Carolyn Aydin's Work on Communication and Information Systems in Hospitals

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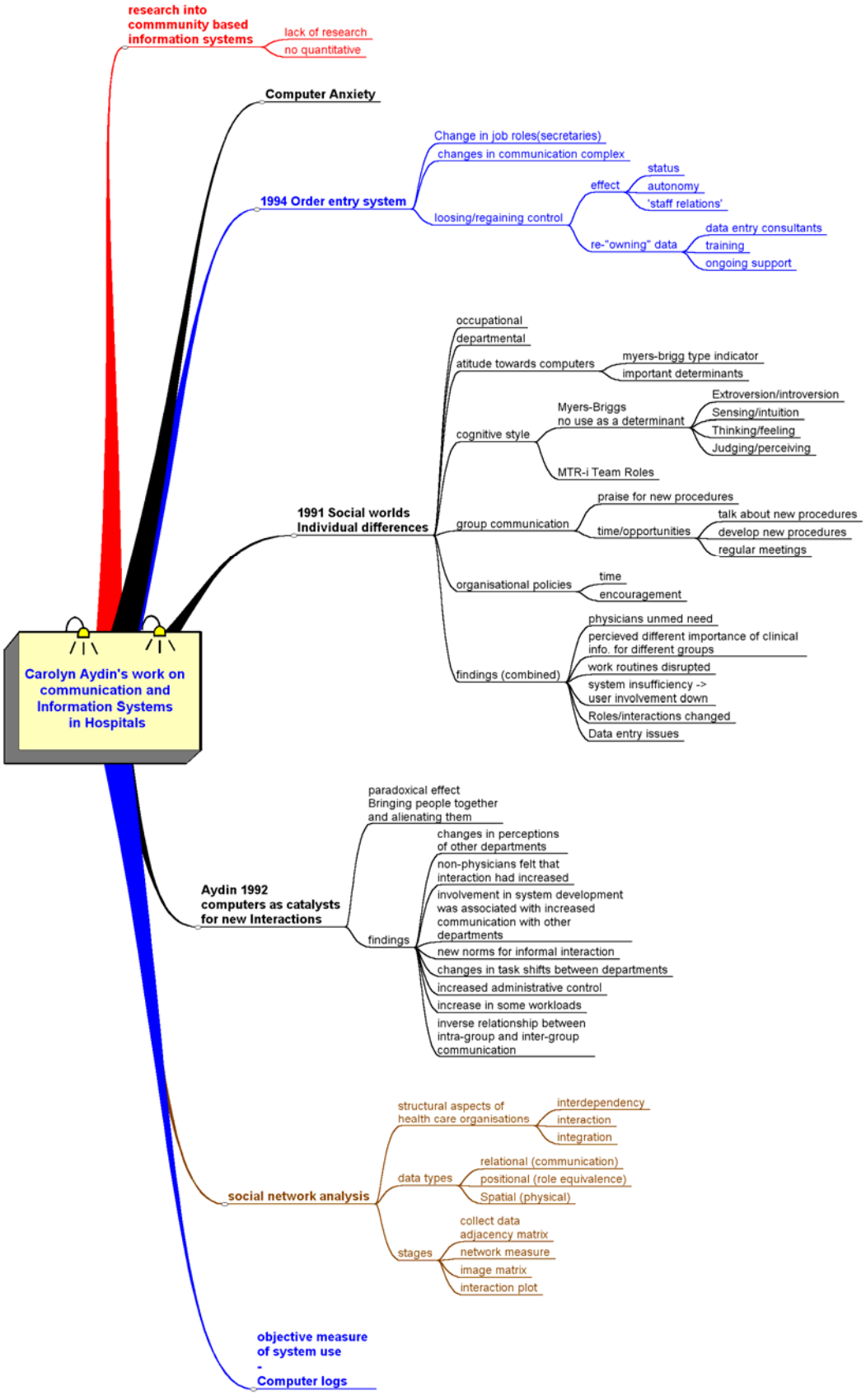

How this document should be used:
This document has been designed to be suitable for web based and face-to-face teaching. The text has been made to be as interactive as possible with exercises, Multiple Choice Questions (MCQs) and web based exercises.

If you are using this document as part of a web-based course you are urged to use the online discussion board to discuss the issues raised in this document - there are many - and share your experiences / thoughts and solutions with other students.

Who is this document aimed at?
This document is aimed at the following types of people:

- Those who wish to become involved in system development but are not interested in the nuts and bolts of programming, such people are commonly called domain experts and act a bridges between a professional group to which they belong (e.g. medics, Solicitors etc) and IT experts.
- As an introduction for those just beginning professional computer science courses
- Managers involved in information systems procurement or maintenance

I hope you enjoy working through this document.

Robin Beaumont

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1. Before you start

1.1 Prerequisites

This document does not assume you have any detailed knowledge. If you do find that particular aspects require you to read more before understanding the text I would be most grateful to hear from you at robin@organplayers.co.uk

1.2 Required Resources

The ability to be able to read this document while having access to the Internet so that you can check out various web sites mentioned in the text.

I would strongly recommend that you obtain copies of the articles discussed in this document:

Aydin C E 1994 Computerised Order Entry in a large medical center in Anderson, Aydin & Jay 1994 Evaluating Health Care Information Systems. Sage Publications

Aydin C E Rice R E 1991 Social worlds, individual differences and implementation. Information & management 20 119 - 136

Aydin C E Rice R E 1992 Bringing social worlds together. Journal of Health & Social Behaviour 33 168 - 185

1.3 Learning Outcomes

This document aims to provide you with the following useful information listed as a set of learning outcomes.

As you work through this document you should periodically come back to these learning outcomes, ticking off those with which you feel happy. Because this is such a large section, I have divided the learning outcomes into two subsections:

Carolyn Aydin's papers

Be aware of the lack of quantitative research concerning communication between professional healthcare groups in the community	❑
Be able to describe the research approaches adopted by Carolyn Aydin in her Healthcare research	❑
Be aware of the use of questionnaires for collecting appropriate data when analysing communication in Healthcare	❑
Be aware of the problems with using self reporting techniques and the advantages / disadvantages of using computer generated audit files as an alternative method	❑
Be aware of the use, and limitations, of qualitative techniques such as interviewing or shadowing to provide additional contextual information.	❑
Be able to provide a description of Aydin's et al "Social worlds" concept	❑

Be able to describe the three broad categories of factors that affect peoples attitudes towards computers	❑
Be able to describe the 'computer anxiety' concept and administer the Web based questionnaire used to measure it	❑
Be aware of the Myers-Briggs type indicator	❑
Be aware of the type of questions to ask when assessing group communication	❑
Be aware of the major changes that can take place in attitudes towards computer systems during development / implementation	❑
Be aware of the significant disruption in working practices and role changes that can occur during computer systems development/implementation	❑
Be aware that any competing activity (i.e. computer related) is despised if it reduces patient contact by some Healthcare professionals	❑
Be aware of the relationship between usefulness of a computer system and user involvement in development etc.	❑
Be aware that Data entry issues are of major concern when developing / implementing Clinical Healthcare Information Systems	❑
Be aware that both planned and unplanned changes occur during system development / implementation	❑
Be aware that implementation of interdepartmental systems acts as a catalyst for traditional forms of communication which need to be supported	❑
Be aware that Management of data quality issues requires new roles to develop providing tact and sensitivity	❑

Social Network Analysis (SNA)

Be able to describe in general terms what SNA is	❑
Be aware of the structural aspects of Healthcare organisations	❑
Be aware that SNA can be useful when investigating a number of organisational issues	❑
Be able to provide a description of an Interaction Plot	❑
Be able to provide a basic interpretation for a specific Interaction Plot	❑

2. Introduction

This document looks at the communication between various groups of workers by primarily considering the affect that the installation of a computer system has had upon them. The emphasis is upon the research methods used along with the findings.. Specifically this document does not consider the communications revolution brought about by the Internet which is discussed in another document.

Unfortunately, very little quantitative research has been carried out in the healthcare sector concerning communication between groups of workers and information systems and much of the research that exists is mostly anecdotal or even political polemic. It could be argued, in the case of the UK literature, that a good example of such polemic is much of the well known 'Information for Health' document along with other various strategy documents that have been created over the years for the UK NHS.

The lack of this type of research in the UK seems even more strange given the fact that some excellent UK based qualitative research has been carried out looking at how various groups of people work with technology. See Heath C and Luff P 2000, who provide examples such as the London underground control room and the patient-doctor interaction. You can also visit their website (Kings College London, Work, Interaction and Technology Research Group Home page: http://www.kcl.ac.uk/schools/sspp/mgmt/research/wit/).

Because I have been unable to find a single good quality quantitative research paper investigating communication between various professional groups in the community health care setting, it not being based almost entirely on anecdotal evidence (i.e. Ovretveit 1993), I have decided to concentrate on intra and interdepartmental communication in this document. This lack of research seems a most unsatisfactory situation, particularly in the UK given the fact that significant amounts of money have been put into computer based community information systems with very poor results other than in the GP sector.

It would be nice to think that a student on one of the many courses I teach may become sufficiently interested in the analysis techniques described in this document, along with other techniques described on my site, to decide to use them in the community setting and thereby produce some very valuable research.

Luckily the situation is not totally bleak as some excellent research has been carried out in the US by Carolyn Aydin et al related to the implementation of various hospital Information Systems and this will be the focus of this document.

We will specifically look at three of her, now classic papers:

Aydin C E 1994 Computerised Order Entry in a large medical center in Anderson, Aydin & Jay 1994 Evaluating Health Care Information Systems. Sage Publications

Aydin C E Rice R E 1991 Social worlds, individual differences and implementation. Information & management 20 119 - 136

Aydin C E Rice R E 1992 Bringing social worlds together. Journal of Health & Social Behaviour 33 168 - 185

Lets start by looking at the 1994 paper.

