification, and others. Also included are discussions of mechanical and electronic data processing equipment for achieving an integrated information

system. The functions of the analyst as presented represent a melding of responsibilities for an office manager and a data processing manager.

A staff member at the University of Michigan, after personally interviewing 100 analysts in over 70 organizations, reported that the function of systems specialists was most often found as an adjunct or outgrowth of accounting with the systems manager reporting to the controller (Place, 1964). Recognition of a broader function for systems specialists was noted in some instances by inclusion of the information function in the newer administrative services area. Although a "wait-and-see" attitude was prevalent among the analysts regarding the importance of new mathematical concepts for decision making, a few analysts were attempting to assess the business horizon by reading books on statistics and operations research. When the analysts were queried about the knowledges and characteristics needed by a systems analyst, their replies correlated closely with the qualifications set forth by the Systems and Procedures Association (1956) and corroborated by Thurston (1959). Noticeably lacking, however, was the expressed need for "procedure writing, forms design, work simplification, work measurement, and records management" (Place, 1964, p. 120).

What the last few years have lacked in research studies concerning systems responsibilities has been more than equalized by the proliferation of books and articles about systems and the systems concept. Indeed, it has been deplored by some (Scott, 1961; Leavitt, 1965) that systems emphasis has almost succeeded in achieving the status of a fad, similar to the popularization and exploitation that contributed to the disrepute into which human relations theory has fallen.

Out of the welter of systems materials, a few generalizations can be gleaned. One generalization concerns the production of profound changes in all human activity wherever information and its uses occur. The automation of information processing is destined to be of far greater significance than the first superficial assessment indicated-- that it was primarily a change in office and manufacturing methods (Diebold, 1962; Leavitt and Whisler, 1958).

Some of the needed terminology or jargon, now so freely applied to the new concepts of business systems, is defined in terms of flows. Forrester (1958) explained the business system as one "in which flows of information, materials, manpower, capital equipment and money set up forces that determine the basic tendencies towards growth, fluctuation and decline" (p. 52). Intimately associated with the concept of flows is the concept of feedback or cybernetics, which opens new doors for understanding social systems and the business organization in particular (Forrester, 1968). "Flows" and "cybernetics" introduce the principle of management by exception--that is, directing management's attention only to performance which is off-target according to established criteria (Tuthill, 1966).

It seems that many companies have been afflicted with "electronic computeritis"--the early signs of which may be detected by an undue preoccupation with how data will be processed and the characteristics of the hardware (Konvalinka and Trentin, 1965). Treatment for this situation is recommended as the determination of the kind of information that is needed--how soon and how often. Only then should the important consideration of kind of equipment be weighed (Konvalinka and Trentin, 1965; Daniel, 1961; Dearden and McFarlan, 1966; McDonough and Garrett,

1965; and others). The justification for a large "figure factory" should depend on the size and nature of the business operation rather than on the enigmatic desire for a "status symbol." The computer system is not necessarily synonymous with a management information system per se (Konvalinka and Trentin, 1965).

Accounting facts supply much of the information on which a so-called common data base is constructed. The data base paved the way for the earliest computer applications of the more routine business transactions, mostly in accounting--payroll, billing, and purchasing (Simon, 1967; Daniel, 1961; Dearden and McFarlan, 1966; and others). In these applications, the computer proved itself to be such an insatiable giant tabulator that it was looked upon as a panacea for the continuing rise in clerical costs and information processing problems. In these rather mundane applications are found the prevalent "piecemeal" or "firefighting" approaches to information systems. Such disparate approaches are now recognized as providing management with very little in the way of the more meaningful information which it needs for effective decision making (Spaulding, 1964; Tuthill, 1966; Konvalinka and Trentin, 1965; and others). Determination of the kind of information that an executive wants or needs is often obscured by his habits of thinking that information is exclusively in accounting systems and the reports thus generated (Daniel, 1961).

When the rationale of providing information requirements to management is no longer merely clerical cost reduction, it appears that a higher order of systems planner or analyst is needed. This sort of specialist-generalist is identified as a professional who is not merely a theoretician, but one with profound understanding of the

"realities and subtleties of business operation and the technical
intricacies of management control and information systems . . . profes-
sional . . . but no narrow specialist" (Blumenthal, 1964, pp. 32-33).
Such a specialist is an expert, but unlike the traditional functional
specialist, he is a "superb generalist . . . a new breed of manager"
(Schoderbek and Schoderbek, 1965, pp. 35-36).

Recognition of the professionalism of the new breed of manager is
being hampered by lack of suitable delegation of responsibility placed
at a high planning level, divorced from the operating functions. As
previously noted, some managements are recognizing this new function
or profession and according it high status (Leavitt and Whisler, 1958).
"Top-flight" status is even indicated for the senior systems specialist
in the analogy calling him a "cabinet minister" in charge of developing
and maintaining a communications network (Brooker, 1965, p. 32).

It has been suggested that a systems man, functioning as both a
specialist and a generalist, "wears many hats" at different periods in
systems study--judge as he gathers and reviews pertinent data for
synthesizing, innovator as he studies relationships and determines
plans, and diplomat as he tries to convince management or other person-
nel of the feasibility of his plans (Zubryd, 1966; Schlosser, 1964).

Summary and Critique

The preceding review of the literature mirrors change--change in
the identification of the business firm as a social organization; change
in the theories of management of organizations; and change in the
structures of existing jobs and the creation of new ones.

To study the history of society is to study its organizations.

Modern civilization depends largely on organizations as the most ratio-
nal and efficient form of social groupings known. Business organiza-
tions, like all organizations, are recognized as social contrivances
deliberately structured for the purpose of attaining specific goals.
"Running an organization" is recognized as management, and the philos-
ophies which guide managers in their approaches to managing are recog-
nized as schools of management thought or theories of management.

Since organizations operate in changing environments and since
attitudes and motivations of people vary, management philosophies
necessarily must be adapted over time. The classical or traditional
theory of management views workers as motivated by economic rewards
and views the organization as characterized by efficient adaptation to
new technological tools. Partly as a reaction to this extreme emphasis
on efficiency at the sacrifice of human needs, the neoclassical or
human relations theory of management gained prominence. This theory
recognized the significance of leadership, small social groupings, and
participation--those things that are distinct from the organization
charts. It remained the task of another approach, modern organization
theory, to relate the concepts of efficiency and employee satisfaction
into a more complete and integrated organization. The systems concept,
with its emphasis on the interrelatedness of the organization and its
environment--tasks, individuals, technology, and communication--provides
such an approach.

Needs for organizational personnel are inextricably linked with
the goals, technology, and management theory of the organization,
varying over time as the organization attempts to adapt to the complex-
ities of changing internal and external requirements. Progressive

mechanization, in both the factory and the office, is responsible, in
part, for changes in the information or communication needs of the
business system and in the functions of persons ministering to the
information needs. The office, long recognized as the "fountainhead of
information," is in transition, assuming a greater scope in most firms
as continuing efforts are made to integrate the data processing efforts
among functional divisions of the business organization. The computer
is implicated as the "information change agent," bringing both benefits
and perplexities.

The resolution of some of the perplexities depends in part on
qualified organizational personnel who are at once conversant with
management information needs and the ways in which the information may
be supplied. Findings in the literature indicate recognition of such
a specialist, but the extent of his responsibilities and functions is
muddled. On the one hand, it seems as if the total information function
is assumed by a more enlightened traditional office specialist, while
on the other hand, it seems as if a computer specialist is most fre-
quently "given the nod." A proliferation of articles provides evidence
of the concern with which management views its need for the right
information for the most effective decision making. There is, however,
scant empirical evidence of the tasks, skills, or knowledges used by
information specialists. The Benson study implicates the office
specialist and the Spaniol study implicates the computer specialist.
Yet the readings in the literature indicate that the information
function in business organizations is assumed by a cross of the two
specialists, known variously as a systems man, systems analyst, or
information systems specialist. Additional inquiry is needed to

increase empirical knowledge of prevailing business behavior regarding

the competencies which the information specialist-generalist uses in

his staff position as an aide to management.

CHAPTER III

DESIGN OF THE STUDY

This study was designed to obtain data from a random sample of
persons actively participating in their organizations as systems
personnel. Data were obtained from the respondents regarding the
competencies they judged to be important in fulfilling the formal
task requirements of their jobs now and five years from now. Through
descriptive data obtained, it is possible to show percentage relation-
ships between organizational variables of industry, size, and assigned
systems function and respondents' salaries, years of college, degrees,
undergraduate majors, and methods of training. The descriptive data
are further used to build a profile of the systems man today. Some of
the data are used to test hypotheses concerning the competencies used
by systems personnel.

The present chapter elaborates on the research design by present-
ing a general paradigm, an interpretation of the paradigm depicting
the theoretical framework which is a basis for the study, and the
hypotheses to be tested. It also describes the study instrument used
to gather the data, and the various analyses made of the data to fulfill
the purposes of the study.

Paradigms of the Study

The paradigm in Figure 2 is a conception of the factors which
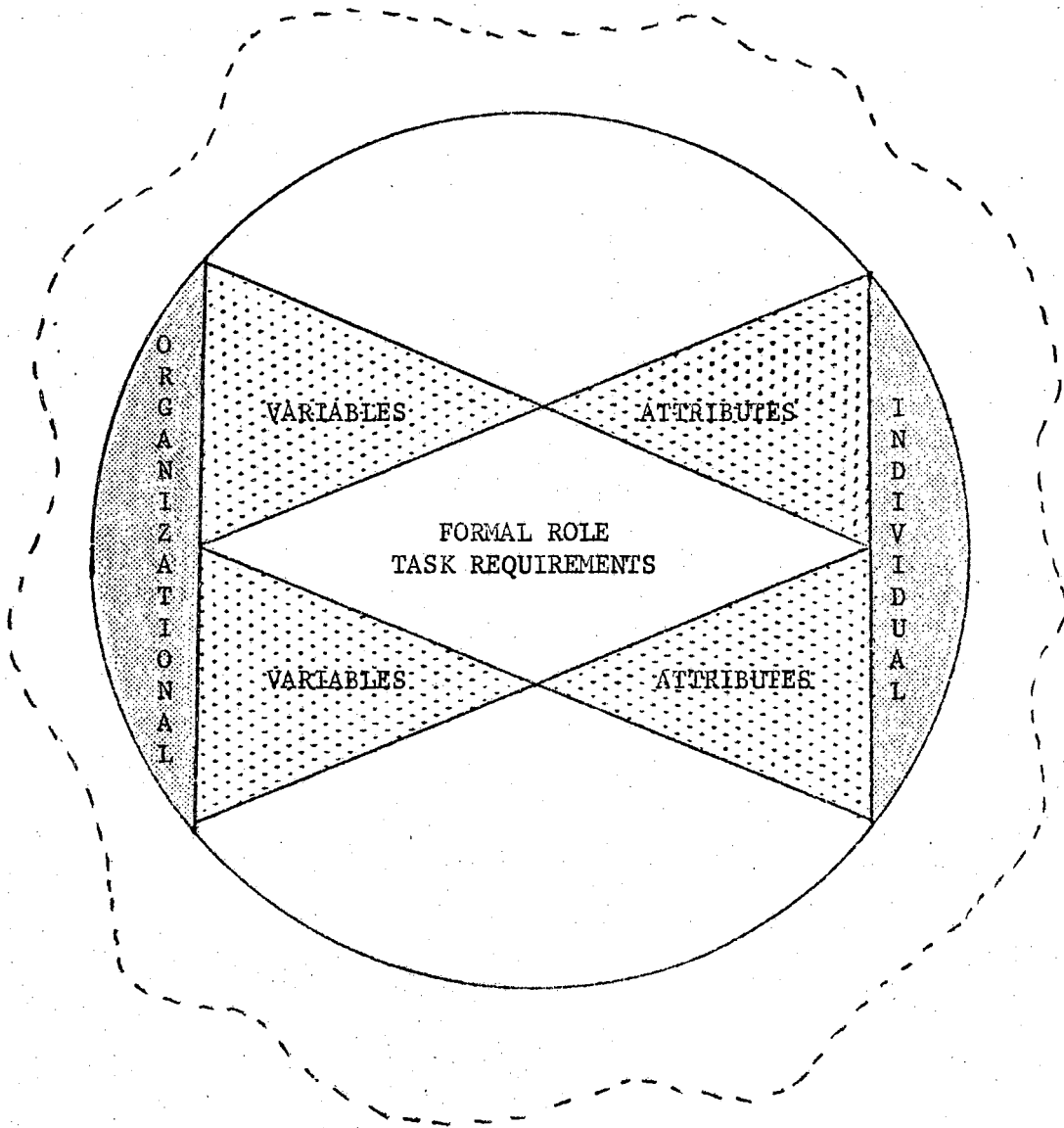
Figure 2. A Paradigm of Factors That Influence Organizational Roles

Operating within the boundary imposed by society and the cultural environment is the organization. Within this boundary, organizational variables and individual attributes interact to influence any organizational role.

influence the evolving roles of organizational personnel. Parsons
(1960) notes that all organizations have as their essential boundary
systems the institutional system or relations with the larger community
or society. The operation of any organization depends not only upon
product sales or services but also upon the support and legitimation
of its activities by the larger social structure. Business organiza-
tions are influenced by the federal government regarding policies and
practices on mergers, monopolies, minimum wage laws, tax regulations,
and fair labor employment practices among other things. Business
organizations must also relate to the general public regarding support
for private enterprise and types of restrictions on private power.

Since organizations do not exist in a static world, the surround-
ing environment is in a state of flux and is depicted by a broken
boundary line. Within this changing environment, the organization as
a system has certain enduring properties (Katz and Kahn, 1966) such as
the technology of the organization, the organizational structure, its
complexity, formal policies, rewards, and penalties which help to
determine organizational roles and role behavior.

Because the job has different significance for the organization
and for the individual, its definition must be the result of consensus
at any point in time (Thompson, 1967). Bakke (1953) speaks of this
interaction of the organization and the individual as "the fusion
process." Simon (1965) notes that the whole subject of job classifi-
cation is a variable depending upon the specifications of the employees
who are to fill the positions established by the organization and like-
wise the organizational structure is a variable depending for its form
upon the staffing of the agency.

The concept of role according to Etzioni (1961), Parsons (1960), Bakke (1953), Argyris (1964), Thompson (1961), and others seems to be an attempt to understand organizational behavior (job definitions) as circumscribed in part by organizational variables and individual attributes.

Figure 3 is an interpretation of the paradigm applicable to the formal role of the information systems analyst. It abstracts from probable organizational variables two for study--the size of the organization and the hierarchial position assigned to the particular systems person. From the individual's possible attributes are abstracted two for detailed study--formal education and years of systems experience. These four variables form the basis for the hypotheses regarding the competencies deemed most essential to the present performance of their jobs by the systems personnel in the sample. These four variables are also used as the basis for the hypotheses to assess differences in the job competencies judged essential five years in the future.

Theory of the Study

The following presentation of theory and its relation to this study is adapted from Daniel Katz and Robert L. Kahn's The Social Psychology of Organizations (1966) and James D. Thompson's Organizations in Action (1967).

1. PURPOSE: To identify competencies which information systems analysts judged important for the performance of their jobs.
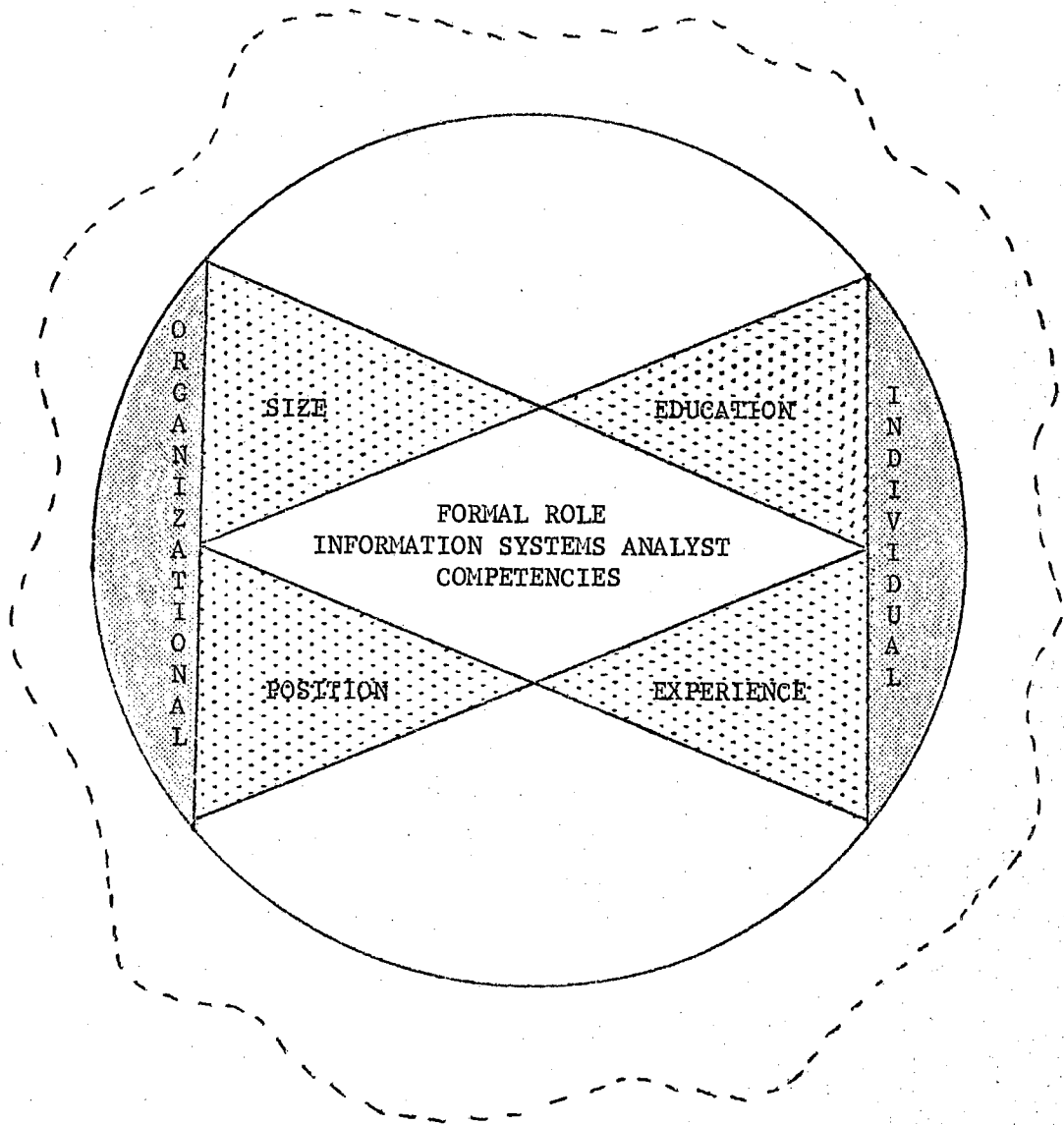
Figure 3. An Interpretation of the Factors Thought to
Influence Description of the Role of the
Information Systems Analyst

THEORY: Roles describe specific forms of behavior associated
          with given tasks; they developed originally from task
          requirements. In their pure or organizational form,
          roles are standardized patterns of behavior required
          of all persons playing a part in a given functional
          relationship, regardless of personal wishes or inter-
          personal obligations irrelevant to the functional
          relationship (Katz and Kahn, 1966, p. 37).

APPLICATION: Compilation of competencies judged most important
          for fulfilling duties of the information systems
          analyst.

2. PURPOSE: To determine whether the competencies are influenced
          by organizational variables of
                a. the size of the organization
                b. hierarchial position in the organization's
                    systems department.

    THEORY: The vertical structure of an organization is not merely
          a gradient of reward; it frequently divides members of
          the organization into two or more classes. The <u>dynamic</u>
          or common motivation of a group of members is determined
          by their work function and by their hierarchial position
          in the structure (Katz and Kahn, 1966, p. 84).

          . . . the structural properties of organization are
          sufficiently stable so that they can be treated as
          independent of the particular persons in the role set.
          For such properties as size, number of echelons, and
          rate of growth, the justifiable abstraction of organi-
          zational properties from individual behavior is even
          more obvious (Katz and Kahn, 1966, p. 187).

    APPLICATION: By statistical analysis (chi square) determine the
          effect of size of organization on the competencies
          judged important by the respondents.

          By statistical analysis (chi square) determine the
          effect of hierarchial position on the competencies
          judged important by the respondents.

3. PURPOSE: To determine whether the competencies are influenced by
          the individual's
                a. formal educational training
                b. years of experience in the systems area

    THEORY: Enduring attributes of the person refer to all those
          variables which describe the propensity of an individual
          to behave in certain ways (Katz and Kahn, 1966, p. 187).

APPLICATION: By statistical analysis (chi square) determine the effect of education on the competencies judged important by the respondents.

By statistical analysis (chi square) determine the effect of years of experience in systems on the competencies judged important by the respondents.

4. PURPOSE: To give guidance to educational organizations as they plan curricula.

   THEORY: The fact remains, however, that if modern society is to be viable it must sort individuals into occupational categories; equip them with relevant aspirations, beliefs, and standards; and channel them to relevant sectors of 'the' labor market. On those dimensions most relevant to jobs as defined technologically, each occupational category is relatively homogeneous, and it is this relevant uniformity which enables individuals and organizations to meet in the labor market (Thompson, 1967, p. 105).

   APPLICATION: Determine by percentage compilations the "basics" which might be included in any business curriculum and the "extras" that are applicable to the systems function.

The Study Hypotheses

The study hypotheses inquire into the differences in the judged importance of competencies by analysts working in organizations of various sizes and those with supervisory responsibilities and those without such responsibilities. Additionally, the study hypotheses inquire into the differences in the judged importance of competencies by analysts with varying amounts of formal education and with varying years of experience in systems. Stated in research form the study hypotheses are as follows:

1. The present judged importance of a selected competency is independent of

   a. size of organization

        b.   level of systems responsibility

        c.   formal education

        d.   years of experience in systems

2.   The future judged importance of a selected competency is independent of

        a.   size of organization

        b.   level of systems responsibility

        c.   formal education

        d.   years of experience in systems

The Study Instrument

The instrument formulated to gather the data for this study was a questionnaire developed from a study of the literature, job analyses, other research questionnaires concerned with needed skills and knowledge for job performance, interviews with employed systems analysts, and consultation with Oklahoma State University faculty members. Ideas on items were gleaned from the McLennan (1965) study instrument, the Spaniol (1967) study instrument, and the Dvorak (1951) study instrument.

