Methods, Guidelines and Procedures for the Specification and Evaluation of Office Communication Networks and Services (OCNS)

(Report 3 of 3)

by

Centre for the Evaluation of Communications
and Information Technologies (CECIT)

University of Waterloo

Prepared for
Department of Communications
Government Telecommunications Agency
Division of Development and Engineering

Under contract no: OSU81-00496
"The Development of a Methodology to Evaluate Office Communications Networks and Services in the Federal Government"

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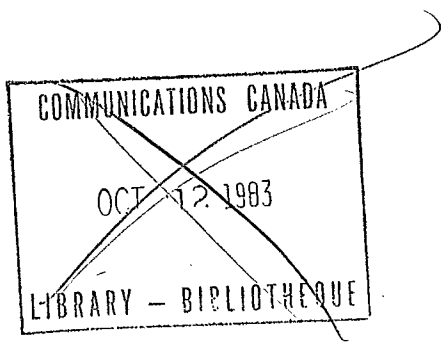

Under this contract, the following three reports have been provided:

Report 1: An Annotated Review of the Literature on the Specification and Evaluation of Office Communications Information Systems

Report 2: Communication Networks and Services Vendor Offerings and Their Applications

Report 3: Methods, Guidelines and Procedures for the Specification and Evaluation of Office Communication Networks and Services (OCNS)

Methods, Guidelines and Procedures for the Specification and Evaluation of Office Communication Networks and Services (OCNS)

The Centre for the Evaluation of
Communication-Information Technologies

University of Waterloo
Waterloo, Ontario
N2L 3G1

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Chapter 1

INTRODUCTION

The purpose of this document is to serve as a guide to those within DOC and its client departments, who may act as advisors in specifying and evaluating office communication networks and services (OCNS) within the Federal Government. The objective of this guide is not to be a final treatise on the subject of specification and evaluation of OCNS. Such a task is still very much an art and is far from being a well developed and rigorously formulated science.

The above qualification must necessarily be made at the outset lest those who may use this guide should look to it as a bible or "blue book" for quick answers to problems relevant to the area. There are no substitutes for comprehensive and detailed analysis of the activities of an organization to determine the opportunities for providing OCNS, the specification of the architecture or configuration of the system, and the evaluation of an installed system. Consequently, the success of the OCNS advisor is very much predicated upon his/her appreciation of what can and what cannot be accomplished.

Hence, the role of this guide is just what the name suggests: an aid or a set of guidelines to those who wish to provide advice in the OCNS area. It attempts to be as comprehensive as possible in documenting the steps involved in providing advice to client departments in the specification and evaluation of OCNS. However, it is up to the analyst to de-

termine, given the constraints of time, cost, and other resources, whether to go through the entire sequence of activities or focus on specific components of a full scale programme. No matter what strategy one adopts, the following sections should prove useful to the advisor's assignment.

Chapter 2

IDENTIFYING OPPORTUNITIES FOR OCNS - THE ORGANIZATIONAL SCAN

Once an assignment has been accepted, the first step is to determine the potential or scope for providing OCNS to a client department. This task is perhaps best accomplished by way of a series of personal, face-to-face interviews with the senior management of the client organization. Interviews are a useful technique for gathering information, particularly when the task is that of fact and opinion finding. It allows one to explore issues in detail providing sufficient feedback to remove problems of ambiguity. Furthermore, given that the subjects at this stage will be senior management personnel, the interview is a more appropriate approach than such techniques as questionnaires which senior managers may find objectionable. Ideally, the individuals interviewed should include those who will be making the decision to proceed with an OCNS programme in their department and those who have responsibility for the department's successful performance and operation.

Initially, separate interviews should be conducted with a sample of senior managers (5 to 10). The objective is to elicit from each one their concerns about the department's performance, ideas for improving performance, etc. The interviews may be held at the interviewee's own office, but preferrable is a neutral territory like a conference room. The advantage of the latter is that the interviewee may feel less defen-

sive in providing answers to specific questions and will not be interrupted during the interview.

The interviews should be scheduled in advance and each of the managers to be interviewed notified of the time, day, and place of their appointment. A telephone reminder the day before will help to ensure attendance at the interviews.

While interviews may range from free-form to fully structured, a recommended strategy is that of the semi-structured interview. Here the interviewer keeps a list of questions to be asked and allows the interviewee to respond freely to these questions. The responses are recorded in writing by the interviewer. The interviewer will decide upon the list of questions based on his knowledge of the client organization and its operations. Table 1 offers guidelines for the interview format.

TABLE 1

POINTS TO BE COVERED IN THE INITIAL INTERVIEWS WITH SENIOR MANAGEMENT PERSONNEL

1. What are the goals, objectives, and missions of the organization?
2. What are its key products and functions?
3. Who are the key producers/players of the organization?
4. How is performance/productivity measured?
   a) for the organization
   b) for the individuals
5. What are the targeted/actual levels of productivity?
6. What problems/bottlenecks exist?
   a) structural
   b) technological
   c) spatial
   d) personnel
   e) other
7. What is the role of communications?
   a) network
   b) modalities
   c) frequency/volume
   d) distance
   e) content
8. What is the role of information processing?
   a) information requirements
   b) information availability
   c) quality, quantity

d) access/retrieval problems

9. What is the role of support systems?

   a) What is presently available?

   b) What is needed?

10. The role of OCNS

   a) awareness of OCNS

   b) expectations re OCNS accomplishment

11. Resource availability

   a) funds

   b) staffing

12. What is the climate of the organization?

   a) management philosophy

   b) employee relations

   c) technological readiness

13. Introduce how you might proceed

   a) OCNS prospectus

   b) OCNS task force[1]

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[1] Issues covered in greater detail in Chapter 5 on Implementation Strategies.

The detailed review of all interview responses is a crucial stage in the advisor's role. Whether or not an OCNS programme will proceed and whether the advisor will be part of that programme may depend upon how well opportunities for the provision of OCNS in the client's department are documented.

Based on the responses from the interviews and on other information obtained about the organization at this point, the advisor will attempt to identify areas in the organization which would benefit most from new technology and will focus on these in his report to senior management. As an example, assume the interview participants identified invoicing as a major bottleneck in the organizations' workflow. The advisor must analyze factors which contribute to this problem and decide whether technological solutions may be applied to improve the situation.

The output from this phase is an opportunities report ("A Prospectus for OCNS at Dept. XYZ"), which should be submitted for the careful perusal of the senior management of the client organization. The OCNS advisor may arrange to meet with the client to review this report.

If the client organization decides to proceed with a programme of OCNS, those who are responsible should follow through the next sections to determine the configuration or architecture of the OCNS package, to plan its installation, and to perform an evaluation of the system.

Chapter 3

OCNS SPECIFICATION AND EVALUATION

3.1 DETERMINING WHAT DATA TO COLLECT

Having decided to proceed with the implementation of an OCNS programme, those responsible have the responsibility of determining the appropriate system configuration. The initial set of interviews with senior management will have broadly indicated what should be provided. However, the investigator should corroborate these initial readings with "objective" data.

The kinds of data to be gathered depends on how detailed and comprehensive one wants to be in the task of specification and evaluation. There are certain types of data which should be gathered in any event. We discuss these in the following sections. The discussion indicates the type of data to be collected, the reasons for collecting them (i.e. whether for specification or evaluation), how the data are to be used, the procedures available for collecting the data and, whenever appropriate, specimen samples of a recommended data collection procedure. These are to serve as guidelines only. The actual procedure or data collection instrument employed will depend upon the nature of the client organization, the resources available (time and money), and, of course, the advisor's judgement as to the level of detail necessary.

Generally speaking, the data can be categorized as follows:

* Archival/Existing Data
* Attitudinal Data
* Task/Activity Data
* Communications Data

and

* Support System Data

3.2 ARCHIVAL/EXISTING DATA

The first step in any data collection effort, whether for specification or for evaluation, is to determine what kinds of data exist. There is no point in designing an elaborate programme to collect data which already exists in an organization's files, archives, or libraries.

Table 2 provides a list of some of the more common data available.

TABLE 2

TYPES OF ARCHIVAL DATA

1. Organizational charts
2. Floor/physical layouts
3. Job descriptions
4. Policies and Procedures
5. Communications Equipment
6. Information Processing Equipment
7. Information Storage Facilities
8. Financial Data
   a) sales
   b) production
   c) payroll
   d) communication costs
   e) purchasing
9. Personnel
   a) size
   b) turnover
   c) absenteeism
   d) union contracts

Each class of data could be used for either specification or evaluation purposes. When the data are used to identify existing relationships, the data are used for specification; when they are used to provide a basis of comparison against which to measure the impact of an OCNS, they are being used for evaluation purposes. Organizational

charts and floor layouts, for example, help establish two types of network configurations: authority and spatial. Not only do they allow one to specify who may need to communicate with whom in providing an OCNS, but they also serve as the benchmarks against which a post-implementation audit of the actual communication patterns may be judged. Various types of costs, such as payroll and communication costs, may be used in evaluating the impact of OCNS. Also, such data as absenteeism and turnover are critical in evaluating the success of an OCNS programme.