3. Aydin 1994 - Computerised Order Entry

One of the few 'research' projects that has looked at interaction between hospital departments using a valid research design along with quantitative measures is that by Aydin 1994. One of the first aspects in her research was to define a valid measure of 'human interaction between departments" to consider this here is an exercise to get your brain working!

Exercise 1.

If you were going to measure 'human interaction between departments' in a hospital, how might you answer the following? Consider both qualitative and quantitative tools.

- What techniques would you use to collect the data?
- How might you measure the concept of 'human interaction between departments'?

Before seeing how Aydin went about solving the above problems I will give you a brief summary of the paper.

3.1 Summary

Carolyn Aydin 1994 aims to provide a full description of the affects that the implementation of an "order entry system" called ORDERS had upon four wards and two support departments in terms of staff attitudes and various communication aspects amongst other things. An order entry system provides users with the facility to request various services online such as blood tests and x-rays.

The four wards were:

- ICU (Intensive Care Unit)
- P/P Op (Pre-Post Operative holding area)
- Two surgical wards

The hospital was in the United States.

The two departments that she wished to assess were:

- Radiology
- Admissions

The computerised order entry system was designed to allow ward staff the opportunity to request x-rays and carry out the administrative tasks of informing the admissions department of patient transfers and discharges.

3.2 Tools

To analyse the 'human interaction between departments' She used both qualitative and quantitative tools to collect the required data:

1. Quantitative Questionnaires: These were administered to all registered nurses, licensed vocational nurses and unit secretaries during training sessions for the pilot units prior to the implementation of the order entry system. A second questionnaire was administered to "all staff" (p266) on the units following system implementation. An attempt was made to match up the pre/post implementation questionnaires

In addition to various other questions, the questionnaire requested respondents to:

- Indicate how often they usually spoke to someone from Admissions and Radiology by telephone (ranging from 1= Never to 6=Many times a day)
- Rate the communication between their area and Admissions and Radiology (ranging from 1=poor to 7=excellent)

2. Qualitative Processes: These included in-depth interviewing and observations of system implementation and use (p265, p266).

I wonder how the two questions in the quantitative questionnaire equate with the answer you gave on the previous page to "How might you measure the concept of 'human interaction between departments'?".

3.3 Literature review

Carolyn Aydin 1994 provides a literature review, citing the following main findings (references for the findings can be found in the original article) related to changes in communication following the introduction of a computer information system:

1. Nurses spend less time telephoning other departments following implementation of an Order Entry System (Staggers 1988)
2. Increased interdepartmental communication
3. Although remote access to information may eliminate the need for some routine interpersonal communication such as telephone calls to obtain lab results, individuals in departments...meet face-to-face at least as often as before the computer system was implemented.
4. Working relationships between departments improve (p261). This is possibly due to: increased communication, a reduction in problem laden telephone calls and standardising the requirements for the information as a result of using a computerised request form (p263).

From the above literature review findings, she formulated the following research questions:

1. Will the frequency of telephone calls between nursing units and ancillary departments decrease following computer implementation?
2. Will nursing employees in a large medical center perceive improvements in the overall quality of communication with other departments following computer implementation?

3.4 Interaction styles

She skilfully and deliberately selected two departments (Radiology and Admissions) which were known to have different quality levels of communications with the various nursing departments. The details for each department are given below.

Radiology:

"Nursing staff transmit physician orders to Radiology using the computer system. Radiology and nursing then schedule the time for the procedure via telephone. The radiology staff still maintains a paper trail of printout requests until procedures are completed. Radiology is currently purchasing an additional computer system to automate their internal operations and allow an electronic ORDERS interface to be developed. In the interim, updating of ORDERS once procedures are completed is done by clerical staff in the Radiology department - thus the reason for the paper trail." (p265)

Admissions:

..."The efficiency of the admissions process has long been an area of concern. Since the summer of 1985, the Department of Admissions has used a computer system called the Patient Management (PM) system to automate admission, discharge, and transfer (ADT) functions for the medical centre. Difficult telephone communication between nursing areas and admissions, however, has continued to be an issue. Admissions employees maintain that nurses delay notification of discharges to put off having a new patient admitted until the next shift. Nurses, in contrast, cite poor communication and short staffing in Admissions as the root of the problem.

When ORDERS was implemented, an electronic interface was developed to upload PM patient registration information into ORDERS patient files. This interface was designed to allow nursing staff to manage patient transfers and discharges using ORDERS as a message-only function. The initial "pending" message puts the Admissions department on alert to locate a bed on a new unit in event of patient transfer, or, on patient discharge, the message signals the department that a bed may soon be vacated. The "completed" message indicates that either (1) the patient has been discharged from the hospital or (2) the transferred patient has been received in the new unit. Changes to the patient census, however, are performed by the Admissions staff on receipt of computer printouts. The patient census is maintained within the PM system but can be displayed on the nursing units using ORDERS."

Exercise 2.

The above abstracts provide much food for thought! Consider the following:

Communication with the Radiology department was considered to be good. What aspects described in the above abstract might be the reasons for this?

In contrast, communication quality with the Admissions department is considered to be poor. What do you think the reasons are for such a tortuous and apparently illogical communications process?

3.5 Changes in Job Roles

The ORDERS system replaced a paper based process whereby physician orders were transcribed onto paper requisitions. Because the process of transcribing was most frequently carried out by unit secretaries, their job role expanded with the implementation of ORDERS:

"the secretaries' job responsibilities have expanded to include basic computer skills and a better understanding of medical terminology. The latter responsibility results from the need to match physician requests for radiology procedures with a list of menu selections. Unit secretaries are promoted, with a salary increase, to the position of communication technician in recognition of the expanded role. All unit secretaries are eligible for promotion following successful completion of an ORDERS training class and proficiency examination." (p264)

Exercise 3.

> Do you feel it was necessary to upgrade the secretaries financially because of the increase in skill requirements for the job?
>
> Because it is highly unlikely that a junior doctor's salary would be increased if they were required to enter operational information for an Electronic Patient Record (EPR), are there any alternative 'bonuses' that could be offered to them in this situation?

3.6 Results

The results are divided up into those from the questionnaires and those from the in-depth interviews and observations.

3.6.1 Questionnaires

Nursing Units Grouped Together:

1. No changes were found between telephone or quality of communication with the Admissions department pre-post ORDERS.
2. No changes were found in the quality of communication with the Radiology department pre-post ORDERS.

Individual Nursing Units/Departments:

Overall, Radiology showed a drop in telephone communication pre-post ORDERS, but this was dependent upon nursing unit as the East unit (surgical) demonstrated an increase.

Admissions: Frequency and quality of communication dependent upon nursing unit:

- ICU lower than rest both pre and post implementation
- East quality of communication lower post implementation

Radiology:

- Different pattern of results to that of the Admissions department
- Pre/Post operative department had more telephone communication with Radiology than other units both pre and post ORDERS
- Pre/Post operative department demonstrated lower rating for quality of communication than other units pre-ORDERS

3.6.2 Qualitative Results

"Results from detailed interviews with systems implementers helped clarify the quantitative findings...According to these respondents, several factors may explain the lack of change in both frequency and rating of communication with the Department of Admissions. Order entry for this department is a message only function requiring two messages to complete a single transfer or discharge of a patient. The initial message, a "pending" message, puts the Admissions department on alert to locate a bed on a new unit in event of patient transfer or, on patient discharge, this message signals the department that a bed may soon be vacated. Although computer order entry may reduce the telephone volume by half, the potential for complete elimination of telephone communication did not exist at the time of the pilot study. The Admissions department was required to telephone the nursing unit during the transfer function on location of a suitable bed for the transferring patient. (The system was latter modified to allow online notification of the new bed assignment.) The lower volume of telephone communication with the ICU perhaps reflects the fact that only patient transfers, not discharges, are precipitated from this area.

The lower rating on communication quality depicted by the east unit may be driven by the larger volume of patient transfers carried out on this unit. As a monitored unit transitioning between the ICU and the general care unit, tighter bed control is mandated on the East unit. These conditions may require heavier dependence on the telephone to keep the patient flow continual. Interviews indicated that this higher volume of telephone contact concerning the tense issue of bed vacancy and patient movement may create the potential for more dysfunctional communication." (p270)

In other documents we discussed qualitative techniques, including ethnography, which are used to gain a understanding of users' requirements, and here we see a similar approach, lets look now at specific issues that Aydin discovered during the qualitative data collection.

3.6.3 Nursing and Radiology

"Findings concerning communication patterns between the Radiology department and the nursing units stem from a different set of circumstances. Prior to computerization, Radiology requisitions were handwritten, initiated on the nursing units by a secretary or nurse copying the physician's exact language or terminology for tests to be ordered. The decision as to the appropriate test to be performed and charge code was in the command of the Radiology department on receipt of the order. With computer order entry, the decision making and translation of radiology test names are transferred to the computer user at the nursing unit level, either a secretary or a nurse. This individual, who has limited expertise in radiology, now enters orders into the radiology database by selecting from menu options, significantly magnifying the potential for error. Although the errors are detected and corrected by Radiology, the clarification process results in a significant increase in telephone communication between Radiology and nursing. A growing concern over this issue on the part of Radiology may actually impair relations between the departments. This shift in tasks from Radiology to nursing points to the need for additional training of nurses and secretaries in radiology terminology." (p270)

Exercise 4.

List the main findings in each of the above paragraphs.

