Information & Management 20 (1991) 119–136
North-Holland

SOS

Social worlds, individual differences, and implementation

Predicting attitudes toward a medical information system *

Carolyn E. Aydin
Nursing Research and Development, Cedars-Sinai Medical Center, Los Angeles, CA 90048-0750, USA

Ronald E. Rice
School of Communication, Information and Library Studies, Rutgers University, New Brunswick, NJ 08903, USA

Implementation research has identified a wide variety of factors, such as individual differences, implementation practices, and system usage, that influence the success or failure of information systems. The present research proposes that, especially in health care organizations, both occupational and departmental social worlds are additional, important predictors of individual reactions to medical information systems. Quantitative and qualitative methods were used to investigate the two-year process of implementing a computerized medical records information system in one health care organization. Results support the importance of social worlds, as well as some of the traditional implementation influences (but not individual differences such as cognitive style, prior computer experience, age) in understanding individual attitudes toward the computer system. The study also highlights current implementation issues and their implications for system planners and managers. The research adds to our understanding of the complexity of attitudes toward technological innovations, and the importance of membership in social worlds in influencing those attitudes.

Keywords: User Attitudes, Work Groups, Social Worlds, Implementation, Medical Information Systems, Network Analysis.

* The authors would like to thank the administrators and respondents of the sample organization for cooperating in the project, Dr. Lynne Markus for her help in making this project possible, and Dr. Eric Eisenberg and two anonymous reviewers for their comments. This research was conducted while Dr. Aydin was a doctoral student at the University of Southern California.

Problem Statement

Computerized medical information systems are "formal arrangements by which the facts concerning the health or health care of patients are stored and processed in computers" (Lindberg, 1979, p. 9). Medical information systems linking patient care areas with departments (e.g., pharmacy, radiology, clinical lab) are currently being adopted by a large number of health care organizations (Packer, 1985). Perhaps as many as half of these systems, however, encounter dissatisfaction, interference, resistance, or failure. These outcomes have been attributed to poor system design, improper fit with organizational and social features, negative attitudes and social relationships within the hospital, medical norms about technology and patient care, and national health policies (Brenner and Logan, 1980; Dowling, 1980; Lindberg, 1979; Smith and Kaluzny, 1986).

In accord with Lucas' multidimensional model

Carolyn Aydin received her Ph.D. from the Annenberg School of Communications at the University of Southern California and is continuing her research focus on the impacts of medical information systems at Cedards-Sinai Medical Center in Los Angeles. Her research interests include communication patterns in health care organizations, occupational adaptation to technological change, and the implementation of medical information systems. Previous papers have been published in the *Journal of Health and Social Behavior* and the *Proceedings of the Sumposium on Computer Applications in Medical Care.*

Ronald E. Rice (Ph.D. Stanford University, 1982) is Associate Professor, School of Communication, Information and Library Studies, Rutgers University, New Brunswick, NJ 08903. He is co-editor or co-author of *Public communication campaigns* (1981, 1989, Sage), *The new media: Communication, research and technology* (1984, Sage), *Managing organizational innovation* (1987, Columbia University Press) and *Research methods and new media* (1988, Free Press). He has published widely in the areas of diffusion of innovations, network analysis, and organizational computer-mediated communication systems.

of information systems implementation (1981), we propose that attitudes toward a medical information system [1] are influenced by multiple contextual factors, including individual differences (cognitive style, prior computer experience, age), system use, and organizational implementation practices (interaction with trainer and analysts, understanding of the system, work group communication, and organizational policies concerning developing new uses for the system). The present longitudinal case study extends previous research by proposing that membership in occupational and departmental social worlds also influences individual attitudes toward a medical information system. That is, we argue that the user's professional and departmental contexts must be considered when explaining attitudes toward a new information system.

Influences on Attitudes toward a Medical Information System

Social Worlds in Health Care Settings

The concept of "social worlds" is central to the symbolic interactionist perspective, a sociological point of view that defines society as a "network of interpersonal communication, connecting persons organically" (Stryker, 1981, p. 5). Individuals create their reality and attitudes toward objects such as a new computer system through interaction with others and through membership in a common social context. Therefore, the social worlds to which they belong should shape the opportunities, criteria for, and circumstances of these interactions (Kling, 1980; Stryker, 1981). The crucial concept motivating our belief in the importance of social worlds is that individuals – whether implementors, managers, or users – are not isolated, independent actors. Rather, they use systems and develop attitudes toward them within various social contexts. Considering those social contexts is necessary to better understand the process and outcomes of implementing information systems.

To define social worlds within organizations, we use Van Maanen and Barley's (1985, p. 38) definition of a subculture: where members "interact regularly with one another, identify themselves as a distinct group within the organization, share a set of problems commonly defined to be the problems of all, and routinely take action on the basis of collective understandings unique to the group." Individuals may belong to a number of different social worlds, depending upon the role they are taking (Mauksch, 1972a,b). In the social structure characteristic of American hospitals and clinics, individual employees are often members of at least two primary social worlds: occupational and departmental.

Occupational Social Worlds

Research on innovations in health care settings has documented the importance of *occupation* in predicting individual reactions. Membership in specific health occupations implies similar kinds of training, professional norms and standards, participation in associations, etc. These represent similar socialization processes and thus similar criteria for evaluating new aspects of their occupational activities.

Different variables, for example, have been found to influence the adoption of *medical* versus *non-medical* innovations in hospitals (Kimberly and Evanisko, 1981). Reviewing computer implementation in health care settings, Counte, Kjerulff, Salloway, and Campbell (1987) noted that physicians and technical personnel were most positive towards computers, nurses and nursing students least positive, and clerical staff in an intermediate position. Other studies, however, have shown different patterns in the reactions of personnel in medical occupations. Nurses and pharmacists, for example, were enthusiastic about a system called PROMIS because it expanded their expertise and professional roles. Physicians, on the other hand, were less enthusiastic about the system because it infringed upon their traditional use of information by requiring them to read parts of the medical record they were accustomed to skipping over (Fisher, Stratmann, Lundsgaarde, and Steele, 1987). Aydin (1989) noted differences in attitudes toward a medical records system between members of pharmacists and nurses, as well as both increased friction and cooperation between the two groups, as new roles were introduced by the implementation of the system. Regardless of context, however, occupation consistently emerges as

[1] See "The Setting and The System" section below for a more complete description of the particular system analysed here.

a significant influence on individual reactions in health care organizations.

Therefore, we would expect that membership in different occupational social worlds will influence individuals' attitudes toward a medical information system.

Departmental Social Worlds

Focussing only on occupational membership fails to consider the importance of ongoing *departmental* communication in maintaining social worlds (Shibutani, 1978; Van Maanen and Barley, 1985). Although physicians in different departments in the same hospital are all likely to be concerned with treating patients, and to identify themselves occupationally as "physicians," physicians who work within the same department are likely to communicate and act according to collective understandings about agreed-upon departmental tasks in ways that may differ from those in other departments. Furthermore, physicians and nurses working in the same department will share common concerns related to the specific tasks of that department. Groups such as departments tend to "minimize internal conflict and focus on issues that maximize consensus" (Van de Ven, 1986, p. 596.) Communication within departments, at the very least, has the potential to forge agreements concerning individual actions needed to attain departmental goals (Donnellon, Gray, and Bougon, 1986). Departments also "control many of the stimuli to which an individual is exposed in the course of his organizational activities" (Hackman, 1983, p. 1457). Individuals who belong to the nursing occupation may perform similar tasks, but interpret these tasks differently based upon specific departmental problems and concerns.

Researchers have noted different reactions to medical information systems among members of the same occupational group working in different departments or organizations. Kaplan (1986, 1989), for example, noted differences in definitions of the technologists' role in different clinical laboratories in the same medical center. Barley (1986) reported that the first use of body scanners in the radiology departments of two hospitals resulted in new boundaries between the various technological subunits, but with different patterns of change in each hospital.