The task of collecting archival data is much easier if, as part of the OCNS programme, a senior staff member from the client organization is appointed as a liaison to the advisor. The person so appointed should be someone who has sufficient experience within the department and one who knows where to find the archival data needed for the study.

3.3 ATTITUDINAL DATA

The attitudinal data of greatest importance here relates to people's perceptions and feelings about themselves and their co-workers, their jobs, the organization and the communication/information technologies used in their organization. Though these data are subjective in nature, they are important.

One reason for this importance is that people may act on the basis of feelings and reactions rather than on some "objective" measure of reality. Consequently, both types of data (objective and attitudinal) are necessary to explain behaviour.

Attitudinal data can be particularly valuable in gauging likely responses to a new technology. For example, if the attitudes toward a new system are generally negative one could conclude that extensive training and personal attention might be necessary to obtain its acceptance and use.

A preliminary attitude survey would assist the specification process by identifying critical attitude areas, as mentioned previously, where the investigator's intervention may be necessary. Subsequent attitude measures provide a basis for evaluation of these interventions.

3.3.1 How to Collect Attitudinal Data

The most generally accepted procedures for collecting attitudinal data are interviews and questionnaires. Each of these is discussed in subsequent sections.

3.3.1.1 Interviews

While interviews may be used to gather attitudinal data, they are time consuming and costly. A questionnaire may be administered to a fairly large group of people at the same time, while interviews are best held "one-to-one" or with only a few people. The information generated in interviews is more difficult to code and is less amenable to analytical routines than questionnaire data.[2]

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[2] While there are some semi-analytic techniques that can be applied, such as a manual factor analysis, these are extremely laborious.

Interviews do have a "personal touch" and provide opportunities to explore issues in detail. The usefulness of interviews is limited by the interviewer's skills. They are best used to elaborate, verify, and elucidate points already examined through the use of a questionnaire. From the standpoint of logistics, interviews are less attractive than questionnaires since scheduling a large number of interviews (time, place, attendance, etc.) is far more difficult than administering a questionnaire to the same group of people. Given the relative merits of the questionnaire over those of the interview, we suggest that the advisor use the questionnaire as a vehicle for gathering attitudinal data.

3.3.1.2 Questionnaires

Though questionnaires are time consuming to design, they have the advantage of being able to collect large volumes of data quickly and with minimum disruption to the organization. Additionally, they can be distributed to a large group of people, ensuring wide coverage, while maintaining uniformity in posing the questions. The questionnaire, if properly designed, is easy for the subjects to complete. A typical questionnaire can be completed in 15-20 minutes. The resulting data are relatively easy to code and analyse.

Offsetting these advantages is the problem of ambiguity. Unless the questions are carefully worded, it is likely that responses will be based on a variety of interpretations. A second problem is rooted in the questionnaire approach itself. No matter how well worded, a questionnaire will only provide relevant data to the extent that the ques-

tionnaire designer has an understanding of its purpose, the organization in which it is administered and the people who are responding to it.

In succeeding sections, guidelines for design and administration of questionnaires are presented. Some relevant dimensions are discussed and a sample questionnaire is presented.

3.3.1.3 Some Guidelines for the Design of an Attitude Questionnaire

There are certain simple facts which should be kept in mind when designing a questionnaire. A general word of caution: Just as it is important to examine archival data before one sets out to collect new data, it is also imporant to look for, whenever possible, already existing data collection instruments. A number of these can be found in the literature on organizational behavior; others can be obtained from organizations specializing in a particular type of research. Only if convinced that a totally new approach is necessary should one proceed to design a new instrument. In that case, the following points should be considered.

The most important point concerns the language used:

1.1. It should be simple, precise, concise (short words, active tense).

1.2. It should be geared to the level of the potential respondent, not that of the designer (avoid using your jargon).

1.3. Select words which have the same meaning to all participants - avoid ambiguity (use the client organization's vocabulary if necessary).

2.0. Each question should cover only one dimension or factor (lay out a table of factors and check the questions related to each).

3.0. Avoid questions which might be objectionable to some people (e.g. politically sensitive, prying questions, sexist wording).

4.0. Sequence the questions (e.g. randomize) so as not to create a set response.

5.0. Use closed rather than open-ended questions; avoid speculation on the part of the respondent as to what you really mean by a question.

Questions may be scored on a Likert-type[3] scale of Strongly Agree to Strongly Disagree, (see sample) and then coded on a scale of 1 to 5 (some prefer a 1 to 7 scale) for statistical analysis.

3.3.1.4 Administration

The individuals who will be surveyed should be informed in advance. This group should form a representative sample of the client organization by function, hierarchical level, age, sex, etc. Although the questionnaire may be distributed to each participant to be completed at their leisure, it is preferable to schedule time in a conference room and gather subjects there for questionnaire completion. This will ensure a high rate of return and provides an opportunity to introduce the

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[3] There are other methods of designing and scoring a questionnaire - such as paired-comparisons, etc. Most are too time consuming to be of use here.

research program and discuss its goals and how the data will be used. It is critical to convince respondents that individual data (i.e. attitudes, communication pattern, etc.) will not be reported, except in aggregate form. Consequently, the researcher should go to extremes to ensure that the data are confidential and are seen to be confidential by those participating in the study. In addition, if people have any questions or doubts, these can be responded to immediately. In any event, it is a wise idea to have a senior officer of the client organization provide a covering letter endorsing the data collection effort. It is important to project a sense of legitimacy and relevance.

The data described in Table 3, can be used for either specification or evaluation. For example attitude data can be used to highlight problem areas (specification). When a suitable strategy has been developed and implemented further attitude questionnaires can be administered to measure the impact of these changes (evaluation).

3.3.1.5 A Sample Questionnaire

The sample questionnaire appears in Table 4. Normally there would be a cover sheet, with room for an ID# (confidentiality) and a set of instructions. These might read as follows:

"The following pages contain a number of statements concerning your job, your work group, your attitudes and preferences concerning communications, information processing, technology, and other aspects of your work situation. Please read each statement carefully. Then, indicate how strongly you agree or disagree with each by circling the appropriate number."

TABLE 3

SOME RELEVANT DIMENSIONS WHICH MAY BE IMBEDDED IN AN ATTITUDE QUESTIONNAIRE

1. Organizational Climate (S, E)
2. Interpersonal Relations (S, E)
3. Job Satisfaction (S, E)
4. Technology (S, E)
   a) Attitude
   b) Expectations
5. Information (S, E)
   a) Availability
6. Productivity (S, E)
   a) Improvements

Note that questions 1 and 2 attempt to gauge the climate of the organization; 3 and 4, the level of satisfaction with one's job; question 5 looks at certain information; questions 6 and 7 deal with inter-personal relations; questions 8 and 10 deal with attitudes toward a technology, while question 9 relates to productivity.

One could develop additional questions, phrasing them in such a way that the level of agreement between questions on each dimension would give an indication of the present status quo.

TABLE 4

SAMPLE ATTITUDE QUESTIONS

(for demonstration only)
(Relevant dimensions are indicated in parentheses.)

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	1	2	3	4	5
1. Rewards and Encouragement clearly outweigh threats and criticisms in this organization.	(organizational climate)				
2. In this organization, getting the job done is more important than people's feelings.	(organizational climate)				
3. If I had a chance to do the same kind of work in another organization, I would not hesitate for a moment to move there.	(job satisfaction)				
4. Considering the skills and efforts I put into my job, I am satisfied with my present job.	(job satisfaction)				
5. I wish I could get more timely information.	(information)				
6. I enjoy working with my co-workers.	(inter-personal relations)				
7. Most of my friends are from work.	(inter-personal relations)				
8. Electronic mail is a solution to our communication problems.	(technology)				
9. Our productivity level is below what it should be.	(productivity)				
10. Electronic mail will improve our productivity.	(technology)				

3.4 TASK/ACTIVITY ANALYSIS

The data that will be most useful and meaningful from the standpoint of OCNS specification and evaluation are task analysis and communications data. In this section, we will discuss the relevance of task data and some methods for collecting it.

The advisor's ability to determine the specific configuration of an OCNS package for a client is going to depend upon his ability to determine the nature of work people do in the client's organization. While the data from the initial set of interviews and questionnaires would be useful in determining potential or opportunities for OCNS, the specification of the system architecture should be based on a detailed analysis of what people do at work, determining from that information what types of services are to be provided.