One of the main issues raised above is the loss of control from the Radiology department. What strategies could the Radiology department adopt to regain some control?

3.6.4 Methods of Regaining Control

Aydin describes a Pharmacy department that lost control over its "own" (Aydin 1989) data entry but managed to maintain control by:

- Acting as expert consultants concerning data entry
- Training secretaries and nurses
- Ongoing support following implementation

The above issue, concerning the regaining of control, is just one aspect of a common theme that I might be accused of being obsessed with:

"**Physicians and nurses may resist the implementation of a new computer system if it negatively affects their status, autonomy, or traditional staff relations** (Anderson, Jay, Schweer, and Anderson, 1986; Brenner and Logan, 1980; Counte, Kjerulff, Salloway, and Campbell, 1987)" from Anderson, Aydin and Jay 1994 p135.

In the above abstract, Anderson el al uses the rather vague term 'traditional staff relations', such a concept several researchers have attempted to investigate further including Anderson himself. We will consider this again in the next section.

3.7 Summary & MCQs

The above description of Aydin's 1994, research into the implementation of a computer system, demonstrates how fruitful such an exercise often is generating large amounts of useful information and suggesting better approaches to future projects. To help you revise the detail provided above I have included a set of Multiple Choice Questions based on the material in the above section.

Exercise 5. -MCQs (Aydin 1994)

1. What is the main problem concerning research investigating human interaction between various healthcare groups? *(one correct answer)*

a. Too much quantitative research
b. Lack of quantitative research
c. Too complex a subject area to explore
d. Lack of appropriate measures available
e. Area not important enough to research

2. Concerning the research investigating human interaction between various healthcare groups, which of the following areas has been least researched? *(one correct answer)*

a. Patient/doctor
b. Between doctors
c. Between hospital departments
d. Between various community based healthcare workers
e. Between the community and hospital doctors

3. What has Carolyn Aydin, amongst a few others, done to make herself well known? *(one correct answer)*

a. Investigate the communication within a user group involved in an order entry system
b. Investigate and develop a method specifying communication standards for developing order entry systems
c. Investigate the communication from the system developers to end users of an order entry system
d. Investigate aspects of communication for a computerised order entry system for a hospital
e. Investigate non verbal aspects of communication for a computerised order entry system for a hospital

4. What type of system is "ORDERS"? *(one correct answer)*

a. Bed occupancy management system
b. Case management system
c. Electronic order entry system
d. Electronic messaging system
e. Patient Management System

5. Aydin 1994 considered several nursing departments along with two hospital facilities ('departments'). Which of the following two were they? *(two correct answers)*

a. Radiology
b. ITU (Intensive Care Unit)
c. Biochemistry
d. Admissions
e. Histopathology

6. Aydin 1994 distributed questionnaires at what times? *(one correct answer)*

a. Pre, during and post implementation
b. Post implementation only
c. Pre and post implementation
d. Pre and post implementation and after two years
e. Pre and during implementation and after two years

7. Aydin 1994 measures two aspects of communication. Which of the following two were they? *(two correct answers)*

a. Frequency of face to face meetings
b. Frequency of telephone communication
c. Frequency of emails
d. Quality of all forms of communication
e. Quality of verbal communication
f. Quality and quantity of communication

8. Aydin 1994 provides details of previous relevant research findings. Which of the following are true *(three correct answers)*

a. Nurses spend less time making telephone calls
b. Decreased significantly interdepartmental communication
c. Decreased significantly face to face communication
d. Increased interdepartmental communication
e. Did not significantly decrease face to face communication

9. One of the previous research findings was the 'improvements in interdepartmental relationships'. Which of the following may have helped account for this (one correct answer)?

a. Stricter managerial control
b. Development of computerised request forms
c. Development of IT training programs
d. Development of across departmental care pathways
e. Development of video conferencing

10. The ORDERS system allowed personnel in the Admissions department initially to *(one correct answer)*:

a. View nursing orders
b. Receive emails from nurses
c. Change the bed state ('census') in the PM system
d. Communicate via email with nurses
e. Authorise transfers of patients

11. When the ORDERS system was implemented, units secretaries were *(two correct answers)*

a. Reduced in number with compulsory redundancies
b. Given a change of job title
c. Asked to change working hours
d. Promoted
e. Re-assigned to other departments not using ORDERS

12. Aydin 1994 provides a detailed quantitative and qualitative analysis of her findings. When discussing the aggregated data from the various nursing units, which of the following are correct? *(two correct answers)*

a. No changes in telephone or quality of communication with admissions
b. Some changes in telephone communication with admissions
c. Significant decrease in quality of communication with Radiology
d. No changes in quality of communication with Radiology
e. Significant changes in telephone, but no change in quality of communication with admissions

13. Aydin 1994 found that a task which was originally carried out by Radiology employees was now carried out by another group of employees. Who were they? *(one correct answer)*

a. Radiology assistants
b. Medical students/interns
c. Nurse practitioners
d. Nurses and occasional secretaries
e. Secretaries

14. When a department looses control of its data, Aydin (1989) suggests that there are ways in which it has been found that it can regain some control, which of the following are they? *(three correct answers)*:

a. Developing a tighter control on the process again
b. Setting standards and preventing those outside the department from entering information
c. Acting as data entry advisors
d. Training data entry personnel
e. Liaising with an outside company to provide support (facilities management)
f. Offering ongoing support

4. Aydin and Rice 1991 Social worlds, individual differences

Carolyn Aydin collaborated with Ronald Rice, who is Professor of Communication Studies at Rutgers University, in two papers concerning health information systems. They specifically investigated the possible effect that belonging to one or more particular type of social group ("social worlds") had upon attitudes towards a medical system.

The first paper, entitled "Social worlds, individual differences and implementation" (Aydin and Rice 1991), considered the implementation of a large Student Health Service (SHS) Information System. The design of the research was similar to that described in Aydin 1994: measurements were taken before and after implementation, and in this instance, a follow-on survey was carried out approximately one year after the second one.

Aydin and Rice 1991 were particularly interested in investigating the concept of 'social worlds'. We will ignore the sociological theory underlying the concept (called symbolic interactionism), instead referring to how the authors briefly describe it:

> *Individuals create their own 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 (p120).*

The authors link the social world concept to that of an organisational subculture, using Van Maanen and Barley's (1985 p38) definition which reads:

> *where members "interact regularly with one another, identify themselves as a distinct group with 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" (p120)*

Much of the above is pretty obvious. However, the interesting point, particularly for healthcare, is that "individual employees are often members of at least two primary social worlds: occupational and departmental" (p120).

Aydin and Rice have some interesting things to say about both occupational and departmental social worlds, which is provided after the exercise below

Exercise 6.

For yourself, which do you consider to be the most important: the occupational or departmental social world?

4.1 Occupational Social Worlds

"Research on innovation in health care settings has documented the importance of occupational 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 socialisation 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 hospital (Kimberly and Evenisko 1981). Reviewing computer implementation in health care settings, Counte, Kjerulff, Salloway and Campbell 1987 noted that physicians and technical personal 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 there 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 a significant influence on individual reactions in health care organisations." (p121)

4.1.1 Departmental Social Worlds

"Focusing 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 Van 1986 p596). 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 the individual is exposed in the course of his organizational activities' (Hackman 1983 p1457). 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 centre. 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." (p121)

4.2 Multiple Contextual Factors Affecting Attitudes Towards Computers

Obviously Aydin and Rice 1991 did not believe that belonging to one or more social worlds was the only determinant in attitudes to computers. Drawing on other research findings, they set about measuring the following factors which had been found to influence attitude to computers or suggested that they might play a part in it:

1. Individual differences

1. Age
2. Cognitive style
3. Prior computer experience
4. Occupation/department details (to measure the two social worlds)

2. Implementation practices

1. Interaction with trainer
2. Relations with computer staff (part of the Ives, Olson and Baroudi 1983 user information satisfaction scale)
3. Knowledge of the system (part of the Ives, Olson and Baroudi 1983 user information satisfaction scale)
4. Feeling of participation in implementation (part of the Ives, Olson and Baroudi 1983 user information satisfaction scale)
5. Work group communication
6. Organisational policies

3. System usage

While an in-depth discussion of the above factors is outside the remit of this document, we will consider a little more how Aydin and Rice 1991 measured 'cognitive style', work group communication and organisational policies in the next few sections but first a quick aside.

4.3 Computer Anxiety

Closely linked to the above issue of measuring individual factors that may affect one's attitude to computers is the idea of measuring how anxious one is about using technology. To measure this, a computer anxiety score has been developed which I would like you to learn about now.

Exercise 7.

If you have not done so already please go to the following site and fill in the computer anxiety questionnaire. Make sure you read the introduction to the questionnaire and write down your results. If you are working through this document as part of an on-line course why not post your results to the discussion board - how valid do you feel they are?

The computer anxiety questionnaire can be found at:

http://www.robin-beaumont.co.uk/virtualclassroom/contents.htm then click on the section 3.1 link "How terrified are you of computers" for the questionnaire

4.3.1 Cognitive Styles

Cognitive styles according to Aydin and Rice 1991 "represent characteristic modes of functioning shown by individuals in their perceptual and thinking behaviour" (Zmud 1979, p967). To measure cognitive style, Aydin and Rice 1991 make use of the framework developed by Myers and McCaulley 1985, including the well known Myers-Briggs type questionnaire. There are numerous websites dedicated to various aspects of the questionnaire called the Myers-Briggs Type Indicator.

Unfortunately the developers of the Myers-Briggs Indicator keep very strict control on its use and dissemination - you can't even just try it out or go to any web site to see it? So much for academic knowledge being shared freely.