Therefore, we would expect that membership in different departmental social worlds will influence individuals' attitudes toward a medical information system.

Individual Differences: Cognitive Style, System Use, Age

Although we argue that social context is an important influence on users' attitudes, an individual's own unique frame of reference and experience (such as cognitive style, computer experience, and age are also theorized to be an important influence) (Lucas, 1981; O'Reilly, Parlette, and Bloom, 1980).

Cognitive Style

Cognitive styles "represent characteristic modes of functioning shown by individuals in their perceptual and thinking behavior" (Zmud, 1979, p. 967). Individuals who rely on logical structures to clarify a situation (thinking types) should have less difficulty adapting to computer-based tasks and consequently a more positive attitude toward a new medical information system than those who rely primarily on affective processes in problem solving (feeling types) (Aydin, 1987; Keen and Morton, 1978; Myers and McCaulley, 1985). Additionally, those with a more "feeling type" of cognitive style will more likely prefer direct interaction with patients rather than performing more abstract information system tasks.

Therefore, we would expect that health care individuals with a more "thinking type" cognitive style will have more positive attitudes toward a medical information system than individuals with a more "feeling type" cognitive style.

Prior Experience with Computers

Research findings on the influence of previous computer experience on acceptance of information systems are mixed (Kerr and Hiltz, 1983). The lack of standardization between systems may make it difficult for experienced computer users to adapt to a new system, resulting in "too much" experience being negatively related to acceptance. Increased experience may also raise the users' criteria for satisfaction, leading to a negative relationship between experience and acceptance of a new system. Researchers studying medical systems, however, have shown experience to result in greater acceptance of computer systems (Hodge, 1977; Startsman and Robinson, 1972). Familiarity with

the social world of computing, as well as greater technical skill and understanding of computers, are likely contributors to this result.

Therefore, we expect that individuals with more computer experience will have more positive attitudes toward a medical information system.

Age

Age has been shown to relate both positively and negatively to attitudes toward a variety of innovations in general and to computer applications in particular (Rogers, 1983). Typically, people who are younger, and who have spent fewer years at an organization may be less resistant to changes in job tasks, or to innovations in general. However, several of the studies showing that age was positively correlated with innovativeness involved nurses. In the context of health care organizations, it is possible that younger nurses are more idealistic about their role and see computers as lessening their commitment to patient care, rather than as facilitating record keeping and reducing paper work.

Therefore, we expect the general result to be that younger employees in a health care organization will have more positive attitudes toward a medical information system than will older employees, but that the results may be opposite for nurses.

Implementation Practices and Policies

Finally, in addition to social contexts and individual differences, two factors directly related to an information system itself should influence attitudes toward a system: involvement in the implementation process, and experience with the system through usage.

Involvement

An underlying theme in discussions of the implementation process is the importance of user participation for successful system implementation (Hirschheim, 1985; Ives and Olson, 1984; Lucas, 1981; Markus, 1984). Such involvement in the implementation process has been proposed to improve potential users' understanding of the system, help designers and implementors orient the system more toward users' needs, and increase emotional and political commitment to the system. Participation in the implementation process may also bring together members of different social worlds to learn more about the system, and influence the design and management of the system in ways that accommodate the needs of those different social worlds, thus improving attitudes toward the system.

Some common forms of involvement in implementation include interaction with systems analysts and trainers, general understanding of the system, work group and supervisory support for learning about the system, and organizational policies concerning support for learning and experimentation with the new system (Ives and Olson, 1984; Johnson and Rice, 1987). However, involvement and participation are complex processes, involving a wide variety of practices and measures (Johnson and Rice, 1987: note 5.5; Markus, 1984) and contingent on information processing tasks (Kraemer, Dutton, and Northrop, 1981) and other management practices (Hirschheim, 1983).

Therefore we expect that involvement in the implementation process will result in more positive attitudes toward a medical information system, but will that relationship may be contingent on the type of involvement.

Use of the Information System

Use of an information system provides individuals with an opportunity to assess system features and capabilities, input requirements and products, and how well the system meets their needs. Thus use of a medical information system may influence employee attitudes toward the system both positively and negatively (Counte et al., 1987). An information system may help achieve desired potential benefits, leading those who use the system more to have more positive attitudes toward it. However, it may also create additional demands on users' time and energies, and force departments to change how they perform their work, so that increased usage may be associated with negative attitudes. These changes may also be met with initial uneasiness if they conflict with expectations held by different social worlds (Hirschheim, 1985; Johnson and Rice, 1987; Kaplan, 1989).

Therefore, we expect that computer use will generally influence attitudes toward the computer system, but that the direction of association may vary by occupational or departmental social world.

Method

The Setting and the System

The present research is a case study of the Student Health Service (SHS) of a large urban university. SHS employs between 100 and 125 full- and part-time employees as well as numerous student workers.

The system implemented in this setting was an integrated medical records information system running off a dedicated minicomputer. The vendor and system planners designed the computerized system to approximate the paper-and-pencil systems previously used in various SHS departments, with the most immediate and pressing problem being patient scheduling. By the end of the study period many system functions were operating to (1) schedule appointments for patients and physicians, (2) create a common database for student demographic and elibility information, (3) generate encounter forms (which patients took with them to each department, and which were used to note all treatment and billing information for later entry into the system), (4) enter codes for diagnoses and services performed, (5) reconcile written encounter forms with data entered in the computer, and (6) generate reports. Although the vendor's complete system could provide a wide range of integrated applications, as of the end of this study it was primarily an information collection, management, tracking, and reporting system. That is, it did not include functions for communicating orders for tests, reporting of lab results, or analyzing patient outcomes for medical research.

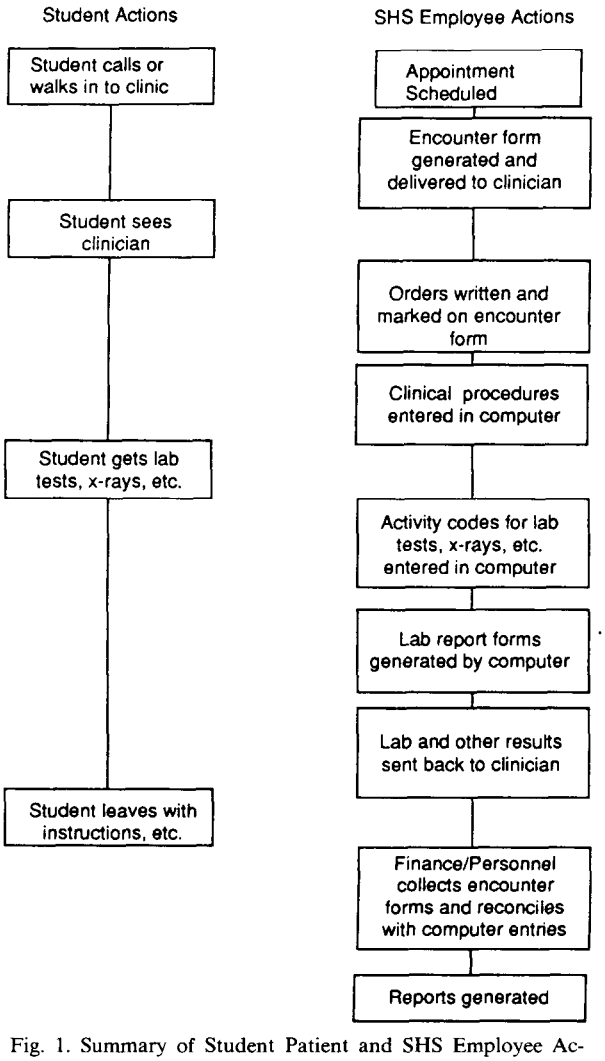


Fig. 1. Summary of Student Patient and SHS Employee Actions Using Medical Information System.