Task analysis data are useful both from a specification and evaluation standpoint. For example, when writing specifications for an organization, understanding its text processing or data processing requirements is essential in deciding whether or not one should provide these capabilities. Task analysis is especially useful in highlighting information storage and retrieval capabilities required at a work station or group level. Furthermore, it enables one to establish profiles of the key products of a group or department.

From an evaluation standpoint, task data are absolutely essential to determine if new services have improved the efficiency of work procedures, improved the quality and quantity of key products, and/or provided faster, more efficient ways for storing, retrieving, and processing information. Measurement of the impact of the technology upon the ways

in which people organize their work, and interact, etc. requires an understanding of what it is that they do now and how they do it.

3.4.1 Collecting Data on Tasks/Activities

Although the need for collecting task data is transparent, the methodologies for doing so are not. This is still an area where much research is required. There is no formula that allows one to gather such data and draw the inferences for OCNS application. In the following section, we discuss some general procedures, including those developed by CECIT in the past, and comment on the circumstances where each might be most appropriate.

3.4.1.1 Questionnaires

Just as one may design a questionnaire to collect general attitudes, one may also use a questionnaire to collect data on what people do at work. Such questionnaires should be highly structured. The level of detail requested should be decided by comparing the marginal usefulness of additional data to the cost of obtaining it. Also it is important to avoid overburdening the subjects with too many questions or by demanding too much detail in their responses.

The procedures of designing and administering the questionnaire are comparable to those cited earlier (see Sections 3.3.1.3 and 3.3.1.4). It is perhaps best done in small groups where there is an opportunity for answering questions, clarifying issues, etc.

3.4.1.2 Interviews

Task data may also be collected by way of interviews. We have already discussed general merits and drawbacks of interviews (Section 3.3.1.1). Interviews may be the sole procedure used or may supplement an initial questionnaire. The latter was the approach CECIT adopted in its studies. Questionnaire data provided the basis for conducting detailed personal interviews (one-on-one) lasting about 90 minutes. The interviews were conducted in a very structured manner, with the interviewer using pre-coded forms and menus to elicit various details of the tasks from the subject and to record these data. The success of these interviews depended on how willing and cooperative the subject was and on the interviewer's ability to structure the session well and ask pertinent questions.

Our own experience can best be described as a qualified success. The interviewer was inundated with a large body of data and faced with the problems of codifying them. The task of data coding was made somewhat easier by the development of what may be loosely called a task taxonomy. We say loosely as we are far from developing a task classification scheme that truly would meet the stringent criteria used in taxonomies in the biological or physical sciences.

3.4.1.3 Activity Logs

A third procedure for collecting information regarding what goes on in an organization involves using a task or activity log. This contains essentially the same dimensions as one would attempt to gather via a

questionnaire or interview. It differs in the way it is administered. Typically, the log would be kept as a diary of one's daily activities: logging or recording each task and its related attributes as they take place sequentially in real time.

The log's main advantage is that it generates more objective data, as these are recorded immediately after the fact rather than based on memory of past events. However, it has a drawback: every time a task has to be logged, it causes an interruption to an ongoing activity. Depending on how the log is designed and how many bits of data per task are to be recorded, the logging procedure can range from simple to complex. As a rule of thumb to ask only for information which is most pertinent from the standpoint of specification and evaluation of OCNS. Once again, the expertise of the advisor is critical in the design of the log.

3.4.1.4 Administration

Of the three procedures available, determining which one to use is primarily a matter of the availability of resources and personal preference. Interviews are the most time consuming and costly approach of these three procedures. While questionnaires can be completed in one session, logs are usually completed over a period of a few days. These two methods, however, are less costly compared to interviews.

The points covered under 3.3.1.4 are also relevant in administering a questionnaire or log or interviews for the collection of task data. Someone should make spot-checks two or three times during the day to ensure all items are being faithfully recorded. This is especially important at the beginning of the study period. All of the data collection

instruments should be designed so that as much of the data as possible can be coded in a binary forma (0, 1). This will make the data much easier to use in subsequent keypunching and statistical analysis. Some additional points will be discussed in the section on Communications Diary.

3.4.1.5 Some Relevant Task Dimensions

We will discuss a few of the relevant task dimensions that one should consider when designing a task data collection procedure. Additional dimensions may be explored as the advisor deems necessary.

1. Task Name (a brief description of task)
2. Sources of Information Inputs (S, E)
3. Destinations of Information Outputs(S, E)
4. Methods of Accessing/Retrieving Information (S, E)
5. Nature and Volume of Inputs/Outputs (S, E)
6. Methods of Distributing Information (S, E)

Items 2 - 6 are important because they are the clues to the communication links which exist and the types of mechanisms for information exchange between people. This is very useful from the standpoint of specifying and evaluating office communication network characteristics. It is quite obvious that the chief cause of operational inefficiency in most organizations is the inability of people to quickly obtain information which is meaningful and useful.

In addition, information regarding the nature and volume of inputs and outputs can shed light on the capacity, and bandwidth

characteristics of the office communication network. High volume data traffic between two nodes in a network will have different implications from low volume graphics or image traffic.

7. Information Processing and Support System Requirements (S, E)

This is a very significant area which needs to be understood in order to specify and evaluate OCNS. Once each person receives the information he/she requires, the types of transformations these inputs are subjected to and the aids/support systems which are used in the transformation processes can point to the opportunities for providing new, more efficient augmentation technologies at the work station level. Whether or not one needs on-line access to computational, forecasting, planning, scheduling, etc. type of tools is to be determined based on what one does now and how one does it.

8. Storage Requirements (S, E)

The success of the new OCNS technology is partly based on its capability to provide computer storage of one's data files with on-line capability for easy access and retrieval. While storing information traditionally has posed no problems, retrieving information from storage has been a significant problem. Finding where and how the organization presently stores information assists the OCNS designer in determining the information storage/retrieval capabilities which should be provided at the work station level in the future.

9. Time Spent on Task

A final item to be considered is the amount of time one spends in various tasks. This is useful as a guide to evaluating the impact of OCNS which claim to save time by providing fast access to, and efficient tools for, processing information. Finding out how much time people spend on various tasks before and after introducing OCNS is useful in substantiating claims regarding time savings in task completion.

3.4.1.6 A Specimen Task/Activity Log

While the dimensions outlined above and others may be imbedded in a questionnaire or used in interviews, they appear in Table 5 in the design of a specimen Task/Activity Log.

SAMPLE TASK/ACTIVITY LOG

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#	TASK NAME & BRIEF DESCRIPTION	INFORMATION INPUTS				INFORMATION PROCESSING		INFORMATION OUTPUTS				ESTIMATE TIME SPENT ON TASK (min.)
		SOURCES	NATURE	VOLUME	METHOD OF ACCESSING/ RETRIEVING	WHAT IS DONE IN PROCESSING INFORMATION	AIDS/SUPPORT SYSTEMS USED IN PROCESS	DESTINATION	NATURE	VOLUME	METHOD OF DISTRIBUTION	

TABLE 5

3.5 COMMUNICATIONS DATA

As mentioned already, the class of data which can provide the most useful guidelines for the specification and evaluation of OCNS is that on communications in the organization. In task analysis the stress is on the transformation of inputs to outputs. In communications analysis, the stress is on the flow of information (i.e. the network or linkages which exist in the organization and the media used in information exchange).

Having identified task and communications as two separate dimensions for analytical purposes, we should remember that the two are closely tied to each other. The attributes of one provide information on those of the other.

Communication is a basic element of organizations and is the glue that binds together their sub-units. If the communication channels or links are severed, the organization will cease to function. It is not surprising then to hear many chief executives concerned about the communication problems in organizations; they recognize the critical role of communication. The role is extensive because most office workers spend 60-90 per cent of their time in communication. Any technology that would allow people to be more effective and efficient in their communications would generally be seen as a definite improvement.

Communication is significant for other reasons. While things like the organizational chart display the authority structure of an organization, the communication patterns reflect the operational structure of the organization. Therefore, efforts to improve organizational effi-

ciency by modifying the structure must examine this communication network.

From a specification standpoint, collecting communications data makes eminent sense. Knowing who communicates with whom, for how long, how frequently, about what, and using what media is essential to uncovering the organization's present communications patterns and new services requirements. From the standpoint of evaluating an OCNS, these data are important since some of the changes to be evaluated pertain to alterations in the communications patterns or in mode utilization.

As an example, we find that two people communicate with each other quite heavily, but each have indicated that they have difficulty reaching each other when it is necessary. Assuming that physical relocation to improve proximity and visibility is not a solution, one could explore the possibility of providing an electronic mail capability.

