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**TELEMEDICINE:
ACCEPTANCE VARIABLES
IN POLICY RESEARCH**

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TELEMEDICINE:

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By

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To my family

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ABSTRACT

TELEMEDICINE:
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By

Stephen John Danowski

This investigation into acceptance variables in telemedicine innovation was conducted with 35 subjects from the Veterans Administration Medical Center, Battle Creek. Respondents were members of a medical team practice including physicians, psychologists, nurses, and social workers. This correlational study utilized vari- from empirical research on the communication of innovations. These included structural network variables, such as connectedness and integration, along with an exploratory variable called Media Style. The research questions explored relationships between these variables and an individual's preference for the innovation. Some Network Connectedness variables were significantly related to preference for the innovation at the 95% significance level. Media Style variables were also significantly related to preference for the innovation.

CHAPTER I

Introduction

Definition and Overview

In order to organize a discussion of telemedicine, the marriage of technology and the practice of medicine, it appears thematically profitable to follow the functional description put forth by Simon in his Science of the Artificial (Simon, 1969) regarding any man-made artifice: 1.) a discussion of its purpose or goal; 2.) a description of its inner characteristics; and 3.) a description of the surroundings in which it operates. According to Simon, any manufactured thing is molded by the inner and outer environment and is in fact an interface between the two. Simon's model depicts the outer environment controlling the goals of a system, and the goals, in turn, responsible for the characteristics which the system assumes. In the context of the present investigation of telemedicine, the outer environ-ment is considered to be public policy and the inner environment is considered to be the technology itself.

The following discussion will utilize Simon's convenient functional description in order first to characterize historical or existing telemedicine systems based on their purpose. Following this their inner environment, the

technology itself, will be scrutinized; and finally the outer environment, or public policy dimensions, will be delineated.

System Objectives

The objectives for which telemedicine systems have been designed range from uses for diagnosis of patients either directly or over a distance, for consultation between health care personnel, for education--either formative or in-service training, or for administrative functions of a health care organization.

The primary distinction which may be drawn between the purpose and objectives of any telemedicine system, regardless of its design components, appears to be whether its intended usage is for direct diagnosis by the physician or care practitioner, or whether its purpose is more generally for communication with the possibility of substituting for hands-on contact by the physician. The distance to be bridged may be a few feet, a city block, or even vast reaches of outer space. In an extreme view formulated by Maxmen (Maxmen, 1976), computer branching theory can be utilized by a computer-telemedicine system for diagnosis and prescription of treatment with the displacement of the physician altogether.

Inner Characteristics: the Technology

Following Simon's model, the inner characteristics of a telemedicine system are considered for this paper to be the technology itself. The technology of telemedicine ranges from sophisticated and costly machines used for direct diagnosis and laboratory testing to hybrid telecommunication systems with video, telephone, and computer components. An example of an everyday, yet nonetheless complex, telemedicine system is the telephone, a staple of the medical practice for consultation, such as between a physician and pharmacist.

Examples of telemedicine systems date as far back as Marconi when ship to shore radio was used for medical emergencies at sea (Williams, 1984). Video technology made its entrance into the field of telemedicine in 1959 when Dr. Cecil Wittson bridged a distance of a few feet across a street at the University of Nebraska School of Medicine for the purpose of psychiatric consultation (Wittson, 1965). Since then, video technology has assumed a variety of roles. To cite but a few examples, miniature video cameras are used directly by the physician for orthoscopic surgery. In the last ten years, the proliferation of cable systems in this and other countries has provided a means for health information to be distributed through a videotex medical database. The ongoing educational needs of the medical profession in some cases are served by professional journals stored on video tape or disc. The AT6 Satellite and attendant video

technology has also been used for educational purposes as well as for linking physicians with patients in remote areas for diagnosis (Brown, p. 23). Computers have been used for all housekeeping tasks of the health center, from patient check-in to billing (Brown, p. 13). In addition to analog and digital cable linkages, other means of distributing telemedicine information include microwave, satellites, and cellular radio.

Outer Environment: Policy Issues

Referring back to Simon's model describing the science of the artificial, the surrounding environment of the telemedicine system is considered in this paper to be public policy regarding health care, especially telemedicine. This latter point is postulated on the assumption that matters affecting the quality and cost of health care are not a private concern but instead one shared by most of the members of society. The public policy environment in which telemedicine systems function, at least in the United States, appears to be preoccupied for the most part with the cost and equitable distribution of health care, especially as the population of rural areas may be impacted (Brown, 1983). Several projects have adequately demonstrated the ability of telemedicine systems to serve these populations with high quality care, but what remains uncertain is whether these programs have been cost effective (Park, p. 32). Another public policy consideration is the feasability of maintaining a nationalized system of health care. It has

been suggested that the computerization of medical records offers a means for managing health insurance aspects of such a nationally coordinated system. A secondary policy issue regarding telemedicine is the programming of the many new channels resulting from the proliferation of cable systems and other means of distributing information (the new relative abundance of electronic spectrum channels). The new ability of these means to distribute health care information is tied to a preventative mode of health care in which the physician is not necessarily the center.

Elton has summarized the policy issues surrounding telemedicine as follows:

Financial (funding implications); Privacy (e.g., access to computerized medical information); Diffusion of Responsibility; Personnel Supply Implications; Compatibility (its advantages versus those of diversity for the sake of comparison); Flexibility (e.g., leaving open options for future adaptation); Differential Impact on Sectors of the Community (with regards to current inequalities of distribution); Common Carrier Issues; Risk of Coupling (risks of failure after society becomes dependent on systems); and Research.

Elton states the <u>research</u> policy issue to be identification of:

> What existing or future research needs to be given high priority to remove or reduce the uncertainties most significant at the planning level (Elton, p.178-9).

Following Simon's model with the outer environment predicting goals of a system, and these goals determining

the characteristics of a system, this chapter will go on to specifically discuss research as a powerful policy issue shaping the current state of affairs regarding communications oriented telemedicine systems.

Human Factors.

Alex Reid addresses the research policy issue raised by Elton in an abstract to telemedicine research funded by the British Government (Reid, 1971). Reid confines himself to a policy perspective "on all fours" with Elton's and states that more than enough is known about the technological capabilities of telemedicine systems. He places the crucial need for research at the level of "human factors," calling for studies that would combine the laboratory and outside world, focused on typical consumers (Reid, 1971).

Technological Capability.

Contemporary research originating in the United States did not share Reid's focus on the human factors of telemedicine research. Instead, United States government funded research efforts were confined almost exclusively to further elaboration of technological capability variables. The most widely known and earliest of this series of field trials was a bidirectional video connection for consultation between physicians at Massachussetts General Hospital, in Boston with nurses at Logan Airport, also in Boston. It was started by Dr. Kenneth Bird, soon after a tragic plane crash

resulted in many unnecessary deaths because physicians were blocked from the disaster scene by masses of gawkers along the freeway (Park, p.25).

The most recent wave of research in telemedicine was conducted by NASA in conjuction with the space shuttle program. Confronted with the possibility of providing medical care to persons over a vast distance of outerspace, an ambitious program --STARPAHC--was undertaken. Its main significance in updating prior telemedicine research was in its incorporation of microcomputers into a central role in the care delivery network. The computer was situated at the hospital and was linked to field units. It was used primarily for: 1.) diagnostic and treatment aid for paramedics in the field; 2.) scheduling patient referral visits and transportation; 3.) drug formulary information; and 4.) Census and nursing orders for patients (Brown, 1983). Dozens of telemedicine studies have filled in the spaces between Logan Airport and STARPAHC; yet each study in turn has omitted "human factor" variables such as acceptance of a telemedicine innovation (Bashshur, 1975).

Current Underutilization of Communications Systems

It is the premise of this project that policy determines the objectives of a system (Simon, 1969). In regards to telemedicine, it is specifically government funded research which has played a significant role in determining the current state of affairs regarding communications-type telemedicine systems: In contrast to the high rate of

technological adoption for telemedicine systems used for direct diagnosis or laboratory testing by the physician, communications-type systems which take away hands-on contact by the care practitioner have lagged far behind (Williams, 1984). In fact, there is far more technology in place than is currently being utilized (Williams, 1982; Brown, 1983). We argue that this situation has occurred because of the omission of the important acceptance variables from the funded research initiatives. The absence of these variables appears to have had a differential impact on direct diagnosis versus communications-type systems. It is reported that the physician will resist any attempt to interfere with a change in hands-on contact with the patient (Brown, 1983). If a trial system calls for such a change, the care practioners' acceptance of the new system would seem to supercede any other technological capability variables in relative importance within the context of the research project. However, acceptance variables were not included in the projects originating from United States government initiatives, even though the communication science had long underscored the importance of acceptance variables in the innovation process (Rogers 1971).

According to Argyris, the failure of policymakers to include a variable such as acceptance derived from the behavioral sciences is not unique to telemedicine. It is the problem of planning and policymakers as system designers in general. Argyris asserts that "the planners

in our society have, until recently, been economists and lawyers turned bureaucrats." Argyris further criticizes the policy creation process citing the bureaucrats' failure to consider the implementation stage (Argyris, p. 4). After a system is designed by the planner it is merely turned over to the organization's administrators. Often it is not even utilized. The topdown nature in which directives are issued to subordinates by higherups does not remove the problem of employees accepting and utilizing an innovation. Given the health care practitioners resistance to changes in hands-on procedures, the innovation of telemedicine systems may be expected to introduce even more problems of acceptance than in non-medical organizational settings.

Purpose

This research goes outside of the strict boundaries of a typical policy study which usually involves legal or economic issues. The purpose of the study is to introduce variables from the communication science in an exploratory setting within the policy research framework established above. This is done in order to assist the policymaking process by uncovering significant relationships between these and other variables which will lead to further investigations relevant to the planning stage of a telecommunications system. A secondary purpose of the research is to apply knowledge about communications networks in the process of innovation in order to develop strategies for the implementation of a system in a hospital in Battle Creek.

The reported failure of telemedicine systems creates a loss of potential benefits to society, such as providing service to rural populations. Additionally, there is a loss incurred by society because telecommunication systems, once adopted by an organization or group of organizations, have been shown to accrue additional benefits beyond those originally envisioned by the system designers (Bretz, 1983; Park, 1974). The failure of telemedicine systems to gain acceptance in the medical work place results not only in the primary loss of improving patient care, but also in an opportunity cost where potential benefits remain masked until widespread acceptance fosters new applications.

The research described in this paper was conducted at a Veterans Administration hospital in Battle Creek, Michigan. At the time this research was designed and conducted, the hospital was without a telemedicine system for patient check-in. At the time this thesis was written, hospital administration was in the early implementation stages of such a system.

Summary

This chapter has set a framework for looking at telemedicine policy issues. A telemedicine system has been described as the interface between the technology of its internal composition and the outer environment of public policy. The discussion has underscored the importance of human factors for research leading to the acceptance of

telemedicine systems. A specific area that the current exploratory field study will investigate is the set of social system variables known in the behavioral science as structural communication networks. Relationships will be explored between these and other variables in order to lead to further investigations which may be useful to policymakers involved in system design.

