OPINION LEADERSHIP AND NETWORK CENTRALITY
WITH RESPECT TO TEACHING INNOVATIONS
WITHIN ACCOUNTING HIGHER EDUCATION

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ABSTRACT

OPINION LEADERSHIP AND NETWORK CENTRALITY
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By

Vincent Francis McCormack

This study applied portions of the methodologies of diffusion of innovations research and communication network analysis research to the field of university-level accounting education, in order to help bring about an understanding of the ways in which developments in teaching technology are disseminated among accounting educators. Since prior application of these methodologies to the context of accounting education had never been made, this research represents a pioneering, exploratory, tentative, descriptive work. The study has attempted to provide a start toward accomplishing the long-run objective of securing maximal rates of adoption, of improvements in instructional technology, by accounting educators.

The methodology employed in this research attempted to identify key relationships existing within the communication activities of departments of accounting faculty with respect to teaching-related topics. Twenty dependent variables were operationalized in order to measure the extent to which individuals performed two key roles in the communication process:

1. The role of opinion leader, from diffusion of innovations research, consists of being a potential influential and focus of advice-seeking communication within the department;

2. The role of occupying a central position in a communication network--network centrality--consists of serving a linking function in the transmission of information between individuals in a department, and is a product of the structure of the communication network in the department.

A census of all full-time, permanent, accounting faculty members from ten AACSB schools was conducted to obtain the data from which the twenty dependent, and forty-two independent, variables were generated. Although the overall response rate for the ten schools was in excess of ninety per cent, concentrations of non-respondents prohibited the calculation of dependent variable measures at two schools. After testing for, and finding no appreciable evidence of, response bias, ninety-seven individuals from the remaining eight schools were identified as the respondent set to be analyzed.

The independent variables--categorized as biographic characteristics, interpersonal communication variables and mass media communication variables--were based upon generalizations from diffusion research regarding the social status, cosmopoliteness, social participation, extent of change agent contact, exposure to mass media, innovativeness, and technical competence of opinion leaders. All variables were standardized within each department, resulting in sixty-two measures of relative individual differences.

Initially, the existence of linear relationships between all dependent and independent variables was tested through the use of Pearson product-moment correlation coefficients. The relationships within the variable sets were then explored utilizing the results of principal components factor analyses with varimax rotation, with respect to each of the dependent and independent variable sets. Factor scores were calculated for each of the resulting significant factors, creating twenty new factor score variables which represented the significant components of the variability within each of the original variable sets. Finally, linear relationships between the independent variable factor score sets, and each significant factor from the dependent variable factor score sets, were identified using the results of multiple linear progression procedures.

Limitations of this research consisted of the assumption of a linear model, and the potential effect of violations of the assumption of multivariate normal distributions. The results of this study may, strictly speaking, be generalized only to the schools and individuals analyzed. Selected characteristics, of the ten departments in which the data was gathered, are presented in order to assist the reader who wishes to infer the results of this research to a specific population of interest.

OPINION LEADERSHIP AND NETWORK CENTRALITY WITH RESPECT TO TEACHING INNOVATIONS WITHIN ACCOUNTING HIGHER EDUCATION

By

Vincent Francis McCormack

A DISSERTATION

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DEDICATION

I believe most accounting graduate students enter a doctoral program in order to become teachers. Many graduate students whom I have been privileged to know have expressed the feeling, at least early in their careers, that they hoped teaching would be a more personal and satisfying way of providing service to humanity than at least some of the other alternatives available to individuals with training in the field of accounting.

Over the years, I have seen much of this idealism slowly diminish; largely, I believe, due to a reward structure within higher education that all too often forces an individual to devote more and more of his efforts to activities other than teaching. It is to my fellow faculty within accounting higher education that this dissertation is dedicated. It is my hope that the results of this and similar research in the future will enable us, in spite of ourselves, to offer our students what they so well deserve--the best education that we can give them.

ACKNOWLEDGEMENTS

Very early in this writer's doctoral program, he promised himself that he would attempt a dissertation whose results would at least have a chance of benefitting students in accounting. This writer was extraordinarily fortunate to find an individual, in the person of Professor Gardner M. Jones, who was not only willing to chair a dissertation that was multidisciplinary in nature, and unfashionable in the current vogue of doctoral research in accounting; but who was also willing to put up with the trials and tribulations of this writer as he attempted to teach a thousand students a year and write this dissertation at the same time.

Professor Roland F. Salmonson has been this writer's advisor throughout his doctoral program, and has provided assistance in many different ways. Professor Everett M. Rogers can be held accountable for first sparking this writer's interest in the field of communication theory and research--an interest which, in large measure, was responsible for this writer continuing his doctoral program during a period in which personal difficulties made the effort barely seem worthwhile.

Professor Richard V. Farace opened the world of communication network analysis to this doctoral student. His encouragement and patience with an accounting doctoral student attempting to assimilate a resonable core of knowledge in a research area unknown to most accountants, has been monumental. Heartfelt appreciation is extended to all these individuals; this writer's major regret is that this dissertation is neither an accurate, nor adequate, representation of their contributions.

Sincere thanks are also due to many other friends--doctoral students, faculty and staff--at Michigan State University, The Pennsylvania State University, and elsewhere. They have provided needed friendship, criticism, encouragement and help at innumerable points in time. Rather than attempt to identify each individual, and thereby inadvertently omit persons who should be mentioned, this writer hopes that his inadequate collective thanks will be understood by all.

This writer also wishes to express his appreciation to the Touche Ross Foundation for financial support during part of the period in which this dissertation was written.

Most importantly, this writer would like to thank his wife, Pat. She has suffered, with this writer, through too many impoverished years, and the seemingly interminable delays and frustrations in making progress on this dissertation. To her, this writer expresses his love, thanks and hope that accomplishment of the objective makes the sacrafices seem worthwhile.

Finally, this writer can only hope that, in some later year, his now-young son, Michael, will stumble upon this obscure piece of research that has occupied so much of his father's time, and understand.

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INTRODUCTION

Overview

This study applied portions of the methodologies of diffusion of innovations research and communication network analysis research to the field of university-level accounting education, in order to help bring about an understanding of the ways in which developments in teaching technology are disseminated among accounting educators. Since prior application of these methodologies to the context of accounting education had never been made, this research represents a pioneering, exploratory, tentative, descriptive work. The study has attempted to provide a start toward accomplishing the long-run objective of securing maximal rates of adoption, of improvements in instructional technology, by accounting educators.

Nature of the Problem

Instructional Technology (IT) has been defined as:

> . . . a systematic way of designing, carrying out, and evaluating the total process of learning and teaching in terms of specific objectives, based on research in human learning and communication, and employing a combination of human and nonhuman resources to bring about more effective instruction.[1]

Its importance to the learning process has been summed up in the following statement by the Commission on Instructional Technology:

> In the conviction that technology can make education more productive, individual and powerful, make learning more immediate, give instruction a more scientific base, and make access to education more equal, the Commission concludes that the nation should increase its investment in instructional technology, thereby upgrading the quality of education, and ultimately, the quality of individuals' lives and of society generally.[2]

Many teaching assistants and new faculty members, given the task of teaching an accounting course for the first time, have been exposed to a "throw them in the pool and they'll learn how to swim" philosophy with respect to how the particular course might be taught most effectively.[3] This is, in this writer's opinion, symptomatic of a relative lack of emphasis accorded effective teaching techniques for accounting topics. In the words of a recent American Accounting Association (AAA) Committee:

> . . . the Committee is of the opinion that the major impediment to the marriage of IT and accounting education is the low status which learning theories and research now occupy on the scale de rigueur of accounting intellectualism. . . If IT becomes fashionable in the order of our pursuits into quantitative analysis and behavioral science, a solid framework will have been established for steady and meaningful progress.[4]

As a result of the above and other reasons advanced by the AAA Committee, such as "the fallacious assumption that holders of the Ph.D. are ipso facto experts of the learning process,"[5] the Committee believes that there has been relatively little progress to date:

While the Committee has discovered some exemplary applications of IT in accounting education, we are of the opinion that a thorough beginning throughout accounting education has not yet begun. This is not intended as an indictment--for accounting educators are not uniquely ineffective or remiss in this regard--but rather as a call to action. The signs are clear that great changes will occur in education within the decade of the 70's, and in truth have already begun. . .

The immediate challenge to accounting educators arises in part from the fact that some other academic disciplines have already begun to elevate the status of IT in a variety of ways, indicating both the conviction as to its importance in furthering the academic objectives of their disciplines, and their intention of taking organized and systematic action in this field.[6]

It appears the profession has been taking tentative steps in the direction of IT research and application. For example, the 1968 edition of "A Guide to Accounting Instruction: Concepts and Practices," prepared by an AAA Committee, states:

In recent years there have been numerous developments which are of considerable importance to the teaching of accounting. The use of television as an instructional medium has increased. Recent technological progress in data processing has provided the accountant with a powerful tool--the computer. . . Programmed instruction is another teaching method which is finding increased application for accounting education. This teaching method can be used in combination with other traditional methods in the process of developing more effective learning by the student.[7]

In addition, a review of the Teacher's Clinic and Education Research sections of <u>The Accounting Review</u> in recent years indicates there has been experimentation with a variety of IT topics by accounting educators. Articles related to course content include a report on the role of EDP in auditing courses by two professional committees,[8] and topics such as a suggested emphasis for introductory accounting courses.[9] Articles related to teaching technology encompass the use of computer-generated assignments,[10] probabilistically answered examinations,[11] and modularized learning;[12] various computerized applications, including case studies[13] and simulations;[14] statistical sampling programs[15] and simulations;[16] and the use of such diverse technology as programmed instruction,[17] teaching machines,[18] conference telephone calls[19] and microwave TV in a case course.[20]

The recently published "Accounting Education: Problems and Prospects," by the AAA contains articles on learning and motivation theory, devotes nearly 200 pages to articles on instructional innovations and contains sections on performance evaluation and research in accounting education.[21] Since April 1971, the AAA has offered limited financial assistance grants specifically for projects with promise of advancing knowledge and experience in one or more phases of educational innovations.[22] Recently, the AAA established an Outstanding Accounting Educator Award, for which excellence in teaching and contributions to accounting education are criteria for nomination.[23]

A review of Dissertation Abstracts has revealed a number of dissertations which have investigated IT topics applied to accounting education. For example, at least seven doctoral dissertations in recent years have conducted experiments testing the effectiveness of programmed c

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instruction in the teaching of accounting principles.[24] These and other dissertations along similar lines have experimented with rate-controlled speech,[25] free operant learning,[26] computer-assisted instruction,[27] random access tapes,[28] business gaming,[29] and multi-media formats.[30] However, inasmuch as half of these studies are Ed.D. dissertations, the sheer number of the dissertations is a deceptively large indicant of the extent of IT dissertation research by accounting educators. According to the results of a survey published in a recent monograph by Paul Garner, the percentage of accounting education-related dissertations is a small--four per cent--percentage of the total dissertations written by accounting doctoral candidates. Garner finds this somewhat surprising:

> It is a little more unexplainable why subjects relating to Accounting Education have not been pursued more frequently and vigorously, since it is well known that more than 75% of the doctoral candidates in accounting thus far go into academic careers and it would be therefore somewhat of a 'natural' for the budding professors to do their doctoral research and writing on educational topics. For the period under observation, however, there is no trend toward pedagogical topics.[31]

In addition, it is likely that IT topic studies comprise only a part of the dissertations classified by Garner as being related to accounting education.

Finally, although the above sources provide evidence of at least some research in IT related to accounting education, a word of caution has been sounded by the Committee on Instructional Technology concerning a lack of quality exhibited by IT research in general up to the time of the Committee's report:

> There is too little research, too much of it is of low quality, too little is relevant to the most serious problems of education; and, in general, there is too little direct relationship between research and implementation.[32]

To bring the above criticism closer to home, the AAA Committee on Multi-Media Instruction makes the following comment regarding research on programmed instruction:

> . . . The use of programmed materials in accounting education could benefit from more disciplined experiments. . . we venture that most applications lack the statistical authenticity to reach valid conclusions.[33]

To sum up the situation to date:

1. There is a need for quality research regarding the application of newer IT methods to accounting education;

2. There appears to be an emerging awareness of the importance of IT research and its application by accounting educators; and

3. There is limited current implementation within accounting education of the existing newer instructional methods.

This dissertation focuses on the last of these three items. No matter how good any specific instructional innovation may be,[34] its overall effectiveness in accounting higher education will be a function of the extent of its implementation. It is inconceivable to this writer that there will be unlimited resources available, much less

expended, for achieving maximal rates of adoption of newer teaching methods within accounting education. The patterns of increasing resistance by state legislatures in granting the budget requests of state institutions, cut-backs in monies available for federally funded research and dissemination programs, and the financial difficulty of many smaller and private institutions, have become all too evident in recent years. Given scarce resources, and/or the desire to use the resources that are available for securing the adoption of educational innovations most efficiently, a strategy of being able to focus resource expenditures where they will be most effective is highly desirable.

This study attempts to provide a start toward identifying elements of a strategy whereby the more timely and efficient implementation of newer instructional methods may be secured. This research does not make value judgments concerning the desirability of using specific teaching techniques in accounting courses; it attempts to facilitate the future adoption, of present or future instructional technology innovations, within accounting higher education.

Prior Research and Methodological Approach of the Study

A relatively recent IT innovation in accounting education is programmed learning, an example of which is the Edwards, Hermanson, Salmonson programmed text.[35] Inasmuch as a textbook is a commercial product, the publisher designed a marketing strategy with the objective of securing maximum sales volume for the product. The marketing strategy is, in many ways, analogous to the overall objective of this research: to facilitate the adoption of existing, or future, IT innovations in accounting education.

Studies on this general theme--the adoption of innovations over time in a social system--have been carried out for many years in a variety of academic disciplines: anthropology, sociology, education, medical technology and marketing, among others.[36] It eventually became apparent to researchers such as Rogers, that many of these studies, although set in the framework of differing disciplines and covering a wide variety of social systems, were reaching substantially similar conclusions. A concerted effort has been made in the last fifteen years to bring together the results of the separate research traditions, culminating in the listing of 112 generalizations regarding the workings of the diffusion process.[37]

Because diffusion research, now considered a subset of communications research, specifically deals with the adoption of ideas and practices perceived as new by the members of the social system being considered, this writer believes diffusion theory has particular promise for application to the problem area being considered. In addition, since many of the generalizations from diffusion research have been developed from studies covering a wide variety of innovations and social systems, it is likely that i

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concepts and relationships from these prior studies have relevance for the present problem, although the validity of their use with reference to IT innovations in accounting education needs to be empirically tested.

The only major study of which this writer is aware, that has applied elements of diffusion theory to a social system which included accounting faculty members, is the 1967 book by Richard Evans, "Resistance to Innovation In Higher Education."[38] Using the semantic differential as a measurement method, this study examines the attitudes of faculty members from various departments--including accounting--at one school toward instructional television. Although Evans, in the early chapters of his book, draws heavily upon material from Everett Rogers' 1962 book on the diffusion of innovations,[39] the attempted relationships are, in this writer's opinion, often inappropriate and modified to coincide with the form of the author's data base. It is interesting to note that results of the same study were originally published in 1962 under the title, "The University Faculty and Educational Television: Hostility, Resistance and Change."[40] No mention was made of diffusion research in the 1962 version.

The diffusion research tradition in education was led in the early years by Paul Mort[41] of Columbia University Teacher's College, and in recent years by Ronald Havelock[42] of the Institute of Social Research. The great bulk of the studies which comprise this research tradition have t

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examined primary or secondary educational systems.[43] Havelock identifies four major strategic orientations for securing the adoption of educational innovations: problem-solving; social interaction (SI); research, development and diffusion; and his own linkage concept.[44] Of these strategies, the SI approach has the largest empirical foundation and is, in this writer's opinion, the most appropriate for application to accounting education.

A significant element is the design of a diffusion strategy using an SI approach is the concept of opinion leadership, which has been defined as follows:

> Opinion leadership is the degree to which an individual is able to informally influence other individuals' attitudes or overt behavior in a desired way with relative frequency.[45]

The concept of opinion leadership developed from the assumption of a two-step flow communication model as the foundation of the diffusion process. The steps in the flow were posited as follows:

> The first step, from sources to opinion leaders, is mainly a transfer of information; whereas the second step, from opinion leaders to their followers, involves also the spread of influence.[46]

More recent theory has assumed a multi-step flow model, which incorporates the two-step flow model, the one-step flow model and the hypodermic needle model.[47] The multi-step flow model "suggests that there are a variable number of relays in the communication flow from a source to a receiver."[48]

The importance of opinion leaders in planning a diffusion strategy may be seen in the following:

> Several researches indicate that when the social system is modern, the opinion leaders are quite innovative; but when the norms are traditional, the leaders also reflect this norm in their behavior. By their close conformity to the system's norms, the opinion leaders serve as an apt model for the innovation behavior of their followers.[49]

Thus, opinion leaders function as potential influentials in their system, serve a linking function in the transfer of information, and must be considered in designing a diffusion strategy regardless of the location of the system's norms on a modernism-traditionalism continuum.

Communication network analysis, a subset of communications research, also provides a means of identifying individuals who play key roles in the communication activities within their system. A description of a communication network, and a brief summary of network analysis, follow:

> Communication networks arise in a social system where repetitive, recurring patterns of interaction take place among the system's members. Communication networks, then, are derived from an aggregate or sum of the interactions in a system, occurring across time and space. The networks provide the means by which messages move from member to member throughout the system. The basic unit of interaction is the <u>linkage</u> or communication relation between pairs of system members, i.e., the dyadic linkage.[50]

> The <u>initial</u> goals of communication network analysis are essentially descriptive or classificatory in nature. That is, the initial analytic task is to reduce the membership of the system to some smaller number of categories that allow the investigator to describe the networks in whatever manner best fits the purpose of the research. Given that the relations under study reflect various aspects of the

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> communication or message exchange process among system members, one logical set of categories to use are those that delineate various communication roles. These roles may be defined in differing ways, but often they are of three main types: (1) member of a communication group, (2) inter-group linker, and (3) isolate, or non-participant in the network.[51]

Thus, although network analysis does not necessarily deal with messages that are perceived as new by members of the system,[52] network analysis does enable the classification of individuals in a defined network by functional roles such as group member, bridge, liaison, tree node, and isolate.[53] Individuals in certain of these roles--liaisons and bridges--provide a linking dimension between groups in the network and thereby play key roles in the dissemination of information throughout the network.

This writer is unaware of <u>any</u> major study that has applied network analysis to a system--large <u>or</u> small--which has included accounting faculty members and for which the communication topic area has been instructional technology or teaching innovation. In addition, since the analytical tools for identifying roles and network structure in larger systems have only recently become available,[54] there have been relatively few empirical studies that have examined role characteristics in larger systems of any kind.[55] The advent of the analytical tools for larger systems has spurred consideration of structural variables at many different levels of analysis--individual, group, sub-system and system,[56] resulting in refinements of the measurement processes at all levels of analysis.[57]

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In summary, elements of the methodologies of both diffusion research and network analysis have been utilized in this study. Each methodology attempts to identify key relationships existing within the communication activities in a given system:

1. The concept of opinion leadership, from diffusion research, focuses on potential influentials, and advice-seeking relationships, in the system, and

2. The concept of functional communication roles from network analysis focuses on the linkage and structure dimensions within a communication network.

By the application of these tools in the context of higher education in accounting, this dissertation examines aspects of the communication process occurring within selected systems of accounting educators, with the hope of identifying focal points potentially useful in the formulation of a strategy for securing maximal rates of adoption.

This study, in many respects, is truly an exploratory one. The ground being covered is virgin, and in some instances has proven either barren or resistant to close scrutiny. Nonetheless, it is the hope of this writer that the research has provided a significant start toward addressing a problem that should be of real concern to accounting educators.

Organization of the Thesis

Chapter II of the dissertation discusses the selection and operationalization of the dependent and independent variables, the data-gathering procedures used, response results, bias considerations, and specification of the data sets analyzed.

The statistical analysis of the data, presented in Chapter III, begins with a Pearson product moment correlation analysis. This is followed by a discussion of the factor analysis procedures employed, the determination of significant factors, and the results of the factor analyses. Finally, the multiple regression procedures used, and the results of the multiple regression analyses, are discussed in the closing section of the chapter.

The initial section of Chapter IV consists of a summary of the results of the analyses contained in the preceding chapter; subsequent sections of Chapter IV detail the major conclusions of the study, discuss the major limitations of the analyses, and provide suggestions for future research.

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FOOTNOTES TO CHAPTER I

[1]Commission on Instructional Technology, To Improve Learning, ed. by Sidney G. Tickton (2 vols.; New York: R. R. Bowker Company, 1970), Vol. I, p. 21.

[2]Ibid., p. 10.

[3]This statement, of course, reflects this writer's opinion, based upon his personal experience, as well as upon discussions with junior faculty at many major institutions. It appears to this writer that the practice described represents the rule, rather than the exception.

[4]Committee on Multi-Media Instruction in Accounting, "Report of the Committee on Multi-Media Instruction in Accounting," Supplement to Volume XLVII of The Accounting Review, 1972, p. 115.

[5]Ibid.

[6]Ibid., pp. 115-16.

[7]American Accounting Association Committee to Prepare a Revised Accounting Teachers' Guide, A Guide to Accounting Instruction: Concepts & Practices (2d ed.; Cincinnati, Ohio: South-Western Publishing Co., 1968), p. 84.

[8]American Accounting Association Committee on Accounting Education and American Institute of Certified Public Accountants Computer Education Subcommittee, "Inclusion of EDP in an Undergraduate Auditing Curriculum: Some Possible Approaches," The Accounting Review, Vol. XLIX (October, 1974), pp. 859-64.

[9]Barry E. Cushing and Charles H. Smith, "A New Emphasis for Introductory Accounting Instruction," The Accounting Review, Vol. XLVII (July, 1972), pp. 599-601.

[10]Eugene L. Zieha, "Computer-Generated Accounting Assignments," The Accounting Review, Vol. XLIX (July, 1974), pp. 600-02.

[11]Irvin N. Glein and John B. Wallace, Jr., "Probabilistically Answered Examinations: A Field Test," The Accounting Review, Vol. XLIX (April, 1974), pp. 363-66.

[12]Jay M. Smith, Dale Taylor and Harold Western, "Experiment in Modularized Learning for Intermediate Accounting," *The Accounting Review*, Vol. XLIX (April, 1974), pp. 385-90.

[13]James J. Benjamin and Donald E. Ricketts, "A Profit Planning Project in the Management Accounting Course," *The Accounting Review*, Vol. XLVIII (October, 1973), pp. 794-97.

[14]William R. Kinney, Jr., "The Use of the Time-Shared Interactive Computer in Audit Education," *The Accounting Review*, Vol. XLIX (July, 1974), pp. 590-94; J. Timothy Sale, "Using Computerized Budget Simulation Models as a Teaching Device," *The Accounting Review*, Vol. XLVII (October, 1972), pp. 836-39.

[15]David H. Li, "Audit-Aid: Generalized Computer-Audit Program as an Instructional Device," *The Accounting Review*, Vol. XLV (October, 1970), pp. 774-78; V. Thomas Dock, Dan M. Guy and Doyle Z. Williams, "Integrating the Computer in the Classroom: An Approach in Auditing," *The Accounting Review*, Vol. XLIX (January, 1974), pp. 149-53.

[16]Alvin A. Arens, Robert G. May and Geraldine Dominiak, "A Simulated Case for Audit Education," *The Accounting Review*, Vol. XLV (July, 1970), pp. 573-78; Paul H. Walgenbach and Werner G. Frank, "A Simulation Model for Applying Audit Sampling Techniques," *The Accounting Review*, Vol. XLVI (July, 1971), pp. 583-88.

[17]Billy E. Askins, "Determining the Effectiveness of Programmed Instruction--A Training Course Example," *The Accounting Review*, Vol. XLV (January, 1970), pp. 159-63; William Markell and Wilfred A. Pemberton, "Programmed Instruction in Elementary Accounting--Is It Successful?" *The Accounting Review*, Vol. XLVII (April, 1972), pp. 381-84.

[18]G. Fred Streuling and Gary L. Holstrum, "Teaching Machines Versus Lectures in Accounting Education: An Experiment," *The Accounting Review*, Vol. XLVII (October, 1972), pp. 806-10.

[19]Michael H. Granof, "Conference Telephone Calls: A Means to Bridge the Academic--'Real World' Gap," *The Accounting Review*, Vol. XLVIII (July, 1973), pp. 612-14.

[20]Andrew M. McCosh, "The Case Method of Accounting Instruction and Microwave Television," *The Accounting Review*, Vol. XLVII (January, 1972), pp. 161-64.

[21]James Don Edwards, ed., *Accounting and Education: Problems and Prospects* (n. p.: American Accounting Association, 1974).

[22]See _The Accounting Review_, Vol. XLVI (April, 1971), p. 397.

[23]See _The Accounting Review_, Vol. XLVIII (April, 1973), pp. 440-41.

[24]Franklin Eugene Butts and Gary L. Prickett, "The Effect of Audio-Tutorial and Programmed Instruction Laboratories on Achievement in Accounting Principles" (unpublished Ed.D. dissertation, Colorado State University, 1969); Charles Douglas Cloud, "An Experimental Study Comparing the Effectiveness of Programmed Instruction and the Conventional Method of Teaching First-Semester Principles of Accounting" (unpublished D.B.A. dissertation, Arizona State University, 1971); Victoria Lee DeFore Daily, "The Effect of Programmed Instruction in the Teaching of Principles of Accounting" (unpublished Ed.D. dissertation, Colorado State University, 1969); Mildred Williams Glover, "An Experiment in the Use of Programmed Instruction in Elementary College Accounting" (unpublished Ed.D. dissertation, University of Georgia, 1970); Sunion Theodore Hong, "An Empirical Study of the Effectiveness of Programmed Instruction and Computer-Assisted Instruction in Elementary Accounting" (unpublished Ph.D. dissertation, New York University, 1972); Joseph Lee Humphrey, "An Inquiry Into Programmed Instruction as a Pedagogical Technique in Accounting Education" (unpublished D.B.A. dissertation, Texas Tech University, 1971); Dominick Salvatore Orefice, "An Experiment to Determine the Effectiveness of Programmed Instruction in Elementary Accounting" (unpublished Ed.D. dissertation, Rutgers University, The State University of New Jersey, 1971).

[25]Frederick Miller Cole, "A Study of Comprehension Levels of College Students Studying Elementary Accounting Via Rate-Controlled Speech" (unpublished Ed.D. dissertation, University of Florida, 1971).

[26]Milton Mike Will, "The Effect of Free Operant Learning on Achievement in the Principles of Accounting Course" (unpublished Ph.D. dissertation, University of North Dakota, 1970).

[27]Hong, "An Empirical Study of the Effectiveness of Programmed Instruction and Computer-Assisted Instruction in Elementary Accounting."

[28]Stephen Michael Flanagan, "The Effectiveness of Random Access Tapes in the Instruction of Elementary Accounting (unpublished Ed.D. dissertation, University of Northern Colorado, 1970).

[29]Jimmy Carl Caldwell, "An Inquiry Into Business Gaming as a Pedagogical Technique in Accounting Education" (unpublished Ph.D. dissertation, University of Alabama, 1970).

[30]Butts and Prickett, "The Effect of Audio-Tutorial and Programmed Instruction Laboratories on Achievement in Accounting Principles;" Julius Onvorah Onah, "An Experimental Study Using the Audio-Visual Tutorial System to Teach Principles of Accounting to Community College Students" (unpublished Ph.D. dissertation, Michigan State University, 1971).

[31]Paul Garner, *Some Reflection on Research by Doctoral Candidates in Accounting* (University, Alabama: Center for Business and Economic Research, University of Alabama, 1973), p. 8.

[32]Commission on Instruction Technology, *To Improve Learning*, Vol. II, p. 917.

[33]Committee on Multi-Media Instruction in Accounting, "Report of the Committee," p. 119.

[34]This writer hopes that progress in the first area mentioned--quality research in IT related to accounting education--will provide a foundation for judging the desirability of implementing specific instructional methods. Certainly there are abundant research settings--multiple section courses in large schools--for careful experimentation. If an organization such as the AAA would fund a program of such experimentation, this writer believes substantial progress would be made. A start in this direction has been made in the form of a limited number of research grants that have been available since 1971.

[35]James Don Edwards, Roger H. Hermanson, and R. F. Salmonson, *Accounting, A Programmed Text* (2 vols.; Homewood, Illinois: Richard D. Irwin, Inc., 1967).

[36]See in particular Everett M. Rogers with F. Floyd Shoemaker, *Communication of Innovations, A Cross-Cultural Approach* (2d ed., New York: The Free Press, 1971), pp. 44-70.

[37]*Ibid.*, pp. 346-85.

[38]Richard I. Evans, *Resistance To Innovation In Higher Education* (San Francisco: Jossey-Bass Publishers, Inc., 1970).

[39]E. M. Rogers, *Diffusion of Innovation* (New York: Free Press, 1962).

[40]Richard I. Evans, Ronald G. Smith, and William K. Colville, The University Faculty and Educational Television: Hostility, Resistance, and Change (Houston, Texas: University of Houston, 1962).

[41]Rogers with Shoemaker, Communication of Innovations, p. 58.

[42]See, for example, Ronald G. Havelock, A Guide to Innovation in Education (Ann Arbor, Michigan: Institute for Social Research, 1970); Ronald G. Havelock and Mary G. Havelock, Training for Change Agents (Ann Arbor, Michigan: Institute for Social Research, 1973); Ronald G. Havelock, The Change Agent's Guide to Innovation in Education (Englewood Cliffs, New Jersey: Educational Technology Publications, 1973).

[43]Good examples in this category include the summary of the Columbia studies compiled by Donald H. Ross, Administration for Adaptability: A Source Book Drawing Together the Results of More Than 150 Studies Related to the Question of Why and How Schools Improve (New York: Metropolitan School Study Council, 1958), and the work by Richard O. Carlson, Adoption of Educational Innovations (Eugene, Oregon: The Center for the Advanced Study of Educational Administration, 1965).

[44]Havelock, Change Agent's Guide, pp. 151-68.

[45]Rogers with Shoemaker, Communication of Innovations, p. 35.

[46]Ibid., p. 205.

[47]Ibid., pp. 203-09.

[48]Ibid., p. 209.

[49]Ibid., p. 35.

[50]Richard V. Farace, William D. Richards, Peter R. Monge, and Eugene Jacobson, "Analysis of Human Communication Networks In Large Social Systems," unpublished paper, Department of Communications, Michigan State University, May, 1973. p. 3.

[51]Ibid., p. 4.

[52]Although it may by specification of the content of the communication for which the network is defined. As an example, a number of researchers have subdivided work-related communication into content areas such as production, innovation, and maintenance, and then defined separate networks for each content area. See, for example, Richard V. Farace and Jerome David Johnson, "Comparative Analysis of Human Communication Networks In Selected Formal Organizations" (mimeographed copy of a paper presented at the International Communication Association meeting in New Orleans, April, 1974).

[53]See, for example, Farace, et al., "Large Social Systems," pp. 13-14.

[54]The most frequently used data source for network analysis has been sociometric choice data. Although smaller systems can feasibly be analyzed by hand, the process becomes unwieldy with larger systems. Weiss describes a method of storing sociometric data in matrix form, and then reordering rows and columns of the matrix to form groups and identify structural patterns: Robert Stuart Weiss, "Processes of Organization" (unpublished Ph.D. dissertation, University of Michigan, 1954). This technique proved reasonable for moderate size systems, but has been substantially improved for the analysis of large systems by a computer program developed by Richards. See William D. Richards, Jr., "An Improved Conceptually-Based Method for Analysis of Communication Network Structures of Large Complex Organizations" (mimeographed; East Lansing, Michigan: Department of Communication, Michigan State University, 1971); William D. Richards, Jr., "Network Analysis in Large Complex Systems: Techniques and Methods--Tools" (mimeographed copy of paper presented at the International Communication Association meeting in New Orleans, April, 1974).

[55]See, for example, Richard V. Farace and James A. Danowski, "Analyzing Human Communication Networks in Organizations: Applications to Management Problems" (mimeographed copy of paper presented at the International Communication Association meeting, March, 1973); Donald MacDonald, "Communication Roles and Communication Content In a Bureaucratic Setting" (unpublished Ph.D. dissertation, Michigan State University, 1970).