A health warning about the Myers-Briggs Type Indicator

Many Psychologists highlight problems with this questionnaire along with its results, for more details see the excellent Wikipedia entry at http://en.wikipedia.org/wiki/Myers-Briggs_Type_Indicator

4.3.2 The Myers-Briggs Type Indicator

The following extract is taken from (unfortunately the material is no longer available at the website http://www.dragonstrike.com/dstrike/mbti/mbtiinfo.htm See: http://www.dragonstrike.com/dstrike/mbti/mbti.htm) :

"Carl Jung, the renowned Swiss psychiatrist, did not believe that differences in thinking between people were just a product of their environment and experience. He believed that people are born with a preferred way of using their minds, specifically in how they take in information about a situation and how they organize that information and reach a conclusion about it. He believed that those preferences are largely responsible for our outward behavior and the differences in behavior between people.

In his theory of Psychological Types, Jung proposes two distinct and contrasting ways of taking in information, which he called sensing and intuiting and two ways of organizing that information and coming to a conclusion, which he called thinking and feeling.

Katherine Cook Briggs and her daughter Isabel Briggs Myers after years of observation and study of human personality extended and elaborated on Jung's theory. They added two additional preferences. The first addresses how people interact with the world, which they called extraversion and introversion . The second measures how people orient themselves to the outer world, which they called judging and perceiving.

The theories propose that everyone has a natural preference for one of the two opposites on each of the four different preferences, (sensing/intuiting, thinking/feeling, extraversion/introversion, and judging/perceiving) and that together these preferences account for much of the differences between individual people.

What is the Myers-Briggs Personality Indicator?

The Myers-Briggs Type Indicator or MBTI(r) is a questionnaire based on Jung's theory of psychological types and the work of Katherine Cook Briggs and Isabel Briggs Myers. The MBTI(r) reports an individual's preferences according to each of four scales: extraversion/introversion, sensing/intuiting, thinking/feeling and judging/perceiving.

What are Preferences?

Important to understanding the Myers-Briggs indicator is the concept of preferences. This has been most easily explained using the analogy of handedness. Almost everyone has a hand that they prefer to write with. It does not mean that they cannot write with the other hand, only that the preferred hand is more comfortable, natural and easier to use. The same is true with our minds. We are all born with a preferred way of using our minds specifically in how we interact with the external world, how we take in information, how we form conclusions and how we orient ourselves toward our outer world. No one preference is right or wrong or better or worse than the other. A preference for one mode of thinking does not imply the absence of its complement, only that one mode of thinking is more comfortable and more natural than the other.

Preferences do not dictate who we are, what we can do or be. However, they can help us to understand why we, as normal healthy people, might think differently from other normal healthy people and help us understand our own strengths and weaknesses that together they make us individuals and make us all different.

The Four Scales

- Extroversion/Introversion
- Sensing/Intuition
- Thinking/Feeling
- Judging/Perceiving

Extroversion/Introversion

The extroversion/introversion or E/I scale of the Myers-Briggs indicator is a measure of how people interact with their world. Extroverts generally direct their energy outwards and are more involved with the outer world of people and things while introverts direct their energy inwards and focus on their private inner world of concepts and ideas. Extroverts get their inspiration and energy from interacting with their exterior world whereas introverts are re-energised by inner reflection. Both are valid and normal ways of interacting with the world. Introverts are quite capable of dealing in the outer world when necessary; they will just tend to reflect on things first before acting. And of course, extroverts are capable of deep reflective thought; they just prefer to be more action-oriented and would rather spend more time doing rather than thinking about it.

Sensing/Intuition

The sensing/intuition or S/I scale of the Myers-Briggs indicator measures how people prefer to take in information, become aware of things, or "see" a situation. Jung's theory proposes two methods of taking in information: sensing and intuiting. People who perceive by sensing rely mainly on their five senses to bring in the required information. People who perceive by intuiting focus more on a form of indirect perception through the subconscious. This form of perceiving is known as "using one's intuition" or "going on a hunch".

This is not to say that people who prefer sensing do not have or use intuition or that people who prefer intuiting do not use their five senses. It means that people who prefer sensing are more comfortable and prefer to deal in actualities than dwell on ideas that seem to come out of nowhere. And people who prefer the intuiting method of perceiving would rather deal with the possibilities and impressions that are presented by their own minds rather than be limited to the information that is actually there in front of them. In other words, people who prefer the sensing method of obtaining information limit their intake of information to the words on the page whereas people who prefer intuiting will "read between the lines."

Thinking/Feeling

The thinking/feeling or T/F scale of the Myers-Briggs indicator deals with how we make decisions. Once we have taken in information about a situation through either sensing or intuiting we are in a position to form conclusions. Jung's theory asserts that there are two contrasting ways of organising information and coming to conclusions: thinking and feeling. People who prefer thinking as their preferred method for reaching conclusions do so by a logical, objective process aimed at coming to an unbiased conclusion. On the other hand, people who prefer feeling as their preferred method use personal, subjective values upon which to base their conclusions. Both are valid methods of reaching conclusions.

Again this is not to say that thinking people do not use any feeling in making their judgments or that feeling people do not think when they make their decisions. It only suggests that people have a preferred method for processing information. An individual who prefers thinking as their method of reaching conclusions will be more inclined to insist on "sticking to the facts." People who prefer feeling will be less interested in the facts and more interested on the effect the decision will have on the people, relationships, community, etc.

Judging/Perceiving

The judging/perceiving or J/P scale measures whether people primarily use their judging processes or perceiving processes in their dealing with the external world. People who prefer a judging orientation will seek to bring structure and order to their environment and lives. They will make decisions and move on. They like to plan and schedule their lives and stick to that plan. People who prefer a perceiving orientation tend to maintain a more flexible and spontaneous environment. They prefer to leave their options open and will avoid making decisions to the last minute. They feel confined and restricted by plans and schedules."

(end of extract)

You can find an alternative explanation of the MBTI along with a similar questionnaire called the "MTR-i Team Roles questionnaire" at **http://www.teamtechnology.co.uk/belbin.html** The MTR-i Team Roles questionnaire claims to have a relationship with the MBTI but also provides information concerning how a person functions in a group. Unfortunately you have to pay for the questionnaire.

Exercise 8.

Unfortunately, the complete MBTI questionnaire is not in the public domain. However, you can complete a shortened version at:

http://www.humanmetrics.com/cgi-win/JTypes2.asp

Go to this site and complete the questionnaire. I came out as a "ESFJ".

If you like testing yourself have a look at: http://www.wizardrealm.com/tests/personality.html where there are questionnaires for everything.

4.4 How the MBTI was used

Aydin and Rice 1991 cited previous work by Aydin 1987; Keen and Morton 1978 and Myers and McCaulley 1985 to suggest the following: "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). 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." (p121)

They were therefore, in this particular piece of research, only interested in one of the four MBTI scales. The abstract below describes how they collected the necessary data:

"The abbreviated version (Form AV) of the Myers-Briggs Type Indicator (MBTI) was attached to the time 1 [pre-implementation] questionnaire...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)."

4.5 Measuring Work Group Communication and Organisational Policies

A number of questions were developed, some from previous research cited in the article, of which the respondent was allowed a single choice from a typical Likert scale given below:

1=strongly disagree
2=disagree
3=slightly disagree
4=neutral
5=slightly agree
6=agree
7=strongly agree

The questions given are shown below:

A. Work Group Questions:

1. [Receive adequate] praise for new procedures from supervisor
2. [Receive adequate] praise for new procedures from co-workers
3. [Given adequate time and opportunities to] talk about new procedures with supervisors
4. [Given adequate time and opportunities to] talk about new procedures with co-workers
5. [Given adequate time and opportunities to] develop new procedures
6. [Given adequate time and opportunities to] attend regular meetings

B. Organisational Policies:

1. Policies discourage new procedures
2. No time to learn/develop new procedures
3. Others do not encourage me to experiment

4.6 Measuring Occupational and Departmental Social Worlds

To measure occupational and departmental social worlds, Aydin and Rice 1991:

> *"Divided all respondents into five occupational categories: administrators, office/clerical workers, physicians, nurses and other medical workers. Additionally all employees were classified into a dichotomous variable (medical/non-medical). "*

Similarly, a code was designated for each of the seven departments that took part in the research: Primary Care, Woman's Health, Specialty Clinics, Finance and Personnel, Medical Records, the Laboratory and Health Education.

Exercise 9.

Do you think the above divisions are appropriate for the research?

The work group questions may be said to measure a number of concepts associated with one's work. What other concept(s) do you think they might also partially measure?

4.7 Analysis Techniques

Aydin and Rice 1991 employed a large number of statistical analysis techniques, including factor analysis and multiple regression.

They also used a technique called 'social network analysis' that will be discussed later when considering the final paper. The technique was used in this instance "to demonstrate that physicians, nurses, and other medical workers occupy a position in the social structure that is different from that of administrators and clerical employees" (p135). This helped to validate the coding of medical versus non-medical personnel described on the previous page.

This document does not discuss the mathematical / statistical concepts.

If you are interested in learning about the above statistical techniques, excepting the network analysis techniques, Ronald Rice maintains a web site (http://www.comm.ucsb.edu/faculty/rrice/ricelink.htm) with links to several excellent online resources.

Alternatively I would recommend the following two books which attempt to provide a understanding of statistics rather than acting as mere cookbooks:

Glantz S A 1992 (3rd ed.) Primer of Biostatistics. Mcgraw-Hill

G R Norman Streiner D L 1994 Biostatistics: The bare essentials. Mosby (each chapter has a wonderful CRAP detector section!)

