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Project Report

DND OCS FIELD TRIAL IMPACT ASSESSMENT

Final Report

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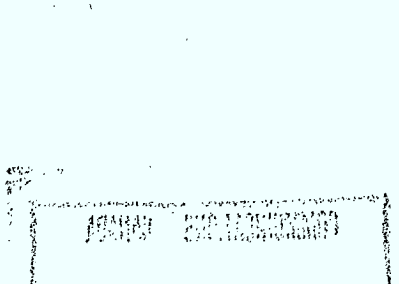

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I

INTRODUCTION

In May of 1984, Abt Associates prepared a "Detailed Impact Assessment Plan" for the Office Communications System (OCS) Field Trial at the Department of National Defense (DND). The workplan and schedule in that document were developed under the assumption that the system ("RENAISSANCE" developed by XIOS Systems Corporation) would be installed and operational in February of 1985. We planned to allow three months for system use to stabilize. Then, in June of 1985, the post-implementation measurements were to be taken. Our final project report was to be submitted at the end of August.

As events unfolded, it became apparent that the schedule described in our Impact Assessment Plan was not going to be met. Developmental problems with the system as initially installed in September of 1984, prompted the DND project Manager (PM OCS) to limit the initial installation to two nodes. These two nodes then participated in a so-called "Mini-Trial" for a period of approximately two months. Once system performance reached a level acceptable to DND in the two Mini-Trial nodes, the other nodes were installed. The system software also went through a series of enhancements over a period of several months. It was only in June of 1985 that the system was finally accepted by DND. Hence, strictly speaking, the Field Trial only began formally in June, 1985.

This report is the last of four documents produced by Abt Associates of Canada for the DND OCS Field Trial. In addition to the "Detailed Impact Assessment Plan" mentioned above, project deliverables have included the "Baseline Report" submitted in October of 1984, and an "Interim Report" submitted in September of 1985. This final report both incorporates relevant material from the latter two documents, and presents new information on the impact of the Field Trial at DND.

Chapter II of this report summarizes the highlights of our findings. A description of the Field Trial site is presented in Chapter III. In Chapter III we describe the DND Office Communication System and summarize its history. The methodology of our impact assessment is described in Chapter V. Chapters VI through XI present our detailed findings. We conclude this report with a discussion of our findings.

NOTE:

During the extended time period covered by this project several changes have taken place in the business structure of the vendor and its product orientation. The original vendor, Systemhouse Limited (SHL) restructured its business operations, including a separation of its office automation activities into an operating company called XIOS Systems Corp. which was then sold to a parent organization of SHL.

At about the same time, the product to be used in the Field Trial -- "EXPRESS" -- was renamed "RENAISSANCE". In this report we use the terms "Systemhouse", "SHL" and "XIOS", and "EXPRESS" and "RENAISSANCE" interchangeably.

II

HIGHLIGHTS

A. THE FIELD TRIAL SITE

The OCS Field Trial in the Department of National Defence has been carried out at National Defence Headquarters, in Ottawa, and at Air Command Headquarters and Canadian Forces Base, Winnipeg. At NDHQ the primary focus of the study was the Financial Services Branch, and at Air Command Headquarters and Canadian Forces Base, Winnipeg, the focus was the comptrollers organizations. The total number of participants in the Field Trial was approximately 200 to 240 individuals.

The participants are predominantly male (134, or 63% of the total). The male participants tend to be older (most were over 30), 70 (52%) had completed university and were long-serving, relatively senior individuals (58, or 43% were in supervisory positions). The females tended to be younger (42, or 52% were under 30). Only 23 (28%) had completed university and most (71, or 88%) were non-supervisory and had been with DND for less than five years. Most females were privates or civilian equivalents. Most of the participants had had some exposure to computer systems prior to the OCS project, however only one in five described themselves as possessing an intermediate or advanced level of expertise.

The OCS system installed in DND was the "RENAISSANCE" system developed by XIOS Systems Corp.

This system was implemented following a series of steps including:

- Pre-trial planning and site preparation.
- Analysis of the current situation.

- Definition of the functional requirements and specifications for the DND system.
- Final specification of the OCS system.
- Implementation of a "mini-trial."
- Extension of the system to cover the complete target population.

The process described above took place over a period of approximately three years.

The system, as installed, consisted of 10 "user nodes" -- 5 in NDHQ, Ottawa; 3 in the Narono building, Ottawa; and 2 in Winnipeg.

Each node consisted of a microcomputer, a number of workstations, a range of office automation software tools and connections to a wider communications system.

The overall configuration, as installed, consisted of:

- 18 Northern Telecom Displayphones.
- 69 Digital Equipment Corporation VT220 visual display terminals.
- 17 word processors (IBM personal computers, using Multi-Mate software).
- 20 IBM personal computers.
- 14 node printers.