The questionnaire was revised and refined through consultation with statisticians in the Oklahoma State University College of Education and with research consultants in the Oklahoma State University Computer Center and through try-outs with individual analysts before being submitted August 9, 1968 to 51 persons, a 50 percent stratified sample of members of the Tulsa, Oklahoma chapter of the Association for Systems Management. On August 17, 1968, a follow-up postal card was sent to the non-respondents. With this procedure, a 66.7 percent

response was obtained. Some questions indicated a need for minor clarifications.

The final questionnaire was a printed four-page, 8½ by 11 inch leaflet. (See Appendix A.) It was unsigned, but an identification number was included to be used only for the purpose of follow-up. Items included a statement of activities by which the respondent determined whether he was to complete the questionnaire, job and company characteristics, personal characteristics, and the competency checklist subdivided into Administrative and Organizational Competencies; Accounting, Financial, Economic, and Computational Competencies; Computer and Equipment Competencies; Employee and Personnel Compentencies; and Public Relations, Product, Marketing, and Legal Competencies.

The competency check list was designed to elicit judgments regarding the importance of selected competencies to the respondent's job performance now and five years from now.

Collection of the Data

In the early planning stages of this study, it was decided to seek the cooperation of the Association for Systems Management (formerly Systems and Procedures Association) in selecting a mailing list. The Association was receptive to the proposal, asking, however, that the study instrument be submitted for approval and stipulating that the Association draw the desired sample inasmuch as its membership list was not available for release.

In accordance with these guides, the researcher asked the Association to select a ten percent sample of the Association's national membership list by selecting every tenth name after the first had been

chosen at random. This procedure, sometimes referred to as systematic

sampling (VanDalen and Meyer, 1966), is used when a frame of a given

population is available. The procedure was appropriate for this study

since all geographical areas within the United States (Chapters of the

Association) would be represented. VanDalen and Meyer (1966) note that

a systematic sample may also be considered random when the order of

the units on the sample would have no effect on the variables under

consideration.

The Association drew the desired sample, addressed the envelopes

supplied by the researcher, and returned the addressed envelopes to

the researcher for insertion of the study instrument.

The original mailing was sent to 717 persons and included a

letter of explanation, the study instrument, and an addressed postage-

paid return envelope. The cover letter was reproduced by instant

printing, thus permitting the careful insertion of each individual's

name, address, and appropriate salutation.

Eight days after the original mailing was completed an airmail

postal card reminder was addressed to all nonrespondents. Both the

first and second follow-up letters included a copy of the questionnaire

as well as a progress report.

The timetable for mailings of the original and follow-up materials

was as follows:

(1) Original inquiry mailing, November 12, 1968.

(2) Airmail postal card reminder, November 20, 1968.

(3) First follow-up letter, December 14, 1968.

(4) Second follow-up letter, February 21, 1969.

Returns on this study instrument amounted to 580 replies from

the 698 persons thought to have been contacted. This is an 83.1

percent response. The percentage of returns and non-returns is

reported in Table I.

TABLE I

DISTRIBUTION OF THE POPULATION BY RETURNS AND
NON-RETURNS TO THE SURVEY INSTRUMENT

Category	Number	Percent Total (N = 717)	Percent Contacted (N = 698)
Total persons in the population	717	100.0	-
Returned by postoffice	5		-
No longer with firm	11		-
Overseas assignment	1		-
Medical leave	1		-
Deceased	1		-
Total persons not reached	19	2.7	-
Total persons thought to have been contacted	698	97.3	100.0
Analyst responses	468		
Non-analyst responses	97		
Incomplete and/or late	15		
Total respondents	580	80.9	83.1
Total non-respondents	118	16.4	16.9

Analysis of the Data

The voluminous data gathered from the study instrument were
coded and punched on data cards for use in computer tabulations. To
fulfill the first purpose of the study, namely to identify the compe-
tencies which information systems analysts judged most important for
the performance of their jobs now and five years in the future, it
was necessary to use a statistical technique by which the most impor-
tant competencies could be chosen. Therefore, frequency counts and a
numerical value assigned to the classes of "importance" defined in the
study instrument were used to compute a "consensus index number."
The consensus index number was then used to rank each of the ninety-
eight competencies, both in the present and in the future, along a
four-place decimal continuum ranging from +3.00 representing a perfect
rating of "Very important" to .00 representing a rating of "Unimpor-
tant."

This continuum provided the basis from which the chi-square
analyses of independence were made to test the hypotheses (purposes
two and three of the study) concerning the effect on the importance of
the competencies of organizational size, assigned organizational posi-
tion, and the analyst's formal education and years of systems experi-
ence. Three hundred twenty chi-square tests of independence were
performed with the help of a computer.

The five percent level of significance was selected at the out-
set of the study as the level which must be attained before the
researcher would reject a null hypothesis. The conclusions drawn in
this study are based on this five percent level although all

statistical results are reported in terms of significance levels or exact probabilities either in the body of the thesis or in the appendices. This method of reporting allows the reader to set his own significance level for rejection of the null hypothesis tested.

The chi-square value is obtained by utilizing observed and expected frequencies and their discrepancy and is then interpreted for significance from a chi-square table which gives the probability of equaling or exceeding the computed value for the specified degrees of freedom. If the probability is small (not more than five in one hundred) that the computed difference is due to chance, the null hypothesis is rejected and it is concluded that a significant difference between groups exists.

Complex hypotheses involving tests of numerous sub-hypotheses are rejected when analyzation of all the tests indicate real differences between groups.

Summary

This chapter has described the research design of the study and has presented a general paradigm and its interpretation from which the theory of the study was drawn. Each of the two parallel complex hypotheses was composed of four sub-hypotheses regarding organizational size, assigned organizational position, the analyst's formal education, and his years of experience in systems work.

The study instrument, the sample drawn, and the procedures used to collect the data were described. The chapter concludes with explanations of the statistical procedures employed to analyze the data and to test the major hypotheses.

CHAPTER IV

PROFILE OF THE INFORMATION SYSTEMS ANALYST

The data gathered from the study instrument sent to the random

sample of members of the Association for Systems Management cover the

job activities of information systems analysts, their job and company

characteristics, and personal characteristics, as well as the compe-

tencies used in fulfilling their job responsibilities. A report follows

on the job activities, the job and company characteristics, and personal

characteristics. Findings related to the job competencies will be

presented in Chapters V and VI.

Activities of the Job

Respondents were asked to define the broad outlines of their jobs

by checking any or all of the eight suggested activities on the study

instrument. In addition, space was provided for comments on these

activities. Only the responses from those who spent at least half of

their job time on the itemized activities were considered in this

reporting. By this criterion, 468 usable responses were deemed to be

from persons who were systems analysts. Of the non-analysts, that is

those who did not spend at least half of their job time on the itemized

activities, it was noted that over 90 percent were concerned with at

least some of the suggested activities. A broad definition of the job

of the information systems analyst, gained from a frequency ranking

of the eight suggested activities, is presented in Table II.

TABLE II

FREQUENCY RANKING OF JOB ACTIVITIES FOR THE
INFORMATION SYSTEMS ANALYST

N = 468	Percentage of Total	Activity
431	92.1	Do you study, analyze, and improve internal information systems which service, control, and coordinate all operations of an organization in order that the organization may become more operationally efficient?
429	91.7	Do you implement--after management acceptance--new or improved systems, train operating personnel, and provide for evaluation and adjustments?
412	88.0	Do you work with forms design and control as well as other formal reports and their control?
403	86.1	Do you plan for the accurate and timely feedback of the information required by management to evaluate performance?
389	83.1	Do you integrate, whether by manual or mechanical means or a combination of both, the transmittal of data to and from all parts of the organization?
383	81.8	Do you initiate, coordinate, and/or maintain written policies and/or procedures into appropriate manuals?
335	71.9	Do you recommend work simplification and work measurement techniques, equipment selection and office layouts?
331	70.7	Do you examine division or department methods of operation and their use of human and physical facilities?

More than 90 percent (92.1 percent) of the 468 systems analysts agreed that studying, analyzing, and improving internal information systems, with subsequent implementation of approved systems, was a part of their job activity as an information systems analyst.

A surprisingly large number of respondents (88.0 percent) indicated they worked with forms design and control as well as other formal reports and their control. This finding does not agree with current articles suggesting that this activity is of lessening importance.

The area of least participation was that of divisional or departmental methods of operation, an activity of only 71 percent (70.7 percent) of the respondents. One respondent noted that because of "departmental autonomy" this was a "hands-off" area. Another noted that he was allowed to be involved in departmental operations in only a "cursory way." Perhaps departmental operations are the last bastion to give way to the emerging concept that information--data generated in the operation of the organization--is to be used wherever it is needed for the improvement of the organization, without regard to departmental demarcation.

There was a little more participation in the procedural activities involving work simplification, work measurement techniques, equipment selection, and office layouts; however, only 71.9 percent indicated responsibility in this area. Perhaps this finding supports indications in the literature that this area is becoming less important to the systems job.

Job and Company Characteristics

The environment in which the information systems analyst functions varies with the job and company characteristics. To increase knowledge about these factors, a report follows concerning the types of organizations in which the analysts were employed, the sizes of the organizations, salaries earned, years of experience in systems work, and organizational positions held.

Types and Sizes of Organizations

Two related types of employing organizations were most frequently represented and together accounted for more than half (50.5 percent) of the respondents: Manufacturing (26.1 percent) and Manufacturing-Sales (24.4 percent). About two-fifths (92 of 236) of the respondents in these two related types of organizations were working in organizations of 1,000 to 4,999 employees. This distribution, and that of all respondents by types and sizes of organizations, may be seen in Table III.

The Consulting type of organization accounted for a total of 10.3 percent of the respondents, with more than one-third (3.8 percent) working in the smallest size grouping in the study, 1 to 99 employees. Among those included in the Consulting classification were management consultants, Certified Public Accountants, and computer software consultants. The large number of consultants was not anticipated when the study instrument was constructed; therefore, no special classification was prepared, the plan being to assign such consultants to the Other classification. As the data were being analyzed, it

TABLE III

DISTRIBUTION OF RESPONDENTS BY TYPE OF ORGANIZATION PRESENTED BY SIZE OF ORGANIZATION

Type of Organization	Size of Organization													Total by Type of Organization N = 468	
	1-99		100-499		500-999		1000-4999		5000-9999		10,000 Up				
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
Banking	1	.2%	10	2.1%	8	1.7%	17	3.6%	1	.2%	2	.4%	39	8.3%
Consulting	18	3.8%	9	1.9%	4	.9%	11	2.4%	4	.9%	2	.4%	48	10.3%
Education	3	.6%	5	1.1%	5	1.1%	6	1.3%	4	.9%	2	.4%	25	5.3%
Government	2	.4%	2	.4%	2	.4%	3	.6%	4	.9%	7	1.5%	20	4.3%
Insurance	2	.4%	9	1.9%	6	1.3%	8	1.7%	5	1.1%	0	.0%	30	6.4%
Manufacturing	4	.9%	9	1.9%	14	3.0%	54	11.5%	13	2.8%	28	6.0%	122	26.1%
Manufacturing-Sales	0	.0%	16	3.4%	14	3.0%	38	8.1%	14	3.0%	32	6.8%	114	24.4%
Sales	0	.0%	0	.0%	1	.2%	5	1.1%	1	.2%	5	1.1%	12	2.6%
Utility	1	.2%	2	.4%	1	.2%	5	1.1%	4	.9%	6	1.3%	19	4.1%
Other	5	1.1%	4	.9%	5	1.1%	12	2.6%	6	1.3%	7	1.5%	39	8.3%
Total by Size of Organization	36	7.7%	66	14.1%	60	12.8%	159	34.0%	56	12.0%	91	19.4%	468	100.0%

became obvious that the lack of a separate classification would mask valuable information, so the area on the data card planned for Transportation was reassigned to Consulting and the four Transportation entries were transferred to Other.

Banking organizations and the Other classification shared the third and fourth frequency rankings, each employing 8.3 percent. In the Banking classification, nearly one-half (17 of 39) of the analysts were working in organizations of 1,000 to 4,999 employees. Less than one-third (12 of 39) of the analysts in the Other classification were working in organizations of this size. In the Other classification, two types of organizations were found to be most frequently represented, with 7 respondents each. One of these two sub-classifications was concerned with the gathering and dissemination of information such as newsgathering, publishing, printing, and broadcasting; and the other sub-classification represented medical services such as hospitals and clinics.

The largest percentage (34.0 percent) of the analysts was employed by organizations in the size grouping of 1,000 to 4,999 employees, with the next largest percentage (19.4 percent) of the analysts employed by organizations of 10,000 or more.

Comparison of Types of Organizations with Previous Surveys

To compare findings of this study with those of previous surveys, it was necessary to regroup some of the data to permit percentage comparisons of types of employing organizations. Manufacturing and Manufacturing-Sales continued to employ the largest number of respondents, but the percentage representation shows a sizeable decline from

previous surveys. Increases were noted in Consulting, Education, and Other classifications. These changes indicated by the comparisons in Table IV, imply recognition by all types of organizations of the importance of deliberate planning for gathering and using information for more effective organizational operations.

TABLE IV

COMPARISON OF RESPONDENTS BY TYPE OF ORGANIZATION
WITH PREVIOUS SURVEYS

Type of Organization[b]	This Study 1969		SPA Surveys[a]		
	Number	%	1965	1959	1955
			Percent of Total		
Banking and Insurance	69	14.6%	14%	15%	17%
Consultant	48	10.3%	3%	4%	
Other	35	7.5%	3%	4%	10%
Education	25	5.3%	1%		
Government	20	4.3%	3%	3%	4%
Manufacturing and Manufacturing-Sales	122) 114)	50.5%	66%	59%	60%
Sales or Trading	12	2.6%	3%	6%	4%
Utility or Transportation	23	4.9%	7%	9%	5%
This Study N =	468	100.0%	100%	100%	100%

[a]Source: *Profile of a Systems Man*. Cleveland, Ohio: Systems and Procedures Association, 1965, p. 8.

[b]Data have been regrouped to permit comparison.

Salary by Type of Organization

The study instrument provided for eight designated monthly salary groupings; but the lowest of these, "Under $500," was not used by any respondent, thus reducing the number of salary groupings to seven. Twelve respondents did not reply to the salary question. (See Table V.)

Almost 80 percent (79.6 percent) of the 456 systems analysts who furnished salary information reported receiving a monthly salary of $1,000 or more, and nearly one-tenth (9.9 percent) received $1,750 or more monthly. Fewer than 4 percent (3.7 percent) received less than $750 a month.

A large percentage (45.9 percent) of analysts in the Banking classification received salaries in the lower two salary ranges (less than $1,000 a month). This was a larger percentage than was found in any other type of organization. The Consulting classification was easily the leader in the upper salary range--$2,000 or more monthly-- with 25.5 percent reporting this salary. There were no respondents in the upper salary range among the classifications of Banking, Insurance, or Utility.

Salary by Years of Experience in Systems

Recognition of years of experience in systems work was evidenced by salary rewards. Of the 44 respondents with 0 to 3 years of experience in systems, 31 (70.5 percent) were in the lower two salary ranges (less than $1,000 a month) whereas only 1 (2.3 percent) of the 43 respondents with over 20 years of experience in systems received less

TABLE V

DISTRIBUTION OF RESPONDENTS BY SALARY PRESENTED BY TYPE OF ORGANIZATION

Monthly Salary Range	Banking		Consulting		Education		Government		Insurance		Manufacturing		Mnfg-Sales		Sales		Utility		Other		Total by Salary Range $N = 456$[a]	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
$ 500 - $ 749	6	16.2%	1	2.1%	1	4.0%	1	5.0%	0	.0%	4	3.3%	3	2.7%	0	.0%	1	5.3%	0	.0%	17	3.7%
750 - 999	11	29.7%	1	2.1%	2	8.0%	4	20.0%	6	20.7%	26	21.7%	13	11.8%	1	9.1%	3	15.8%	9	23.7%	76	16.7%
1000 - 1249	9	24.3%	9	19.1%	9	26.0%	10	50.0%	15	51.7%	45	37.5%	42	38.2%	6	54.5%	3	15.8%	8	21.1%	156	34.2%
1250 - 1499	4	10.8%	11	23.4%	8	32.0%	1	5.0%	7	24.1%	26	21.7%	22	30.0%	2	18.2%	6	31.6%	13	34.2%	100	21.9%
1500 - 1749	4	10.8%	10	21.3%	2	8.0%	3	15.0%	1	3.4%	12	10.0%	22	20.0%	1	9.1%	4	21.1%	3	7.9%	62	13.6%
1750 - 1999	3	8.1%	3	6.4%	2	8.0%	0	.0%	0	.0%	4	3.3%	4	3.6%	0	.0%	2	10.5%	3	7.9%	21	4.6%
2000 Up	0	.0%	12	25.5%	1	4.0%	1	5.0%	0	.0%	3	2.5%	4	3.6%	1	9.1%	0	.0%	2	5.3%	24	5.3%
Total by Type of Organization	37	100.0%	47	100.0%	25	100.0%	20	100.0%	29	100.0%	120	100.0%	110	100.0%	11	100.0%	19	100.0%	38	100.0%	456	100.0%

[a]Twelve respondents did not reply to the salary question.

than $1,000 a month. Over half (51.2 percent) of the respondents with

20 or more years of experience in systems were in the upper three

salary ranges ($1,500 or more a month) but no respondent with 0 to 3

years of experience in systems was in these ranges. (See Table VI.)

Years of Experience in Systems by Type of Organization

More than half (53.8 percent) of the analysts in Banking had 7

or fewer years of systems experience. This may possibly explain the

previously noted concentration of analysts in Banking in the lowest

two salary ranges.

Of the total group of 468 respondents, barely more than 20

percent (21.6 percent) had 15 or more years of systems experience and

almost 60 percent (59.4 percent) had 10 or fewer years of experience

in systems, supporting current thought expressed in the literature

that systems is an emerging area in organizations. (See Table VII.)

Years of Experience in Systems by Organizational Position

The grouping of respondents into four levels of organizational

systems position was a carefully considered judgmental function of the

replies to the free response items of the study instrument: title of

the respondent's present job, title of his immediate superior, and

title of previous jobs in systems or systems related work. Respondents

who had executive positions such as vice-president or controller were

classified as executive officers; and those who were responsible for

unit activity such as a systems department were classified as managers

of systems. Respondents who had no supervisory responsibilities were

classified as either junior or senior analysts according to their

TABLE VI

DISTRIBUTION OF RESPONDENTS BY SALARY PRESENTED BY YEARS OF EXPERIENCE IN SYSTEMS

Monthly Salary Range	Years of Experience in Systems												Total By Salary Range N = 456	
	0 - 3		4 - 7		8 - 10		11 - 14		15 - 19		Over 20			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
$ 500 - $ 749	8	18.2%	4	3.0%	2	2.1%	3	3.4%	0	.0%	0	.0%	17	3.7%
750 - 999	23	52.3%	37	28.0%	8	8.5%	4	4.6%	3	5.4%	1	2.3%	76	16.7%
1000 - 1249	7	15.9%	57	43.2%	41	43.6%	30	34.5%	14	25.0%	7	16.3%	156	34.2%
1250 - 1499	6	13.6%	20	15.2%	23	24.5%	28	32.2%	10	17.9%	13	30.2%	100	21.9%
1500 - 1749	0	.0%	10	7.6%	15	16.0%	13	14.9%	14	25.0%	10	23.3%	62	13.6%
1750 - 1999	0	.0%	1	.8%	4	4.3%	3	3.4%	8	14.3%	5	11.6%	21	4.6%
2000 Up	0	.0%	3	2.3%	1	1.1%	6	6.9%	7	12.5%	7	16.3%	24	5.3%
Total by Years of Experience in Systems	44	100.0%	132	100.0%	94	100.0%	87	100.0%	56	100.0%	43	100.0%	456	100.0%

TABLE VII

DISTRIBUTION OF RESPONDENTS BY YEARS OF EXPERIENCE IN SYSTEMS PRESENTED BY TYPE OF ORGANIZATION

Years of Experience in Systems	Type of Organization																				Total by Years of Experience N = 468	
	Banking		Consulting		Education		Government		Insurance		Manufacturing		Mnfg-Sales		Sales		Utility		Other			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
0 – 3	7	17.9%	0	.0%	0	.0%	1	5.0%	2	6.7%	13	10.7%	13	11.4%	1	8.3%	0	.0%	7	17.9%	44	9.4%
4 – 7	14	35.9%	13	27.1%	7	28.0%	5	25.0%	9	30.0%	34	27.9%	35	30.7%	4	33.3%	6	31.6%	8	20.5%	135	28.8%
8 – 10	9	23.1%	10	20.8%	8	32.0%	4	20.0%	9	30.0%	26	21.3%	22	19.3%	4	33.3%	2	10.5%	5	12.8%	99	21.2%
11 – 14	2	5.1%	12	25.0%	6	24.0%	4	20.0%	4	13.3%	22	18.0%	24	21.1%	2	16.7%	6	31.6%	7	17.9%	89	19.0%
15 – 19	4	10.3%	7	14.6%	3	12.0%	3	15.0%	3	10.0%	20	16.4%	7	6.1%	1	8.3%	2	10.5%	8	20.5%	58	12.4%
Over 20	3	7.7%	6	12.5%	1	4.0%	3	15.0%	3	10.0%	7	5.7%	13	11.4%	0	.0%	3	15.8%	4	10.3%	43	9.2%
Total by Type of Organization	39	100.0%	48	100.0%	25	100.0%	20	100.0%	30	100.0%	122	100.0%	114	100.0%	12	100.0%	19	100.0%	39	100.0%	468	100.0%

responses. There were many similarities in titles, but there were also

many differences, denoting the lack of agreement on job titles for

areas of seemingly comparable activities.

As might be expected, the relationship between years of experi-

ence in systems and level of systems responsibility is apparent in that

nearly two-thirds (65.4 percent) of the executives had 15 or more years

of experience in systems, but not one executive was found in the

grouping of 0 to 3 years of experience in systems. Junior analysts

were distributed in the groupings of less experience in systems, with

no entry recorded for 15 or more years of experience in systems. These

data may be observed in Table VIII.