4.8 The Findings

While the above description of some aspects of the research project focuses entirely on the quantitative part of the research, it must not be forgotten that qualitative interviews were also carried out.

In the original paper, the results are presented in five sections:

1. Overview
2. Occupational social world
3. Departmental social world
4. Bivariate relationships
5. Combined analysis of occupational social worlds, individual differences, implementation and use

Much of the above analysis, as would be expected from the title of the paper, focuses on the attitudes towards the medical system. One significant finding was that the derived MBTI score did not help predict the attitude score.

However, for the purpose of this document, I will focus on the 'social worlds' aspects of the results under the following seven headings:

1. Unmet expectations from physicians
2. Differences in importance of clinical information to various medical employees
3. Disruption in working routines
4. Departmental social worlds
5. System insufficiency resulting in reduced user involvement
6. Changing role for the Finance/Personnel departments
7. Data entry issues

4.8.1 Unmet expectations from physicians

"While physicians shared the generally high expectations for the system [pre-implementation], their opinions has changed dramatically by [the time the third questionnaire was distributed]. 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. " (p128)

4.8.2 Differences in importance of clinical information to various medical employees

"Nurses and other medical employees [non physicians]...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." (p128)

4.8.3 Disruption in working routines

"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." (p129)

4.8.4 Departmental social worlds

A one-way ANOVA for the combined attitude scale in the final questionnaire "indicated a significant overall difference in departments...Women's health employees had significantly less positive attitudes than did Primary Education and Medical records. Findings from the interviews and observations of SHS employees help clarify the 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, ensured. The subsequent negotiated rearrangement of tasks resulted in only office/clerical staff using the computer. In fact, clinicians were subsequently forbidden to use computer terminals. Nurse practitioners [at the time of the final questionnaire] 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." (p129-130)

"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, veneral disease etc.), as well as the more commonly cited advantages such as the legibility of the encounter form." (p130).

Aydein points out that the system development literature constantly emphases the importance of user participation to ensure a positive attitude to any system. But, in contrast, the present research under discussion demonstrated that "the survey results showed Women's Health respondents to be statistically less positive towards the computer than those in Primary Care" (p130). She provides several reasons for this apparent discrepancy between her findings and that in the general literature:

1. "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 fifteen minutes or might be multi-scheduled.) "

2. The work is organised very differently in the two departments. "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 to users, but an overall negative attitude." This analysis is supported by further examination of the data ...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." (p130)

4.8.5 System insufficiency resulting in reduced user involvement

"...although physicians had at least some involvement in implementation, there 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" (p129).

4.8.6 Changing role for the Finance/Personnel departments

"By the end of the study period...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 realised that before the system had been implemented, they had no way to measure error rates in billing or treatment information." (p131)

4.8.7 Data entry issues

While data entry issues have been touched upon in the above extracts, I feel it is pertinent also to provide the following:

"The question as to who is to enter the data in the computer is...a major issue that affects employee attitudes toward computerisation 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 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 p25).

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 patient in a 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." (p133)

4.9 Conclusions & MCQs

"Results support the importance of [both occupational & departmental] 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" (p119).

In the above abstract 'traditional implementation influences' means work group communication and organisational policies. As both these issues are considered in more depth in the paper, we will not discuss them further here. Now, a selection of Multiple Choice Questions to help you digest the information given above.

Exercise 10.

1. At what times were the questionnaires given out in the Aydin and Rice 1991 paper? *(one correct answer)*

a. Pre, during and post implementation
b. Pre and post implementation
c. One year before implementation, during and one year following implementation
d. During and post implementation
e. Pre, post implementation and one year afterwards

2. Aydin and Rice 1991 consider two primary social worlds that hospital employees inhabit (two options correct):

a. Occupational
b. Scholastic
c. Salary banding
d. Departmental
e. Specialty

3. What is the name of the sociological theory that underpins the Aydin and Rice 1991 idea of social worlds *(one correct answer)*:

a. Symbolic psychoanalysis
b. Symbolic interactionism
c. Symbolic transcendentalism
d. Interactive functionalism
e. Interactive materialism

4. Why did nurses like using the PROMIS system? *(one correct answer)*

a. Reduced workload
b. Expanded professional role
c. Increased time for patient contact
d. Were paid to use it
e. Were given additional staff to support it

5. According to Van de Van 1986, a group such as a department (choose two answers):

a. Eventually attempts to take over other departments
b. Focuses on issues that maximise consensus
c. Minimises external communication
d. Minimises internal conflict
e. Focuses attention on supporting those in the group

6. Aydin and Rice 1991 classified the factors that were found to be important in determining attitudes to computer systems into three categories. What were the three categories (choose three)?

a. Individual differences
b. Job satisfaction
c. Technical success of the system
d. Implementation practices
e. Percentage spent on training
f. System use
g. Prior computer knowledge

7. What is the Myers-Briggs Type Indicator (MBTI)? *(one correct answer)*

a. A measure of attitude towards computer systems
b. A measure of attitude towards knowledge sharing
c. A measure of cognitive style
d. A measure of cognitive awareness
e. A measure of learning style preferences

8. The Myers-Briggs Type Indicator (MBTI) consists of four scales. Which of the following represents one of them? *(one correct answer)*

a. Judging/Perceiving
b. Optimism/Pessimism
c. Subservience/Dominance
d. Feeling/emotional absence
e. Altruism/Selfishness

9. Aydin and Rice 1991 only made use of one of the Myers-Briggs Type Indicator (MBTI) scales. Which of the following was it? *(one correct answer)*

a. Introversion/Extraversion
b. Thinking/Feeling
c. Optimism/Pessimism
d. Subservience/Dominance
e. Feeling/emotional absence

10. Aydin and Rice 1991 measure the concept of "work group communication". Two of the items measure the level of something that respondents feel they need to receive from supervisors and co-workers. What is it (choose one)?

a. Adequate payment
b. Adequate resources
c. Adequate praise
d. Adequate training
e. Adequate IT technology to allow communication

11. Aydin and Rice 1991 measure the concept of "work group communication". Three of the questions relate to asking the respondents if they are given adequate time/opportunity to (choose three items):

a. Talk about new procedures with supervisor/co-workers
b. Discuss communication with colleagues
c. Develop training material
d. Develop new procedures
e. Attend regular training sessions
f. Attend regular meetings
g. Attend regular health checks
h. Talk about ways of improving communication with co-workers
i. Talk about ways of improving communication with supervisors

12. Aydin and Rice 1991 measure the concept of "Organisational Policies". There are three questions to this scale; what are they concerning (choose three)?

a. Discouragement of new working hours
b. Discouragement of new procedures
c. Time to develop new procedures
d. Discouragement of experimentation
e. Discouragement of role sharing
f. Time to develop new skills
g. Time to develop new facilities

h. Discouragement of risk taking

13. Social network analysis is used by Aydin and Rice 1991 to (choose one):

a. Identify the relative social positions of different age groups
b. Identify the relative social positions of different departmental social worlds
c. Identify the relative financial positions of different occupations
d. Identify the relative social positions of different occupations
e. Identify the relative financial positions of different

14. What was the focus of the Aydin and Rice 1991 paper (choose one)?

a. Technical requirements for a Health Information System
b. Work group requirements for a Health Information System
c. Attitudes towards a Health Information System
d. Training requirements for a Health Information System
e. Communication requirements for a Health Information System

15. In the notes concerning Aydin and Rice 1991, I identified seven issues concerning the qualitative (supported by quantitative) findings. What were these seven issues (choose 7)?

a. Changing roles of medical staff
b. Changing roles of departments
c. Data quality issues
d. Data entry issues
e. Unmet needs of interns
f. Unmet needs of physicians
g. Unmet needs of nurses
h. Differences in importance of clinical information to various group
i. Importance of aggregating information for managers
j. Disruption in working routines
k. Need to change working routines
l. Departmental social worlds
m. System insufficiency resulting in reduced user involvement
n. User involvement as a catalyst for change

5. Computers as Catalysts for New Interactions in Health Care Organisations - Aydin and Rice 1992

While Carolyn Aydin and Ronald Rice considered the interactions between departments in the Aydin and Rice 1991 paper, in their 1992 paper (Aydin and Rice 1992) they considered them in more depth. This paper, entitled "Bringing social worlds together: Computers as catalysts for new interactions in Health Care Organisations," focused much more on two aspects of communication following implementation of a computer system, specifically the extent to which members of different departments:

- Exchange information
- Understand each other's work (p169)

The paper draws on the same dataset as that used in Aydin and Rice 1991.

In the introduction they discuss the seemingly paradoxical affect that a computer may have upon an organisation, both encouraging communication between staff and departments and also having the power to result in alienation at the same time.

5.1 Departmental and Occupational Social Worlds Revisited

The authors consider more fully the definition of both a department and an occupation than they did in their previous paper, specifically suggesting that a department has the following three features:

1. Physical proximity
2. Boundaries, such as specialised vocabularies, making it necessary to recode at the boundaries
3. Focus of attention of group members and blinding them to other issues by influencing perceptions, values and beliefs

They suggest, quoting research findings, that departmental social worlds may be more important than occupational social worlds in defining membership to reference groups in some instances.