[56]See, in particular, William D. Richards, Jr., "Network Analysis in Large Complex Systems: Theoretical Basis" (mimeographed copy of paper presented at the International Communication Association meeting in New Orleans, April, 1974); William D. Richards, Jr., "Network Analysis in Large Complex Systems: Metrics" (mimeographed copy of paper presented at the International Communication Association meeting in New Orleans, April, 1974); Farace, et al., "Large Social Systems," pp. 18-21.

[57]This is exemplified by the increasing complexity of the data-gathering forms used in recent years, which now often include, in addition to identification of the contact, multiple content areas, frequency levels and direction of initiation with respect to the communication activity being measured. See Peter R. Monge and George H. Lindsay, "The Study of Communication Networks and Communication Structure in Large Organizations" (mimeographed copy of paper presented at the International Communication Association meeting in New Orleans, April, 1974) for a good introduction to network analysis in general, as well as sample data instruments. More comprehensive examples include Edwin H. Amend, "Liaison Communication Roles of Professionals in a Research Dissemination Organization" (unpublished Ph.D. dissertation, Michigan State University, 1971); MacDonald, "Communication Roles and Communication Content;" and Donald F. Schwartz, "Liaison Communication Roles in a Formal Organization" (unpublished Ph.D. dissertation, Michigan State University, 1968).

CHAPTER II

GENERATION OF THE DATA BASE

From a potential population of interest of all accounting educators in the United States, ten AACSB schools were defined as separate systems and selected for inclusion in the study. A census of all full-time, permanent, accounting faculty members at these schools was conducted to obtain the data from which 20 dependent, and 42 independent, variables were generated. Although the overall response rate for the study was in excess of 90 per cent, concentrations of nonrespondents prohibited the calculation of dependent variable measures at two schools. Ninety-seven individuals from the remaining eight schools form the respondent data set used in subsequent analyses.

The first section of this chapter specifies the population and sample, and is followed by sections on the data-gathering procedures used, selection and operationalization of the dependent and independent variables, response bias testing, and the data modification procedures.

Population and Sample

The ultimate population of relevance to the research question addressed by this study consists of all teachers

of accounting at the college level. Inasmuch as the methods used in this research to measure opinion leadership and the linking communication function require virtually a 100 per cent sample and response rate from the defined system, the overall population was broken into smaller systems--departments--so that control procedures which would permit a realistic chance of achieving the high required response rates could be employed.

For the purpose of this research, a department was defined as all full-time, permanent, accounting faculty members at an institution of higher learning, who had been in residence at least one full term during the academic year in which the data was gathered--1974-75. This definition excludes:

1. Part-time faculty members such as practitioners teaching an accounting course, and individuals whose primary responsibilities were those of an administrative position other than department head or chairman;

2. Non-permanent individuals such as visiting faculty from another school, and graduate students who held the rank of instructor or equivalent;

3. Faculty who held a full-time, permanent position at their institution, but who had been gone all academic year.

Ten departments of accounting, chosen from the membership of the American Association of Collegiate Schools of Business (AACSB) were selected for inclusion in the

study and form the defined population. The AACSB school group includes many large and/or state universities, and is considered a significant population with respect to two dimensions which have relevance for this research. First, the number of students in the accounting programs at many of the AACSB institutions is substantial. Since students are at least one, if not the primary, group who would benefit from improved instructional methods, selection of these schools promises large numbers of potential beneficiaries.[1] Second, interviews with a number of publisher representatives, conducted when this study was in the research design stage, indicated that a large school often serves as a model--opinion leader--for smaller schools in the nearby geographic vicinity, with respect to factors such as course content and selection of textbooks. This appears to be especially prevalent in states with large branch, or state, systems.

Although the ten schools selected were not chosen at random, they are considered representative of the AACSB population in this research.[2] In order that the reader may, if he so desires, infer the results of this study to a population of interest such as all AACSB institutions, summary descriptive information concerning department size, highest academic degree, professional certification, academic rank distribution, tenure status, total years teaching and years at present institution for the faculty at the ten schools selected, is presented in Table 1. In addition,

Table 1. Summary of Descriptive Information Pertaining to Departments Which Received Questionnaires

	DEPARTMENT SIZE					
	Smallest	Largest	Mean	Total Departments		Total Faculty
Number of faculty	5	19	12.6	10		126
	HIGHEST ACADEMIC DEGREE					
	Masters		Doctorate			Total Faculty
Number of faculty	24		102			126
Percent of total	19.05%		80.95%			100%
	PROFESSIONAL CERTIFICATION					
	Certified		Not Certified			Faculty
Number of faculty	96		30			126
Percent of total	76.19%		28.31%			100%
	ACADEMIC RANK DISTRIBUTION					
	Instructor, Lecturer	Assistant Professor	Associate Professor	Full Professor		Total Faculty
Number of faculty	3	55	26	42		126
Percent of total	2.38%	43.65%	20.63%	33.33%		100%
	TENURE STATUS					
	Tenured		Non-tenured			Total Faculty
Number of faculty	68		58			126
Percent of total	53.97%		46.03%			100%
	TOTAL YEARS TEACHING					
	0-4	5-9	10-14	15-19	20+	Total Faculty
Number of faculty	30	39	17	9	31	126
Percent of total	23.81%	30.95%	13.49%	7.14%	24.60%	100%
	YEARS AT PRESENT INSTITUTION					
	0-4	5-9	10-14	15-19	20+	Total Faculty
Number of faculty	59	29	14	7	17	126
Percent of total	46.83%	23.02%	11.11%	5.56%	13.49%	100%

it might be noted that the ten departments are geographically dispersed over most of the continental United States, and are evenly split between schools on a quarter system, and schools on a semester or trimester system.

Three major types of statistical techniques are employed in this research, with different units of analysis examined depending upon the procedure used. Variable means for respondent and non-respondent groups were tested for differences using t-tests; 60 z-score variables for each of 97 individuals were factor analyzed by variable type; factor scores for each individual, generated from the factor analyses, were used as a data base for multiple regression procedures. Where appropriate, tests of statistical significance have been presented as an aid in interpreting the results, and to supply an additional informational dimension for the reader who wishes to infer the results to a population of interest. The reader should, of course, be aware that since the individual respondents analyzed in this research constitute a population--not a random sample--then, for some of the procedures used, any actual difference is a "statistically significant" difference. Whether such differences represent meaningful differences is a matter of judgment; as is the interpretation of the size of correlation coefficients, factor loadings and adjusted R squares.[3]

Data Gathering Procedures

The data analyzed in this research was gathered in two phases--two of the 10 schools were chosen for the initial distribution of the instruments in fall of the 1974-75 academic year; the remaining eight schools were censused in late spring of the same academic year. In both instances, an individual known to the faculty at each school distributed the questionnaires, assured respondents of anonymity, and requested the cooperation of the individuals in his department. Since only minor editorial changes were made in the questionnaire sets used for each distribution, and since the differing times of collection were not considered a significant difference, the data sets from the two distributions were combined for the analysis in this research. The procedures used for each questionnaire distribution are detailed in the following subsections.

Initial Distribution

Two schools, whose faculty were known personally by the researcher, were selected for the initial distribution of the data instruments. Distribution of the data-gathering materials, which included a cover letter, communication questionnaire and personal contact listing,[4] was made by the researcher, who also assured the respondents of anonymity. Personal interviews were conducted with most of the faculty members at these two schools after the questionnaires had been returned, in order to determine whether the respondents experienced difficulties in filling out the instruments, whether there were semantic difficulties with any questions, and to obtain an estimate of the average time required to complete all materials. No unforeseen difficulties were encountered,[5] and only very minor changes--spelling and punctuation--needed to be made in the instruments. The average time required by these respondents for completing both the communication questionnaire and personal contact listing was half an hour.

There were also strong indications from the interviews that an implicit, perceived "norm" exists for the amount of communication that a faculty member should have with his colleagues on professional and teaching-related matters.[6] Many respondents, both in the initial and second distribution groups, expressed surprise at the relatively low--as perceived by the respondents--frequency levels of communication with their fellow faculty members that they reported in their own questionnaire answers. These feelings were universal enough to have generated conversations on this topic, after most of the data-gathering had been completed, between groups of faculty members at most of the ten schools included in the study.

Second Distribution

As previously mentioned, the ten schools selected from the AACSB population are geographically dispersed over most of the continental United States. Since it was not economically feasible to obtain the data by personal interviews with the faculty at the remaining eight schools, thereby necessitating use of the United States Postal Service,

the following procedures were used in an attempt to provide the study with source credibility at each school.

First, the cooperation of an individual faculty member, who agreed to handle the distribution of the questionnaire and to request the participation of his fellow faculty members, was obtained in advance. These individuals also served as information sources after the actual distributions had been made--for questions from their fellow faculty concerning the nature and purpose of the research, and for the researcher with respect to problems encountered in gathering the data at each school.

A second procedure used was to make sure, in advance, that the department chairman knew of the research, knew that his faculty were being asked to participate and would, as a minimum, not discourage participation. This was accomplished by an initial letter briefly explaining the nature and the purpose of the research, followed by a telephone call in which any questions by the chairman concerning the study were answered, and in which his cooperation, in the form of a memo to his faculty or mention of the study in a faculty meeting, was solicited.

The package of materials distributed to each faculty member at each school consisted of:

1. Cover letter for the data instruments;

2. Communication questionnaire, which was the data source for all independent variable measures and the opinion leadership dependent variables;

3. Personal contact listing, the data source for the network centrality dependent variable measures;

4. A return envelope with individually typed to and from address labels, and which bore a forty cent stamp; and

5. The envelope containing the above materials, bearing an individually typed label addressed to each faculty member.

All printed materials used in these data-gathering procedures were personalized to the maximum extent possible, and were professionally printed. For example, the cover letters for each of the individual questionnaires were individually typed, using an IBM MT/ST typewriter, on Michigan State University letterhead; had the name which the author of the cover letter would usually have used in addressing each respondent included in the salutation; and were individually signed in ink. Samples of the letters to department chairmen, cover letters, communication questionnaires, and personal contact listings are included in the Appendix.

Operationalization of the dependent and independent variable measures generated from the combined data sets of the initial and second distributions are detailed in the following two sections.

Dependent Variable Measures

Twenty dependent variable measures were selected for analysis in this research--six opinion leadership indexes that measure reported advice-seeking behavior, and fourteen network centrality indexes that measure the extent to which individuals provide a linking dimension in the flow of information throughout their system.

Three of the six opinion leadership indexes pertain to advice sought with respect to new teaching methods; the remaining opinion leadership indexes are defined with respect to advice sought regarding overall teaching effectiveness and improvement. The fourteen network centrality indexes are split along similar lines--7 variables measure teaching innovation communication; 7 variables measure communication on many teaching-related matters. The concepts underlying, and the method of calculating, each index are presented in the following subsections.

Opinion Leadership Indexes

Opinion leadership has often been measured using a sociometric choice question of the following general form: "Whom would you ask for information or advice concerning Topic X?" Variants of this question include asking the question with respect to past, rather than future, behavior; and the specification of a limited number of choices "whom you would be most likely to" or "whom you have sought out most often." Responses would be solicited from as many members of the defined system as possible, resulting in choice nominations from most members of the system.[7] The data from this type of question can be conveniently represented in the form of either a sociogram or matrix. For example, suppose the data set listed in Figure 1 represents the choice nominations from a defined five member system:

> Individual 1 chooses individuals 2 and 3, in that order.
> Individual 2 chooses individuals 3 and 4, in that order.
> Individual 3 chooses individual 2.
> Individual 4 chooses individual 3.
> Individual 5 chooses individual 1.

Figure 1. Opinion Leadership Choice Listing Data Set

A sociogram is an illustration of the number and direction of reported sociometric choice nominations, where each individual in the defined system is represented by a circle and each choice is represented by an arrow. A directed arrow pointing toward one circle--individual A--from another circle--individual B--represents individual A having been chosen by individual B. See the left half of Figure 2.

Figure 2. Non-reciprocated and Reciprocated Dyads

If reciprocal choices have been made by individuals A and B--each has chosen the other--the arrow between the two individuals will point in both directions, as in the right half of Figure 2. The following sociogram represents the data set listed in Figure 1:

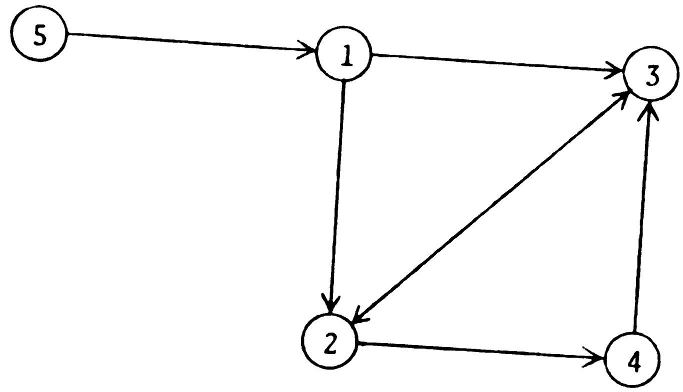

Figure 3. Sociogram of Figure 1 Choice Data

A method of representing sociometric choice data that is especially convenient for computational purposes is the use of a square matrix, whose rows represent the respondents--choosers--and whose columns represent their choices. A cell entry of 1 in the matrix indicates the existence of a choice by the row individual of the column individual; a cell entry of 0 indicates the lack of such a choice. The matrix in Table 2 is a representation of the choice data from Figure 1.

Either method of representing the data can be useful for the analysis of opinion leadership. For example, counting the number of directed arrows toward each individual in the sociogram will inform the researcher as to which individuals are chosen most often for advice concerning the topic of the question. A reference to Figure 3 indicates that individual 3 has been chosen most often--three times--by the other system members, and individual 2 has been chosen next most often. The same information can

Table 2. Binary Matrix of Figure 1 Choice Data

Individual Respondent Number \ Individual Choice Number	1	2	3	4	5
1	-	1	1	0	0
2	0	-	1	1	0
3	0	1	-	0	0
4	0	0	1	-	0
5	1	0	0	0	-
	1	2	3	1	0

be read from the column totals of the matrix in Table 2. Thus, the number of choices received by each individual in the system is a basic measure of the extent to which other members in the system report either having sought, or are willing to seek, the advice of that individual concerning the question topic.

This basic measure, consisting of the number of choice nominations received, can then be converted to a size-free, continuous variable with a potential range of zero to one by dividing by the total possible number of choices that could be received. In formula form, the resultant measure is:

$$\text{Unweighted Opinion Leadership Index} = \frac{a}{n - 1}$$

a = number of choices received
n = number of individuals in the system

Individuals 2 and 3 in the preceding five member data set would have unweighted opinion leadership scores of 0.500 and 0.750, respectively, indicating they are chosen by 50 per cent and 75 per cent of the other members in their system.

A slight variation of the above index can be achieved by assigning inverse weights according to the order in which an individual's choices are listed. Thus, if up to two choices were specified in the question, the individual chosen--listed--first by a respondent would receive a score of two, and the individual chosen second would receive a score of one. Data in this form can be analyzed in either a sociogram or matrix form, the easier of which is usually the matrix representation. The only adjustment required consists of replacing cell entries of 1 with the appropriate assigned weight. A matrix of this type, prepared for the data from Figure 1, is illustrated in Table 3. The column totals of this matrix yield the sums of the weights corresponding to the choices each individual has received and are, in themselves, a second basic measure of opinion leadership. This measure can be converted to a size-free, continuous index with a potential range of zero to one by dividing the weight score sum for any individual

Table 3. Weight Matrix of Figure 1 Choice Data

Individual Choice Number

Individual Respondent Number	1	2	3	4	5
1	-	2	1	0	0
2	0	-	2	1	0
3	0	2	-	0	0
4	0	0	2	-	0
5	2	0	0	0	-
	2	4	5	1	0

by the maximum that could be achieved. In formula form, this index would be:

$$\text{Weighted Opinion Leadership Index} = \frac{b}{c\ (n - 1)}$$

b = column total from matrix
c = number of choices in question
n = number of individuals in the system

The third measure of opinion leadership employed in this research is based on the concept of centrality--the degree to which an individual is linked to the other members of his system. When operationalized with respect to opinion leadership choice data, this concept becomes the degree to which an individual functions as a real, or potential, influence center or focal point, in the advice-seeking communication patterns within his system. By incorporating the idea of advice-seeking links between system members, the third measure allows for paths of potential influence in the advice-seeking behavior of individuals in the network. For example, in the simple sociogram illustrated in Figure 4, individuals B and C would each have opinion leadership

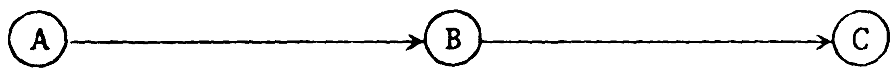

Figure 4. Three Member Chain Sociogram

index scores of 0.50, weighted or unweighted, and individual A would have index scores of 0.00. Yet, if you had to choose the one individual in the system who would, everything else being equal, have the greatest potential influence in this three member system, you would choose individual C. Why? Because if individual C can influence individual B, who can, in turn, influence individual A, then individual C can also potentially influence individual A.[8] An alternate way of stating this consists of describing the advice-seeking relationships in terms of directed paths up to two steps in length between each of the system members:

There are no directed paths to individual A.
There is a one-step directed path from individual A to individual B.
There is a one-step directed path from individual B to individual C.
There is a two-step directed path from individual A through individual B to individual C.
There are no two-step directed paths to individual B.

The method of calculating the index from this data proceeds as follows. The maximum possible path length--allowing no redundant links or steps--from one individual to another in a system of n individuals is (n-1) steps in length. Since the shorter the path, everything else being equal, the greater the potential influence,[9] the shortest directed path from each individual to each other individual--if a directed path exists[10]--is identified. These shortest paths are then inversely weighted, beginning with a weight of (n-1) for a one-step path, (n-2) for a two-step path, and so on. For example, individual 4 in Figure 3 is connected by two-step directed paths from individuals 1 and 3. Since there are five members in this system, each of these two-step paths would be weighted with a value of 3. The weights corresponding to the shortest directed paths toward one individual from all other system members are then summed and divided by $(n-1)^2$, the maximum score that could be attained.[11] These calculations, for the three member system illustrated in Table 4, are illustrated below:

Table 4. Directed Centrality Opinion Leadership Index Calculations for Figure 4 Choice Data

	Shortest Path		Path Weights			Weight Sum
Individual	1-step	2-step	1-step	2-step	Sum	$\div (n-1)^2$
A	0	0	0	0	0	0
B	1	0	2	0	2	0.500
C	1	1	2	1	3	0.750

The resultant measure, termed the directed centrality opinion leadership index, is a size-free, continuous variable with a potential range from zero to one. Notice that this index has rank ordered individuals A, B and C in the order of their relative potential influence, whereas both of the previous measures failed to discriminate between individuals B and C. Individual A has a directed index value of 0.00, indicating that he is not sought for advice by any other members of his system. Individual C has the highest directed centrality index value--0.75--indicating very high, but not the maximum possible, potential influence. If there had also been a one-step directed path from individual to individual C, then the index value for individual C would be 1.00, indicating that he is the locus of directed one-step paths from all other members of his system.

All three opinion leadership measures just cited are used in this research and were calculated with reference to each of two topic areas--new teaching methods and general teaching. The specific questions used in the questionnaire to obtain this data were the following:

4.1 Do you discuss ways to improve the learning experience of your students with any full-time, permanent accounting faculty members in your department? Yes____. No____. (IF NO: Please continue with question 4.2) IF YES: 4.1.1 Please list the names of the three individuals you seek out most often for information and/or advice.

____

____

____

4.2 Do you discuss new teaching methods and materials in accounting education (e.g., programmed textbook, teaching by television, preparing transparencies) with any full-time, permanent accounting faculty members in your department? Yes____. No____. (IF NO: Please continue with question 4.3) IF YES: 4.2.1 Please list the names of the three individuals you seek out most often for information and/or advice.

____

____

____

The terminology "ways to improve the learning experience of your students," used in question 4.1, was selected as representative of the multitude of possible topics that could be considered related to teaching improvement and overall teaching effectiveness. The topic of question 4.2--new teaching methods and materials--was intended to be a subset of the general teaching dimension of question 4.1.

The six opinion leadership indexes calculated for each individual are summarized in Figure 5:

Teaching Topic Area	Index Type	Variable Designation
Ways to improve learning experience	Weighted	D1
	Unweighted	D2
	Directed centrality	D3
New teaching methods and materials	Weighted	D4
	Unweighted	D5
	Directed centrality	D6

Figure 5. Opinion Leadership Variable Designations

Network Centrality Indexes

Functional communication roles have usually been identified by analyzing data obtained from questions of the following general type: "Which of your fellow employees do you communicate with about Topic X?" More complex data bases can be generated by asking respondents to indicate the approximate frequency of contact, to identify the usual mode of communication, to indicate the average directionality of contact, to assess the general importance of the contact, and by specifying multiple topics of communication.[12]

Whereas the focus of opinion leadership is on directed paths of communication, the focus of communication network analysis in this research is on bi-directed, or non-directed, paths. In other words, the existence of a defined communication link between two individuals implies the possible transfer of information from either individual to the other. In the nine member system illustrated in Figure 6,

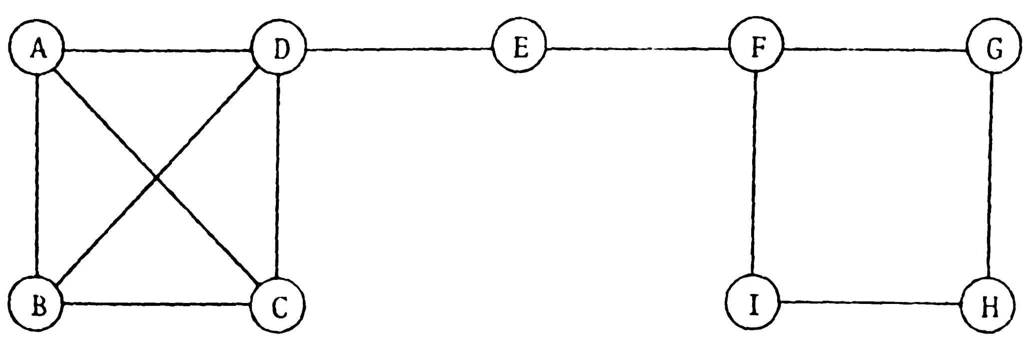

Figure 6. Network Analysis Sociogram with Liaison

individual E occupies a key role in the transfer of information throughout this nine member system, by virtue of being the only communication link between the two groups of individuals in the network--individuals A, B, C and D form one group; individuals F, G, H and I form the second group. The communication role of individual E in this system has been termed that of a "liaison"--an inter-group linking individual. The other important linking role is that of a "bridge"--an individual who, although the member of a defined group, also functions as a communication link to another group. For example, in the eight member system illustrated in Figure 7, both individuals D and F occupy

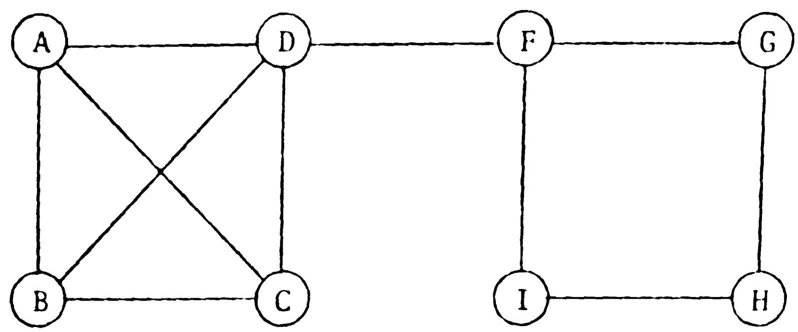

Figure 7. Network Analysis Sociogram with Bridges

bridge roles. Individual D is a member of the group composed of individuals A, B, C and D; individual D also has a direct link to individual F, who is a member of the group composed of individuals F, G, H and I. Note, in the sociograms in Figures 6 and 7, that the heads of the arrows used to represent links between individuals in the system have been removed--denoting the absence of specified directionality--and that the definitions of liaison and bridge roles assume that a transfer of information could take place in either direction. Thus, for example, a message could be transmitted from individual C to individual I, or vice versa; in either case, the message would be transmitted along a path which includes the link between individuals D and F.

A rank ordering of each system individual, according to the extent that each individual serves a linking function between other system members, can be achieved by calculating a non-directed centrality index. The procedures for calculating a non-directed index are similar to those used in the calculation of the directed opinion leadership index discussed previously. First, the shortest path from each individual in the system to each other individual in the system is identified. In calculating the index score for a specified individual, his shortest one-step paths, two-step paths, and so on, are identified, inversely weighted and summed. This total is then divided by the maximum possible score that could be attained--$(n-1)^2$ for an individual belonging to a system with n individuals. The calculation of non-directed centrality index scores for the individuals in the system illustrated in Figure 6 is presented in Table 5.

Notice, in Table 5, that individual E, the liaison, has the highest index score--0.891. Individuals D and F each have the next highest index score of 0.875, because a

Table 5. Non-directed Centrality Index Calculations for Figure 6 Choice Data

Individual	Shortest Paths 1-step	2-step	3-step	4-step	5-step
A	3	1	1	2	1
B	3	1	1	2	1
C	3	1	1	2	1
D	4	1	2	1	0
E	2	5	1	0	0
F	3	2	3	0	0
G	2	2	1	3	0
H	2	1	1	1	3
I	2	2	1	3	0

Individual	Weighted Shortest Step Paths 1-step	2-step	3-step	4-step	5-step	Sum	Weight Sum $\div (n-1)^2$
A	24	7	6	10	4	51	0.797
B	24	7	6	10	4	51	0.797
C	24	7	6	10	4	51	0.797
D	32	7	12	5	0	56	0.875
E	16	35	6	0	0	57	0.891
F	24	14	18	0	0	56	0.875
G	16	14	6	15	0	51	0.797
H	16	7	6	5	12	46	0.719
I	16	14	6	15	0	51	0.797

message would have to be transmitted through the same number of total steps--16 steps[13]--to reach all other connected members of the system, regardless of whether the message originated with individual D or individual F. If individual E was the initiator of the message, however, all other connected members of the system could be reached in a total of 15 steps. Hence, individual E is slightly more central to his system as a whole than individuals D and F, and has a higher non-directed centrality index value.

The arithmetic steps involved in the calculation of the non-directed centrality index are identical to those required for the calculation of the directed centrality opinion leadership index. A major difference in the interpretation of these two indexes hinges on the differing definitions of a communication link upon which each index is based. The non-directional flow of information that is assumed with the non-directed index requires a reciprocity decision to be made by the researcher--is it sufficient, in order to define a communication link between two individuals, if only one of the two individuals mentions the other as a contact? Alternatively, should each individual be required to mention the other as a contact in order for a link to be defined? A decision by the researcher to accept the first alternative requires the addition of contacts to those reported in the original data; a decision to accept the latter alternative--require reciprocity--requires the deletion of contacts from those reported in the original data. The more conservative of the two approaches, that of requiring reciprocity, was used in calculating the non-directed centrality indexes reported in this study. The number of contacts added or deleted would be the same, inasmuch as the researcher is either completing a link for which half already exists, or deleting the existing half of the same link. Calculating the total number of added or deleted contacts, as a percentage of the total reported contacts, provides a measure indicating either how closely the reported relationships in the data correspond to the non-directional relationships that are assumed, and/or the existence of measurement error.[14]

Respondents in this research were asked to indicate, from a listing of all individuals in their department, those persons with whom they communicated on any of four topic areas--teaching production, teaching innovation, teaching maintenance and professional communication.[15] The descriptions contained in the questionnaire for these four topic areas are presented below:

1. Professional Communication: includes all teaching, research and service related communication.
2. Teaching Production: discussions concerning, and the preparation of, course materials, lectures, cases, quizzes, examinations; time spent in the classroom.
3. Teaching Innovation: discussion of, and the development and use of, new teaching methods and techniques; discussions concerning substantial revisions of course format, materials, content.
4. Teaching Maintenance: conducting office hours; grading student work; assigning grades; student and peer teaching evaluations and feedback.

Please note that the four categories above are not mutually exclusive. Categories 2, 3 and 4--"Teaching

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Production", "Teaching Innovation" and "Teaching Maintenance"--are mutually exclusive and together include all teaching-related communication. These three categories form a subset of Category 1--"Professional Communication"--which, as defined in this study, includes all teaching, research and service-related communication.

The topic area of primary concern in this research is the teaching innovation category. Non-directed centrality indexes, with respect to teaching innovation communication, were calculated based on the reported communication network data from each department concerning this topic. In addition, non-directed centrality indexes were calculated for a composite of the three teaching topic areas. This composite teaching topic category will hereafter be referred to as "combined teaching;" a communication contact for the combined teaching network was defined as the existence of a reported contact for any of the three separate teaching categories. For example, if individual A listed individual B as a communication contact for teaching production and/or teaching innovation and/or teaching maintenance, this was considered to be a reported contact with respect to combined teaching.

Responses to the professional communication topic category were used solely as a partial check in determining whether respondents understood the directions supplied in the questionnaire pertaining to the network analysis sections. For example, since the three teaching topic areas were defined as subsets of the professional communication category, then if a respondent identified an individual as a contact for any of the three teaching topic areas, he should also have listed contact with that individual in the professional communication category. The reverse, however, is not necessarily true, since a reported contact in the professional communication category could have been with reference to research or service-related topics.

Respondents were also asked to indicate the approximate frequency of communication with each listed contact according to the following six point scale:

6 = at least once a day
5 = 2 or 3 times per week
4 = about once per week
3 = 2 or 3 times per month
2 = about once per month
1 = about once per term

When defining a communication link for the combined teaching category, the highest frequency level listed for any of the three teaching topic areas was chosen as the frequency level of the combined teaching link. For example, if individual A reported contact with individual B in the teaching production category at a frequency level of 4, in the teaching innovation category at a frequency level of 2, and reported no communication with individual B in the teaching maintenance category, then the frequency level designating the contact with individual B in the combined teaching category would be 4. Thus, the frequency levels used for combined teaching represent a lower bound, and conservative, estimate of the frequency of teaching-related communication.[16]

Non-directed centrality indexes, with reference to both teaching innovation and combined teaching, were calculated at six different sets of frequency levels--once per term or more; once per month or more; two or three times per month, or more; once per week or more; two or three times per week, or more; and once a day or more. Thus, six indexes were calculated for each individual for each of the two content areas. These twelve indexes[17] are summarized in Figure 8.

Content Area	Frequency Levels	Variable Designation
	Once per term or more	D7
	Once per month or more	D8
Teaching Innovation	2-3 times per month or more	D9
	Once per week or more	D10
	2-3 times per week or more	D11
	Once a day or more	D12
	Once per term or more	D14
	Once per month or more	D15
Combined Teaching	2-3 times per month or more	D16
	Once per week or more	D17
	2-3 times per week or more	D18
	Once a day or more	D19

Figure 8. Unweighted Non-directed Centrality Variable Designations

In addition, a weighted index was calculated for each individual for each content area by multiplying the six indexes for each content area by inverse weights corresponding to the ratios between the different frequency levels represented. The weights used in these calculations are listed in Table 6; a sample calculation follows the table.

Table 6. Non-directed Centrality Index Frequency Set Weights

Index Frequency Set	Semester System Weight	Quarter System Weight
Once per term, or more	1.000	1.00
Once per month, or more	3.750	2.50
2-3 times per month, or more	9.375	6.25
Once per week, or more	15.000	10.00
2-3 times per week, or more	37.500	25.00
Once a day, or more	75.000	50.00

As an example, the following steps were used to calculate the weighted combined teaching centrality index measure for each individual from School X, a school on a quarter term system. The individual's D14 value was multiplied by a weight of 1; the individual's D15 value was multiplied by 2.5; the D16 value was multiplied by 6.25; and so on. The six weighted values were then summed and divided by the sum of the quarter term weights--94.75. The variable designations for the two weighted indexes are listed in Figure 9.

Content Area	Index Type	Variable Designation
Teaching Innovation	Weighted	D13
Combined Teaching	Weighted	D20

Figure 9. Weighted Non-directed Centrality Variable Designations

The 20 measures of opinion leadership and network centrality discussed in this section comprise what can be thought of as the dependent, or criterion, variables analyzed in this research. The 42 independent, or predictor, variables are discussed in the following section.