Personal Characteristics

As individuals, analysts bring to their jobs a great variety of

personal characteristics. To increase knowledge about these factors,

a report follows concerning the age, sex, and educational preparation

of the respondents, together with their recommendations for preparation

for systems work.

Age, Sex, and Type of Organization

The information systems analyst was found to be a comparatively

young person. Nearly half (44.2 percent) of the analysts were in the

30 to 39 years of age grouping, and over 90 percent (90.2 percent) were

under 50 years of age. This is yet another finding which supports

expressions in other writings that information systems are of recent

concern to the organization.

The Banking classification had nearly twice as many analysts

TABLE VIII

DISTRIBUTION OF RESPONDENTS BY YEARS OF EXPERIENCE IN SYSTEMS PRESENTED BY LEVEL OF SYSTEMS RESPONSIBILITY

Years of Experience in Systems	Level of Systems Responsibility								Total by Years of Experience N = 468	
	Executive Officer		Manager of Systems		Senior Analyst		Junior Analyst			
	No.	%	No.	%	No.	%	No.	%	No.	%
0 - 3	0	.0%	17	5.2%	13	14.4%	14	58.3%	44	9.4%
4 - 7	4	15.4%	95	29.0%	30	33.3%	6	25.0%	135	28.8%
8 - 10	4	15.4%	76	23.2%	17	18.9%	2	8.3%	99	21.2%
11 - 14	1	3.8%	71	21.6%	15	16.7%	2	8.3%	89	19.0%
15 - 19	7	26.9%	41	12.5%	10	11.1%	0	.0%	58	12.4%
20 or more	10	38.5%	28	8.5%	5	5.6%	0	.0%	43	9.2%
Total by Level of Systems Responsibility	26	100.0%	328	100.0%	90	100.0%	24	100.0%	468	100.0%

(35.9 percent) in the youngest age grouping (below 29) as did the next highest classification reported for this age group. This correlates with the previously mentioned findings about Banking--that the analysts were in the lowest salary ranges and had the fewest years of systems experience.

It is interesting that all analysts in the Sales type of organization were concentrated between 30 and 49 years of age, with no representatives in the younger or older age groupings. The Utility classification, with 31.6 percent of its respondents over 50 years of age, followed by the Government classification, with 20.0 percent of its respondents over that age, accounted for the highest concentration of older analysts. (See Table IX.)

Only 17 (3.6 percent) of the 468 respondents were women. This small percentage appears to be a corroboration of other recent findings. Mitchell (1969) reported that women hold few business management positions. Although no women were found in the classifications of Consulting, Sales, or Utility, they were rather evenly distributed among the remaining classifications.

Educational Preparation

A high level of educational preparation was found among the respondents, of whom 69.9 percent held college degrees. More than half (50.9 percent) of the analysts had been awarded the bachelor's degree; 17.5 percent had earned the master's degree; and 1.5 percent had achieved the doctor's degree. Of those who had not earned a degree, 20.9 percent had attended college one or more years. Fewer than 10 percent of the analysts had not attended college at all.

TABLE IX

DISTRIBUTION OF RESPONDENTS BY AGE PRESENTED BY TYPE OF ORGANIZATION

Years of Age	Banking		Consulting		Education		Government		Insurance		Manufacturing		Mnfg-Sales		Sales		Utility		Other		Total by Age Group N = 468	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Under 29	14	35.9%	8	16.7%	3	12.0%	3	15.0%	1	3.3%	16	13.1%	19	16.7%	0	.0%	1	5.3%	7	17.9%	72	15.4%
30 - 39	13	33.3%	23	47.9%	13	52.0%	4	20.0%	14	46.7%	16	48.4%	19	46.5%	9	75.0%	3	15.8%	16	41.0%	207	44.2%
40 - 49	8	20.5%	14	29.2%	9	35.0%	9	45.0%	14	46.7%	33	27.0%	34	29.8%	3	25.0%	9	47.4%	10	25.6%	143	30.6%
50 - 59	3	7.7%	2	4.2%	0	.0%	4	20.0%	1	3.3%	13	10.7%	7	6.1%	0	.0%	6	31.6%	6	15.4%	42	9.0%
Over 60	1	2.6%	1	2.1%	0	.0%	0	.0%	0	.0%	1	.8%	1	.9%	0	.0%	0	.0%	0	.0%	4	.9%
Total by Type of Organization	39	100.0%	48	100.0%	25	100.0%	20	100.0%	30	100.0%	122	100.0%	114	100.0%	12	100.0%	19	100.0%	39	100.0%	468	100.0%

Recommendations for Preparation for Systems Work

The practicing systems analysts who responded to this survey were asked to make recommendations in two areas for systems work. Their judgment was requested as to the most appropriate undergraduate college major and as to the most effective methods of training.

Recommended Undergraduate College Majors. Respondents were asked to consider the appropriateness of four suggested undergraduate college majors and to rank them in order of judged importance as preparation for information systems analysts. They were also permitted to insert and rank a major of their own choosing. One of the four suggested majors, Business Administration, was the overwhelming first choice, being ranked first in appropriateness by 351 (75.0 percent) of the respondents. The other suggested undergraduate majors of Engineering, Liberal Arts, and Mathematics were ranked first by 27, 37, and 32 respondents, respectively. Sixteen of the respondents inserted a major of their own choosing as a first choice. These and other rankings may be seen in Table X.

The Business Administration major, as suggested in the study instrument, might include any one of the following majors: accounting, economics, industrial relations, marketing, office management, organization and management, and others. No attempt was made to determine which of these areas might afford the best preparation for analysts.

Recommended Methods of Training. Respondents were asked to consider nine types of training as preparation for systems work, and from among them to rank the four types that they considered most effective. By a substantial majority, the respondents replying to

TABLE X

RANKING OF SUGGESTED UNDERGRADUATE COLLEGE MAJORS FOR
INFORMATION SYSTEMS ANALYSTS

Rank	Business Administration	Engineering	Liberal Arts	Mathematics	Other	Not Ranked
1	351	27	37	32	16	15
	(75.0%)	(5.8%)	(7.9%)	(6.8%)	(3.4%)	(1.1%)
2	69	92	123	151	16	17
	(14.7%)	(19.7%)	(26.3%)	(32.3%)	(3.4%)	(3.6%)
3	29	116	97	183	13	30
	(6.2%)	(24.8%)	(20.7%)	(39.1%)	(2.8%)	(6.4%)
4	6	177	159	72	14	40
	(1.3%)	(37.8%)	(34.0%)	(15.4%)	(3.0%)	(8.5%)
5	3	21	18	5	23	398
	(0.7%)	(4.5%)	(3.8%)	(1.1%)	(4.9%)	(85.9%)

TABLE XI

RANKING OF SUGGESTED TYPES OF TRAINING FOR
INFORMATION SYSTEMS ANALYSTS

Rank Number	College or University	Employer Company	On-the-Job Training	Graduate School	Not Ranked
1	250	86	46	39	57
	(53.4%)	(18.4%)	(9.8%)	(8.3%)	(10.1%)
2	83	131	72	63	119
	(17.7%)	(28.0%)	(15.4%)	(13.5%)	(25.4%)
3	52	90	75	53	198
	(11.1%)	(19.2%)	(16.0%)	(11.3%)	(42.4%)
4	37	60	83	46	242
	(7.9%)	(12.8%)	(17.7%)	(9.8%)	(51.8%)

this question ranked undergraduate college or university study as the most effective preparation for systems work. The second most effective type of preparation, as chosen by the analysts, was that provided by the employing company, or in-service training. Informal on-the-job training and graduate school were the third and fourth choices of analysts. (See Table XI, preceding page.)

These rankings for methods of training seem to substantiate professional appraisals that the information systems analyst is not a technician but has need for expanded educational training, preferably college.

Summary

Descriptive data obtained from the study instrument were used to draw a profile of the information systems analysts by presenting their job activities, by disclosing the nature of their job and company environments, and by ascertaining their personal characteristics. There were, of course, wide variations; yet a modal summary of the data revealed the following profile of the information systems analyst.

He was primarily concerned with improving the flow of information through his organization so that all operations contributed to its effectiveness and efficiency. This attainment involved implementation of new or improved systems and an evaluation of such systems.

The analyst was employed by a Manufacturing or Manufacturing-Sales organization of 1,000 to 4,999 employees. His monthly salary was between $1,000 and $1,249, and he had some supervisory responsibilities.

The analyst was a man, young in both experience and age, since he had 7 or fewer years of experience in systems and was no more than

39 years old. He had a bachelor's degree in Business Administration and recommended such a degree as the most appropriate preparation for analysts. His professional courtesy and interest were implied by his returning the questionnaire sent him.

CHAPTER V

FINDINGS RELATED TO THE JOB COMPETENCIES OF
INFORMATION SYSTEMS ANALYSTS

One of the purposes of this study was to identify the competencies

used by information systems analysts in the performance of their jobs.

The concern of this chapter is with the data gathered for that purpose

from the "Competency Checklist" of the study instrument. In Chapter

IV, a broad definition of the job of information systems analysts was

presented by a frequency ranking of the various job activities in

which the respondents participated. Findings are now presented from

a detailed analysis of the competencies required in performance of

those activities.

Plan for Gathering and Analyzing Data

One section of the study instrument designed for use in this

study was planned to elicit judgments from practicing systems personnel

(those who spent at least half of their job time on any or all of eight

itemized activities) regarding the importance of a rather exhaustive

list of ninety-eight job competencies. These competencies were arranged

by areas thought to be significant in the systems function. The

particular competencies selected for inclusion in the areas were chosen

from those found in the literature, job analyses, interviews with

employed systems analysts, the pilot survey study, and suggestions

from Oklahoma State University professors concerned with systems

analysis. Allowance was made in the questionnaire for the addition of

other competencies or for the amplification or clarification of others.

The specific competencies may be seen in Appendix B, Tables XXIX and

XXX, or in the various tables in the following discussion.

Overview for Elicitation of Judged Importance of Competencies

The selected analysts were asked to indicate the degree of

importance with which they regarded each competency in the performance

of their jobs as information systems analysts. The analysts were

further asked to consider the importance with which they regarded each

competency for the same job performance five years in the future.

The following code was suggested for the judgments of importance:

Very important. Competency is considered essential or vital
to adequately perform your job.

Moderately important. Competency is not considered essential
to the performance of your job but is
considered to be of significant value.

Slightly important. Competency is considered to be of minor
importance to the performance of your job.

Unimportant. Competency is considered to have no value to the
performance of your job.

Plan for Evaluating and Synthesizing Judged Importance of the
Competencies

Two steps were used in evaluating and synthesizing the judgments

made by the respondents regarding the importance of each of the compe-

tencies for job performance. The first step was the computation of a

consensus index number. The second step involved the use of the

consensus index number to determine the overall classifications of importance for the competencies.

Computation of the Consensus Index Number. For each competency a consensus index number was computed by assigning scale values of 3, 2, 1, and 0 to the respective classifications of "Very important," "Moderately important," "Slightly important," and "Unimportant" on the study instrument. Each assigned scale value was multiplied by the number of replies in each of the corresponding classifications, the products summed and divided by the total number of persons in the sample--468 respondents--to arrive at the final consensus index number.

An example of the computation of the consensus index number is illustrated by the response to the first competency in the study instrument, "Know organization's objectives." Of the 468 respondents, 356 placed this competency in the "Very important" classification, 94 in the "Moderately important" classification, 16 in the "Slightly impor- tant" classification and 2 in the "Unimportant" classification. After scale values of 3, 2, 1, and 0 were assigned to the respective classi- fications, the consensus index number for "Know organization's objec- tives" was computed as follows:

$$\frac{(3 \times 356) + (2 \times 94) + (1 \times 16) + (0 \times 2)}{468} = \frac{1,272}{468} = 2.7179$$

Use of Consensus Index Number. By means of the consensus index number computed for each of the ninety-eight competencies it was possible to rank the competencies, both in the present and in the future, along a four-place decimal continuum ranging from +3.00, representing a perfect rating of "Very important" to .00, representing a rating of "Unimportant." A judgmental selection for classifications

of importance was then made by assigning "Very important" to compe-
tencies with a consensus index number of 2.0 or above, "Moderately
important" to competencies with a consensus index number of 1.5 through
1.9999, "Slightly important" to competencies with a consensus index
number of 1.0 through 1.4999, and "Unimportant" to competencies with
a consensus index number of .0 through .9999.

Overview of Results of Judged Importance of Competencies

By application of the consensus index number to the judged
importance of the competencies, it was deemed that respondents
presently considered 37 (37.8 percent) of the 98 competencies to be
"Very important" for job performance; 25 (25.5 percent) "Moderately
important;" 22 (22.4 percent) "Slightly important;" and 14 (14.3 per-
cent) "Unimportant."

Ratings of judgments concerning the importance of competencies
five years in the future revealed "Very important" ratings for 43
(43.9 percent) of the 98 competencies; "Moderately important" for 26
(26.5 percent); "Slightly important" for 23 (23.5 percent); and
"Unimportant" for 6 (6.1 percent).

The trend seemed to be to select more competencies as "Very
important" and fewer as "Unimportant" for five years in the future.
A tabulation of these results by designated areas indicated on the
study instrument may be seen in Table XII. These results will be
more fully interpreted in the remainder of this chapter.

TABLE XII

CLASSIFICATIONS OF IMPORTANCE OF COMPETENCIES TABULATED BY AREAS OF SYSTEMS

Systems Area of Competencies	Classification of Importance									
	Very Important		Moderately Important		Slightly Important		Unimportant		Total Competencies	
	Present No. %	Future No. %	Present No. %	Future No. %	Present No. %	Future No. %	Present No. %	Future No. %	No.	%
Administrative and Organizational Competencies (24 competencies considered)	18	17	5	6	1	1	0	0		
Accounting, Financial, Economic and Computational Competencies (21 competencies considered)	2	8	8	5	6	8	5	0		
Computer and Equipment Competencies (21 competencies considered)	1	2	8	9	6	5	6	5		
Employee and Personnel Competencies (17 competencies considered)	12	12	2	2	1	2	2	1		
Public Relations, Product, Marketing, and Legal Competencies (15 competencies considered)	4	4	2	4	8	7	1	0		
Total by Importance:										
Present	37 37.8%		25 25.5%		22 22.4%		14 14.3%		= 98 or	100.0%
Future		43 43.9%		26 26.5%		23 23.5%		6 6.1%	= 98 or	100.0%

Ranking of Judged Importance of Competencies

Competencies and the judgments concerning their importance for
the job of information systems analyst are presented by areas thought
to be significant in systems work. In each area, the competencies are
first presented in the order in which they appeared on the study
instrument, classified as to their importance by use of the consensus
index number. The next presentation of the competencies is by a
sequential ranking of the consensus index numbers within each designated
area by both the present and future judged importance of the compe-
tencies.

Administrative and Organizational Competencies

Three-fourths (18 of 24) of the competencies in the area of
Administration and Organization received a consensus index rating of
2.0 or above and were thus considered "Very important" to the present
job of the information systems analyst. These 18 competencies com-
prised nearly one-half of the total of 37 "Very important" competencies
from among all areas. (See Table XII, page 70.)

Although there were minor fluctuations in the rating values
within the Administrative and Organizational Competencies, all except
one--"Prepare data flow analyses using charting symbols"--retained
their importance rating as viewed for five years in the future. (See
Table XIII.) Nearly all of the "Very important" rated competencies
indicated the need for a systems analyst to share a management view-
point such as "Know organization's objectives" (2.7179 present, 2.8611

TABLE XIII

CLASSIFICATION OF IMPORTANCE OF ADMINISTRATIVE AND ORGANIZATIONAL COMPETENCIES
BY CONSENSUS INDEX NUMBER

24 Competencies	Very Important		Moderately Important		Slightly Important		Unimportant	
	Present	Future	Present	Future	Present	Future	Present	Future
Know organization's objectives	2.7179	2.8611						
Know organization of the company well	2.4722	2.6068						
Know administrative policies	2.4380	2.5342						
Plan and schedule office work			1.9551	1.9274				
Develop plan for providing office services and communication			1.8419	1.9487				
Develop new office systems, procedures, and methods and improve those already in existence	2.5000	2.3632						
Know the particular uses and possibilities of office supplies, equipment, appliances, furniture			1.6218	1.6581				
Know advantages and disadvantages of mechanical office equipment and computer operations	2.5256	2.5363						
Appraise ways of reducing office costs	2.1068	2.1645						
Prepare or supervise preparation of office manuals and procedures			1.9658	1.9615				
Gather, analyze, and interpret facts	2.8419	2.7521						
Design work station arrangements and office layouts					1.4188	1.4316		
Analyze input and output data	2.5449	2.4423						
Determine departmental information needs	2.6950	2.6346						
Analyze management's planning and control problems	2.5620	2.7415						
Simplify work procedures	2.1517	2.0962						
Prepare data flow analyses using charting symbols	2.0301			1.8889				
Work with forms requirements, design, control			1.9274	1.7714				
Identify commonality of information needs	2.4231	2.4936						
Identify management information needs	2.6453	2.7564						
Know theories of management	2.2821	2.5406						
Delineate areas appropriate for programmed decision making	2.1453	2.3568						
Evaluate value vs. cost of information	2.4167	2.6218						
Design an over-all management information system	2.2628	2.5983						
Total Competencies by Importance								
Present	18		5		1		0	
Future		17		6		1		0

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future), "Gather, analyze, and interpret facts" (2.8419 present,

2.7521 future), and others.

The necessity for the management viewpoint was emphasized by a

respondent who said, "He /the analyst/ is the reference source for

management and must consider management goals when designing a system."

Another respondent added the comment that "An analyst is a 'catalyst'

who . . . must consider management." Still another respondent offered

the idea that a systems analyst is a systems planner and as such is a

matching half with an organization planner--management. Total organi-

zational responsibility and the necessity for the managerial viewpoint

was expressed in this way: "He /the analyst/ must be capable of

weighing and balancing empire builders' pressure with common logic and

must design his system as though the total responsibility of the organi-

zation were his responsibility."

"The office" as a data-gathering, processing, and disseminating

center was given some attention. High within the "Very important"

classification were two competencies--"Develop new office systems,

procedures, and methods and improve those already in existence" (2.5000

present, 2.3632 future) and "Know advantages and disadvantages of

mechanical office equipment and computer operations" (2.5256 present,

2.5363 future). When one considers that the computer and its peripheral

equipment provided the stimulus of the current evolution or revolution

in processing data, it is not surprising to find these two office-

related competencies placed high in the "Very important" classification.

Two other closely allied competencies--"Simplify work procedures"

(2.1517 present, 2.0962 future) and "Appraise ways of reducing office

costs" (2.1068 present, 2.1645 future)--were placed lower in the "Very

important" classification. Possibly the need for simplifying work procedures and reducing office costs is sublimated to a greater need for more effective information and communication.

With the possible exception of "Work with forms requirements, design, control" (1.9274 present, 1.7714 future), competencies in the "Moderately important" classification were concerned with office affairs. Included in this group were "Plan and schedule office work" (1.9551 present, 1.9274 future), "Develop plan for providing office services and communication" (1.8419 present, 1.9487 future), "Know the particular uses and possibilities of office supplies, equipment, appliances, furniture" (1.6218 present, 1.6581 future), and "Prepare or supervise preparation of office manuals and procedures" (1.9658 present, 1.9615 future).

Also concerned with office affairs was the single competency in the "Slightly important" classification--"Design work station arrangements and office layouts" (1.4188 present, 1.4316 future). The comparatively low ranking of these five competencies would seem to indicate a trend away from an earlier office specialist role for the information systems analyst toward a broader organizational role as "the reference source for mangement."

An anomaly was noted in the rating accorded the competency "Work with forms requirements, design, and control" (1.9274 present, 1.7714 future). On the Frequency Ranking of Job Activities, Table II, page 46, 412 respondents (88.0 percent) indicated they worked with forms design and control. In view of this rather high indication of involvement, it was surprising that there was not a higher rating on the consensus index number for importance to present job performance.

It seems clear that the respondents anticipate that this competency

will be of even less relative importance five years in the future.

Even though nearly all of these competencies were rated "Moderately

important," they were at the bottom of the sequential ranking of

competencies within the Administrative and Organizational area--for

both present job performance and that of five years in the future.

This sequential ranking may be seen in Table XIV.

Accounting, Financial, Economic, and Computational Competencies

Less than one-tenth (2 of 21) of the Accounting, Financial,

Economic, and Computational Competencies were considered "Very impor-

tant" (consensus index rating 2.0 or more) to the present job perfor-

mance of information systems analysts. However, a noticeable change

occurred as the analysts considered their job performance five years

in the future. For that period, one-third (8 of 21) of the competen-

cies in this area were rated "Very important." This rate of increase

in importance from the present to the future exceeded that for any

other area of systems considered in this study and contributed to the

increased number of competencies deemed to be "Very important" in the

future. (See Table XII, page 70.)

Only two competencies, "Know the established basic principles of

accounting" (2.1902 present, 2.1773 future) and "Conduct feasibility

studies" (2.4701 present, 2.5021 future), were rated "Very important"

for the present. They retained this high position for the future.

This finding would be expected inasmuch as the basic principles of

accounting are essential to the successful operation of any organi-

zation, and feasibility studies are the springboard to any changes

TABLE XIV

SEQUENTIAL RANKING OF THE JUDGED IMPORTANCE OF ADMINISTRATIVE AND ORGANIZATIONAL COMPETENCIES

Competency	Consensus Index Number
For Present Job Performance	
Gather, analyze, and interpret facts	2.8419
Know organization's objectives	2.7179
Identify management information needs	2.6453
Determine departmental information needs	2.5940
Analyze management's planning and control problems	2.5620
Analyze input and output data	2.5449
Know advantages and disadvantages of mechanical office equipment and computer operations	2.5256
Develop new office systems, procedures, and methods and improve those already in existence	2.5000
Know the organization of the company very well	2.4722
Know administrative policies	2.4380
Identify commonality of information needs	2.4231
Evaluate value vs. cost of information	2.4167
Know theories of management	2.2821
Design an over-all management information system	2.2628
Simplify work procedures	2.1517
Delineate areas appropriate for programmed decision making	2.1453
Appraise ways of reducing office costs	2.1068
Prepare data flow analyses using charting symbols	2.0321
Prepare or supervise preparation of office manuals and procedures	1.9658
Plan and schedule office work	1.9551
Work with forms requirements, design, control	1.9274
Develop plan for providing office services and communication	1.8419
Know the particular uses and possibilities of office supplies, equipment, appliances, furniture	1.6218
Design work station arrangements and office layouts	1.4188
For Job Performance Five Years in the Future	
Know organization's objectives	2.8611
Identify management information needs	2.7564
Gather, analyze, and interpret facts	2.7521
Analyze management's planning and control problems	2.7415
Determine departmental information needs	2.6346
Evaluate value vs. cost of information	2.6218
Know the organization of the company very well	2.6068
Design an over-all management information system	2.5983
Know theories of management	2.5406
Know advantages and disadvantages of mechanical office equipment and computer operations	2.5363
Know administrative policies	2.5342
Identify commonality of information needs	2.4936
Analyze input and output data	2.4423
Develop new office systems, procedures, and methods and improve those already in existence	2.3632
Delineate areas appropriate for programmed decision making	2.3568
Appraise ways of reducing office costs	2.1645
Simplify work procedures	2.0962
Prepare or supervise preparation of office manuals and procedures	1.9615
Develop plan for providing office services and communication	1.9487
Plan and schedule office work	1.9274
Prepare data flow analyses using charting symbols	1.8889
Work with forms requirements, design, control	1.7714
Know the particular uses and possibilities of office supplies, equipment, appliances, furniture	1.6581
Design work station arrangements and office layouts	1.4316

requiring financial outlay. (See Table XV.)