SHS's own implementation strategy included the hiring of a system analyst and assigning the medical records administrator (also a credentialed teacher) as system coordinator/trainer. A committee composed of the executive director, a system analyst, and the coordinator/trainer made most of the decisions related to system implementation.

Figure 1 summarizes how the users, the system, and the encounter forms helped manage the student patient flow.

Research Design

The research design included three waves of questionnaires distributed to all organization employees (1) several months before the new information system was implemented, (2) several months after implementation had begun, and (3) approximately one year after the second survey. The analyses below use selected items from the Time 1 and Time 3 questionnaires. Questionnaires were distributed at staff meetings and employees sealed and mailed completed questionnaires to a university department outside of the medical center. Researchers followed up non-respondents by letter or personal telephone call over a period of approximately 2 to 4 months after the distribution of the questionnaires. Of the 111 employees at SHS during Time 1 (some were seasonal or part-time), 88 were still employed at Time 3; 74 of

these employees (84%) completed both the Time 1 and Time 3 questionnaires.

The authors also conducted moderately structured, 1/2 to 1-hour, interviews with personnel in each occupation and department, as well as in key positions. The first set of interviews took place prior to system implementation; the second set several months after implementation had begun; and the third set following completion of the last questionnaire. Researchers also observed individuals using both the previous paper and pencil system and the computer system in their daily work.

Measurement

Attitudes Toward Computer System

Based upon Schultz and Slevin's (1975) conclusion that an individual's cost-benefit evaluation was one of the most useful measures of perceived system success, respondents were asked to indicate their level of agreement (on a 7-point scale ranging from "strongly disagree" to "strongly agree") with the following question: "The new SHS information system is worth the time and effort required to use it". This item was measured at both Time 1 (Variable 1) and Time 3 (Variable 2).

At Time 3, two additional questions that would only be meaningful *after* respondents had experience with the system asked them to rate the extent to which the system increased (1) the *ease* of performing the department's work and (2) the *quality* of the department's work.

Finally, a "combined attitude scale" (Variable 3) was computed by creating factor scores from a principal components analysis of (1) the residuals of the regression of the Time 3 "system worth time/effort" value on the Time 1 "system worth time/effort" value (to control for autocorrelation between Time 1 and Time 3) and (2) the two Time 3 questions concerning ease and quality. (See *Table 1* for descriptive statistics, factor loadings, variance explained, and alpha reliabilities.)

Table 1
Factor Loadings and Descriptive Statistics for Time 3 Combined Attitude Toward Computer Scale (Variable 3).

Variables	Factor Loadings	Descriptives	
		M	s.d.
Time 3 – System has changed:			
ease of department's work [a]	*0.91*	4.63	1.65
quality of department work [a]	*0.92*	4.97	1.45
Residuals from regression of System is worth time/effort required to use it [b] at Time 3 on Time 1	*0.71*	0.03	1.50
Eigenvalue	2.18		
Percent variance	73%		
Alpha if variables added	0.81		

$n = 62$

[a] Original scale: 1 = significantly increased, 2 = increased, 3 = slightly increased, 4 = no change/no opinion, 5 = slightly decreased, 6 = decreased, 7 = significantly decreased. Scale reversed for analysis.

[b] Scale: 1 = strongly disagree, 2 = disagree, 3 = slightly disagree, 4 = neutral, 5 = slightly agree, 6 = agree, 7 = strongly agree.

Occupational And Departmental Social Worlds

Individuals were classified as members of both occupational and departmental social worlds on the basis of questionnaire responses and archival information. The five occupational categories (Variable 4) were administrators (ADMs), office/clerical workers (O/C), physicians (MDs), nurses (RNs), and other medical workers (OMs). In addition, a dichotomous variable grouped employees into 0 = non-medical (the first two) and 1 = medical (the last three) occupational social worlds. (Network analyses validated the theoretical distinctions between occupational social worlds: see Appendix.) The seven departments (Variable 5) that included the bulk of the respondents were Primary Care, Women's Health, Specialty Clinics, Finance and Personnel, Medical Records, the Laboratory, and Health Educaton.

Individual Differences: Cognitive Style

The abbreviated version (Form AV) of the Myeres-Briggs Type Indicator (MBTI) was attached to the Time 1 questionnaire to measure the cognitive style of the respondent (Variable 6). (See Myers and McCaulley [1985] for reliability and validity information.) Respondents were grouped into four categories based on the thinking/feeling scale of the MBTI: 1 = high thinking (thinking score higher with a difference between thinking and feeling categories of more than five points), 2 = low thinking (thinking score higher than feeling score, but with a difference of five points or less), 3 = low feeling (feeling score higher than thinking score, but with a difference of five points or less), and 4 = high feeling (feeling score higher

with a difference of more than five points between thinking and feeling).

Individual Differences: Computer Experience

At Time 1, respondents indicated their highest prior level of experience with computers by selecting from 1 = none (34%), 2 = using reports/information produced by computer (12%), 3 = entering data by using a terminal (19%), 4 = doing word processing on terminal or computer (24%), 5 = using other applications (e.g., databases, statistics) (8%), to 6 = programming/repairing (3%). Respondents also indicated the number of years with the highest level of experience. A computer experience scale was then calculated by multiplying the number of years by the code for the highest level of experience (Variable 7).

Individual Differences: Age

Age was measured simply by number of years since birth (Variable 8).

Implementation: Interaction With Trainer

The computer system trainer rated her interaction with each employee as 0 = no involvement, 1 = initial training only, and 2 = ongoing interaction and consultation (Variable 9).

Implementation: Relations With Computer Staff (Variable 10) And Knowledge / Involvement (Variable 11)

These variables represented two of the five factors of the Ives, Olson, and Baroudi (1983)

Table 2
Factor Loadings and Descriptive Statistics for Relations with Computer Staff (Variable 10) and Knowledge/Involvement (Variable 11). [a]

Variables	Factor Loadings		Descriptives	
	10	11	M	s.d.
Relations with Computer Staff				
Relationships w/system analysts/trainers:				
dissonant/harmonious	*0.84*	0.07	5.09	1.34
bad/good	*0.85*	0.02	5.11	1.42
Attitude of system analysts/trainers:				
belligerent/cooperative	*0.84*	0.23	5.03	1.55
negative/positive	*0.86*	0.25	5.09	1.47
Communication with analysts/trainers:				
dissonant/harmonious	*0.79*	0.16	5.05	1.40
destructive/productive	*0.79*	0.12	4.86	1.42
Knowledge / Involvement			4.06	1.69
Understanding of the system:				
insufficient/sufficient	0.23	*0.88*	4.31	1.56
incomplete/complete	0.17	*0.84*	3.97	1.51
Feeling of participation in implementation:				
negative/positive	0.23	*0.70*	4.23	1.93
insufficient/sufficient	0.17	*0.76*	4.14	1.91
Eigenvalue	4.01	2.08		
Percent variance	13%	7%		
Alpha if high-loading variable added	0.95	0.91		

[a] Variables 10 and 11 are Factors 2 and 4 from the Ives, Olson, and Baroudi (1983) five-factor User Information Satisfaction Scale. Factor loadings shown here were calculated using all Time 3 organizational members responding to the items ($n = 65$). Factor analysis only with Time 1/Time 3 respondents showed similar factor loadings. Means and standard deviations based on Time 1/Time 3 respondents. Mean scales were used in the analysis. Original scale: 1 = most positive response, 7 = most negative response. Scale reversed for analysis.