Independent Variable Measures

Rogers and Shoemaker cite a number of generalizations, culled from the results of many prior diffusion studies, concerning attributes of opinion leaders. To summarize most of these, opinion leaders have higher social status, are more cosmopolite, have greater social participation, have greater change agent contact, and have greater exposure to mass media than their followers. In addition, in modern systems, opinion leaders are more innovative and technically competent than their followers.[18] The independent variables selected for analysis in this study were chosen by applying these generalizations concerning opinion leadership to the social system of higher education in accounting. The resulting 42 independent variables have

been categorized as 8 biographic variables, 22 interpersonal communication variables, and 12 mass media communication variables.

Interpersonal communication channels are defined by Rogers and Shoemaker as "those that involve a face-to-face exchange between two or more individuals,"[19] and are operationalized in this research in terms of convention attendance, contact with other faculty and contact with publisher representatives. Mass media communication channels are "all those means of transmitting messages that involve a mass medium, such as radio, television, film, newspapers, magazines, and the like, which enable a source of one or a few individuals to reach an audience of many."[20] The mass media channel variables that are operationalized in this research refer to selected accounting and non-accounting publications. Thus, the interpersonal and mass media communication variable sets measure the perceived frequency of use, and importance, of alternative information sources concerning new teaching methods. The biographic variables are detailed in the following subsection.

Biographic Variables

The social status of a faculty member is undoubtedly a function of many different individual and system level variables. For example, factors which denote social status at a large, research oriented institution may have little, or even negative, status implications at a junior or community college; and vice versa. Four variables were selected as possible representations of faculty status at an intitution--highest academic degree held, academic rank, total years teaching and years at the institution. Data for these variables was obtained from the following questions:

1.2 What is the highest academic degree you have received?

_____Bachelor's
_____Master's
_____Doctorate

1.4 What is your present academic rank?

_____Professor
_____Associate Professor
_____Assistant Professor
_____Instructor or lecturer

1.5 Approximately how many total years have you been teaching?

_____less than 1 year
_____1 year, but less than 2
_____2 years, but less than 5
_____5 years, but less than 10
_____10 years, but less than 15
_____15 years, but less than 20
_____20 years or more

1.6 Have you taught at more than one institution within the last ten academic years? Yes____. No____. (IF NO: Please continue with question 1.7) IF YES: 1.6.1 Please list the institutions at which you have taught, within the last ten academic years, prior to latest employment at your present school.

Name of Institution	Academic Year(s) Employed

One facet of the technical competence of a faculty member is his up-to-dateness and familiarity with new developments having an impact on his academic field. One such development in recent years has been the computer. Measures of the extent of use and familiarity with computers and computer programs were obtained from the following questions:

3.1 Have you used computer facilities in courses you have taught, academic research or related activities within the last five academic years? Yes____. No____. (IF NO: Please continue with question 4.0) IF YES: 3.1.1 In which activity or activities have you used these facilities?

_____Courses taught
_____Research
_____Other (please specify):_____________.

3.2 Did you write or personally debug any of the programs you used in these activities? Yes____. No____. (IF NO: Please continue with question 4.0) IF YES: 3.2.1 Approximately how frequently did you write or personally debug the programs you used in connection with these activities?

____always ____often ____sometimes ____seldom

A computer utilization score was obtained by simply counting the number of different types of use mentioned in response to question 3.1; thus, the scale for this variable was zero to three. A frequency of program preparation score was obtained using response data from question 3.2, by weighting an "always" answer as 3, an "often" answer as 2, a "sometimes" answer as 1, and a "seldom" answer as 0. This four point scale, as well as the other scales used in this research to measure degrees of frequency and importance with respect to the communication variable sets, were developed by Bass, Cascio and O'Connor.[21]

Innovativeness has been defined by Rogers and Shoemaker as "the degree to which an individual is relatively earlier in adopting new ideas than the other members of his system,"[22] where relatively earlier refers to the actual time of adoption.[23] Inasmuch as a multiple measure of innovativeness--determining the relative earliness of adopting a number of innovations, rather than just a single innovation--is likely preferable to a single measure, researchers have often calculated innovativeness scales from time of adoption data pertaining to more than one innovation.[24] From interviews with publisher representatives and selected accounting faculty members, as well as from a review of the published education-related literature in recent accounting journals, seven innovations were selected for inclusion in the questionnaire--programmed instruction, modules, viewgraph, slides and filmstrips, television, motion pictures and simulation.[25] Time of adoption data for these seven innovations was obtained using the following questions:

2.1 Have you used programmed instruction or modular course content in any courses you have taught within the last five academic years? Yes___. No___. IF NO: Please continue with question 2.2) IF YES: 2.1.1 Please examine the following list and ask yourself: first, have you used it; second, in which years did you use it; and third, was it prepared commercially (C), non-commercially by other persons (O), or did you prepare it yourself (S). For each time you have used an item, enter the appropriate preparation code in the year column corresponding to that use.

Prior to 1970-71	1970-71	1971-72	1972-73	Current & 1973-74	Method
					Programmed Instruction
____	____	____	____	____	written material
____	____	____	____	____	teaching machine
____	____	____	____	____	computer-assisted
____	____	____	____	____	Modules

2.2 Have you used a viewgraph, slide transparencies or filmstrips in any course you have taught within the last five academic years? Yes____. No____. (IF NO: Please continue with question 2.3) IF YES: 2.2.1 Please examine the following list and ask yourself: first, have you used it; second, in which years did you use it; and third, was it prepared commercially (C), non-commercially by other persons (O), or did you prepare it yourself (S). For each time you have used an item, enter the appropriate preparation code in the year column corresponding to that use.

Prior to 1970-71	1970-71	1971-72	1972-73	Current & 1973-74	Method
					Viewgraph
____	____	____	____	____	individual transparencies
____	____	____	____	____	continuous roll
					Slides and filmstrips
____	____	____	____	____	without taped sound synchronization
____	____	____	____	____	with taped sound synchronization

2.3 Have you used television or motion pictures in any course you have taught within the last five academic years? Yes____. No____. (IF NO: Please continue with question 2.4) IF YES: 2.3.1 Please examine the following list and ask yourself: first, have you used it; second, in which years did you use it; and third, was it prepared commercially (C), non-commercially by other persons (O), or did you prepare it yourself (S). For each time you have used an item, enter the appropriate preparation code in the year column corresponding to that use.

Prior to 1970-71	1970-71	1971-72	1972-73	Current & 1973-74	Method
					Television
____	____	____	____	____	live lectures, with feedback
____	____	____	____	____	live lectures, without feedback
____	____	____	____	____	pre-recorded audio-visual tapes

2.4 Have you used simulation projects in any course you have taught within the last five academic years? Yes____. No____. (IF NO: Please continue with question 3.0) IF YES: 2.4.1 Please examine the following list and ask yourself: first, have you used it; second, in which years did you use it; and third, was it prepared commercially (C), non-commercially by other persons (O), or did you prepare it yourself (S). For each time you have used an item, enter the appropriate preparation code in the year column corresponding to that use.

Prior to 1970-71	1970-71	1971-72	1972-73	Current & 1973-74	Method
					Simulation
____	____	____	____	____	business games
____	____	____	____	____	financial statement
____	____	____	____	____	statistical sampling
____	____	____	____	____	systems design
____	____	____	____	____	budgeting and/or control
____	____	____	____	____	behavioral

Two innovativeness-related indexes were employed in this research. The first index was obtained by simply counting the number of innovations used--of the original list of seven--by each individual respondent. The second index was calculated by noting the first indicated use, or lack thereof, of each innovation, and assigning a score for each response using one of the following weights:

Table 7. Weights Used in Calculating Innovativeness Index

Academic Year of First Reported Use	Assigned Weight
Prior to 1970-71	3
1971-72, 1972-73	2
1973-74, 1974-75	1
Not used	0

The sum of the weights assigned for each innovation for each individual constitutes the innovativeness index.[26] Z-scores were then calculated by adjusting individual scores for their respective department's mean and standard deviation.

A summary of the eight biographic independent variables measured in this research is presented in Figure 10:

Variable Name	Variable Designation
Highest academic degree	I1
Academic rank	I2
Years at present institution	I3
Total years teaching	I4
Computer utilization	I5
Frequency of program preparation	I6
Innovativeness	I7
Number of innovations used	I8

Figure 10. Biographic Variable Designations

Interpersonal Communication Variables

Cosmopoliteness is "the degree to which an individual is oriented outside his immediate social system."[27] In diffusion studies of rural and peasant societies, cosmopoliteness has frequently been operationalized in terms of the number of trips by a farmer/villager to urban centers or other villages.[28] An analogous measure with respect to accounting educators is attendance at regional and national conventions. Since the programs of many conventions include formal presentations pertaining to educational topics, the questions used in this research pertaining to convention activity were subdivided into attendance at educational presentations and informal discussions with other faculty, a measure of social participation.

Additional measures of the degree of an individual's external orientation to his immediate social system--defined herein as his department--include the extent of interaction with non-accounting faculty, both in business and non-business fields, at his own school; and the extent of contact with faculty at other schools. Since the concern of this research is with facilitating the adoption of newer instructional methods, these measures of external orientation were operationalized in terms of their perceived use and importance as sources of information with respect to new teaching methods and materials.

Finally, an additional interpersonal source of information regarding innovations is the change agent. A change agent is "a professional who influences innovation decisions in a direction deemed desirable by a change agency."[29] One example of a change agent in the context of higher education in accounting is the traveling publisher representative, who attempts to secure the adoption of proucts such as textbooks, filmstrips and simulations marketed by the change agency--the particular publishing house with which the agent is affiliated.

The following questions were used to obtain data regarding the perceived extent of involvement with, and importance of, convention activity, contact with other faculty, and contact with publisher representatives:

4.3 Which of the following types of interpersonal contact are sources of information for you with respect to new teaching methods and materials that could be, or are being, applied in accounting education? Please assign one of the following frequency codes and one of the following importance codes <u>for each</u> item listed.

<u>Frequency Codes</u>	<u>Important Codes</u>
1 = always engage in	1 = extremely important
2 = very often engage in	2 = quite important
3 = engage in fairly many times	3 = moderately important
4 = occasionally engage in	4 = somewhat important
5 = never engage in	5 = not important

<u>Frequency</u>	<u>Importance</u>	<u>Activity</u>
		when attending national conventions/ conferences
________	________	presentations on education-related topics
________	________	informal discussions with other faculty

Frequency	Importance	Activity
		when attending regional conventions/ conferences
_________	_________	presentations on education-related topics
_________	_________	informal discussions with other faculty

4.4 Which of the following types of interpersonal contact are sources of information for you with respect to new teaching methods and materials that could be, or are being, applied in accounting education? Please assign one of the following frequency codes and one of the following importance codes for each item listed.

Frequency Codes	Importance Codes
1 = always engage in	1 = extremely important
2 = very often engage in	2 = quite important
3 = engage in fairly many times	3 = moderately important
4 = occasionally engage in	4 = somewhat important
5 = never engage in	5 = not important

Frequency	Importance	Activity
_________	_________	discussions with publisher representatives
		discussions with faculty from your institution
_________	_________	with accounting colleagues
_________	_________	with faculty from non-accounting business fields
_________	_________	with faculty from non-business fields
		discussions with faculty from other institutions
_________	_________	with accounting colleagues
_________	_________	with faculty from non-accounting business fields
_________	_________	with faculty from non-business fields

The frequency and importance code descriptions were adapted from large sets of description scaled by Bass, Cascio, and O'Connor.[30] Z-scores were calculated for each variable by standardizing within each department. Variable identification numbers assigned to the resulting 22 variable set are listed in Figure 11:

Activity	Frequency	Importance
when attending national conventions		
presentations on education-related topics	I9	I13
informal discussions with other faculty	I10	I14
when attending regional conventions		
presentations on education-related topics	I11	I15
informal discussions with other faculty	I12	I16
discussions with publisher representatives	I17	I18
discussions with faculty from your school		
with accounting colleagues	I19	I22
with non-accounting business faculty	I20	I23
with faculty from non-business fields	I21	I24
discussions with faculty from other schools		
with accounting colleagues	I25	I28
with non-accounting business faculty	I26	I29
with faculty from non-business fields	I27	I30

Figure 11. Interpersonal Communication Variable Designations

Mass Media Communication Variables

Mass media sources of information with respect to new teaching methods were categorized in this research into two types--the education-related sections or issues of major accounting journals, and non-accounting journals or sources.[31] From an analysis of the content of major accounting and education journals, as well as from other publications of which most accounting faculty would be aware, such as Collegiate News & Views and Dissertation

Abstracts, ten potential mass media sources were selected, and are listed below:

Accounting	Non-Accounting
Book Review Section, The Accounting Review	Audiovisual Instruction
Education and Professional Training, Journal of Accountancy	Collegiate News & Views
Education Research and Academic Notes, The Accounting Review	Dissertation Abstracts
Supplement to The Accounting Review, Committee Reports	Educational Product Report
	Education Recaps
	Research Reporter

Data pertaining to the frequency of use, and perceived importance, of these journals as sources of information with respect to new teaching methods, was obtained from the following question:

4.5 Which of the following publications are sources of information for you with respect to new teaching methods and materials that could be, or are being, applied in accounting education? Please assign one of the following frequency codes and one of the following importance codes <u>for each</u> item listed below.

Frequency Codes	Importance Codes
1 = always read or scan	1 = extremely important
2 = very often read or scan	2 = quite important
3 = read or scan fairly many times	3 = moderately important
4 = occasionally read or scan	4 = somewhat important
5 = never read or scan	5 = not important
6 = have no knowledge of this source	6 = have no knowledge of this source

Frequency	Importance	Publication
________	________	Audiovisual Instruction
________	________	Book Review section, The Accounting Review

Frequency	Importance	Publication
________	________	Collegiate News and Views
________	________	Dissertation Abstracts
		Education and Professional Training, Journal of Accountancy
________	________	Educational Product Report
________	________	Education Recaps
________	________	Education Research and Academic Notes, The Accounting Review
________	________	Research Reporter
________	________	Supplement to the Accounting Review: Committee Reports
________	________	Other (please specify):__________
________	________	

Twelve variables pertaining to the above question were selected for further analysis by the following procedure. Responses in the frequency column, pertaining to the non-accounting sources listed in question 4.5, were dichotomized into awareness categories as follows:

Table 8. Mass Media Variable Awareness Codes

Frequency response code	Awareness of source	Awareness code
1, 2, 3, 4, 5	Aware	1
6	Not aware	0

The resulting awareness codes were then summed by publication, and by individual. The mean number of non-accounting publications of which respondents were aware was 2.73 publications per respondent. Inasmuch as over 98 per cent of the respondent individuals were aware of Collegiate News & Views and Dissertation Abstracts, the average respondent did not realize that even one of the other four non-accounting publications existed. Furthermore, with respect to these four publications--Audiovisual Instruction, Educational Product Report, Education Recaps and Research Reporter--fewer than half of the individuals who were aware of any of these sources indicated any use of the source--listed a frequency response of 1, 2, 3 or 4. Because of the extremely low variability of the response data with respect to these four publications, these sources were deleted from further analysis.

Variable identification numbers for the remaining 12 variables, each of which were standardized by adjusting for the departmental mean and standard deviation, are listed in Figure 12.

In summary, a total of 42 independent variables--8 biographic variables, 22 interpersonal communication variables and 12 mass media communication variables--are operationalized in this research. The independent variables were formulated by applying generalizations from diffusion research regarding the social status, cosmopoliteness, social participation, extent of change agent contact, exposure to mass media, innovativeness and technical competence of opinion leaders to the setting of higher education in accounting.

Source	Frequency	Importance
Collegiate News and Views	I31	I33
Dissertation Abstracts	I32	I34
Book Review section, The Accounting Review	I35	I39
Education and Professional Training, Journal of Accountancy	I36	I40
Education Research and Academic Notes, The Accounting Review	I37	I41
Supplement to the Accounting Review, Committee Reports	I38	I42

Figure 12. Mass Media Communication Variable Designations

Z-scores were obtained for all dependent and independent variables by standardizing within each department. The effect of this procedure was to control for the department level effect, producing variable measures for each individual that could be compared across departments for all individuals. All variables were then tested for potential response bias, and the inevitable missing pieces of data were identified and analyzed by type, using the procedures presented in the following sections.

Response Bias

Independent Variables

Responses were received from 116 of the total 126 faculty members in the defined population, yielding an overall response rate of 92.06 per cent. Oppenheim suggests two procedures for estimating response bias:

> To study response bias, we must make sure that we know the return date of every questionnaire, for it has been found that respondents who send in their questionnaire very late are roughly similar to non-respondents. We have given to us two methods to find out whether and in what way a bias has been introduced: first, by comparing respondents with non-respondents on the original sampling list (in terms of geographic location. . . type of qualification. . . and so on), and second, by comparing early respondents with late respondents (in terms of their answers to the questionnaire).[32]

In accordance with Oppenheim's second suggestion, the following procedure was used to obtain an estimate of response bias for the 42 z-score independent variables analyzed in this research.[33]

A six week period, starting with the respective date of distribution of each questionnaire, was allowed for receipt of the completed instruments. Using the end of the third week as a cutting point, 105 respondents were classified as earlier respondents--those individuals whose returns were received by the end of the third week--and 11 respondents were classified as late respondents--those individuals whose responses were received during the fourth, fifth, or sixth weeks. Percentage breakdowns of these respondent groupings are presented in Table 9.[34]

All 42 z-score independent variables were then tested for response bias using two-tailed t-tests. A total of three differences in sample means, significant at the

Table 9. Respondent Categories

	Respondent Category				
	Early	Late	Total	Did Not	Total Faculty
Number of faculty	105	11	116	10	126
Percentage of total faculty	83.33%	8.73%	92.06%	7.94%	100%
Percentage of total respondents	90.52%	9.48%	100%		

ten per cent level or better, were discovered and are presented in Table 10.[35]

Table 10. Independent Variable Response Bias Results

Information Source	Respondent Category	Number	Mean	Calculated t-statistic
Importance of contact with non-business faculty at own school	Earlier	102	0.0603	2.0665*
	Late	11	-0.5596	
Frequency of contact with accounting faculty at other schools	Earlier	99	-0.0586	2.0396*
	Late	10	0.5801	
Importance of Collegiate News and Views	Earlier	102	0.0625	2.1426*
	Late	11	-0.5794	

*significant at $p \leq .05$

Thus, compared to the earlier respondents, contact with non-business faculty at their school and the magazine Collegiate News & Views are relatively less important as information sources concerning new teaching methods for late respondents. In addition, late respondents report relatively higher levels of contact with accounting faculty at other institutions than do earlier respondents. Care should be taken in interpreting these results as meaningful, however, since, at a 95 per cent confidence level, it would be expected that at least two of the 42 t-tests would be significant simply by chance.

Dependent Variables

The same procedures used in the response bias testing for the independent variables, with the following modifications, were used in obtaining an estimate of response bias for the 20 dependent variable measures.

Although the overall response rate for the study was in excess of ninety per cent, eight of the ten non-respondents were from two schools, for which the response rates were 50 per cent and 66 2/3 per cent.[36] Inasmuch as a response rate approaching 100 per cent is necessary in order to be able to legitimately calculate opinion leadership and network centrality indexes, it was felt that the response rates from these schools were not sufficient to permit the calculation of dependent variable measures. Consequently, the 21 individuals from these two schools were deleted from subsequent analysis, leaving a population of eight schools from which responses had been received from 103, of the total 105, faculty members.[37]

For the purpose of estimating non-response bias, the remaining 105 faculty members were split into two groups--94 respondents who had returned their questionnaires by the end of the first three weeks; and the 11 individuals consisting of the two non-respondents, and the nine respondents who returned their instruments during the fourth, fifth, or sixth weeks.

The 20 z-score dependent variables were than each examined for response bias using two-tailed t-tests. The two differences in sample means significant at the 10 per cent level or better are presented in Table 11:

Table 11. Dependent Variable Response Bias Results

Dependent Variable	Respondent Category	Number	Mean	Calculated t-statistic
Teaching innovation centrality, frequencies 6-6	Earlier	94	-0.0240	2.1503*
	Late, non	11	0.2048	
Combined teaching centrality, frequencies 6-6	Earlier	94	-0.0240	2.1503*
	Late, non	11	0.2048	

*significant at $p \leq .05$

It should be noted that the index scores for these two variables are identical for all individuals in the study. This is partly a reflection of the method used in assigning the combined teaching frequency levels--if two individuals listed contact with each other for the teaching innovation category at a frequency of 6, they would have been assigned frequency levels of 6 for the combined teaching category. However, the teaching innovation and combined teaching frequency levels need not necessarily have been the same for all individuals; in fact, prior research suggests that they could usually have been expected to differ.[38] If a frequency level of 5 or less had been reported for teaching innovation, a combined teaching frequency level of 6 would still have been assigned if a value of 6 had been reported for either teaching production and/or teaching maintenance. However, since indexes D12 and D19 represent the upper bound in frequency levels measured, there were very few individuals for whom a communication link was defined in any category at this level. The presence of just one such individual in the late and non-respondent group was sufficient to significantly alter the mean of the group and cause the identified differences in means.

Further, since values for D12 and D19 were identical for all individuals, then, in effect, only one of 19 independent t-tests resulted in a significant difference. It would be expected, at a 95 per cent confidence level, for approximately one of the 19 to have been significant on the basis of chance alone.

In summary, all dependent and independent z-score variables analyzed in this research were tested for the effects of response bias using two-tailed t-tests. Although in both the dependent and independent variable sets, at least one significant difference between sample means was identified, the total number of significant differences was approximately the number that would be expected on the basis of chance alone.

In addition, it was possible to obtain data on six biographic variables--highest academic degree, professional certification, academic rank, tenure status, total years teaching and years at present institution--for all 126 faculty members in the defined population. Using the non-standardized data for these six variables, χ^2 tests of independence were made comparing:

1. The 116 total respondents versus the 10 total non-respondents; and

2. The 105 individuals in the 8 schools for which dependent variables were calculated, versus the 21 individuals in the remaining 2 schools.

No differences significant at the 10 per cent level were found.

It is concluded that there is no appreciable evidence supporting the existence of response bias.

Data Modification Procedures

The questionnaires returned by the 103 respondents with dependent variable measures were examined for completeness and correctness in following the instructions on the instruments. In any instance where an individual either omitted an answer to a question, answered the question but used an unintelligible or improper code, or supplied an answer to a question which indicated a lack of understanding of the directions pertaining to that question, the response for the question was considered missing. Of the total 103 individuals, 73 respondents had no missing values for any of the 62 variables analyzed, another 24 individuals had from one to six missing values for the 62 variables, and five individuals had more than six missing values.

An analysis of the missing cases per variable, and missing variables per case, indicated that the occurrence of missing values could be considered to be of two types:

1. Essentially random--28 of the 42 independent variables had zero, one, or two missing cases spread among the respondents in no systematic way.

2. Systematic with the two variable groups consisting of the eight variables pertaining to convention activity, and the six variables pertaining to contact with faculty at other institutions. As will be noted in Table 12, these two variable groups contained the lowest number of respondents with no missing values for any of the variables in these groups. A possible explanation for these lower

completion rates lies in the verbal descriptions of the codes required for answering these question groups. For example, frequency code 5 was represented by "never engage in." A younger faculty member, who had never attended a regional convention, may well have felt that "never engage in" was not an accurate representation of his attitude, or intentions, concerning attendance at regional conventions; and decided to leave the questions pertaining to this activity blank. Such a decision would result in four missing values for that respondent; it is this pattern of missing values that has been labeled systematic.

Table 12. Missing Data Cases for Independent Variable Groups

	Biographic	Convention Activity	Publisher Rep. Contact	Contact With Faculty at Own School
Number of variables	8	8	2	6
Respondents with no missing values for this group	103	91	101	100

	Contact With Faculty at Other Schools	Mass Media Publications	Total Data Set Without Substitution	Total Data Set With Substitution
Number of variables	6	12	42	42
Respondents with no missing values for this group	93	99	73	97

As a result of the foregoing analysis, a maximum of six missing values was allowed per respondent--up to four of the systematic type described above, and an allowance of one or two missing values of the random type. For the 24 respondents with from one to six missing independent variable values, the mean value of the missing variable within each school--zero--was substituted. Using this procedure, a total of 95 missing values were substituted, an average of approximately four for each of the 24 respondents with from one to six missing values. The six respondents who had more than six missing values each, were considered to be the equivalent of non-respondents, and were deleted from further analysis. A summary of the resulting data base, subsequently used for the factor analyses and multiple regression procedures, is contained in Table 13.

Table 13. Data Bases With and Without Missing Value Substitutions

	Respondents With No Missing Values	Respondents With from 1-6 Missing Values	Totals
Number	73	24	97
Total data points including dependent variables	4,526	1,488	6,014
Missing values substituted	0	95	95
Percentage missing values substituted	0	6.38%	1.58%

It is felt that the procedures used for the substitution of missing data were conservative. Not only was the total percentage of data substituted low--1.6 per cent in total--but, in addition, the effect of substituting mean values was to depress the variance contained in the independent variables affected. Although the factor analysis results presented in Chapter III are based on the 97 case data base containing the substituted missing values, the same factor analysis procedures were run for the 73 individual data base in which no missing values were substituted. The results obtained from this additional analysis were neither significantly, nor meaningfully, different from those reported in Chapter III.

In summary, this chapter has detailed the procedures used in generating the 62 variable data base used in the factor analyses and multiple regression procedures presented in the next chapter. The analysis focuses on relative differences, between 97 individual faculty members at 8 AACSB schools, with respect to their opinion leadership, network centrality, biographic characteristics, interpersonal communication behavior and use of mass media communication information sources.

FOOTNOTES TO CHAPTER II

[1]Unfortunately, good up-to-date statistical summaries pertaining to higher education in accounting are seldom available. According to the results of a survey conducted in 1968 by Doyle Z. Williams, A Statistical Survey of Accounting Education, 1967-68 (New York: American Institute of Certified Public Accountants, 1969), the AACSB schools conferred 44.3 per cent of all baccalaureate degrees in accounting during 1966-67. Further, of the 25 institutions conferring the largest number of baccalaureate degrees in accounting during 1966-67, 18 were AACSB schools. Finally, 20 of the 25 schools with the largest number of full-time, daytime undergraduate business students during 1967-68 were AACSB accredited. Ibid., pp. 30-33.

[2]The 10 departments selected are considered representative of the AACSB population by this researcher.

[3]All statistical analyses reported in this research were performed using SPSS Version 6.0 on an IBM 370 Model 368 computer. See Norman H. Nie, Hadlai Hull, Jean G. Jenkins, Karin Steinbrenner, and Dale H. Bent, SPSS: Statistical Package for the Social Sciences (2d ed., New York: McGraw-Hill Book Company, 1975). The validity of the results of the statistical tests reported here depends upon, most importantly, the accuracy of the data bases analyzed. Although every effort was made, when coding, punching and verifying the data, to ensure an error-free data base; it is, of course, possible that errors existed.

[4]Samples of these instruments appear in the Appendix. A detailed explanation of the questions used to obtain data for this research is contained in the following subsections on dependent and independent variable measures.

[5]The phrase "unforeseen difficulties" is used here, because the personal contact listing is, in itself, a somewhat onerous instrument to complete. This instrument requires self-examination by the individual of his communication habits with his colleagues; some difficulty can be considered normal.

[6]Partly for this reason, it was decided to use z-scores, obtained by standardizing all variables within each department. The effect of adjusting each individual's scores by the mean and standard deviation of his department is to remove the department level effect. An examination of sub-system and system level effects, and a determination of the extent and nature of their interaction with the individual components would be of great interest. However,

attempts to measure and assess system effects have met with relatively little success to date. See, for example, F. Floyd Shoemaker, "System Variables and Educational Innovativeness in Thai Government Secondary Schools" (unpublished Ph.D. dissertation, Michigan State University, 1971). The analysis reported in the present study concentrates on relative individual differences.

[7]Rogers and Shoemaker identify three methods of measuring opinion leadership: sociometric choice, informant ratings, and self-designation. The sociometric choice method is considered the most valid method by Rogers and Shoemaker, and is the method used to measure opinion leadership in this research. See Rogers with Shoemaker, Communication of Innovations, pp. 215-17.

[8]This is, of course, an assumption of transitivity with respect to the underlying relationship. In addition, when an individual makes a choice nomination of another individual, we assume that this implies the probability of the first individual being influenced by the second is greater than zero.

[9]Assuming that the probabilities, or strengths, of all defined links are either equal or, if differences exist, that the differences are not of sufficient magnitude to change the result. There are similar underlying assumptions with respect to links that are not reported.

[10]A directed path will not exist if the individual is an isolate, or if there is no path between the two individuals for which all steps are directed. For example, in Figure 4, there is a directed path from individual A to individual C, but no directed path from individual C to individual A.

[11]In a system of n individuals, the maximum number of choices that any system member could receive is $(n-1)$, the number of other system members. Since a one-step path is weighted by the value $(n-1)$, then an individual who is chosen by--has a one-step directed path from--all other persons in his system would have a score of $(n-1)(n-1)$, or $(n-1)^2$.

[12]For a concise summary of how to construct a data-gathering instrument for network analysis, and an example of a complete sample instrument, see Richard V. Farace, "Instructions for Design and Use of Network Analysis Instrument" (mimeographed copy of unpublished paper, Department of Communication, Michigan State University, June, 1974). The personal contact listing instrument used in this research closely follows the example provided by Farace.

[13]The interested reader can easily calculate these totals from the first table in Table 5. It requires a total of three steps for individual F to reach the three system members connected by one-step paths; a total of four steps to reach the two individuals connected by two-step paths; and nine steps to reach the three individuals connected by three-step paths. The sum of these total steps--16--is the number of steps required to reach all other connected members of the system. This step total is really the basic measure of contrality; the purpose of weighting the step paths by (n-1) for a one-step path, (n-2) for a two-step path, and so on, is to make the basic measure a size-free, continuous variable with a potential range from zero to one.

[14]This is discussed in much more detail in Richards, "Theoretical Basis". See, especially, pp. 14-16.

[15]The subdivision of teaching topics into production, innovation and maintenance categories follows Farace, "Network Analysis Instrument". See also Farace and Johnson, "Comparative Analysis", for a description of a number of data sets using this categorization.

[16]Frequency levels for the separate teaching categories were not summed, or otherwise combined, to obtain the frequency level for combined teaching, since any given conversation, or other type of communication, could include multiple topics in different categories. Responses to the professional communication category were checked against the frequency levels determined for the combined teaching category to ensure that the frequency level listed for professional communication was greater than, or equal to, the combined teaching frequency level.

[17]The variable designations listed in Figure 8 and 9 actually refer to z-score variables that were obtained by standardizing each index by department.

[18]Rogers with Shoemaker, Communication of Innovations, pp. 378-80. In traditional systems, opinion leaders are apt to be less, or no more, technically competent than their followers, and not especially innovative. Ibid. Whether higher education can be considered an example of either a modern, or traditional, system is a question which, at best, lacks a definitive answer. As one respondent remarked, "I doubt that teaching is any different in 1975 than in 1900 or 1776." However, compared to many of the settings of previous diffusion research studies--rural and village societies--we might consider higher education relatively modern.

[19]Ibid., p. 252.

[20]Ibid.

[21]Bernard M. Bass, Wayne F. Cascio and Edward J. O'Connor, "Magnitude Estimations of Expressions of Frequency and Amount," Journal of Applied Psychology, 1974, Vol. 59, No. 3, pp. 313-20. This excellent article develops optimal four through nine point scale descriptions from 39 and 44 descriptive expressions of frequency and amount, respectively. Further, if one accepts the viewpoint of the authors, a good case can be made for considering these four through nine point scales as being ratio level variables in some applications--a highly desirable state of affairs with obvious implications for the statistical analysis of questionnaire data.

[22]Rogers with Shoemaker, Communication of Innovations, p. 27.

[23]Ibid.

[24]See, for example, Everett M. Rogers with Lynne Svenning, Modernization Among Peasants: The Impact of Communication (New York: Holt, Rinehart and Winston, Inc., 1969), pp. 56, 294.