Very closely allied to these two competencies were those of future importance--"Know the established principles of cost accounting" (1.9295 present, 2.0150 future) and "Develop cost controls" (1.8590 present, 2.0021 future). The importance of these competencies would seem to take cognizance of the fact that costs are often a prime consideration to organizations and hence would be of importance to organization planners and systems planners--halves of the same job, as previously mentioned.

Another grouping within the "Very important" classification for the future was concerned with statistical analysis. This group was composed of the competencies of "Employ simulation techniques" (1.5877 present, 2.0833 future), "Know principles of sampling, reliability, validity" (1.7009 present, 2.0406 future), and "Employ operations research (OR) techniques (improving efficiency of producing product or providing service by use of statistics or mathematical techniques)" (1.5385 present, 2.0321 future). The high future importance of this related group of competencies would seem to indicate a growing awareness and use of statistics in management decision making--hence, the concern of information systems analysts.

Ranking high within the "Moderately important" classification for five years in the future were two groups of competencies comparable to those in the "Very important" classification. These groups were composed of competencies concerned with costs and with statistical analysis. The "cost" group included "Prepare budgets" (1.6260 present, 1.9530 future), "Analyze and interpret financial statements" (1.5128 present, 1.8419 future), and "Know principles of capital management,

TABLE XV

CLASSIFICATION OF IMPORTANCE OF ACCOUNTING, FINANCIAL, ECONOMIC, AND COMPUTATIONAL COMPETENCIES
BY CONSENSUS INDEX NUMBER

21 Competencies	Classification of Judged Importance							
	Very Important		Moderately Important		Slightly Important		Unimportant	
	Present	Future	Present	Future	Present	Future	Present	Future
Know the established basic principles of accounting	2.1902	2.1773						
Know the established principles of cost accounting		2.0150	1.9295					
Conduct cost studies		2.0598	1.9328					
Prepare budgets			1.6260	1.9530				
Conduct feasibility studies	2.4701	2.5021						
Plan payroll accounting procedures					1.4509	1.3761		
Develop cost controls		2.0021	1.8590					
Plan credit and collection operations					1.0214	1.0769		
Know tax regulations for federal, state, and municipal requirements						1.0171	.8462	
Employ operations research (OR) techniques (improving efficiency of producing product or providing service by use of statistics or mathematical techniques)		2.0321	1.5385					
Employ probability theory				1.8013	1.3419			
Know principles of sampling, reliability, validity		2.0406	1.7009					
Employ simulation techniques		2.0833	1.5877					
Interpret functions and their graphs				1.7991	1.4829			
Apply matrix algebra						1.2778	.9252	
Use mathematical models					1.1667	1.6603		
Design linear program						1.3868	.9509	
Analyze and interpret financial statements			1.5128	1.8419				
Know principles of capital management, financing				1.8419	1.4487			
Conduct investment analyses						1.2415	.8718	
Assess general business indicators (economics, currency)						1.4081	.9915	
Total Competencies by Importance								
Present	2		8		6		5	
Future		8		5		8		0

financing" (1.4487 present, 1.8419 future). The "statistical analysis" group included two competencies--"Employ probability theory" (1.3419 present, 1.8013 future) and "Interpret functions and their graphs" (1.4829 present, 1.7991 future). Speaking of the latter group, several respondents commented that perhaps statistical competencies would become more important if management became more sophisticated and less fearful of using statistical analysis as a basis for decisions.

None of the competencies in this area of systems was rated "Unimportant" for five years in the future, whereas 5 were so considered in the present. Of these, the competency, "Know tax regulations for federal, state, and municipal requirements" (0.8462 present, 1.0171 future), was felt by several respondents to be unnecessary because such information could be found when needed. Another competency, "Assess general business indicators (economics, currency)" (0.9915 present, 1.4081 future), brought comments by some respondents to the effect that this could be done when the problem under consideration warranted it. One analyst furnished the summation: "The tools are important. The application to specifics is not." Still another systems man stressed that "the fundamentals of every operation must be grasped in the specific business for full qualification--and can be learned on the job if backed by management."

A sequential ranking of competencies in this area is presented in Table XVI. This table provides information on the ranking of the competencies that have been discussed as well as for those not previously mentioned.

TABLE XVI

SEQUENTIAL RANKING OF THE JUDGED IMPORTANCE OF ACCOUNTING, FINANCIAL,
ECONOMIC, AND COMPUTATIONAL COMPETENCIES

Competency	Consensus Index Number
For Present Job Performance	
Conduct feasibility studies	2.4701
Know the established basic principles of accounting	2.1902
Conduct cost analyses	1.9338
Know the established principles of cost accounting	1.9295
Develop cost controls	1.8590
Know principles of sampling, reliability, validity	1.7009
Prepare budgets	1.6260
Employ simulation techniques	1.5877
Employ operations research (OR) techniques (improving efficiency of producing product or providing service by use of statistics or mathematical techniques)	1.5385
Analyze and interpret financial statements	1.5128
Interpret functions and their graphs	1.4829
Plan payroll accounting procedures	1.4509
Know principles of capital management, financing	1.4487
Employ probability theory	1.3419
Use mathematical models	1.1667
Plan credit and collection operations	1.0214
Assess general business indicators (economics, currency)	.9915
Design linear program	.9509
Apply matrix algebra	.9252
Conduct investment analyses	.8718
Know tax regulations for federal, state, and municipal requirements	.8462
For Job Performance Five Years in the Future	
Conduct feasibility studies	2.5021
Know the established basic principles of accounting	2.1773
Employ simulation techniques	2.0833
Conduct cost analyses	2.0598
Know principles of sampling, reliability, validity	2.0406
Employ operations research (OR) techniques (improving efficiency of producing product or providing service by use of statistics or mathematical techniques)	2.0321
Know the established principles of cost accounting	2.0150
Develop cost controls	2.0021
Prepare budgets	1.9530
Analyze and interpret financial statements	1.8419
Know principles of capital management, financing	1.8419
Employ probability theory	1.8013
Interpret functions and their graphs	1.7991
Use mathematical models	1.6603
Assess general business indicators (economics, currency)	1.4081
Design linear program	1.3868
Plan payroll accounting procedures	1.3761
Apply matrix algebra	1.2778
Conduct investment analyses	1.2415
Plan credit and collection operations	1.0769
Know tax regulations for federal, state, and municipal requirements	1.0171

Computer and Equipment Competencies

Only one of 21 competencies in the area of Computer and Equipment was accorded a consensus index rating of 2.0 or above and was thus considered "Very important" to the present job of the information systems analyst. Moreover, only two competencies were so indicated for five years in the future. It is noticeable that for this same period, five competencies were considered to be "Unimportant." This is in marked contrast to the future importance of competencies in other areas of systems. A review of Table XII, page 70 reveals that only one other competency was ranked "Unimportant" for the future.

The one competency in the Computer and Equipment area that was rated "Very important" for both the present and the future job performance of the information systems analyst was "Prepare system specifications for programming" (2.3761 present, 2.3291 future). (See Table XVII.) By rating this competency in the highest classification of importance, it seems as if the respondents were saying that a knowledge of how to use the computer and its communication possibilities for a more effective organization is basic for good systems development. To "Work with on-line real-time systems" (1.4637 present, 2.0064 future) showed a sizeable increase in importance. Perhaps this increase indicates a recognition of the increasing importance of making immediately available to the computer certain operating data so that information or output may be kept current.

The "Moderately important" rating accorded the group of computer and equipment competencies that were concerned with "working with" various parts of the computer complex may possibly indicate that, as

TABLE XVII

CLASSIFICATION OF IMPORTANCE OF COMPUTER AND EQUIPMENT COMPETENCIES
BY CONSENSUS INDEX NUMBER

21 Competencies	Classification of Judged Importance							
	Very Important		Moderately Important		Slightly Important		Unimportant	
	Present	Future	Present	Future	Present	Future	Present	Future
Prepare system specifications for programming	2.3761	2.3291						
Operate computer							.5962	.5598
Work with data origination devices			1.7030	1.7906				
Work with data transmission equipment			1.6474	1.9466				
Work with data plotting devices						1.1987	.9038	
Work with disk files			1.7350	1.8184				
Work with computer input-output equipment			1.8548	1.8440				
Work with leased wire communication systems			1.5042	1.8419				
Work with magnetic tape files			1.7051	1.6517				
Work with on-line real-time systems		2.0064			1.4637			
Operate unit record equipment							.4893	.3718
Wire unit record panel boards							.2714	.2030
Work with analog computers							.4060	.5983
Code in machine language							.6645	.5883
Code in pseudo languages					1.0940	1.0897		
Debug, test, modify, and rewrite programs					1.1453	1.0598		
Establish program standards			1.7628	1.8462				
Use decision tables			1.5748	1.8013				
Utilize report generators					1.2244	1.3825		
Utilize sorting programs and routines					1.3333	1.3184		
Work with computer monitoring-control systems				1.5107	1.2009			
Total Competencies by Importance								
Present	1		8		6		6	
Future		2		9		5		5

one analyst said, "To work them /data origination devices, data trans-

mission equipment, disk files, etc.7 or plan their use is not impor-

tant, but to understand their potential is essential."

The competencies selected as "Slightly important" or "Unimpor-

tant" were those largely concerned with a more routine, procedural

type of competency that might very well be assigned to trainees or to

those with less experience and less training.

A summarization of the many comments furnished in this area of

the Computer and Equipment Competencies was captured by the analyst

who said, "Although actual 'hands on' competency is not required, a

systems man must know the principles of computers, capabilities, what

they will and won't do, what input is needed, and what output can be

received--another tool."

A sequential ranking of competencies within the Computer and

Equipment area, displayed in Table XVIII, shows rather vividly the low

regard accorded this group of competencies for the job performance of

information systems analysts.

Employee and Personnel Competencies

More than two-thirds (12 of 17) of the competencies in the area

of Employees and Personnel were deemed to be "Very important" (consensus

index number of 2.0 or above) to the information systems man, both

presently and five years in the future. This area of systems work was

the second highest contributor to the total of 37 "Very important"

competencies for the present and 43 "Very important" competencies for

five years in the future from among all areas. There was a remarkable

consistency of agreement as to the present and future importance of

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TABLE XVIII

SEQUENTIAL RANKING OF THE JUDGED IMPORTANCE OF COMPUTER
AND EQUIPMENT COMPETENCIES

Competency	Consensus Index Number
For Present Job Performance	
Prepare system specifications for programming	2.3761
Work with computer input-output equipment	1.8548
Establish program standards	1.7628
Work with disk files	1.7350
Work with magnetic tape files	1.7051
Work with data origination devices	1.7030
Work with data transmission equipment	1.6474
Use decision tables	1.5748
Work with leased wire communication systems	1.5042
Work with on-line real-time systems	1.4637
Utilize sorting programs and routines	1.3333
Utilize report generators	1.2244
Work with computer monitoring-control	1.2009
Debug, test, modify, and rewrite programs	1.1453
Code in pseudo languages	1.0940
Work with data plotting devices	.9038
Code in machine language	.6645
Operate computer	.5962
Operate unit record equipment	.4893
Work with analog computers	.4060
Wire unit record panel boards	.2714
For Job Performance Five Years in the Future	
Prepare system specifications for programming	2.3291
Work with on-line real-time systems	2.0064
Work with data transmission equipment	1.9466
Establish program standards	1.8462
Work with computer input-output equipment	1.8440
Work with leased wire communication systems	1.8419
Work with disk files	1.8184
Use decision tables	1.8013
Work with data origination devices	1.7906
Work with magnetic tape files	1.6517
Work with computer monitoring-control systems	1.5107
Utilize report generators	1.3825
Utilize sorting programs and routines	1.3184
Work with data plotting devices	1.1987
Code in pseudo languages	1.0897
Debug, test, modify, and rewrite programs	1.0598
Work with analog computers	.5983
Code in machine language	.5833
Operate computer	.5598
Wire unit record panel boards	.2030

the competencies in this area. (See Table XII, page 70.)

There was almost unanimous agreement as to the great importance of four competencies in this area and their consensus index numbers approached the perfect agreement number of 3.0, ranging downward from 2.9081 to a "low" of 2.8761. These four competencies, the highest ranked of all 98 competencies for both present and future importance, were:

> "Communicate orally to individuals and to groups" (2.8803 present, 2.9017 future)
>
> "Communicate clearly in writing (Letters, memos, reports, etc.)" (2.8953 present, 2.8996 future)
>
> "Gain confidence of personnel" (2.9081 present, 2.8868 future)
>
> "Use tact and diplomacy" (2.8782 present, 2.8761 future)

(See Table XIX.)

Not only were these competencies considered "Very important" by nearly all the respondents, but they were elaborated on by respondent after respondent who must have felt a compulsion to add emphasis. Several commented in almost the same words: "The ability to communicate is absolutely essential." Another was more specific in saying, "Communicate effectively with both management and co-workers." The idea of communication was also carried by several comments placed after "Convince others of feasibility of innovations" (2.6880 present, 2.7500 future): "This is 'salesmanship' or 'communication.'" Speaking of this same competency, several systems men cautioned, "Sell before installing." Even after the competency of "Plan and conduct meetings" (2.6068 present, 2.7628 future) was added a single word--"Communicate." No doubt, the respondent who listed as another competency, "Placate temperamental female employees," really meant "Communicate!"

TABLE XIX

CLASSIFICATION OF IMPORTANCE OF EMPLOYEE AND PERSONNEL COMPETENCIES
BY CONSENSUS INDEX NUMBER

17 Competencies	Classification of Judged Importance							
	Very Important		Moderately Important		Slightly Important		Unimportant	
	Present	Future	Present	Future	Present	Future	Present	Future
Communicate orally to individuals and to groups	2.8803	2.9017						
Communicate clearly in writing (letters, memos, reports, etc.)	2.8953	2.8996						
Gain confidence of personnel	2.9081	2.8868						
Plan and conduct time and motion studies					1.1688	1.1774		
Use tact and diplomacy	2.8782	2.8761						
Evaluate the abilities of organization personnel	2.3996	2.5705						
Give, score, and interpret standardized tests							.8034	.8611
Set up wage and/or salary programs						1.1774	.9808	
Train employees	2.1239	2.1667						
Direct work of others on projects	2.5107	2.6068						
Participate in planning sessions	2.7030	2.8056						
Plan and conduct meetings	2.6068	2.7628						
Administer a job analysis program			1.5513	1.6966				
Discuss, write, revise job descriptions			1.6004	1.6560				
Define management relationships	2.0769	2.3120						
Convince others of feasibility of innovations	2.6880	2.7500						
Coordinate functions of systems personnel	2.4551	2.6538						
Total Competencies by Importance								
Present	12		2		1		2	
Future		12		2		2		1

The competency "Gain confidence of personnel" (2.9081 present, 2.8868 future) elicited numerous extra notations to the effect that this was extremely important. One respondent also offered the idea that to gain confidence "the systems man must lead."

A closely linked group of competencies with high importance ratings was concerned with guiding and evaluating personnel: "Coordinate functions of systems personnel" (2.4551 present, 2.6538 future); "Direct work of others on projects" (2.5107 present, 2.6068 future); "Evaluate the abilities of organization personnel" (2.3996 present, 2.5705 future); and "Train employees" (2.1239 present, 2.1667 future).

The competency, "Define management relationships" (2.0769 present, 2.3120 future) brought frequent comments. Several indicated its great importance by saying it was the most important. One proffered the idea of placing "management responsibility where the incentive is." Another approach was suggested by the statement that ". . . much effort is needed to establish the understanding within management of the real functions of their positions." A comment that perhaps belongs to this competency and was deeply underscored by its author was, "Learn to give credit for your results to department heads--management knows."

Again, as in the Administrative and Organizational area, the competencies of lesser importance proved to be the procedural type of competencies that very largely were the province of an earlier type of information specialist. Such a group included: "Administer a job analysis program" (1.5513 present, 1.6966 future); "Discuss, write, revise job descriptions" (1.6004 present, 1.6560 future); "Plan and conduct time and motion studies" (1.1688 present, 1.1774 future); and "Set up wage and/or salary programs" (0.9808 present, 1.1774 future).

TABLE XX

SEQUENTIAL RANKING OF THE JUDGED IMPORTANCE OF EMPLOYEE
AND PERSONNEL COMPETENCIES

Competency	Consensus Index Number
For Present Job Performance	
Gain confidence of personnel	2.9081
Communicate clearly in writing (letters, memos, reports, etc.)	2.8953
Communicate orally to individuals and to groups	2.8803
Use tact and diplomacy	2.8782
Participate in planning sessions	2.7030
Convince others of feasibility of innovations	2.6880
Plan and conduct meetings	2.6068
Direct work of others on projects	2.5107
Coordinate functions of systems personnel	2.4551
Evaluate abilities of organizational personnel	2.3996
Train employees	2.1239
Define management relationships	2.0769
Discuss, write, revise job descriptions	1.6004
Administer a job analysis program	1.5513
Plan and conduct time and motion studies	1.1688
Set up wage and/or salary programs	.9808
Give, score, and interpret standardized tests	.8034
For Job Performance Five Years in the Future	
Communicate orally to individuals and to groups	2.9017
Communicate clearly in writing (letters, memos, reports, etc.)	2.8996
Gain confidence of personnel	2.8868
Use tact and diplomacy	2.8761
Participate in planning sessions	2.8056
Plan and conduct meetings	2.7628
Convince others of feasibility of innovations	2.7500
Coordinate functions of systems personnel	2.6538
Direct work of others on projects	2.6068
Evaluate the abilities of organizational personnel	2.5705
Define management relationships	2.3120
Train employees	2.1667
Administer a job analysis program	1.6966
Discuss, write, revise job descriptions	1.6560
Plan and conduct time and motion studies	1.1774
Set up wage and/or salary programs	1.1774
Give, score, and interpret standardized tests	.8611

The relatively few competencies of lesser importance are included in the sequential ranking given in Table XX, preceding page.

Public Relations, Product, Marketing, and Legal Competencies

By use of the consensus index number, nearly one-fourth (4 of 15) of the competencies in the Public Relations, Product, Marketing, and Legal area were determined to be "Very important" both presently and five years in the future for the job performance of the information systems analyst. Although the contribution from this area to the total "Very important" competencies assembled from all areas was not large, it did represent a consistent evaluation of importance--the same four competencies were chosen for both rating periods. It was also noticeable in this group that not a single competency was thought to be "Unimportant" five years in the future although there were a number rated "Slightly important." These trends may be observed in Table XII, page 70.

In the area of these "Environmental" competencies, the "Very important" ones were all concerned with the parameters or boundaries which guide the organizational functions. These included boundaries imposed by the industry--"Know particular industry (products, economics)" (2.0406 present, 2.2286 future); boundaries imposed by the organization itself--"Know organization's products or services" (2.4338 present, 2.5150 future); and boundaries usually encouraged by the organization--"Represent the company image" (2.2329 present, 2.4359 future) and "Participate in a professional organization" (2.2863 present, 2.3846 future). These and other selections may be seen in Table XXI.

The "Moderately important" classification was composed of

TABLE XXI

CLASSIFICATION OF IMPORTANCE OF PUBLIC RELATIONS, PRODUCT, MARKETING, AND LEGAL COMPETENCIES
BY CONSENSUS INDEX NUMBER

15 Competencies	Classification of Judged Importance							
	Very Important		Moderately Important		Slightly Important		Unimportant	
	Present	Future	Present	Future	Present	Future	Present	Future
Know government regulations of organizations (ICC, SEC, etc.)					1.0897	1.4103		
Represent the company image	2.2329	2.4359						
Participate in community affairs			1.6329	1.8462				
Participate in a professional organization	2.2863	2.3846						
Keep abreast of tax regulations and procedures					1.0021	1.1774		
Know basic legal relationships					1.2692	1.4615		
Know particular industry (products, economics)	2.0406	2.2286						
Know organization's products or services	2.4338	2.5150						
Provide for market research				1.5021	1.1667			
Develop production standards					1.1774	1.3611		
Provide for inventory controls			1.7521	1.8782				
Plan for customer relations				1.5705	1.3782			
Forecast sales					1.2479	1.4744		
Analyze organization's markets					1.1752	1.4658		
Know trade relationships, promotion, advertising						1.1859	.9615	
Total Competencies by Importance								
Present	4		2		8		1	
Future		4		4		7		0

essentially the same types of boundary defining competencies as in the previously discussed "Very important" group. These "Moderately important" competencies included: "Participate in community affairs" (1.6329 present, 1.8462 future); "Provide for market research" (1.1667 present, 1.5021 future); and "Plan for customer relations" (1.3782 present, 1.5705 future). The competency "Provide for inventory controls" (1.7521 present, 1.8782 future) may carry a dual meaning--that of adequacy of supply for customer satisfaction or that of cost control.

The "Slightly important" classification seemed to contain competencies that were more specific in nature; and many of the competencies, perhaps, should be the responsibility of the departments. For example, one analyst suggested "'Forecast sales,' 'Analyze organization's markets', and 'Know trade relationships' are the responsibility of the sales department. Let them decide what is needed but help them to draw up format or specifications." "Know government regulations of organizations (ICC, SEC, etc.)" (1.0897 present, 1.4103 future) and "Keep abreast of tax regulations and procedures" (1.0021 present, 1.1774 future) parallelled similar competencies in the Accounting and Mathematical area and elicited many of the same comments. These comments were to the effect that such information could be found as needed.