With regard to occupational social worlds, the authors consider that "one measure of power of an occupation is the 'relative ability of the occupation to protect its task domain from encroachment' and/or the ability to encroach upon others (Kronus 1976 p5). In the present setting, most departments using the system were clinics composed of individuals in a number of different occupations. Thus, we...might expect groups such as nurses or physicians to increase their communication with their counterparts in other departments as they attempt to control the 'definition, conduct, and evaluation of their work' (Child and Fulk 1982 p155)." (p172)

From the above quotation, it can be seen how the authors draw on previous research findings to form various research hypotheses. Thus by considering the above concepts in more depth along with the appropriate research findings, the authors were able to produce a set of hypotheses. These are given below:

1. Individuals who are involved in the computer implementation process will interact more with other departments.
2. Individuals who communicate with others about the system will interact more with other departments.
3. Individuals who use the computer system will interact more with other departments.
4. Computer implementation will be accompanied by both planned and unplanned changes in departmental tasks and roles.
5. Departments experiencing tasks changes between departments will interact more with other departments.
6. Occupational groups experiencing role and/or task changes will interact more with other departments.

As is the standard procedure in empirical research, the next stage after stating the research hypothesis is usually to consider devising the appropriate measuring instruments. Several of the measures have already been discussed in Aydin and Rice 1991. We will now consider two more particular measures in detail on the next page.

Exercise 11.

Write down which of the above research hypotheses you think will be confirmed or rejected.

5.2 Measuring Information Exchange and Understanding Across Departments

"On the T3 [last] questionnaire, each employee reviewed a list of all 11 SHS departments and rated the 'extent to which understanding or exchanging information with each of the following SHS departments has increased or decreased' because of the system. The scale ranged from 1='significantly increased' to 7= significantly decreased. Respondents were instructed that 'By exchanging information, we mean any type of information exchanged in any way (such as from the computer, in person, by telephone, memos, meetings etc.) By understanding, we mean understanding the work each department does (including problems, procedures, decisions, information needed, etc.). An overall perceived *change in information exchange* score and an overall perceived *change in understanding work* score were created for each respondent, averaged across all departments other than the respondents' own." (p173)

Exercise 12.

> Can you think of more objective ways of measuring the above concepts? What might be the problems with such measures?

5.3 Regression Modelling

In predicting the overall average for each respondent perceived change in information exchange and understanding work in other departments, the authors used regression modeling and found that the only significant predictors were:

1. Relations with computer staff (part of the Ives, Olson and Baroudi 1983 user information satisfaction scale)
2. Work group communication

Besides the standard regression modelling, much use was made of the qualitative aspects of the research in the present paper under discussion. The results were presented under the following headings:

- Changes in departmental tasks and roles
- Group perceptions of new interactions

5.4 Changes in Departmental Tasks and Roles

	Direction of Change in Interdepartmental Interaction		
Type of Change	Increase	No Change	Decrease
Planned	New role of Medical Records in entering data (e.g., diagnosis) for computerized studies for all departments	All departments enter own data in computer	All departments retrieve information (e.g. student telephone numbers) through computer terminal
	Medical Records Administrator-appointed computer Coordinator/Trainer		Lab generates own computerized report form, no longer depends on form sent from clinics to report results.
	New role of Finance/Personnel in tracking operations and monitoring data entry from all departments		
Unplanned	New role of Medical Records personnel as informal "gurus" to computer users in other departments		
	Evolving role of Finance/Personnel personnel as computer "gurus" through role in monitoring data entry from all departments.		

The above table (taken from the original paper) shows the changes that occurred, classified as planned or unplanned along the left-hand side of the table along with the effect each had concerning interdepartmental communication across the top. Thus the first column represents tasks that resulted in increased communication, the second column where no change in communication was encountered and the third column those tasks that resulted in decreased communication.

5.5 Group Perceptions of New Interactions

We will consider the perceptions of the new interactions brought about by the computer system for the two group worlds separately.

5.5.1 Departmental Perceptions

There was found to be a significant difference for changes in understanding other departments' work, with medical records differing significantly from each other department except Finance/Personnel. In fact "employees in Medical Records, Finance/Personnel perceived the greatest increases in understanding the work of other departments." (p180)

No difference was found in the 'information exchange' score between departments.

5.5.2 Occupational Perceptions

"Results indicated that non-medical workers were significantly more likely to perceive increased interaction. Physicians, on the other hand, perceived no change in interaction, while nurses and other medical employees perceived only slight increases...[Further analysis demonstrated that] Office/clerical employees differed significantly on both Information exchange and work understanding from MDs and other medical workers."

Exercise 13.

> Look back at the description of the Aydin and Rice 1991 paper and see if you can suggest why the physicians may have perceived no increase in interaction or understanding of other departments' work.

5.6 Reconsidering the Research Hypotheses

The six research hypotheses stated earlier, along with the decision to accept/reject each, are shown below:

1. Individuals who are involved in the computer implementation process will interact more with other departments - **Confirmed by regression analysis**
2. Individuals who communicate with others about the system will interact more with other departments - **Confirmed by regression analysis**
3. Individuals who use the computer system will interact more with other departments - **Rejected by regression analysis**
4. Computer implementation will be accompanied by both planned and unplanned changes in departmental tasks and roles - **Confirmed by qualitative findings**
5. Departments experiencing task changes between departments will interact more with other departments - **Partially confirmed (department dependent) by qualitative findings**
6. Occupational groups experiencing role and/or task changes will interact more with other departments - **Rejected by qualitative findings**

The discussion section of the paper considers six main issues:

1 Aspects of planned and unplanned change

a New norms for informal interaction

b Task shifts between departments

c Increased administrative control

2 New tasks and new interactions

3 Departmental social worlds

We will discuss these next.

5.7 Aspects of Planned and Unplanned Change

In the Aydin and Rice 1992 paper, this is discussed under three sub-headings:

- **New norms for informal interaction** - Details can be found in the table given on the previous page concerning departmental tasks and roles
- **Task shifts between departments** - Details can be found in the table given on the previous page concerning departmental tasks and roles
- **Increased administrative control** - While the above table provides a summary of the changes that occurred in the Finance/Personnel department, it is pertinent to provide more information here:

In the case of Finance/Personnel, the most striking example of increased interaction with other departmental social worlds evolved from the department's new formal role in tracking the operations of all SHS departments. This new role had its roots in the desire of SHS administrators for increased tracking and control of SHS operations. The negotiations of the role, however, occasioned ongoing exchanges between Finance/Personnel and other SHS departments, both to accomplish the task and to gain acceptance from other departments of the new role.

During the early stages of computer implementation,...40 percent of the encounter forms did not match the data entered into the computer by the departments. Finance/ Personnel's feedback to the various departments and clinics concerning errors and missing encounter forms was met with resentment at first, especially from physicians in the clinics. In fact, the enlarged role of Finance/Personnel elicited different reactions from employees in different departments. Most interview respondents simply noted that someone from Finance/Personnel picked up their copies of the encounter forms and worked with them to resolve the errors. One respondent however, vehemently described the Finance/Personnel representative as someone who 'does nothing else but analyse errors and circulate graphs showing the errors of all departments for everyone to see.'

In general, employees in Finance/Personnel seemed sensitive to the possibility that their new role might threaten some employees. Finance/Personnel's weekly report back to each department, for example, referred to errors as 'follow ups' rather than errors, although the report did compare error percentages by department. According to both Finance/Personnel employees and members of other departments, computerisation also highlighted operational problems and made the need for explicit policies and procedures obvious, a need not felt before the computer system was implemented. As one respondent noted, the system 'forces you to articulate things' and understand how tasks are related. Before computerisation, departments had different procedures; 'now it's necessary to know the proper way' " (p197).

5.8 New Tasks/Interactions and Departmental Social Worlds

The authors discuss two specific areas regarding new tasks and new interactions:

New tasks and new interactions

1. Laboratory

It was predicted that the laboratory would increase its communication with other departments as it was assigned tasks once carried out by the clinics. However this did not happen, despite the fact that "Lab employees actually anticipated such an increase prior to implementation" (p180).

2. System use by nurses and other medical occupations

"System use by nurses and other medical occupations varied by department. Rather than enhancing their jobs, many medical employees expressed concern that learning and using the computer was an inappropriate use of their time, which, they felt, might be better spent in their traditional task of patient care. In fact...Nurses in the Woman's clinic...used the system extensively, but indicated that their system applications were specific to women's health concerns and maintained that it would 'seem like bragging' to share their system projects at organisation-wide meetings with other nurses." (p180)

Departmental Social Worlds

The authors also considered the effects that the computer system had upon departmental social worlds.

They discuss the different ways the nurses adapted to the computer system in Women's Health and Primary Care to demonstrate the finding that 'departmental worlds' may be more important than 'occupational worlds'.

If you can't remember the details, look back at the section describing how differently the nurses in Women's Health and Primary Care used the system.

5.9 Summary and MCQs - Adyin and Rice 1992

The authors emphasise the importance of taking into account both departmental as well as occupational factors when considering system implementation. They felt that:

"...supports and extends recent research that links employee communication networks with performance on a new computer system. According to Papa (1990), the more co-workers an employee talks to about a new technology and the more frequently he or she talks about the new computer, the more productive the employee will be on the new system. The present project extends these individual-level findings by focusing on how departmental norms may either encourage or discourage employees from developing new contacts with other departments to talk about the computer system. Administrators need to anticipate at least some of these issues in their own organisations in order to encourage and facilitate the interpersonal interactions essential to effective implementation." (p181-182)

"Increased interdepartmental interaction occasioned by the computer implementation process has the potential to change communication in broad ways that go beyond the contacts related to the computer system. Ideally, new interactions can smooth relations and facilitate the flow of information between departments, with positive effects on the organisation as a whole.

Computerisation, however, also can lead to increased workloads, task shifts, and new roles accompanied by conflict between groups. The new interdependencies occasioned by medical information systems may create a need for additional coordination and control strategies (McCann and Galbraith 1981).