[25]The scant available research on the extent of adoption of newer teaching methods within accounting education indicates very little adoption to date of these newer techniques. In fact, according to the results of a survey by an American Accounting Association committee, the viewgraph is the only "newer" method to have achieved even a moderate level of adoption by the year 1970. Committee on Multi-Media Instruction in Accounting, "Report of the Committee," pp. 117-18. Since the list of questions from which data was obtained for the seven innovations is quite extensive, it was felt desirable to include use of a viewgraph in the listing so that most respondents would be able to indicate use of at least one of the listed methods. Since 95 of the total 116 respondents reported viewgraph use, compared to 42 users of the next most frequently utilized innovation--simulation--it appears likely that inclusion of the viewgraph in the innovation list served its purpose. Although data pertaining to viewgraph use was included in the innovativeness-related indexes that were constructed, the effect of so doing is negligible in terms of differentiating individuals.

[26]The number of innovations used index was employed in this research because of the substantive theoretical difficulties involved in calculating a true innovativeness measure. No claims are being made in this research that what has been termed the "innovativeness index" is free from potentially serious measurement problems. For example, to construct a valid innovativeness index requires a defined system with the same population over the time period being examined. Even for a relatively short period of time, such as five years, the turnover among accounting faculty members is sufficiently high so as to make it virtually impossible to meet this condition and, at the same time, maintain significant numbers of individuals. The only "innovation" that has achieved relatively high adoption levels--the viewgraph--is hardly a recent development and only tenuously can be considered an innovation. If a truly valid measure of innovativeness could, in fact, have been constructed, it would have been treated as a primary dependent variable in this research.

[27]Rogers with Svenning, Modernization, p. 147.

[28]See, for example, Chapter 7 of Rogers with Svenning, Ibid., pp. 146-68, and most of the sources cited as support for generalization 6-11 in Rogers with Shoemaker, Communication of Innovations, p. 378.

[29]Rogers with Shoemaker, Communication of Innovations, p. 227.

[30]Bass, Cascio and O'Connor, "Expressions of Frequency and Amount".

[31]At the time the questionnaire was being designed, the first volume in the American Accounting Association's Education Series: James Don Edwards, ed., Accounting Education: Problems and Prospects (n.p.: American Accounting Association, 1974), had not yet been released. Interestingly, despite the fact that the publication had been distributed to association members three months before the second data-gathering distribution, fewer than ten respondents identified this volume as an information source regarding new teaching methods in their answers to the questionnaire.

[32]A. N. Oppenheim, Questionnaire Design and Attitude Measurement (New York: Basic Books, Inc., 1966), p. 34.

[33]Oppenheim's first suggestion for studying response bias--by directly comparing respondents with non-respondents--was accomplished in the following way. It was possible to obtain data from independent sources on the 10 non-respondents for six variables--highest academic degree, professional certification, academic rank, tenure status, total years teaching and years at present institution. Sources from which this information was obtained, and cross-checked when possible, included the faculty member at each school who distributed the questionnaires; college catalogs; American Association of Collegiate Schools of Business, Faculty Personnel, ed. by Cyril C. Ling (10th ed; St. Louis, Missouri: American Association of Collegiate Schools of Business, 1970); James R. Hasselback, Accounting Faculty, 1974-75 (Gainesville, Florida: By the Author, 1974).

The respondent and non-respondent groups were then compared, with respect to these six variables, using χ^2 tests of independence. No differences significant at the 10 per cent level were identified, although it should be noted that four of the ten non-respondents were full professors with 20 or more years of service.

[34]The approximate dates of distribution were obtained either from the individual at each school who distributed the instruments, or from individual respondents. These dates varied somewhat by school and by individual. As completed returns were received, the date of receipt was recorded and the length of time for completion was calculated. Thus, many different six week periods are represented in Table 9.

[35]Note that the applicability of these statistical tests for inferential purposes assumes that the early and late respondent groups represent independent random samples from similar groups within a larger population. The use of these statistics for inferential purposes has already been discussed in the population and sample section of this chapter. With respect to the data reported in Table 10, the difference between the cited number of earlier and late respondents for each variable, and the 105 and 11 cases which make up each total group, is due to missing cases for the respective variables.

[36]Although it was impossible to ascertain the exact reasons for the difference between the total 62 per cent response rate--13 of 21 individuals--from the two excluded schools, and the 98 per cent response rate--103 of 105 individuals--from the other 8 schools, two factors appear to have been especially important. First, both of the excluded schools are on a semester system; since the distribution of questionnaires at these schools was made either during, or just after, the final examination period for the

Spring semester, it was either difficult or impossible to reach some faculty members. Second, a conversation that occurred in the early stages of the data-gathering process at one of the excluded schools, and in which the feeling was expressed by a few faculty members that some of the questions in the instruments were of a highly sensitive nature, may have depressed the overall response rate at that school. Even if it had not, because of the time at which the conversation took place--early in the data-gathering process--the potential contamination of the resulting data would have made inclusion of this school questionable.

[37]Chi-square tests of independence, comparing the 23 individuals deleted with the 105 individuals retained, were performed on the biographic variables for which data was available for all 126 individuals--highest academic degree, professional certification, academic rank, tenure status, total years teaching and years at present institution. All six tests failed to reach significance at the 10 per cent level.

[38]This is suggested by results such as that when communication categories are trichotomized into production, innovation and maintenance, the mean number of links for any role type is substantially higher in the production network than in the innovation or maintenance networks. See Farace and Johnson, "Comparative Analysis", pp. 13, 18.

CHAPTER III

ANALYSES OF THE DATA BASE

In this chapter, the existence of linear relationships, between the 62 independent and dependent variables operationalized in Chapter II, is examined through an analysis of the results of three statistical procedures. First, the existence of linear relationships between the dependent and independent variables is tested through the use of Pearson product-moment correlation coefficients. Second, relationships within the variable sets are explored utilizing the results of principal components factor analyses with varimax rotation. Based upon the results of these factor analyses, factor scores were then calculated for each of the significant factors, creating twenty new factor score variables which represented the significant components of the variability within each of the original variable sets. Finally, linear relationships between the independent variable factor score sets, and each significant factor from the dependent variable factor score sets, are identified using the results of multiple linear regression procedures.

Pearson Correlation Analysis

As detailed in Chapter II, the independent variables were selected based upon generalizations by Rogers and Shoemaker concerning the relationships between social status, technical competence, innovativeness, social participation, cosmopoliteness, change agent contact, and mass media exposure with respect to opinion leadership. Although formal hypotheses have not been stated in this research with respect to the direction of these relationships, all such relationships would be expected to be positive. This writer is unaware of prior research which provides a foundation for positing relationships between the independent variable measures and the network centrality dependent variables employed in this research.[1]

Relationships between and within variable sets were initially assessed using Pearson product-moment correlation coefficients;[2] as an aid in interpreting these results, the correlation coefficients have been tested for statistical significance using two-tailed tests of significance.[3] The magnitude of the correlation coefficients required to achieve various levels of statistical significance, with n - 2 = 95 degrees of freedom, are presented in Table 14 below.

Biographic Variables

Of the variables selected to represent social status--highest academic degree, academic rank, years at present

Table 14. Significance Levels of Selected Pearson Product-Moment Correlation Coefficients Using a Two-Tail Test with 95 Degrees of Freedom

Correlation Coefficient	Significance Level
.17	$p = .10$
.20	$p = .05$
.26	$p = .01$
.28	$p = .005$
.33	$p = .001$
.35	$p = .0005$
.39	$p = .0001$

institution and total years teaching--only academic rank correlated at the $p \leq .05$ level or better with opinion leadership, and then only with the generalized opinion leadership measures (D1, D2, D3). Thus, as may be seen in Table 15, the higher the relative academic rank, the higher the relative generalized opinion leadership.

However, three of the four social status variables--academic rank, years at present institution and total years teaching--correlated negatively at the $p \leq .05$ level or better with both sets of centrality indexes. An examination of Tables 16 and 17 shows that these three representations of institutional seniority were significantly correlated with the middle frequency ranges (D9, D16, D17) and the weighted indexes (D13 and D20). Thus, the lower the relative academic rank, the fewer years at the institution and the fewer total years teaching relative to departmental colleagues; the higher the relative centrality with respect to both teaching

Table 15. Pearson Correlations of Social Status With Opinion Leadership

Social Status	Opinion Leadership D1	D2	D3	D4	D5	D6
I1	0.14	0.17	0.14	-0.06	-0.02	0.03
I2	0.25*	0.26*	0.25*	0.12	0.16	0.15
I3	0.16	0.16	0.22*	0.08	0.13	0.07
I4	0.15	0.17	0.18	0.07	0.11	0.15

*significant at $p \leq .05$

Social Status Variable Designations

Variable Name	Variable Designation
Highest academic degree	I1
Academic rank	I2
Years at present institution	I3
Total years teaching	I4

Opinion Leadership Variable Designations

Teaching Topic Area	Index Type	Variable Designation
Ways to improve learning experience	Weighted	D1
	Unweighted	D2
	Directed Centrality	D3
New teaching methods and materials	Weighted	D4
	Unweighted	D5
	Directed Centrality	D6

Table 16. Pearson Correlations of Social Status With Teaching Innovation Network Centrality

Social Status	Teaching Innovation Network Centrality						
	D7	D8	D9	D10	D11	D12	D13
I1	-0.06	0.00	0.05	0.07	0.08	0.04	0.02
I2	-0.13	-0.15	-0.27**	-0.13	-0.03	-0.07	0.21*
I3	-0.18	-0.10	-0.22*	-0.14	-0.17	-0.11	-0.22*
I4	-0.12	-0.18	-0.21*	-0.18	-0.20*	-0.14	-0.24*

*significant at $p \leq .05$
**significant at $p \leq .01$

Social Status Variable Designations

Variable Name	Variable Designation
Highest academic degree	I1
Academic rank	I2
Years at present institution	I3
Total years teaching	I4

Teaching Innovation Network Centrality Variable Designations

Content Area	Frequency Levels	Variable Designation
Teaching Innovation	Once per term or more	D7
	Once per month or more	D8
	2-3 times per month or more	D9
	Once per week or more	D10
	2-3 times per week or more	D11
	Once a day or more	D12
	Weighted	D13

Table 17. Pearson Correlations of Social Status With Combined Teaching Network Centrality

Social Status	Combined Teaching Network Centrality						
	D14	D15	D16	D17	D18	D19	D20
I1	0.10	0.05	0.08	0.09	0.08	0.04	0.11
I2	-0.08	-0.10	-0.24*	-0.33**	-0.08	-0.07	-0.21*
I3	-0.13	-0.17	-0.27**	-0.33**	-0.21*	-0.11	-0.30**
I4	-0.10	-0.21*	-0.27**	-0.34**	-0.24*	-0.14	-0.33**

*significant at $p \leq .05$
**significant at $p \leq .01$

Social Status Variable Designations

Variable Name	Variable Designation
Highest academic degree	I1
Academic rank	I2
Years at present institution	I3
Total years teaching	I4

Combined Teaching Network Centrality Variable Designations

Content Area	Frequency Levels	Variable Designation
Combined Teaching	Once per term or more	D14
	Once per month or more	D15
	2-3 times per month or more	D16
	Once per week or more	D17
	2-3 times per week or more	D18
	Once a day or more	D19
	Weighted	D20

innovation and general teaching-related matters. This suggests a composite of younger, junior faculty members as being those individuals at the core of their departmental communication networks regarding teaching-related matters. Very interestingly, as seen just previously, those relatively high in generalized opinion leadership were relatively higher in academic rank than their colleagues. This suggests that the individuals who function as opinion leaders are not the same individuals who are most central to their departmental communication networks, and that there is a separation of the roles of opinion leader versus liaison or bridge. This relationship will be examined further in following subsections.

Neither of the variables representing technical competence--computer utilization and frequency of program preparation--correlated at the .20 level or above with any of the dependent variable measures. Thus, there is no demonstrable evidence in this research of a meaningful relationship between computer utilization and program preparation, and opinion leadership or network centrality. See Tables 18 and 19.

The two innovativeness-related variable measures--innovativeness and number of innovations used--both correlated with most of the opinion leadership measures at $p \leq .05$ or better. The relationship between the number of innovations used (I8) and opinion leadership pertaining to

Table 18. Pearson Correlations of Technical Competence With Opinion Leadership

Technical Competence	Opinion Leadership					
	D1	D2	D3	D4	D5	D6
I5	0.02	0.04	0.11	0.08	0.09	0.03
I6	-0.07	-0.10	-0.08	-0.05	-0.07	-0.14

Technical Competence Variable Designations

Variable Name	Variable Designation
Computer utilization	I5
Frequency of program preparation	I6

Opinion Leadership Variable Designations

Teaching Topic Area	Index Type	Variable Designation
Ways to improve learning experience	Weighted	D1
	Unweighted	D2
	Directed Centrality	D3
New teaching methods and materials	Weighted	D4
	Unweighted	D5
	Directed Centrality	D6

Table 19. Pearson Correlations of Technical Competence With Teaching Innovation Network Centrality And Combined Teaching Network Centrality

Technical Competence	Teaching Innovation Network Centrality						
	D7	D8	D9	D10	D11	D12	D13
I5	0.14	0.13	-0.04	0.06	-0.06	-0.02	0.08
I6	0.07	0.20	0.11	0.01	-0.10	-0.10	0.14
	Combined Teaching Network Centrality						
	D14	D15	D16	D17	D18	D19	D20
I5	0.01	0.17	0.08	0.12	0.14	-0.02	0.13
I6	-0.01	0.12	0.10	0.04	-0.09	-0.10	0.02

Technical Competence Variable Designations

Variable Name	Variable Designation
Computer utilization	I5
Frequency of program preparation	I6

Teaching Innovation and Combined Teaching Network Centrality Variable Designations

Content Area	Frequency Levels	Variable Designation
Teaching Innovation	Once per term or more	D7
	Once per month or more	D8
	2-3 times per month or more	D9
	Once per week or more	D10
	2-3 times per week or more	D11
	Once a day or more	D12
	Weighted	D13
Combined Teaching	Once per term or more	D14
	Once per month or more	D15
	2-3 times per month or more	D16
	Once per week or more	D17
	2-3 times per week or more	D18
	Once a day or more	D19
	Weighted	D20

new teaching methods (D4, D5, D6) was particularly high--D4 correlated with I8 at approximately the $p \leq .01$ level; D5 correlated with I8 at approximately the $p \leq .005$ level; and D6 correlated with I8 at slightly better than the $p \leq .02$ level. All correlations between innovativeness (I7) and the six opinion leadership measures were significant at the $p \leq .05$ level or better. Thus, the relatively earlier the innovations used, and the relatively larger the number of innovations used, the relatively greater the opinion leadership. See Table 20.

Conversely, of the 28 separate correlations in Table 21 between the innovativeness and network centrality variable measures, only two were significant at the minimum five per cent level; both were negatively correlated. It is concluded that there is little evidence suggesting a relationship between network centrality and innovativeness.

To summarize these results, innovativeness and academic rank are both positively correlated with opinion leadership pertaining to general teaching-related matters. Innovativeness and the number of innovations used both correlate positively with teaching methods opinion leadership. Academic rank, total years teaching, and years at the institution all correlate negatively with both teaching innovation and combined teaching network centrality.

Table 20. Pearson Correlations of Innovativeness With Opinion Leadership

Innovativeness	Opinion Leadership					
	D1	D2	D3	D4	D5	D6
I7	0.22*	0.23*	0.27**	0.20*	0.21*	0.23*
I8	0.17	0.18	0.20*	0.26**	0.28**	0.25*

*significant at $p \leq .05$
**significant at $p \leq .01$

Innovativeness Variable Designations

Variable Name	Variable Designation
Innovativeness	I7
Number of innovations used	I8

Opinion Leadership Variable Designations

Teaching Topic Area	Index Type	Variable Designation
Ways to improve learning experience	Weighted	D1
	Unweighted	D2
	Directed Centrality	D3
New teaching methods and materials	Weighted	D4
	Unweighted	D5
	Directed Centrality	D6

Table 21. Pearson Correlations of Innovativeness With Teaching Innovation Network Centrality And Combined Teaching Network Centrality

Innovativeness	Teaching Innovation Network Centrality						
	D7	D8	D9	D10	D11	D12	D13
I7	0.03	0.02	-0.09	-0.16	-0.21*	-0.11	-0.10
I8	0.02	0.01	-0.09	-0.13	-0.18	-0.09	-0.10
	Combined Teaching Network Centrality						
	D14	D15	D16	D17	D18	D19	D20
I7	0.06	0.02	-0.09	-0.21*	-0.12	-0.11	-0.11
I8	0.03	-0.03	-0.10	-0.18	-0.11	-0.09	-0.13

*significant at $p \leq .05$

Innovativeness Variable Designations

Variable Name	Variable Designation
Innovativeness	I7
Number of innovations used	I8

Teaching Innovation and Combined Teaching Network Centrality Variable Designations

Content Area	Frequency Levels	Variable Designation
Teaching Innovation	Once per term or more	D7
	Once per month or more	D8
	2-3 times per month or more	D9
	Once per week or more	D10
	2-3 times per week or more	D11
	Once a day or more	D12
	Weighted	D13
Combined Teaching	Once per term or more	D14
	Once per month or more	D15
	2-3 times per month or more	D16
	Once per week or more	D17
	2-3 times per week or more	D18
	Once a day or more	D19
	Weighted	D20

Interpersonal Communication Variables

For the purposes of examining the relationships between the 22 interpersonal communication variable measures and the 20 dependent variable measures, the interpersonal communication variables were grouped into three categories--measures of social participation, cosmopoliteness, and extent of change agent contact.

Social Participation

The variables included in this category were those variables pertaining to the perceived frequency and importance, as sources of information about new teaching methods and material, of participation in informal discussions with other faculty at national and regional conventions (I10, I12, I14, I16); and the perceived frequency and importance of contact with departmental colleagues (I19, I22).

As may be seen in Table 22, of the 36 correlations between these six variables and the opinion leadership measures, only two were significant at the five per cent level or better. Thus, persons relatively high in opinion leadership apparently do not perceive these measures of social participation as being relatively more frequently used, or important, information sources for them than did their colleagues.

However, five of the six measures of social participation were correlated at the $p \leq .05$ level or better

Table 22. Pearson Correlations of Social Participation With Opinion Leadership

Social Participation	Opinion Leadership					
	D1	D2	D3	D4	D5	D6
I10	0.14	0.12	0.16	0.05	0.02	0.14
I12	0.17	0.11	0.21*	0.09	0.03	0.12
I14	0.17	0.18	0.06	0.08	0.06	0.15
I16	0.13	0.11	0.07	0.06	0.02	0.04
I19	0.17	0.15	0.23*	0.13	0.10	0.08
I22	0.13	0.16	0.11	0.14	0.17	0.12

*significant at $p \leq .05$

Social Participation Variable Designations

Activity	Frequency	Importance
When attending national conventions informal discussions with other faculty	I10	I14
When attending regional conventions informal discussions with other faculty	I12	I16
Discussions with faculty from your school with accounting colleagues	I19	I22

Opinion Leadership Variable Designations

Teaching Topic Area	Index Type	Variable Designation
Ways to improve learning experience	Weighted	D1
	Unweighted	D2
	Directed Centrality	D3
New teaching methods and materials	Weighted	D4
	Unweighted	D5
	Directed Centrality	D6

with both sets of centrality indexes. The relationships identified in Tables 23 and 24 were positive and clustered at the lower and middle frequency levels. In addition, it may be noted that I10, I12, I14, I16 and I19 were all correlated significantly with the two weighted centrality indexes (D13, D20); three of the ten correlations were significant at the $p \leq .01$ level or better. Four of the remaining 27 significant correlations were significant at approximately the $p \leq .001$ level or better. Thus, those individuals with relatively higher centrality index measures perceive informal discussions at national and regional conventions as being both a relatively more frequently used, and important, source of information than do their colleagues with relatively lower centrality index scores. In addition, those individuals with central roles in their communication network perceive themselves as communicating more frequently with their colleagues about teaching than do those individuals who are not as active in their departmental network.[4] Although these results might have been expected, it is of particular interest to note that the measures of social participation are significantly correlated with network centrality, whereas they are not significantly correlated with opinion leadership. This, again, supports the contention that the role of an opinion leader is distinct from the role of liaison or bridge.

Table 23. Pearson Correlations of Social Participation With Teaching Innovation Network Centrality

Social Partici-pation	Teaching Innovation Network Centrality D7	D8	D9	D10	D11	D12	D13
I10	0.30**	0.22*	0.19	0.16	0.19	0.16	0.27**
I12	0.24*	0.25*	0.16	0.08	0.20*	0.18	0.24*
I14	0.23*	0.20*	0.26**	0.19	0.13	0.14	0.23*
I16	0.15	0.24*	0.25*	0.16	0.10	0.16	0.23*
I19	0.22*	0.20*	0.20*	0.00	0.01	0.14	0.22*
I22	-0.02	0.06	0.13	0.01	-0.01	0.12	0.06

*significant at $p \leq .05$
**significant at $p \leq .01$

Social Participation Variable Designations

Activity	Frequency	Importance
When attending national conventions informal discussions with other faculty	I10	I14
When attending regional conventions informal discussions with other faculty	I12	I16
Discussions with faculty from your school with accounting colleagues	I19	I22

Teaching Innovation Network Centrality Variable Designations

Content Area	Frequency Levels	Variable Designation
Teaching Innovation	Once per term or more	D7
	Once per month or more	D8
	2-3 times per month or more	D9
	Once per week or more	D10
	2-3 times per week or more	D11
	Once a day or more	D12
	Weighted	D13

Table 24. Pearson Correlations of Social Participation With Combined Teaching Network Centrality

Social Partici-pation	Combined Teaching Network Centrality D14	D15	D16	D17	D18	D19	D20
I10	0.32**	0.26**	0.20*	0.20*	0.11	0.16	0.26**
I12	0.24*	0.20*	0.21*	0.17	0.16	0.18	0.25*
I14	0.32**	0.20*	0.16	0.15	0.10	0.14	0.21*
I16	0.20*	0.13	0.20*	0.17	0.15	0.16	0.22*
I19	0.41**	0.33**	0.31**	0.28**	0.13	0.14	0.35**
I22	0.30**	0.11	0.11	0.19	0.10	0.12	0.16

*significant at $p \leq .05$
**significant at $p \leq .01$

Social Participation Variable Designations

Activity	Frequency	Importance
When attending national conventions informal discussions with other faculty	I10	I14
When attending regional conventions informal discussions with other faculty	I12	I16
Discussions with faculty from your school with accounting colleagues	I19	I22

Combined Teaching Network Centrality Variable Designations

Content Area	Frequency Levels	Variable Designation
Combined Teaching	Once per term or more	D14
	Once per month or more	D15
	2-3 times per month or more	D16
	Once per week or more	D17
	2-3 times per week or more	D18
	Once a day or more	D19
	Weighted	D20

Cosmopoliteness

Fourteen variables were categorized as measures of an individual's external orientation to his system--the perceived frequency and importance, as information sources pertaining to new teaching methods, of educational presentations at national and regional conventions (I9, I11, I13, I15); of contact with non-accounting faculty at the individual's own institution (I20, I21, I23, I24); and of contact with accounting and non-accounting faculty at other institutions (I25, I26, I27, I28, I29, I30).

Only 1 of the 84 correlations in Table 25, between the cosmopoliteness measures and the opinion leadership variable measures, was significant at the $p \leq .05$ level or better. It could have been expected that approximately 4 of the 84 correlations would have been significant on the basis of chance alone; these results clearly suggest that there was no relationship between the 14 cosmopoliteness measures employed in this research and the six opinion leadership measures.

Of the 84 correlations in Table 26, between the cosmopoliteness variables and teaching innovation centrality, 14 were significant at the $p \leq .05$ level or better. Six of these 14 significant positive correlations pertained to the frequency and importance of contact with non-accounting business faculty at the individual's own institution (I20,

Table 25. Pearson Correlations of Cosmopoliteness With Opinion Leadership

Cosmopo-liteness	Opinion Leadership D1	D2	D3	D4	D5	D6
I9	0.12	0.13	0.16	-0.02	-0.05	-0.08
I11	0.12	0.10	0.24*	-0.09	-0.10	0.01
I20	0.05	0.06	0.17	0.03	0.01	0.03
I21	-0.01	-0.05	0.06	0.03	-0.04	0.04
I25	0.17	0.14	0.16	0.16	0.14	0.13
I26	-0.01	0.00	0.06	0.00	-0.01	0.03
I27	-0.06	-0.07	-0.11	0.01	-0.03	0.05
I13	0.07	0.09	0.05	-0.08	-0.04	-0.03
I15	0.01	-0.03	0.05	-0.13	-0.14	-0.06
I23	0.07	0.08	0.16	0.08	0.04	0.09
I24	-0.03	-0.06	0.07	0.05	-0.03	0.08
I28	0.17	0.18	0.12	0.16	0.15	0.10
I29	-0.08	-0.11	-0.01	-0.07	-0.12	0.01
I30	0.02	0.00	0.01	0.09	0.04	0.11

*significant at $p \leq .05$

Cosmopoliteness Variable Designations

Activity	Frequency	Importance
When attending national conventions presentations on education-related topics	I9	I13
When attending regional conventions presentations on education-related topics	I11	I15
Discussions with faculty from your school		
with non-accounting business faculty	I20	I23
with faculty from non-business fields	I21	I24
Discussions with faculty from other schools		
with accounting colleagues	I25	I28
with non-accounting business faculty	I26	I29
with faculty from non-business fields	I27	I30

Opinion Leadership Variable Designations

Teaching Topic Area	Index Type	Variable Designation
Ways to improve learning experience	Weighted	D1
	Unweighted	D2
	Directed Centrality	D3
New teaching methods and materials	Weighted	D4
	Unweighted	D5
	Directed Centrality	D6

Table 26. Pearson Correlations of Cosmopoliteness with Teaching Innovation Network Centrality

Cosmopo-liteness	Teaching Innovation Network Centrality						
	D7	D8	D9	D10	D11	D12	D13
I9	0.08	0.10	0.04	0.06	-0.02	0.00	0.08
I11	0.05	0.08	-0.08	0.00	-0.07	-0.04	0.03
I20	0.13	0.23*	0.21*	0.23*	0.12	-0.01	0.21*
I21	0.07	0.22*	0.13	0.06	-0.01	0.10	0.14
I25	0.31**	0.16	0.15	-0.03	0.00	0.03	0.13
I26	0.15	0.21*	0.22*	0.16	0.00	-0.08	0.18
I27	0.03	0.12	0.31**	0.10	-0.02	-0.06	0.13
I13	0.00	0.07	0.07	0.06	0.09	0.08	0.10
I15	-0.05	0.05	0.07	0.07	0.06	0.05	0.07
I23	0.00	0.16	0.22*	0.26	0.15	0.16	0.19
I24	-0.01	0.13	0.09	0.10	0.15	0.19	0.10
I28	0.04	0.13	0.25*	0.10	0.05	0.15	0.12
I29	0.01	0.14	0.16	0.20*	0.23*	0.12	0.14
I30	-0.01	0.12	0.19	0.17	0.11	0.14	0.14

*significant at $p \leq .05$
**significant at $p \leq .01$

Cosmopoliteness Variable Designations

Activity	Frequency	Importance
When attending national conventions presentations on education-related topics	I9	I13
When attending regional conventions presentations on education-related topics	I11	I15
Discussions with faculty from your school		
with non-accounting business faculty	I20	I23
with faculty from non-business fields	I21	I24
Discussions with faculty from other schools		
with accounting colleagues	I25	I28
with non-accounting business faculty	I26	I29
with faculty from non-business fields	I27	I30

Teaching Innovation Network Centrality Variable Designations

Content Area	Frequency Levels	Variable Designation
Teaching Innovation	Once per term or more	D7
	Once per month or more	D8
	2-3 times per month or more	D9
	Once per week or more	D10
	2-3 times per week or more	D11
	Once a day or more	D12
	Weighted	D13

I23); the remaining 8 significant correlations were distributed among six different independent variables. It is concluded that the only discernible relationship is that the relatively higher the perceived frequency and importance of contact with non-accounting business faculty at the individual's own school, the relatively higher the teaching innovation centrality.

In Table 27, it may be seen that 26 of the 84 correlations between the cosmopoliteness variables, and the combined teaching centrality index measures, were significant at the $p \leq .05$ level or better. Eleven of these 26 correlations were significant at the $p \leq .01$ level or better; fifteen of the 26 were clustered at higher frequency levels (D17, D18). The strongest relationship appears to be between combined teaching centrality, and the perceived frequency and importance of contact with accounting faculty at the other schools (I25, I28). In addition, there is evidence supporting a relationship between the perceived frequency of contact with non-accounting faculty--both business and non-business--at an individual's own school (I20, I21), and combined teaching centrality. In conclusion, the higher the relative perceived frequency and importance of contact with accounting faculty at other schools, and the higher the perceived frequency of contact with non-accounting faculty at an individual's own school,

Table 27. Pearson Correlations of Cosmopoliteness With Combined Teaching Network Centrality

Cosmopo-liteness	Combined Teaching Network Centrality						
	D14	D15	D16	D17	D18	D19	D20
I9	0.04	-0.07	-0.02	-0.03	0.03	0.00	0.01
I11	0.03	-0.12	-0.05	-0.11	0.02	-0.04	-0.07
I20	0.24*	0.13	0.14	0.33**	0.24*	-0.01	0.22*
I21	0.15	0.12	0.15	0.34**	0.36**	0.10	0.25*
I25	0.36**	0.14	0.24*	0.25*	0.12	0.03	0.27**
I26	0.14	0.12	0.18	0.30**	0.14	-0.08	0.19
I27	0.06	0.08	0.15	0.25*	0.11	-0.06	0.12
I13	0.11	-0.04	0.05	-0.03	0.06	0.08	0.06
I15	0.04	-0.10	0.05	-0.02	0.11	0.05	0.01
I23	0.26**	0.05	0.06	0.22*	0.18	0.16	0.11
I24	0.18	0.05	0.05	0.20*	0.34**	0.19	0.14
I28	0.29**	0.02	0.22*	0.28**	0.12	0.15	0.20*
I29	0.22*	0.03	0.13	0.28**	0.23*	0.12	0.16
I30	0.19	0.05	0.10	0.24*	0.22*	0.14	0.15

*significant at $p \leq .05$
**significant at $p \leq .01$

Cosmopoliteness Variable Designations

Activity	Frequency	Importance
When attending national conventions		
presentations on education-related topics	I9	I13
When attending regional conventions		
presentations on education-related topics	I11	I15
Discussions with faculty from your school		
with non-accounting business faculty	I20	I23
with faculty from non-business fields	I21	I24
Discussions with faculty from other schools		
with accounting colleagues	I25	I28
with non-accounting business faculty	I26	I29
with faculty from non-business fields	I27	I30

Combined Teaching Network Centrality Variable Designations

Content Area	Frequency Levels	Variable Designation
Combined Teaching	Once per term or more	D14
	Once per month or more	D15
	2-3 times per month or more	D16
	Once per week or more	D17
	2-3 times per week or more	D18
	Once a day or more	D19
	Weighted	D20

the higher the relative combined teaching centrality. It is, once again, interesting to note the evidence of these associations with network centrality, and the lack of these relationships with opinion leadership.

Change Agent Contact

The extent of change agent contact is represented in this research by only two variables--the perceived frequency and importance of contact with publisher representatives (I17, I18).

Four of the six correlations in Table 28, between the perceived frequency of contact with publisher representatives (I17) and the six opinion leadership measures, were significant at the $p \leq .05$ level; one of the remaining two was significant at less than $p = .06$. These correlations suggest the existence of a relationship between opinion leadership and frequency of contact with publisher representatives, although the relationship appears to be somewhat stronger with respect to teaching methods opinion leadership than with respect to generalized opinion leadership.

Since only 1 of the 28 correlations in Table 29 between the extent of change agent contact and the network centrality measures is significant at the required five per cent level, it is concluded that there is no evidence supporting the existence of a relationship between these variables.