Almost half (7 of 15) of the competencies in this area were considered of only slight importance to the position of the information systems analyst. This area accounted for a larger percentage in the "Slightly important" classification than did any other single area of systems. The sequential ranking of these and other "Environmental" competencies may be seen in Table XXII.

TABLE XXII

SEQUENTIAL RANKING OF THE JUDGED IMPORTANCE OF PUBLIC RELATIONS,
PRODUCT, MARKETING, AND LEGAL COMPETENCIES

C o m p e t e n c y	Consensus Index Number
For Present Job Performance	
Know organization's products or services	2.4338
Participate in a professional organization	2.2863
Represent the company image	2.2329
Know particular industry (products, economics)	2.0406
Provide for inventory controls	1.7521
Participate in community affairs	1.6325
Plan for customer relations	1.3782
Know basic legal relationships	1.2692
Forecast sales	1.2479
Develop production standards	1.1774
Analyze organization's markets	1.1752
Provide for market research	1.1667
Know government regulations of organizations (ICC, SEC, etc.)	1.0897
Keep abreast of tax regulations and procedures	1.0021
Know trade relationships, promotion, advertising	.9615
For Job Performance Five Years in the Future	
Know organization's products or services	2.5150
Represent the company image	2.4359
Participate in a professional organization	2.3846
Know particular industry (products, economics)	2.2286
Provide for inventory controls	1.8782
Participate in community affairs	1.8462
Plan for customer relations	1.5705
Provide for market research	1.5021
Forecast sales	1.4744
Analyze organization's markets	1.4658
Know basic legal relationships	1.4615
Know government regulations of organizations (ICC, SEC, etc.)	1.4103
Develop production standards	1.3611
Know trade relationships, promotion, advertising	1.1859
Keep abreast of tax regulations and procedures	1.1774

Trends Indicated by the Judged Importance of the Competencies

The detailed analysis of the judged importance of the individual competencies indicated some to be more important than others to the job of the information systems analyst. It also revealed that some of the competency areas thought to be a part of the systems job were more important to the job than were others. The area of Administration and Organization contributed nearly half of the competencies thought to be "Very important" for the job at the present and five years in the future. The next highest contributor was the area of Employee and Personnel competencies, which accounted for almost a third of the total "Very important" present and future competencies. These areas were followed in order by Accounting, Financial, Economic and Computational Competencies; Public Relations, Product, Marketing, and Legal Competencies; and Computer and Equipment Competencies. Although it might seem that the computer was not important to the job of the information systems analyst, descriptive comments (of which there were many) urged the understanding of the potential of the computer. One analyst summarized this idea: "Although actual 'hands on' competency is not required, a systems man must know the principles of computers, capabilities, what they will and won't do, what input is needed, and what output can be received--another tool." The low competency contribution of the Computer and Equipment area might, then, possibly be explained by the fact that many of the competencies within that area were concerned with the "hands on" type of competency.

Among all areas of systems considered in this study, the 37 competencies appraised as "Very important" for present job performance,

are ranked sequentially in Table XXIII. The sequential ranking of the competencies in the classifications of less importance may be seen in Appendix B.

Similarly, the 43 competencies judged to be "Very important" for job performance five years in the future are ranked sequentially in Table XXIV. The sequential ranking of the competencies in the classifications of less importance may be seen in Appendix B.

The judged importance of the competencies in the "Very important" classification for both the present and five years in the future will be considered in another way in the next chapter. That chapter will inquire into the relationship between the judged importance of the competencies in the "Very important" classification and selected organizational variables and individual attributes.

Summary

This chapter has presented a detailed analysis of the judged importance of the job-related competencies previously marked by a randomly selected group of systems personnel. A rating technique to determine classifications of importance for the competencies was explained. By use of the rating technique, it was determined that the systems analysts considered 37 (37.8 percent) of the 98 competencies "Very important" for job performance at present; 25 (25.5 percent) "Moderately important;" 22 (22.4 percent) "Slightly important;" and 14 (14.3 percent) "Unimportant."

As the analysts attempted to assess the importance of the competencies five years in the future, the ratings accorded the 98 competencies changed somewhat. Of the 98 competencies, 43 (43.9 percent)

TABLE XXIII

SEQUENTIAL RANKING OF COMPETENCIES IN THE "VERY IMPORTANT"
CLASSIFICATION FOR PRESENT JOB PERFORMANCE

Competency	Consensus Index Number
Gain confidence of personnel	2.9081
Communicate clearly in writing (letters, memos, reports, etc.)	2.8953
Communicate orally to individuals and to groups	2.8803
Use tact and diplomacy	2.8782
Gather, analyze, and interpret facts	2.8419
Know organization's objectives	2.7179
Participate in planning sessions	2.7030
Convince others of feasibility of innovations	2.6880
Identify management information needs	2.6453
Plan and conduct meetings	2.6068
Determine departmental information needs	2.5940
Analyze management's planning and control problems	2.5620
Analyze input and output data	2.5449
Know advantages and disadvantages of mechanical office equipment and computer operations	2.5256
Direct work of others on projects	2.5107
Develop new office systems, procedures, and methods and improve those already in existence	2.5000
Know the organization of the company very well	2.4722
Conduct feasibility studies	2.4701
Coordinate functions of systems personnel	2.4551
Know administrative policies	2.4380
Know organization's products or services	2.4338
Identify commonality of information needs	2.4231
Evaluate value vs. cost of information	2.4167
Evaluate the abilities of organizational personnel	2.3996
Prepare systems specifications for programming	2.3761
Participate in a professional organization	2.2863
Know theories of management	2.2821
Design an over-all management information system	2.2628
Represent the company image	2.2329
Know the established basic principles of accounting	2.1902
Simplify work procedures	2.1517
Delineate areas appropriate for programmed decision making	2.1453
Train employees	2.1239
Appraise ways of reducing office costs	2.1068
Define management relationships	2.0769
Know particular industry (products, economics)	2.0406
Prepare data flow analyses using charting symbols	2.0321

TABLE XXIV

SEQUENTIAL RANKING OF COMPETENCIES IN THE "VERY IMPORTANT" CLASSIFICATION
FOR JOB PERFORMANCE FIVE YEARS IN THE FUTURE

Competency	Consensus Index Number
Communicate orally to individuals and to groups	2.9017
Communicate clearly in writing (letters, memos, reports, etc.)	2.8996
Gain confidence of personnel	2.8868
Use tact and diplomacy	2.8761
Know organization's objectives	2.8611
Participate in planning sessions	2.8056
Plan and conduct meetings	2.7628
Identify management information needs	2.7564
Gather, analyze, and interpret facts	2.7521
Convince others of feasibility of innovations	2.7500
Analyze management's planning and control problems	2.7415
Coordinate functions of systems personnel	2.6538
Determine departmental information needs	2.6346
Evaluate value vs. cost of information	2.6218
Know the organization of the company very well	2.6068
Direct work of others on projects	2.6068
Design an over-all management information system	2.5983
Evaluate the abilities of organizational personnel	2.5705
Know theories of management	2.5406
Know advantages and disadvantages of mechanical office equipment and computer operations	2.5363
Know administrative policies	2.5342
Know organization's products or services	2.5150
Conduct feasibility studies	2.5021
Identify commonality of information needs	2.4936
Analyze input and output data	2.4423
Represent the company image	2.4359
Participate in a professional organization	2.3846
Develop new office systems, procedures, and methods and improve those already in existence	2.3632
Delineate areas appropriate for programmed decision making	2.3568
Prepare systems specifications for programming	2.3291
Define management relationships	2.3120
Know particular industry (products, economics)	2.2286
Know the established basic principles of accounting	2.1773
Train employees	2.1667
Appraise ways of reducing office costs	2.1645
Simplify work procedures	2.0962
Employ simulation techniques	2.0833
Conduct cost analyses	2.0598
Know principles of sampling, reliability, validity	2.0406
Employ operations research (OR) techniques (improving efficiency of producing product or providing service by use of statistics or mathematical techniques)	2.0321
Know the established principles of cost accounting	2.0150
Work with on-line real-time systems	2.0064
Develop cost controls	2.0021

were considered "Very important;" 26 (26.5 percent) "Moderately impor-

tant;" 23 (23.5 percent) "Slightly important;" and 6 (6.1 percent)

"Unimportant."

The "Very important" group of competencies for both the present

and the future will be used in the next chapter to inquire into the

relationship between judged importance and organizational variables

and individual attributes.

CHAPTER VI

TESTS OF HYPOTHESES

The previous chapter was concerned with the identification of
competencies which information systems analysts judged important for
role performance now and five years in the future. In order to further
delineate the formal role of the information systems analyst, this
chapter inquires into the relationships between the judged importance
of the competencies in the "Very important" classification and selected
organizational variables and individual attributes. The relationships
which were investigated are expressed as null statements in two parallel
complex hypotheses concerning the present and future judged importance
of the competencies. Comments are made about those hypotheses which
were rejected because a significant difference was noted between groups
at the previously selected .05 level of significance. Because the
complex hypotheses contain many sub-hypotheses, an over-all judgment
is made concerning the major hypothesis for each organizational
variable and each individual attribute.

The two parallel complex hypotheses differed only in the time--
present or five years in the future--for which the judgments of impor-
tance were indicated. Therefore, it was feasible to present the find-
ings from tests of the hypotheses according to the selected organi-
zational variable or the individual attribute under consideration.
This method of presentation facilitates comparisons of the importance

of each competency at the present and five years in the future and
perception of trends, according to the influence of the variable under
study.

In order to satisfy the requirements for use of the chi-square
statistic, it was necessary to regroup some of the data. Because of
minor differentiation observed between judgments of "Slightly impor-
tant" and "Unimportant," these groupings for judged importance of
competencies were routinely combined in a single grouping designated
"Unimportant." All other regroupings of data for testing are recognized
as each organizational variable or individual attribute is considered.

The response distribution tables (raw data) used in the chi-square
tests which revealed a significant difference among groups may be
found in Appendix C. In addition, results of all chi-square tests may
be found in Appendix D. In both presentations, all statistical results
are reported in terms of significance levels or exact probabilities so
that the reader may set his own significance level for rejection of
the null hypothesis.

Relationship Between Size of Organization and

Judged Importance of Competencies

Hypotheses 1a and 2a explore the present and future relationship
between the judged importance of the selected competencies and one of
the organizational variables--size of the organization.

For purposes of testing, all organizations with fewer than 1,000
employees were considered "Small;" organizations with 1,000 or more
employees but fewer than 5,000 were considered "Medium;" and all
organizations with 5,000 or more employees were considered "Large."

Present Relationship

Hypothesis 1a: The present judged importance of a selected

competency is independent of size of organization.

Results of the tests made with 37 competencies and the organizational

variable of size disclosed a great similarity among analysts in organi-

zations of varying sizes regarding the present judged importance of

the selected competencies. Since there were no significant differences

registered, this hypothesis was accepted. The conclusion was reached

that organizational size was not significantly associated with the

present judged importance of the selected competencies.

Future Relationship

Hypothesis 2a: The future judged importance of a selected

competency is independent of size of organization.

Again there was great similarity among analysts in organizations of

varying sizes, with a significant difference registered for only one

competency. Therefore, the hypothesis was accepted; and the conclusion

was reached that the future judged importance of the selected compe-

tencies was not appreciably affected by the size of the organization.

The competency for which a significant difference was registered was

"Know organization's products and services" from the area of Public

Relations, Product, Marketing, and Legal Competencies. Rather curious-

ly, it was of relatively greater importance to analysts in the small

and medium size organizations than to analysts in the large organiza-

tion. This same viewpoint was apparent for five additional competencies

for which the differences approached significance.

Conclusions Concerning Size of Organization and Judged Importance

of Competencies

Regardless of the size of the employing organization, analysts

closely agreed on the importance of the selected competencies for job

performance. The only significant difference registered was for a

single competency five years in the future. A study of the data for

this competency and other competencies for which the tests approached

significance reveals that analysts in large organizations may not

consider certain competencies as necessary for job performance as do

their counterparts in the small and medium size organizations. From

these trends, a conjecture seems warranted to the effect that as the

organization becomes over 5,000 employees in size, the information

systems analyst becomes more of a specialist--a consultant to manage-

ment but not responsible for managerial functions of supervision,

training, and others. However, evidence for such a conjecture is far

too inconclusive for anything but acceptance of the two parallel

sub-hypotheses that the selected competencies are independent of the

size of the organization when considered for both the present and

five years in the future.

Relationship Between Level of Systems Responsibility and

Judged Importance of Competencies

Hypotheses 1b and 2b consider the relationship between the

judged importance of selected competencies and the second organizational

variable considered in this study--level of systems responsibility--to

see whether analysts with supervisory responsibilities are more likely

to regard the competencies as essential for job performance.

In order to test this hypothesis, all respondents were categorized as either "Managers" or "Non-managers" according to their responsibility for supervision of others. Obviously, those labeled "Managers" were responsible for the systems activities of one or more persons, whereas "Non-managers" were responsible for only their own systems activities.

Present Relationship

Hypothesis 1b: The present judged importance of a selected competency is independent of level of systems responsibility. Although analysts in the two levels of systems responsibility agreed substantially on the judged importance of 23 of the selected competencies, they differed significantly on 14, with six of these meeting the very rigorous .001 level of significance. Plainly there were sharp disagreements regarding the importance with which analysts in different organizational positions viewed the competencies. From study of the data, it became evident that the significant differences recorded were attributable to the high importance with which "Managers" regarded the 14 competencies. This same viewpoint was also obvious for six additional competencies whose test results approached significance. Therefore, on the basis of the 14 significant differences noted and the six differences which approached significance--all indicating that the selected competencies were more important to "Managers" than "Non-managers"--the decision was made to reject the hypothesis and to conclude that the present judged importance of the competencies is not independent of the level of systems responsibility.

Clearly "Managers" and "Non-managers" varied noticeably in their

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appraisals concerning the judged importance of the competencies in

certain areas of systems work. The 14 competencies for which a signif-

icant difference was noted, are presented in Table XXV. The first two

competencies listed in the table are concerned with management concepts

from the area of Administration and Organization. The next two compe-

tencies listed are from the Accounting, Financial, Economic, and

Computational area. The large group of seven competencies is from

the area of Employees and Personnel. The last three competencies are

from the area of Public Relations, Product, Marketing, and Legal

Competencies--a group previously designated as concerned with organi-

zational boundaries. The great emphasis accorded all of these compe-

tencies by the "Managers" seems consistent since the designated group

of competencies appears to be primarily managerial in nature.

Future Relationship

Hypothesis 2b: The future judged importance of a selected

competency is independent of level of systems responsibility.

Since significant differences were recorded for only nine of 43

comparisons used to explore this relationship, the hypothesis must be

accepted.

"Managers" generally considered the nine competencies for which

significant differences emerged to be of greater importance than did

the "Non-managers." It is not surprising that most of these differences

were centered in the area of Employees and Personnel. (See Table XXVI.)

Among the nine competencies were four which showed substantial

reductions from present to future in the statistical significance

levels. (Compare Table XXV, page 104 with Table XXVI.) The changes in

TABLE XXV

JOB-RELATED COMPETENCIES ABOUT WHICH "MANAGERS" AND "NON-MANAGERS"
DIFFERED SIGNIFICANTLY AS TO PRESENT JUDGED IMPORTANCE

C o m p e t e n c y	Significance Level			
	.05	.02	.01	.001
Identify management information needs	x			
Design over-all management information system	x			
Know established basic principles of accounting			x	
Conduct feasibility studies	x			
Evaluate abilities of organizational personnel				x
Train employees				x
Direct work of others on projects				x
Participate in planning sessions			x	
Plan and conduct meetings				x
Define management relationships				x
Coordinate functions of systems personnel				x
Represent the company image			x	
Participate in a professional organization		x		
Know particular industry		x		

TABLE XXVI

JOB-RELATED COMPETENCIES ABOUT WHICH "MANAGERS" AND "NON-MANAGERS"
DIFFERED SIGNIFICANTLY AS TO FUTURE JUDGED IMPORTANCE

Competency	Significance Level			
	.05	.02	.01	.001
*Design over-all management information system		x		
Conduct cost analyses	x			
Employ simulation techniques		x		
*Evaluate abilities organizational personnel			x	
*Train employees			x	
*Define management relationships			x	
Convince others of feasibility of innovations		x		
*Coordinate functions of systems personnel	x			
*Represent the company image	x			

*For this competency a significant difference was also registered on
its present judged importance.

significance level were determined to be in the direction of the

"Non-managers."

Conclusions Concerning Level of Systems Responsibility and Judged

Importance of Competencies

Marked differences were noted between the judgments of present

importance made by "Managers" and "Non-managers." In general, the

managerial analysts considered competencies in the area of Employees

and Personnel vastly more important for job performance than did the

analysts without supervisory responsibilities. The trend that is

indicated, however, is one of greater agreement between the two groups

of analysts regarding the importance of all competencies for five years

in the future.

The direction of change toward agreement among groups, verified

by a general decline in levels of significance for many of the compe-

tencies and bolstered by a reduction in the number of competencies for

which tests indicated a significant difference, seems to support a

deduction that "Non-managers" are becoming more like "Managers" in

their views concerning job-related competencies.

Relationship Between Formal Education and Judged

Importance of Competencies

Hypotheses 1c and 2c assert that the individual attribute of

formal education is not related to judgments concerning the importance

of a selected group of competencies.

In order to test this hypothesis, all respondents were grouped

according to the highest degree completed. All who had not earned any

degree were assigned to the grouping, "No degree;" those who had an undergraduate degree were assigned to the grouping, "Undergraduate degree;" and those with either a master's or doctor's degree were assigned to the grouping, "Graduate degree."

Present Relationship

Hypothesis 1c: The present judged importance of a selected competency is independent of formal education.

Despite the differing educational backgrounds, great similarity was expressed by the analysts in their appraisals of the importance of the selected competencies; and this hypothesis was accepted.

A significant difference was recorded for only a single competency--"Know the established basic principles of accounting." In addition, no definite trend could be discovered among the data of those competencies whose results approached significance. Therefore, there was no adequate basis for asserting that the individual attribute of formal education was related to the judgments of the importance of the competencies.

Future Relationship

Hypothesis 2c: The future judged importance of a selected competency is independent of formal education.

Significant differences were reported for only two competencies: "Know theories of management" and "Know the established basic principles of accounting." Additionally, a study of the test results which approached significance failed to disclose any clear pattern that would prevent the acceptance of the hypothesis. The conclusion was reached that the

judged importance of the group of 43 selected competencies was independent of the formal education of the respondents.

Of interest is the finding that a significant difference for both the present and five years in the future was recorded for "Know the established basic principles of accounting." This competency was considered "Very important" by a higher percentage of analysts with "No degree" than by analysts with undergraduate or graduate degrees. Whether this emphasis by the analysts without a degree is a result of the demands of their jobs or whether it indicates a lack of skill in this area is open to supposition.

Conclusions Concerning Formal Education and Judged Importance of Competencies

Only three significant differences were recorded for the relationship between formal education of the analysts and the judged importance of the competencies, with two of these registered for the present and future importance of "Know the established basic principles of accounting." Not only were the significant differences minimal in number, but no clear trend was discernible in the results which approached significance; thus, the strongest impression gained is that the judged importance of the selected competencies is not appreciably altered by the educational backgrounds of the analysts.

Relationship Between Years of Experience in Systems and Judged Importance of Competencies

Hypotheses 1d and 2d inquire into the present and future relationship between the second individual attribute--years of experience in

systems--and appraisals of importance of selected competencies to see
whether persons with more years of experience in systems are inclined
to view the competencies with greater importance.

In order to adhere to the requirements imposed by the chi-square
statistic, data were regrouped so that respondents with 0 to 3 years
of systems experience composed one group; those with 4 to 7 years of
experience made up the second group; those with 8 to 14 years of expe-
rience formed the third group; and those with 15 or more years of
experience represented the last group.

Present Relationship

Hypothesis 1d: The present judged importance of a selected

competency is independent of years of experience in

systems.

Of the 37 competencies used in comparisons to determine the disposition
of the hypothesis, significant differences were recorded for 19. With
one exception, greater percentages of analysts with 15 or more years
of experience in systems rated these competencies "Very important."
Those analysts with 8 to 14 years of experience in systems also rated
many of these competencies as "Very important." By consideration of
these findings, together with other results which approached signifi-
cance and which pointed in the same direction, the decision was made
to reject the hypothesis. The conclusion was reached that years of
experience in systems was significantly associated with the present
judged importance of the competencies.

The 19 competencies on which analysts with varying years of
experience in systems differed significantly may be seen in Table XXVII.

TABLE XXVII

JOB-RELATED COMPETENCIES ABOUT WHICH ANALYSTS WITH VARYING
YEARS OF EXPERIENCE IN SYSTEMS DIFFERED SIGNIFICANTLY
AS TO PRESENT JUDGED IMPORTANCE

Competency	Significance Level			
	.05	.02	.01	.001
Know organization's objectives				x
Know organization of the company well				x
Know administrative policies			x	
Identify commonality of information needs			x	
Know theories of management				x
Know established basic principles of accounting				x
Conduct feasibility studies		x		
Prepare system specifications for programming	x			
Evaluate abilities of organizational personnel				x
Train employees				x
Direct work of others on projects				x
Participate in planning sessions				x
Plan and conduct meetings				x
Define management relationships				x
Coordinate functions of systems personnel				x
Represent the company image	x			
Participate in a professional organization				x
Know particular industry	x			
Know organization's products or services				x

All five areas of systems included in this study are represented in this group. The first five competencies listed are Administrative and Organizational Competencies; the next two are in the area of Accounting, Financial, Economic, and Computational Competencies; the single competency is from the Computer and Equipment Competencies; the large group of seven competencies is concerned with Employees and Personnel; and the last four competencies are from the Public Relations, Product, Marketing, and Legal Competencies.

The only competency which was significantly less important to those with the most years of experience in systems is "Prepare system specifications for programming." Curiously, this competency was of the same relative unimportance to those with 0 to 3 years of experience in systems. It would seem from the data analyzed that years of experience in systems appreciably affected the present judged importance of the competencies.