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CHAPTER II

Theoretic Rationale

Overview

The following chapter will summarize the findings of the general literature review of experimental telemedicine systems reported in Chapter I regarding system goals, technological composition, and public policy issues, especially policy research. It will review general social system variables from historical innovation research in keeping with a focus on "human factors" in regards to policy research. The discussion will then be narrowed to communication structural network variables, as well as exploratory attitude and media style variables.

Introduction

The entry of telecommunications technology into the health care setting can cause a great deal of uncertainty for personnel. The critical factor determining the survival of a telemedicine system is acceptance by the physicians and patients (Brown, p.9). Government funded research initiatives in the United States, however, have failed to look at the acceptance factor in telemedicine system design, focusing instead on technological capability variables and

shunning those from the behavioral sciences. These research projects, through ommission of acceptance variables, have cast a spotlight on the policy formation phase of telemedicine system design and the importance of policymakers becoming sensitive to problems of implementation.

Brief Historical Review

Historically, the behavioral sciences have held not only technological variables but also social system variables as important within the innovation process. These latter variables encompass a wide range from the general influence of the peer network (especially those who have already adopted the new idea), to compatibility (the degree to which an individual perceives a system to fit with her or his experiences), and complexity (the clarity of meaning of the innovation for the individual adopter) (Rogers, 1971). According to Shoemaker, acceptance factors differ from case to case with special differences existing between innovations of choice versus those disseminated downward by higherups in a hierarchic organizational structure (Shoemaker, 1971). This is referred to as authority dissemination of an innovation. This aspect of innovation research is studied from time to time yet not consistently.

A survey of literature from organizational theory depicts the employees confronted with technological change in a state of fear. With respect to this, Lawrence draws a distinction between fear of modification of their physical routine (technological variables) and how people expect this

change to "alter their established relationships in the organization" (Lawrence, p.639). He states that employees do not resist technical change so much as they resist the anticipated changes in their human relationships. He underscores the importance of the policymaker becoming sensitive to the "specific social arrangements" which employees may believe will be impacted by a technological innovation (Lawrence, p.641).

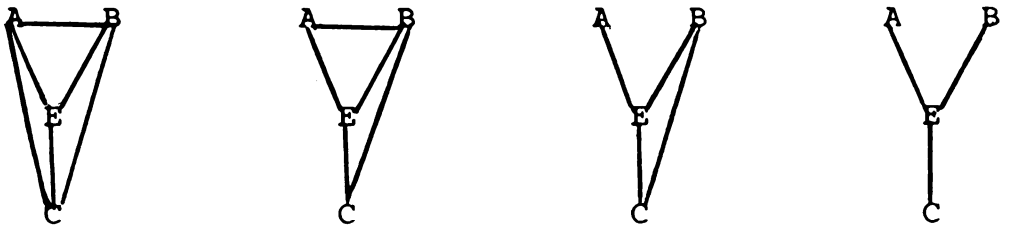
The problem of getting policymakers to consider the implementation stage essentially is getting them to look at what knowledge already exists from the behavioral sciences about how innovations become adopted by an individual or organization. Within the last decade, social system variables, particularly communication structural variables, have moved to the center of these discussions.

Communication Structural Variables

Lauman has addressed communication structural variables at length in his work regarding the form and substance of urban social structures. He bases his technique of analysis on the individual as a focal anchoring point and considers their links with three other individuals identified as friends. Lauman considers both the homogeneity of the network (similiarity in social position) and its connectedness (to what extent do the three friends have friendship relations with each other). This measure of connectedness is then described as radial versus interlocking.

Figure I

Graphic Depiction of Communication Structural Networks



Completely Interlocking | Partially Interlocking I | Partially Interlocking II | Radial

The personal network described by Lauman assumed new prominence when it emerged as an extremely important variable in innovation research, especially originating from the communication science.

Connectedness and Integration

Two of the main theoretical building blocks upon which communication scholars base their investigations are: a.) connectedness--an index measure of the relationships an organizational member (unit of analysis) has with another organizational member and b.) integration--the degree to which members of an individual's personal communication network are linked to each other, i.e. whether the network is interlocking or radial (a star pattern) (Rogers,

1981). It is important to note that Rogers and others have come to sustitute the term integration for Lauman's connectedness. The connectedness term is then used to refer to some index which quantifies the association between the unit of analysis and the three nodes around it.

As stated above, structural communication variables such as connectedness and integration have been shown to be associated with the innovation adoption process. Following are some research findings which were helpful in formulating research questions for the current project:

Medical doctors with higher individual connectedness (more friends and professional associates among other doctors) were more innovative in prescribing a new antibiotic drug. Isolates were markedly less innovative in adopting the new drug than were nonisolates (Coleman, 1966).

1. Earlier adopters are more highly integrated with the social system than later adopters (Rogers, 1971).

2. Radial network individuals use audioconferencing, computerbased "broadcasting," and electronic mail more than non-radials (Danowski, 1983).

3. Earlier adopters have more social participation (higher connectedness) than later adopters (Rogers, 1971).

Network Stability

Another structural network variable which receives only occasional attention in communication science is the stability of communication networks which may be associated with other variables in an innovation adoption scenario. Stability of a comunication network quite simply is whether the network has the same respondents from time one to time two (Rogers, 1981). The model promulgated by Rogers et al. was essentially a linear one. The subject over time is depicted proceeding through stages of awareness, interest, evaluation, trial, and adoption (Rogers, 1971). The stability variable retains importance therefore in the context of this linear model.

Attitude Variables

As stated above, the linear model of innovation adoption depicts the individual or some other unit of analysis involved in an educational, evaluative process leading to trial and possible adoption. There has been research, however, challenging the linear model (Rice and Case, 1983). This research reports that preexisting attitudes to the innovation and not the amount of time of exposure to it may be associated with amount of utilization and acceptance. Other evidence supporting an association between preexisting attitudes about technology and adoption of an innovation is reported in a study by Dordick of the uses of telecommunication technology for vocational rehabilitation.

Attitude was considered one of the most complex barriers to surmount in getting people to use the new technologies. These attitudes were derived from experiences with the technology in everyday life (Dordick, 1978). Rice and Case also suggested the presence of a specific attitude variable they termed as a media style (a personal preference for a specific media over others as a means for day to day communication) (Rice and Case, 1982).

There does not appear to be a great deal of information available regarding the attitudes of physicians and other care providers to telemedicine systems. What little information which has been published are reports from physicians themselves regarding their colleagues. Dr. Kenneth Bird has commented on the resistance to change by physicians accompanying the introduction of a telemedicine system. One department chief of a telemedicine project observed that physicians "called the camera 'Big Brother,' covered it with their coats, and tampered with the equipment" (Park, 1974).

A possible explanation given for this phenomenon of physicians' problematic attitude towards communication-oriented telemedicine comes from Dr. J. U. Brown:

> The physician resists any attempt to interfere with direct patient contact; he [she] prefers handwritten records to computer tapes and he [she] prefers not to delegate authority to other members of the health care team. These attitudes militate against the use of technology to deliver health services (Brown, p.1).

A telemedicine innovation scenario holds many variables: disruption of the doctor-patient relationship; changes in

other social relationships, such as between physicians and subordinates; and potential attitude barriers towards the technology itself. Little light has been shed on relationships between these variables, however, at least in part due to the apparent lack of telemedicine innovation research with physicians as respondents. The likelihood of obtaining meaningful results from such research without the cooperation of physicians is poor and as reported above, physicians for the most part do not have a history of cooperation with the telemedicine research effort. The present research proceeded, however, with the assumption that physicians would respond to this research inquiry. Chapter IV, Results, addresses the actual response rate encountered.

Research Questions

1. What communication structures are most likely to foster acceptance of the innovation?

Prior research has placed an emphasis on integration variables in association with innovation adoption (Rogers, 1981; Danowski, 1983).

2. Is perceived stability of communication networks from pre- to post-adoption associated with likelihood of adoption?

Network stability variables are often overlooked in innovation research (Rogers, 1981). Because of the lack of empirical data surrounding this variable, the stability variable has been included as a means of providing data for

further investigation associating it with innovation adoption.

3. Do individuals with radial communication structures perceive technological innovation as an improvement for the general system of care?

Research results have portrayed the radial individual as more likely to adopt computer-mediated messaging systems (Danowski, 1983) than individuals with more interlocking networks. If usage is a measure of perceived benefit, perhaps more radial individuals would perceive a computer-mediated telemedicine system as an improvement to the system of care.

4. Do individuals with interlocking communication structures perceive technological innovation as a worsening of the general system of care?

This research question poses the reverse assumption of Question 3 regarding degree of radiality and preference for computer-mediated communication.

5. Are attitudes about media from everyday life associated with likelihood of adoption?

This research question is premised on the findings of Dordick (Dordick, 1978) showing existing attitudes about media to be a significant barrier blocking acceptance of a telecommunications innovation for vocational rehabilitation. There is additional support for posing this question in the findings of Rice (Rice and Case, 1983) regarding the

existence of a personal preference for specific media associated with the amount of usage of a computer messaging system by university faculty.

Summary

The preceding chapter has presented a historical background for telemedicine innovation research. It has reported findings in the literature about employee resistance to technical change and uncertainty over resulting changes in social relationships. It has introduced the social struc-ural variable--communication networks--which is one of the important concepts used in this research. Further, the theoretical building blocks of connectedness and integration have been introduced. A sampling of constructs derived from the communication sciences regarding innovations and network structure has been reviewed. The new research findings suggesting a link between innovation adoption and prior attitude have been reported as well as special problems of physicians as gatekeepers to innovations which remove hands-on contact in the care practice. Finally, research questions have been formulated and discussed within the context of prior research findings.

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CHAPTER III

Procedures and Methods

Overview

The following chapter will briefly review the context in which the research questions were introduced; describe the research methodology including classificatory variables; detail the methodological assumptions; and finally will restate the research questions in operational form relative to the instrumentation and procedure.

Introduction

Thus far we have established the importance of the policymaker becoming acquainted with behavioral science knowledge concerning communication networks and the process of innovation in an organization. We have established five research questions concerning structural communication networks, attitude, and the implementation phase of a telecommunications innovation. The inference of likelihood of adoption of the proposed innovation rests heavily on the answer to the following question: How do the personnel of the health care organization ascribe a value, positive or negative, to the proposed system. Likelihood of adoption is inferred directly from the degree of favorability towards

the proposed system. Another dimension of this investigation rests outside of the research questions, i.e., to approach the unique challenges of implementation offered by a medical setting which must be overcome if a system is to gain widescale acceptance. Considering the case by case variance of telemedicine systems, specifically what is called for to approach this secondary problem is a field study. It is beyond the scope of the present study to conduct more than a one-shot case study. However, baseline data will be generated which could facilitate a future study at the site measuring before/after effects of the technological intervention. Beyond that, a study of the entire life cycle of the innovation could be undertaken. The present study, however, seeks to utilize whatever relationships are uncovered between structural network variables, attitude and likelihood of adoption in the context of the studies specific site, the Veterans Administration Medical Center, Battle Creek, in order to develop implementation strategies which may be useful to policymakers at the site.