Table 28. Pearson Correlations of Change Agent Contact With Opinion Leadership

Change Agent Contact	Opinion Leadership D1	D2	D3	D4	D5	D6
I17	0.19	0.21*	0.11	0.23*	0.20*	0.24*
I18	0.05	0.08	0.03	0.05	0.03	0.09

*significant at $p \leq .05$

Change Agent Contact Variable Designations

Activity	Frequency	Importance
Discussions with publisher representatives	I17	I18

Opinion Leadership Variable Designations

Teaching Topic Area	Index Type	Variable Designation
Ways to improve learning experience	Weighted	D1
	Unweighted	D2
	Directed Centrality	D3
New teaching methods and materials	Weighted	D4
	Unweighted	D5
	Directed Centrality	D6

Table 29. Pearson Correlations of Change Agent Contact With Teaching Innovation Network Centrality And Combined Teaching Network Centrality

Change Agent Contact	Teaching Innovation Network Centrality						
	D7	D8	D9	D10	D11	D12	D13
I17	0.04	0.09	0.09	0.09	-0.08	0.04	0.06
I18	-0.08	0.06	-0.09	-0.13	-0.07	0.14	-0.01
	Combined Teaching Network Centrality						
	D14	D15	D16	D17	D18	D19	D20
I17	0.10	0.07	0.05	0.25*	0.02	0.04	0.12
I18	0.06	0.14	-0.01	0.01	-0.01	0.14	0.10

*significant at $p \leq .05$

Change Agent Contact Variable Designations

Activity	Frequency	Importance
Discussions with publisher representatives	I17	I18

Teaching Innovation and Combined Teaching Network Centrality Variable Designations

Content Area	Frequency Levels	Variable Designation
Teaching Innovation	Once per term or more	D7
	Once per month or more	D8
	2-3 times per month or more	D9
	Once per week or more	D10
	2-3 times per week or more	D11
	Once a day or more	D12
	Weighted	D13
Combined Teaching	Once per term or more	D14
	Once per month or more	D15
	2-3 times per month or more	D16
	Once per week or more	D17
	2-3 times per week or more	D18
	Once a day or more	D19
	Weighted	D20

In summary, the only interpersonal communication variable employed in this research, which exhibits a significant relationship with relative opinion leadership, is the relative perceived frequency of contact with publisher representatives.

The relative perceived frequency of contact with both accounting and non-accounting business faculty at an individual's own school is positively associated with both relative teaching innovation and combined teaching centrality, as are the relative frequency and importance of informal discussions with other faculty at national and regional conventions.

The relative perceived importance of contact with non-accounting business faculty at an individual's own school has been found to be positively associated with relative teaching innovation centrality; while the relative perceived frequency and importance of contact with accounting faculty at other schools has been found to be positively associated with relative combined teaching centrality.

Exposure to Mass Media

The perceived frequency and importance of six different mass media sources--the Book Review Section, Education Research and Academic Notes, and the Committee Reports Supplement, all of <u>The Accounting Review</u>; the Education and

and Professional Training section of the Journal of Accountancy; Dissertation Abstracts; and Collegiate News & Views--made up the twelve variables related to mass media exposure.

The only significant relationship between any of these twelve variables and the opinion leadership measures appears to be, from Table 30, between generalized teaching opinion leadership and the perceived frequency of use of the Education Research and Academic Notes section of The Accounting Review.

As with the correlations between the mass media variables and the opinion leadership measures, less than 6 of the total correlations between teaching innovation centrality and the mass media variables were significant at the $p \leq .05$ level. If a significant relationship exists, it appears to be between teaching innovation centrality and the perceived importance of the Committee Reports Supplement to The Accounting Review as an information source. It should be noted that the number of significant correlations between the mass media variables and opinion leadership, and between the mass media variables and teaching innovation centrality, was approximately the number of correlations that could have been expected to appear as significant solely on the basis of chance.

In Table 32, however, where the correlations between the mass media variables and combined teaching centrality variables are listed, over 20%--19--of the 84 total correlations were significant at the $p \leq .05$ level. The strongest

Table 30. Pearson Correlations of Mass Media Exposure With Opinion Leadership

Mass Media Exposure	Opinion Leadership D1	D2	D3	D4	D5	D6
I31	0.15	0.18	0.08	0.09	0.09	0.10
I32	-0.05	-0.01	-0.03	-0.04	-0.05	-0.04
I35	0.17	0.14	0.14	0.09	0.04	0.11
I36	0.15	0.14	0.18	0.10	0.07	0.18
I37	0.22*	0.20*	0.27**	0.17	0.10	0.23*
I38	0.04	-0.01	0.10	0.01	-0.07	0.09
I33	-0.09	-0.11	-0.03	-0.12	-0.07	-0.02
I34	-0.06	-0.05	0.02	-0.10	-0.14	-0.13
I39	-0.04	0.00	-0.11	-0.18	-0.19	-0.17
I40	0.18	0.15	0.17	0.01	0.03	0.10
I41	0.09	0.10	0.12	0.00	-0.02	-0.03
I42	0.06	0.06	0.04	-0.03	-0.06	0.02

*significant at $p \leq .05$
**significant at $p \leq .01$

Mass Media Exposure Variable Designations

Source	Frequency	Importance
Collegiate News and Views	I31	I33
Dissertation Abstracts	I32	I34
Book Review section, The Accounting Review	I35	I39
Education and Professional Training, Journal of Accountancy	I36	I40
Education Research and Academic Notes, The Accounting Review	I37	I41
Supplement to the Accounting Review, Committee Reports	I38	I42

Opinion Leadership Variable Designations

Teaching Topic Area	Index Type	Variable Designation
Ways to improve learning experience	Weighted	D1
	Unweighted	D2
	Directed Centrality	D3
New teaching methods and materials	Weighted	D4
	Unweighted	D5
	Directed Centrality	D6

Table 31. Pearson Correlations of Mass Media Exposure With Teaching Innovation Network Centrality

Mass Media Exposure	Teaching Innovation Network Centrality						
	D7	D8	D9	D10	D11	D12	D13
I31	0.10	0.04	0.07	-0.12	-0.18	-0.08	-0.01
I32	-0.05	0.12	0.20*	0.11	0.00	0.04	0.12
I35	-0.05	0.09	0.05	0.01	0.07	0.00	0.03
I36	0.05	0.14	0.15	-0.01	-0.04	0.17	0.11
I37	0.07	0.21*	0.17	-0.03	-0.03	0.14	0.16
I38	0.00	0.19	0.07	0.04	0.18	0.18	0.15
I33	0.07	0.02	-0.19	-0.19	-0.03	0.14	-0.06
I34	-0.13	0.12	0.14	0.10	-0.00	0.10	0.09
I39	-0.12	0.04	-0.04	0.02	0.12	0.15	-0.03
I40	-0.04	0.04	-0.03	-0.10	-0.19	0.12	-0.08
I41	0.14	0.20*	0.00	-0.12	0.03	0.15	0.11
I42	0.11	0.24*	0.07	0.07	0.12	0.19	0.21*

*significant at $p \leq .05$

Mass Media Exposure Variable Designations

Source	Frequency	Importance
Collegiate News and Views	I31	I33
Dissertation Abstracts	I32	I34
Book Review Section, The Accounting Review	I35	I39
Education and Professional Training, Journal of Accountancy	I36	I40
Education Research and Academic Notes, The Accounting Review	I37	I41
Supplement to the Accounting Review, Committee Reports	I38	I42

Teaching Innovation Network Centrality Variable Designations

Content Area	Frequency Levels	Variable Designation
Teaching Innovation	Once per term or more	D7
	Once per month or more	D8
	2-3 times per month or more	D9
	Once per week or more	D10
	2-3 times per week or more	D11
	Once a day or more	D12
	Weighted	D13

Table 32. Pearson Correlations of Mass Media Exposure With Combined Teaching Network Centrality

Mass Media Exposure	Combined Teaching Network Centrality D14	D15	D16	D17	D18	D19	D20
I31	0.03	0.06	0.13	0.09	0.00	-0.08	0.12
I32	0.15	0.12	0.21*	0.24*	0.09	0.03	0.24*
I35	0.07	0.09	0.19	0.05	0.09	0.00	0.12
I36	0.22*	0.21*	0.17	0.15	0.16	0.17	0.23*
I37	0.29**	0.17	0.26*	0.19	0.04	0.14	0.22*
I38	0.12	0.11	0.10	0.23*	0.29**	0.18	0.20*
I33	0.13	0.08	-0.02	-0.02	0.06	0.14	0.05
I34	0.13	0.03	0.13	0.14	0.07	0.10	0.08
I39	0.00	0.03	0.10	0.04	0.20*	0.15	0.11
I40	0.21*	0.02	0.09	-0.05	0.02	0.12	0.05
I41	0.23*	0.17	0.22*	0.15	0.25*	0.15	0.28**
I42	0.15	0.10	0.03	0.14	0.31**	0.19	0.16

*significant at $p \leq .05$
**significant at $p \leq .01$

Mass Media Exposure Variable Designations

Source	Frequency	Importance
Collegiate News and Views	I31	I33
Dissertation Abstracts	I32	I34
Book Review Section, The Accounting Review	I35	I39
Education and Professional Training, Journal of Accountancy	I36	I40
Education Research and Academic Notes, The Accounting Review	I37	I41
Supplement to the Accounting Review, Committee Reports	I38	I42

Combined Teaching Network Centrality Variable Designations

Content Area	Frequency Levels	Variable Designation
Combined Teaching	Once per term or more	D14
	Once per month or more	D15
	2-3 times per month or more	D16
	Once per week or more	D17
	2-3 times per week or more	D18
	Once a day or more	D19
	Weighted	D20

relationship again appears to be with the perceived frequency and importance of the Education Research and Academic Notes section of The Accounting Review as an information source (I37, I41). There is also evidence supporting the existence of relationships between combined teaching centrality and the perceived frequency of use of Dissertation Abstracts; the Education and Professional Training section of the Journal of Accountancy; and the perceived frequency of use of the Committee Reports Supplement to The Accounting Review (I32, I36 and I38, respectively).

As the reader may recall from Chapter II of this dissertation, four non-accounting journals were deleted from further analysis because the average respondent was unaware that any of the four existed, much less indicated use of the publications. In addition, there were two places in the communication questionnaire where respondents were asked to list any other--than already listed in question 4.5--publications that served as sources of information for them with respect to new teaching methods and materials. No individual additional sources were cited frequently enough to warrant mention in this research.

These results, in conjunction with the correlations cited previously, suggest to this writer that The Accounting Review, and, in particular, its Education Research and Academic Notes section, is the only relatively frequently used, and important, mass media source for opinion leaders and those individuals with high centrality measures.

Opinion Leadership with Network Centrality

Of particular interest in this research, which has attempted to lay the foundation for further research whose results will permit the design of diffusion strategies for securing maximal rates of adoption, are the relationships between the dependent variable sets of opinion leadership--with respect to teaching in general, and with respect to new teaching methods and materials--and communication network centrality--with respect to teaching innovation, and with respect to all teaching-related communication. Of particular interest are the extent to which opinion leadership and network centrality are generalized across all teaching related matters, rather than being teaching method specific; and an assessment of the relationship between the functions of opinion leadership and network centrality. This section examines the correlation matrices representing relationships between and within the dependent variable sets, beginning with the opinion leadership variable measures.

As shown in Table 33, the correlations within and between the opinion leadership variable sets were all very high. Thus, to the extent that respondents were able to distinguish between questions 4.1 and 4.2 in the communication questionnaire, there appears to be very substantial overlap in the opinion leadership function served by individuals. As would be expected, the three variables pertaining to opinion leadership with respect to new teaching methods (D4, D5, D6) were more highly correlated with each other than with

Table 33. Pearson Correlations Within Opinion Leadership Variable Set

Opinion Leadership	Opinion Leadership D1	D2	D3	D4	D5	D6
D1		0.95**	0.79**	0.67**	0.63**	0.62**
D2			0.73**	0.65**	0.65**	0.56**
D3				0.55**	0.47**	0.51**
D4					0.96**	0.81**
D5						0.73**

*significant at p<.05
**significant at p<.01

Opinion Leadership Variable Designations

Teaching Topic Area	Index Type	Variable Designation
Ways to improve learning experience	Weighted	D1
	Unweighted	D2
	Directed Centrality	D3
New teaching methods and materials	Weighted	D4
	Unweighted	D5
	Directed Centrality	D6

the three variables pertaining to opinion leadership with respect to general teaching-related matters (D1, D2, D3); and vice versa.

With respect to the network centrality index sets, whose intercorrelations are listed in Tables 34 and 35, the intercorrelations within each set were much lower than within the opinion leadership variable sets. Within each set, the adjacent frequency level indices correlated highly with each other, but the indexes pertaining to lower frequency levels (D7, D8; D14, D15), in general, did not correlate significantly with the indexes representing more frequent communication (D11, D12; D18, D19). The two weighted indexes (D13, D20) correlated at the $p \leq .0001$ level or better with all their corresponding individual indices except for the indices representing the highest frequency levels of communication (D12, D19). Thus, the weighted indexes can be considered scales representing overall network centrality related to teaching innovation and combined teaching. However, it should be remembered that centrality at low frequency levels apparently does not correlate highly with centrality at higher frequency levels, and that the weighted indices, while good overall representations, correlate more highly with the lower frequency level indices. These relationships will be seen again in the subsection which follows on factor analysis, where it is demonstrated that the total variability contained in each of the centrality index sets contains more than one significant factor.

Table 34. Pearson Correlations Within Teaching Innovation Network Centrality Variable Set

Teaching Innovation Network Centrality	Teaching Innovation Network Centrality						
	D7	D8	D9	D10	D11	D12	D13
D7		0.47**	0.24*	0.14	0.05	0.04	0.52**
D8			0.54**	0.31**	0.13	0.07	0.83**
D9				0.59**	0.21*	0.10	0.78**
D10					0.46**	0.19	0.62**
D11						0.48**	0.39**
D12							0.22**

*significant at $p \leq .05$
**significant at $p \leq .01$

Teaching Innovation Network Centrality Variable Designations

Content Area	Frequency Levels	Variable Designation
Teaching Innovation	Once per term or more	D7
	Once per month or more	D8
	2-3 times per month or more	D9
	Once per week or more	D10
	2-3 times per week or more	D11
	Once a day or more	D12
	Weighted	D13

Table 35. Pearson Correlations Within Combined Teaching Network Centrality Variable Set

Combined Teaching Network Centrality	Combined Teaching Network Centrality D14	D15	D16	D17	D18	D19	D20
D14		0.52**	0.34**	0.28**	0.10	0.10	0.43**
D15			0.59**	0.36**	0.18	0.04	0.69**
D16				0.52**	0.36**	0.06	0.87**
D17					0.55**	0.10	0.70**
D18						0.30**	0.60**
D19							0.18

*significant at $p \leq .05$
**significant at $p \leq .01$

Combined Teaching Network Centrality Variable Designations

Content Area	Frequency Levels	Variable Designation
Combined Teaching	Once per term or more	D14
	Once per month or more	D15
	2-3 times per month or more	D16
	Once per week or more	D17
	2-3 times per week or more	D18
	Once a day or more	D19
	Weighted	D20

The correlations between the centrality index sets are listed in Table 36. An examination of Table 36 reveals a substantial overlap between network centrality pertaining to teaching innovation, and combined teaching network centrality. As would have been expected, the highest correlations were clustered around the upper left to lower right diagonal--corresponding frequency levels--and between the weighted indexes. Thus, the teaching innovation and combined teaching network centrality scores for the 97 individuals analyzed in this research correlated well in excess of $p \leq .0001$ at corresponding frequency levels.

Finally, the correlations between the opinion leadership variable measures and each set of centrality index variables are presented in Tables 37 and 38. It is evident from these tables that, where significant relationships exist, the relationships are between the opinion leadership measures and the lower frequency level centrality indexes (D8, D9, D14, D15, D16). There were no relationships significant at the $p \leq .05$ level between any opinion leadership index and any centrality index representing communication of once per week or more. A possible explanation for these results, based on the previous analyses, is that opinion leadership communication--advice-seeking by individuals--occurs relatively infrequently and with individual opinion leaders who are outside the mainstream of their communication networks. Until communication networks are defined at relatively low frequency levels--once per term or more, or

Table 36. Pearson Correlations of Teaching Innovation Network Centrality With Combined Teaching Network Centrality

Teaching Innovation Network Centrality	Combined Teaching Network Centrality						
	D14	D15	D16	D17	D18	D19	D20
D7	0.45**	0.46**	0.27**	0.15	-0.03	0.04	0.35**
D8	0.38**	0.56**	0.48**	0.37**	0.18	0.07	0.50**
D9	0.27**	0.35**	0.46**	0.51**	0.12	0.10	0.42**
D10	0.13	0.23*	0.18	0.42**	0.22*	0.19	0.27**
D11	0.03	0.17	0.14	0.20*	0.49**	0.48**	0.28**
D12	0.01	0.04	0.06	0.10	0.30**	1.00**	0.18
D13	0.39**	0.55**	0.47**	0.47**	0.25**	0.22*	0.55**

*significant at $p \leq .05$
**significant at $p \leq .01$

Teaching Innovation and Combined Teaching Network Centrality Variable Designations

Content Area	Frequency Levels	Variable Designation
Teaching Innovation	Once per term or more	D7
	Once per month or more	D8
	2-3 times per month or more	D9
	Once per week or more	D10
	2-3 times per week or more	D11
	Once a day or more	D12
	Weighted	D13
Combined Teaching	Once per term or more	D14
	Once per month or more	D15
	2-3 times per month or more	D16
	Once per week or more	D17
	2-3 times per week or more	D18
	Once a day or more	D19
	Weighted	D20

Table 38. Pearson Correlations of Opinion Leadership With Combined Teaching Network Centrality

Opinion Leadership	Combined Teaching Network Centrality						
	D14	D15	D16	D17	D18	D19	D20
D1	0.48**	0.26**	0.30**	0.01	0.02	0.06	0.28**
D2	0.47**	0.27**	0.29**	0.04	0.04	0.00	0.30**
D3	0.45**	0.29**	0.24*	0.02	0.09	0.03	0.25*
D4	0.39**	0.15	0.03	-0.01	-0.04	-0.01	0.04
D5	0.36**	0.14	-0.01	-0.05	-0.08	-0.05	0.01
D6	0.33**	0.14	0.01	0.02	-0.09	0.03	0.02

*significant at $p \leq .05$
**significant at $p \leq .01$

Opinion Leadership Variable Designations

Teaching Topic Area	Index Type	Variable Designation
Ways to improve learning experience	Weighted	D1
	Unweighted	D2
	Directed Centrality	D3
New teaching methods and materials	Weighted	D4
	Unweighted	D5
	Directed Centrality	D6

Combined Teaching Network Centrality Variable Designations

Content Area	Frequency Levels	Variable Designation
Combined Teaching	Once per term or more	D14
	Once per month or more	D15
	2-3 times per month or more	D16
	Once per week or more	D17
	2-3 times per week or more	D18
	Once a day or more	D19
	Weighted	D20

once per month or more--the links representing this advice-seeking communication are excluded.

In addition, it is apparent that, despite the high correspondence between opinion leadership pertaining to teaching methods and opinion leadership pertaining to overall teaching, there is a significant difference in the relationship of these two types of opinion leadership to network centrality. Opinion leadership pertaining to ways to improve the learning experience--teaching in general (D1, D2, D3)--was correlated at the $p \leq .02$ level or better with the combined teaching centrality indexes D14, D15, D16 and D20; and somewhat correlated with D7 and D8. Thus, with respect to teaching in general, there appears to be some overlap between an individual's role as opinion leader and network link.

Opinion leadership with respect to new teaching methods (D4, D5, D6) was significantly correlated <u>only</u> with the lowest network centrality measures (D7, D14), and with <u>neither</u> of the weighted indexes (D13, D20). Thus, an individual's opinion leadership function with respect to new teaching methods appears to be quite distinct from his function as a link in the transmission of information pertaining to teaching innovations, and with respect to general teaching-related topics.

The preceding sections have examined the relationships between the dependent and independent variables operationalized in Chapter II of this dissertation; the relationships between opinion leadership and network centrality were then explored by examining the intercorrelations within and between the sets of dependent variable measures.

The following two sections extend the investigation of these relationships. The section immediately following describes the use of principal components factor analysis on the biographic, interpersonal and mass media independent variable sets; and on the teaching innovation and general teaching dependent variable sets. The final section of this chapter employs multiple regression procedures to relate the most important components in the variability of the independent variable sets to the principal components in the variability of the teaching innovation and general teaching dependent variables.

Factor Analysis

Factor analysis procedures were employed in this research in order to:

1. Identify the most important dimensions within the total variability contained in each of the following variable sets--biographic, interpersonal communication and mass media communication independent variables; teaching innovation and general teaching dependent variables;

2. To reduce the number of dependent and independent variables to a more manageable number, while at the same time retaining as much of the variability in the original variable sets as possible; and

3. To remove the high intercorrelations within the variable sets, so that multiple regressions between dependent variable factors and factors from each independent variable set could be accomplished without multicollinearity problems.

The method of principal components, followed by a varimax rotation of the significant factors and the generation of factor scores for each individual for each significant factor, was chosen to accomplish these objectives.

An explanation of the factor analysis procedures used is presented first, followed by the results of the factor analyses for each independent variable set.

Factor Analysis Procedures Employed

Factor analysis is described by Kerlinger as:

> . . .a method for determining the number and nature of the underlying variables among larger numbers of measures. More succinctly, it is a method for determining R underlying variables (factors) from n sets of measures, R being less than n. . .
>
> Factor analysis serves the cause of scientific parsimony. It reduces the multiplicity of tests and measures to greater simplicity. It tells us, in effect, what tests or measures belong together--which ones virtually measure the same thing, in other words, and how much they do so. It thus reduces the number of variables with which the scientist must cope. It also (hopefully) helps the scientist to locate and identify unities or fundamental properties. . .[5]

The method of principal components factor analysis, using the correlation matrix of all variables in the analysis, extracts linear components of the original variables which account for significant amounts of the total variance contained in the original variable set.[6] The linear model is described by Harman:

> It is the object of factor analysis to represent a variable z_i in terms of several underlying factors, or hypothetical constructs. The simplest mathematical model for describing a variable in terms of several others is a linear one, and that is the form of representation employed here. However, there are still several alternatives within the linear framework, depending on the objective of the analysis. A distinction between two objectives can be made immediately, namely: 1) to extract the maximum variance; and 2) to best reproduce the observed correlations.
>
> An empirical method for the reduction of a large body of data so that a maximum of the variance is extracted was first proposed by Karl Pearson. . . and fully developed as the method of principal components or component analysis, by Harold Hotelling. . . The method for component analysis is simply:
>
> $$z_j = a_{j1}F_1 + a_{j2}F_2 + \ldots + a_{jn}F_n \quad (j = 1,2,\ldots n),$$
>
> where each of the n observed variables is described linearly in terms of n new uncorrelated components $F_1, F_2, \ldots, F_n$.[7]

Although the volume of mathematical calculations required for a factor analytic solution is overwhelming, even for a relatively small variable set;[8] Kerlinger, among others, has suggested a geometric interpretation of the factoring process:

> To show the logic of the principal factors method without considerable mathematics is difficult. One can achieve a certain intuitive understanding of the method, however, by approaching it geometrically. Conceive tests or variables as points in m - dimensional space. Variables that are highly and positively correlated should be near each other and away from variables with which they do not correlate. If this reasoning is correct, there should be swarms of points in space. Each of these points can be located in the space if suitable axes are inserted into the space, one axis for each dimension of the m dimensions. Then any point's location is its multiple identification obtained by reading its coordinates on the m axes. The factor problem is to shoot axes through neighboring swarms of points and to so locate these axes that they "account for" as much of the variances of the variable as possible.[9]

Thus, the linear composite--factor--explaining the largest portion of the total variance is extracted first, followed by the second factor, which explains the largest portion of the remaining variance--total variance less the variance explained by the first factor--and so on. The result, up to this point, is the unrotated[10] factor matrix, consisting of a vector of weights, for each factor, representing the correlation of each original variable with each extracted factor. These weights are usually referred to as "loadings"; variables with high loadings--correlations--with a given factor are identified as representing that factor, whereas variables with low loadings contribute little to the factor. Each factor is also identified by an "eigenvalue," a measure of the proportion of the total variability explained by that factor.

Although as many factors as there are variables could be extracted, if a relatively large portion of the total variability is contained in only a few factors, it has become common practice to retain only the first few factors. Harman mentions this in his discussion of principal components:

> An important property of this method, insofar as the summarization of data is concerned is that each component, in turn, makes a maximum contribution to the sum of the variances of the n variables. For a practical problem, only a few components may be retained, especially if they account for a large percentage of the total variance.[11]

Determining the number of factors to be retained is not only one of the most important decision points in factor analysis; but is also one for which there is no general agreement with respect to the proper approach to be taken, much less general agreement with respect to a specific test to be used for making the decision.[12] The most frequently used guide, at the present time, appears to be the Kaiser, or Kaiser-Guttman, suggestion of using an eigenvalue of one as the lower bound in choosing the number of factors to be rotated. Use of the rule of a minimum eigenvalue of unity has considerable appeal, since an eigenvalue of one represents the average contribution of any single variable in the analysis toward the total variability of all variables in the set.[13] As a result, retaining a factor whose eigenvalue is substantially less than one is tantamount to obtaining an approximation of a variability dimension whose contribution toward the total variability is less than the average contributed by any single variable. Hence, the Kaiser-Guttman rule was employed as one of the screening devices used in determining the rank of the factor matrices--number of factors retained in each solution. However, since the specification of any rule of this sort is arbitrary, all factor solutions whose minimum eigenvalue fell in the .90 to 1.10 range were considered for retention.

An additional test, frequently used in determining the number of factors to retain and rotate, whose justification by Cattell[14] was its proven empirical utility, is a form of graphical analysis called a scree test. A graph, on which the proportionate contribution of each factor toward the total variance is plotted, is examined in order to identify the factor on the highest point of the "scree"--a flattened section of the curve caused by the relatively low equal contributions toward total variability of successive factors. In addition, Rummel[15] mentions a discontinuity phoenomenon, which often exists in the curves plotted for the scree test, for use as a possible discriminator in determining matrix rank.

Since a number of authors suggest employing a number of techniques, rather than relying on just one technique, all the previously mentioned techniques have been used in this research. The procedures utilized for determining the appropriate number of factors to retain and rotate may be summarized as follows. After obtaining the unrotated principal components solution, the Kaiser-Guttman rule and scree test were applied to estimate the number of factors to rotate. If the two tests were in agreement, a rotated solution was obtained for the number of factors determined by the two tests; if the tests were not in agreement, as was more often than not the case, rotated solutions were obtained for both a greater and lesser number of factors than indicated by any one test. All rotated solutions were then examined for clarity of factor structure using guidelines such as Thurstone's criteria for simple structure.[17]

After determining the number of significant dimensions in the unrotated principal components solution, the method of varimax rotation was applied to the reduced factor matrix in order to clarify the variable patterning in the factors:

> The varimax method rotates the factors in an attempt to display more clearly the interrelationships between the original variables. It identifies separate clusters of highly interrelated variables by producing within each factor as many high and low loadings as possible.[18]

An extension of Kerlinger's previously cited geometric analogy, as applied to the process of rotation, is as follows:

> Most factor analytic methods produce results in a form that is difficult or impossible to interpret. Thurstone argued that it was necessary to rotate factor matrices if one wanted to interpret them adequately. . .It is the configuration of. . . variables in factor space that is of fundamental concern. In order to discover these configurations adequately, the arbitrary reference axes must be rotated. In other words, we assume that there are unique and 'best' ways to view the variables in n - dimensional space.[19]

It may be further noted that the varimax method of rotation is perhaps the most commonly employed method of rotation, and is one of the family of orthogonal rotation methods whose members share the characteristic of producing maximally independent--uncorrelated--factors.[20] The varimax procedure, then, both clarifies the factor structure and yields uncorrelated factors.

Each resulting factor represents a composite, or construct, which is primarily composed of the variables with high loadings on that factor. Values for each individual in the analysis, representing variable values for each of these new constructs, may then be calculated. To take maximum advantage of the zero intercorrelation between the factors requires the calculation of "true factor scores"[21] for each individual for each factor. These factor scores are linear composites of all variables in the variable set being analyzed and, consequently, represent each individual's scores for the constructs represented by the identified factors. These new variables--factor scores for each individual for each factor--are useful as long as the construct represented by each factor may be identified. Factor identification is accomplished by examining the loadings of the variables on each factor; the construct represented by the factor is identified, or named, by noting which variables load highly on that factor. Each resulting factor score is a scaled variable representing the original variables most highly correlated with the new construct.[22]

This subsection has detailed the factor analysis procedures employed in this research. A principal components model was chosen and the unrotated matrix solutions were examined, using the Kaiser-Guttman rule and Cattell's scree test, to determine the number of significant factors to retain and rotate. Varimax rotation was then applied and factor scores representing the new constructs were calculated for each of the 97 individuals in the analysis. The following subsections detail the results of these procedures as applied to the three independent, and two dependent, variable sets.

Biographic Variable Set

Factor analysis of the eight biographic variables resulted in a four factor solution. Although the Kaiser-Guttman and scree tests both indicated a three factor solution as being most appropriate, the use of a four factor solution both substantially improved the factor structure, and increased the explained variability from 78.0 to 87.9 of the total variance.

The unrotated matrix in Table 39 yields a quite clear three factor structure with an undefined fourth factor. An examination of the rotated matrix in Table 34, however, reveals an extremely precise four factor solution.

Factor 1 is measured by three variables that might be considered representative of institutional seniority--academic rank, years at institution and total years teaching (I2, I3, I4). The loadings of each of these three variables on Factor 1 are very high, as may be seen in Table 39.

The two innovativeness related measures (I7, I8) are the dominant variables in Factor 2, both loading at the .96 level; while the two technical competence measures (I5, I6) are the primary variables in Factor 3. Finally, highest academic degree (I1) is only primary variable in Factor 4, with a loading of .97.

Table 39. Factor Analysis of Biographic Variables

Factor Number	Eigenvalue	Percent of Variance Explained	Cumulative Percent of Variance
1	3.01	37.6	37.6
2	2.19	27.4	65.0
3	1.04	13.0	78.0
4	0.79	9.9	87.9

UNROTATED FACTOR MATRIX

Variable	Factor 1	Factor 2	Factor 3	Factor 4
I1	0.32	-0.15	0.87	-0.30
I2	0.85	0.12	0.29	0.24
I3	0.87	0.12	-0.21	0.27
I4	0.93	0.04	-0.06	0.20
I5	-0.42	0.58	0.28	0.38
I6	-0.59	0.30	0.25	0.49
I7	0.22	0.91	-0.06	-0.27
I8	0.03	0.94	-0.05	-0.25

ROTATED FACTOR MATRIX

Variable	Factor 1	Factor 2	Factor 3	Factor 4
I1	0.11	-0.05	-0.07	0.98
I2	0.86	0.07	-0.03	0.35
I3	0.90	0.10	-0.22	-0.12
I4	0.91	0.05	-0.26	0.06
I5	-0.12	0.29	0.80	-0.10
I6	-0.25	-0.02	0.82	-0.08
I7	0.17	0.96	0.06	-0.01
I8	0.01	0.96	0.17	-0.05

Biographic Variable Designations

Variable Name	Variable Designation
Highest academic degree	I1
Academic rank	I2
Years at present institution	I3
Total years teaching	I4
Computer utilization	I5
Frequency of program preparation	I6
Innovativeness	I7
Number of innovations used	I8

In summary, the biographic independent variable set factor analysis has yielded a very clear factor structure composed of institutional seniority, innovativeness, a measure of technical competence and highest academic degree.

Interpersonal Communication Variable Set

Twenty-two independent variables comprise the interpersonal communication variable set, with sets of measures pertaining to activities at national and regional conventions; discussions with publisher representatives; and contact with other faculty.

The unrotated factor matrix, presented in Table 40, provides the typical pattern of a generalized first factor with some, but not all, of the remaining factors identifiable. Application of the Kaiser-Guttman rule would result in the rotation of six factors, whereas application of the scree and discontinuity tests would result in the selection of seven factors for rotation. The six factor solution provided a clearer factor structure, according to Thurston's guidelines, and was the solution chosen, although it should be noted that the resulting rotated matrix is not as clear as the equivalent matrix for the biographic independent variable set.