An important issue to be considered in the installation of an electronic mail network is the decision about who should be in the network. A lack of communications analysis to determine the real network required can result in low usage of the system. This can occur, for example, when participants are given electronic mail capability for political reasons (e.g. level of seniority) and not because they need to communicate with the other members on the network. Communication network and content analysis are therefore significant ingredients for system specification and evaluation.

3.5.1 How to Collect Communications Data

Communications data can be collected via questionnaires, interviews, or logs/diaries. We have already discussed the relative merits and drawbacks of each of these procedures.

The communications diary has a number of advantages over the other procedures. It is a very simple procedure to use involving little effort on the part of those who have to record the data. Admittedly, recording data interrupts ongoing activities. Each communication episode is recorded immediately following its completion. Thus, it is likely to be more objective than questionnaires which require recall or estimates. Furthermore, since there are at least two people in a given communication, we have an opportunity to check inter-recorder reliability, assuming both parties keep the diary. One could, of course, conduct interviews to further establish the reliability of the data obtained by the diaries. Our experience shows cross-check reliability in the range of 50 - 60%. While this is not as high as one would like, it is far higher than that obtained by other procedures.

3.5.1.1 Some Relevant Communications Dimensions

The following are some of the attributes of organizational communication about which one should collect data.

1. Other party to the communication (S, E)
2. Who initiates the communication (S, E)
3. Mode used in communication (S, E)
4. Elapsed time (S, E)

5. Content of communication (S, E)

6. Location/Distance (S, E)

7. Communication Failure/Responses (S, E)

Note that all the preceding attributes have relevance for both specification and evaluation. Item #1, for example, is needed to determine the network (i.e. who should have access to whom). Item #3 allows us to determine if any substitution effects result from introduction of a new service. This may be determined by examining the percentage use of the available communication media both before and after installing the new service. Item #5 is useful in establishing the bandwidth requirements. Item #7 may be used to identify failure patterns and the shifts in these by doing "before and after comparisons".

3.5.1.2 A Specimen Communications Diary

We recommend using a diary to collect communications data because of its ability to generate fairly reliable data with relative ease. A specimen sample of a communications diary is shown in Table 6. We have included an abbreviated set of instructions below. The detailed set can be found in Appendix A.

Instructions for Communications Diary

Please record all of your communications, immediately after each occurs, on the Communications Diary. These include all memos, letters, forms, telephone calls, face-to-face visits, etc., whether sent or re-

ceived. Please record attempts to communicate, even if you fail to get through. Personal greetings and simple requests, such as "may I borrow a paper clip", need not be recorded.

At the end of each day, leave your completed diaries on your desk and we will collect them. Thank you.

COMMUNICATIONS DIARY

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Name: _____ Position: _____ Date: _____ Page ____ of ____

Interaction No.	Other Party to Interaction: Name	ID No.	MODES: Intermediary: Own	Intermediary: Other	Initiated by: Self	Initiated by: Other	Face-to-Face	Telephone	Mail: Internal	Mail: External	Hand Delivered	Computer Terminal	Telex/Cable	Other	Estimated Time (in minutes)	CONTENT: Message	Document	Alpha-Numerics: Data Base	Graphics	Images	Video	LOCATION: Intra-Facility	Inter-Facility	Intra-City	Inter-City	FAILURES: Causes: Busy	Not There	System Failure	Action Taken: No Action Taken	Left Message: Call me back	Left Message: With Content	Accepted Substitute	Waited	Will Try Again Later
1																																	
2																																	
3																																	
4																																	
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Interaction No. and Comments

TABLE 6

3.5.1.3 Administration

The diary is to be kept by everyone in the study sample. Before commencing the data collection procedure, the advisor should decide for what period of time the diaries should be completed. From our experience, a period of one week is usually adequate.

The diaries should be distributed first thing in the morning and picked up at the end of the day by the advisor or a member of the study team. They should be checked each night and omissions, inconsistencies, etc. highlighted. The next day these discrepancies should be reviewed with the subject and rectified, if possible.[4]

3.6 SUPPORT SYSTEM UTILIZATION DATA

Another set of data to be collected pertains to the utilization patterns of the various support systems available in the organization. The relevance of these data is that they provide a picture of which systems are being used and which are not. We have already mentioned how an inventory of all support systems should be made at the beginning of the study. However, there is no reason to assume the availability of a system implies its utilization. In one study, CECIT found that close to two-thirds of those surveyed were not even aware of the existence of certain support systems (e.g. faxcom units). In another case, though the availability of a system (e.g. dictaphone) was recognized, it was hardly ever used. Consequently by determining what is available, who

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[4] See Sections 3.3.1.4 and 3.4.1.4 for additional comments.

uses it, and how much, one can learn a lot about the technological readiness of an organization and the factors which enhance/inhibit the acceptance and utilization of various support systems.

In addition, this information may be used in deciding upon the provision of new support systems, especially in conjunction with task/activity and communications data. For example, if task analysis indicates a high need for fast, letter quality document production and the support system inventory does not show the availability of a word processor, a decision to acquire one should be considered. If, on the other hand, word processors are already available but addition of a communications option is being considered (based on the data from the communications analysis), then having data on current utilization patterns is essential to evaluate the impact of this option.

3.6.1 How to Collect Data on Support Systems Utilization

A suitable approach to collecting data on support system utilization would be a log. By logging the actual use, more objective data is obtained than by using a questionnaire or interview, although the latter procedures are feasible. The log should be designed and administered in the same fashion as the logs described previously. Ideally, much of the usage data should be monitored by the system itself. For example, computer based systems such as electronic EPABX's and computer mail systems can be programmed to automatically collect data on frequency of interaction, duration, initiator and recipient.

3.6.1.1 Relevant Dimensions

Regardless of the system, there are certain common characteristics that should be monitored. These include:

1. Type of System: Dictaphone, Electronic Mail, Faxcom, etc. (S, E)
2. Duration of Use: How Long (S, E)
3. Access Mode: Self, Intermediary (S, E)
4. System Failure (S, E)
5. System Location (S, E)
6. Use: Shared, Dedicated (S, E)

Each of the above may be used either for specification or evaluation purposes. Identifying the type of systems available (item 1) is the first step in collecting data for either purpose. Measuring the duration of use (item 2) and the mode used (item 3) provides information on traffic patterns throughout the organization. This information can be used to identify the bottlenecks, under or over utilization and other problems. Items 4, 5 and 6 provide data which help to explain these phenomena.

3.6.1.2 A Specimen Support Systems Utilization Log

The following specimen (Table 7) may be used as a basis for gathering usage data of the various support systems available in the client's organization. The log would normally have a cover sheet with room for an ID# (for confidentiality) and a set of instructions. These instructions could be as follows:

"Each time you use one of the support services listed below, please indicate your usage pattern by filling in the appropriate columns. Refer to the menu on the left side for recording Type of System Used (e.g. if Telephone, mark "11" under this column on log)."

SAMPLE SUPPORT SYSTEMS UTILIZATION LOG

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(for demonstration purposes only)

TYPE OF SYSTEM USED (refer to MENU for code)	ACCESS MODE		Duration of use (min.)	LOCATION OF SYSTEM		SYSTEM FAILURE	
	Self	Other		Internal to Dept.	External to Dept.	Occurred (S)	Specify cause of problem (see note *)

MENU

01 Word Processor
02 Calculator
03 Copier
04 Printer
05 Computer
06 Dictaphone
07 Faxcom
08 Fiche Reader
09 Typewriter
10 Electronic Mail
11 Telephone

* A menu of reasons for system failure could also be included.

TABLE 7

3.6.1.3 Administration

The general procedures outlined in Section 3.3.1.4 regarding the administration of data collection logs/diaries apply here as well. The major problem is deciding upon a representative time period in which to collect system usage data. One way to avoid this problem is to repeat the measures at several intervals and to either aggregate the data or analyse them for constant patterns. In the case of the task/activity log or the communications diary, a period of one full working week may be sufficient to generate a reasonably large data base. However, in the case of system usage, data may need to be collected over a longer period of time to generate sufficient data. This is going to vary from group to group or from one department to another. For new systems, our experience indicates that 3-6 months are required to obtain stabilized utilization patterns.

In administering the various logs, it would appear that a careful strategy would be to administer one type of log at a time. Having to do all logs at once would be annoying to those who have to complete them. It could also pose data reliability problems as juggling too many logs could be a taxing affair. If the data indicates that certain individuals are not using some of the systems or that some systems are generally being avoided, one should thoroughly investigate the reasons for these behaviours. The investigator may wish to increase his confidence by carrying out spot checks and making personal observations during the data collection phase.

Chapter 4

EVALUATION

Unless an organization has the rare ability to predict with perfect accuracy the impact that an office communication system will have on its operations and employees, an evaluation of that system is recommended. The purpose of an evaluation is to learn something about the system, its uses and its effects. This enables the organization to better adapt the system to suit its needs. Although it would seem obvious that an organization should learn from its experiences and mistakes, rarely are adequate evaluations undertaken.