The software provided with the RENAISSANCE system provided an integrated approach to:

- Document preparation and editing.
- Electronic mail and messaging.
- Electronic indexing and filing.

- Activity management.
- Security.
- Customization of software to provide standard DND formats.

Additional customization facilities were provided on personal computers. All devices, to some degree, were capable of interconnection.

The system, as implemented, differed significantly from the system proposed in 1983. Specifically, many of the system functions expected to be provided by the RENAISSANCE system were instead provided using the capabilities of personal computers, as were word processing facilities (originally intended to be provided using specialized word processors).

Further, following a series of compromises, the actual detailed functionality of individual functions changed from the original specifications.

The changes outlined above had a significant effect on the impact of the Field Trial system on DND operations.

B. THE IMPACT ASSESSMENT METHODOLOGY

The original impact assessment workplan called for a formal pre-post research approach, making extensive use of quantitive instruments. In practice, in several cases, it proved inappropriate, or impossible, to use these instruments to the degree anticipated. In part, this was due to the unexpectedly long time that elapsed between system selection and "full" implementation, which called for frequent modification of the evaluation plan (and time schedule) to react to the changing circumstances. Additionally, as the project progressed, the study team, in conjunction with DND and the Department of Communications' OCS project team, made modifications to the workplan to focus on areas of greatest interest.

The major steps in the methodology consisted of:

- Baseline data collection, using:
  - On-site observations and interviews with Field Trial participants.
  - The Survey of Organizations (a machine-scored, standardized instrument describing organization conditions and practices).
  - The Organization Assessment Instruments (which examine the context, structure and behaviour of an organization).
  - The Attitudes Towards Office Technology instrument.
  - A communications diary.
  - An information source log.
- Interim observations, including:
  - Continuing participant observation, using some semi-structured analysis tools.
  - Ongoing review of project logs and documentation.
  - Discussions with vendor and DND OCS project manager.
- Post-implementation measurement, including:
  - The limited use of system-generated data.
  - Study team technical opinion.
  - Continuing participant observation.
  - A user survey.
  - The information source log.

C. OUR FINDINGS

Our study findings are summarized below, under the five major headings established by the OCS project office. In addition, we also summarize our

findings from our technical analysis of the system and its implementation, which, we believe is necessary to understand fully, the other study findings.

1. System performance

The overall use of the RENAISSANCE system was very low. Survey data indicated that only 16% of participants became regular users, and nearly 1/3 of participants made no use at all of the system. Only 46% of the possible users actually used the system, once or more, during the 10 working days for which system usage data was recorded.

High levels of usage concentrated on the "standalone" applications carried out on the personal computers (that is, word processors, spreadsheets and other programming activities).

The "integrated" applications, in particular electronic mail and messaging, and activity management, were little used.

Where the system was used, participants, in general, found it easy to use.

A major issue, throughout the study, was that of reliability. Reliability of the system varied considerably during the project, and from node to node. Most users were, to a great extent, dissatisfied with the reliability of the system. In addition, almost all users were unhappy with the response time of the system.

2. User acceptance

Most participants, prior to the Field Trial, were neutral or positive towards the use of technology in the office. Despite the mixed success of the system, as implemented, overall user acceptance of office technology continued to be high and, indeed, in most cases, actually improved during the study.

Interestingly, users with low or negative expectations, prior to the system being installed, tended to be most positive in assessing the degree to which the system met their expectations. Those who had high expectations were, in general, not satisfied that their expectations had been met.

The system did not appear to have a high degree of match to the demands of the user group and their organization. Only some 22% of respondents perceived a good match between their job demands and the functions provided by the system. Additionally, few participants felt the system provided a high degree of conformity to DND standards.

Similarly, only a few individuals felt that the system made any significant contribution towards better decision making.

However, in certain "pockets," the system had greater impact, most often in areas where extensive use was made of a personal computers. There were few strong positive or negative reactions to the physical environment surrounding the trial. While some participants identified problems with heat, crowding and noise, overall these were not major problems during the trial.

3. Human social impacts

The Field Trial system had a positive impact on the work life of many of the participants. Again, the impact was greatest on the PC users. Very few negative impacts were identified.

Again, relatively minor impacts in the health, safety and stress areas were identified. Few participants perceived any real health impact, caused by the system. Where these effects were noted, they were most frequently in the heavier used PC areas.

Little impact was noted on stress levels.

Impacts on morale and motivation were generally neutral to positive. The system did contribute to increased creativity, had some positive impacts on opportunities for personal achievement and, with one exception, was not perceived as threatening job security (7% of PC users did perceive their job security as being very much reduced).

Some users also felt that the interest in their workday had been increased through the implementation of the system.