Research Methodology

The research methodology selected for the present investigation is a correlational study. Phase one attempts to identify relationships between classificatory variables outlined below. Phase two is descriptive--based on the results of phase one.

Research Variables

Network Connectedness.

An index measure of the amount of communication between the respondent and other organizational members. Network Connectedness is measured separately for current and projected (a time following adoption of a telemedicine system) patient intake, task and social networks.

Network Integration.

An index measure of the estimated amount of communication between the organizational members named by the respondent. Network Integration is measured separately for current and projected patient intake, task and social networks.

Network Stability.

An index measure of the extent to which organizational members named by a respondent remain the same from time one (current) to time two (projected) for patient intake, task and social networks.

Media Style.

An index measure of repondent's preference for everyday media, such as video, telephone, computer, face-to-face, and written as a means of communication.

Value of the System.

An index measure of respondent's degree of favorability towards the telemedicine system proposed in a scenario of technological innovation.

Methodological Assumptions

The sociogram derived from the instrumentation detailed below will yield data at the ordinal level. Therefore, nonparametric correlational analysis will be used for analysis of the data.

Limitations of the Study

Correlational Analysis.

Correlational analysis identifies simply "what goes with what" in relationships under investigation with no indication of cause and effect models. It is less rigorous than an experimental approach with a primary shortcoming being the lack of a controlled independent variable. A danger of this means of approach to the research questions is that it might uncover spurious relationships with little or no relevance or value. Other relational patterns uncovered may be arbitrary and ambiguous (Isaac, 1971).

Faults in the Instrument.

The research instrument used in the present study incorporates components such as a sociometric, Lickert

items, and a set of semantic differentials. Problems from its application in the present study will be discussed in Chapter V of this work. The current investigation is a one-shot case study. Therefore in order to elicit information regarding variables following adoption of an innovation, it is necessary to ask the respondents for projections along the lines of inquiry followed in the sociometric portion of the instrument. If significant findings should emerge, for example, regarding Network Stability and disposition to the innovation, these results would require validation in a study following the actual technological intervention at the hospital site.

Research Site

The Veterans Administration Medical Center Battle Creek (VAMCBC) is located in the Fort Custer Military Complex, Battle Creek, Michigan. The medical center campus is comprised of 30 buildings housing live-in patients and facilities for outpatient care.

The population under investigation at this site are staff members belonging to what is known as the team practice. Individuals from the greater staff populations of physicians, psychologists, nurses, and social workers are assigned to teams (one professional role member per team), which are permanently attached to the various wards of the hospital. The team is involved in the administration of care to each patient from intake to discharge. The VAMBC lent itself as a particularly attractive site for this

exploratory field research because at the present time it is without central processing equipment or microcomputers. Yet at the same time, the administration of the medical center was in the discussion stage of introducing computer equipment at the facility. One of the applications for which a system would be brought on-line is the collection of demographic data from patients at the intake stage of the care process. (At present, interviews are conducted face-to-face by each member of the intake team). At the same time, the VAMBC has a history of introducing telecommunication innovations. A great deal of technology is in place at the site. This is significant in the context of the present investigation as it provides a basis for exploring attitudes towards technology used in everyday experiences as these attitudes may relate to acceptance of a telemedicine system.

A one-way closed circuit video system links the buildings which house the medical wards, housekeeping operations and administrative functions of the hospital. Video programming can be originated from the well-equipped media center or can be received by satellite dish. Operations of the medical center appear to rely somewhat heavily on the use of telephones for the completion of day-to-day tasks. Perhaps this is due to the sprawling nature of the medical campus and its decentalization. (Most support functions, e.g. security, are housed in their own buildings, as are the various medical wards).

Respondents

Respondents selected for the study were members of patient intake teams of the various wards at the VAMCBC. The substance abuse ward was omitted from the sample as it had an operational structure different from the other wards. Therefore, the wards studied included 12, 7-1, 39-1, 39-2, 14B and 10. With the exception of 10, these wards each had two patient intake teams assigned to it. The total number of intake teams was 11.

Sample Units

The patient intake team of the various wards in the hospital provided the sampling unit for this study. The teams are composed of unique and known members from each of the roles described above (psychologist, etc.).

Sample Design

Department heads from Social Work, Psychology, and Psychiatry acted as informants who identified staff personnel assigned to each of the teams. The head nurse of each ward named the nurses assigned to the intake teams. As there was a great deal of variance in nursing assignments due to shift and part-time personnel, head nurses were asked: "Which nurses were assigned to team practice on January 18, 1984?"

Unit of Analysis

Although the research instrument is designed to get at the patient intake communication network (as well as other task and social networks), the person-centered sociometric technique described later in this chapter restricts our data analysis to the individual respondent as the unit of analysis. This limits generalizability of the results to the population at the VAMCBC.

Instrument

The survey instrument is comprised of three sections (found in Appendix C). The first section is a sociometric used in numerous studies of structural communication networks like those by Danowski (1984). The sociometric portion of the instrument is focusses upon current communication contacts and also for a time following adoption of a telecom-munications system for patient intake. The scenario supplied to the respondent is as follows:

> The patient is seated beside an attendant who will input data into a computer file with a keyboard. The attendant asks the patient a battery of questions amassing a complete patient history, and enters responses into the computer. The attendant instructs the computer to sort through these data using existing interview guidelines for patient check-in by departments. Separate history reports of the patient are compiled for the psychologist, physician, social worker, and nurse and will be delivered to each person's office.

The second section is a series of Likert items addressing a variety of issues suggested by the specific scenario

of technological innovation detailed above. The third section of the instrument is a series of semantic differential items from Osgood (Osgood, 1957) applied to five specific media the respondent is expected to encounter from day to day at the hospital.

Network Integration and Network Connectedness variables are operationalized from responses to the sociometric portion of the research instrument. It was adapted from standard person-centered sociometric instruments from communication science. This technique for gathering data on communication networks closely follows the technique used by Lauman (1964) who places its origin in the anthropological sciences beginning in the 1940's.

The respondent is asked to name the three people with who, he/she talks the most. The duration of the normal contact for each communication link is quantified with a ratio measure (minutes) for current connectedness, and with an interval measure (frequency over standard intervals of time, such as days, weeks, and months) for current integration and all of the projected measures. Lauman did not originate the breakout of communication activities by content areas. Communication scholars added this dimension to the sociometric technique during the 1970's. For the present study these content areas are: Intake Networks, Task Networks, and Social Networks. Intake procedures are considered separately from other task procedures because the scenario of technological adoption provided the respondent calls for a telemedicine system to facilitate patient

intake. The remaining content area addressed in the sociometric questions is social contact, referred to as non-task. The respondent estimates how often he/she converses with each of the three people nominated for these content areas and then estimates the amount of communication between each pair of the individuals named. Respondents are asked to make these estimates for the present time and also to make corresponding estimates for a time after introduction of the telecommunications innovation. This is done to elicit information about perceived change of communication networks which is addressed in the second research question regarding stability from pre- to post-adoption.

The person-centered technique used by Lauman was chosen for the present study because it allows guaranteed anonymity. The guaranteed anonymity was required by the human subjects committee. This condition was accepted by the researcher. It was felt that less reluctance by respondents asked to complete questionaires would be encountered with an anonymous instrument. Further, prior research has demonstrated that the person-centered technique allowed adequate reliability for the present study. Lauman sought to measure the reliability of his technique of network construction by interviewing the persons named as friends by study subjects. He reports about a 43% overlap between those which respondents reported as friends and these latter individuals' self-reports of friendship bonds.

The Likert section attempts to get at the value, from negative to positive, assigned by the respondent to the

hypothetical innovation's impact on the current system of health care at the research site. The resultant value is needed for planned comparisons between communication structure and likelihood of adoption, as well as attitudinal variables towards technology in general. The items were developed for the present research from descriptive data gathered at the health center prior to the research. It was designed to include variables such as administrative barriers, improvement of the general system, improvement of the intake process as well as the ease with which the system would be adapted. It was impossible to conduct a pretest of these items at the present site without contaminating the sample because nearly all professional staff members are involved in the patient intake process. It would be equally undesirable to pretest the Likert items at a similiar institution given the lengthy time investment required by the Veterans Administration's research screening procedure (six months in the present case).

The lack of a pretest for the Likert items raises the issue of construct validity. To address the issue the early stages of the data reduction procedure includes a factor analysis of the Likert responses with results reported in Chapter IV. Items which show an acceptable degree of validity will be weighted using factor coefficients and then summed. This procedure should allow a sufficient degree of construct validity for the Likert section.

The semantic differential section of the study was

designed to yield data for the exploratory portion of this research about the role of attitude toward technology as a predictor of the likelihood of acceptance of a telecommunications innovation. It was adapted from the body of literature surrounding the work of Osgood, Tannenbaum and Suci (Osgood, 1957). Adjective pairs selected have been shown to cut across the three factors which can be meaningfully measured with this technique: activity, potency, and evaluation (Osgood, 1957). Five media were selected for this portion of the study: telephone, video, face-to-face, written memo, and computer. For each media, the identical set of adjective pairs were presented to the respondent for rating using a seven-point scale. In the data analysis phase of the investigation a mean will be computed for each media based on the coded responses to the semantic differential adjective pairs. The data base derived from this section, therefore, will be a set of five mean values, one corresponding to each media, for every respondent. The means will then be used in correlational analysis with the value variable.

Procedures

First contact was made with the population in mid-July, 1983. The researcher met with Dr. Larry Schwartz, outgoing chair of the VAMCBC Joint Research and Development Committee. A proposal for research was drafted and submitted for consideration in late August, 1983. Due to Dr. Schwartz's objection to technical jargon used in the

proposal it was withdrawn by the researcher before consideration by the human subjects committee. The proposal was resubmitted in September, 1983, and subsequently approved. In October, 1983, the researcher went before the Joint Research and Development Committee to defend the proposal. The committee recommended acceptance of the researcher as a non-salaried employee of the Veterans Administration for the conduct of the research. This status was granted to the researcher in December, 1983.

Various members of the intake teams under study were members of either of the two committees with reviewed the proposal for this project. Contact with members of the population not on these committees first occurred in January, 1984. The contacts which each of the intake team members leading to their participation in the study occurred during the winter months of 1984, when patient levels are at their peak. Informants at the site refer to these annual peak levels of intake as "the wintering phenomena." (It is reasoned that potential patients spend most of their time outdoors in moderate weather months and do not precipitate intake proceedings by relatives.) Social workers were selected by the researcher for the first wave of survey administration.