Effective evaluation requires that it be part of the original planning exercise. The reason is simple. Effective evaluation involves not only examining a system's impact after the fact, but also comparing the effect to what existed before the system was installed. Without such a basis for comparison, little learning can take place. Hence, effective evaluation requires that baseline data be gathered before a system is installed. This can be most easily done in conjunction with the data gathering for system specification - the needs analysis. This is why the evaluation exercise should be included in the plans from the very start.

4.1 SUBJECT

There are at least six different subject areas that one might wish to evaluate. Each is discussed, and suggestions about how one might gather the appropriate data are included.

4.1.1 Technical Performance

4.1.1.1 Relevance

The issue here is straightforward. Does the system operate in terms of its technological components, as it should - does it satisfy the specifications used for design? If it does not, there may be little point in proceeding with the other forms of evaluation, because the likelihood of the system satisfying the other criteria is bound to be reduced. A system that does not function as it is expected to is unlikely to be well accepted, even if it performs valued services. Unfortunately, while the examination of the technical functioning of a system seems like a logical first step in the evaluation process, often such testing is taken lightly or is not even conducted at all.

4.1.1.2 Criteria and Measures

The criteria are of two types. One focuses on the engineering aspects of the system. These concern such things as: speed of response, downtime, and the probability of being able to execute a command.

The other type of criteria reflects the degree of agreement between the specifications which follow from the needs analysis and the actual functions provided by the system. In other words, have the specifications been met?

4.1.1.3 Data Collection and Analysis

If a system is not capable of monitoring its own technical performance, two other methods can be used. One is to conduct periodic tests of the system's technical responses as an industrial engineer might do in a factory. The other is to have the users log such things as response time, failure of a command to elicit the expected response, downtime and the like. If people are heavy users, this can only be done periodically.

The primary method to determine if all of the specifications have been met is to put the system through its paces under test conditions. Again, a standard engineering approach would be used. In addition, one should examine the system in operational use. An analysis of failures and of user expectations not being met may shed further light on the extent to which the stated specifications have been satisfied.

4.1.2 Cost-Benefit Analysis

4.1.2.1 Relevance

Few would question the relevance of undertaking a cost-benefit analysis. The purchase or lease of any new OCNS has to be justified, and by far the most acceptable justification is that it is economic to do so. The issue that remains is whether or not one can convert the expected costs and benefits into economic values.

4.1.2.2 Criteria and Measures

Cost-benefit analyses can best be discussed if they are divided into two separate categories. One concerns efficiency - providing the same

service at a lower cost. The other involves effectiveness - providing value added services.

When efficiency is the only issue, the criterion for the evaluation is simple. Assuming that the new system performed as well as or better than the old, did it cost less? The measures used are dollars and cents.

When value added services enter the equation, the analysis is likely to be both complex and subjective. To take an example, let us say that a new OCNS saves a manager 15 minutes, on the average, of his time each day. You cannot simply calculate the labor costs of his fifteen minutes and assume that this is the value added. Rather, you have to be able to estimate the value of the products and services that he has produced during this extra fifteen minutes that he would not have been able to accomplish otherwise. While one often feels that additional activity has been undertaken, rarely can one measure it in terms of economic gains.

4.1.2.3 Data Collection and Analysis

To conduct a cost-benefit analysis using efficiency as the criterion, one should determine all of the capital and labor costs associated with the use of an OCNS and compare these with the like costs incurred before the system was installed. One must insure that the labor costs used are real costs and not those imputed to time saved. Unless benefits are achieved through personnel reductions or expanded workloads, they can be included only if they are directly attributable to an identifiable economic output, one which could not have been obtained had the OCNS not been in place.

Increased effectiveness, which is the more likely result obtained from a new office communication system, is far more difficult to demonstrate quantitatively. The most likely evidence are high system use, positive attitudes toward the system and/or pronouncements that one is now able to do a "better job." In addition, one can collect a listing of specific benefits such as: fewer interruptions, higher completion rate of telephone calls, higher quality reports and more rapid distribution of letters and messages. The problem is attaching an economic value to these benefits which can be used to offset costs.

One way to estimate the benefits attached to all of the services provided by an OCNS is to determine what people would pay to prevent the system from being removed. Another approach is to ask what one would pay for each of the components of the system, and then sum these for a total. Neither method is very precise, but both can provide rough estimates which can be obtained over the short run. The real value of a service can only be determined over the long run after the users have had a chance to adapt their behavior to make full use of the system, and after it has had a chance to affect the "bottom line."

4.1.3 Satisfaction of User Needs

4.1.3.1 Relevance

This is the most important of all evaluation issues. Presumably an OCNS is being installed to satisfy user needs - to provide services that the users perceive as beneficial. If the identified needs are not being met, this must be brought to light so that the appropriate changes can be made to the system; or it can be removed if it is likely to remain

unsatisfactory. Furthermore, even if the appropriate services are being provided but are not perceived as appropriate by the users, system usage will be far lower than it should be. Thus, both the reality of the situation and users' perceptions of it ought to be determined.

4.1.3.2 Criteria and Measures

Whether or not user needs are satisfied is a reflection of two different things. The first is the effectiveness of the user needs analysis, conducted to provide the specifications for the system's design. The second is the process of implementation. Were the users adequately informed about the system and its purposes, and were they properly trained in its use.

The product of the two should be reflected in actual system usage. High usage suggests both that needs are being met and that the system was implemented effectively. Minimal usage suggests a poorly conducted needs analysis and/or an inadequate implementation process. Thus, one should be in a position to distinguish between the two should system usage fall well below expectations. This requires that the processes used for each be examined. Since the field is new, there are no well accepted standards. Nevertheless, one can ask the question of whether or not the user needs analysis and the implementation processes were undertaken with sufficient planning and care in execution that one could reasonably believe that they would be successful.

In addition to system usage, attitudes provide insight into the satisfaction of user needs, especially attitude change. If after using this system, attitudes toward it, the work being done and the general

work environment, become increasingly positive, these provide good evidence that user needs are being satisfied.

4.1.3.3 Data Collection and Analysis

System usage data are central to the evaluation of the satisfaction of user needs. Most systems which are software controlled can be programed to record data on their own use. Not to have such programs is an oversight in system design. When usage data are collected automatically, the data can be as detailed as necessary and are accurate, and the method is unobtrusive. The individual using the system does not have to change his/her behavior to provide the evaluators with usage data. The only data that will be lacking are answers to the question of why they used the system as they did. The answers can be obtained via an interview or open ended questionnaire.

If the system is not capable of automatically collecting data on its use, diaries and logs can be used as alternatives. Reliability will suffer somewhat, but these methods remove the possibility that users might fear the system because it is secretively collecting data that reflect on their personal capabilities. Questionnaires and interviews are not likely to be effective ways of getting system usage data, as people have difficulty recalling what it is that they have done.

Most attitudes should be measured both before and after the installation of the system to determine what changes have occurred. The only exception would be questions on specific aspects of the new system. Among other things, questions should be asked regarding attitudes toward: OCNS technology in general, physical working conditions, rela-

tions with one's peers, job status, job content and how the organization stacks up against others as a desirable employer. These data can also be used to gauge the impact of the system on the individual, work methods and procedures and organizational relations. The simplest way to collect such data is by means of a questionnaire, using techniques described in the previous chapter. All other approaches, such as the use of an interview, are feasible. However, they are far more costly and no more reliable.

Aside from the system usage data, the data gathered to evaluate the effectiveness of the needs analysis will have to be essentially descriptive. The description should be of what was done and how. The analysis of such data will, of necessity, be very subjective. The issue will be whether or not the needs analysis was sufficient, in terms of validity and detail, to provide an effective basis for system specification.

Data on the implementation of the OCNS should cover the information provided members of the organization during the planning and specification phases of the program, and the training given to them on how to use the system. An evaluation of whether or not adequate information has been distributed can be undertaken by a questionnaire. Basically, one wants to discover what the people know and what their attitudes are toward the implementation process.

Training programs can be evaluated in several ways. One is to test the trainees' skill in accomplishing various tasks using the system. This should be done immediately after the training program and some time later well after the system has been used on an operational basis. Attitudes toward the training program can be obtained by questionnaire.

These are useful to determine which of several different training methods might be the best to use in the future.

4.1.4 Impact on Work Methods and Procedures

4.1.4.1 Relevance

The issue concerns the effect that an OCNS has on who does what and how. This is relevant, not only as a basis for determining the effect that a system has on both the individuals and the organization using it, but to better understand the relationship of these new technologies to work related behavior as well. The better we can document the actual changes in work methods and procedures, the better able we will be to make the best use of office communication systems in the future.