Future Relationship

   Hypothesis 2d: The future judged importance of a selected

      competency is independent of years of experience in

      systems.

Since only five instances of significance were reported in comparisons made to explore this relationship, there is insufficient evidence for rejection of this hypothesis. Therefore, it is concluded that years of experience in systems are not significantly associated with the judged importance of the competencies for five years in the future.

The five significant differences, reported in Table XXVIII, were in favor of analysts with more years of systems experience. The first

TABLE XXVIII

JOB-RELATED COMPETENCIES ABOUT WHICH ANALYSTS WITH VARYING
YEARS OF EXPERIENCE IN SYSTEMS DIFFERED SIGNIFICANTLY
AS TO FUTURE JUDGED IMPORTANCE

C o m p e t e n c y	Significance Level			
	.05	.02	.01	.001
Know established principles of cost accounting	x			
Employ simulation techniques		x		
*Participate in professional organization		x		
*Know particular industry		x		
*Know organization's products or services				x

*For this competency a significant difference was also registered on
its present judged importance.

two competencies are from the area of Accounting, Financial, Economic, and Computational Competencies. Analysts with 15 or more years of experience in systems considered the competency "Know the established principles of cost accounting" to be significantly more important than expected. Similarly, the indication is that analysts with 8 or more years of experience in systems rated the competency "Employ simulation techniques" of greater importance than did analysts with less experience. The group of three competencies is from the Public Relations, Product, Marketing, and Legal Competencies. Interestingly, for each of these three, analysts with 4 to 7 years of experience in systems indicated it was of comparatively great importance to "Participate in a professional organization," to "Know particular industry," and to "Know organization's products or services."

Conclusions Concerning Years of Experience in Systems and Judged Importance of Competencies

The present judged importance of the competencies seemed noticeably related to the analysts' years of experience in systems. Significant differences were recorded for 19 of 37 competencies, and the hypothesis was rejected. Yet, when this same relationship was explored for five years in the future, a startling change occurred as evidenced by a reduction from 19 to 5 significant differences. From indications of the direction of these significant differences and a mixed trend in those results approaching significance, it appears that analysts with varying years of experience reach a greater accord as they contemplate the importance of the competencies five years in the future. The accord, however, is neither totally in the direction of those with

the most years of experience nor in the direction of those with the
least years of systems experience, but is rather one of mutual accord.

Summary

Findings from tests of the two parallel complex hypotheses,
intended to further delineate the formal role of the information
systems analysts, were reported and summarized in this chapter under
four headings. Two of the four headings concerned the organizational
variables of size of organization and level of systems responsibility.
The last two headings involved the individual attributes of formal
education and years of experience in systems.

When the relationship between size of organization and judged
importance of the competencies was explored, only one significant
difference was reported. Therefore, the conclusion was reached that
the size of the employing organization did not seem to be related to
the judged importance of the job-related competencies for the present
or five years in the future.

A study of the relationship between level of systems responsibil-
ity and present judged importance of the competencies revealed 14
significant differences and six approaching significance, all in the
direction of the "Manager" group. The conclusion was reached that
the present judged importance of the competencies was not independent
of level of systems responsibility. When the relationship between
level of systems responsibility and the future judged importance of
the competencies was considered, there was a sizeable decline in the
number of significant differences. The hypothesis was accepted that
level of systems responsibility was not significantly related to the

future judged importance of the competencies.

The third relationship investigated was between formal education and judged importance of the competencies. Since only three significant differences were noted for both present and future judgments, it was concluded that the judged importance of the competencies was not differentially influenced by the formal education of the analysts.

To study the last major relationship, comparisons were made between varying years of experience in systems and the judged importance of the competencies. The comparisons revealed that a present significant relationship existed for slightly more than half of the competencies, with the direction of significance toward analysts with the largest number of years of experience in systems. Additional differences, approaching significance and weighted in the same direction as the significant results, were used as substantiation for the decision to reject the hypothesis. When the same relationship was examined for five years in the future, a sharp decline was noted in the number of significant differences. The decision was made to accept the hypothesis that the future judged importance of the selected competencies was not appreciably influenced by the analysts' years of experience in systems.

CHAPTER VII

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Business organizations, like all social organizations, are
contrived systems, striving for a sensitive balance between organi-
zational variables--structure, tasks, technology, and people (actors)--
for continued survival in a changing world. The Industrial Revolution,
initiating major changes in factory production methods, and the Infor-
mation Processing Revolution, effecting changes in both the factory
and office communication systems, are resulting in a complexity of
social and personnel needs. Seeking to be responsive to the preparation
of its citizens for useful work, the educational community is interested
in direction and interpretation of these needs. Empirical studies of
prevailing business behavior help provide direction so that overspecial-
ization and overfragmentation of the curriculum may be avoided.

The Literature in the Field

A continuing demand for top-level staff personnel, capable of
identifying management's information needs and of planning for fulfill-
ing those needs, is reported in readings in the literature. The demand
for such personnel, identified in this study as information systems
analysts, developed in response to changes in the information or
communication requirements of a complex business system. Increasingly

sophisticated information requirements and progressive mechanization
in both the factory and office are handmaidens contributing to changing
personnel needs in business organizations. When most business organi-
zations were relatively small in size and only beginning to be intro-
duced to rather simple factory mechanization, information requirements
were comparatively simple. Management found an adequate philosophy
of management in the classical or traditional theory structured on its
pillars of division of labor, scalar and functional processes, line
and staff organization, and span of control concept. More extensive
mechanization, often resulting in larger and more complex organizations,
coupled with employee reaction to impersonal treatment necessitated a
different approach to information needs and philosophy of management.
The neoclassical or human relations school of management fulfilled
such a requirement. Over time, as social needs of workers were accord-
ed excessive consideration (often at the sacrifice of economic effi-
ciency of organizations) and advances in both factory and office
mechanization and automation accelerated, a more adequate philosophy
of management was needed. Modern organization theory, with its empha-
sis on the organization as a system of interrelated and interacting
parts, provides the unifying approach. Communication, or information
for more effective decision making and control, is recognized as the
very essence of a social system or business organization. The computer
continues to cause extensive changes in data processing activities,
providing undreamed of possibilities for information and control of an
increasingly complex business system. The potentialities of the comput-
er complex for more vital information are dependent, however, on their

being harnessed and channeled into an integrated flow of information

for use when and where needed in activities of the business organi-

zation.

The activities of the specialists who have long been recognized

as responsible for the information function in organizations are

reflecting change. There are indications that office specialists are,

in some instances, assuming greater and more extensive responsibilities

for an integrated data processing system for the entire business

organization. In other instances, these extended responsibilities are

being supplied by computer specialists. Readings in the literature

indicate that new personnel--information systems specialists--repre-

senting a combination of technical and conceptual skills, are respon-

sible in some organizations for the increasingly important information

function. Scant research evidence is available as to the nature and

extent of the competencies used by such new personnel. It is in this

area that significant findings could extend knowledge by reporting

in some detail the most important job-related competencies used by

systems personnel. This study further extends knowledge by assessing

the strength of relationships between the importance of selected compe-

tencies and certain organizational variables and individual attributes.

Additional dimensions to knowledge are gained by delineating job

activities, job and company characteristics, and personal character-

istics of systems personnel.

Purpose and Design of the Study

This study was designed to obtain information from a random

sample of persons actively participating in their organizations as systems personnel. It sought to increase knowledge of the personal and company characteristics of information systems analysts and to gather information regarding the necessity for certain competencies indicated as useful to the analysts in fulfilling the formal task requirements of their jobs. Such information facilitated identification of competencies judged to be of the most importance to the analysts now as well as those judged to be of the most importance five years in the future. By comparing some of the data from the study, it was possible to test hypotheses concerning the influence of certain organizational variables and individual attributes on appraisals of the importance of the competencies.

The Study Hypotheses

Two parallel complex hypotheses, differing only in time--present or five years in the future--were formulated to ascertain the influence of certain organizational variables and individual attributes on the judged importance of selected competencies. The organizational variables were delineated as size of organization and level of systems responsibility. The individual attributes were recognized as formal education and years of experience in systems.

The Study Instrument

In order to elicit data concerning personal and company characteristics of information systems analysts and to identify the competencies which they considered important to their job performance now and five

years from now, a four-page printed questionnaire (8½ by 11 inches)

was designed. In the fall of 1968, this questionnaire was mailed to

a random sample of 717 persons drawn from the national membership of

the Association for Systems Management. More than four-fifths (83.1

percent) cooperated by returning usable questionnaires.

Analysis of the Data

All responses to the questionnaire were coded and analyzed with

the aid of computer tabulations. Frequency counts and percentage

relationships contributed to analyzations of the descriptive data

while chi-square tests to determine significant differences among

groups aided in interpretation of the study hypotheses.

Results of the Study

The findings of the study are summarized in three parts accord-

ing to (1) job activities, job and company characteristics, and

personal characteristics of information systems analysts; (2) identi-

fication of the competencies judged to be important for job performance

now and five years in the future, noting the contribution from each

area of systems work to the total number of essential competencies;

and (3) relationship between judged importance of selected competencies

according to organization variables and individual attributes.

Job Activities, Job and Company Characteristics, and Personal
Characteristics of the Information Systems Analyst

More than nine-tenths of the 468 information systems analysts

agreed that the major activities of their jobs concerned improving the flow of information through the organization by implementing or improving systems and by evaluating such systems. Systems activities receiving the least participation concerned work simplification or work measurement and divisional or departmental methods of operation.

Respondents were most frequently employed by two related types of organizations--Manufacturing and Manufacturing-Sales. The largest percentage of analysts worked in organizations composed of 1,000 to 4,999 employees. Percentage comparisons with previous surveys revealed sizable increases in Consulting, Education, and Other classifications, implying that in all types of organizations there was recognition of the importance for deliberate planning for information needs. Recognition of the information function was found in the salaries earned. More than four-fifths of the analysts who furnished salary information reported a monthly salary of $1,000 or more, and nearly one-tenth reported $1,750 or more, whereas few (3.7 percent) reported receiving less than $750 a month. Years of experience in systems work was evidenced by higher monthly salaries, with over one-half of the analysts with 20 or more years of experience in systems receiving $1,500 or more monthly. Years of experience in systems work was also recognized by assigned supervisory responsibilities, with nearly two-thirds of the supervisors having 15 or more years of experience in systems.

Information systems analysts were men, comparatively young in both experience and age--nearly three-fifths were 39 years of age or under and had 10 or fewer years of experience in systems. More than two-thirds of the analysts had the bachelor's, master's, or doctor's

degree, whereas fewer than one-tenth had no formal college preparation.

Analysts had most frequently majored in business administration, and

they recommended college training with this major as the best prepara-

tion for systems work. The next most effective training was deemed

to be that provided by an employing company through its in-service

training--a supplement to formal college preparation.

Identification of Competencies Judged to be Important for Job Performance Now and Five Years in the Future

Judgments of the importance with which analysts regarded each of

98 competencies in the performance of their jobs now and five years

in the future were evaluated by computation of a consensus index

number for each competency. Application of the consensus index number

revealed that analysts presently considered more than one-third (37)

of the competencies to be "Very important" for job performance and

nearly one-half (43) of all (98) competencies to be "Very important"

five years from now.

Nearly half of the present and future "Very important" compe-

tencies (18 present, 17 future) were from the area of Administration

and Organization, indicating need for the analysts to share a manage-

ment viewpoint. Examples of highly important competencies, for both

present and future job performance are: "Gather, analyze, and inter-

pret facts" and "Analyze management's planning and control problems."

Less than one-tenth (2) of the competencies in the Accounting,

Finance, Economic, and Computational area were presently considered

"Very important," but almost four-tenths (8) were considered to be

"Very important" competencies five years from now. This rate of increase in importance from present to future exceeded that for any other area of systems considered in this study. High importance for both present and future was accorded "Know the established basic principles of accounting" and "Conduct feasibility studies."

Fewer "Very important" competencies were identified in the area of Computer and Equipment than in any other area of systems considered in this study. The one competency considered presently important-- "Prepare system specifications for programming"--was joined by one other--"Work with on-line real-time systems"--to make only two competencies in this area which received high appraisals of importance for the future. Frequent comments supplied by the analysts indicated the importance of knowing the principles, capabilities, and potentialities of computers, yet recognized the importance of realizing their limitations.

Great consistency in appraisals of present and future importance was accorded the competencies in the area of Employees and Personnel. They accounted for about one-third (12) of the total "Very important" competencies for both the present and five years in the future. There was almost unanimous agreement as to the high importance of four competencies in this area. These competencies are: "Communicate orally to individuals and to groups," "Communicate clearly in writing," "Gain confidence of personnel," and "Use tact and diplomacy." They received the highest present and future consensus index ratings among all 98 competencies considered in this study.

In the area of Public Relations, Product, Marketing, and Legal

competencies, the same four competencies were selected for both present
and future importance. These competencies concerned industry and
organizational environments as well as professional association and
image of the analysts.

Relationship Between Judged Importance of Selected Competencies
According to Organization Variables and Individual Attributes

In order to further delineate the formal role of the information
systems analyst in accordance with the theory of the study, two parallel
complex hypotheses differing only regarding time (present or five years
in the future) were formulated. Information was sought regarding the
extent of the relationship between judged importance of selected compe-
tencies and two organizational variables--size of organization and
level of systems responsibility--and two individual attributes--formal
education and years of experience in systems.

Great similarity among organizations of varying sizes regarding
both the present and future judged importance of selected competencies
led to the conclusion that size of the employing organization was not
related to appraisals concerning the importance of the competencies.

Since more than a third of the present relationships between the
judged importance of the competencies and level of systems responsi-
bility showed significant differences between groups of analysts, the
conclusion was reached that level of systems responsibility signifi-
cantly influenced the present appraisals of importance. However, a
decline of nearly half the number of significant differences between
groups of analysts contributed to the decision that level of systems

responsibility did not differentially influence the future judged

importance of the job-related competencies.

Because only a scant number of significant differences was noted

in the relationships between appraisals of importance of the compe-

tencies and the extent of formal education of the analysts, it was

concluded that the appraisals of the competencies now and five years

from now were independent of the formal educational level of the

analysts.

Comparisons of present judged importance of competencies and

years of experience in systems revealed significant differences among

groups for more than half of the selected competencies, contributing

to the conclusion that the present judged importance of the competencies

was appreciably affected by years of systems experience of the analysts.

There was a sharp decline in the number of significant differences

between groups when the analysts contemplated the importance of the

competencies five years in the future. Because of the extent and

direction of the decline, the decision was reached that years of experi-

ence in systems did not substantially affect the appraisals of impor-

tance for five years in the future.

Conclusions

1. _A prime concern of information systems analysts is that of_

implementing and evaluating information flows in their organizations.

A high percentage of analysts considered the job activity of

greatest import to be that of optimizing information flow in their

organizations. This was true in spite of implications of varying

responsibilities suggested by the myriad current job titles of those

engaged in systems work.

2. <u>The ability of analysts to communicate and to work with all</u>

<u>levels of organizational personnel is accorded very high importance</u>

<u>in striving for more effective and efficient business operations</u>.

Of all competencies considered to be important to the information

systems analyst, those concerned with communicating clearly, both

orally and in writing, and of tactfully and diplomatically working

with others received "top-billing." Not only is skill in these compe-

tencies essential for systems work, but such skill is avidly sought

in many areas.

3. <u>Plans for information flow must be tailored for each organi-</u>

<u>zation and must be consistent with its objectives, policies, philosophy</u>,

<u>and structure</u>.

Job-related competencies in the area of Administration and Organi-

zation received high ratings of importance. These competencies indi-

cated the necessity for analysts to share a management viewpoint when

providing for information flow.

4. <u>Information systems analysts need to be increasingly conver-</u>

<u>sant with sophisticated cost and statistical techniques</u>.

Only two competencies in the area of Accounting, Finance, Econom-

ics, and Computation were presently considered essential for analysts,

but there was a four-fold increase in such competencies for five years

in the future. This rate of increase indicates a progressive need for

proficiency in assessing and weighing cost factors and for facility

in applying statistical techniques to obtain vital information for

management.

5. <u>In planning for information flow, it is essential for infor-</u>
<u>mation systems analysts to understand the principles, capabilities,</u>
<u>and potentialities of computers as well as their limitations</u>.

From the Computer and Equipment area of systems, very few compe-
tencies were designated essential. This indicated only that actual
"hands on" experience with the computer and computer equipment is not
essential for information systems analysts. Using the free response
sections of the questionnaire, analysts repeatedly stressed the impor-
tance of understanding and employing the capabilities of the computer
and computer system. They viewed the computer as another tool for
providing vital information for management, not to be equated with a
management information system.

6. <u>Job-related competencies needed by information systems</u>
<u>analysts seem to be independent of organizational variables and</u>
<u>individual attributes</u>.

Among analysts in different sizes of employing organizations,
great similarity was evident in the appraisals of job-related compe-
tencies.

Among analysts with different levels of systems responsibility,
some variance was found in appraisals of present importance of the
competencies. This variance was markedly reduced in appraisals for
five years in the future, leading to the conclusion that level of
systems responsibility did not significantly affect appraisals of
job-related competencies.

Analysts with different kinds of formal education very largely
agreed on the appraisals of importance for the competencies.

Although there were a great many significant differences among analysts with varying years of experience in systems as they appraised present importance of the competencies, there was far greater agreement in the appraisals for five years in the future. This led to the decision that as time goes by, appraisals of importance of competencies may not be differentially influenced by years of experience in systems.

Recommendations and Suggestions for Further Study

A few recommendations follow concerning information systems analysts and their educational preparation in a changing social and technological world of work, as well as some suggestions for extending research on the information function in organizations.

Recommendations Concerning Information Systems Analysts and Their Educational Preparation

1. Higher education organizations have an important role in the preparation of information systems analysts as aides to mangement. Departments, schools, or colleges of business seem best able to provide education for future information systems analysts. The education that is required is not a narrow technical one, but is rather one that provides both liberal and specialized knowledges.

2. Liberal or basic knowledges greatly needed by information systems analysts are widely transferable to many areas of work and perhaps to all of life. These basic knowledges should include skill in communicating, both in speech and in writing; ability to understand and appreciate the needs and motivations of other persons; ability to

approach, analyze, and resolve problems objectively; ability to organize

scarce and disparate resources to achieve objectives; and ability to

be flexible in a rapidly changing social and technological world of

work.

3. Specialized knowledges greatly needed by information systems

analysts should not be excessively departmentally confined but should

encompass all areas of education for business in recognition of the

systems viewpoint. Integration of knowledges and concepts from areas

of accounting, economics, finance, law, management, marketing, mathe-

matics, and statistics is needed for fuller understanding of what

business really is, how it is organized, and how business organizations

must necessarily relate to other economic, social, and governmental

organizations--all of which are interrelated systems within the system

of society itself.

4. Knowledge of the computer and its potentialities should be

gained by information systems analysts. Fundamentals of the computer,

as presently taught in many organizations of higher education, may be

adequate for basic background knowledge. However, attention needs to

be directed to the selection or development of electronic data process-

ing courses that are not subject to rapid obsolescence. Such courses

should emphasize the synthesis of knowledge from all areas of business

to make more vital information available for management decision

making.

5. Business organizations can most effectively serve their own

information needs by employing persons well prepared in school with

basic and specialized knowledges and by providing in-service training

for these employees. Such training would be the "frosting for the cake," accomplishing personnel orientation to a particular organization in a particular situation.

Areas for Further Study

1. The nature of the function of information systems analysts is in a state of flux, with wide areas of both agreement and disagreement. Studies similar to this one should be made in the future in order to obtain a better understanding of the personnel requirements that develop in response to changing technology. Such studies would provide a longitudinal approach to evaluation of the information function in organizations.

2. Studies of information personnel and/or their task-related activities, based on anecdotal detail or other empirical evidence, should be undertaken to amplify survey research such as this study.

3. Studies are needed to determine the kind and extent of "computer communication" skill needed for management and management oriented personnel who are primarily in the position of "connoisseur" of computer capabilities.

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APPENDIX A

STUDY INSTRUMENT AND MAILED MATERIALS

QUESTIONNAIRE ON INFORMATION SYSTEMS ANALYST

Please check (✓) as many of the following activities as you perform on your job. You may check one, some, or all.

☐ Do you study, analyze, and improve internal information systems which service, control, and coordinate all operations of an organization in order that the organization may become more operationally efficient?

☐ Do you plan for the accurate and timely feedback of the information required by management to evaluate performance?

☐ Do you integrate, whether by manual or mechanical means or a combination of both, the transmittal of data to and from all parts of the organization?

☐ Do you implement -- after management acceptance -- new or improved systems, train operating personnel, and provide for evaluation and adjustments?

☐ Do you initiate, coordinate, and/or maintain written policies and/or procedures into appropriate manuals?

☐ Do you examine division or department methods of operation and their use of human and physical facilities?

☐ Do you recommend work simplification and work measurement techniques, equipment selection and office layouts?

☐ Do you work with forms design and control as well as other formal reports and their control?

1. Is your regular job assignment (at least half or more of your time) devoted to some or all of the activities just described?

   ☐ Yes ☐ No   Comment _____

   If your answer is NO, do not finish filling in the questionnaire but please mail it to the researcher as it is vital for complete tabulation of the results.