Table 3
Factor Loadings and Descriptive Statistics for Work Group Communication (Variable 12) and Organizational Policies (Variable 13). [a]

Variables	Factor Loadings		Descriptives	
	12	13	M	s.d.
Work Group Communication [b]			−0.08	1.01
Praise for new procedures				
from supervisor	*0.82*	−0.24	3.59	1.70
from co-workers	*0.85*	−0.14	3.48	1.58
Talk about new procedures				
with supervisor	*0.86*	−0.03	3.85	1.88
with co-workers	*0.87*	−0.12	3.81	1.82
Develop new procedures	*0.72*	−0.26	3.32	1.87
Attend regular meetings	*0.48*	−0.42	2.77	1.93
Organizational Policies [b]			−0.05	1.02
Policies discourage new procedures	−0.12	*0.74*	3.42	1.67
No time to learn/develop new procedures	−0.06	*0.73*	4.58	1.91
Others do not encourage me to experiment	−0.22	*0.76*	3.95	1.77
Eigenvalue	4.25	1.43		
Percent variance	47%	16%		
Alpha if high-loading variable added	0.88	0.61		

[a] Factor loadings calculated using all Time 3 organizational members responding to the items ($n = 73$). Factor analysis only with Time 1/Time 3 respondents showed similar factor loadings. Means and standard deviations based on Time 1/Time 3 respondents. Factor scores were used in analysis.
[b] Scale: 1 = strongly disagree, 2 = disagree, 3 = slightly disagree, 4 = neutral, 5 = slightly agree, 6 = agree, 7 = strongly agree.

Table 4
Correlation Matrix and Descriptive Statistics for Analyzed Items and Scales for Time 1/Time 3 Respondents.

Variable number	6	7	8	9	10	11	12	13	14	1	2	3
Individual Differences												
6 Cognitive Style	–	0.13	−0.12	0.01	−0.02	0.01	−0.06	−0.06	0.17	0.01	−0.04	−0.12
7 Computer Experience		–	−0.24 *	0.20 *	−0.04	0.16	0.39 **	0.04	0.15	0.07	0.07	0.15
8 Age			–	−0.08	0.11	−0.01	−0.16	−0.28	−0.10	−0.13	0.00	0.17
Implementation												
9 Interaction with Trainer				–	0.31 **	0.38 **	0.44 **	−0.06	0.63 **	0.10	0.10	0.17
10 Relations with Computer Staff					–	0.59 **	0.10	−0.15	0.36 **	0.39 **	0.35 **	0.20
11 Knowledge/Involvement						–	0.38 **	−0.27 *	0.41 **	0.45 **	0.25 *	0.13
12 Work Group Communication							–	0.16	0.37 **	0.26 *	0.20	0.21
13 Organizational Policies								–	0.07	0.08	−0.29 *	−0.39 **
14 Computer Use Scale									–	0.19	0.16	0.03
Attitudes Toward System												
1 T1-System Worth Time/Effort										–	0.46 **	0.29 *
2 T3-System Worth Time/Effort											–	0.76 **
3 T3-Combined Attitude Scale Toward Computer												–
M	2.76	4.88	39.90	0.88	5.11	4.06	−0.08	−0.05	2.35	6.03	5.28	0.00
s.d.	1.15	6.45	11.60	0.86	1.27	1.69	1.01	1.02	1.84	1.06	1.63	1.00

$n = 74$; * $p < 0.05$; ** $p < 0.01$.

User Information Satisfaction Scale (See Ives et al. for the reliability and validity of these scales). As implied by Ives et al., the mean of each set of items within each scale was used to represent these two implementation concepts. (See *Table 2* for descriptive statistics, factor loadings indicating high-loading items, variance explained, and alpha reliabilities of the mean scales.)

Implementation: Work Group Communication (Variable 12) And Organizational Policies (Variable 13)

Work group communication items measured the extent to which the work group (supervisors and co-workers) supported and discussed the development of new computer procedures. Organizational policy items measured organizational constraints against learning about and experimenting with the new system. These items were developed by Taylor and Bowers (1972) as part of a set of standardized measures and have been used to assess implementation policies in previous studies (Johnson and Rice, 1987; Rice, 1990). Factor scores created by the regression method were used to represent these two implementation concepts. (See *Table 3* for descriptive statistics, factor loadings, variance explained, and alpha reliabilities.)

Use Of The Computer System

Respondents noted the extent to which they used the system in four ways, including "use the system's terminals," "provide information to it," "use information provided by it," and "use reports provided by it," ranging from "1 = never" to "5 = most of the day" for each. As most employees were expected to provide information for the system and use information and reports from the system, the level of terminal use was used to distinguish system users from non-users. A 6-point computer use scale (Variable 14) was created, ranging from a code of "0" for respondents who never used the system in any of the four ways, to "1" for those who never used the terminals but did use the system in one of the three other ways, to "5" for respondents who used the terminals "most of the day."

Table 4 presents the zero-order correlations among the quantitative variables, as well as the mean and standard deviation for each variable.

Results

Both quantitative and qualitative findings indicated that SHS employees held positive attitudes toward the computer system (the system will be, or is, worth the time and effort required to use it) at both Time 1 and Time 3. [2] (See *Table 5*.) The mean attitude for all employees, however, decreased significantly from 6.02 (agree) at Time 1 to 5.27 (between slightly agree and agree) at Time 3 ($p < 0.01$). Members of the medical social world reported a statistically significant decrease from Time 1 to Time 3 (5.86 to 4.84; (closer to slightly agree than to neutral), $p < 0.01$. Members of the non-medical occupations also reported a slight, but not statistically significant decline from 6.19 to 5.77, *ns*, but were more positive at both time periods.

The general decline in attitudes on the part of all employees from high expectations before implementation to still slightly positive attitudes nearly two years later is a reaction common to such innovations (Counte et al., 1987). This increase in the overall variance from 1.09 at Time 1 to 1.65 at Time 3 also indicates that an initial consensus of high expectations had given way to a wider range of less positive attitudes, particularly by members of the medical social world, as the computer implementation process unfolded. Our

[2] It may well be argued that it is difficult to assess the significance of attitudes toward a system without an assessment of the reliability and performance of the system. However, "objective" measures of reliability and performance are no less subject to dispute than are "subjective" measures, and often do not speak to criteria of interest to users (Markus, 1984). However, Table Five does provide evaluations of the system, its information, and its accessibility, using scales developed by, or derived from, prior research. In general, respondents reported that the only areas in which they rated the system worse than "neutral" was in the time it took for the system to respond, and the time it took to have requests for system changes processed. Relevance, reliability, accuracy, precision and completeness of the information from the system, and various aspects of accessibility (ability to log on, ability to understand commands, time to wait to use the terminal) were all rated as positive. Generally, users rated all these items more positively than did non-users. Interview and archival data also showed clear benefits from using the system, such as increased legibility, declining rates of error in records-keeping, and increased ability to extract and use patients demographic information for analyses and reports. However, we do not report on these aspects of the study in the present research.

Table 5
Mean Evaluations of System, Users and Non-Users.

Aspect Rated	Adjective End-Points (from 1 to 7)	Users	Non-Users
System Satisfaction [a]			
Relevance of information	useful/useless	2.3	3.5
from the system	relevant/irrelevant	2.3	3.3
Reliability of information	high/low	2.9	2.8
from the system	superior/inferior	2.9	3.8
Accuracy of information	accurate/inaccurate	2.9	3.5
from the system	high/low	2.8	3.5
Precision of information	definite/uncertain	3.1	4.0
from the system	high/low	3.1	3.8
Completeness of information	sufficient/insufficient	3.6	4.1
from the system	adequate/inadequate	3.5	4.3
Time required to develop	reasonable/unreasonable	4.0	4.0
the system	acceptable/unacceptable	3.8	4.1
Processing of requests for	fast/slow	4.7	5.0
changes to the system	timely/untimely	4.5	3.9
Accessibility [b]			
Ability to log on to system	easy/hard	2.6	3.8
Ability to understand commands	easy/hard	3.0	3.9
Time wait to use terminal	short/long	3.9	4.2
Time wait to get printed info	short/long	4.0	3.5
Time for system to respond	short/long	4.5	4.5

[a] Items from Ives, Olson, and Baroudi (1983) User Information Satisfaction Scale.
[b] Items derived from studies of system accessibility by Culnan (1984, 1985) and Rice and Shook (1988).

qualitative analyses below support these findings and explore the reactions of different groups to the system.