4.1.4.2 Criteria and Measures

There are really no criteria, per se, for the evaluation, as this is a descriptive exercise. What one is doing is documenting what was done before, what was planned to take place, and what actually takes place after the system is installed and usage patterns become stable.

4.1.4.3 Data Collection and Analysis

Data on work related behavior - methods and procedures - can be obtained by a wide variety of means. The questionnaire is the simplest to use but the least reliable. People are seldom very aware of what it is that they actually do. An interview is relatively easy, but it is costly to conduct and it has the same reliability problems as the questionnaire. Direct observation is usually the most reliable, but it is also

the most expensive procedure. Diaries and logs of activities are relatively cheap, relatively reliable, but viewed as a nuisance to complete. Thus, cooperation is sometimes difficult to obtain. A combination of several means provides the capability of cross-checking the results, and is undoubtedly the best approach. This, however, depends upon the time and money available for an evaluation. Here one has to make decisions between what is feasible and what is desirable, according to the circumstances.

Two kinds of comparisons should be made using work methods and procedures data. One is to compare the situations before and after the installation of the OCNS, a documentation of the actual changes made. The other is to compare the planned with the actual, post OCNS work related behavior. This provides a means for examining the reality of the plans and the effectiveness of their execution.

4.1.5 Impact on the Individual

4.1.5.1 Relevance

No matter how effective the new office communication system might be, it is hazardous to ignore the impact that it might have on individual (and collective) users. First of all, there is the societal concern about the impact - is the individual being de-personalized or are his/her capabilities being enhanced? Is drudgery being added or removed? Second, but of greater importance to an organization, are the short run benefits of an OCNS likely to last over the long run? If individual reactions and attitudes are negative, turnover, absenteeism and sabotage may outweigh any apparent benefit.

4.1.5.2 Criteria and Measures

There are two aspects to the impact that an OCNS might have on its individual users that should be considered in an evaluation. One is relatively objective. What is the person doing now, and how, compared with what the person was doing before. This concerns job content and was discussed in section 4.1.4. The other aspect is subjective. What attitudes does one hold toward his/her job, the organization, the work environment, and the relationships that one has with one's fellow workers?

4.1.5.3 Data Collection and Analysis

Attitude data should be collected on both one's perception of the new technology, its impact and its utility, and on most of the standard organizational climate dimensions. The latter are needed to detect shifts in attitudes toward work, the organizational environment, the physical environment, employee benefits and the like. Even though these might not have changed from an objective point of view, if one's attitudes toward them have changed because of the installation of an OCNS, either positively or negatively, this should be taken into account during an evaluation of its impact.

As noted several times previously, attitude data are most easily gathered by means of a questionnaire.

4.1.6 Impact on Organizational Relations

4.1.6.1 Relevance

One of the impacts that is often overlooked, but which may have major consequences for an organization, is the impact that an office communication system might have on the actual structure of an organization. By "actual structure" we mean the network of interpersonal relations which is used to get the work done. Also, the authority and control structures might be affected, changing the influence of the formal hierarchy.

4.1.6.2 Criteria and Measures

The actual organizational structure is probably best represented by the communication network which is used to accomplish organizational objectives. If one wishes to distinguish issues of control, network data can be gathered according to content, though the use of anything more complex than a very simple taxonomy is likely to reduce data reliability considerably.

4.1.6.3 Data Collection and Analysis

Communication network data can be gathered most effectively by the communication system itself. This will exclude face-to-face interactions, which can be obtained by means of a simple diary. Note that if one relies on the automatic collection of data, it is highly unlikely that content data can be obtained. Thus, if content is an important variable for the evaluation exercise, other means will have to be engaged.

Communication diaries are a second best approach. They are easy to use and relatively reliable. However, few people like to complete them. As a consequence, they cannot be used for an extended period of time, nor are they really suitable for collecting data at random intervals over time. Questionnaires have also been used to ask people with whom they communicate, how often, etc., but reliability here is usually so low that the data gathered are not worth the effort involved in obtaining them.

4.2 PROCEDURES

Evaluation procedures are very similar to those which should be used to gather data to aid in the specification of an OCNS. Nevertheless, there are a few additional cautions which deserve to be stated.

First and foremost, the evaluation phase has to be included in the plans for the design and installation of an OCNS at the very beginning. Evaluation cannot be considered as separate, especially since much of the data that are to be used during the evaluation have to be gathered before the system is installed. If an evaluation program is not included in the initial plans, adequate before-installation data are not likely to be collected, and all one will be able to do is to conduct an after-the-fact evaluation. These are seldom worth the effort. They are so subjective that they tend to do nothing more than confirm the preconceived notions of those who conduct the study (i.e. If you want someone to prove that the system is in fact cost-effective, have a true believer carry out the study on an after-the-fact basis).

Second, evaluation should not be seen as a one-shot event. If a system is going to adapt to the changing needs of an organization, an evaluation should be conducted at periodic intervals, both to determine what the adaptations ought to be and to evaluate how successful the past adaptations have been. An in-place evaluation scheme is much easier to undertake if it is viewed as part of one's job.

The timing of an ex post evaluation is of some concern. Essentially, it should be conducted after the OCNS has been in place long enough so that its users are past the learning phase and its use has stabilized. On the other hand, an evaluation should be conducted as soon as is reasonable so that the number of other extraneous factors, such as changes in personnel, will not have time to intervene. Very simple systems can be evaluated no more than two months after installation. Complex systems, such as an integrated office communication-information system, should not be evaluated sooner than six months after implementation. The results of evaluations conducted after a greater time elapse risk being influenced by factors unrelated to the new system. Thus, truly complex systems ought to be evaluated more than once. As long as the evaluation routine is not viewed as overly onerous, evaluations could be conducted every six months until the use of the system has truly stabilized and no further system adaptations are anticipated.

Evaluations, if they are to be successful, must be seen by those being evaluated as supportive and not punitive. If they are used to bring about system changes and/or improvements in training and/or interesting changes in job assignments or promotions, then employees will be willing to participate in the evaluation exercises and will provide reliable and

useful data. If, however, the evaluations are seen as a means for rewarding or punishing people, then the exercise will soon be sabotaged. The use of evaluations, like individual performance reviews, are a reflection of management philosophy. If that is supportive, evaluations are worthwhile undertaking. If the philosophy is punitive and destructive, there is little point in going ahead with the exercise.

Finally, in conjunction with the point made above, there should be some consequence of an evaluation. People will want to know why they spend their time in providing data, and will expect to know at least some of the results. More concretely, if the system is not functioning in a way that they find supportive, they will expect that the evaluation will be used as a basis to adapt the system to provide better support. If this is not done, the organization should be prepared to provide a very credible reason why.

Chapter 5

IMPLEMENTATION STRATEGIES

5.1 ESTABLISHMENT OF A TASK FORCE OR STUDY TEAM

It is important to establish a team of individuals from within the organization to plan for an office automation study and to work together in the implementation of office automation technology.

It is also essential to obtain the support of top management personnel for the study. If this group visibly supports the OCNS, other levels of management are likely to accept the new technology more readily.

5.1.1 Guidelines for Selection of Task Force

1. The task force will be selected by the organization's top management. At that time, its members should be informed of the objectives of the study, their expected commitments to the study, and the expected completion date for the study.
2. The task force should include members from both the professional and support staff within the organization in order to obtain a wide range of perspectives and functional experience in the group.
3. One member of the group should be appointed as coordinator of all study activities. This individual will be responsible for coordinating daily matters and for liaising with any external contacts regarding the study (e.g. consultants, vendors). It is im-

portant that the person possess excellent inter-personal communication skills, with proven capability in organizing long-term projects and obtaining the cooperation of others. This leader should be knowledgeable of the organization's operations and should be respected and trusted by both the top management and the users.

4. It is important that the scope of the study be related to the size of the office automation budget, as well as the availability of staff resources to participate in the study. In many situations, a pilot trial of new equipment is the most suitable approach, considering the above two factors.

5.1.2 Purposes of Task Force

This type of group can serve several purposes within the organization:

1. To develop communications throughout the organization regarding office automation, making staff aware of its objectives and keeping them informed of plans for change, and to gather feedback from workers about office automation;
2. To encourage participation in office automation projects within the organization;
3. To identify competent people who can contribute to the objectives of the office automation study;
4. To evaluate present systems (there is no benefit in automating inefficient procedures) in the organization;
5. To ensure the capabilities of present equipment are utilized;

6. To prevent unnecessary duplication of hardware or software within the organization;
7. To be responsible for the specification and implementation of new technology and the post-implementation evaluation of the technology.

5.2 PILOT TRIAL

Regardless of the scale of an implementation, it must be a phased and gradual process, allowing people sufficient time to adjust to changes in their office environment.