It is also important to note that a strong inverse relationship may exist between intra-group and intergroup interactions. "Removing barriers to obtain gains in intergroup interactions may also reduce intragroup cohesion, ' with unintended effects for the individual departments in the organisation (McCann and Galbraith 1981, p72; Mintzberg 1979). For example, Laboratory employees who alter their work patterns to speed the communication of test results to other departments also must continue to adhere to departmental procedures that unsure the accuracy of the results they report. While on balance, increased communication and coordination may had positive effects on the overall functioning of healthcare organisations, impact on work performed within the individual departments has not yet been explored.

Even a highly structured operational system that is not explicitly communicative may lead employees to develop their own informal, face-to-face contacts to support system use. Managers who recognize the importance of these new contacts will develop strategies to facilitate new interpersonal interactions that smooth the flow of information between departments and improve the delivery of care." (p182)

Exercise 14. MCQs

1. Aydin and Rice 1992 mention the paradoxical effect that computers can have. What is this? *(select one)*

a. Encourage health improving and damaging behaviour
b. Encourage beneficial and non-beneficial learning
c. Encourage thriftiness and uncontrolled expenditure
d. Encourage ocular gymnastics and ocular stagnation
e. Encourage both alienation and integration

2. Aydin and Rice 1992 mention the three characteristics of departments which are important when considering communication. They are: *(select three*)

a. Physical proximity
b. Have a salary structure
c. Have boundaries
d. Have a set of resources
e. Focus of attention
f. Focus for educational activities
g. Provide support
h. Provide physical shelter

3. How did Aydin and Rice 1992 extend the measure of "information exchange" compared to Aydin 1991? *(select one)*

a. Included a measure of density
b. Included monitoring face to face meetings
c. Included "any written form of communication"
d. Included "any form of communication"
e. Included monitoring computer use via a audit trail

4. In Aydin and Rice 1992, regression modelling found that only two of the variables measured predicted the "information exchange" and "understanding work in other departments". These were: *(select two)*

a. Age
b. Relations with co-workers
c. Relations with computer staff
d. Work group communication
e. MBTI score
f. Prior computer use

5. In Aydin and Rice 1992, which of the following aspects of the system resulted in no change in interdepartmental interaction? *(select one)*

a. Carrying out backup procedures
b. Ordering sterile supplies
c. Entering data into the computer
d. Monitoring patients' movements
e. Monitoring data quality

6. In Aydin and Rice 1992, which of the following aspects of the system resulted in increases in interdepartmental interaction *(select one)?*

a. Certain medical staff becoming gurus
b. Medical records becoming data input gurus
c. Nurses organising interdepartmental training sessions
d. Finance/Personnel organising interdepartmental training sessions
e. Certain medical staff presenting information from the system at interdepartmental meetings

7. In Aydin and Rice 1992, which of the following aspects of the system resulted in decreases in interdepartmental interaction (*select two*)?

a. Laboratory generation of report forms
b. Ward generation of report forms
c. Retrieval of information at computer terminals
d. Printing of reports at computer terminals
e. Printing of encounter forms

8. In Aydin and Rice 1992, which of the following departments gained greatest understanding of the working of other departments *(select two)?*

a. Finance
b. ICU
c. Women's Health
d. Medical records
e. Primary Care
f. Anaesthetics

9. In Aydin and Rice 1992, which of the following statements relating to the various research hypotheses are correct *(select one)?*

a. Individuals who do not use the computer system will interact more with other departments - Rejected by regression analysis
b. Individuals who are involved in the computer implementation process will interact more with other departments - Confirmed by regression analysis
c. Individuals who communicate with others about the system will interact more with other departments - Not confirmed by regression analysis
d. Computer implementation will not be accompanied by both planned and unplanned changes in departmental tasks and roles - Confirmed by qualitative findings
e. Departments experiencing task changes with departments will interact more with outside organisations - Partially Confirmed (department dependent) by qualitative findings

10. Aydin and Rice 1992 discuss three aspects of planned/unplanned change. Which are? *(select three)*

a. New norms for computer interaction
b. New norms for informal interaction
c. Task training
d. Task shifts between departments
e. Administrative problems
f. Increased administrative control
g. Administrative salary structures

11. What percentage of encounter forms did not initially match the data entered in Aydin and Rice 1992? *(select one)*

a. 10%
b. 30%
c. 40%
d. 50%
e. 75%

12. In Aydin and Rice 1992, what term did the Finance/Personnel department use in reports when referring to data errors: *(select one)*

a. Errors
b. Follow ups
c. Computer operator data entry errors
d. Mis-keys
e. Operator errors

13. In the summary in Aydin and Rice 1992, they refer to an inverse relationship. What is this referring to? *(select one)*

a. Intergroup stability/intragroup stability
b. Intragroup cohesion/intergroup interaction
c. Intergroup cohesion/intragroup interaction
d. Intragroup uniformity/intergroup interaction
e. Intragroup cohesion/intergroup swapping

6. Social Network Analysis

This is the last section of this document and looks at a specific technique mentioned in one of Aydin's papers. In the first of the papers by Aydin and Rice (Aydin and Rice 1991), we discussed a technique used to help quantify the level of communication between different occupational groups. The technique was "Social Network Analysis". This is an important quantitative sociological technique and will now be considered in more depth.

Rice and Anderson 1994 provide a clear introduction to the topic, including a discussion of how it has been used in several healthcare projects, including Aydin and Rice 1991. I will use Rice and Anderson 1994 as the basis for this description of the technique. We will begin by discussing the three structural aspects of healthcare organisations.

6.1 Three Structural Aspects of Healthcare Organisations

Rice and Anderson 1994 consider the following three structural aspects of healthcare organisations as being important determinants to the adoption and utilisation of computer based information systems:

- **Interdependency**
- **Interaction**
- **Integration**

Interdependency

Few medical care tasks can be performed without the cooperation of one or more departments (Aydin and Rice 1992), but at the same time "Fundamental tensions exist in health care settings because of differentiation and interdependency" (Rice and Anderson 1994 p136).

Interaction

Interpersonal interaction with patients and other healthcare workers is often a primary professional motivation for workers in health settings (Mauksch 1972).

Structure of communication networks determines which physicians are likely to be early or late adopters of new drugs (Coleman, Katz and Menzel 1966; Stross and Harlan 1979) and a hospital information system (see Rice and Anderson 1994 p137 for references).

Level of Integration

"Integrated medical information systems that create common databases...require health care departments to cooperate, altering interdependencies and interactions across departmental and occupational boundaries. For example, how nurses enter drug information into a system will affect how the pharmacy department provides services and manages its billing (Aydin 1989). These interdependencies necessitate standardised forms, terminology, and policy and procedures, possibly requiring considerable interdepartmental coordination, negotiationss and conflict (Cook 1985)." (p137)

Exercise 15.

Consider any department and list a few of its interdependencies, interactions and level of integration. It need not be within the healthcare arena. For example, it could be the delicatessen in the local supermarket.

6.2 Types of Data Used in Social Network Analysis

Social network analysis requires data that provides information about the frequency, strength and value of relationships among members of a network. Such data is classified into three types:

1. **Relational (= communication)**
2. **Positional (= role equivalence)**
3. **Spatial (physical distance)**

Relational data indicates the extent to which network members interact directly or indirectly with one another. Such an example might be where a doctor consults a nurse about a particular patient's eating habits. It may involve the measurement of non-verbal communication such as the time to receive internal post or a report of some type. Ideally, both the quantity and quality of the interaction is measured.

Positional "is the extent to which they share the same role in a group or organisation and thus share the same the same sets of obligations, status and expectations" (p139).

Spatial is data concerning the actual physical proximity between each member of the network. For example, a study might measure the walking time between each member's office.

Although ideally all three types of data should be collected for a social network, as in the case with most research this is not always possible. To give you a taste for the technique I will describe the Social Network Analysis that was carried out by Aydin and Rice 1991.

6.3 Example of the Use of Social Network Analysis - Aydin and Rice 1991

The above authors used Social Network Analysis to obtain empirical evidence to support the assumptions that:

- Intra-occupational interactions exist.
- Physicians, nurses and other medical workers occupy a position in the social structure that is different from that of administrators and clerical employees.

In this instance, the technique involved the following stages:

- Stage One: collection of data to create an adjacency matrix
- Stage Two: manipulate adjacency matrix to obtain network measures
- Stage Three: development of an image matrix
- Stage Four: development of an interaction plot

6.3.1 Stage One: Collection of Data to Create an Adjacency Matrix

Relational Data

This was the collection of relational data by means of a network roster which was included in a questionnaire. The roster listed each individual working in the organisation at that time or in the recent past.

Respondents were asked to circle "How frequently, on average, do you have significant discussions with other [each listed] personnel about how you accomplish your work", using the scale 0=not once in a 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.

In this instance the result was a 62 X 62 matrix, the various respondents being represented down and across the matrix. "The cell values of this matrix were than squared, to approximate the number of times per month i interacted with j (i.e., 'every day' is approximately 25 days a month, and 5x5 = 25)" (Aydin and Rice 1991 p135).

It should be noted that at this stage, respondents could have also been asked to rate various other aspects of interactions such as the effort required or quality of the interactions.

Positional (Organisational) and Spatial Data

"The system trainer provided a formal organizational reporting chart and a floor plan indicating each employees location" (Rice and Anderson 1994 p152).

The resulting matrix or each dataset is called an "adjacency matrix".

Direction of communication is from column to row (->).

6.3.2 Stage Two: Manipulate Adjacency Matrix to Obtain Network Measures

The resulting matrixes can be manipulated various ways to obtain a number of measures. Often the matrixes are analysed both at the individual and group level. For both in the present example "To identify within- and cross-occupational relations, a 5 X 5 matrix was constructed...of within-occupation and cross-occupation communication relations".