Occupational Social Worlds

While all groups had equally high positive expectations about the system at Time 1, results for the Time 3 combined attitude scale indicated that members of the medical occupational social world had significantly more negative attitudes (−0.39) than did members of the non-medical occupational social world (0.36) at Time 3 ($t = 3.05$, $p < 0.01$). Furthermore, an overall ANOVA for the Time 3 combined attitude scale indicated a significant difference among the five occupational social worlds ($F(4, 56) = 4.14$, $p < 0.01$). A posteriori Duncan multiple range tests showed that physicians (−1.19) were significantly more negative than each of the other occupational groups (administrators = 0.77, clericals = 0.25, other medical = −0.14, and nurses = −0.34) at Time 3.

These findings were supported and extended by the interviews with SHS employees. While physicians shared the generally high expectations for the system at Time 1, their opinions had changed dramatically by Time 3. The physicians' dissatisfaction with the system stemmed from the fact that they had originally expected clinical information to be available through the computer at the touch of a button. This high expectation turned out to be incorrect for two reasons. First, of course, obtaining customized results from a computer information system is rarely achieved by simply "pressing a button." Second, the system was implemented initially as an administrative system, and physicians were just beginning to see clinical reports generated. While one physician noted that there were positive aspects to the system, especially the computer-generated daily appointment list and the encounter form, she did not envision any change in the current emphasis on clerical/accounting tasks. System administrators, however, did plan to gradually add more clinically-oriented analyses and reports.

Nurses and other medical employees, on the other hand, did not seem overly concerned that the computer system was not being used for clinical purposes. Instead, other medical personnel, and nurses in particular, were more vocal about

whether learning and using the computer was an appropriate use of their time, which, they felt, might be better spent in patient care. Direct interaction with patients was a highly valued occupational norm.

Nurses also cited difficulties stemming from the fact that using the system to accomplish portions of their tasks often required them to interrupt their daily patient care routines. In contrast to office/clerical workers who may use the computer most of the day, medical employees either (1) used the computer on an occasional basis to look up schedules or find a student's telephone number, or (2) set aside time during parts of the day to help enter activity codes into the computer for their particular department.

Participation in the implementation process also emerged as a more significant issue for physicians than for other SHS employees. While several non-physician respondents expressed a desire on an open-ended question on the Time 3 questionnaire for more input into system decision-making, interviews with respondents six months later indicated that involvement was no longer an issue, except for physicians. In fact, most employees interviewed noted that they had all been given the opportunity for training and that the coordinator/trainer was more than willing to help them solve system-related problems. In addition, several clerical workers were given their choice of job assignments when computerization resulted in changes in their previous jobs.

In contrast to the responses of other workers, however, one Primary Care physician described physician dissatisfaction by noting that physicians were consulted early in the implementation process, but that their influence waned as the system emphasis shifted to clerical/accounting tasks. SHS administrators had considered the Associate Director for Primary Care (also a physician) to represent the physicians' views. This individual, however, may have found it difficult to reconcile her membership in multiple social worlds. (See the Appendix for an analysis of the relative positions of the occupational social worlds and possible difficulties in crossing the social worlds boundary.)

In any case, by Time 3, other physicians felt that they should have had a representative who was not also an administrator. Thus, although physicians had at least some involvement in implementation, their dissatisfaction with the system may have led them to interpret their involvement as insufficient. In contrast to the implementation literature's support for the notion that insufficient involvement contributes to an unsuccessful system, in this case an insufficient system may have contributed to unsuccessful involvement.

Departmental Social Worlds

Statistical results (ANOVA) showed no significant differences between departments on the single attitude item (system worth time/effort) at either Time 1 or Time 3. However, employees in both Primary Care and Women's Health did report statistically significant decreases over time on this item (from 6.18 to 5.06, $p < 0.05$, and from 5.86 to 4.56, $p < 0.05$, respectively).

A one-way ANOVA for the combined attitude scale at Time 3, however, indicated a significant overall difference among departments ($F(6,46) = 2.28$, $p < 0.05$). A posteriori Duncan tests showed Women's Health employees to have significantly less positive (-1.08) attitudes than did Primary Care (-0.01), Finance/Personnel (0.29), Health Education (0.41), and Medical Records (0.43) ($p < 0.05$). Findings from the interviews and observations of SHS employees help clarify these departmental differences.

Primary Care and Women's Health are the busiest clinics at SHS. Primary Care is the largest SHS department and the one in which the student/patient is usually seen first. In the waiting area a clerk enters information for walk-in appointments in the computer, generates encounter forms, directs students, and answers innumerable questions. Reminiscent of a small bureaucracy, several Primary Care employees noted that a particular task involving some aspect of the computer system was not supposed to be part of their job. Occasionally, respondents made oblique references to "political agendas" and "lack of communication" regarding different aspects of the computer system.

In Primary Care, clinicians (especially nurse practitioners) used the computer system when it was first implemented. A combination of too much work and difficulties adapting to the computer on the part of particular nurse practitioners, however, ensued. The subsequent negotiated rearrangement of tasks resulted in only office/clerical staff using the computer. In fact, clinicians were subsequently

forbidden to use the computer terminals. Nurse practitioners, at Time 3, were no longer even permitted to relieve the clerk generating encounter forms next to the triage office. One respondent noted that administrators thought clinicians might attempt to change their schedules on the computer.

Women's Health, in contrast, is a department where everyone "takes a turn at the front desk." Because of limited space, all clinicians are physically closer to each other and to the computer terminals than are personnel in Primary Care. While there are few physicians in Women's Health, the nurse practitioners not only use the computer, but also enter the clinicians' schedules at the beginning of each university quarter and take an active role in decisions involving system use in their department. Interview respondents, in fact, described several computer functions as essential to their operations. Clinicians in Women's Health, for example, frequently need to telephone a patient with lab results or other information. In the past, the student's record had to be retrieved from Medical Records just to get the telephone number. Now the clinician either uses the terminal herself or telephones the clerk at the front desk who gets the telephone number from the computer. Daily computerized schedules for each clinician are equally essential. Nurse practitioners in Women's Health also cited the importance of the computer for tracking students for studies related particularly to women's issues (e.g., rape, venereal disease, etc.), as well as the more commonly cited advantages such as the legibility of the encounter form.

As noted above, however, the survey results showed Women's Health respondents to be statistically less positive toward the computer than those in Primary Care (who were essentially neutral), even though they seemed to use the computer much more extensively, with more involvement of all employees. What might explain this apparent discrepancy? First, Women's Health had considerably more difficulty than the other departments in adapting their previous scheduling system to the computer. (The system initially would only provide half-hour blocks for appointments, when appointments often took only 15 minutes or might be multiply-scheduled.) Second, although both departments perform the same scheduling, data entry, and report generation functions, the work is organized very differently. In Primary Care, only half of the respondents are computer users and no clinicians use the computer. In Women's Health virtually all personnel use the computer. Thus, instead of dividing tasks into clerical and medical categories, the computer work in Women's Health is, to some extent, shared by all. This sharing may result in additional workday interruptions for all, rather than a dedicated task for a few, leading to specific positive benefits for the users, but an overall negative attitude.

This analysis is supported by further examination of the data for the organization as a whole. In fact, the eight respondents – all office/clerical employees – who used the terminals "most of the day," had very positive attitudes toward the computer system. However, the large number of respondents who used the terminals "several times a day" – composed of employees from all departments and occupational categories, but especially medical employees – had relatively negative attitudes toward the system.