Factor 1 of the rotated matrix presented in Table 40 is best represented by the variable measures pertaining to the importance of contact with non-accounting faculty, both at an individual's own school and at other schools (I23,

Table 40. Factor Analysis of Interpersonal Communication Variables

Factor Number	Eigenvalue	Percent of Variance Explained	Cumulative Percent of Variance
1	6.84	31.1	31.1
2	2.69	12.2	43.3
3	2.49	11.3	54.6
4	1.82	8.3	62.9
5	1.43	6.5	69.4
6	1.32	6.0	75.4

Interpersonal Communication Variable Designations

Activity	Frequency	Importance
When attending national conventions		
presentations on education-related topics	I9	I13
informal discussions with other faculty	I10	I14
When attending regional conventions		
presentations on education-related topics	I11	I15
informal discussions with other faculty	I12	I16
Discussions with publisher representatives	I17	I18
Discussions with faculty from your school		
with accounting colleagues	I19	I22
with non-accounting business faculty	I20	I23
with faculty from non-business fields	I21	I24
Discussions with faculty from other schools		
with accounting colleagues	I25	I28
with non-accounting business faculty	I26	I29
with faculty from non-business fields	I27	I30

UNROTATED FACTOR MATRIX

Variable	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
I9	0.25	0.69	-0.03	-0.24	0.38	0.03
I10	0.64	0.15	-0.53	-0.26	-0.15	0.01
I11	0.22	0.75	-0.02	-0.07	0.32	0.15
I12	0.56	0.20	-0.54	-0.30	-0.17	0.08
I13	0.40	0.65	0.24	0.35	0.10	-0.09
I14	0.68	0.21	-0.44	0.06	-0.31	-0.14
I15	0.34	0.67	0.36	0.30	0.03	-0.07

Table 40--Continued

Variable	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
I16	0.58	0.31	-0.39	0.13	-0.44	-0.03
I17	0.40	-0.15	-0.06	0.31	0.19	0.69
I18	0.29	-0.04	-0.02	0.54	-0.10	0.62
I19	0.60	-0.44	-0.31	0.11	0.32	-0.11
I20	0.67	-0.10	0.01	-0.47	0.27	0.02
I21	0.60	-0.14	0.35	-0.18	0.33	-0.01
I22	0.48	-0.39	-0.25	0.45	0.28	-0.19
I23	0.71	-0.16	0.20	0.08	0.13	-0.25
I24	0.67	-0.12	0.46	0.17	0.09	-0.23
I25	0.67	-0.17	-0.29	-0.16	0.31	0.00
I26	0.56	-0.14	0.26	-0.46	-0.07	0.27
I27	0.46	-0.20	0.48	-0.34	-0.25	0.34
I28	0.70	-0.21	-0.19	0.34	-0.08	-0.10
I29	0.72	-0.04	0.32	-0.07	-0.36	-0.11
I30	0.62	-0.04	0.56	0.10	-0.32	-0.11

ROTATED FACTOR MATRIX

Variable	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
I9	-0.15	0.17	-0.01	0.23	0.79	-0.12
I10	-0.04	0.81	0.22	0.27	0.11	-0.01
I11	-0.12	0.15	-0.08	0.11	0.82	0.06
I12	-0.10	0.81	0.12	0.27	0.12	0.02
I13	0.41	0.10	0.06	-0.17	0.75	0.12
I14	0.23	0.82	0.24	-0.02	0.13	0.05
I15	0.47	0.04	-0.08	-0.14	0.73	0.10
I16	0.26	0.82	0.05	-0.10	0.15	0.15
I17	-0.04	0.04	0.26	0.24	0.07	0.82
I18	0.14	0.10	0.07	-0.07	0.03	0.86
I19	0.02	0.22	0.81	0.19	-0.14	0.11
I20	0.10	0.24	0.38	0.71	0.15	-0.10
I21	0.34	-0.10	0.40	0.56	0.20	0.01

Table 40--Continued

Variable	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
I22	0.12	0.11	0.82	-0.14	-0.10	0.19
I23	0.52	0.13	0.55	0.25	0.11	-0.03
I24	0.70	0.05	0.44	0.23	0.16	0.02
I25	-0.03	0.36	0.60	0.42	0.09	0.05
I26	0.28	0.17	0.01	0.75	-0.02	0.10
I27	0.47	0.03	-0.16	0.68	-0.13	0.21
I28	0.37	0.42	0.57	-0.02	-0.06	0.24
I29	0.74	0.32	0.10	0.33	0.00	0.02
I30	0.87	0.07	0.06	0.24	0.05	0.08

I24, I29, I30). Although the loadings are lower than in the rotated solution for the biographic variable set, three of these four interpersonal variables load on Factor 1 at approximately the .70 level or above.

Factor 2 is measured by the four variables representing the frequency and importance of informal discussions with other faculty while at national and regional conventions (I10, I12, I14, I16); all four variables load in excess of the .80 level. Factor 3 is comprised of the four variables measuring the frequency and importance of contact with other accounting faculty members, both from an individual's own school and at other schools (I19, I22, I25, I28). Of these four variables, contact with departmental peers (I19, I22) loads more highly than contact with accounting academicians at other institutions (I25, I28). It may also be noted that this factor is not pure--composed solely of variables with either high or low loadings.

Factor 4 of the interpersonal communication variable factor score set is represented by the frequency of contact with non-accounting faculty, again with respect to both an individual's own school (I20, I21), and other schools (I26, I27). Factors 5 and 6 are quite well-defined factors, with Factor 5 dominated by the measures of frequency and importance of attending educational presentations at regional and national conventions (I9, I11, I13, I15); and Factor 6 measuring the frequency and importance of contact with publisher representatives (I17, I18). The loadings of all six primary variables for these last two factors are in excess of the .72 level.

It is interesting to note the patterns into which these 22 variables have grouped themselves. Consider the eight variables pertaining to convention activities (I9 through I16). It would have been expected that these eight variables would correlate with each other, but it was not clear, at least to this researcher, that these variables would break into informal discussion versus educational presentation groups, as opposed to frequency versus importance, or national versus regional. This breakdown is especially interesting considering that, as seen in a previous section of this chapter, the informal discussion measures correlated with low centrality levels, but not with the opinion leadership measures.

Further, it might have been expected that the twelve measures pertaining to contact with other faculty members would split along institutional lines. As seen in Table 40, however, the primary division is between accounting and non-accounting faculty regardless of institution, followed by a separation of the frequency and importance of contact with non-accounting faculty.

Factor analysis of the interpersonal communication variables resulted in the following six factor solution--the importance of contact with non-accounting faculty members; frequency of contact with non-accounting faculty; the frequency and importance of contact with other accounting faculty; frequency and importance of attendance at convention educational presentations; frequency and importance of informal discussions with other faculty while at conventions; and the frequency and importance of contact with publisher representatives. Slightly in excess of 75% of the total variability contained in the 22 original z-score variables was retained in the six factors extracted and rotated.

Mass Media Communication Variable Set

The principal component analysis of the 12 mass media communication variables resulted in the selection of a four factor solution. Although the scree test indicated an optimal selection of three factors for rotation, application of the Kaiser-Guttman and clarity of structure criteria resulted in the choice of a four factor solution.

The resulting four factors, as may be seen in Table 41, explain slightly over 70% of the total variability. The unrotated factor matrix is composed of a generalized first factor, followed by a series of unidentified bi-polar factors. Factor 1 in the rotated solution presented in Table 41, represents the frequency of use of the accounting mass media sources (I35, I36, I37, I38). Factor 2 is largely a function of the perceived importance of the accounting mass media sources (I40, I41, I42), although the variable measuring the importance of the Book Review Section of *The Accounting Review* (I39) is not a part of this factor.

Table 41. Factor Analysis of Mass Media Communication Variables

Factor Number	Eigenvalue	Percent of Variance Explained	Cumulative Percent of Variance
1	4.62	38.5	38.5
2	1.62	13.5	51.9
3	1.20	10.0	62.0
4	1.03	8.6	70.5

UNROTATED FACTOR MATRIX

Variable	Factor 1	Factor 2	Factor 3	Factor 4
I31	0.50	-0.54	0.27	0.43
I32	0.26	0.54	0.61	0.19
I33	0.43	-0.23	-0.18	0.75
I34	0.31	0.77	0.04	0.23
I35	0.70	-0.22	0.44	-0.25
I36	0.75	-0.29	-0.13	-0.13
I37	0.85	-0.15	0.18	-0.10
I38	0.68	-0.18	-0.05	-0.29
I39	0.67	0.25	-0.14	-0.09
I40	0.60	0.18	-0.51	0.03
I41	0.74	0.26	-0.10	-0.02
I42	0.64	0.23	-0.44	-0.06

Table 41.--Continued

ROTATED FACTOR MATRIX

Variable	Factor 1	Factor 2	Factor 3	Factor 4
I31	0.48	-0.12	-0.03	0.74
I32	0.17	-0.13	0.85	0.03
I33	-0.00	0.28	0.04	0.87
I34	-0.12	0.40	0.75	-0.02
I35	0.88	0.00	0.16	0.08
I36	0.65	0.43	-0.14	0.23
I37	0.79	0.30	0.15	0.23
I38	0.66	0.37	-0.09	0.03
I39	0.50	0.36	0.40	0.02
I40	0.16	0.78	0.02	0.13
I41	0.42	0.58	0.32	0.09
I42	0.24	0.77	0.09	0.04

Mass Media Exposure Variable Designations

Source	Frequency	Importance
Collegiate News and Views	I31	I33
Dissertation Abstracts	I32	I34
Book Review section, The Accounting Review	I35	I39
Education and Professional Training, Journal of Accountancy	I36	I40
Education Research and Academic Notes, The Accounting Review	I37	I41
Supplement to the Accounting Review, Committee Reports	I38	I42

Factors 3 and 4 are well-defined, and measure the frequency and importance of Dissertation Abstracts (I32, I34), and Collegiate News and Views (I31, I33), respectively. Loadings of the primary variables for the latter three factors, with the exception of I41 in Factor 2, are all in excess of .73. It is somewhat disappointing to note that I41--the perceived importance of the Education Research and Academic Notes section of The Accounting Review does not load more highly than .58, inasmuch as I37 and I41 were the only two mass media variables that appeared to be significant from the results of the Pearson correlation analysis.

In summary, the four factor solution of the 12 variable mass media independent variable set is composed of factors pertaining to the frequency of use of the accounting journals, the importance of their use, and the frequency and importance of Dissertation Abstracts and Collegiate News and Views.

Analyses of the teaching innovation and general or combined teaching dependent variable sets follow.

Teaching Innovation Dependent Variable Set

Since the dependent variables pertaining to teaching innovation were of primary significance in this research, the opinion leadership and network centrality dependent variables were grouped by communication topic--teaching innovation versus combined or general teaching--rather than by functional area--opinion leadership versus network centrality.

The two weighted indexes (D13, D20) were not included in the dependent variable sets factor analyzed, inasmuch as each of these weighted indexes represents a linear composite of its corresponding individual frequency level measures.

Factor analysis of the nine teaching innovation dependent variables--the three opinion leadership variables (D4, D5, D6), and the six network centrality variables (D7 through D12), resulted in a three factor solution in which 73% of the total variance was explained by the first three factors. Although application of the scree test tended to indicate a four factor solution,[23] application of the Kaiser-Guttman rule and structural clarity criteria resulted in the retention of three factors for rotation.[24] Interestingly, the patterns exhibited by the unrotated and rotated matrices, illustrated in Table 42, are very similar, with both matrices yielding quite similar, identifiable factors containing high loadings.

Factor 1 of the rotated matrix is represented by the opinion leadership measures (D4, D5, D6), all of which load at the .87 level or better. Factor 2 is seen to represent the low and middle frequency level measures (D8, D9, D10), whereas Factor 3 is dominated by the two highest frequency level indices (D11, D12).

It would have been expected, based on the high intercorrelations between the opinion leadership variables, that one of the significant factors would represent opinion leadership. Of particular interest, however, is the result

Table 42. Factor Analysis of Teaching Innovation Dependent Variables

Factor Number	Eigenvalue	Percent of Variance Explained	Cumulative Percent of Variance
1	2.87	31.9	31.9
2	2.41	26.8	58.6
3	1.29	14.4	73.0

UNROTATED FACTOR MATRIX

Variable	Factor 1	Factor 2	Factor 3
D4	0.96	-0.07	0.15
D5	0.93	-0.11	0.14
D6	0.87	-0.07	0.16
D7	0.44	0.42	-0.31
D8	0.30	0.66	-0.41
D9	0.01	0.78	-0.33
D10	-0.03	0.78	0.06
D11	-0.19	0.61	0.58
D12	-0.05	0.42	0.72

Table 42.--Continued

ROTATED FACTOR MATRIX

Variable	Factor 1	Factor 2	Factor 3
D4	0.97	0.07	-0.03
D5	0.94	0.03	-0.06
D6	0.89	0.04	-0.02
D7	0.31	0.06	-0.08
D8	0.13	0.82	-0.01
D9	-0.15	0.82	0.16
D10	-0.10	0.61	0.48
D11	-0.13	0.16	0.84
D12	0.06	-0.04	0.83

Teaching Methods Opinion Leadership Variable Designations

Teaching Topic Area	Index Type	Variable Designation
New teaching methods and materials	Weighted	D4
	Unweighted	D5
	Directed Centrality	D6

Teaching Innovation Network Centrality Variable Designations

Content Area	Frequency Levels	Variable Designation
Teaching Innovation	Once per term or more	D7
	Once per month or more	D8
	2-3 times per month or more	D9
	Once per week or more	D10
	2-3 times per week or more	D11
	Once a day or more	D12
	Weighted	D13

that the centrality measures split into two identifiable factors. This finding emphasizes the dangers inherent in relying on one particular frequency level index--as many prior pieces of research have done--or even in relying on a relatively small range of indexes, as adequate representations of network centrality. This finding also suggests the possibility of identifying different groups of individuals with high centrality at different frequency levels, or more likely, an integrated structural patterning of the network as networks are defined at different minimum frequency levels. It appears possible that a categorization of individuals with respect to their network centrality, similar to the categorization of adopters based on their innovativeness,[25] could be formulated.

General Teaching Dependent Variables

Results of the principal components analysis of the nine general teaching, or combined teaching, dependent variables (D1, D2, D3, D14 through D 19) were quite similar to the results obtained with respect to the innovation dependent variables.

A three factor solution, explaining 74 per cent of the total variance, was chosen based on application of the Kaiser-Guttman rule and structual clarity criteria.[26] The patterns exhibited by the unrotated and rotated matrices were somewhat different in this case--the first factor in the unrotated matrix shown in Table 43 is a general factor, followed by a somewhat bi-polar factor.

The first factor in the rotated matrix, illustrated in Table 43, clearly represents the opinion leadership dimension; D1, D2 and D3 all load on the factor in excess of .86. Factor 2 is measured by the low and middle frequency level centrality variables (D14, D15, D16, D17), whereas Factor 3 is again represented by the two highest frequency level indexes (D18, D19). Thus, the combined teaching dependent variables decompose into an opinion leadership factor, a low and middle frequency level centrality factor and a higher frequency level centrality factor. The caveat with respect to relying on one or a small range of arbitrarily chosen frequency level(s) as an overall measure of network centrality, that was cited with respect to the teaching innovation dependent variables, also applies to the combined teaching dependent variables.

Of further interest is the additional evidence provided in Tables 42 and 43 concerning the relationship between opinion leadership and network centrality. Although each of the three factors in each solution are uncorrelated with the other factors from the same solution, an examination of the correlations of the original variables with each factor set supports the results obtained in the Pearson correlation analysis earlier in this chapter.

Specifically, with respect to the teaching innovation variable measures, it is apparent from Table 42 that there is little correspondence between the roles of opinion

Table 43. Factor Analysis of Combined Teaching Dependent Variables

Factor Number	Eigenvalue	Percent of Variance Explained	Cumulative Percent of Variance
1	3.54	39.3	39.3
2	1.99	22.2	61.5
3	1.12	12.5	74.0

UNROTATED FACTOR MATRIX

Variable	Factor 1	Factor 2	Factor 3
D1	0.83	-0.46	0.18
D2	0.82	-0.44	0.13
D3	0.77	-0.40	0.15
D14	0.72	0.01	-0.24
D15	0.63	0.33	-0.39
D16	0.64	0.49	-0.21
D17	0.39	0.74	-0.07
D18	0.31	0.67	0.40
D19	0.11	0.28	0.80

Table 43.--Continued

ROTATED FACTOR MATRIX

Variable	Factor 1	Factor 2	Factor 3
D1	0.96	0.09	0.04
D2	0.93	0.12	0.01
D3	0.87	0.11	0.04
D14	0.53	0.53	-0.13
D15	0.25	0.77	-0.12
D16	0.20	0.80	0.10
D17	-0.12	0.77	0.32
D18	-0.06	0.47	0.69
D19	0.08	-0.09	0.84

General Teaching Opinion Leadership Variable Designations

Teaching Topic Area	Index Type	Variable Designation
Ways to improve learning experience	Weighted	D1
	Unweighted	D2
	Directed Centrality	D3

Combined Teaching Network Centrality Variable Designations

Content Area	Frequency Levels	Variable Designation
Combined Teaching	Once per term or more	D14
	Once per month or more	D15
	2-3 times per month or more	D16
	Once per week or more	D17
	2-3 times per week or more	D18
	Once a day or more	D19
	Weighted	D20

leader and liaison or bridge member as represented by the centrality index variables. Only one of the centrality index variables--D7--correlates with the opinion leadership factor in excess of .15; furthermore, the loading--correlation--of D7 with the opinion leadership factor is only .31. Compared with the loadings of the other significant variables in the solution, this loading is quite low. Thus, with respect to communication concerning teaching innovations, there appears to be little relationship between opinion leadership and network centrality.

An examination of the loadings of the combined teaching centrality variables, with the first--opinion leadership--factor in Table 43, provides additional support for the relationship cited earlier in this chapter. D14--combined teaching centrality at a frequency level of once per term or more--correlates with the general teaching opinion leadership factor at the .53 level--approximately the same level with which it correlates with Factor 2. The loadings of the other five centrality measures with Factor 1 steadily decrease until they become approximately zero as the highest centrality frequency levels are reached. It is apparent that, where a relationship between opinion leadership and network centrality exists, the relationship is between the lowest centrality indexes and opinion leadership. Thus, there is relatively little correspondence between opinion leadership and network centrality with respect to communication concerning general teaching topics, and it is only when networks are defined at very infrequent levels of communication that the appearance of a relationship emerges.

In summary, this section has detailed the factor analysis procedures employed in this research, and has discussed the results of the principal component factor analyses of five variable sets--biographic, interpersonal communication and mass media communication independent variables; teaching innovation and general teaching dependent variables. Factor scores were calculated for each individual for each of the twenty significant factors identified in the separate analyses. The final section of this chapter is devoted to discussing the results of using the generated factor scores in multiple regression analyses.

Multiple Regression Analysis

Multiple regression was employed in this research as a means of further exploring the relationships between the standardized independent and dependent variables which had, up to this point, been correlated and factor analyzed.

In the first major section of this chapter, the Pearson product-moment correlations between each independent and dependent variable, as well as within the dependent variable sets, were presented. Although that section does provide evidence of the relationship within each individual pair of variables which were correlated, it does not provide evidence of the relationships that exist when the dependent and independent variables are grouped.

In the second section of this chapter, results of the factor analyses of the three independent and two dependent variable sets were presented, and the significant dimensions of the variability within each of these variable sets were identified. Factor scores were then calculated for each individual for each significant factor.

The final section of this chapter explores relationships between the significant dimensions within each of the independent variable sets with the dependent factor score variables by the use of multiple regression procedures.

Multiple Regression Procedures

In the context of this research, multiple regression is simply an extension of the analysis in the first section of this chapter--Pearson correlation analysis--using the factor score variables as data rather than the original z-score variables. Since the factor score variables within each independent variable set are uncorrelated, thereby eliminating the danger of multicollinearity problems, the use of multiple regression allows the calculation of a correlation coefficient--usually referred to as "multiple R"--between each dependent factor score variable and each set of independent variable factors.

The general model for multiple linear regression is specified by Tatsuoka as:

> Given measurements on a set $X_1, X_2, \ldots X_p$ of prediction variables and on one criterion variable Y for a group of N individuals, the problem of multiple regression is to construct a linear function

$$\tilde{y} = a + b_1X_1 + b_2X_2 + \ldots + b_pX_p$$

having the property that the sum of squared errors,

$$\varepsilon^2 = \Sigma(Y - \tilde{Y})^2 = (Y - a - b_1X_1 - b_2X_2 - \ldots - b_pX_p)^2$$

is as small as possible for the data at hand. More specifically, the prcblem is to determine the true values of $a, b_1, b_2, \ldots, b_p$ so as to minimize the quantity ε^2.[27]

In fact, the multiple regression procedures used in this research employed a somewhat simpler form of the general model specified above. Since the factor scores within each independent variable set were uncorrelated, and were normally distributed variables with a mean of 0 and a standard deviation of 1, the constant term--"a" term in the linear model--for each calculated regression equation was equal to 0. In addition, the coefficients for each independent variable were, in actuality, "beta coefficients"--standardized regression coefficients.[28] Or, put in another way, the b coefficients and the beta coefficients--standardized b's. . . for each independent variable in each regression equation are identical.

The regression equations reported in this section were calculated using the forward stepwise procedure available in SPSS. With this procedure,

> The variable that explains the greatest amount of variance in the dependent variable will enter first; the variable that explains the greatest amount of variance in conjunction with the first will enter second, and so on. In other words, the variable that explains the greatest amount of variance unexplained by the variables already in the equation enters at each step. And one or more of the variables may never be entered into the equation if the statistical criteria are not met.[29]

The inclusion of variables in the regression equation ceases either when all independent variables have been included, or when the "F level" is too low to warrant inclusion. "F level," in this context, is explained as:

> . . . F. . . relates to the F ratio computed in a test for significance of a regression coefficient. At each step in the analysis, F ratios are computed for variables not already in the equation. The F ratio for a given variable is the value that would be obtained if the variable were brought in on the very next step.[30]

The default F level of .01 was used in this research. In effect, this meant that if inclusion of the additional variable would have contributed very little in explaining the variability in the dependent variable, given the other variables already in the equation, then the additional variable was not included.

Usually, when an independent variable is deleted from a regression equation--either by not being included, or by being removed if a procedure other than forward stepwise is used--the b coefficients of the independent variables in the reduced regression equation will differ from the respective b coefficients of the same variables in the original regression equation. However, in this research, since the factor score variables within each variable set are independent, the b coefficients of the independent variables in the regression equation are not affected by the inclusion, or deletion, of other factor score variables from the same variable set. The b, or beta, coefficients in the regression equations reported in this research are, in fact, the

Pearson product-moment correlations between the independent variable factors and each dependent variable factor. Thus, by examining the tables in this section, the reader has simultaneously available both the correlations of <u>each</u> independent variable factor with each dependent variable factor--as long as the independent variable factor is included in the regression equation--and the correlation of the included independent variable factors as a <u>set</u> with the dependent variable factor--the multiple R. It is in this sense that the multiple regression procedures used in this section are viewed as an extension of the Pearson correlation analysis. The reader seeking to interpret the size of the coefficients of the individual variable factors may use Table 14 of this chapter, in which the magnitude of Pearson correlation coefficients required to achieve various levels of statistical significance, with $n - 2 = 95$ degrees of freedom, are presented.

The equivalent statistical test for the multiple R--the correlation of the independent variables in the equation, as a set, with the dependent variable--is the overall F-test with k and $N - k - 1$ degrees of freedom, where k is the number of independent variables in the equation and N is the number of individuals.[31]

The per cent of variance of the dependent variable, explained by the set of independent variables, is given by the square of the multiple R:

The interpretation of the multiple correlation coefficient exactly parallels that of the regular product-moment ('zero order') correlation coefficient; its square indicates the proportion of variabiltiy in Y that is accounted for by the linear regression on the predictors in the normative sample.[32]

Tatsuoka goes on to say:

It is important to realize that the 'proportion of variability accounted for' which R^2 represents, refers only to what is true of the particular sample used in constructing the regression equation. There will almost always be some decrease in the corresponding proportion for subsequent samples. (This is why it is necessary to cross-validate the regression equation on an independent sample in order to get a more accurate estimate of the efficiency of actual predictions by the equation. Generally speaking, the amount of decrease--which is called shrinkage--becomes greater as the number of prediction variables increases. A formula is available for estimating (approximately) what the proportion of accounted for variability is likely to be in a subsequent sample. The square root of this estimated proportion is called the multiple R corrected for shrinkage and is given by

$$R' = \sqrt{1 - \frac{N-1}{N-p-1}(1 - R^2)}$$

Where R is the observed (uncorrected) multiple-R, p is the number of predictors, and N is the number of cases in the normative sample.[33]

Notice, then, that although the size of the coefficients of the individual independent variables are not affected by the addition or deletion of other independent variables from the same set, the more variables there are in the regression equation, the greater will be the percentage loss in adjusting the original R^2 for shrinkage.

As a further note in the interpretation of the adjusted R^2 statistics presented here, and as a caveat that applies to all analyses in this chapter, the multiple R and adjusted R^2 statistics of this section assume an underlying linear model. This multiple R statistic, in essence, is an assessment of how well the calculated linear regression equation fits the observed data; the adjusted R^2 statistic indicates the per cent of variance explained by the linear composite of independent variables, adjusted for shrinkage. Since the linear model is by far the most widely used model at the present time, it was considered appropriate for application in this dissertation. However, unless a linear model can be found which is, in fact, a perfect fit for the actual data, a higher order model--polynomial or transformed function--can always be found which will improve the fit of the regression equation to the data, and increase both the multiple R and adjusted R^2.[34]

Finally, since the regression equations are computed for each of the three independent variable sets of factors separately, the reported statistics apply only to the specific relationships tested. If all three independent factor score variable sets were combined in a single regression analysis, the total per cent of variance of each dependent variable, explained by the combined independent factor score variables, would undoubtedly be greater than for any of the regressions for the separate independent variable sets.[35] However, since the factor scores of each independent variable sets are correlated with the factor scores from the other independent variable sets, potential multicollinearity and interpretation problems would arise.

Accordingly, the independent variable sets are treated separately.

The final sections of this chapter provide the results of the multiple regression analyses for each independent variable set with each of the dependent variable factors.

Biographic Variables

Of the 18 regressions between the three independent variable factor score sets and the six dependent factor score variables, only 8 regressions yielded regression equations significant at the $p \leq .05$ level as indicated by the overall F-test. Of the six regressions between the biographic factor score variables--institutional seniority, innovativeness, computer familiarization and highest academic degree (IFAC1 through IFAC4, respectively)--and the dependent factor score variables, four resulted in regression equations significant at the $p \leq .05$ level; these four are reported in Table 44. Of these four, two equations were significant at better than the 1 per cent level.

Approximately 10 per cent of the variability in combined teaching opinion leadership (DFAC1) was explained by positive relationships with innovativeness, institutional seniority and highest academic degree (IFAC2, IFAC1, IFAC4). Although the full regression equation, significant at the $p \leq .05$ level, included computer familiarization as an independent variable, the Pearson correlation of this

Table 44. Biographic Independent Variable Factors Regressed with Combined Teaching and Teaching Innovation Dependent Variable Factors

Dependent Variable: Combined Teaching Opinion Leadership

Multiple R	0.36
R Square	0.13
Adjusted R Square	0.10
Calculated F	4.63
Significance	$p \leq .01$

Independent Variables:	B	Beta
Innovativeness	0.24	0.24
Institutional seniority	0.23	0.23
Highest degree held	0.14	0.14

Dependent Variable: Teaching Innovation Opinion Leadership

Multiple R	0.28
R Square	0.08
Adjusted R Square	0.06
Calculated F	4.01
Significance	$p \leq .03$

Independent Variables:	B	Beta
Innovativeness	0.26	0.26
Institutional seniority	0.11	0.11

Dependent Variable: Combined Teaching Network Centrality at Low and Middle Frequency Levels

Multiple R	0.40
R Square	0.16
Adjusted R Square	0.12
Calculated F	4.42
Significance	$p \leq .01$

Independent Variables	B	Beta
Institutional seniority	-0.36	-0.36
Innovativeness	-0.11	-0.11
Highest degree held	0.11	0.11
Computer familiarization	0.09	0.09

Dependent Variable: Teaching Innovation Network Centrality at Low and Middle Frequency Levels

Multiple R	0.25
R Square	0.06
Adjusted R Square	0.04
Calculated F	3.13
Significance	$p \leq .05$

Independent Variables:	B	Beta
Institutional seniority	-0.22	-0.22
Computer familiarization	0.12	0.12

variable--IFAC3--with the dependent variable was very low. The regression equation with innovativeness, institutional seniority, and highest academic degree (IFAC2, IFAC1, and IFAC4) was significant at better than the 1 per cent level, and was the equation at which the highest adjusted R^2 level was reached. This latter equation will be considered as the indicant of the primary relationships involved. These relationships confirm and expand upon what was discovered in the previous analyses; opinion leaders with respect to general teaching-related matters are more innovative than their peers and more senior in their institutions, in terms of highest academic degree, academic rank, total years teaching and years at their specific school.

The regression equation between the biographic factor score variables and opinion leadership with respect to teaching innovation (DFAC4) was significant at the $p \leq .05$ level with two independent variables included--innovativeness and institutional seniority (IFAC2, IFAC1). The betas for both of these independent factor score variables were positive, and approximately six per cent of the total variance of DFAC4 was explained by these two variables. These results provide evidence of a relationship undetected by the Pearson correlation analysis. The relationship between innovativeness and teaching methods opinion leadership was previously found to exist--all six correlations between I7 and I8, and D4, D5 and D6 were significant at better than the five per cent level. When the three measures comprising institutional seniority were combined as a significant factor (IFAC1) and regressed in conjunction with the innovativeness factor (IFAC2), it was found that both factors contributed towards explaining the variability in teaching methods opinion leadership. Thus, although the relationship between institutional seniority and teaching methods opinion leadership does not appear to be as strong as the relationship between institutional seniority and combined teaching opinion leadership, the profile of an opinion leader as being an individual both innovative and relatively senior in the organization is strengthened. This profile is in sharp contrast to the profile of individuals who are relatively high in network centrality, as is developed below.

Approximately 12 1/2 per cent of the variability in DFAC2--combined teaching centrality at low and middle frequency levels--was explained by the regression equation comprising the four biographic variable factors. As may be seen in Table 44, the overall regression equation was significant at better than the 1 per cent level. Innovativeness and institutional seniority were both negatively correlated with DFACZ; computer familiarization and highest academic degree were both positively correlated with DFACZ. Thus, those individuals relatively central in the communication patterns within their departments with respect to teaching topics, are relatively less senior in their organizations; hold, on the average, somewhat higher academic degrees; are more familiar with the use of computers and with computer programming; and are relatively less innovative. To this researcher, this set of characteristics strongly suggests younger, junior faculty members as being the individuals with relatively high general teaching centrality measures.

The calculated regression equation between teaching innovation centrality at low and middle frequency levels (DFAC5) and the biographic factor score variables yielded a negative correlation between teaching innovation centrality and instituitonal seniority (IFAC1), as well as a positive correlation between computer familiarization (IFAC3) and DFAC5. Slightly over 4 per cent of the variance in teaching innovation centrality was explained by these two independent variable factors. These results reinforce the profile of individuals with high network centrality as being younger, more up-to-date--in terms of familiarity with computers and computer programming--faculty members.

Finally, neither of the regressions between the biographic variable factor score set and the measures of network centrality at high frequency levels (DFAC3 and DFAC6) resulted in regression equations significant at $p \leq .05$.

Interpersonal Communication Variables

Only 2 of the 6 regressions between the interpersonal communication factor score variables (IFAC5 through IFAC10), and the dependent factor score variables, regression equations significant at the $p \leq .05$ level.

Reduced versions of both equations, however, were significant at $p \leq .01$.