I. JOB AND COMPANY CHARACTERISTICS

2. In what type of industry are you employed?
   - ☐ Banking, Financial
   - ☐ Education
   - ☐ Government
   - ☐ Insurance
   - ☐ Manufacturing
   - ☐ Manufacturing & Sales
   - ☐ Sales (Wholesale &/or Retail)
   - ☐ Transportation
   - ☐ Utility
   - ☐ Other_____

3. What is the number of employees in the organization you serve in carrying out your responsibilities?
   - ☐ 1 - 99 ☐ 100 - 499 ☐ 500 - 999 ☐ 1000 - 4999 ☐ 5000 - 9999 ☐ 10,000 or more

4. How many of these employees would check one or more of the items listed in Question 1?
   - ☐ 1 - 4 ☐ 5 - 9 ☐ 10 - 19 ☐ 20 - 29 ☐ 30 - 49 ☐ 50 or more

5. What is the title of your present job? _____

6. What is your monthly salary before taxes?
   - ☐ Under $500 ☐ $750 - $999 ☐ $1250 - $1499 ☐ $1750 - $1999
   - ☐ $500 - $749 ☐ $1000 - $1249 ☐ $1500 - $1749 ☐ $2000 or more

7. What is the title of your immediate superior? _____

8. What is the number of people whom you supervise directly or who report to you?
   - ☐ None ☐ 1 - 9 ☐ 10 - 19 ☐ 20 - 29 ☐ 30 - 49 ☐ 50 or more

9. What was the title of previous job(s) in systems or systems related work?

   _____

10. What is the total number of years experience you have had in systems or systems related work in this organization or previous organization(s)?
    - ☐ 0 - 3 ☐ 4 - 7 ☐ 8 - 10 ☐ 11 - 14 ☐ 15 - 19 ☐ 20 and over

II. PERSONAL CHARACTERISTICS

11. What is your age?   ☐ Under 29   ☐ 30 - 39   ☐ 40 - 49   ☐ 50 - 59   ☐ 60 and over

12. What is your sex?   ☐ Male   ☐ Female

13. How many years of college education have you completed? (Please circle the appropriate number.)

    None   1   2   3   4   5   6   7   8

14. Did you receive a degree?   ☐ Yes   ☐ No

15. If answer was YES, please indicate title of degree. _____

16. How many years of technical education did you complete other than your formal college education?

    None   ☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5

17. What undergraduate college majors do you consider most appropriate for education and information systems analysts?

	Please rank 1-2-3-4-5 (using 1 for most appropriate) these majors for systems	Please check (✓) your major
BUSINESS ADMINISTRATION (e.g. Accounting, economics, industrial relations, marketing, office management, organization and management, etc.)	☐	☐
ENGINEERING (e.g. Electrical, industrial, mechanical engineering, etc.)	☐	☐
LIBERAL ARTS (e.g. Art, English, geography, history, languages, logic, music, philosophy, psychology, science, etc.)	☐	☐
MATHEMATICS (e.g. Algebra, calculus, differential equations, numerical analysis, trigonometry, etc.)	☐	☐
OTHER MAJOR (Please specify) _____	☐	☐

18. What methods of training do you consider most effective as a means of preparation for your job in systems work? In *each* column please rank 1-2-3-4 (with 1 for most important) the four types of preparation you judge to be most important.

	Most Effective Preparation	Preparation I Have Used
College or university (undergraduate study)		
Correspondence school		
Employer company or in-service training		
Equipment manufacturer school		
Graduate school		
Junior college		
Informal on-the-job training		
Private business school		
Technical school		
Other (Please specify)		

III. COMPETENCY CHECKLIST

19. Please use the following code to indicate the importance with which you regard each competency:

Very important . . . . . Competency is considered essential or vital to the performance of your job.

Moderately important . Competency is *not* considered essential but is considered to be of significant value to the performance of your job.

Slightly important . . . Competency is considered to be of minor importance to the performance of your job.

Unimportant . . . . . . Competency is considered to have no value to the performance of your job.

Please check (✓) degree competency necessary

	To do your job now				To do your job future 5 yrs.			
ADMINISTRATIVE AND ORGANIZATIONAL COMPETENCIES	Very Important	Moderately Important	Slightly Important	Un-important	Very Important	Moderately Important	Slightly Important	Un-important
Know organization's objectives								
Know the organization of the company very well								
Know administrative policies								
Plan and schedule office work								
Develop plan for providing office services and communication								
Develop new office systems, procedures, and methods and improve those already in existence								
Know the particular uses and possibilities of office supplies, equipment, appliances, furniture								
Know advantages and disadvantages of mechanical office equipment and computer operations								
Appraise ways of reducing office costs								
Prepare or supervise preparation of office manuals and procedures								
Gather, analyze, and interpret facts								
Design work station arrangements and office layouts								
Analyze input and output data								
Determine departmental information needs								
Analyze management's planning and control problems								
Simplify work procedures								
Prepare data flow analyses using charting symbols								
Work with forms requirements, design, control								
Identify commonality of information needs								
Identify management information needs								
Know theories of management								
Delineate areas appropriate for programmed decision making								
Evaluate value vs. cost of information								
Design an over-all management information system								
Others								

ACCOUNTING, FINANCIAL, ECONOMIC, AND COMPUTATIONAL COMPETENCIES								
Know the established basic principles of accounting								
Know the established principles of cost accounting								
Conduct cost analyses								
Prepare budgets								
Conduct feasibility studies								
Plan payroll accounting procedures								
Develop cost controls								
Plan credit and collection operations								
Know tax regulations for federal, state, and municipal requirements								
Employ operations research (OR) techniques (improving efficiency of producing product or providing service by use of statistics or mathematical techniques)								
Employ probability theory								
Know principles of sampling, reliability, validity								
Employ simulation techniques								
Interpret functions and their graphs								
Apply matrix algebra								
Use mathematical models								
Design linear program								
Analyze and interpret financial statements								
Know principles of capital management, financing								
Conduct investment analyses								
Assess general business indicators (economics, currency)								
Others								

	To do your job now				To do your job future 5 yrs.			
	Very Important	Moderately Important	Slightly Important	Un- Important	Very Important	Moderately Important	Slightly Important	Un- Important

COMPUTER AND EQUIPMENT COMPETENCIES

Prepare system specifications for programming . . . .
Operate computer . . . .
Work with data origination devices . . . .
Work with data transmission equipment . . . .
Work with data plotting devices . . . .
Work with disk files . . . .
Work with computer input-output equipment . . . .
Work with leased wire communication systems . . . .
Work with magnetic tape files . . . .
Work with on-line real-time systems . . . .
Operate unit record equipment . . . .
Wire unit record panel boards . . . .
Work with analog computers . . . .
Code in machine language . . . .
Code in pseudo languages . . . .
Debug, test, modify, and rewrite programs . . . .
Establish program standards . . . .
Use decision tables . . . .
Utilize report generators . . . .
Utilize sorting programs and routines . . . .
Work with computer monitoring-control systems . . . .
Others _____

EMPLOYEES AND PERSONNEL COMPETENCIES

Communicate orally to individuals and to groups . . . .
Communicate clearly in writing (letters, memos, reports, etc.) . . . .
Gain confidence of personnel . . . .
Plan and conduct time and motion studies . . . .
Use tact and diplomacy . . . .
Evaluate the abilities of organization personnel . . . .
Give, score, and interpret standardized tests . . . .
Set up wage and/or salary programs . . . .
Train employees . . . .
Direct work of others on projects . . . .
Participate in planning sessions . . . .
Plan and conduct meetings . . . .
Administer a job analysis program . . . .
Discuss, write, revise job descriptions . . . .
Define management relationships . . . .
Convince others of feasibility of innovations . . . .
Coordinate functions of systems personnel . . . .
Others _____

PUBLIC RELATIONS, PRODUCT, MARKETING, AND LEGAL COMPETENCIES

Know government regulations of organizations (ICC, SEC, etc.) . . . .
Represent the company image . . . .
Participate in community affairs . . . .
Participate in a professional organization . . . .
Keep abreast of tax regulations and procedures . . . .
Know basic legal relationships . . . .
Know particular industry (products, economics) . . . .
Know organization's products or services . . . .
Provide for market research . . . .
Develop production standards . . . .
Provide for inventory controls . . . .
Plan for customer relations . . . .
Forecast sales . . . .
Analyze organization's markets . . . .
Know trade relationships, promotion, advertising . . . .
Others _____

COMMENTS AND SUGGESTIONS _____

OKLAHOMA STATE UNIVERSITY · STILLWATER

College of Business
FRontier 2-6211, Ext. 258

74074

November 12, 1968

This is a request for a gift of some of your precious time. Your
name has been selected from the Systems and Procedures Association
membership list by the Association in cooperation with the writer
in order that you might help clarify the job of the information
systems analyst.

It is the purpose of this study to collect data that will delineate
the competencies the information systems analyst uses in successfully
fulfilling his job responsibility. This information will be most
helpful to business curriculum planners in their continuing effort
toward a more effective education.

Won't you please help the systems profession--and a doctoral candidate--
by taking the time to fill out the enclosed questionnaire and mail it
in the postage-paid envelope so that we may have the benefit of your
judgment as a leader in systems work.

Sincerely yours,

Ethel H. Shrout

Mrs. Ethel H. Shrout
Principal Researcher

Enclosure
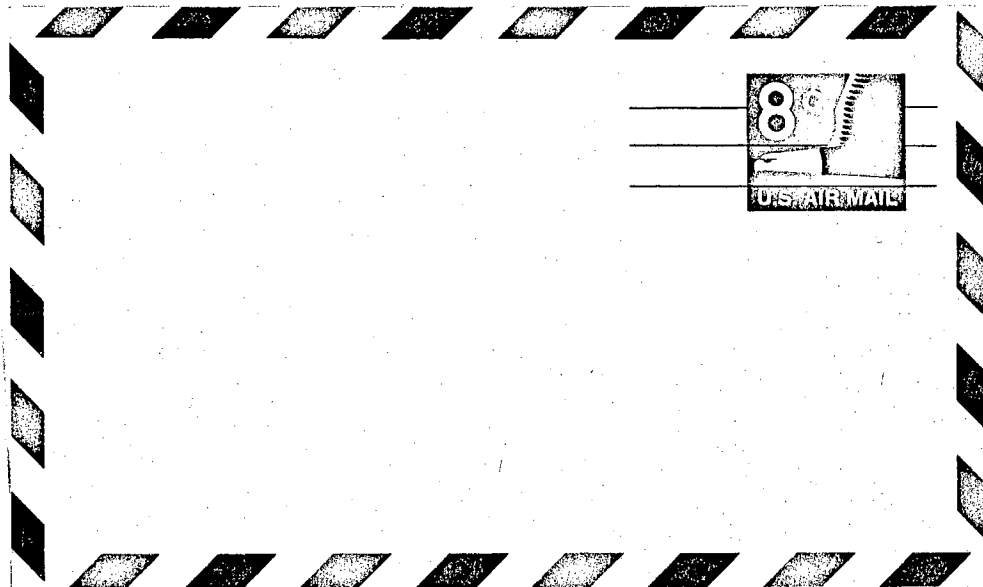
Because your judgment is vital to the success of
the research project to determine the competencies of the
information systems analyst, would you please--if you have
not already done so--fill in the questionnaire that was
recently mailed to you.

Sincerely,

Ethel H. Shrout

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OKLAHOMA STATE UNIVERSITY · STILLWATER

College of Business   74074
FRontier 2-6211, Ext. 258

December 14, 1968

Several weeks ago a questionnaire was mailed to you to help
determine the competencies of the information systems analyst.
Your name has been selected from the membership list of the
Systems and Procedures Association by the Association.

The response from this mailing and a subsequent postcard
reminder has been excellent. To date 480 replies have been
received--almost 66 2/3 percent.

Your opinion as a leader in systems work would make this
response even more significant and the results more valid.
If you have not already mailed a questionnaire, won't you
please help by completing the enclosed questionnaire and
returning it in the postage-paid envelope.

                    Sincerely yours,

                    Ethel H. Shrout
                    Mrs. Ethel H. Shrout
                    Principal Researcher

Enclosure

OKLAHOMA STATE UNIVERSITY · STILLWATER

College of Business
FRontier 2-6211, Ext. 258

74074

February 21, 1969

Data about the information systems analyst is being readied for the computer, but there is yet time to include your response in the survey.

Thus far an 80 percent return has been attained--thanks to the cooperation of Systems and Procedures Association members. Won't you please contribute to the research by using the enclosed questionnaire so that YOUR judgment may be included in the results.

Sincerely yours,

Ethel H. Shrout

Mrs. Ethel H. Shrout
Principal Researcher

Enclosure

Would you like to have a summary of the results? Just indicate your desire on the questionnaire.

APPENDIX B

SEQUENTIAL RANKING OF COMPETENCIES BY
CLASSIFICATIONS OF LESS IMPORTANCE

TABLE XXIX

SEQUENTIAL RANKING OF COMPETENCIES BY CLASSIFICATIONS OF
LESS IMPORTANCE FOR PRESENT JOB PERFORMANCE

C o m p e t e n c y	Consensus Index Number
"Moderately Important"	
Prepare or supervise preparation of office manuals and procedures	1.9658
Plan and schedule office work	1.9551
Conduct cost analyses	1.9338
Know the established principles of cost accounting	1.9295
Work with forms requirements, design, control	1.9274
Develop cost controls	1.8590
Work with computer input-output equipment	1.8548
Develop plan for providing office services and communication	1.8419
Establish program standards	1.7628
Provide for inventory controls	1.7521
Work with disk files	1.7350
Work with magnetic tape files	1.7051
Work with data origination devices	1.7030
Know principles of sampling, reliability, validity	1.7009
Work with data transmission equipment	1.6474
Participate in community affairs	1.6325
Prepare budgets	1.6260
Know the particular uses and possibilities of office supplies, equipment, appliances, furniture	1.6218
Discuss, write, revise job descriptions	1.6004
Employ simulation techniques	1.5877
Use decision tables	1.5748
Administer a job analysis program	1.5513
Employ operations research (OR) techniques (improving efficiency of producing product or providing service by use of statistics or mathematical techniques)	1.5385
Analyze and interpret financial statements	1.5128
Work with leased wire communication systems	1.5042
"Slightly Important"	
Interpret functions and their graphs	1.4829
Work with on-line real-time systems	1.4637
Plan payroll accounting procedures	1.4509
Know principles of capital management, financing	1.4487
Design work station arrangements and office layouts	1.4188
Plan for customer relations	1.3782
Employ probability theory	1.3419

TABLE XXIX (Continued)

Competency	Consensus Index Number
Utilize sorting programs and routines	1.3333
Know basic legal relationships	1.2692
Forecast sales	1.2479
Utilize report generators	1.2244
Work with computer monitoring-control	1.2009
Develop production standards	1.1774
Analyze organization's markets	1.1752
Plan and conduct time and motion studies	1.1688
Provide for market research	1.1667
Use mathematical models	1.1667
Debug, test, modify, and rewrite programs	1.1453
Code in pseudo languages	1.0940
Know government regulations of organizations (ICC, SEC, etc.)	1.0897
Plan credit and collection operations	1.0214
Keep abreast of tax regulations and procedures	1.0021

"Unimportant"

Competency	Consensus Index Number
Assess general business indicators (economics, currency)	.9915
Set up wage and/or salary programs	.9808
Know trade relationships, promotion, advertising	.9615
Design linear program	.9509
Apply matrix algebra	.9252
Work with data plotting devices	.9038
Conduct investment analyses	.8718
Know tax regulations for federal, state, and municipal requirements	.8462
Give, score, and interpret standardized tests	.8034
Code in machine language	.6645
Operate computer	.5962
Operate unit record equipment	.4893
Work with analog computers	.4060
Wire unit record panel boards	.2714

TABLE XXX

SEQUENTIAL RANKING OF COMPETENCIES BY CLASSIFICATIONS OF LESS
IMPORTANCE FOR JOB PERFORMANCE FIVE YEARS IN THE FUTURE

Competency	Consensus Index Number
"Moderately Important"	
Prepare or supervise preparation of office manuals and procedures	1.9615
Prepare budgets	1.9530
Develop plan for providing office services and communication	1.9487
Work with data transmission equipment	1.9466
Plan and schedule office work	1.9274
Prepare data flow analyses using charting symbols	1.8889
Provide for inventory controls	1.8782
Participate in community affairs	1.8462
Establish program standards	1.8462
Work with computer input-output equipment	1.8440
Work with leased wire communication systems	1.8419
Analyze and interpret financial statements	1.8419
Know principles of capital management, financing	1.8419
Work with disk files	1.8184
Use decision tables	1.8013
Employ probability theory	1.8013
Interpret functions and their graphs	1.7991
Work with data origination devices	1.7906
Work with forms requirements, design, control	1.7714
Administer a job analysis program	1.6966
Use mathematical models	1.6603
Know the particular uses and possibilities of office supplies, equipment, appliances, furniture	1.6581
Discuss, write, revise job descriptions	1.6560
Work with magnetic tape files	1.6517
Plan for customer relations	1.5705
Work with computer monitoring-control systems	1.5107
Provide for market research	1.5021
"Slightly Important"	
Forecast sales	1.4744
Analyze organization's markets	1.4658
Know basic legal relationships	1.4615
Design work station arrangements and office layouts	1.4316
Know government regulations of organizations (ICC, SEC, etc.)	1.4103
Assess general business indicators (economics, currency)	1.4081

TABLE XXX (Continued)

Competency	Consensus Index Number
Design linear program	1.3868
Utilize report generators	1.3825
Plan payroll accounting procedures	1.3761
Develop production standards	1.3611
Utilize sorting programs and routines	1.3184
Apply matrix algebra	1.2778
Conduct investment analyses	1.2415
Work with data plotting devices	1.1987
Know trade relationships, promotion, advertising	1.1859
Plan and conduct time and motion studies	1.1774
Set up wage and/or salary programs	1.1774
Keep abreast of tax regulations and procedures	1.1774
Code in pseudo languages	1.0897
Plan credit and collection operations	1.0769
Debug, test, modify, and rewrite programs	1.0598
Know tax regulations for federal, state, and municipal requirements	1.0171

"Unimportant"

Competency	Consensus Index Number
Give, score, and interpret standardized tests	.8611
Work with analog computers	.5983
Code in machine language	.5833
Operate computer	.5598
Operate unit record equipment	.3718
Wire unit record panel boards	.2030

APPENDIX C

SIGNIFICANT CHI-SQUARE ANALYSES FOR
TESTS OF HYPOTHESES

TABLE XXXI

SIGNIFICANT CHI-SQUARE ANALYSIS FOR TESTS OF HYPOTHESES
RELATED TO SIZE OF ORGANIZATION

Size of Organization	Very Important	Moderately Important	Unimportant	Result
Know Organization's Products or Services				
Present				
Small	110	40	12	
Medium	110	41	8	$x^2 = 11.4230$
Large	84	41	22	$p < .05$

TABLE XXXII

SIGNIFICANT CHI-SQUARE ANALYSES FOR TESTS OF HYPOTHESES
RELATED TO LEVEL OF SYSTEMS RESPONSIBILITY

Level of Systems	Very Important	Moderately Important	Unimportant	Result
		Identify Management Information Needs		
		Present		
Manager	266	69	19	$x^2 = 7.1329$
Non-Manager	73	28	13	$p < .05$
		Design an Over-all Management Information System		
		Present		
Manager	187	110	57	$x^2 = 7.2059$
Non-Manager	44	44	26	$p < .05$
		Future		
Manager	258	70	26	$x^2 = 8.7891$
Non-Manager	84	13	17	$p < .02$
		Know the Established Basic Principles of Accounting		
		Present		
Manager	146	157	51	$x^2 = 12.3796$
Non-Manager	39	42	33	$p < .01$
		Conduct Cost Analyses		
		Present		
Manager	126	133	95	$x^2 = 6.1133$
Non-Manager	40	55	19	$p < .05$
		Conduct Feasibility Studies		
		Present		
Manager	225	96	33	$x^2 = 7.8206$
Non-Manager	56	41	17	$p < .05$
		Employ Simulation Techniques		
		Future		
Manager	154	120	80	$x^2 = 9.1652$
Non-Manager	32	53	29	$p < .02$

TABLE XXXII (Continued)

Level of Systems	Very Important	Moderately Important	Unimportant	Result
Evaluate the Abilities of Organizational Personnel				
		Present		
Manager	224	99	31	$x^2 = 41.1757$
Non-Manager	40	40	34	$p < .001$
		Future		
Manager	250	84	20	$x^2 = 13.3641$
Non-Manager	62	36	16	$p < .01$
Train Employees				
		Present		
Manager	165	127	62	$x^2 = 26.1841$
Non-Manager	24	52	38	$p < .001$
		Future		
Manager	179	108	67	$x^2 = 12.5167$
Non-Manager	36	48	30	$p < .01$
Direct Work of Others on Projects				
		Present		
Manager	257	80	17	$x^2 = 63.2785$
Non-Manager	38	52	24	$p < .001$
Participate in Planning Sessions				
		Present		
Manager	281	61	12	$x^2 = 12.8006$
Non-Manager	72	33	9	$p < .01$
Plan and Conduct Meetings				
		Present		
Manager	255	85	14	$x^2 = 17.2656$
Non-Manager	63	36	15	$p < .001$
Define Management Relationships				
		Present		
Manager	159	124	71	$x^2 = 19.2779$
Non-Manager	32	37	45	$p < .001$

TABLE XXXII (Continued)

Level of Systems	Very Important	Moderately Important	Unimportant	Result

Define Management Relationships

		Future		
Manager	206	100	48	$x^2 = 13.7650$
Non-Manager	45	41	28	$p < .01$

Convince Others of Feasibility of Innovations

		Future		
Manager	294	40	20	$x^2 = 8.6507$
Non-Manager	91	22	1	$p < .02$

Coordinate Functions of Systems Personnel

		Present		
Manager	263	62	29	$x^2 = 67.7821$
Non-Manager	38	41	35	$p < .001$
		Future		
Manager	283	45	26	$x^2 = 7.5051$
Non-Manager	78	26	10	$p < .05$

Represent the Company Image

		Present		
Manager	194	98	62	$x^2 = 10.3584$
Non-Manager	43	41	30	$p < .01$
		Future		
Manager	217	89	48	$x^2 = 6.8595$
Non-Manager	55	42	17	$p < .05$

Participate in a Professional Organization

		Present		
Manager	170	141	43	$x^2 = 8.4707$
Non-Manager	37	59	18	$p < .02$

Know Particular Industry

		Present		
Manager	137	139	78	$x^2 = 8.3050$
Non-Manager	31	44	39	$p < .02$

TABLE XXXIII

SIGNIFICANT CHI-SQUARE ANALYSES FOR TESTS OF HYPOTHESES
RELATED TO FORMAL EDUCATION

College Degree	Very Important	Moderately Important	Unimportant	Result
	Know Theories of Management			
	Present			
None	95	29	17	$x^2 = 10.6544$
Undergraduate	168	50	20	$p < .05$
Graduate	51	32	6	
	Know the Established Basic Principles of Accounting			
	Present			
None	64	55	22	$x^2 = 10.6544$
Undergraduate	88	113	37	$p < .05$
Graduate	33	31	25	
	Future			
None	66	51	24	$x^2 = 10.9035$
Undergraduate	89	116	33	$p < .05$
Graduate	35	32	22	