Manipulation of the matrixes can produce several types of measures of which Rice and Anderson 1994 (p145) mention five types:

1. **Density** is the number of relations or ties between pairs of network members divided by the total number of possible ties. Values range from 0 to 1.0 if each member is directly connected to all other network members.
2. **Centrality** represents the degree to which information and resources are dispersed throughout the group or centered around a few individuals.
3. **Prominence** is the predominance of a particular network member. It can be computed by the ratio of the number of interactions the member initiated to those that were initiated by colleagues.
4. **Multiplexity** can be measured as the proportion of group members with whom a member had more than one type of relationship.
5. **Prestige:** Rice and Anderson 1994 (p145) use a 'prestige measure' which ranges from 0, where no one consults the member (ie physician), to 1, where all other group members consult the member.

The above description concerning the 5 X 5 matrix for within- and cross-occupational relations was actually a density matrix. This was obtained by considering "Each occupation's row and column values [which] were...divided by the number of members of that occupation to create the proportional density" Rice and Anderson 1994 (p157).

Density Matrix:

Occupation	N	MD	OM	RN	AD	CL
Physicians (MD)	6	2.77	1.94	2.45	2.28	0.47
other med. (OM)	15	3.50	3.93	1.92	5.08	2.04
Nurses (RN)	12	4.85	3.60	8.19	12.83	3.42
Admin. (AD)	6	3.28	3.11	5.41	3.33	7.12
Clerical (CL)	29	1.24	1.2	2.26	4.13	3.99

...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)". (Aydin and Rice 1991 p135).

6.3.3 Stage Three: Development of an Image Matrix

"This is a technique where a matrix is created by dichotomizing each value into '1' if the value is higher than the overall mean density (i.e. 3.76 [in the above example]) or '0' otherwise." (Aydin and Rice 1991 p135)

Image Matrix:

	(receive from)					
(Sent to)						
Occupation	N	MD	OM	RN	AD	CL
Physicians (MD)	6	**0**	**0**	**0**	**0**	**0**
other med. (OM)	15	0	1	0	0	0
Nurses (RN)	12	1	0	1	1	0
Admin. (AD)	6	0	0	1	1	1
Clerical (CL)	29	0	0	0	1	1

"Compared to the average level of communication interaction at SHS, MDs receive information from RNs but do not otherwise communicate with the rest of SHS or even among themselves. Administrators (AD) occupy a central place by communicating reciprocally with RNs and office/clerical staff, all three of whom also communicate within there own occupations. Other medical staff (radiologists, pharmacy) basically communicate only with themselves." (Rice and Anderson 1994 p157)

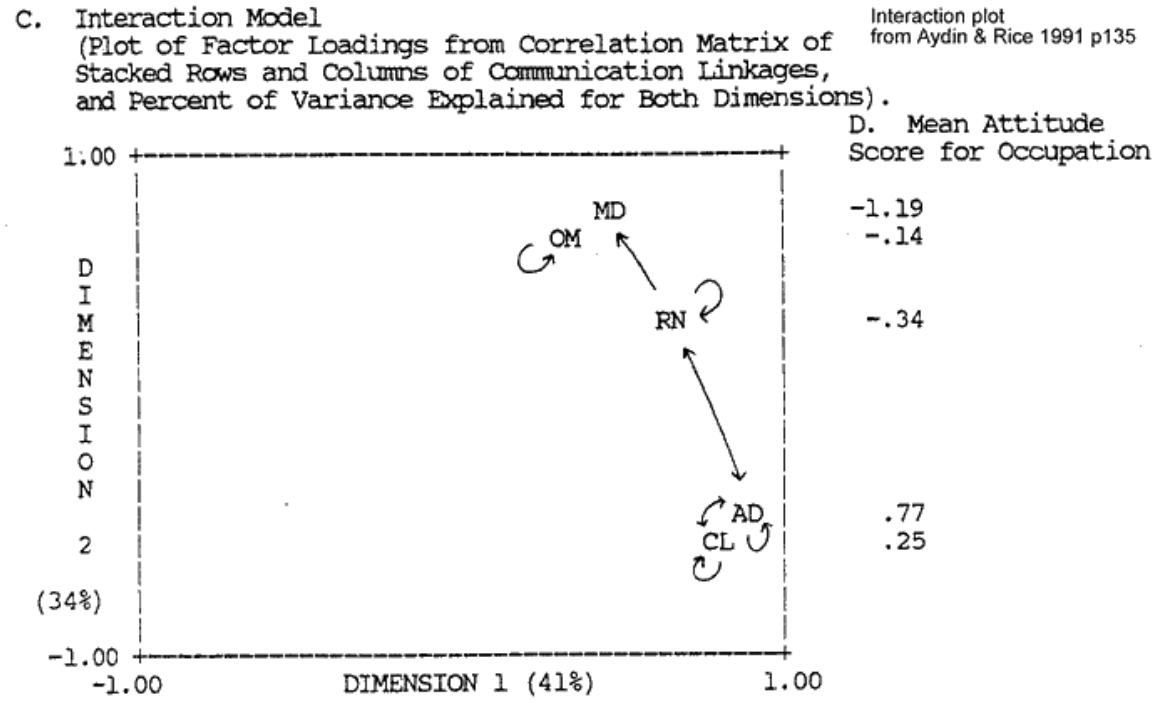
6.3.4 Stage Four: Development of an Interaction Plot

This is a rather complex procedure which I provide for reference below.

From reading the material in this document I would not expect anyone to be assessed on the statistical details, only on his or her ability to interpret an interaction plot

"...a combined matrix was constructed by concatenating the original density matrix with its transpose (to take into account of 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. 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 by nurses." (Aydin and Rice 1991 p136)

The arrow in the interaction plot indicates that the interaction is greater than the average density of the network. Therefore an arrow pointing to the same group (to itself) indicates that the group communicates with itself at a higher level than the average.



6.4 Other Examples of Social Network Analysis

The above example, although a rather simple one compared to most examples of Social Network Analyses, demonstrates the use of the procedure in gaining empirical evidence for 'gut feelings'. In fact, Rice and Anderson 1994 suggest that the procedure is useful for the following four reasons:

1. Investigating roles, such as members of particular cliques or isolates
2. Investigating members and positions in the network
3. Investigating relationships, including a number of characteristics such as strength, direct and stability
4. Investigating the overall structure of the network

6.5 Network Analysis and Collection of Data

You may have realised that each item in the matrix could be any measure that you cared to collect about the member. For example, Rice and Anderson 1994 (p143 - 150) provides an example of Social Network Analysis concerned with physicians' position in a referral and consultation network and which predicted their adoption and utilisation of a medical information system. In this example, the use of particular computer system modules by each physician forms one particular matrix.

6.6 Objective Measures of System Use

The above study also uses an objective measure of system use (by analysing the computer system audit) compared to the respondents' 'perceived' level of use measure mentioned in the previous research papers discussed.

The technique of using computer generated user audit files is a well known technique. For an example of detailed analysis of GPs interactions with a prescription advice software application (Prodigy) see:

http://www.robin-beaumont.co.uk/virtualclassroom/chap13/report1.pdf

One of the common findings from such studies is the large discrepancy often found between the self-reported levels of system use and those actually recorded by the system.

Within the context of network analysis this could easily be added as just another variable.

6.7 References to Social Network Analysis

The International Network for Social Network Analysis (INSNA) provides a large number of links including software (some free) for drawing various diagrams:

http://www.insna.org/

For an excellent article demonstrating the analysis of the common cold (and other health issues - see the references to the article) from a social network perspective see the freely available Journal of Social Structure at:

http://www.cmu.edu/joss/content/articles/volume1/cohen.html

You can download a free package with limited functionality (called GRIN - Graph Interface) to draw various graphs from:

http://www.geocities.com/pechv_ru/

6.8 MCQs

Exercise 16.

1. Which of the following is considered to be a structural aspect of a healthcare organisation? *(select one option)*

a. Financial stability
b. Integration
c. Financial fluidity
d. Introspection
e. Inequality

2. What is positional data in Social Network Analysis? *(select one option)*

a. Data concerning the degree of role similarity between two persons in an organisation
b. Data concerning the degree of similarity between two persons in an organisation
c. Data concerning the degree of attitudinal similarity between two persons in an organisation
d. Data concerning the degree of salary similarity between two persons in an organisation
e. Data concerning the degree of similarity in professional grouping between two persons in an organisation

3. What is spatial data in Social Network Analysis? *(select one option)*

a. Data concerning the geographical position between persons in an organization
b. Data concerning the time difference between similar tasks carried out by different persons in an organization
c. Another name for measuring the personal body space of individuals in an organization
d. A measure for the amount of floor space allocated to each employee

4. Which of the following provides the best description of an interaction plot? *(select one option)*

a. A tabular technique that shows the level of interaction between various groups in an organisation
b. A graphical technique that shows the level of interaction between various groups in an organisation
c. A tabular technique that shows the meanings of interaction between various groups in an organisation
d. A graphical technique that shows the meanings of interaction between various groups in an organisation
e. A graphical technique that shows the relative utility of communication for a number of groups within an organisation

7. Summary

In this document we have discussed three papers by Carolyn Aydin. All three demonstrated a high degree of planning and use of both qualitative and Quantitative techniques. Besides the obvious questionnaire and interviewing techniques she used the more exoteric technique of Social Network Analysis.

The results of her studies demonstrate that implementation of an information system has far reaching effects upon the organisation, possibly several of which are rather unexpected. Rather than go through the various detailed findings in a narrative style I suggest that you re-visit the drawing ("mindmap") on the front page, print it out and add your own comments.

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