In addition to clinics such as Primary Care and Women's Health, employees in the ancillary departments (e.g., lab, x-ray) also had varying reactions to the computer system. Survey results for the Lab, for example, showed negative expectations that did not seem to improve with implementation of the system. Interview respondents linked their negative attitudes to a shift in tasks between departments. Assistants in the clinics no longer complete lab order forms; rather, Lab employees must now generate their own reporting form for each test. According to one employee, "with the implementation of the computer system the Laboratory has been given the work of another department. This has not only caused confusion, but increased the workload considerably."

Finally, only Finance/Personnel maintained their initial enthusiasm for the system from Time 1 through Time 3. In the opinion of one physician, the medical information system had evolved into an administrative/clerical system supporting the financial functions of the organization. Thus, in another type of task change related to the computer system, Finance/Personnel employees began to assume an expanded role involving auditing the computer data entry of all departments as well as generating reports. Finance/Personnel employees had assumed additional work and new tasks, but, rather than evaluating this change in a

negative way, perceived their new tasks as central to SHS operations. By the end of our study period, however, Finance/Personnel employees were beginning to feel that all their slack time was now spent in reconciling encounter forms with database information, rather than using the system to perform custom analyses that had been an important initial expectation. However, they also realized that before the system had been implemented, they had no way to measure error rates in billing or treatment information.

Bivariate Relationships

Bivariate correlations (Table Four) showed that none of the individual-level variables (cognitive style, prior computer experience, age) was associated with the combined attitude scale. As speculated, however, younger nurses held less favorable attitudes toward the system ($r = 0.74$, $p < 0.01$). The correlation was also positive and statistically significant for office/clerical workers ($r = 0.49$, $p < 0.01$), but negative and non-significant for the three other occupations.

Overall, there was no statistically significant correlation between system usage and the combined attitude scale. As speculated, however, there were considerable differences among the departments in this correlation, although the results are very tentative considering the small sample sizes. Specialty clinics and the director's office showed the strongest positive correlations ($r = 0.92$, $p < 0.05$, and $r = 0.63$, *n.s.*, respectively), while health education and medical records showed the strongest negative correlations ($r = -0.83$, $p < 0.01$, and $r = -0.33$, *n.s.* respectively). Correlations for the laboratory, primary care, and women's health departments ranged from $r = -0.19$ to 0.20.

Finally, only Organizational Policies was significantly correlated with the combined attitude scale. Note, however, that Relations with Computer Staff, and Knowledge/Involvement, were both significantly correlated with the two *separate* (T1 and T3) "system worth time/effort" variables, possibly because initial involvement leads to positive expectations, which, in this case, decreased by a year later (see Note 2 again). So, insofar as all the involvement variables except Organizational Policies are correlated with system usage (from $r = 0.63$ to $r = 0.36$, $p < 0.01$), it may be that involvement in implementation can motivate usage and initially high expectations, but these initial high expectations, if unmet, may lead to disappointments, or apathy, in spite of level of use.

Combined Analysis of Occupational Social Worlds, Individual Differences, Implementation and Use

To control for interdependency among the variables, we performed several multiple regression analyses predicting the Time 3 combined attitude scale. The final hierarchical model (occupational social world entered first [0 = medical, 1 = non-medical], then the implementation variables, then computer use) was statistically significant [$F(4,40) = 4.59$, $p < 0.004$)], and explained 25% of the variance. The standardized beta coefficients for each final variable were as follows: for the dummy-coded occupational variable, -0.10 (ns); for work group communication, 0.37 ($p < 0.02$); for organizational policies, -0.41 ($p < 0.007$); and for the computer usage scale, -0.35 ($p < 0.02$).

Thus when all the variables were combined in a multivariate analysis, the final equation showed that positive attitudes were moderately explained by (1) support from one's work unit for learning how to use the system, (2) organizational policies that support learning about and experimenting with the system, and (3) lower levels of system usage. The medical/non-medical social worlds distinction, individual differences (cognitive style, prior computer experience, age), and the additional implementation variables (interaction with trainer, relations with computer staff, knowledge/involvement), did not influence employee attitudes toward the system when the other variables were statistically controlled.

Note that several ANOVA and *t*-test results, and our interview notes, suggest considerably greater influence of the two social world contexts (occupational and department) than do these regressions.

Discussion

Quantitative and qualitative results indicated that membership in both occupational and departmental social worlds helped to explain attitudes toward the information system, although neither emerged as the more powerful influence. More

specifically, occupational distinctions seemed to be principally related to employees' role expectations. Physicians, for example, expected involvement in decision-making and felt the system had become primarily an administrative system, while other medical employees were more concerned with computer use as an infringement on their patient care activities. Departmental concerns, on the other hand, were often related to how work was organized in the department and the way in which computer tasks were allocated.

Individual differences such as cognitive style, computer experience, and age, played no part in predicting overall attitudes toward the system. Focused but not general involvement in implementation, and several aspects of computer use, also predicted employee reactions to the computer system. Interview and survey results reflected the important distinction between the two primary social worlds of medical and non-medical personnel in modern health care institutions. These differences go beyond simple task assignments, to "what it is like" to work in a department and how individuals interpret and share changes in their social worlds. Thus while responses to general survey items about use and involvement can contribute to our understanding of assessments of systems such as this one, an examination of social world membership helps identify specific functional and dysfunctional aspects of the system and its implementation in specific work settings.

With respect to the implementation process, it appears that generalized contacts (with the trainer and system analyst) and generalized positive assessments of participation and understanding of the system are not sufficient to affect attitudes toward the system. However, more focused work group communication (discussion with and praise from both supervisors and co-workers) about new ways to use the system do lead to more positive attitudes, and organizational policies that discourage such learning lead to more negative assessments. We argue elsewhere (Johnson and Rice, 1987; Rice, 1990) that these more focussed, and communication-oriented, implementation activities generate a greater likelihood of learning how a system can support an individual's and an organizationa's activities, and help to diffuse those insights to other users.

The level of use of this medical information system is generally not associated with attitudes toward the system, although office/clerical workers using the system all day were most positive about the computer. Medical workers who report moderate use of the system may hold a negative attitude toward they system because (a) occasional use interrupts their traditional interpersonal interactions and work flow, (b) occasional use may involve new tasks but not motivate management to develop new job descriptions, and (c) new procedures may require some activities that benefit another department or that prevent the realization of other, expected uses.

A comparison of the quantitative and qualitative results also adds additional information. At Time 1 the survey responses showed, for the most part, uniformly high expectations for the system with no significant differences between social worlds. The Time 1 interviews, however, indicated that the actual benefits expected by members of the medical and non-medical social worlds were different, with physicians anticipating clinical information "at the touch of a button" while administrators hoped to better manage staff schedules, support budget allocations, reduce billing errors, and provide custom analyses of patient demographics and illness patterns. Thus the Time 3 differences between social worlds reflect the different realizations of initial expectations.

The contrast between the initial apparent agreement among most SHS employees concerning the value of the computer system and the later divergence of opinion also has practical implications. According to Donnellon, Gray, and Bougon (1986, p. 44) "organization members may have different reasons for undertaking the action and different interpretations of the action's potential outcomes, but they nonetheless act in an organized manner." In the case of SHS, employees acted to implement a new computer system, agreeing that it would be beneficial to the organization, although different occupations and departments expected different benefits. The underlying differences in expectations, however, also led to conflicting reactions as the implications for each group became clear. The decision to emphasize administrative over medical applications resulted in the negative physician attitudes at Time 3, although administrators were attempting to convince physicians that the system would eventually benefit them as well. In this case, initial agreement on the need for organizational change did not necessarily

ensure that specific expectations of members of different social worlds were met.