The full regression equation cited in Table 45 between combined teaching centrality at low and middle frequency levels (DFAC2), and the interpersonal factor score variables (IFAC5 through IFAC10), included all six of the independent variable measures. The coefficients of all independent variables were positive, except for the coefficient of ZFAC9--the perceived frequency and importance of attendance at convention educational presentations--which exhibited a negative relationship. Approximately 11 per cent of the variance is combined teaching centrality at low and middle frequency levels (DFAC2) was explained by the six independent factor score variables, whereas approximately 12 per cent of the variance in DFAC2 was explained by a reduced equation containing all the independent factor score variables except for IFAC10--contact with publisher representatives. The five variable equation was found to be significant at $p \leq .01$ in the overall F-test, and will be used as evidence of the primary underlying relationships. Thus, network centrality concerning general teaching-related matters, at low and middle frequency levels of communication, was found to be positively correlated with the perceived frequency and importance of contact with other accounting faculty members; contact with non-accounting faculty members; and with engaging in informal discussions with other faculty members at conventions. A negative relationship was found

Table 45. Interpersonal Communication Independent Variable Factors Regressed With Combined Teaching Dependent Variable Factors

Dependent Variable: Combined Teaching Network Centrality at Low and Middle Frequency Levels

Multiple R	0.41
R Square	0.16
Adjusted R Square	0.12
Calculated F	3.57
Significance	$p \leq .01$

Independent Variables:	B	Beta
Frequency of contact with non-accounting faculty	0.25	0.25
Frequency and importance of contact with other accounting faculty	0.20	0.20
Frequency and importance of informal discussions with other faculty at conventions	0.19	0.19
Frequency and importance of attendance at educational presentations at conventions	-0.13	-0.13
Importance of contact with non-accounting faculty	0.11	0.11

Dependent Variable: Teaching Innovation Network Centrality at Low and Middle Frequency Levels

Multiple R	0.36
R Square	0.13
Adjusted R Square	0.08
Calculated F	2.73
Significance	$p \leq .03$

Independent Variables:	B	Beta
Frequency and importance of informal discussions with other faculty at conventions	0.25	0.25
Frequency of contact with non-accounting faculty	0.23	0.23
Importance of contact with non-accounting faculty	0.07	0.07
Frequency and importance of contact with other accounting faculty	0.07	0.07
Frequency and importance of contact with publisher representatives	-0.05	-0.05

to exist with the perceived frequency and importance of attendance at convention educational presentations.

Somewhat similarly, the full regression equation, significant at $p \leq .05$, between the interpersonal communication factor score variables and teaching innovation network centrality at low and middle frequency levels (DFAC5), included all six independent factor score measures. The highest adjusted R^2--slightly under 10 per cent--was achieved with the inclusion of just two independent factor score variables--the perceived frequency and importance of participating in informal discussions at conventions (IFAC6), and the perceived frequency of contact with non-accounting faculty (IFAC8). A reduced regression equation containing IFAC5--the perceived importance of contact with non-accounting faculty--in addition to IFAC6 and IFAC8, was significant at $p \leq .01$; approximately 9 1/2 per cent of the total variability in DFAC5 was explained by this regression equation. All variable coefficients were positive except for the coefficient associated with IFAC10--the frequency and importance of contact with publisher representatives--which was negative. Thus, the primary relationships exhibited between the interpersonal communication variables and teaching innovation centrality, at low and middle frequency levels, appeared to be between network centrality and the perceived frequency and importance of two interpersonal sources of information--informal discussions at national and regional conventions, and contact with non-accounting faculty. Additional relationships with teaching innovation network centrality included a positive relationship with the frequency and importance of contact with other accounting faculty, and a negative relationship concerning contact with publisher representatives.

As was the case with the results of the regression equations with the opinion leadership measures, the results of the regression equations with respect to combined teaching innovation centrality confirm and expand upon the results of the z-score Pearson correlation analyses. Although only two of the six regressions produced regression equations significant at $p \leq .05$, the results of the Pearson correlation section identified only one relationship between an interpersonal variable and any of the opinion leadership measures, and no relationships that held specifically for high network centrality levels. As previously mentioned in Chapter II, very little communication contact was defined at the highest frequency levels; thus, the wealth of relationships found with respect to centrality at the low and middle frequency levels applies to most of the 97 individuals in the analysis.

Mass Media Variables

As was the case with the interpersonal factor score variables, only two of the six regressions between the mass media factor score variables and the dependent factor score variables were significant at $p \leq .05$. Regrettably, neither of these statistically significant regression equations explained variance in the teaching innovation factor score variable set.

The mass media factor score variables were identified as the frequency of use of accounting journals (IFAC11) the perceived importance of accounting journals as an information source (IFAC12), and the perceived frequency of use and importance of Dissertation Abstracts and Collegiate News and Views (IFAC13 and IFAC14, respectively). As may be seen in Table 46, two of these variables--IFAC11 and IFAC13--were found to be related to combined teaching centrality at low and middle frequency levels; slightly over 4 1/2 per cent of the variance in DFAC2 was explained by these positive relationships. Thus, these results indicate that individuals with relatively high combined teaching centrality scores use the accounting journals as an information source regarding new teaching methods more frequently than their colleagues, and have a higher frequency of use, and perceived importance, of Dissertation Abstracts as a source of information.

The final regression equation significant at $p \leq .05$ explained slightly over 4 per cent of the variance in general teaching network centrality at high frequency levels. The independent variables included in the regression equation were IFAC11 and IFAC12--the frequency of use and perceived importance of the accounting journals. Thus, individuals more central to their general teaching communication networks at high frequency levels perceive the accounting journals

Table 46. Mass Media Communication Independent Variable Factors Regressed With Combined Teaching Dependent Variable Factors

Dependent Variable: Combined Teaching Network Centrality at Low and Middle Frequency Levels

Multiple R	0.26
R Square	0.07
Adjusted R Square	0.05
Calculated F	3.30
Significance	$p \leq .05$

Independent Variables:	B	Beta
Frequency and importance of Dissertation Abstracts as an information source	0.18	0.18
Frequency of use of the accounting journals as an information source	0.18	0.18

Dependent Variable: Combined Teaching Network Centrality at High Frequency Levels

Multiple R	0.25
R Square	0.06
Adjusted R Square	0.04
Calculated F	3.11
Significance	$p \leq .05$

Independent Variables:	B	Beta
Importance of the accounting journals as an information source	0.23	0.23
Frequency of use of the accounting journals as an information source	0.09	0.09

as a more important, and frequently used, source of information for themselves than do the other members of their departments.

The results reported in this subsection are not identical to, but do confirm, the results of the Pearson correlation section of this chapter. Although 2 of the 3 Pearson correlations between combined teaching opinion leadership and the frequency of use of the Education Research and Academic Notes section of The Accounting Review (I37) were found to be significant, the correlation between the frequency of use of the accounting journals (IFAC11) and combined teaching opinion leadership (DFAC1) was not significant at $p \leq .05$. Apparently, when combined with the other accounting journal sources in IFAC11, the strength of the relationship between the Education Research and Academic Notes section of The Accounting Review as an information source, and the combined teaching opinion leadership variables, was diluted. Thus, the Education Research and Academic Notes section of The Accounting Review appears to be the only accounting journal source more frequently used as a source of information, with respect to new teaching methods, by general teaching opinion leaders than by their colleagues.

The accounting journal sources, as a group, are a more frequently used source of information by individuals with high combined teaching centrality indexes--at all frequency levels--and are considered a more important source of information by those individuals central to their networks at higher frequency levels. In addition, Dissertation Abstracts is both more frequently used, and is considered more important, by individuals central to their network at the low and middle frequency levels. The results of both the Pearson correlation and multiple regression analyses may be summarized as follows.

The Education Research and Academic Notes section of The Accounting Review is the only accounting journal source more frequently used by both general teaching opinion leaders, and by individuals relatively more central to their general teaching communication networks. The frequency and importance of Dissertation Abstracts is postively associated with high and middle frequency level combined teaching centrality. Given the younger, junior faculty profile developed in the previous analyses--representing individuals with high combined teaching centrality--the relationship between network centrality, and the frequency of use and importance of Dissertation Abstracts, might have been expected. Finally, the accounting journal sources of information are more frequently used by individuals central to their networks at low and middle frequency levels, and are perceived as more important by the key individuals in networks defined at high frequency levels.

FOOTNOTES TO CHAPTER III

[1]The work by MacDonald and Schwartz examines relationships between liaisons and non-liaisons with respect to demographic and communication variables. The role of liaison has not been explicitly defined in the present research, but was used as an explanatory concept in the discussion of centrality measures. In communications research, the concepts of liaisonness and centrality are related, but not identical, and no commonly accepted liaisonness index has yet been formulated. The work of Guimaraes employs communication integration--a measure of the overall connectedness of a system, and a measure which is a system analog to individual centrality measures--as a dependent variable. However, his analysis examines relationships between systems, rather than employing the focus of the present research--relative individual differences. See MacDonald, "Communication Roles and Communication Content." Schwartz, "Liaison Communication Roles;" and Lytton L. Guimaraes, "Communication Integration in Modern and Traditional Social Systems: A Comparative Analysis Across Twenty Communities of Minas Gerais, Brazil" (unpublished Ph.D. Dissertation, Michigan State University, 1972).

[2]See virtually any basic statistical text, such as Gene V. Glass and Julian C. Stanley, Statistical Methods in Education and Psychology (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1970), pp. 109-27.

[3]See Nie, et al., SPSS, p. 281. A two-tail test is employed in this research partly because of the lack of evidence for predicting the direction of the relationships between the independent variables and network centrality, and partly because of the difficulties involved in interpreting the meaningfulness of the size of the correlation coefficients. For example, a correlation coefficient of only .168 is sufficient for statistical significance at the $p = .05$ level using a one-tail test with $n - 2 = 95$ degrees of freedom, whereas the same coefficient--.168--is significant at only the $p = .10$ level using a two-tail test. Since the tests presented here are, in fact, simply an aid in the interpretation of the results, rather than being tests of formal statistical hypotheses, use of the two-tail test might be thought of simply as a more conservative approach in interpreting the size of the coefficient.

Even when a formal statistical test is used, however, a statistically significant difference does not necessarily imply a meaningful difference. Although a correlation coefficient of .200 is statistically significant at the p = .05 level using a two-tail test and 95 degrees of freedom, whether the .200 represents a meaningful difference is a matter of judgment. The usual procedure in such a case is to compare the size of the coefficients with the results of similar previous research. As previously mentioned, however, such data are not, to this writer's knowledge, available with respect to the network centrality measures. In addition, suitable data for comparison purposes are unavailable with respect to opinion leadership in the institutionalized setting of higher education.

It should be recognized, of course, that any correlation coefficient differnt from 0 is, in fact, statistically significant in this research, inasmuch as the present analysis examines a population. The formal use of the significance tests reported here is based on the assumption that the individuals who were analyzed constitute a random sample from a larger population of research significance.

[4]This result could be considered supportive of the research results reported by Farace and Danowski regarding the perceptions of liaisons and non-liaisons with respect to the perceived number of communication contacts, etc. See Farace and Danowski, "Networks in Organizations."

[5]Fred N. Kerlinger, Foundations of Behavioral Research (2d ed., New York: Holt, Rinehart and Winston, Inc., 1973), p. 659.

[6]See William W. Cooley and Paul R. Lohnes, Multivariate Data Analysis (New York: John Wiley & Sons, Inc., 1971), p. 129.

[7]Harry H. Harman, Modern Factor Analysis (2d ed., Chicago: The University of Chicago Press, 1967), pp. 14-15.

[8]For example, Harman cites the time required with a desk calculator, for the calculation of just the first factor weights in a twenty-four variable analysis, to be more than seventy hours. Ibid., p. 156.

[9]Kerlinger, Behavioral Research, pp. 667-68. Although Kerlinger is speaking here of the principal factor model, rather than the principal component model per se, the geometric analogy would be applicable to all factor analytic models.

[10]The concept of rotation will be discussed at a later point in this section.

[11]Harman, Modern Factor Analysis, p. 15.

[12]Maurice M. Tatsuoka, Multivariate Analysis: Techniques for Educational and Psychological Research (New York: John Wiley & Sons, Inc., 1971), pp. 146-48.

[13]In order to eliminate the difficulties involved in factoring variables with different size scales or ranges, most modern factor analytic solutions are obtained after first standardizing the variables. With n variables, then, the total variability of these n variables will be n times 1 equals n. Thus, the total variability--n--divided by the number of variables--n--represents the average contribution of any single variable toward the total variability of all variables in the set.

[14]Raymond B. Cattell, "The Scree Test for the Number of Factors," Multivariate Behavioral Research, Vol. 1 (April, 1966), pp. 245-76.

[15]R. J. Rummel, Applied Factor Analysis (Evanston, Illinois: Northwestern University Press, 1970), pp. 364-65. Rummel mentions the discontinuity test in conjunction with the common factor model, an alternative approach to the principal component model. However, since the decision regarding the number of factors to be retained must be made before rotation regardless of the model employed, the test for discontinuity could have potential utility with either model.

[16]See for example, Tatsuoka, Multivariate Analysis, pp. 146-48; and Chapter 15 of Rummel, Applied Factor Analysis, pp. 349-67.

[17]See Harman, Modern Factor Analysis, pp. 97-99.

[18]Robert Libby, "Prediction Achievement and the Use of Simulated Decision Makers In Information Evaluation" (unpublished Ph.D. Dissertation, University of Illinois, 1974), p. 62. As noted by Libby, a complete discussion of this procedure is contained in Harman, Modern Factor Analysis, pp. 304-13.

[19]Kerlinger, Behavioral Research, p. 671.

[20]See Ibid., p. 673, among others.

[21]The factor scores used in this research were calculated by the SPSS Factor routine. Details of the procedure employed may be found in the Nie, et al. SPSS manual: SPSS, pp. 487-90. By a "true factor score" is meant a method of calculating the new variable value using all the original variables to some degree, depending upon their loadings on the specific factor for which the score is being calculated. This procedure may be contrasted with approaches in which

only a single variable, or subset of variables, is used in the computational procedure. The use of a single variable, called the basic variable approach, has the advantage of preserving experimental reality, but requires that the variable be loaded very highly on the factor and allows relatively highly intercorrelated variables to be chosen to represent the different factors. This introduces the possibility of multicollinearity problems if further analysis such as multiple regression is to be used.

[22]As mentioned previously, there have been virtually no substantive applications of the diffusion research or network analysis methodologies in the context of innovation in higher education. The variables used in this research were selected based on preliminary interviews, a review of related research, and the operationalization of constructs from the diffusion and network analysis research traditions. Since this dissertation is primarily an exploratory effort, it was decided to use a method of factor representation aimed at identifying significant dimensions in the total variability of the variables used--generation of true factor scores--rather than procedures such as the basic variable method.

[23]"Tended to indicate" in this context refers to the difficulties involved in actually applying the scree test. Since the method involves the subjective determination of when a graphed curve starts to flatten out, the method is imprecise in situations where the curve does not have marked discontinuities.

[24]It may be of interest to the reader, after examining the three factor solution presented in Table 42, to know that the four factor solution followed a pattern similar to the three factor solution. Specifically, whereas the three factor solution will be shown to yield factors representing opinion leadership, low centrality levels and high centrality levels; the four factor solution yielded factors representing opinion leadership, as well as low, middle and high centrality frequency levels. The major points discussed in Chapter III of this dissertation regarding the three factor solution would also be applicable to the four factor solution.

[25]See Chapter 5 of Rogers with Shoemaker, Communication of Innovations, pp. 174-96, for a discussion of the adopter categorization scheme based on innovativeness.

[26]The scree test was even more difficult for this researcher to apply to the combined teaching dependent variables than for the teaching innovation dependent variables. Results of the scree test again inidcated a four factor solution as being the most appropriate, whereas application of the Kaiser-Guttman rule and Thurstone's structural clarity criteria suggested a three factor solution.

[27]Tatsuoka, Multivariate Analysis, p. 26.

[28]For a discussion of the relationship between "b" and "beta," see the excellent basic reference to regression by John Neter and William Wasserman, Applied Linear Statistical Models: Regression, Analysis of Variance and Experimental Designs (Homewood, Illinois: Richard D. Irwin, Inc., 1974), pp. 267-68.

[29]Nie, et al., SPSS, p. 345.

[30]Ibid., p. 346.

[31]See, for example, Ibid., pp. 334-40, as well as Neter and Wasserman, Applied Linear Models, p. 228. In the tables of this section, the calculated F statistic for each significant regression equation is given; in addition, and of more potential utility to the reader, the calculated significance levels for these F tests are reported. Actual significance levels for these F-tests were calculated using a computer program contributed by Professor Andrew Snyir, of the Pennsylvania State University, to whom appreciation is expressed.

[32]Maurice M. Tatsuoka, Validation Studies: The Use of Multiple Regression Equations, Selected Topics in Advanced Statistics: An Elementary Approach, Number 5 (Champaign, Illinois: The Institute for Personality and Ability Testing, 1969), p. 11.

[33]Ibid., pp. 11-12. See also, for example, Neter and Wasserman, Applied Linear Models, p. 229. It might be noted here that the "adjusted R^2" reported in version 6.0 of SPSS does not use the formulas cited by either of the above sources in calculating the adjusted R^2. The formula used by SPSS presents a slightly more liberal--closer to the original R^2--adjusted R^2 than most published sources. The adjusted R^2 statistics presented in the tables in this section use the formulas specified by Tatsuoka, Neter and Wasserman, and others. In a recent newsletter, SPSS has announced that it intends to revise the formula used in their calculations to conform with the more accepted version.

[34]Further, there is theoretical justification for expecting non-linear relationships between opinion leadership, and at least some of the independent variables, to exist. See Rogers with Shoemaker, Communication of Innovations, p. 190. However, identifying the best fitting, and most useful, polynomial functions as expressions of the relationship between the dependent and independent variable factors, and variables, in a very complex task that is considered outside the scope of this exploratory research. This writer has, in fact, started examining these relationships and found much greater adjusted R^2s--e.g. up to 20% with just one of the independent standardized variables--than are reported in this research. However, the complexities of identifying the best, most general, and most useful transformations make this further investigation a worthy research project in its own right.

[35]As a means of assessing how much is, in fact, lost by splitting the independent variable sets and using single dependent variable factors, it may be of interest to the reader to know that the first significant canonical variate alone, in a canonical correlation of the 14 independent variable factors and 6 dependent variable factors, yielded a canonical correlation coefficient of .639, significant at less than the 2 per cent level, which explained 40.8 per cent of the total variance. Further, it should be remembered that up to 30% of the variability within each independent variable set was lost by extracting only the significant uncorrelated factors; it is likely that a larger portion of the total variability would be retained with more complex factor models, such as those suitable for oblique rotation procedures, where the resulting factors are allowed to be correlated.

CHAPTER IV

SUMMARY AND CONCLUSIONS

Summary

Chapter IV of this research is devoted to an exposition of the overall results of the previous data analyses; a conclusions section, in which the research results are applied in the context of the existing problem area; a section mentioning some of the limitations of the current research; and a brief final section offering suggestions for the direction of further research in the problem area of achieving increased implementation of existing, or future, innovative teaching methodology within accounting higher education.

Methodology

Forty-two independent, and twenty dependent, variables were operationalized in Chapter II. The independent variables were categorized as 8 biographic, 22 interpersonal communication, and 12 mass media communication variables; each variable was standardized within each school resulting in a relative measure of the differences between the 97 individuals, from 8 schools, who formed the respondent set analyzed in this research. The 20 dependent variable measures, which were also standardized within each school, consisted of 6 measures of opinion leadership and 14 measures of network centrality. Half of the opinion leadership variables, and half of the network centrality variables, pertained to communication regarding new teaching methods and materials; the remaining halves of the opinion leadership and network centrality variable sets pertained to all teaching-related communication. For the convenience of the reader, a listing of the variable name and designation of each of the 62 z-score variables is presented in Figure 13.

Initially, the existence of linear relationships between all independent and dependent z-score variables was estimated by Pearson product-moment correlation coefficients. The significant relationships which were identified are listed in Table 47.

The relationships within the variable sets was then explored by conducting a principal components factor analysis for each of the following variable sets--biographic independent; interpersonal communication independent; mass media communication independent; teaching innovation, or teaching methods, dependent; and combined teaching dependent. A determination of the number of significant dimensions within the variability of each of these five variable sets was made by determining the number of significant factors. Four significant factors were extracted from the 8 biographic variable set; 6 factors were retained from the 22 interpersonal communication and variable set; and 4 significant

Figure 13

BIOGRAPHIC INDEPENDENT VARIABLES

Designation	Variable Name
I1	Highest academic degree
I2	Academic rank
I3	Years at present institution
I4	Total years teaching
I5	Computer utilization
I6	Frequency of program preparation
I7	Innovativeness
I8	Number of innovations used

INTERPERSONAL COMMUNICATION INDEPENDENT VARIABLES

Designation	Variable Name
I9	Frequency of attendance at educational presentations at national conventions
I10	Frequency of participating in informal discussions with other faculty at national conventions
I11	Frequency of attendance at educational presentations at regional conventions
I12	Frequency of participating in informal discussions with other faculty at regional conventions
I13	Importance of attendance at educational presentations at national conventions
I14	Importance of participating in informal discussions with other faculty at national conventions
I15	Importance of attendance at educational presentations at regional conventions
I16	Importance of participating in informal discussions with other faculty at regional conventions
I17	Frequency of participating in discussions with publisher representatives

Figure 13.--Continued

Designation	Variable Name
I18	Importance of participating in discussions with publisher representatives
I19	Frequency of participating in discussions with other accounting faculty at own school
I20	Frequency of participating in discussions with non-accounting business faculty at own school
I21	Frequency of participating in discussions with non-business faculty at own school
I22	Importance of participating in discussions with other accounting faculty at own school
I23	Importance of participating in discussions with non-accounting business faculty at own school
I24	Importance of participating in discussions with non-business faculty at own school
I25	Frequency of participating in discussions with other accounting faculty at other schools
I26	Frequency of participating in discussions with non-accounting business faculty at other schools
I27	Frequency of participating in discussions with non-business faculty at other schools
I28	Importance of participating in discussions with other accounting faculty at other schools
I29	Importance of participating in discussions with non-accounting business faculty at other schools
I30	Importance of participating in discussions with non-business faculty at other schools

MASS MEDIA COMMUNICATION INDEPENDENT VARIABLES

Designation	Variable Name
I31	Frequency of use of Collegiate News & Views as an information source
I32	Frequency of use of Dissertation Abstracts as an information source

Figure 13.--Continued

Designation	Variable Name
I33	Importance of Collegiate News & Views as an information source
I34	Importance of Dissertation Abstracts as an information source
I35	Frequency of use of the Book Review section of The Accounting Review as an information source
I36	Frequency of use of the Education and Professional Training section of the Journal of Accountancy as an information source
I37	Frequency of use of the Education Research and Academic Notes section of The Accounting Review as an information source
I38	Frequency of use of the Committee Reports Supplement to The Accounting Review as an information source
I39	Importance of the Book Review section of The Accounting Review as an information source
I40	Importance of the Education and Professional Training section of the Journal of Accountancy as an information source
I41	Importance of the Education Research and Academic Notes section of The Accounting Review as an information source
I42	Importance of the Committee Reports Supplement to The Accounting Review as an information source

OPINION LEADERSHIP DEPENDENT VARIABLES

Designation	Variable Name
D1	Unweighted general teaching opinion leadership index
D2	Weighted general teaching opinion leadership index
D3	Directed centrality general teaching opinion leadership index
D4	Unweighted teaching methods opinion leadership index
D5	Weighted teaching methods opinion leadership index
D6	Directed centrality teaching methods opinion leadership index

Figure 13.--Continued

NETWORK CENTRALITY DEPENDENT VARIABLES

Designation	Variable Name
D7	Teaching innovation centrality at once per term or more
D8	Teaching innovation centrality at once per month or more
D9	Teaching innovation centrality at 2-3 times per month or more
D10	Teaching innovation centrality at once per week or more
D11	Teaching innovation centrality at 2-3 times per week or more
D12	Teaching innovation centrality at once a day or more
D13	Weighted teaching innovation centrality index
D14	General teaching centrality at once per term or more
D15	General teaching centrality at once per month or more
D16	General teaching centrality at 2-3 times per month or more
D17	General teaching centrality at once per week or more
D18	General teaching centrality at 2-3 times per week or more
D19	General teaching centrality at once a day or more
D20	Weighted general teaching centrality index

Figure 13. Complete Listing of Standardized Variable Names and Designations

Table 47. Summary of Significant Relationships Between Independent and Dependent Variables

Dependent Variables	Biographic Variables: Pearson Correlation: Independent Variable	Pearson Correlation: Direction of Relationship	Multiple Regression: Independent Variable	Multiple Regression: Direction of Relationship
D1, D2, D3 DFAC1	I2 I7	+ +	IFAC2 IFAC1 IFAC4	+ + +
D4, D5, D6 DFAC4	I7 I8	+ +	IFAC2 IFAC1	+ +
D14, D15, D16, D17 DFAC2 D18, D19 DFAC3	I2 I3 I4	- - -	IFAC1 IFAC2 IFAC4 IFAC3	- - + +
D8, D9, D10 DFAC5 D11, D12 DFAC6	I2 I3 I4	- - -	IFAC1 IFAC3	- +

Table 47.--Continued

Dependent Variables	Interpersonal Communication Variables: Pearson Correlation: Independent Variable	Pearson Correlation: Direction of Relationship	Multiple Regression: Independent Variable	Multiple Regression: Direction of Relationship
D1, D2, D3 DFAC1		-		-
D4, D5, D6 DFAC4	I17	+		-
D14, D15, D16, D17 DFAC2; D18, D19 DFAC3	I10	+		
	I12	+		
	I14	+	IFAC8	+
	I16	+	IFAC7	+
	I19	+	IFAC6	+
	I25	+	IFAC9	-
	I28	+	IFAC5	+
	I20	+		
	I21	+		
D8, D9, D10 DFAC5; D11, D12 DFAC6	I10	+	IFAC6	+
	I12	+	IFAC8	+
	I14	+	IFAC5	+
	I16	+	IFAC7	+
	I19	+	IFAC10	-
	I20	+		
	I23	+		

Table 47.--Continued

Dependent Variables	Mass Media Communication Variables: Pearson Correlation — Independent Variable	Pearson Correlation — Direction of Relationship	Multiple Regression — Independent Variable	Multiple Regression — Direction of Relationship
D1, D2, D3 DFAC1	I37	+	-	
D4, D5, D6 DFAC4	-		-	
D14, D15, D16, D17	I32	+	IFAC13	+
DFAC2	I41	+	IFAC11	+
	I37	+		
D18, D19	I36	+	IFAC12	+
DFAC3	I38	+	IFAC11	+
D8, D9, D10 DFAC5	-		-	
D11, D12 DFAC6	-		-	

factors were extracted from the 12 mass media communication independent variable set. Three significant factors were extracted from each of the 12 z-score, dependent variable sets pertaining to teaching innovation and general teaching-related communication. Varimax rotation was applied in order to clarify the structure of each significant factor; each final factor was then identified by noting which of the original z-score variables correlated most highly with that factor. A listing of the name and designation of each of the 20 significant factors is contained in Figure 14. Factor scores were calculated, for each of the 97 individuals for each of the 20 significant factors, thereby creating 20 new factor score variables representing the significant components of the variability within the z-score variable sets.

The relationship between the independent variable factor score sets and each significant dimension in the variability of the dependent variable sets was examined using multiple linear regression procedures. The set of significant factors generated from each z-score, independent variable set was regressed with each of the 6 dependent variable factors; 8 of the 18 separate regressions resulted in regression equations found to be significant at the $p \leq .05$ level. A summary of the relationships between independent and dependent variable factors, as contained within these regression equations, is given in Table 47.

The overall summary of the results which follows has attempted to combine the most important, and consistent,

Figure 14

BIOGRAPHIC VARIABLE FACTORS

Designation	Factor Name	Primary Variables
IFAC1	Institutional seniority	I2, I3, I4
IFAC2	Innovativeness	I7, I8
IFAC3	Computer familiarization	I5, I6
IFAC4	Highest degree held	I1

INTERPERSONAL COMMUNICATION VARIABLE FACTORS

Designation	Factor Name	Primary Variables
IFAC5	Importance of contact with non-accounting faculty	I23, I24, I29, I30
IFAC6	Frequency and importance of informal discussions with other faculty at conventions	I10, I12, I14, I16
IFAC7	Frequency and importance of contact with other accounting faculty	I19, I22, I25, I28
IFAC8	Frequency of contact with non-accounting faculty	I20, I21, I26, I27
IFAC9	Frequency and importance of attendance at educational presentations at conventions	I9, I11, I13, I15
IFAC10	Frequency and importance of contact with publisher representatives	I17, I18

Figure 14.--Continued

MASS MEDIA COMMUNICATION VARIABLE FACTORS

Designation	Factor Name	Primary Variables
IFAC11	Frequency of use of the accounting journals as an information source	I35, I36, I37, I38
IFAC12	Importance of the accounting journals as an information source	I40, I41, I42
IFAC13	Frequency and importance of Dissertation Abstracts as an information source	I32, I34
IFAC14	Frequency and importance of Collegiate News & Views as an information source	I31, I33

COMBINED TEACHING DEPENDENT VARIABLE FACTORS

Designation	Factor Name	Primary Variables
DFAC1	Combined teaching opinion leadership	D1, D2, D3
DFAC2	Combined teaching network centrality at low and middle frequency levels	D14, D15, D16, D17
DFAC3	Combined teaching network centrality at high frequency levels	D18, D19

Figure 14.--Continued

TEACHING INNOVATION DEPENDENT VARIABLE FACTORS

Designation	Factor Name	Primary Variables
DFAC4	Teaching innovation opinion leadership	D4, D5, D6
DFAC5	Teaching innovation network centrality at low and middle frequency levels	D8, D9, D10
DFAC6	Teaching innovation network centrality at high frequency levels	D11, D12

Figure 14. Complete Listing of Factor Score Variable Names, Designations and Primary Variables

research findings from these separate analyses into a unified whole.

Opinion Leadership

First, it can be said that opinion leadership, as traditionally measured in diffusion of innovations research, exists within higher education in accounting. A profile of opinion leaders as being individuals both relatively more innovative, and more senior in their organizations, than their fellow accounting faculty members was developed from the results of the Pearson correlation and multiple regression analyses.

Second, the information sources most frequently used, and considered important, by opinion leaders were, for the most part, the same as for their colleagues. The only interpersonal communication source more frequently used by opinion leaders, than by their colleagues, was contact with publisher representatives; the only mass media source used more frequently by opinion leaders was the Education Research and Academic Notes section of The Accounting Review.

Finally, there is substantial evidence to support the contention that the role of being an opinion leader is quite distinct from the role of functioning as an important link in the day-to-day communication activities within an accounting department concerning teaching-related matters. First, the results of the factor analyses of the dependent variable sets indicate that the only overlap between opinion leadership and network centrality occurs at very low frequency levels of communication. Hence, it appears that although individuals may be sought out for information or advice regarding many types of teaching-related matters, the opinion leaders are not the same individuals who comprise the core of the network participants in their department at even moderate frequency levels of communication. Further, the only overlap between opinion leadership and network centrality, regarding new teaching methods or teaching innovations, exists at the lowest frequency level on the measurement scale used in the personal contract listing--once per term. Second, as will be seen in the following subsection, the characteristics of opinion leaders are in marked contrast with the characteristics of individuals with relatively high centrality indexes.

Network Centrality

In contrast to the characteristics of those persons who function as opinion leaders in their systems, individuals who play central roles in their departmental communication networks concerning teaching matters are relatively junior in the organization--in terms of academic rank, total years teaching and years at the institution. Further, such individuals have more familiarity with computers and, on the average, hold somewhat higher degrees.

The most important interpersonal communication sources for individuals with high centrality measures are leadership and network centrality occurs at very low frequency levels of communication. Hence, it appears that although individuals may be sought out for information or advice regarding many types of teaching-related matters, the opinion leaders are not the same individuals who comprise the core of the network participants in their department at even moderate frequency levels of communication. Further, the only overlap between opinion leadership and network centrality, regarding new teaching methods or teaching innovations, exists at the lowest frequency level on the measurement scale used in the personal contact listing--once per term. Second, as will be seen in the following subsection, the characteristics of opinion leaders are in marked contrast with the characteristics of individuals with relatively high centrality indexes.

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The most important interpersonal communication sources for individuals with high centrality measures are informal discussions with other faculty while at national and regional conventions, and contact with other accounting and non-accounting faculty at their own schools. In addition, there is evidence from the multiple regression analyses that, while contact with faculty at other schools is relatively more important to individuals with high network centrality indexes; contact with publisher representatives, and educational presentations at conventions, are relatively less important as sources of information for these individuals than for the average respondent.

Finally individuals who are central to their departmental communication networks, with respect to general teaching-related communication, perceive the accounting journals--particularly The Accounting Review--and Dissertation Abstracts as being relatively more important sources of information with respect to new teaching methods and materials. None of the mass media sources, however, were considered relatively more important by individuals with high centrality measures pertaining to teaching innovation, than by the average respondent.

Thus, it may first be concluded that communication networks may be defined, with respect to the communication that occurs between members of accounting departments, concerning teaching innovation and general teaching-related topics.

Second, the characteristics of individuals with relatively high centrality indexes suggest that the linking informal discussions with other faculty while at national and regional conventions, and contact with other accounting and non-accounting faculty at their own schools. In addition, there is evidence from the multiple regression analyses that, while contact with faculty at other schools is relatively more important to individuals with high network centrality indexes; contact with publisher representatives, and educational presentations at conventions, are relatively less important as sources of information for these individuals than for the average respondent.