One of the requirements of the Joint Research and Development Committee was the conduct of "Informed Consent" interviews with every subject asked to complete a questionnaire. Members of the population selected as respondent's were contacted by telephone and an appointment was set. At the meeting resulting from this appointment, the subject was read the "informed consent" document provided by the Veterans Administration. In addition, the subject was read the form entitled "Information About the Technology Survey" which contained a brief description of the study including its purpose, the involvement required, guarantees of anonymity, the voluntary nature of the respondent's participation, and the promise of a brief written report sent to those respondents indicating an interest in receiving it. The informed consent interviews were usually conducted in groups of two or three for efficiency. When this procedure was completed each subject was handed a survey and asked to complete it at that time. The researcher waited nearby in the office or some other waiting area and was available to collect the surveys after completion.

Following survey administration to the population of social workers involved in patient intake, a procedural change was initiated in order to use time more efficiently. Following completion of the informed consent interview, the respondent was handed the survey with a stamped envelope addressed to the researcher. This change was cleared through informal contact with the Joint Research and Development Committee.

Statistical Analysis Procedures

Reduction of Network Data

Isolate Identification.

The first step towards answering the research questions regarding relationships between network structure variables, attitude and favorability towards the innovation is to separate relative communication isolates from the rest of the respondent pool. In order to achieve this, a primary index describing Network Connectedness was constructed for current patient intake networks as follows:

1. Respondents with less than three contacts are separated from the others. These are considered extreme isolates and further measures of network structures are not computed.

2. For the remaining respondents, the amount of communication with each of the three named contacts is summed. The mean amount of primary communication was calculated. Cases falling below one standard deviation from this amount were coded as isolates. The remaining valid cases were coded as nonisolates.

Network Integration.

The construction of an integration index for current and projected patient intake, task, and social networks was

accomplished as follows:

1. Median splits are performed on each pair of individuals named by the respondent with those pairs above the median coded as one, and those below as 0.

2. These three new variables are summed with scores ranging from 0 to 3 which constitutes a 4-point scale. Zero represents a more radial network and 3 a more interlocking one (Danowski, 1984).

Network Stability.

To answer the research questions regarding the perceived stability of the respondent's patient intake, task, and social networks from time one to time two (following technological intervention), an index measure was taken from the subject's response to the questions regarding: a.) any changes in the individuals named for patient intake, task, and social networks from time one to time two; and b.) the number of individuals named at time two different from time one.

Media Style

In order to answer the research question regarding meaningful relationships between disposition towards media in everyday life and disposition to the specific innovation described in the scenario. Mean values from responses to semantic differential adjective pairs are computed for five different media.

Value of the System

All of the research questions concern associations between structural network, and Media Style variables; and likelihood of telemedicine system adoption inferred from favorability towards the system. In order to measure the latter variable it is necessary to reduce the Likert data into a single variable describing the respondents overall perception of the innovation. To accomplish this, the following analytic procedures are followed:

1. The Likert items are factor analyzed. Factor scores from the rotated varimax factor matrix are used to weight each of the Likert variables.

2. The weighted Likert values are then summed. The resulting value is taken to be a measure of likelihood of adoption.

Research Questions Operationalized

1. What communication structures are most likely to foster acceptance of the innovation?

Are there significant positive or negative correlations between the Network Connectedness index (of current and projected patient intake, task and social networks) and Value of the System? Are there significant positive or negative correlations between the Network Integration index (of current and projected patient intake, task, and social networks) and Value of the System?

2. Is perceived stability of communication networks

from pre- to post- adoption associated with likelihood of adoption?

Is there a significant positive or negative relationship between the Network Stability index (for patient intake, task, and social networks) and Value of the System?

3. Do individuals with radial communication structures perceive technological innovation as an improvement for the general system of care?

Is there a significant negative correlation between Network Integration (for current and projected patient intake, task and social networks) and Value of the System?

4. Do individuals with interlocking communication structures perceive technological innovation as a worsening of the general system of care?

Is there a positive significant relationship between Network Integration (for current and projected patient intake, task, and social networks) and Value of the System?

5. Are attitudes about media from everyday life associated with likelihood of adoption?

Are there significant positive or negative relationships between means from semantic differential adjective pairs for five media and Value of the System?

Summary

This chapter has addressed the research questions outlined in Chapter Two and discussed how the present study is

designed to provide an answer to these questions. The sample units, design, and units of analysis were described as individual members of selected health care teams from the site. Development of the survey instrument was discussed, along with procedures for its administration. Data analytic procedures to be performed on data gathered from the instrument were outlined and the research questions were operationalized in the context of the data analysis procedures.

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CHAPTER IV

Results

Overview

The following chapter will discuss results of the present investigation into the introduction of a telemedicine innovation at the Veterans Administration Medical Center, Battle Creek. It will detail the response rate; assignment of isolate/nonisolate status to respondent cases; provide an overview of the nonparametric correlation coefficients used; and provide the results of the correlational analysis.

Response Rate

Fifty "informed consent" interviews were conducted and at the conclusion of each interview a questionnaire was provided to the respondent. Thirty-eight questionnaires were returned for a response rate of 76% overall. Sixteen were received from social workers providing 100% response, nine from nurses for a response rate of 82%, 10 from psychologists for a response rate of 91%, and 3 from physicians for a response rate of 25%.[1] Of these, 35 were considered valid cases from respondents currently involved in patient intake procedures and comprised the pool of responses subjected to data analysis. (Two social workers and one physician reported they were not involved in patient intake and were therefore eliminated.) One case, (a physician) was

subsequently eliminated because it did not report at least three individuals for communication about patient intake.

Identification of Isolates

Thirty-four questionnaires from respondents reporting involvement in patient intake reported at least 3 communication network links for the primary network. These provided the core data base for identification of isolate/nonisolate status based on the following procedures: the amount of communication with each of the three named contacts for patient intake is summed. (Table 1 presents these primary amounts.) The mean amount of primary communication is then calculated. Cases falling below one standard deviation from this amount were coded as isolates. The remaining valid cases were coded as nonisolates. (Case by case identification of isolate/nonisolate status, primary amounts of communication, the mean value and standard deviation of primary communication can be found in Table 1). Thirty-one cases were coded "1" for nonisolate and included for further analysis. Of these, 2 physicians, 7 psychologists, 9 nurses, and 13 social workers were represented. Three cases were coded "0" as isolates. All three were psychologists.

Overview of Statistical Procedures

As discussed in the previous chapters, relevant items within a factor were identified for construction of an index

Table 1

Primary Communication and Isolate/Nonisolate Status

Case Number	Primary Communication Amount (mins.)	0/1 Assignment
1	60	1
2	35	1
3	50	1
4	135	1
5	2	0
6	75	1
7	50	1
8	25	1
9	18	0
10	60	1
11	60	1
12	17	0
13	50	1
14	.....Invalid Case	
15	111	1
16	60	1
17	.....Invalid Case	
18	.....Invalid Case	
19	30	1
20	75	1
21	60	1
22	100	1
23	60	1
24	180	1
25	21	1
26	30	1
27	35	1
28	25	1
29	45	1
30	65	1
31	35	1
32	35	1
33	40	1
34	.....Invalid Case	
35	45	1
36	35	1
37	75	1
38	55	1

$\overline{X}$ = 53.43

S.D. = 34.80

for the Value of the System variable. This was achieved by summing together the respondent's weighted scores for each item composing the index. (Appendix B contains the values of the rotated varimax factor coefficients used for this purpose.) Index scores were necessary in order to explore variables of the research questions regarding Network Connectedness, Network Integration, perceived stability of network relationships, and dispositions towards everyday media revealed by the respondents. Assumptions about the data reduction procedure yielding data representative of ordinal level measurement restrict the current investigation to nonparametric correlational analysis.

Kendall's Tau

The subprogram Nonpar Corr of SPSS was utilized in this study in order to identify significant correlations between the Value of the System variable and other variables described earlier. Kendall's Tau is a correlation coefficient which describes "the extent to which persons or objects are ordered alike on two variables" (Nunally, 1978).

Kendall's Tau is a correlation coefficient useful with data measured at the ordinal level. The Kendall's Tau Summary Table (Table 2) contains information about Value of the System, communication network structure variables, everyday media variables and perceived stability for communication networks from pre- to post-adoption.

Table 2

Kendall's Tau Summary Table of Correlation Coefficients

Variable	Correlation Coefficient	Significance Level
Network Connectedness		
Patient Intake		
-current	.1220	.194
-projected	-.2257	.055
Task		
-current	.3681	.005
-projected	.1368	.170
Nontask		
-current	.2093	.071
-projected	.1395	.175
Network Integration		
Patient Intake		
-current	.1417	.160
-projected	.0573	.346
Task		
-current	.0831	.279
-projected	.0133	.464
Nontask		
-current	.0177	.451
-projected	-.0380	.395

Table 2 -continued

Kendall's Tau Summary Table of Correlation Coefficients

Variable	Correlation Coefficient	Significance Level
Network Stability		
Patient Intake	-.2217	.103
Task	.0585	.326
Nontask	Could not be computed	
Telephone	.1067	.233
Video	.3847	.006
Face-to-Face	.3044	.019
Written Memo	.4911	.001
Computer	.6381	.001

Analysis of the Data

Connectedness Variables

Network Connectedness variables for current and projected patient intake, task, and social networks were studied in order to determine whether they could be associated with disposition towards the innovation (positive or negative) as a predictor of likelihood of adoption.

Connectedness variables were representative of ordinal scales of measurement. Table 2 provides descriptive statistics of Kendall's Tau correlations showing specific relationships between connectedness variables and the Value of the System variable. Network Connectedness for current patient intake was not significantly related to Value of the System. Network Connectedness for projected patient intake was significantly related (at the 95% significance level) to "value of the system" variable. Connectedness for current task matters were significantly related to the Value of the System variable. Connectedness for projected task matters were not significantly related to the value variable. Connectedness for current and projected nontask matters (social) were not significantly related to Value of the System variable.

Integration Variables

Integration variables for current and projected patient intake, task, and nontask maters were studied in order to determine what relationships existed between these variables

and likelihood of adoption of the proposed innovation.

Integration variables are representative of ordinal scales of measurement. Table 2 provides descriptive statistics of Kendall's Tau correlations showing specific relationships between integration and the Value of the System variables. Network Integration for current or projected patient intake, current or projected task matters, and current or projected nontask matters were not significantly related (at the 95% significance level) to the value variable.

Network Stability Variables

Network Stability variables for patient intake, task, and social networks were studied in order to explore relationships between the individual's anticipated changes in social relationships after technological adoption with the Value of the System variable.

Network Stability variables are representative of ratio scales of measurement. Table 2 provides descriptive statistics of Kendall's Tau correlations showing specific relationships between Network Stability variables and the Value of the System variable. The Network Stability variable for patient intake, task, and nontask matters were not significantly related to the Value of the System variable at the 95% significance level.

Media Style Variables

Media Style variables were studied in order to explore whether meaningful relationships exist between disposition towards media in everyday life and attitude toward the innovation.

Media Style variables are representative of ordinal scales of measurement. The mean value for each of five media per respondent (found in Appendix B) were used for nonparametric correlation with the Value of the System variable. Table 2 provides descriptive statistics of Kendall's Tau correlations showing specific relationships between Media Style variables and the value variable. The Telephone variable was not significantly related to Value of the System variable. Video (television), Face to Face, Written Memo and Computer were all significantly related to the value variable at the 95% significance level or higher.