The question of who is to enter the data in the computer is also a major issue that affects employee attitudes toward computerization in health care settings (e.g., Aydin, 1989; Ischar and Aydin, 1988). The controversy over whether physicians and nurse practitioners at SHS should enter data in the computer reflects the more general conflict between the technological and institutional bases for the division of tasks in health care as a whole (Meyer and Scott, 1983). In health care institutions, the delegation of activities to the appropriate occupations is "socially expected and often legally obligatory over and above any calculations of efficiency" (Meyer and Rowan, 1983, p. 25).

While it may be both more accurate and efficient to require physicians or other clinicians (i.e., nurse practitioners) to enter their own orders for patients in the computer, organizations and individual departments within them are often reluctant to do so. Concerns for efficiency often conflict with the professional medical workers' role in which "clerical tasks" such as computer entry may be considered inappropriate. At SHS, solutions varied by department, with Primary Care nurse practitioners negotiating for clerks to do data entry, while workers at all levels in both Women's Health and the Laboratory shared computer tasks.

Conclusion

At its simplest, this study may be interpreted as showing that those who control the implementation of an integrated information system have the opportunity to mold the system to their own benefits (Markus, 1984), and, therefore, rationally hold positive attitudes toward the system. However, the present study also supports the usefulness of examining the influence of social context (here, departmental and occupational social worlds) in explaining individuals' attitudes to an organizational innovation. The results also highlight current implementation issues (such as extent and type of involvement, and unmet expectations) and their implications for system success as more health care institutions adopt medical information systems. In a more general sense, however, the research also contributes to our understanding of the complexity of attitudes toward technological change. Studies such as the research detailed here help us avoid underestimating this complexity by following Barley's (1988, p.72) admonition to keep "one eye firmly on the meanings people attribute to technology and the other glued to people's everyday actions".

References

Aydin, C.E., (1987). The effects of social information and cognitive style on medical information system attitudes and use. In W.W. Stead (Ed.), *Proceedings of the Eleventh Annual Symposium on Computer Applications in Medical Care.* (pp. 601–606.) NY: IEEE.

Aydin, C.E. (1989). Occupational adaptation to computerized medical information systems. *Journal of Health and Social Behavior,* 30, 163–179.

Barley, S.R. (1986). Technology as an occasion for structuring: Evidence from observations of CT scanners and the social order of radiology departments. *Administrative Science Quarterly,* 31, 78–108.

Barley, S.R. (1988). Technology, power and the social organization of work: Towards a pragmatic theory of skilling and deskilling. In *Research in the sociology of organizations,* Vol. 6. (pp. 33–80.) JAI Press, Inc.

Brenner, D.J. and Logan, R.A. (1980). Some considerations in the diffusion of medical technologies: Medical information systems. *Communication Yearbook,* Vol. 4. (pp. 609–623.) Beverly Hills: Sage.

Counte, M.A., Kjerulff, K.A., Salloway, J.C., and Campbell, B.C. (1987). Implementing computerization in hospitals: a case study of the behavioral and attitudinal impacts of a medical information system. In J.G. Anderson and S.J. Jay (Eds.), *Use and impact of computers in clinical medicine.* (pp. 224–237.) New York: Springer-Verlag.

Culnan, M. (1984). The dimensions of accessibility to online information: Implications for implementing office automation systems. *ACM Transactions on Office Automation Systems,* 2(2), 141–150.

Culnan, M. (1985). The dimensions of perceived accessibility to information: Implications for the delivery of information systems and services. *Journal of the American Society for Information Science,* 36(5), 302–308.

Donnellon, A., Gray, B., and Bougon, M.G. (1986). Communication, meaning, and organized action. *Administrative Science Quarterly,* 31, 43–55.

Dowling, A.F. Jr. (1980). Do hospital staff interfere with computer system implementation? *Health Care Management Review,* 5, 23–32.

Fischer, P.J., Stratmann, W.C., Lundsgaarde, H.P., and Steele, D.J. (1987). User reaction to PROMIS: Issues related to acceptability of medical innovations. In J.G. Anderson and S.J. Jay (Eds.), *Use and impact of computers in clinical medicine.* (pp. 284–301.) NY: Springer-Verlag.

Hackman, J.R. (1983). Group influences on individuals. In

M.D. Dunnette (Ed.), *Handbook of industrial and organizational psychology.* (pp. 1455–1525.) NY: John Wiley and Sons.

Hirschheim, R.A. (1983). Assessing participative systems design: Some conclusions from a preliminary study. *Systems, Objectives, Solutions,* 6, 317–327.

Hirschheim, R.A. (1985). *Office automation: A social and organizational perspective.* NY: John Wiley and Sons.

Hodge, M.H. (1977). *Medical information systems.* Germantown, MD: Aspen Systems Corporation.

Ischar, R. and Aydin, C. (1988). Predicting effective use of hospital computer systems. In R.A. Greenes (Ed.), *Proceedings of the 12th annual symposium on computer applications in medical care.* (pp. 862–868.) NY: IEEE.

Ives, B. and Olson, M.H. (1984). User involvement and MIS success: A review of research. *Management Science,* 30, 586–603.

Ives, B., Olson, M.H., and Baroudi, J.J. (1983). The measurement of user information satisfaction. *Communications of the ACM,* 26, 785–793.

Johnson, B.M. and Rice, R.E. (1987). *Managing organizational innovation: The evolution from word processing to office information systems.* NY: Columbia University Press.

Kaplan, B. (1986). Impact of a clinical laboratory system: Users' perceptions. In R. Salamon, B. Blum, and M. Jorgensen (Eds.), *Medinfo 86: Sixth World Congress on Medical Informatics.* (pp. 1057–1061.) Amsterdam: Elsevier Science Publishers B.V.

Kaplan, B. (1989). A job orientation model of impact on work seven months post implementation. In *Medinfo 89: Sixth World Congress on Medical Informatics.* Amsterdam: North-Holland.

Keen, P.G.W. and Morton, M.S.S. (1978). *Decision support systems: An organizational perspective.* Reading, MA: Addison Wesley.

Kerr, E.B. and Hiltz, S.R. (1983). *Computer-mediated communication systems.* NY: Academic Press.

Kimberly, J. and Evanisko, M. (1981). Organizational innovation: The influence of individual, organizational and contextual factors on hospital adoption of technological and administrative innovations. *Academy of Management Journal,* 24, 689–713.

Kling, R. (1980). Social analyses of computing: Theoretical perspectives in recent empirical research. *Computing Surveys,* 12, 61–110.

Kraemer, K., Dutton, W., and Northrop, A. (1981). *The management of information systems.* NY: Columbia University Press.

Lindberg, D.A.B. (1979). *The growth of medical information systems in the United States.* Lexington, MA: Lexington Books.

Lucas, H.Jr. (1981). *Implementation: The key to successful information systems.* NY: Columbia University Press.

Markus, M.L. (1984). *Systems in organizations: Bugs and features.* Boston: Pitman.

Mauksch, H.O. (1972a). Patient care as a perspective for hospital organization research. In B.S. Georgopoulos (Ed.), *Organization research on health institutions.* (pp. 159–172.) Ann Arbor, MI: Institute for Social Research.

Mauksch, H.O. (1972b). Perspective for hospital organization research. In B.S. Georgopoulos (Ed.), *Organization research on health institutions.* (pp. 190–199.) Ann Arbor, Michigan: Institute for Social Research, The University of Michigan.

Meyer, J.D., and Rowan, B. (1983). Institutionalized organizations: Formal structure as myth and ceremony. In J.D. Meyer and W.R. Scott (Eds.), *Organizational environments: Ritual and rationality.* Beverly Hills, CA: Sage Publications.

Meyer, J.D., and Scott, W.R. (1983). *Organizational environments: ritual and rationality.* Beverly Hills, CA: Sage Publications.