TABLE XXXIV

SIGNIFICANT CHI-SQUARE ANALYSES FOR TESTS OF HYPOTHESES RELATED TO YEARS OF EXPERIENCE IN SYSTEMS

Years of Experience	Very Important	Moderately Important	Unimportant	Result
Know Organization's Objectives				
		Present		
0 - 3	24	14	6	
4 - 7	101	30	4	
8 - 14	144	38	6	$x^2 = 23.1320$
15 or More	87	12	2	$p < .001$
Know Organization of Company Very Well				
		Present		
0 - 3	14	21	9	
4 - 7	74	51	10	
8 - 14	100	79	9	$x^2 = 28.9345$
15 or More	71	26	4	$p < .001$
Know Administrative Policies				
		Present		
0 - 3	17	19	8	
4 - 7	64	56	15	
8 - 14	101	68	19	$x^2 = 22.0601$
15 or More	73	24	4	$p < .01$
Identify Commonality of Information Needs				
		Present		
0 - 3	17	25	2	
4 - 7	75	45	15	
8 - 14	104	59	25	$x^2 = 19.5667$
15 or More	68	21	12	$p < .01$
Know Theories of Management				
		Present		
0 - 3	8	22	14	
4 - 7	67	52	16	
8 - 14	81	83	24	$x^2 = 26.8579$
15 or More	58	28	15	$p < .001$

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TABLE XXXIV (Continued)

Years of Experience	Very Important	Moderately Important	Unimportant	Result
Know the Established Basic Principles of Accounting				
		Present		
0 - 3	8	19	17	
4 - 7	50	55	30	
8 - 14	73	90	25	$x^2 = 29.3140$
15 or More	54	35	12	$p < .001$
Know the Established Principles of Cost Accounting				
		Future		
0 - 3	7	22	15	
4 - 7	38	64	33	
8 - 14	59	81	48	$x^2 = 15.8656$
15 or More	46	38	17	$p < .02$
Conduct Feasibility Studies				
		Present		
0 - 3	15	21	8	
4 - 7	77	43	15	
8 - 14	121	49	18	$x^2 = 16.6019$
15 or More	68	24	9	$p < .02$
Employ Simulation Techniques				
		Future		
0 - 3	12	18	14	
4 - 7	46	65	24	
8 - 14	80	57	51	$x^2 = 17.0792$
15 or More	48	33	20	$p < .01$
Prepare System Specifications for Programming				
		Present		
0 - 3	24	8	12	
4 - 7	88	30	17	
8 - 14	126	40	22	$x^2 = 13.5850$
15 or More	58	18	25	$p < .05$

TABLE XXXIV (Continued)

Years of Experience	Very Important	Moderately Important	Unimportant	Result
Evaluate the Abilities of Organizational Personnel				
		Present		
0 - 3	10	19	15	
4 - 7	80	40	15	
8 - 14	103	58	27	x^2 = 33.7925
15 or More	71	22	8	p < .001
Train Employees				
		Present		
0 - 3	6	18	20	
4 - 7	51	56	28	
8 - 14	81	72	35	x^2 = 25.7996
15 or More	51	33	17	p < .001
Direct Work of Others on Projects				
		Present		
0 - 3	17	16	11	
4 - 7	76	45	14	
8 - 14	129	54	5	x^2 = 36.5284
15 or More	19	26	56	p < .001
Participate in Planning Sessions				
		Present		
0 - 3	20	19	5	
4 - 7	101	28	6	
8 - 14	150	32	6	x^2 = 25.5395
15 or More	82	15	4	p < .001
Plan and Conduct Meetings				
		Present		
0 - 3	18	20	6	
4 - 7	89	36	10	
8 - 14	135	46	7	x^2 = 20.7853
15 or More	76	19	6	p < .001

TABLE XXXIV (Continued)

Years of Experience	Very Important	Moderately Important	Unimportant	Result
		Define Management Relationships		
		Present		
0 - 3	10	16	18	
4 - 7	46	51	38	
8 - 14	76	69	43	$x^2 = 24.3092$
15 or More	59	25	17	$p < .001$
		Coordinate Functions of Systems Personnel		
		Present		
0 - 3	16	16	12	
4 - 7	81	30	24	
8 - 14	131	43	14	$x^2 = 27.7513$
15 or More	73	14	14	$p < .001$
		Represent the Company Image		
		Present		
0 - 3	13	19	12	
4 - 7	62	46	27	
8 - 14	105	48	35	$x^2 = 12.9139$
15 or More	57	26	18	$p < .05$
		Participate in a Professional Organization		
		Present		
0 - 3	9	26	9	
4 - 7	51	61	23	
8 - 14	84	83	21	$x^2 = 27.5129$
15 or More	63	30	8	$p < .001$
		Future		
0 - 3	13	27	4	
4 - 7	70	44	21	
8 - 14	96	75	17	$x^2 = 22.1748$
15 or More	65	29	7	$p < .01$

APPENDIX D

RESULTS OF ALL CHI-SQUARE TESTS OF HYPOTHESES

TABLE XXXV

RESULTS OF ALL CHI-SQUARE TESTS OF HYPOTHESES
RELATED TO SIZE OF ORGANIZATION

Competency	Tabulated x^2 and Significance Level	
	Present	Future
Know Organization's Objectives	8.8666 p>.05	1.5341 p>.80
Know Organization of Company Very Well	5.6714 p>.20	8.8696 p>.05
Know Administrative Policies	4.3298 p>.30	3.9281 p>.30
Develop New Office Systems, Procedures, and Methods and Improve Those Already in Existence	1.5063 p>.80	2.2307 p>.50
Know Advantages and Disadvantages of Mechanical Office Equipment and Computer Operations	1.5605 p>.80	0.2593 p>.99
Appraise Ways of Reducing Office Costs	2.9922 p>.50	2.4812 p>.50
Gather, Analyze, and Interpret Facts	3.0138 p>.50	4.2050 p>.30
Analyze Input and Output Data	2.9083 p>.50	6.4416 p>.10
Determine Departmental Information Needs	0.9937 p>.90	4.5518 p>.30
Analyze Management's Planning and Control Problems	6.7990 p>.10	1.4751 p>.80
Simplify Work Procedures	3.0208 p>.50	3.5490 p>.30

TABLE XXXV (Continued)

C o m p e t e n c y	Tabulated x^2 and Significance Level	
	Present	Future
Prepare Data Flow Analyses Using Charting Symbols	6.3854 p>.10	
Identify Commonality of Information Needs	4.1426 p>.30	3.6747 p>.30
Identify Management Information Needs	4.3295 p>.30	0.6882 p>.95
Know Theories of Management	5.3033 p>.20	6.4079 p>.10
Delineate Areas Appropriate for Programmed Decision Making	1.6689 p>.70	6.6358 p>.10
Evaluate Value vs. Cost of Information	9.1099 p>.05	3.4243 p>.30
Design an Over-all Management Information System	8.6248 p>.05	4.6040 p>.30
Know the Established Basic Principles of Accounting	8.6077 p>.05	2.7715 p>.50
Know the Established Principles of Cost Accounting		3.3328 p>.50
Conduct Cost Analyses		4.9427 p>.20
Conduct Feasibility Studies	1.8297 p>.70	0.9603 p>.90
Develop Cost Controls		5.9348 p>.20
Employ Operations Research Techniques		2.8728 p>.50

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TABLE XXXV (Continued)

Competency	Tabulated x^2 and Significance Level	
	Present	Future
Know Principles of Sampling, Reliability, Validity		1.5976 $p > .80$
Employ Simulation Techniques		3.1845 $p > .50$
Prepare System Specifications for Programming	8.9422 $p > .05$	8.2430 $p > .05$
Work With On-line Real-time Systems		1.1283 $p > .80$
Communicate Orally to Individuals and to Groups	1.0006 $p > .90$	1.8192 $p > .70$
Communicate Clearly in Writing	3.7139 $p > .30$	2.3474 $p > .50$
Gain Confidence of Personnel	1.6518 $p > .70$	2.4289 $p > .50$
Use Tact and Diplomacy	2.6720 $p > .50$	3.2015 $p > .50$
Evaluate the Abilities of Organizational Personnel	4.6392 $p > .30$	6.9836 $p > .10$
Train Employees	0.5512 $p > .95$	5.9102 $p > .20$
Direct Work of Others on Projects	2.5531 $p > .50$	4.9479 $p > .20$
Participate in Planning Sessions	7.3018 $p > .10$	7.5540 $p > .10$

TABLE XXXV (Continued)

Competency	Tabulated x^2 and Significance Level	
	Present	Future
Plan and Conduct Meetings	0.6642 $p > .95$	3.2494 $p > .50$
Define Management Relationships	2.1735 $p > .70$	2.8087 $p > .50$
Convince Others of Feasibility of Innovations	2.3690 $p > .50$	2.4431 $p > .50$
Coordinate Functions of Systems Personnel	1.0283 $p > .90$	1.3417 $p > .80$
Represent the Company Image	8.1529 $p > .05$	4.6924 $p > .30$
Participate in a Professional Organization	6.4510 $p > 10$	7.8886 $p > .05$
Know Particular Industry	7.8810 $p > .05$	7.7503 $p > .10$
Know Organization's Products or Services	2.6409 $p > .50$	11.4230 $p < .05*$

*Significant Chi-Square

TABLE XXXVI

RESULTS OF ALL CHI-SQUARE TESTS OF HYPOTHESES
RELATED TO LEVEL OF SYSTEMS RESPONSIBILITY

Competency	Tabulated x^2 and Significance Level	
	Present	Future
Know Organization's Objectives	2.9780 $p > .20$	4.9560 $p > .05$
Know Organization of Company Very Well	5.4620 $p > .05$	3.5047 $p > .20$
Know Administrative Policies	3.0880 $p > .20$	0.2303 $p > .80$
Develop New Office Systems, Procedures, and Methods and Improve Those Already in Existence	3.2173 $p > .20$	0.7447 $p > .50$
Know Advantages and Disadvantages of Mechanical Office Equipment and Computer Operations	2.3389 $p > .30$	3.9519 $p > .10$
Appraise Ways of Reducing Office Costs	1.4596 $p > .30$	3.7781 $p > .10$
Gather, Analyze, and Interpret Facts	2.7062 $p > .20$	2.4055 $p > .30$
Analyze Input and Output Data	1.4679 $p > .30$	3.6807 $p > .10$
Determine Departmental Information Needs	1.6029 $p > .30$	2.1212 $p > .30$
Analyze Management' Planning and Control Problems	1.5340 $p > .30$	2.6300 $p > .20$
Simplify Work Procedures	1.9119 $p > .30$	1.3536 $p > .50$

TABLE XXXVI (Continued)

Competency	Tabulated x^2 and Significance Level	
	Present	Future
Prepare Data Flow Analyses Using Charting Symbols	2.3886 p>.30	
Identify Commonality of Information Needs	2.2235 p>.30	1.6946 p>.30
Identify Management Information Needs	7.1329 p<.05*	0.4373 p>.80
Know Theories of Management	5.3820 p>.05	2.2247 p>.30
Delineate Areas Appropriate for Programmed Decision Making	3.5158 p>.10	2.0960 p>.30
Evaluate Value vs. Cost of Information	3.1592 p>.20	0.0957 p>.95
Design an Over-all Management Information System	7.2059 p<.05*	8.7891 p<.02*
Know the Established Basic Principles of Accounting	12.3796 p<.01*	1.4862 p>.30
Know the Established Principles of Cost Accounting		0.8292 p>.50
Conduct Cost Analyses		6.1133 p<.05*
Conduct Feasibility Studies	7.8206 p<.05*	1.4462 p>.30
Develop Cost Controls		4.7570 p>.05
Employ Operations Research Techniques		1.0104 p>.50

TABLE XXXVI (Continued)

Competency	Tabulated x^2 and Significance Level	
	Present	Future
Know Principles of Sampling, Reliability, Validity		0.6783 $p > .70$
Employ Simulation Techniques		9.1652 $p < .02*$
Prepare System Specifications for Programming	1.7227 $p > .30$	3.2987 $p > .10$
Work With On-line Real-time Systems		1.1116 $p > .50$
Communicate Orally to Individuals and to Groups	1.4829 $p > .30$	0.8819 $p > .50$
Communicate Clearly in Writing	0.1417 $p > .90$	3.5263 $p > .10$
Gain Confidence of Personnel	5.9406 $p > .05$	3.4294 $p > .10$
Use Tact and Diplomacy	0.2797 $p > .80$	4.6443 $p > .05$
Evaluate the Abilities of Organizational Personnel	41.1757 $p < .001*$	13.3641 $p < .01*$
Train Employees	26.1841 $p < .001*$	12.5167 $p < .01*$
Direct Work of Others on Projects	63.2785 $p < .001*$	4.6416 $p > .05$
Participate in Planning Sessions	12.8006 $p < .01*$	1.1616 $p > .50$

TABLE XXXVI (Continued)

C o m p e t e n c y	Tabulated x^2 and Significance Level	
	Present	Future
Plan and Conduct Meetings	17.2656 $p <.001*$	0.1390 $p >.90$
Define Management Relationships	19.2779 $p <.001*$	13.7650 $p <.01*$
Convince Others of Feasibility of Innovations	0.0497 $p >.95$	8.6507 $p <.02*$
Coordinate Functions of Systems Personnel	67.7822 $p <.001*$	7.5052 $p <.05*$
Represent the Company Image	10.3584 $p < .01*$	6.8595 $p <.05*$
Participate in a Professional Organization	8.4707 $p <.02*$	5.4136 $p >.05$
Know Particular Industry	8.3050 $p <.02*$	5.9367 $p >.05$
Know Organization's Products or Services	3.4490 $p >.10$	1.3476 $p >.50$

*Significant Chi-Square

TABLE XXXVII

RESULTS OF ALL CHI-SQUARE TESTS OF HYPOTHESES
RELATED TO FORMAL EDUCATION

Competency	Tabulated x^2 and Significance Level	
	Present	Future
Know Organization's Objectives	1.3693 p > .80	4.1653 p > .30
Know Organization of Company Very Well	8.6920 p > .05	1.7399 p > .70
Know Administrative Policies	4.8712 p > .30	2.6682 p > .50
Develop New Office Systems, Procedures, and Methods and Improve Those Already in Existence	4.4767 p > .30	5.7159 p > .20
Know Advantages and Disadvantages of Mechanical Office Equipment and Computer Operations	1.6430 p > .80	3.1110 p > .50
Appraise Ways of Reducing Office Costs	7.9299 p > .05	7.6009 p > .10
Gather, Analyze, and Interpret Facts	3.1617 p > .50	6.3839 p > .10
Analyze Input and Output Data	3.9039 p > .30	3.1768 p > .50
Determine Departmental Information Needs	4.8637 p > .30	5.1119 p > .20
Analyze Management's Planning and Control Problems	6.3674 p > .10	6.6012 p > .10
Simplify Work Procedures	8.0752 p > .05	7.3283 p > .10

TABLE XXXVII (Continued)

C o m p e t e n c y	Tabulated x^2 and Significance Level	
	Present	Future
Prepare Data Flow Analyses Using Charting Symbols	0.4103 $p > .98$	
Identify Commonality of Information Needs	3.0417 $p > .50$	4.2633 $p > .30$
Identify Management Information Needs	4.0555 $p > .30$	2.5601 $p > .50$
Know Theories of Management	4.1681 $p > .30$	10.6544 $p < .05*$
Delineate Areas Appropriate for Programmed Decision Making	2.7439 $p > .50$	2.5260 $p .50$
Evaluate Value vs. Cost of Information	4.2641 $p > .30$	3.4406 $p > .30$
Design an Over-all Management Information System	4.9162 $p > .20$	2.9518 $p > .50$
Know the Established Basic Principles of Accounting	11.0734 $p < .05*$	10.9035 $p < .05*$
Know the Established Principles of Cost Accounting		8.6553 $p > .05$
Conduct Cost Analyses		1.5707 $p > .80$
Conduct Feasibility Studies	1.9437 $p > .70$	1.6248 $p > .80$
Develop Cost Controls		2.4273 $p > .50$
Employ Operations Research Techniques		3.6588 $p > .30$

TABLE XXXVII (Continued)

Competency	Tabulated x^2 and Significance Level	
	Present	Future
Know Principles of Sampling, Reliability, Validity		4.3849 $p > .30$
Employ Simulation Techniques		2.1707 $p > .70$
Prepare System Specifications for Programming	5.5017 $p > .20$	8.1255 $p > .05$
Work With On-line Real-time Systems		7.5871 $p > .10$
Communicate Orally to Individuals and to Groups	2.7520 $p > .50$	4.0510 $p > .30$
Communicate Clearly in Writing	6.3784 $p > .10$	3.4125 $p > .30$
Gain Confidence of Personnel	7.1461 $p > .10$	4.6195 $p > .30$
Use Tact and Diplomacy	3.5374 $p > .30$	4.0590 $p > .30$
Evaluate the Abilities of Organizational Personnel	7.6354 $p > .10$	4.6192 $p > .30$
Train Employees	7.6673 $p > .10$	5.8112 $p > .20$
Direct Work of Others on Projects	5.7333 $p > .20$	2.5259 $p > .50$
Participate in Planning Sessions	0.3477 $p > .98$	3.8645 $p > .30$

TABLE XXXVII (Continued)

Competency	Tabulated x^2 and Significance Level	
	Present	Future
Plan and Conduct Meetings	4.3501 p > .30	5.7193 p > .20
Define Management Relationships	7.5428 p > .10	2.9190 p > .50
Convince Others of Feasibility of Innovations	8.1296 p > .05	6.3916 p > .10
Coordinate Functions of Systems Personnel	6.2242 p > .10	3.0102 p > .50
Represent the Company Image	8.2007 p > .05	9.1770 p > .05
Participate in a Professional Organization	2.5880 p > .50	2.7759 p > .50
Know Particular Industry	1.5712 p > .80	2.3418 p > .50
Know Organization's Products or Services	1.9609 p > .70	2.0180 p > .70

*Significant Chi-Square

TABLE XXXVIII

RESULTS OF ALL CHI-SQUARE TESTS OF HYPOTHESES
RELATED TO YEARS OF EXPERIENCE IN SYSTEMS

Competency	Tabulated x^2 and Significance Level	
	Present	Future
Know Organization's Objectives	23.1319 $p <.001*$	5.1057 $p > .50$
Know Organization of Company Very Well	28.9345 $p <.001*$	4.3369 $p > .50$
Know Administrative Policies	22.0601 $p < .01*$	7.6130 $p > .20$
Develop New Office Systems, Procedures, and Methods and Improve Those Already in Existence	6.9321 $p > .30$	3.4087 $p > .70$
Know Advantages and Disadvantages of Mechanical Office Equipment and Computer Operations	7.1379 $p > .30$	6.5754 $p > .30$
Appraise Ways of Reducing Office Costs	12.3793 $p > .05$	2.4754 $p > .80$
Gather, Analyze, and Interpret Facts	2.6156 $p > .80$	0.5303 $p > .99$
Analyze Input and Output Data	2.0568 $p > .90$	2.3946 $p > .80$
Determine Departmental Information Needs	8.1945 $p > .20$	3.1498 $p > .70$
Analyze Management's Planning and Control Problems	5.7108 $p > .30$	8.2385 $p > .20$
Simplify Work Procedures	8.8800 $p > .10$	7.1993 $p > .30$

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TABLE XXXVIII (Continued)

C o m p e t e n c y	Tabulated x^2 and Significance Level	
	Present	Future
Prepare Data Flow Analyses Using Charting Symbols	3.7148 $p > .70$	
Identify Commonality of Information Needs	19.5667 $p < .01*$	7.4466 $p > .20$
Identify Management Information Needs	12.4261 $p > .05$	3.2804 $p > .70$
Know Theories of Management	26.8579 $p < .001*$	7.3827 $p > .20$
Delineate Areas Appropriate for Programmed Decision Making	11.1050 $p > .05$	5.7190 $p > .30$
Evaluate Value vs. Cost of Information	5.6192 $p > .30$	1.0966 $p > .98$
Design an Over-all Management Information System	3.7428 $p > .70$	6.5674 $p > .30$
Know the Established Basic Principles of Accounting	29.3140 $p < .001*$	8.9636 $p > .10$
Know the Established Principles of Cost Accounting		15.8656 $p < .02*$
Conduct Cost Analyses		1.5090 $p > .95$
Conduct Feasibility Studies	16.6019 $p < .02*$	5.9585 $p > .30$
Develop Cost Controls		10.3177 $p > .10$
Employ Operations Research Techniques		5.2855 $p > .50$

TABLE XXXVIII (Continued)

C o m p e t e n c y	Tabulated x^2 and Significance Level	
	Present	Future
Know Principles of Sampling, Reliability, Validity		12.5256 p > .05
Employ Simulation Techniques		17.0792 p < .01*
Prepare System Specifications for Programming	13.5850 p < .05*	8.4356 p > .20
Work With On-line Real-time Systems		12.4652 p > .05
Communicate Orally to Individuals and to Groups	9.8342 p > .10	2.8218 p > .80
Communicate Clearly in Writing	8.7980 p > .10	4.2651 p > .50
Gain Confidence of Personnel	11.2629 p > .05	5.7835 p > .30
Use Tact and Diplomacy	4.9153 p > .50	4.2943 p > .50
Evaluate the Abilities of Organizational Personnel	33.7925 p < .001*	12.4824 p > .05
Train Employees	25.7996 p < .001*	11.2630 p > .05
Direct Work of Others on Projects	36.5284 p < .001*	11.9914 p > .05
Participate in Planning Sessions	25.5395 p < .001*	2.0747 p > .90

TABLE XXXVIII (Continued)

C o m p e t e n c y	Tabulated x^2 and Significance Level	
	Present	Future
Plan and Conduct Meetings	20.7853 $p < .01*$	5.4871 $p > .30$
Define Management Relationships	24.3092 $p < .001*$	4.4337 $p > .50$
Convince Others of Feasibility of Innovations	4.6152 $p > .50$	3.6808 $p > .70$
Coordinate Functions of Systems Personnel	27.7513 $p < .001*$	3.9954 $p > .50$
Represent the Company Image	12.9139 $p < .05*$	5.4517 $p > .30$
Participate in a Professional Organization	27.5128 $p < .001*$	22.1748 $p < .01*$
Know Particular Industry	12.9080 $p < .05*$	16.9664 $p < .01*$
Know Organization's Products or Services	27.7563 $p < .001*$	27.2099 $p < .001*$

*Significant Chi-Square

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Doctor of Education

Thesis: A STUDY OF JOB-RELATED COMPETENCIES USED BY INFORMATION
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