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Thus, it may first be concluded that communication networks may be defined, with respect to the communication that occurs between members of accounting departments, concerning teaching innovation and general teaching-related topics.

Second, the characteristics of individuals with relatively high centrality indexes suggest that the linking function, in the transmission of information regarding teaching-related topics, is performed primarily by younger, junior faculty members. Further, the characteristics of these individuals differ from the characteristics of individuals who function as opinion leaders.

Third, individuals with high centrality indexes--whether with respect to teaching innovation or general teaching-related matters--both access, and consider more important, the available interpersonal communication channels as sources of information. In addition, individuals with high centrality indexes pertaining to general teaching-related topics both use, and consider more important than does the average respondent, the published information sources--specifically, the accounting journals and Dissertation Abstracts.

Conclusions

Conclusion 1. Contact with other accounting educators, and *The Accounting Review*, are the only interpersonal communication and mass media information sources, respectively, to be considered even moderately important as sources of information regarding new teaching methods by the average respondent.

The non-standardized mean importance scores for all respondents, on a scale from 0 to 4, for the group of 11 interpersonal communication and 6 mass media communication variables, are listed in Table 48. In order that the function, in the transmission of information regarding teaching-related topics, is performed primarily by younger, junior faculty members. Further, the characteristics of these individuals differ from the characteristics of individuals who function as opinion leaders.

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Table 48. Importance of Interpersonal and Mass Media Information Sources for the Average Respondent

Non-Standardized Variable	Mean	Importance Descriptor
	4.000	Extremely
Discussions with Accounting Colleagues from your School	2.776	Considerably
Education Research and Academic Notes of the Accounting Review	2.275	
Discussions with Accounting Faculty at Other Schools	2.260	
Committee Reports Supplement to the Accounting Review	2.215	
Book Review Section of the Accounting Review	2.105	
	2.000	Moderate

Mean responses for the other 12 non-standardized interpersonal communication, and mass media communication, variables were all below 2.000

reader may interpret these means, importance descriptors, derived from the Bass, Cascio and O'Connor listings,[1] for various mean levels are also presented in the table. An examination of these non-standardized mean importance ratings, for each of the interpersonal and mass media communication sources, indicates that The Accounting Review is the only mass media source to be considered even moderately important by the average respondent. Of even more interest is the fact that the only interpersonal communication sources to be rated at least moderately important by the average respondent were contact with other accounting faculty members, both at an individual's own school and at other schools. To this researcher, these are extremely important results.

First, the fact that The Accounting Review, and contact with other accounting faculty members, are the only information sources considered even moderately important by the average respondent suggests that the dissemination of information and influence regarding new teaching methods and materials is likely to be spread through these channels. Second, the primary importance of the interpersonal channel--contact with other accounting faculty members at an individual's own school--is empirical justification for this research, which has sought to identify and analyze characteristics of the individuals who play key roles in the interpersonal communication channel--the opinion leaders, and the individuals central to the communication networks reader may interpret these means, importance descriptors, derived from the Bass, Cascio and O'Connor listings,[1] for various mean levels are also presented in the table. An examination of these non-standardized mean importance ratings, for each of the interpersonal and mass media communication sources, indicates that The Accounting Review is the only mass media source to be considered even moderately important by the average respondent. Of even more interest is the fact that the only interpersonal communication sources to be rated at least moderately important by the average respondent were contact with other accounting faculty members, both at an individual's own school and at other schools. To this researcher, these are extremely important results.

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Conclusion 2. From the results of the analyses in Chapter III, as summarized in the preceding section of this chapter, it may be concluded that the concepts of opinion leadership and network centrality, with respect to communication concerning teaching-related topics, are applicable within the context of higher education in accounting. Opinion leaders were identified and communication networks were defined, with respect to the communication between faculty members in a department concerning teaching-related topics, using traditional measurement methods.

Conclusion 3. The communication functions of opinion leadership and network centrality, with respect to communication concerning teaching-related topics, appear to be distinct roles within systems of accounting educators, with different individuals serving the different roles. Opinion leaders, with respect to teaching-related matters, tend to be relatively senior in the organization, and more innovative, than their colleagues; individuals with high centrality index scores, with respect to teaching-related communication, are relatively junior in the organization and not especially innovative.

These results appear to be partly accounted for by the roles played by the department chairmen. With respect to the function of opinion leadership, the department chairmen were typically close to the top in a ranking by opinion leadership of all individuals in their department. In 2 of the 8 schools, the department chairmen had the highest opinion leadership ranking; in 1 school, the department chairman had the lowest ranking; in the other five schools, the chairmen ranked in the upper third of their respective groups. However, with respect to the network centrality index measures, the patterns of communication reported by the department chairmen were distinctly different from the communication patterns of their department colleagues, and were quite consistent for all chairmen. In general, the communication concerning teaching-related matters reported by department chairmen was diffuse at a low level--most chairmen reported contact with virtually all their colleagues at very low frequency levels. Very few chairmen reported communication regarding teaching topics with any colleague more frequently than once a month. Thus, networks defined at frequency levels of more than once per month would exclude most of the chairmen; some chairmen would be excluded from networks defined at even lower frequency levels.

These results might seem self-evident to some readers, who would expect department chairmen to be designated as opinion leaders. However, these results do not suggest,

to this researcher, that department chairmen would necessarily be the best targets when designing a diffusion strategy. First, a change agency--used here as representing any individual, group or organization attempting to secure the adoption of a teaching innovation--with limited resources, might very well choose to designate some maximum percentage of the individuals within a given system as targets for their promotion strategy. The use of a maximum percentage such as 10 per cent, would result in the selection of from 1 to 3 individuals for most departments of accounting in the United States. Although almost all department chairmen were in the upper third of their department, with respect to relative opinion leadership rankings, only 2 of the 8 chairmen, in the departments analyzed in this research, would be selected as targets using a 10 per cent criterion. Furthermore, it is likely that the relatively high average opinion leadership ranking of the department chairman is at least partly a function of the fact that they are chairmen, and thus likely viewed as influentials by younger, junior faculty. It does not necessarily follow that department chairmen would be viewed as influentials with respect to teaching matters by relatively senior faculty.

If the decision-making process regarding a particular innovation is largely authoritarian in nature--the department chairman either makes, or heavily influences, the decision--then department chairmen would be key individuals.

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If the decision-making process regarding a particular innovation is largely authoritarian in nature--the department chairman either makes, or heavily influences, the decision--then department chairmen would be key individuals.

An example of this type of decision might be a decision regarding use of an innovation requiring substantial departmental commitments or resources, such as the use of instructional television.[2] However, to the extent that the decision regarding use of the innovation could be made by the individual faculty member and not be upon the direction of the chairman, the informal channels of influence represented by opinion leadership would be important. Many, perhaps most, of the available teaching innovations would be in this category--innovative textbooks; the use of visuals such as slides and filmstrips; innovative organization of course material, such as in modules; the use of cases, simulations, and so forth. By virtue of their position, department chairmen may function as gate keepers in their systems, and thereby be able to increase or prevent, at least to some extent, the adoption of certain teaching innovations within their systems.[3]

Second, at the persuasion stage of the innovation-decision process, the interpersonal channel of communication becomes relatively more important.[4] Thus, the low frequency levels of communication reported by most chairmen might tend to make chairmen relatively poor candidates for assisting at the persuasion stage. Department chairmen might, however, be ideal candidates for assisting at the awareness stage of the innovation-decision process--the simple spreading of information regarding an innovation--by virtue of their

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Conclusion 4. It appears likely, based on the results of this research, that when the decision regarding adoption of an innovation can be made by individual faculty members, that the primary role of the department chairman is as a facilitator at the awareness stage, rather than as an influential at the persuasion stage, of the innovation-decision process.

Conclusion 5. The only interpersonal communication or mass media communication source more frequently used by both opinion leaders and individuals with high network centrality, with respect to communication concerning teaching-related topics, than by the average respondent, is The Accounting Review; in particular, the Education Research and Academic Notes Section of The Accounting Review.

Thus, The Accounting Review is not only an important source of information regarding new teaching methods for the average respondent, as was cited previously; The Accounting Review is also the only mass media source of information used more frequently by both opinion leaders and individuals with high network centrality measures. One can only wonder why the American Accounting Association chose to reject the strong recommendation of one of its committees--that the association publish a journal devoted to research in accounting education.[5] It appears likely that such a publication accessibility to their colleagues. Thus, the fourth conclusion is as follows.

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Conclusion 6. Whereas, in general, opinion leaders with respect to teaching-related matters neither use the available interpersonal communication forces of information more than do their peers, nor consider them as more important; individuals with high centrality measures, with respect to communication concerning teaching-related topics, make more

frequent use of these sources--particularly participating in informal discussions with other accounting faculty while at national and regional conventions, and contact with non-accounting faculty members--and consider them as more important, than do their colleagues.

Thus, the individuals who are central to the communication networks within their departments are also relatively more active than their colleagues in interpersonal channels while at conventions, and with respect to contact with non-accounting faculty. Those persons with high network centrality are likely to be the individuals who first became aware of new teaching methods used by non-accounting faculty acquaintances, and are also the individuals who are in a position to disseminate this information, both within their own departments and to accounting faculty at other schools. The capability of serving these linking functions, in conjunction with the profile of individuals with high relative network centrality as being junior faculty members, suggests to this researcher the importance of attempting to direct the efforts of junior faculty toward accounting education topics and research.

The recommendation made previously--the establishment of a journal of accounting education--would be a significant step in this direction. In this researcher's opinion, providing incentives to graduate students at the dissertation stage, and to junior faculty at the post-doctoral stage, frequent use of these sources--particularly participating in informal discussions with other accounting faculty while at national and regional conventions, and contact with non-accounting faculty members--and consider them as more important, than do their colleagues.

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Limitations

Perhaps the most significant limitation of this research consists of the assumption of a linear model as representative of the underlying relationships between variables. Each of the types of analysis presented in Chapter III--Pearson correlation, principal components factor analysis and multiple linear regression--are based on a linear model or function. As has been previously mentioned, there is evidence from prior diffusion research in other fields,[8] which suggests the existence of a non-linear relationship between opinion leadership and other variables used in this dissertation. However, this writer is unaware of prior research that provides a basis for estimating the linearity, or lack thereof, of the relationship between the network centrality dependent variables operationalized in this research and the independent variable measures.

The assumption of a linear model was made, and is considered appropriate in this research by this writer, for the following reasons. First, the present research is exploratory in nature and the statistical techniques selected have been used simply to provide descriptive measures of linear relationships in the data; these statistical techniques have been used neither for formal hypothesis testing, nor for prediction purposes.

Second, unless the two variables exhibit a perfect linear relationship, a curvilinear function can, potentially, always be found which will better fit the data. The

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Second, unless the two variables exhibit a perfect linear relationship, a curvilinear function can, potentially, always be found which will better fit the data. The selection of suitable transformation functions for the independent variables in this research, or of a general transformation function for the opinion leadership dependent variable(s), is a difficult task and a worthy research project by itself. Even after "better-fitting" models have been identified, the question of whether the higher order models are more useful than the simple linear model remains to be answered.

Finally, from a practical perspective, computer programs for statistical techniques that assume linear models are by far the most widely used and available.

Next, the statistical techniques employed in this research assume bivariate, or multivariate, normal distributions. Thus, a second limitation of the present research is that if violations of these assumptions are present in the data, the statistical analyses may have yielded spurious results.

Third, as has been mentioned many times previously in this research, the departments chosen for distribution of the data-gathering instruments were not a random sample from a defined population. Thus, the results presented in this research may be generalized, in the sense of statistical inference, only to the schools and individuals analyzed. Selected characteristics of the ten departments in which the data was gathered are presented in Chapter II, in order to assist the reader who wishes to infer the results of this research to a specific population of interest.

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Final Note

The current research represents, to the best of this writer's knowledge, a pioneering effort within the context of higher education in accounting. As such, it has not benefited from the previous efforts of a developed research tradition with a similar frame of reference; as a result, the possibilities for further research are correspondingly abundant.

This research has focused solely on relative individual differences between individuals in accounting departments at selected AACSB schools. No attempt has been made to assess dyadic, group or higher level metrics; in addition, many other types of networks could be defined. It is this researcher's opinion that the use of techniques such as network analysis, which retain the structure of the relationships between individuals, allows a more powerful and potentially fruitful analysis than weaker procedures applied on a grander scale.

It is this writer's hope that the results presented here have provided a start, however tentative, toward the development of a research tradition or methodology capable of addressing problems that should be of concern to all accounting educators--those within accounting education.

FOOTNOTES TO CHAPTER IV

[1]Bass, Cascio and O'Connor, "Expressions of Frequency and Amount".

[2]It might very well be, however, that use of a medium such as instructional television would be a collective decision of all the faculty in a department. If this were the case, informal channels of influence would also be a factor.

[3]Rogers with Shoemaker, Communication of Innovations, p. 30. Their potential function as gatekeepers, or facilitators, is the primary reason that department chairmen were consulted prior to the distribution of the survey instruments at each school.

[4]Rogers with Shoemaker, Communication of Innovations, p. 255.

[5]See Committee on Multi-Media Instruction in Accounting, "Report of the Committee," p. 134. See also the forward by Harold Langenderfer contained in Edwards, Accounting Education, p. ix.

[6]Touche Ross & Co., "The Touche Ross Program to Support Accounting Education;" brochure distributed in fall, 1976.

[7]This writer personally believes that one without the other--funding without a publication source, or vice-versa--would be a step, but only a step in the right direction. Substantial dollar funding for education research has been available for years from organizations such as the Alfred P. Sloan Foundation, but has, to the best of this writer's knowledge, been used very little by accounting academicians. Just as important is the fact that the reward systems at most major institutions heavily stress publication records, even going so far as giving different point allocations for publications in different "classes" of journals. With an article in the Education Research section of The Accounting Review as the most prestigious publication outlet available within major accounting journals for research in accounting education, it is not surprising that most doctoral students opt for a dissertation topic which offers better possibilities for recognition.

[8]Rogers and Shoemaker, Communication of Innovations, p. 190.

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APPENDIX

APPENDIX

DATA-GATHERING INSTRUMENTS

a. Initial letter to department chairmen

b. Cover letter to individual faculty members

c. Communication questionnaire

d. Personal contact listing

MICHIGAN STATE UNIVERSITY

GRADUATE SCHOOL OF BUSINESS ADMINISTRATION
DEPARTMENT OF ACCOUNTING & FINANCIAL ADMINISTRATION

EAST LANSING · MICHIGAN · 48824

May 6, 1975

Professor
Head, Department of Accounting
College of Business Administration

Dear :

I am writing to solicit your cooperation on behalf of Vince McCormack, Department of Accounting and Management Information Systems, Pennsylvania State University, who is completing a doctoral degree in accounting at Michigan State.

Vince is conducting a study concerning selected aspects of the communication patterns of accounting faculty members, and is seeking the participation of your faculty in his study. In formulating the research design, Vince has consulted extensively with faculty members from Communications Departments, both at the University of Michigan and Michigan State. My colleagues and I believe that Vince has come upon a novel approach to investigating an issue of real concern to accounting educators.

The major goal of the study is to facilitate the transmission of information concerning new teaching technologies to accounting faculties. One result of the analysis will be a "mapping" of the communication network in your department. The method of analysis used to construct such a mapping requires a 100% sample of the faculty in your department and virtually a 100% response rate. It is hoped that your approval, in the form of a request to your faculty to participate, would help to ensure this degree of cooperation.

In addition, Vince has already contacted of your staff, who has agreed to handle the distribution of the data-gathering instruments. The average time required to complete all materials, based on the results of the pretest anaysis, is half an hour per respondent. Distribution of the questionnaires would take place in approximately ten days; the completed forms would be mailed directly to Vince at Penn State.

I can assure you that no one other than the researcher will see any of the completed questionnaires, and that no individual will be identified by name with any of his or her responses. I can futher assure you that no individual department will be identified by name with the collective responses of its faculty.

May 6, 1975
Page 2

Your cooperation would be very much appreciated, and Vince would be happy to supply your faculty with an abstract of the results of the study. In order to answer any questions you might have concerning the study and to expedite getting the project underway at your school, either Vince or I will be calling you in a few days. Thank you.

Sincerely,

Gardner Jones

Gardner M. Jones
Professor and Chairman

GMJ/lmr

MICHIGAN STATE UNIVERSITY

GRADUATE SCHOOL OF BUSINESS ADMINISTRATION
DEPARTMENT OF ACCOUNTING & FINANCIAL ADMINISTRATION

EAST LANSING · MICHIGAN · 48824

May 13, 1975

Professor
Department of Accounting
College of Business Administration

Dear :

I am writing to solicit your cooperation on behalf of Vince McCormack, Department of Accounting and Management Information Systems, Pennsylvania State University, who is completing a doctoral degree in accounting at Michigan State.

Vince is conducting a study concerning selected aspects of the communication patterns of accounting faculty members, and is seeking your participation in his study. In formulating the research design, Vince has consulted extensively with faculty members from Communications Departments, both at the University of Michigan and Michigan State. My colleagues and I believe that Vince has come upon a novel approach to investigating an issue of real concern to accounting educators.

The major goal of the study is to facilitate the transmission of information concerning new teaching technologies to accounting faculties. One result of the analysis will be a "mapping" of the communication network in your department. The method of analysis used to construct such a mapping requires a 100% sample of the faculty in your department and virtually a 100% response rate. <u>Your</u> response is essential to the completion of this research.

The average time required to complete all materials, based on the results of the pretest analysis, is half an hour. Please mail your completed forms directly to Vince at Penn State using the envelope provided.

I can assure you that no one other than the researcher will see any of the completed questionnaires, and that no individual will be identified by name with any of his or her responses. I can further assure you that no individual department will be identified by name with the collective responses of its faculty.

Your cooperation will be very much appreciated, and Vince would be happy to send you an abstract of the results of the study. Thank you.

Sincerely,

Gardner Jones

Gardner M. Jones
Professor and Chairman

GMJ/nm

Enclosures

ACCOUNTING FACULTY MEMBERS
COMMUNICATION STUDY

COMMUNICATION
QUESTIONNAIRE

INSTRUCTIONS. Many of the questions in this part of the questionnaire can be answered with a check in front of the appropriate answer category. Throughout this questionnaire, guidelines are given in capital letters to summarize the content of each section. When questions can be skipped, the number of the next question to be answered is given.

1.0 BIOGRAPHICAL INFORMATION.

1.1 As stated in the cover letter, no one other than the researcher will see any of the completed questionnaires, and no individual will be identified by name with any of his or her responses. Further, no department will be identified by name with the responses of any or all of its faculty.

I do ask for your name because I am charting the communication "map" of your department; however, all names will be immediately transferred into code numbers upon receipt of your completed instruments, and the original questionnaires will be destroyed.

Your name: ______________________.

1.2 What is the highest academic degree you have received?

_____ Bachelor's
_____ Master's
_____ Doctorate

1.2.1 In what discipline was it awarded? ______________________.

1.3 Have you received any type of professional certification? Yes_____. No_____. (IF NO: Please continue with question 1.4) IF YES: 1.3.1 Which type(s) have you received?

_____ C.F.A.
_____ C.M.A.
_____ C.P.A.
_____ Other (please specify): ______________________.

1.4 What is your present academic rank?

_____ Professor
_____ Associate professor
_____ Assistant professor
_____ Instructor or lecturer

1.4.1 Are you tenured in this rank? Yes_____. No_____.

1.5 Approximately how many total years have you been teaching?

_____ less than 1 year
_____ 1 year, but less than 2
_____ 2 years, but less than 5
_____ 5 years, but less than 10
_____ 10 years, but less than 15
_____ 15 years, but less than 20
_____ 20 years or more

1.6 Have you taught at more than one institution within the last ten academic years? Yes____. No____. (IF NO: Please continue with question 1.7) IF YES: 1.6.1 Please list the institutions at which you have taught, within the last ten academic years, prior to latest employment at your present school.

Name of Institution	Academic Year(s) Employed
______________________	______________________
______________________	______________________
______________________	______________________

1.7 Within the last five years, have you served as faculty advisor or coordinator for any student committees, clubs or fraternities; honors or internship programs; or other major student activities? Yes____. No____. (IF NO: Please continue with question 1.8) IF YES: 1.7.1 Please scan the list below and check those that are applicable.

_____ Accounting Club
_____ Beta Alpha Psi
_____ Beta Gamma Sigma
_____ Honors program
_____ Internship program
_____ student committees
_____ student consulting services (e.g., tax service)
_____ Other (please specify): ______________________.

1.8 Within the last five years, have you served on any professional committees at the national or state level (AAA, AICPA, NAA, etc.) whose charge was concerned with accounting education? Yes____. No____. (IF NO: Please continue with question 2.0) IF YES: 1.8.1 Please list the committee(s), its (their) professional affiliation and level, and the year(s) in which you served.

Committee	Affiliation and Level	Year(s)
______________________	______________	______
______________________	______________	______
______________________	______________	______
______________________	______________	______

2.0 THE NEXT FEW QUESTIONS ARE CONCERNED WITH SPECIFIC INSTRUCTIONAL METHODOLOGY YOU MAY, OR MAY NOT, HAVE FOUND WORTHWHILE TO USE IN COURSES YOU HAVE TAUGHT.

The method of answering each question is the same. You are asked to determine:

a. If you have used the item within the last five academic years,
b. If so, in which academic year or years you used it, and
c. If so, was the item prepared commercially (C), prepared non-commercially by a person or persons other than yourself (O), or prepared by yourself (S).

For those items you have used, if you chose to use any, enter the appropriate preparation code or codes in the year column or columns corresponding to your use of each item. For example, if you previewed "Deep Throat" in one of your classes two years ago, you would answer:

1972-73	Method
C	Motion pictures

2.1 Have you used programmed instruction or modular course content in any courses you have taught within the last five academic years? Yes____. No____. IF NO: Please continue with question 2.2) IF YES: 2.1.1 Please examine the following list and ask yourself: first, have you used it; second, in which years did you use it; and third, was it prepared commercially (C), non-commercially by other persons (O), or did you prepare it yourself (S). For each time you have used an item, enter the appropriate preparation code in the year column corresponding to that use.

Prior to 1970-71	1970-71	1971-72	1972-73	Current & 1973-74	Method
					Programmed instruction
____	____	____	____	____	written material (e.g. text)
____	____	____	____	____	teaching machine
____	____	____	____	____	computer-assisted
____	____	____	____	____	Modules

2.2 Have you used a viewgraph, slide transparencies or filmstrips in any course you have taught within the last five academic years? Yes____. No____. (IF NO: Please continue with question 2.3) IF YES: 2.2.1 Please examine the following list and ask yourself: first, have you used it; second, in which years did you use it; and third, was it prepared commercially (C), non-commercially by other persons (O), or did you prepare it yourself (S). For each time you have used an item, enter the appropriate preparation code in the year column corresponding to that use.

Prior to 1970-71	1970-71	1971-72	1972-73	Current & 1973-74	Method
					Viewgraph
____	____	____	____	____	individual transparencies
____	____	____	____	____	continuous roll
					Slides and filmstrips
____	____	____	____	____	without taped sound synchronization
____	____	____	____	____	with taped sound synchronization

2.3 Have you used television or motion pictures in any course you have taught within the last five academic years? Yes____. No____. (IF NO: Please continue with question 2.4) IF YES: 2.3.1 Please examine the following list and ask yourself: first, have you used it; second, in which years did you use it; and third, was it prepared commercially (C), non-commercially by other persons (O), or did you prepare it yourself (S). For each time you have used an item, enter the appropriate preparation code in the year column corresponding to that use.

Prior to 1970-71	1970-71	1971-72	1972-73	Current & 1973-74	Method
					Television
______	______	______	______	______	live lectures, with feedback
______	______	______	______	______	live lectures, without feedback
______	______	______	______	______	pre-recorded audio-visual tapes
					Motion pictures
______	______	______	______	______	with sound track
______	______	______	______	______	without sound track

2.4 Have you used simulation projects in any course you have taught within the last five academic years? Yes____. No____. (IF NO: Please continue with question 3.0) IF YES: 2.4.1 Please examine the following list and ask yourself: first, have you used it; second, in which years did you use it; and third, was it prepared commercially (C), non-commercially by other persons (O), or did you prepare it yourself (S). For each time you have used an item, enter the appropriate preparation code in the year column corresponding to that use.

Prior to 1970-71	1970-71	1971-72	1972-73	Current & 1973-74	Method
					Simulation
______	______	______	______	______	business games
______	______	______	______	______	financial statement
______	______	______	______	______	statistical sampling
______	______	______	______	______	systems design
______	______	______	______	______	budgeting and/or control
______	______	______	______	______	behavioral

3.0 THE NEXT TWO QUESTIONS DEAL WITH YOUR USE OF COMPUTER FACILITIES IN TEACHING, ACADEMIC RESEARCH AND RELATED ACTIVITIES.

3.1 Have you used computer facilities in courses you have taught, academic research or related activities within the last five academic years? Yes____. No____. (IF NO: Please continue with question 4.0) IF YES: 3.1.1 In which activity or activities have you used these facilities?

______ Courses taught
______ Research
______ Other (please specify): ______________________________.

3.2 Did you write or personally debug any of the programs you used in these activities? Yes____. No____. (IF NO: Please continue with question 4.0) IF YES: 3.2.1 Approximately how frequently did you write or personally debug the programs you used in connection with these activities?

_____ always _____ often _____ sometimes _____ seldom

4.0 THE LAST FEW QUESTIONS IN THIS PART OF THE QUESTIONNAIRE ARE CONCERNED WITH THE SOURCES THAT ARE IMPORTANT TO YOU FOR BECOMING AWARE OF NEW IDEAS, AND PROVIDING INFORMATION NECESSARY FOR EVALUATING NEW IDEAS AND METHODS, IN ACCOUNTING EDUCATION.

4.1 Do you discuss ways to improve the learning experience of your students with any full-time, permanent accounting faculty members in your department? Yes____. No____. (IF NO: Please continue with question 4.2) IF YES: 4.1.1 Please list the names of the three individuals you seek out most often for information and/or advice.

____

____

____

4.2 Do you discuss new teaching methods and materials in accounting education (e.g., programmed textbook, teaching by television, preparing transparencies) with any full-time, permanent accounting faculty members in your department? Yes____. No____. (IF NO: Please continue with question 4.3) IF YES: 4.2.1 Please list the names of the three individuals you seek out most often for information and/or advice.

____

____

____

4.3 Which of the following types of interpersonal contact are sources of information for you with respect to new teaching methods and materials that could be, or are being, applied in accounting education? Please assign one of the following frequency codes and one of the following importance codes for each item listed.

Frequency Codes	Importance Codes
1 = always engage in	1 = extremely important
2 = very often engage in	2 = quite important
3 = engage in fairly many times	3 = moderately important
4 = occasionally engage in	4 = somewhat important
5 = never engage in	5 = not important

Frequency	Importance	Activity
		when attending national conventions/conferences
_____	_____	presentations on education-related topics
_____	_____	informal discussions with other faculty
		when attending regional conventions/conferences
_____	_____	presentations on education-related topics
_____	_____	informal discussions with other faculty

4.4 Which of the following types of interpersonal contact are sources of information for you with respect to new teaching methods and materials that could be, or are being, applied in accounting education? Please assign one of the following frequency codes and one of the following importance codes for each item listed.

Frequency Codes	Importance Codes
1 = always engage in	1 = extremely important
2 = very often engage in	2 = quite important
3 = engage in fairly many times	3 = moderately important
4 = occasionally engage in	4 = somewhat important
5 = never engage in	5 = not important

Frequency	Importance	Activity
______	______	discussions with publisher representatives
		discussions with faculty from your institution
______	______	with accounting colleagues
______	______	with faculty from non-accounting business fields
______	______	with faculty from non-business fields
		discussions with faculty from other institutions
______	______	with accounting colleagues
______	______	with faculty from non-accounting business fields
______	______	with faculty from non-business fields

4.5 Which of the following publications are sources of information for you with respect to new teaching methods and materials that could be, or are being, applied in accounting education? Please assign one of the following frequency codes and one of the following importance codes for each item listed below.

Frequency Codes	Importance Codes
1 = always read or scan	1 = extremely important
2 = very often read or scan	2 = quite important
3 = read or scan fairly many times	3 = moderately important
4 = occasionally read or scan	4 = somewhat important
5 = never read or scan	5 = not important
6 = have no knowledge of this source	6 = have no knowledge of this source

Frequency	Importance	Publication
______	______	Audiovisual Instruction
______	______	Book Review section, The Accounting Review
______	______	Collegiate News and Views
______	______	Dissertation Abstracts
______	______	Education and Professional Training, Journal of Accountancy
______	______	Educational Product Report
______	______	Education Recaps
______	______	Education Research and Academic Notes, The Accounting Review
______	______	Research Reporter
______	______	Supplement to the Accounting Review: Committee Reports
______	______	Other (please specify): ______________.

4.6 Are there any sources of information for you, with repect to new teaching methods and materials in accounting education, that were not included in the last three questions (4.3, 4.4 and 4.5)? Yes ____. No ____. (IF NO: Please continue with the Personal Contact Listing). IF YES: 4.6.1 Please briefly identify these additional sources of information and assign one of the following frequency codes and one of the following importance codes for each of these additional sources.

Frequency Codes	Importance Codes
1 = always engage in, read or use	1 = extremely important
2 = very often engage in, read or use	2 = quite important
3 = engage in, read or use fairly often	3 = moderately important
4 = occasionally engage in, read or use	4 = somewhat important
5 = never engage in, read or use	5 = not important

Frequency	Importance	Source(s)
____	____	____
____	____	____
____	____	____
____	____	____
____	____	____

ACCOUNTING FACULTY MEMBERS
COMMUNICATION STUDY

PERSONAL CONTACT
LISTING

A faculty member's responsibilities and activities are often trichotomized into the general categories of teaching, research and service. The purpose of this study is to identify characteristics and problems of the communication process in which faculty members engage related to their teaching activities. If we can analyze and understand the process, we may be able to increase its efficiency and remedy existing problem areas.

Communication, as defined in this study, includes talking with someone on a face-to-face basis; talking by telephone; reading or writing memos, publications, etc. Exchanging ideas, discussing some new topic, asking or getting information, and giving or receiving an evaluation are all examples of the communication process.

On a following page, the full-time, permanent accounting faculty members in your department are listed in alphabetical order. Next to each name are four major headings, each heading representing a different grouping of communication topics. The four major headings, and examples of activities that could be topics of communication, or communication, in each of these areas are:

1. Professional Communication: includes all teaching, research and service-related communication.

2. Teaching Production: discussions concerning, and the preparation of, course materials, lectures, cases, quizzes, examinations; time spent in the classroom.

3. Teaching Innovation: discussion of, and the development and use of, new teaching methods and techniques; discussions concerning substantial revisions of course format, materials, content.

4. Teaching Maintenance: conducting office hours; grading student work; assigning grades; student and peer teaching evaluations and feedback.

Please note that the four categories above are not mutually exclusive. Categories 2, 3 and 4 -- "Teaching Production", "Teaching Innovation" and "Teaching Maintenance" -- are mutually exclusive and together include all teaching-related communication. These three categories form a subset of Category 1 -- "Professional Communication" -- which, as defined in this study, includes all teaching, research and service-related communication.

Please carefully read down the list of names and decide, for each person listed, whether you communicate with him or her on teaching, research or service-related topics. Code numbers for indicating different frequencies of contact you and that person might have are as follows:

6 = at least once a day	3 = 2 or 3 times per month
5 = 2 or 3 times per week	2 = about once per month
4 = about once per week	1 = about once per term

Frequency Codes

6 = at least once a day
5 = 2 or 3 times per week
4 = about once per week
3 = 2 or 3 times per month
2 = about once per month
1 = about once per term

Initiation Codes

3 = I usually initiate contact
2 = We both initiate, about equally
1 = He or she usually initiates

____
Your Name

NAME OF INDIVIDUAL	COMMUNICATION TOPIC AREAS							
	PROFESSIONAL COMMUNICATION		TEACHING PRODUCTION		TEACHING INNOVATION		TEACHING MAINTENANCE	
	Fre-quency	Initi-ation	Fre-quency	Initi-ation	Fre-quency	Initi-ation	Fre-quency	Initi-ation