Myers, I.B. and McCaulley, M.H. (1985). *Manual: A guide to the development and use of the Myers-Briggs Type Indicator.* Palo Alto, CA: Consulting Psychologists Press.

O'Reilly, C.A., Parlette, G.N., and Bloom, J.R. (1980). Perceptual measures of task characteristics: The biasing effects of differing frames of reference and job attitudes. *Academy of Management Journal,* 23, 118–131.

Packer, C.L. (1985). Historical changes in hospital computer use. *Hospitals.* January 16, 1985.

Rice, R.E. (1990). Organic organizations and centralized units: Use, context, and outcomes of word processing. In J. Morell and M. Fleischer (Eds.), *Advances in the implementation and impact of computer systems,* Vol. 1, NY: JAI Press.

Rice, R. and Richards, W. Jr. (1985). An overview of communication network analysis programs and methods. In Dervin, B. and Voight, M. (Eds.), *Progress in communication sciences,* Vol. 6, (pp. 105–165.) NJ: Ablex.

Rice, R.E. and Shook, D. (1988). Access to, usage of, and outcomes from an electronic message system. *ACM Transactions on Office Information Systems,* 6(3), 255–276.

Rogers, E.M. (1983). *Diffusion of innovations, 3rd edition.* NY: Free Press.

Schultz, R.L. and Slevin, D.P. (1975). Implementation and organizational validity: An empirical investigation. In R.L. Schultz and D.P. Slevin (Eds.), *Implementing operations research / management science.* (pp. 153–182.) NY: American Elsevier.

Shibutani, T. (1978). Reference groups as perspectives. In J.G. Manis and B.N. Meltzer (Eds.), *Symbolic interaction: A reader in social psychology.* (pp. 108–115.) Boston: Allyn and Bacon, Inc.

Smith, D.B. and Kaluzny, A.D. (1986). *The white labyrinth.* Ann Arbor, MI: Health Administration Press.

Startsman, T.S. and Robinson, R.E. (1972). The attitudes of medical and paramedical personnel toward computers. *Computers and Biomedical Research,* 5, 218–227.

Stryker, S. (1981). Symbolic interactionism: Themes and variations. In M. Rosenberg and R.H. Turner (Eds.), *Social psychology, sociological perspectives.* (pp. 3–29.) NY: Basic Books, Inc.

Taylor, J. and Bowers, D. (1972). *Survey of organizations.* Ann Arbor, MI: Institute for Social Research.

Van De Ven, A.H. (1986). *Central problems in the management of innovation.* Management Science, 32, 590–607.

Van Maanen, J. and Barley, S.R. (1985). Cultural organization, fragments of a theory. In P.J. Frost, L.F. Moore, M.R. Louis, C.C. Lundberg, and J. Martin (Eds.), *Organizational culture.* (pp. 31–53.) Beverly Hills: Sage.

Zmud, R.W. (1979). Individual differences and MIS success: A review of the empirical literature. *Management Science,* 25, 966–979.

Appendix: Extending the Occupational Social World Model

Although prior research supports the notion of differences between occupational social worlds in health care organizations, we need empirical evidence to support the assumption that (1) intra-occupational interactions exist, and (2) that physicians, nurses, and other medical workers occupy a position in the social structure that is different from that of administrators and clerical employees.

Therefore, relational data were collected by means of a network roster on the Time 2 questionnaire (see Rice and Richards, 1985 for an overview of network analysis methods). The roster listed each individual working at the organization at that time or in the recent past. Respondents were asked to circle "How frequently, on the average, do you have significant discussions with other [organizational] personnel about how you accomplish your work?", using a scale of 0 = not once in the last year, 1 = once a month or so, 2 = several times a month, 3 = every week, 4 = several times a week, 5 = every day, 6 = several times a day. Because not every one who was listed responded to the questionnaire, was still employed at SHS, or answered at least two of the attitude items, the final usable square matrix was 62×62. The cell values of this matrix were then squared, to approximate the number of times per month i interacted with j (i.e., "every day" is approximately 25 days per month, and $5^2 = 25$).

To identify within- and cross-occupational relations, a 5×5 matrix was constructed that shows the *density* of within-occupation and cross-occupation communication relations (*Figure 2a*). For example, the density of relations from physicians to clerical workers is less than half a day per month, on average (0.47), while from nurses to administrators is about every other day, on average (12.83).

Then, using a technique common to several network analysis approaches, an *image matrix* (*Figure 2b*) was created by dichotomizing each cell value into '1' if the value was higher than the

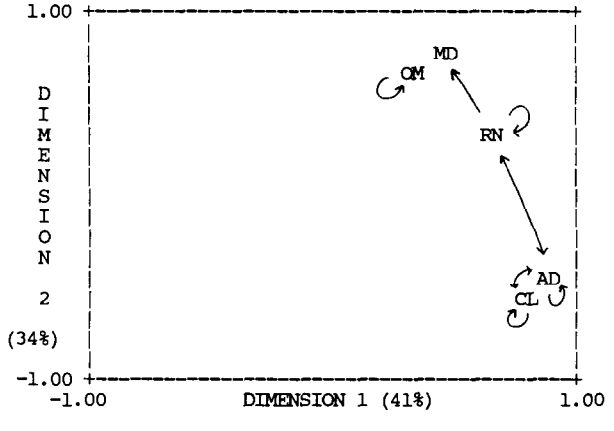
A. Density Matrix

Occupation	N	MD	OM	RN	AD	CL
Physicians	6	**2.77**	1.94	2.45	2.28	.47
Other medical	15	3.50	**3.93**	1.92	5.08	2.04
Nurses	12	4.85	3.60	**8.19**	12.83	3.42
Administration	6	3.28	3.11	5.41	**3.33**	7.12
Clerical	29	1.24	1.20	2.26	4.13	**3.99**

B. Image Matrix

MD	OM	RN	AD	CL
0	0	0	0	0
0	**1**	0	0	0
1	0	**1**	1	0
0	0	1	**1**	1
0	0	0	1	**1**

C. Interaction Model
(Plot of Factor Loadings from Correlation Matrix of Stacked Rows and Columns of Communication Linkages, and Percent of Variance Explained for Both Dimensions).



D. Mean Attitude Score for Occupation

-1.19
-.14
-.34
.77
.25

Fig. 2. Density Matrix, Image Matrix, Interaction Model, and Mean Combined Attitude Score for the Five Occupational Categories at SHS.

overall mean density (3.76) or '0' otherwise. This image matrix shows the strong, directional interaction patterns within and across occupations. For example, physicians do not report that they interact with members of any other occupational social world more than the average occupational interaction level; they do not even reciprocate the nurses' reported above-average interactions with them. Both nurses and administrators interact with themselves, each other, and one other occupation, at greater than average levels.

Finally, a combined matrix was constructed by concatenating the original density matrix with its transpose (to take into account both *sending* and *receiving* patterns of interaction). A correlation matrix was created from this combined matrix, and the loadings from the first two principal components of the correlation matrix were used to create a two-dimensional *interaction plot* of the locations of each of the five occupations in relation to the other occupations (*Figure 2c*). The strong linkages identified by the image matrix were then included in the plot to create a visual portrayal of the greater-than-average relationships among the occupations. Administrators occupy a central place by communicating reciprocally with nurses and clerical workers, all three of whom also communicate internally. Other medical workers basically communicate only with themselves. Overall, the interaction plot clearly shows that the medical and non-medical social worlds occupy two separate positions in the relational space, mediated only by the nurses. Referring back to the overall ANOVA results, groups farther from the administrators generaly have less positive attitudes toward this system, as indicated by the mean combined attitude score listed to the right of each occupational world position (*Figure 2d*).

Figure 2 shows the density matrix (A), the image matrix (B), the interaction plot (C), and the mean attitude score (D).