Summary

This chapter has presented results of the current investigation into telemedicine innovation at the Veterans Administration Medical Center, Battle Creek. A response rate of 76% (including an extremely poor response rate by physicians) provided core data used in nonparametric correlational analysis between communication structural variables, attitude variables, and the Value of the System variable. Network Connectedness for projected patient intake networks and current task networks were significantly

related to Value of the System at the 95% significance level. Network Integration was not significantly related to Value of the System for current or projected patient intake, task or social networks. Network Stability variables were not significantly related to the value variable. The telephone media style variable, one of five media for which attitude measures were collected, was not significantly related to disposition towards the innovation. The remaining Media Style variables, Video, Face-to-Face, Written Memo, and Computer were significantly related to the Value of the System variable at the 95% significance level.

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CHAPTERNOTES

[1]This study encountered an extremely low response rate from physicians. This is consistent with prior research efforts about telemedicine using physicians as respondents. As stated in Chapter II, physicians resist any effort to alter their relationships with patients. Non-response by physicians is problematic to a telemedicine investigation yet is a form of evidence of the importance of further investigations directed at physician acceptance.

CHAPTER V

Discussion

Overview

This thesis has explored telemedicine applications in a field setting. It has been particularly concerned with human communication as an important variable to be addressed in policy research. Two communication structural variables have been measured: Network Connectedness (a measure of the strength of communication relationships between an individual and a selected group of contacts); and Network Integration (a measure representing the individual and her/his communicants in either a radial pattern or an interlocking network). The study has explored relationships between these communication structural variables and a variable measuring the respondent's disposition towards the telemedicine innovation described in a scenario within the research instrument. This latter variable was operationalized as the sum of subjects' weighted responses to Likert items concerning an impending technological innovation. The structural variables were also correlated with subjects' responses to attitudinal measures of telecommunication and other media used from day to day at the hospital. Following is a discussion of the results of these analyses framed within

the research questions discussed in previous chapters.

Discussion of Research Questions

1. What communication structures are most likely to foster acceptance of the innovation?

Prior research offered some evidence that connectedness was positively related to an individual's use of a medical innovation. Results of the current study offer some support for this earlier finding. The higher the Network Connectedness for projected patient intake and current task networks, the more favorable the disposition towards the innovation. It appears to be that personnel who report a high degree of communication--or talking--with other staff members about task matters hold a positive view towards the innovation. An alternative explanation to this finding is that personnel engrossed with task matters may have a more favorable disposition towards any authority-disseminated innovation (what in informal terminology might be called a "gung-ho" military orientation) and the relationship between connectedness and preference for a telemedicine innovation may be a spurious relationship confounded by a preference for the mode of dissemination.

Network Integration in either a more radial or interlocking pattern did not show significant correlations with favorable disposition towards the innovation. The integration variable is addressed separately in the discussion of research questions 3 and 4.

2. Is the perceived stability of communication networks from pre- to post-adoption associated with likelihood of adoption?

Prior research has suggested that employees confronted with technological innovation may fear a change in their interpersonal relationships which would result in a resistance to a technological innovation. Results of the present study did not uncover a relationship between expected change in whom a respondent talks to most and disposition towards the innovation. Possible explanation for these results may be related to prior research showing that the introduction of an audioconferencing system actually increased the amount of frequency of face-to-face communication between employees (Bretz, 1983). One respondent added descriptive data to the present study by commenting that a new computer system would foster more interpersonal communication because of inadvertent "bugs" in the system or procedure. The implication is that additional or existing levels of face-to-face contact would be necessary even after the launch of a system designed to decrease such contact in order to clarify printed outputs of the new system. Another possible explanations for this is that the survey instruments requirement of projected communication patterns does not adequately operationalize a stability variable intended to measure a change from time one to time two.

The following two research questions are combined for the sake of discussion:

3. Do individuals with radial communication structures perceive the technological innovation as an improvement for the general system of care at the VAMCBC?

4. Do individuals with more interlocking communication structures perceive the technological innovation as a worsening of the general system of care at the VAMCBC?

Prior research has suggested that the more radial the individual's communication network, the more they tend to use computer-based message systems. Based on these prior findings it would be expected that the more radial the individual's communication network, the more favorable the response to the innovation. As stated in Chapter III this would be expressed by a strong negative tau coefficient from the nonparametric correlation of integration variables with the value variables. The present study was absolutely without support for a relationship between the degree of radiality and preference for computer-mediated communication. In the context of prior literature on such computer-mediated innovation, this is a startling finding. One possible explanation for the absence of the relationship might be that the scenario used in the instrument had a confounding effect on the expected relationship between increasing radiality and a subject's preference for computer-mediated communication, yet this would not be considered a flaw in the context of the present investigation. Early innovation research indicated authority innovation had an entirely different set of assumptions from that of

innovations of choice. Therefore the present study specifically utilized a scenario which did not give the respondents a choice between using the new system or not. However, in studies cited earlier subjects had been given a choice to use the innovation or not to use it. It may be suggested that confronted with authority-disseminated innovations, a more radial individual's positive feelings for an innovation are confounded by a dislike for the authority mode of dissemination. Additional grounding for this view of the results is organizational theory which generally advocates participatory models of management. This interpretation would be supported further by a finding cited earlier that "radial network individuals are more autonomous with higher internal locus of control" (Danowski, 1975) and "place a higher value on independence" (Danowski, 1983). A study by Schomish of farmer's voting patterns with respect to a merger of agricultural cooperatives (Schomish, 1983) revealed that farmers who were not given a choice in the matter had a more negative attitude towards the proposed change than did those who were given a choice. This underscores the undiminished importance of communication scholars including authority-dissemination variables in their research inquiries for the sake of generalizability of the research findings to organizational settings where often the innovation is not of choice but one mandated by a superior to a subordinate. An alternative explanation of the surprising lack of relationship between increasing radiality and favorability towards

the system is that an unintentional confounding effect may reside in the scenario which represented the innovation in the survey instrument. The stated final product of the new computer-assisted procedure for patient check-in was referred to specifically as a computer printout which would be delivered to the respondent's office. There is some evidence which suggests that radial network individuals use printed media less than nonradials (Danowski and Van Engen, 1983). Radials may be expected to prefer interpersonal contact to the computer printout.

5. Are attitudes about media from everyday life associated with likelihood of adoption?

Prior research has depicted the innovation process as a linear model. As the amount of time an individual spends with an innovation increases, it was expected that the likelihood of adoption increases. This was thought to be a result of gaining knowledge about the innovation and, in effect, learning to like it. However, recent research hinted that a powerful variable of predisposition was more at the heart of the innovation outcome. This recent research shows existing negative attitudes about media from everyday life act as barriers to adoption of similiar innovations. Results of the present study do not refute this finding. Respondents' feelings about the telephone were not significantly related to a positive feeling about the innovation. However, positive feelings about video, written memos, face-to-face contact, and computers were

significantly related to positive feelings about the proposed innovation. At face value, the telemedicine system combines elements of video (the crt), written (the printed output), and computer media into a unified whole. It is not surprising, therefore, that the more favorable attitude towards similiar media from day-to-day experiences, the more positive the attitude towards the innovation.

Suggested Direction for Further Investigation

The present study uncovered relationships between high individual connectedness and favorability towards the proposed innovation. At the same time, strong anticipated relationships between radial network patterns and favorability towards the innovation were not uncovered. It is not clear, however ,if the surprise in the results is attributable to peculiarities of a medical setting for this type of communication network research; unintentional confounding by the survey instrument with representation of the innovation with a scenario assuming a printed output; or an extremely important indication that the lack of authority-elements in prior studies showing more radial network individuals preferring computer-mediated communication limits their generalizability to situations where the innovation is one of pure choice and not disseminated from the top down through a hierarchy. This suggests that future research efforts of relationships between structural communication networks and preference for computer-mediated communication must reintroduce the authority-innovation variable as more

general communication of innovation studies had. Further, the peculiarities of innovation in a hospital setting should be scrutinized as there may be a relationship between connectedness and innovation in this setting more so than these variables in a non-medical setting. Upon completion of the present investigation several directions for future research emerge in the context of "things this researcher would have done differently:" The analysis of relationships between attitudes towards media from day-to-day experiences and disposition towards the innovation may have been enhanced with semantic differential adjective pairs Nunally developed as a familiarity factor. The need for this aspect of the measurement of attitude towards the telemedicine scenario was pointed out by two respondents who noted beneath the set of adjective pairs for the Computer variable an indication that they did not feel qualified to respond, having never dealt with one. In order to study Network Stability, there simply may be no substitute for a longitudinal study. Confronted with the predictable lack of response to survey questionaires by physicians, a study of telemedicine perhaps should include descriptive interviews with physicians to offset limitations imposed on generalizability of the present study imposed by nonrespondent bias.

Other Interesting Patterns Which Emerged

Having amply noted the caveat that approximations of changes in network structure from time one to time two are

based on a projection by the respondent as to behavior in the future following adoption of a hypothetical telemedicine innovation, it is interesting to survey the connectedness and integration variables by role noting changes from time one to time two. (Appendix A contains results arrayed as cross-tabulations of role by Network Integration and Network Connectedness). For Network Integration from time one to time two, social workers saw themselves becoming less radial for patient intake, but nurses and psychologists projected communication structures that were more radial for patient intake. For task matters, again social workers saw themselves becoming less radial from time one to time two, yet nurses and psychologists expected little or no change. It was for social communication that social workers, nurses and psychologists came into agreement that they would become less radial following adoption of the telemedicine innovation. This apparent finding echoes Lawrence's view that employees do not consider salient features of the technological innovation itself, but rather what changes adoption may make on their social relationships in the organization. Since there appeared to be traces of a pattern for Network Integration and Network Connectedness variables considered for respondents role by role, these variables were subsequently subjected to nonparametric correlational analysis with the Value of the System variable using a select-if convention for separation by role. For social workers, relationships between increasing radiality and favorability to the innovation were in the proper

direction for social networks yet not at a significant level. Again, however, as in the large group analysis, task connectedness was significantly related to favorability to the innovation. Nurses' projected task and social Network Integration were also in the proper direction for a relationship between increasing radiality and favorability to the system, yet not at a significant level. Increasing Network Connectedness was not significantly related to favorability to the system for nurses, however, (a pattern not in keeping with the larger findings). The only significant results of connectedness and integration data run with the value variable for psychologists was for projected connectedness (increasing projected Network Connectedness associated with higher favorability to the system). Any conclusions to be drawn from this analysis of variables by role would be that connectedness is apparently the strongest structural variable associated with disposition towards a telemedicine innovation disseminated in an authority fashion. Also it should be noted that role by role, there are indications that integration may be associated with favorability in a hospital setting. As noted above, the correlation coefficients were at least in the proper direction to support such a claim.