5.2.1 Pilot Trial vs Full Scale Implementation

The pilot trial approach to office automation offers both advantages and disadvantages. In making a decision regarding the scale of the implementation, the following points must be considered:

1. Advantages of Pilot Trial Approach:

   a) Identification of Problems with the System

   With every installation, some problems will be encountered. The pilot trial approach allows an organization to experience these problems on a small scale and to identify the cause of the difficulty. Solutions can then be sought in order to avoid the same problems in a full scale implementation.

   b) Economic

   A pilot trial is often most feasible because it involves a small scale installation of equipment and, therefore, requires a lower commitment of funds from the organization.

c) Commitment of Manpower

A pilot trial also requires a lower commitment of manpower from the organization, causing less disruption to its departments and their daily routines. This factor can be viewed in terms of the salary expense incurred (e.g. for working hours lost during installation of equipment or in data collection effort).

d) Impact on Organization

To the extent that the scale of the implementation is smaller, the impacts of the new technology on the office can be more easily monitored or controlled. The pilot trial approach, therefore, can allow members of the task force to identify and develop an understanding of these impacts in advance of the full scale project, and to better prepare the user group for these impacts before introducing the technology in the full scale implementation.

e) Data Collection and Analysis

The pilot trial requires the collection of data from only a small sample so the tasks of gathering and analyzing data are less cumbersome. Also provided in a pilot trial is an opportunity to test data collection instruments, and to obtain feedback regarding their design and content.

2. Disadvantages of Pilot Trial Aproach

a) Difficult to Assess System

Because the pilot trial implementation is on a small scale, it may be difficult to fully evaluate a system in some instances.

For example, in order to fully evaluate the usefulness and impact of electronic mail or other communications systems, a distributed test site is required. Without the appropriate network of users on electronic mail, it may be possible for the users to evaluate the technology on such dimensions as product features or ease of use, but not the overall usefulness of the technology in their work situation.

b) Sample may be Biased

In many instances, the pilot trial user group is selected based on their willingness to cooperate and participate in a trial. It is possible that this group may be biased in their attitudes towards office technology. Office automation is often a very political issue within an organization. For example, managers or departments may insist on participating in an office automation project because the new equipment is perceived as a symbol of status. Consequently, it may be difficult to obtain a truly representative sample for the pilot trial.

c) Time Delay

In some cases, the pilot trial approach is not used because the organization is under constraints to complete the entire installation within a short time frame. An organization may require the capabilities and benefits of the technology sooner than would be possible if a pilot trial was conducted.

5.2.2 Criteria for Site Selection for Pilot Trial

The following criteria must be examined in the process of selecting a site for the pilot trial:

1. Cooperative Subjects

   A successful pilot trial requires the involvement and commitment of its user group, with these subjects indicating a desire to participate in the test. Wherever possible, the subjects must be both willing and able to fully test a system and be prepared to provide feedback regarding implementation strategies.

2. Representative Sample

   The pilot trial group should include both managers and support staff members of a department among which a reasonable amount of communication occurs. There must be a need for the subjects to communicate with one another. This can be determined via the initial information gathering phase of the study (see Section 3.5).

3. Representative Time Period for Pilot Trial

   It is essential that the activity level during the pilot trial be representative for the department. It may not be appropriate, for example, to conduct the trial in July if the majority of staff schedule their vacation at that time. An awareness of peak seasonal workloads of the organization is also important. If such a peak occurs during the installation phase for new equipment it could unfairly influence the evaluation of the new technology.

4. Suitable Environment

The office environment should be adaptable for the pilot trial in the following aspects:

Space - sufficient to accomodate new equipment and still allow for traffic flow.

Lighting - sufficient to prevent eye strain but not cause glare on a terminal screen.

Furnishings - comfortable, adjustable, provide for cables, etc.

Sound absorption - acoustics - control noise level in office.

Wiring - power, lines available.

Psychological environment - morale among workers in test site at good level, no personality conflicts apparent among staff.

5.2.3 Data Collection for Pilot Trial

In order to obtain an evaluation of the technology used in the pilot trial, it is essential to collect comparative data from both before and after the installation of equipment. Data collection procedures have been discussed in detail in Chapters 3 and 4 of this document.

5.3 PRE-INSTALLATION ORIENTATION/PREPARATION OF PEOPLE

Careful planning and consideration of human factors at this stage can contribute significantly to the acceptance of the recommended system. The following are important steps in this process:

5.3.1 Sensitize/Educate User Group

Groups sessions with all potential users of the new system should be conducted by members of the study team prior to the installation. The purpose is to educate the user group regarding the capabilities and functions of the technology being introduced. The direct users, as well as others in the department who will be affected by its introduction, should be included in these sessions. It may be possible to arrange with the vendor a "hands-on" type of demonstration on the premises prior to the actual installation date. The session leader should be prepared to answer questions of a technical nature and also address workers' concerns and fears regarding the impacts of the new technology (e.g. possibility of job reductions, physical side effects). The objective of these steps is to reduce uncertainty regarding office automation.

5.3.2 Prepare Revisions to Work Procedures

Changes to existing procedures may have to be implemented with the introduction of new technology. Both the potential benefits and problems (e.g. security, access to information) that might arise from new 'automated' procedures should be discussed with the user group. Wherever possible, the study team (or task force) should begin to prepare revised procedures to handle changes in information handling or work flow (e.g. maintenance of electronic files). These changes could result in a shift in the workload so that some staff are overwhelmed with work or are faced with tasks of a different type. This is the type of problem which organizations should attempt to prevent.

5.3.3 Plan Physical Layout

At this point, plans should be made for the details of the physical layout of the new technology. For example, desks may have to be rearranged in order to accommodate word processor terminals and to ensure the confidentiality of material as it will be displayed on the screen. For equipment such as printers or terminals, it is also likely that new furniture, with provision for cables and also for the circulation of air to keep the systems cool, will have to be purchased.

5.3.4 Assignment of Job Responsibilities

With the acquisition of new technology it may be necessary to reassign duties or delegate new responsibilities to present staff. To avoid confusion and unnecessary tension among the staff when the new equipment is installed, these issues should be addressed well in advance of the delivery date.

Of equal importance is the decision to hire additional staff where necessary.

5.4 INSTALLATION OF TECHNOLOGY

Scheduling and arrangements for installation of the technology will be made with the vendor. The exact timing of the installation is often not in the control of the purchaser due to 'unforeseen' problems with delivery dates. It is important that office workers be prepared for some unavoidable disruption in their daily work routine during this period. Installation should be phased, if possible, to minimize the disruption to the office.

5.5 TRAINING

The objective of this phase is to provide users with the understanding and skills required to effectively operate the selected technology. Training programmes will vary depending on the type of technology. However, certain key issues must be addressed with any installation and are discussed in the following sections.

5.5.1 Need for Developing Expertise within the Organization

Generally, any training which is provided by the vendor of a product must be supplemented with an in-house training programme. In some cases, a reference manual is the only training tool provided for the use of the purchaser. Outside consultants, when hired, are usually available to assist the user group for a limited amount of time.

It is, therefore, essential to develop expertise within the organization for the provision of training and support on a continuing basis. It is recommended that more than one person acquire in-house expertise with the technology, in order to offer an adequate level of support for the organization during the initial period of adjustment and to provide back-up service as required. For example, during prime operator's absence, equipment should not sit idle.

For some technologies, such as communicating word processing systems, the users may need a period of 3 to 6 months to adjust to and understand the system's full capabilities.

5.5.2 Initial Training Sessions

Upon installation of the new technology, training sessions should be scheduled with each member of the user group. These should be conducted on a one-to-one basis, allowing the user to ask questions and to have direct "hands-on" experience with the new equipment.

The length of time allocated to the individual training sessions will depend on the type of technology implemented. It will depend also on the characteristics of the individuals being trained. Some people will learn more quickly than others and the trainer must consider this fact when planning the programme.

The organization should schedule the installation during a relatively slack period, if possible. Users cannot be expected to learn the new system if they are burdened with pre-existing deadlines.

5.5.3 Follow-up Assistance and Training

It is extremely important that the in-house expert(s) be readily available to assist the users during the months following installation. In addition to the provision of daily informal support, formal follow-up training sessions should be scheduled with each individual to ensure proper use of the technology.

These follow-up sessions can also help prevent frustrations from developing into more serious problems. Again, the timing of these sessions will vary depending on the technology. If, for example, the technology is relatively simple to learn, as in the case of some electronic mail systems, the first follow-up session may be scheduled only a few days after initial training.