Strategies for the VAMCBC

As previously stated, the secondary goal of this research is to assist the administrators of the VAMCBC

planning a telecommunications/computer system for the hospital. One means of developing targeted implementation strategies for the VAMCBC would be to run T-tests of the Value of the System variable data to look for differences in attitude between professional groups at the hospital. Additionally, because of the expected concern over changes in social relationships which might ensue following adoption of a telemedicine system, focus group discussions would be advisable as to the specific social issues to which staff members are sensitive. Such discussions are most appropriate at the early planning stages of the innovation. A practical interpretation of the emergence of the connectedness variable is that word of mouth concerning the innovation would be expected to be positive (the more the respondent reported communicating to others about task matters, the more favorable their disposition to the innovation). Therefore, it would appear profitable to disseminate information about the innovation in staff meeting settings with a good portion of time devoted to discussion. Attitudes about day-to-day media at the hospital appear to be related to attitudes about the innovation. If resistance to the innovation is to be addressed, it might best be done so in the context of separate system components (video screen, versus keyboard, versus computer data base, etc.) in order to isolate objections and thereby overcome them.

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APPENDICES

APPENDIX A

Table A1 a

Crosstabulation of Network Integration by Role

Current Patient Intake					
Count / Row Pct	Integration Index (Radial to Interlocking)				Total
	0	1	2	3	
Social Worker	3 23.1	5 38.5	0 0	5 38.5	13
Nurse	3 33.3	4 44.4	1 11.1	1 11.1	9
Psychologist	1 14.3	2 28.6	1 14.3	3 42.9	7
Physician	1 50.0	0 0	0 0	1 50.0	2
Column Total	8 25.8	11 35.5	2 6.5	10 32.3	31 100.0

Projected Patient Intake					
Count / Row Pct.	Integration Index (Radial to Interlocking)				Total
	0	1	2	3	
Social Worker	5 41.7	1 8.3	4 33.3	2 16.7	12
Nurse	4 44.4	5 55.6	0 0	0 0	9
Psychologist	4 57.1	0 0	0 0	3 42.9	7
Physician	1 50.0	0 0	1 50.0	0 0	2
Column Total	14 46.7	6 20.0	5 16.7	5 16.7	30 100.0

Missing Observations = 1

Note The lower the integration index value, the greater the radiality.

Table A1 b

Crosstabulation of Network Integration by Role

Current Task						Projected Task					
Count / Row Pct	Integration Index (Radial to Interlocking)				Total	Count / Row Pct	Integration Index (Radial to Interlocking)				Total
	0	1	2	3			0	1	2	3	
Social Worker	1 7.7	9 69.2	2 15.4	1 7.7	13	Social Worker	1 7.7	5 38.5	2 15.4	5 38.5	13
Nurse	2 22.2	1 11.1	2 22.2	4 44.4	9	Nurse	1 12.5	1 12.5	2 25.0	4 50.0	8
Psychologist	2 28.6	3 42.9	0 0	2 28.6	7	Psychologist	2 28.6	2 28.6	1 14.3	2 28.6	7
Physician	2 100.0	0 0	0 0	0 0	2	Physician	2 100	0 0	0 0	0 0	2
Column Total	7 22.6	13 41.9	4 12.9	7 22.6	31 100.0	Column Total	6 20.0	8 26.7	5 16.7	11 36.7	30 100.0

Note. The lower the integration index value, the greater the radiality.

Table A1 c

Crosstabulation of Network Integration by Role

Current Social

Current Social

Count / Row Pct	Integration Index (Radial to Interlocking) 0	1	2	3	Total
Social Worker	8	5	0	0	13
	61.5	38.5	0	0	
Nurse	0	3	3	3	9
	0	33.3	33.3	33.3	
Psychologist	3	1	1	1	7
	42.9	14.3	28.6	14.3	
Physician	2	0	0	0	2
	100.0	0	0	0	
Column Total	13	9	5	4	31
	41.9	29.0	16.1	12.9	100.0

Projected Social

Count / Row Pct	Integration Index (Radial to Interlocking) 0	1	2	3	Total
Social Worker	3	3	5	2	13
	23.1	23.1	38.5	15.4	
Nurse	1	0	0	8	9
	11.1	0	0	88.9	
Psychologist	0	1	3	3	7
	0	14.3	42.9	42.9	
Physician	1	0	1	0	2
	50.0	0	50.0	0	
Column Total	5	4	9	13	31
	16.1	12.9	29.0	41.9	100.0

Note The lower the integration index value, the greater the radiality.

Table A2 a

Crosstabulation of Network Connectedness by Role

Current Patient Intake						Projected Patient Intake					
Count Row Pct.	Connectedness Index (Low to High)				Total	Count Row Pct.	Connectedness Index (low to High)				Total
	0	1	2	3			0	1	2	3	
Social Worker	2 15.4	2 15.4	4 30.8	5 38.5	13	Social Worker	5 38.5	2 15.4	2 15.4	4 30.8	13
Nurse	1 11.1	3 33.3	2 22.2	3 33.3	9	Nurse	5 55.6	2 22.2	2 22.2	0 0	9
Psychologist	1 14.3	2 28.6	1 14.3	3 42.9	7	Psychologist	2 28.6	1 14.3	2 28.6	2 28.6	7
Physician	0 0	2 100.0	0 0	0 0	2	Physician	1 50.0	1 50.0	0 0	0 0	2
Column Total	4 12.9	9 29.0	7 22.6	11 35.5	31 100.0	Column Total	13 41.9	6 19.4	6 19.4	6 19.4	31 100.0

Note. The higher the connectedness index value, the greater the reported contact between respondent and three named communicants.

Table A2 b

Crosstabulation of Network Connectedness by Role

Current Task						Projected Task					
Count / Row Pct	Connectedness Index (Low to High)				Total	Count / Row Pct.	Connectedness Index (low to High)				Total
	0	1	2	3			0	1	2	3	
Social Worker	0	7	4	2	13	Social Worker	2	6	3	2	13
	0	53.8	30.8	15.4			15.4	46.2	23.1	15.4	
Nurse	0	1	2	6	9	Nurse	1	1	0	6	8
	0	11.1	22.2	66.7			12.5	12.5	0	75.0	
Psychologist	2	0	2	3	7	Psychologist	2	1	3	1	7
	28.6	0	28.6	42.9			28.6	14.3	42.9	14.3	
Physician	1	0	1	0	2	Physician	1	0	0	1	2
	50.0	0	50.0	0			50.0	0	0	50.0	
Column Total	3	8	9	11	31	Column Total	6	8	6	10	30
	9.7	25.8	29.0	35.5	100.0		20.0	26.7	20.0	33.3	100.0
						Missing Observation = 1					

Note. The higher the connectedness index value, the greater the reported contact between respondent and three named communicants

Table A2 c

Crosstabulation of Network Connectedness by Role

Current Social

Count / Row Pct.	Connectedness Index (Low to High) 0	1	2	3	Total
Social Worker	4	1	6	1	12
	33.3	8.3	50.0	8.3	
Nurse	0	4	2	3	9
	0	44.4	22.2	33.3	
Psychologist	3	3	0	1	7
	42.9	42.9	0	14.3	
Physician	1	0	0	1	2
	50.0	0	0	50.0	
Column Total	8	8	8	6	30
	26.7	26.7	26.7	20.0	100.0

Missing Observations = 1

Current Social

Count / Row Pct.	Connectedness Index (low to High) 0	1	2	3	Total
Social Worker	2	7	3	0	12
	16.7	58.3	25.0	0	
Nurse	1	4	1	3	9
	11.1	44.4	11.1	33.3	
Psychologist	2	4	1	0	7
	28.6	57.1	14.3	0	
Physician	1	0	0	1	2
	50.0	0	0	50.0	
Column Total	6	15	5	4	30
	20.0	50.0	16.7	13.3	100.0

Missing Observations = 1

Note. The higher the connectedness index value, the greater the reported contact between respondent and three named communicants

APPENDIX B

Table B

Mean Values for Media Style Variables

Case Number	Telephone	Video	Face-to-Face	Written Memo	Computer
01	4	5	6	5	4
02	4	4	4	4	4
03	7	6	7	6	7
04	5	4	5	4	4
06	5	5	6	5	4
07	6	4	6	4	5
08	5	5	5	4	5
10	6	6	7	5	6
11	6	6	6	5	5
13	5	6	4	3	5
15	5	2	3	3	4
16	6	5	6	5	5
19	6	5	5	5	4
20	5	5	5	5	6
21	4	4	4	3	3
22	5	5	6	5	7
23	4	4	4	4	3
24	6	6	5	5	6
25	5	9	5	5	4
26	5	5	3	5	5
27	4	5	5	4	5
28	4	4	4	3	3
29	6	5	9	9	5
30	9	9	9	9	9
31	4	5	6	4	5
32	4	4	4	4	4
33	5	5	6	5	5
35	4	5	5	4	5
36	4	4	5	5	6
37	6	6	5	4	6
38	4	4	4	4	4
	$\bar{X}$ = 4.83	$\bar{X}$ = 4.79	$\bar{X}$ = 5.03	$\bar{X}$ = 4.34	$\bar{X}$ = 4.80

Note "9" indicates missing values

APPENDIX C

APPENDIX C

Table C1

Factor Coefficients for Weighting Lickert Items

Variable	Factor Coefficient
1. Smooth Implementation	.59399
2. Changes in Routine	-.02565
3. Administrative Barriers	.21969
4. Attitude Barriers	.45649
5. Improve Patient Intake	.88899
6. Quick Implementation	.60103
7. Bugs in the System	.35993
8. Improve Administrative Efficiency	.69433
9. Improve Service to Patients	.81791

Note. Factor Coefficients from Rotated Varimax Factor Matrix.

APPENDIX D

Directions

Please complete this questionnaire as carefully as possible. Your responses are important to the project. Information you provide will be held by the researcher in strictest confidence. Please complete each question--do not leave any questions blank. Although this questionnaire may appear lengthy, it will go more quickly than it looks because it contains a lot of graphic content.

1. Are you involved in PATIENT INTAKE and DIAGNOSIS? (Please check one)

   _____Yes _____No

   Please check one box below which corresponds to your professional role.

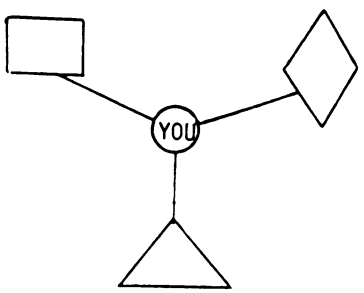
   ☐ psychologist ☐ physician ☐ social worker

   ☐ nurse If you are a nurse, are you presently assigned to a team practice? (Please check one)

   _____Yes _____No

Please think about the three people you communicate with most in the hospital about PATIENT HISTORY, INTAKE PROCESSES, and DIAGNOSIS. Write the professional roles of these people in the SQUARE, DIAMOND, AND TRIANGLE below, e.g. nurse, physician, psychologist, social worker, or other _____. (If other, please indicate a professional role.)

INTAKE NETWORK PART I



ABBREVIATIONS

NU NURSE
PS PSYCHOLOGIST
PH PHYSICIAN
SW SOCIAL WORKER

_____
Other

Now, estimate as best you can how many minutes you usually spend communicating with each person about the typical INCOMING PATIENT.

2. How many minutes do you usually spend communicating with the person in the SQUARE about a typical patient intake?

   _____ minutes per patient

3. How many minutes do you usually spend communicating with the person in the DIAMOND about a typical patient intake?

   _____ minutes per patient

4. How many minutes do you usually spend communicating with the person in the TRIANGLE about a typical patient intake?

   _____ minutes per patient

The next three questions ask you to estimate how often each of the three people you have selected communicate with EACH OTHER about the typical INCOMING PATIENT.

5. How many minutes do you estimate SQUARE SPENDS communicating with DIAMOND about a typical patient intake?

   _____ minutes per patient

6. How many minutes do you estimate SQUARE spends communicating with TRIANGLE about a typical patient intake?

   _____ minutes per patient

7. How many minutes do you estimate DIAMOND and TRIANGLE communicate with each other about a typical patient intake?

_____ minutes per patient

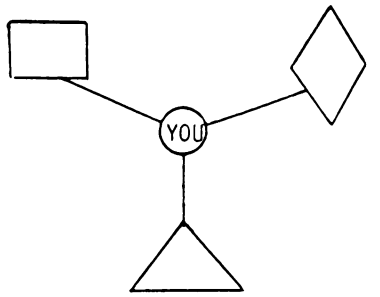
Please read the following scenario describing a system of patient intake which is different procedurally from that which currently exists. This system is based on the use of a computer for patient check-in.

Scenario

The patient is seated beside an attendant who will input data into a computer file with a keyboard. The attendant asks the patient a battery of questions amassing a complete patient history, and enters responses into the computer. The attendant instructs the computer to sort through these data using existing interview guidelines for patient check-in by departments. Separate history reports of the patient are compiled for the psychologist, physician, social worker, and nurse and will be delivered to each person's office.

Assume that your hospital has implemented the data management system described above. Think about the three people you expect you will communicate with most in the hospital about PATIENT HISTORY, INTAKE PROCESSES, and DIAGNOSIS following your hospital's adoption of this system. Write the professional roles of these people in the SQUARE, DIAMOND, and TRIANGLE below, e.g. nurse, physician, psychologist, social worker or other _____. (If "other", please indicate a professional role.)

INTAKE NETWORK PART II



ABBREVIATIONS

NU NURSE
PS PSYCHOLOGIST
PH PHYSICIAN
SW SOCIAL WORKER

_ Other _____

8. Are these the same people you listed above in INTAKE NETWORK PART I (Please check only one box below.)

☐ No ☐ Yes (If yes, please go to No. 9)

(If no, please check only one below)

_____ 3 are different
_____ 2 are different
_____ 1 is different

Now, estimate as best you can how many minutes you PREDICT you will spend communicating with each person about the typical INCOMING PATIENT following your hospital's adoption of this system.

9. How many minutes do you predict you will spend communicating with SQUARE about a typical patient intake?

_____ minutes per patient

10. How many minutes do you predict you will spend communicating with DIAMOND about a typical patient intake?

_____ minutes per patient

11. How many minutes do you predict you will spend communicating with TRIANGLE about a typical patient intake?

_____ minutes per patient

The next three questions ask you to estimate how often you PREDICT each of the three people you have named will spend communicating with EACH OTHER about a typical PATIENT INTAKE following your hospital's adoption of this system.

12. How many minutes do you estimate SQUARE will spend communicating with DIAMOND about a typical patient intake?

_____ minutes per patient

13. How many minutes do you estimate SQUARE will spend communicating with TRIANGLE about a typical patient intake?

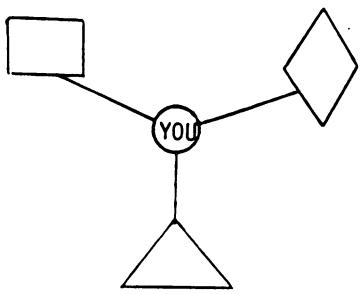
_____ minutes per patient

14. How many minutes do you estimate DIAMOND will spend communicating with TRIANGLE about a typical patient intake?

_____ minutes per patient

Next, please think about the three people you communicate with most in the hospital about TASK matters regardless of the particular task. Who are the three people you communicate with most? Write their professional roles below. Later, you will be asked about non-task communication separately.

TASK NETWORK PART I



ABBREVIATIONS

NU NURSE
PS PSYCHOLOGIST
PH PHYSICIAN
SW SOCIAL WORKER

___ _____
Other

Now, estimate how often you normally communicate with each person about TASK matters.

1. How often do you usually communicate with SQUARE about task matters? (Please check only one box below.)

☐ several times per day ☐ daily ☐ once or twice per week

☐ once or twice per month ☐ less often

2. How often do you usually communicate with DIAMOND about task matters? (Please check only one box below.)

☐ several times per day ☐ daily ☐ once or twice per week

☐ once or twice per month ☐ less often

3. How often do you usually communicate with TRIANGLE about task matters? (Please check only one box below.)

☐ several times per day ☐ daily ☐ once or twice per week

☐ once or twice per month ☐ less often

Next, estimate as best you can how often each of these people communicates with EACH OTHER about TASK matters.

4. How often do you estimate SQUARE communicates with DIAMOND about task matters? (Please check only one box below.)

☐ several times per day ☐ daily ☐ once or twice per week

☐ once or twice per month ☐ less often ☐ never

5. How often do you estimate SQUARE communicates with TRIANGLE about task matters? (Please check only one box below.)

☐ several times per day ☐ daily ☐ once or twice per week

☐ once or twice per month ☐ less often ☐ never

6. How often do you estimate DIAMOND communicates with TRIANGLE about task matters? (Please check only one box below.)

☐ several times per day ☐ daily ☐ once or twice per week

☐ once or twice per month ☐ less often ☐ never

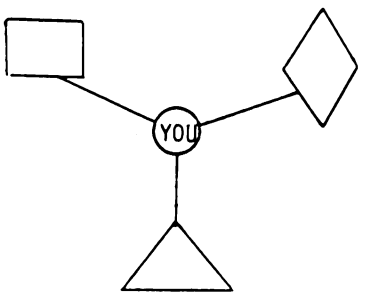
Please read again the following scenario describing a system of patient intake which is different procedurally from that which currently exists. This system is based on the use of a computer for patient check-in:

__ Scenario

The patient is seated beside an attendant who will input data into a computer file with a keyboard. The attendant asks the patient a battery of questions amassing a complete patient history, and enters responses into the computer. The attendant instructs the computer to sort through these data using existing interview guidelines for patient check-in by departments. Separate history reports of the patient are compiled for the psychologist, physician, social worker, and nurse and will be delivered to each person's office.

Assume that your hospital has implemented the data management system described above. Think about the three people you expect you will communicate with most in the hospital about TASK matters following your hospital's adoption of this system. Write the professional roles of these people in the SQUARE, DIAMOND, and TRIANGLE below.

TASK NETWORK PART II



ABBREVIATIONS

NU NURSE
PS PSYCHOLOGIST
PH PHYSICIAN
SW SOCIAL WORKER

__ _____ Other

7. Are these the same people you listed above in TASK NETWORK PART I? (Please check only one box below.)

☐ No ☐ Yes (If yes, please go to No. 8)

(If no, please check only one below)

_____ 3 are different
_____ 2 are different
_____ 1 is different

Now, estimate as best you can how often you PREDICT you will communicate with each person about TASK matters following your hospital's adoption of this system.

8. How often do you predict you will communicate with SQUARE about task matters? (Please check only one box below.)

☐ several times per day ☐ daily ☐ once or twice per week

☐ once or twice per month ☐ less often

9. How often do you predict you will communicate with DIAMOND about task matters? (Please check only one box below.)

☐ several times per day ☐ daily ☐ once or twice per week

☐ once or twice per month ☐ less often

10. How often do you predict you will communicate with TRIANGLE about task matters? (Please check only one box below.)

☐ several times per day ☐ daily ☐ once or twice per week

☐ once or twice per month ☐ less often

The next three questions ask you to estimate how often you PREDICT each of the three people you have named will spend communicating with EACH OTHER about TASK matters following your hospital's adoption of this system.

11. How often do you estimate SQUARE will communicate with DIAMOND about task matters? (Please check only one box below.)

☐ several times per day ☐ daily ☐ once or twice per week

☐ once or twice per month ☐ less often ☐ never

12. How often do you estimate SQUARE will communicate with TRIANGLE about task matters? (Please check only one box below.)

☐ several times per day ☐ daily ☐ once or twice per week

☐ once or twice per month ☐ less often ☐ never

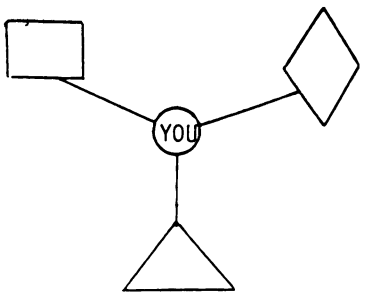
13. How often do you estimate DIAMOND will communicate with TRIANGLE about task matters? (Please check only one box below.)

☐ several times per day ☐ daily ☐ once or twice per week

☐ once or twice per month ☐ less often ☐ never

Finally, please think about the three people you communicate with most in the hospital about NON-TASK matters. Who are the three people you communicate with most? Write their professional roles below.

NON-TASK NETWORK PART I



ABBREVIATIONS

NU NURSE
PS PSYCHOLOGIST
PH PHYSICIAN
SW SOCIAL WORKER

— _____ Other

Now, estimate how often you usually communicate with each person about NON-TASK matters.

1. How often do you usually communicate with SQUARE about non-task matters? (Please check only one box below.)

☐ several times per day ☐ daily ☐ once or twice per week

☐ once or twice per month ☐ less often

2. How often do you usually communicate with DIAMOND about non-task matters? (Please check only one box below.)

☐ several times per day ☐ daily ☐ once or twice per week

☐ once or twice per month ☐ less often

3. How often do you usually communicate with TRIANGLE about non-task matters? (Please check only one box below.)

☐ several times per day ☐ daily ☐ once or twice per week

☐ once or twice per month ☐ less often

Next, estimate as best you can how often each of these people communicates with EACH OTHER about NON-TASK matters.

4. How often do you estimate SQUARE communicates with DIAMOND about non-task matters? (Please check only one box below.)

☐ several times per day ☐ daily ☐ once or twice per week

☐ once or twice per month ☐ less often ☐ never

5. How often do you estimate SQUARE communicates with TRIANGLE about non-task matters? (Please check only one box below.)

☐ several times per day ☐ daily ☐ once or twice per week

☐ once or twice per month ☐ less often ☐ never

6. How often do you estimate DIAMOND communicates with TRIANGLE about non-task matters? (Please check only one box below.)