Also recommended are follow-up group sessions in which the entire group of participants have an opportunity to discuss difficulties experienced with the use of the new technology and to exchange new ideas for various ways of using it. It is advisable to organize this type of meeting after all participants have had adequate time to use the technology on a regular basis, so that each will feel prepared to contribute to the sessions.

5.5.4 Reference Manuals/User Guides

Easy to read reference manuals are essential. It is important that they be kept simple, compact, and include examples of applications, as well as a clearly organized index and table of contents. For quick and handy prompting of the user's memory, a simple and concise reference card should be made available.

The reference manuals which are provided by an equipment vendor often do not meet all these requirements. Therefore, it may be necessary for an organization to develop user manuals in-house. A "walk-through" exercise may be useful in the writing and testing of a user manual. This exercise requires the writer (who is presumably familiar with the equipment) to imagine himself/herself using the system. He/she proceeds step-by-step and notes each activity in the sequence (e.g. flick terminal switch to "on" position, press "return" key on keyboard, etc.). This imagined walk is often better than doing the action, since experienced users tend to skip steps.

On line assistance should be provided, where appropriate, to guide the user through the operation of the system when problems are encountered (e.g. electronic mail).

5.6 ESTABLISHMENT OF REVISED PROCEDURES

The study team, as described at the beginning of this chapter, must examine policies and work procedures carefully and identify the need for revisions. This is a gradual process, beginning as soon as equipment is selected, and often requiring the participation of members of various departments. One example requiring such attention is the establishment of procedures for obtaining a hard copy of an electronically transferred document, in particular one which is transferred from one branch to another. Following are examples of questions which must be addressed in this situation:

> "Who will man the Printer at the destination?
> Will it be necessary to complete a request form for this service?
> On what basis does one assign priority to requisitions?
> Should printed documents be delivered to or picked up by requestor?"

Other examples of issues which would require examination are the maintenance of confidentiality for electronically stored material, the need for restricted access to files, and procedures for maintaining back-up files on an automated system.

5.7 POST-INSTALLATION MONITORING OF SYSTEM

The continual monitoring of the system is vital to the implementation process. Early in the pilot trial, management should appoint responsibility for this function to a member of the task force, so that monitoring procedures may be defined in advance and put in effect immediately following the installation of the new equipment.

5.7.1 Maintenance and Repairs

An on-going record of maintenance and repairs to the system is necessary in order to provide essential information regarding the system performance and cost, generally used in the justification of system acquisition.

5.7.2 Identifying Need for Modifications

The continual process of monitoring the system will also assist in determining what modifications are required over time (e.g. as users change through staff turnover or as business needs alter).

5.7.3 Identifying Problems - Level of Usage

Monitoring the level of use of a system can lead to the indentification of different types of problems. When low usage is identified, it is important to discuss the matter directly with the particular user to determine reasons.

If staff are not using the system to its full potential, it may be due to the lack of a need for certain features of the technology (or even the technology itself).

Other reasons why staff may avoid using a technology are: poor performance of the system (i.e. it does not do what it is supposed to do) or problems with the system design (i.e. poor ergonomics). Software or hardware changes may have to be investigated in these situations.

Low level of use may also be related to the training programme and/or to the level of difficulty encountered in learning how to use a system (or a system feature). In this case, the training programme may need to

be reviewed and changed to place more emphasis on the identified areas of difficulty and to ensure that it allows users to progress at different rates.

Appendix A

COMMUNICATIONS DIARY

Instructions for Communications Diary

Please record all of your communications, immediately after each occurs, on the Communications Diary. These include all memos, letters, forms, telephone calls, face-to-face visits, etc., whether sent or received. Please record attempts to communicate, even if you fail to get through. Personal greetings and simple requests, such as "may I borrow a paper clip", need not be recorded.

At the end of each day, leave your completed diaries on your desk and we will collect them. Thank you.

After each communication (interaction), first fill in the name (or names) of the other party (if he/she works for your organization). If you were at a meeting, you can attach a list of the names on a separate sheet of paper. If the other party works for another organization, just indicate the kind of organization, for example: bank, insurance agent, customer or client, data processing firm, etc. If you communicated with the same other party more than once during the day, instead of filling in the name a second or third time you can merely fill in the number of the interaction where the name first appeared on the Diary.

If someone acted as an intermediary between you and the other party, check whether the intermediary acted on your behalf and/or on the behalf of the other party. For example, if you call someone and the secretary answers before you get to speak to the other party, check the "Other" column under "Intermediary". If Tom Smith hands a note to Bill to be given to you, record Tom Smith as the other party and put a check under "Other, Intermediary". If your secretary opens your mail and arranges it for you, indicate "mail" under "Modes" and place a check under "Own Intermediary".

The next two columns concern who initiated the interaction, you or the other party. Generally, it is quite obvious, but if you meet by accident place a check under "Self", since you must have been away from your workstation.

The modes of communication are listed next. Note, in some instances, such as when someone visits you and gives you a report, two modes are in use (Face-to-Face and Hand Delivered). There may be other instances of multiple modes as well.

Please estimate the time that you spend on interaction, in minutes. This includes preparation time when required, such as that involved in looking up a telephone number and dialing a call, or that used in writing and proofreading a letter.

Please indicate the nature of the content of each communication by placing a check under the appropriate column. It is possible that one interaction will have many types of content.

The next 4 columns pertain to the location of the other party with whom you communicate. If the interaction is with someone in

your building check Intra-facility; if in a nearby building of your organization, indicate Inter-facility; if with another organization in the same city, mark Intra-city; and with a party in another city, check Inter-city.

If you attempt to contact another party, but fail, please place a check under the cause of that failure and another check under the action you take in response to that failure.

For mail, consider all items received from a single source (or source type if outside of the organization) as single communication. However, after the name, estimate the number of pages involved.

If you wish to elaborate on a particular communication, note its number at the bottom of the diary and write your comments in the space provided.

TASK TAXONOMY
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TASK CODE	TASK NAME
P	PLANNING
E	EVALUATING
C	COORDINATING
N	NEGOTIATING/BARGAINING
A	AUTHORIZING
S	SUPERVISING
I	GATHERING/DISSEMINATING INFORMATION
R	RECORD KEEPING
T	SECRETARIAL SUPPORT
Z	UNKNOWN/NOT APPLICABLE

TASK CODE	TASK NAME	
P	PLANNING -	Financial Planning, Budgeting, Policy Formulating, Production Scheduling, Marketing Strategy This is a cognitive (thinking) activity and involves the development of a blueprint for action. It may be interactive (multi-person) in nature and has an extended time horizon.
E	EVALUATING -	Monitoring, Appraising, Auditing, Reviewing, Analyzing, Controlling. The purpose of evaluation is to compare actual results of operation against previously established plans and benchmarks. This is a control function.
C	COORDINATING-	Liaising, Advising/Assisting, Consulting, Arranging/Organizing (eg. meetings). This is an interface or liaison activity. Ensuring the smooth operation of the various individuals, groups, and departments is the objective. Seeking concensus rather than imposing unilateral positions characterizes the task of coordination.
N	NEGOTIATING/ BARGAINING -	Persuading, Selling (ideas, products, etc) Attempting to change the opinion or awareness of others is the chief characteristic of this activity.

TASK CODE	TASK NAME	
A	AUTHORIZING	- Approving, Signing, Exercising Authority. This is the realm of those who have the authority or power to authorize or approve.
S	SUPERVISING	- Staffing (Hiring/Firing), Motivating, Counselling, Training, Directing. The management of human resources (usually subordinates) is an on-going activity of those in supervisory positions.
I	GATHERING/DISSEMINATING INFORMATION	- Requesting (from others), Accessing and retrieving (from files), Investigating, Reporting, Informing, Dictating, Advertising, Representing/ Public Relations. Searching and retrieving information either from storage (eg. files) or from other individuals and distributing information to others either in response to a query or because it is felt that others may need the information is the activity involved. Note that the activity includes the processing of the information after receiving and before transmitting it.
R	RECORD KEEPING	- Bookkeeping, Calculating, Inventorying Invoicing, Placing/Receiving Orders. This is a maintenance function and subsumes a great variety of an organization's ongoing activities. The stress is on those activities which are routine and repetitive. Standard operating procedures and programmes or algorithms either exist or could be developed to guide the execution of record keeping activities.

TASK CODE	TASK NAME	
T	SECRETARIAL SUPPORT	- Transcribing dictation, Typing, Inputing, Editing, Filing, Copying, Printing, Sorting, Storing, Handling Mail, Answering Telephone Calls and General Enquiries, Receiving Clients, etc. This is an intermediary or routing function required to facilitate the flow of information from those who generate to those who seek or need the information. The intermediaries usually act on the form rather than on the content of the information.
Z	UNKNOWN/NOT APPLICABLE	- This category is to be used if none of the preceding categories adequately describes the task involved or the task description is too ambiguous.