☐ several times per day ☐ daily ☐ once or twice per week

☐ once or twice per month ☐ less often ☐ never

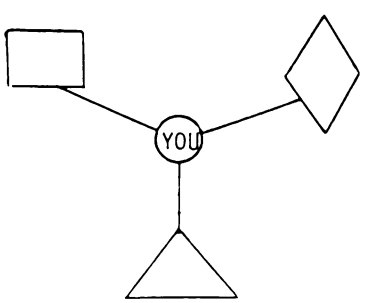
Please read the following scenario describing a system of patient intake which is different procedurally from that which currently exists. This system is based on the use of a computer for patient check-in:

Scenario

The patient is seated beside an attendant who will input data into a computer file with a keyboard. The attendant asks the patient a battery of questions amassing a complete patient history, and enters responses into the computer. The attendant instructs the computer to sort through these data using existing interview guidelines for patient check-in by departments. Separate history reports of the patient are compiled for the psychologist, physician, social worker, and nurse and will be delivered to each person's office.

Assume that your hospital has implemented the data management system described above. Think about the three people you expect you will talk with most in the hospital about NON-TASK matters following your hospital's adoption of this system. Write the professional roles of these people in the SQUARE, DIAMOND, and TRIANGLE below.

NON-TASK NETWORK PART II



ABBREVIATIONS

NU NURSE
PS PSYCHOLOGIST
PH PHYSICIAN
SW SOCIAL WORKER

__ _____
Other

7. Are these the same people you listed above in NON-TASK NETWORK PART I? (Please check only one box below.)

☐ No ☐ Yes (If yes, please go to No. 8)

(If no, please check only one below)

_____ 3 are different
_____ 2 are different
_____ 1 is different

Now, estimate as best you can how often you PREDICT you will communicate with each person about NON-TASK matters following your hospital's adoption of this system.

8. How often do you predict you will communicate with SQUARE about non-task matters? (Please check only one box below.)

☐ several times per day ☐ daily ☐ once or twice per week

☐ once or twice per month ☐ less often

9. How often do you predict you will communicate with DIAMOND about non-task matters? (Please check only one box below.)

☐ several times per day ☐ daily ☐ once or twice per week

☐ once or twice per month ☐ less often

10. How often do you predict you will communicate with TRIANGLE about non-task matters? (Please check only one box below.)

☐ several times per day ☐ daily ☐ once or twice per week

☐ once or twice per month ☐ less often

The next three questions ask you to estimate how often you PREDICT each of the three people you have named will spend communicating with EACH OTHER about NON-TASK matters following your hospital's adoption of this system.

11. How often do you estimate SQUARE will communicate with DIAMOND about non-task matters? (Please check only one box below.)

☐ several times per day ☐ daily ☐ once or twice per week

☐ once or twice per month ☐ less often

12. How often do you estimate SQUARE will communicate with TRIANGLE about non-task matters? (Please check only one box below.)

☐ several times per day ☐ daily ☐ once or twice per week

☐ once or twice per month ☐ less often

13. How often do you estimate DIAMOND will communicate with TRIANGLE about non-task matters? (Please check only one box below.)

☐ several times per day ☐ daily ☐ once or twice per week

☐ once or twice per month ☐ less often

Please read for a final time the following scenario describing a system of patient intake which is different procedurally from that which currently exists. This system is based on the use of a computer for patient check-in:

Scenario

The patient is seated beside an attendant who will input data into a computer file with a keyboard. The attendant asks the patient a battery of questions amassing a complete patient history, and enters responses into the computer. The attendant instructs the computer to sort through these data using existing interview guidelines for patient check-in by departments. Separate history reports of the patient are compiled for the psychologist, physician, social worker, and nurse and will be delivered to each person's office.

For the following nine items please indicate whether you STRONGLY AGREE, AGREE, are UNDECIDED, DISAGREE, or STRONGLY DISAGREE with the statement made.

1. The proposed system would be implemented smoothly.

   SA A U D SD

2. After the proposed system is implemented, changes in routine procedures will be required.

   SA A U D SD

3. There will be administrative barriers to adoption.

   SA A U D SD

4. There will be individual attitude barriers to adoption.

   SA A U D SD

5. The proposed system will improve patient intake.

   SA A U D SD

6. The proposed system will be implemented quickly.

   SA A U D SD

7. There will be "bugs" in the proposed system.

   SA A U D SD

8. The proposed system will improve administrative efficiency.

   SA A U D SD

9. The proposed system will improve service to patients.

   SA A U D SD

Listed below are pairs of adjectives often used to describe people or things. As shown in the box, the spaces indicate the degree to which something is related to one or the other ends of a scale described by these adjectives.

very closely related to fair	quite closely related to fair	only slightly related to fair	equally related to fair or unfair	only slightly related to unfair	quite closely related to unfair	very closely related to unfair

fair: _____: _____: _____: _____: _____: _____: _____: unfair

Please rate TELEPHONE COMMUNICATION according to the degree to which it is related to one or the other ends of each of the scales below. In making your judgements, please mark in the middle of the spaces, check only one space for each scale, and do not omit any scales. Please make judgements according to your feelings about telephone communication in the VA.

TELEPHONE COMMUNICATION IN VA

1.	fair	___:	___:	___:	___:	___:	___:	___:	unfair
	weak	___:	___:	___:	___:	___:	___:	___:	strong
	worthless	___:	___:	___:	___:	___:	___:	___:	valuable
	pleasant	___:	___:	___:	___:	___:	___:	___:	unpleasant
	complete	___:	___:	___:	___:	___:	___:	___:	incomplete
	bad	___:	___:	___:	___:	___:	___:	___:	good
	safe	___:	___:	___:	___:	___:	___:	___:	dangerous
	humorous	___:	___:	___:	___:	___:	___:	___:	serious
	clean	___:	___:	___:	___:	___:	___:	___:	dirty
	tasteless	___:	___:	___:	___:	___:	___:	___:	tasteful
	contemporary	___:	___:	___:	___:	___:	___:	___:	noncontemporary
	positive	___:	___:	___:	___:	___:	___:	___:	negative
	soft	___:	___:	___:	___:	___:	___:	___:	hard
	optimistic	___:	___:	___:	___:	___:	___:	___:	pessimistic
	harmful	___:	___:	___:	___:	___:	___:	___:	beneficial

Please rate TELEVISION according to the degree to which it is related to one or the other ends of each of the scales below.

TELEVISION APPPLICATIONS IN VA

2.									
	fair	____:	____:	____:	____:	____:	____:	____:	unfair
	weak	____:	____:	____:	____:	____:	____:	____:	strong
	worthless	____:	____:	____:	____:	____:	____:	____:	valuable
	pleasant	____:	____:	____:	____:	____:	____:	____:	unpleasant
	complete	____:	____:	____:	____:	____:	____:	____:	incomplete
	bad	____:	____:	____:	____:	____:	____:	____:	good
	safe	____:	____:	____:	____:	____:	____:	____:	dangerous
	humorous	____:	____:	____:	____:	____:	____:	____:	serious
	clean	____:	____:	____:	____:	____:	____:	____:	dirty
	tasteless	____:	____:	____:	____:	____:	____:	____:	tasteful
	contemporary	____:	____:	____:	____:	____:	____:	____:	noncontemporary
	positive	____:	____:	____:	____:	____:	____:	____:	negative
	soft	____:	____:	____:	____:	____:	____:	____:	hard
	optimistic	____:	____:	____:	____:	____:	____:	____:	pessimistic
	harmful	____:	____:	____:	____:	____:	____:	____:	beneficial

Please rate FACE-TO-FACE COMMUNICATION according to the degree to which it is related to one or the other ends of each of the scales below.

FACE-TO-FACE COMMUNICATION IN VA

3.									
	fair	____:	____:	____:	____:	____:	____:	____:	unfair
	weak	____:	____:	____:	____:	____:	____:	____:	strong
	worthless	____:	____:	____:	____:	____:	____:	____:	valuable
	pleasant	____:	____:	____:	____:	____:	____:	____:	unpleasant
	complete	____:	____:	____:	____:	____:	____:	____:	incomplete
	bad	____:	____:	____:	____:	____:	____:	____:	good
	safe	____:	____:	____:	____:	____:	____:	____:	dangerous
	humorous	____:	____:	____:	____:	____:	____:	____:	serious
	clean	____:	____:	____:	____:	____:	____:	____:	dirty
	tasteless	____:	____:	____:	____:	____:	____:	____:	tasteful
	contemporary	____:	____:	____:	____:	____:	____:	____:	noncontemporary
	positive	____:	____:	____:	____:	____:	____:	____:	negative
	soft	____:	____:	____:	____:	____:	____:	____:	hard
	optimistic	____:	____:	____:	____:	____:	____:	____:	pessimistic
	harmful	____:	____:	____:	____:	____:	____:	____:	beneficial

Please rate WRITTEN MEMOS according to the degree to which it is related to one or the other ends of each of the scales below.

WRITTEN MEMO COMMUNICATION IN VA

4.

fair	___:	___:	___:	___:	___:	___:	___:	unfair
weak	___:	___:	___:	___:	___:	___:	___:	strong
worthless	___:	___:	___:	___:	___:	___:	___:	valuable
pleasant	___:	___:	___:	___:	___:	___:	___:	unpleasant
complete	___:	___:	___:	___:	___:	___:	___:	incomplete
bad	___:	___:	___:	___:	___:	___:	___:	good
safe	___:	___:	___:	___:	___:	___:	___:	dangerous
humorous	___:	___:	___:	___:	___:	___:	___:	serious
clean	___:	___:	___:	___:	___:	___:	___:	dirty
tasteless	___:	___:	___:	___:	___:	___:	___:	tasteful
contemporary	___:	___:	___:	___:	___:	___:	___:	noncontemporary
positive	___:	___:	___:	___:	___:	___:	___:	negative
soft	___:	___:	___:	___:	___:	___:	___:	hard
optimistic	___:	___:	___:	___:	___:	___:	___:	pessimistic
harmful	___:	___:	___:	___:	___:	___:	___:	beneficial

Please rate COMPUTER according to the degree to which it is related to one or the other ends of each of the scales below.

computer

5.

fair	___:	___:	___:	___:	___:	___:	___:	unfair
weak	___:	___:	___:	___:	___:	___:	___:	strong
worthless	___:	___:	___:	___:	___:	___:	___:	valuable
pleasant	___:	___:	___:	___:	___:	___:	___:	unpleasant
complete	___:	___:	___:	___:	___:	___:	___:	incomplete
bad	___:	___:	___:	___:	___:	___:	___:	good
safe	___:	___:	___:	___:	___:	___:	___:	dangerous
humorous	___:	___:	___:	___:	___:	___:	___:	serious
clean	___:	___:	___:	___:	___:	___:	___:	dirty
tasteless	___:	___:	___:	___:	___:	___:	___:	tasteful
contemporary	___:	___:	___:	___:	___:	___:	___:	noncontemporary
positive	___:	___:	___:	___:	___:	___:	___:	negative
soft	___:	___:	___:	___:	___:	___:	___:	hard
optimistic	___:	___:	___:	___:	___:	___:	___:	pessimistic
harmful	___:	___:	___:	___:	___:	___:	___:	beneficial

Thank you for your cooperation in this important project.

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