4. Organizational impacts

The system had comparatively little impact on job content and organizational structure. Changes in job content were primarily limited to those of the secretarial workers and analysts using PCs.

Otherwise the only noticeable change was the increased use of keyboarding by professional staff.

There was a general feeling that the use of the Field Trial products did increase the skill requirements or challenges of jobs. However, these were limited.

5. Productivity

The system had a significant impact on the office productivity and work quality of PC users. In contrast, the system had comparatively little impact on the office productivity and work quality of most VT220/Displayphone users. However, for some nodes, such as DMTAS/DFPAS and DFAPA, the impacts on the productivity of VT220/Displayphone users were significant.

6. Technical analysis

The system, as installed, differed considerably from that planned originally. Significant changes included the provision of many facilities on

stand-alone micro-computers (for example, word processing, spreadsheets and custom applications) rather than as part of the "integrated" system originally proposed. These micro-computers, although connected to the network, had only limited compatibility with RENAISSANCE (for example, it was not possible to transfer documents from RENAISSANCE to the micro-computers, for further editing using the micro-based word processing package).

Additionally, there was a lack of, or only limited capability for, a number of functions in RENAISSANCE, whose improvement could have contributed to greater use by participants (for example, the availability of very limited text processing and calendaring functions).

The limited performance figures obtained during our evaluation raise questions related to the capacity of "super" micro-computers of the type used in the trial to handle high volume, concurrent integrated applications (hopefully the continuing improvements in hardware performance and software design will be combined to counterbalance this concern).

Finally, of the four applications actually selected for custom development and implementation on the micro-computers, two proved to be very successful, one had limited success (but is planned for enhancement) and one has not been implemented successfully.

D. INTERPRETATION OF OUR FINIDNGS

By drawing upon our experience in this study and on our wider experience in office automation and technology assessment, we have also developed more general interpretations of our findings, of relevance to the overall assessment of the OCS Program and to others implementing office automation systems. These were:

- Although the overall level of usage of the system was low on the trial site, this may have been influenced by a number of issues specific to this project. These included:

  - Design "failures" that contributed to reduced RENAISSANCE system use, such as the heavy use of stand-alone facilities, the lack of file transfer capabilities and the lack of customization.

  - "Structural" problems caused by the nature of the DND group chosen for the pilot and, to a degree, the nature of OCS pilots themselves. In addition, very specific security-related requirements for the treatment of classified material within DND also had a negative impact.

  - Implementation and operational problems, including extended delays in implementation, the impact of poor response times and low reliability (particularly in the early stages of the trial), and limited flexibility within the system as implemented.

- A number of important lessons learned on the project were identified, including:

  - The importance of of "pre-trialing" proto-type technology before widespread implementation.

  - The difficulties of matching systems to user needs, in complex O.A. studies.

  - The evolutionary nature of office systems, which make it difficult to specify "the system."

  - The need for heavy support for training and "hand-holding" during the implementation and operational phases.

  - The importance of observation as a study tool in technology assessment projects, as compared to more traditional survey driven approaches.

  - "Ease of use" is not the most important criteria for system selection.

  - There are significant difficulties in meeting the expectations of pro-technology participants in pilot studies.

  - The importance of vendors providing system-collected data on system usage and performance to assist assessors and those implementing office systems.

In conclusion, we found that the field trial was a significant learning experience, for both DND and DOC. It identified many areas of problem and opportunity that should be addressed in future office automation projects -- applicable to both public and private sector organizations. Despite the very limited overall use of the system, a number of participants achieved direct benefits from its implementation and use. Hopefully, the analysis provided in this report will assist organizations to draw on this experience to improve the planning and implementation of future projects.

III

THE FIELD TRIAL SITE

A. DND OFFICES INVOLVED IN THE STUDY

The following description of the Field Trial site is based on material prepared by Systemhouse and was previously included in our "Detailed Impact Assessment Plan." As such, this description, with some modifications, reflects the situation at the time of the original needs analysis in early 1983. For the purposes of our study, there have been no significant changes to the trial site.

The DND offices involved in the study are located at National Defence Headquarters (NDHQ) in Ottawa and at Air Command Headquarters and Canadian Forces Base Winnipeg. Most of them deal with financial matters, from either a policy-making or transaction-processing viewpoint. More specifically, the primary focus of the study within NDHQ is the Financial Services Branch headed by the Chief of Financial Services, who is also the Departmental Project Director for the Field Trial. The Branch is divided into two Divisions of three and four Directorates each:

- Financial Policy Procedures Division
  - Directorate of Financial and Personnel Accounting Systems
  - Directorate of Materiel and Technical Accounting Systems.
  - Directorate of Financial Authorities and Policy Analysis.
- Financial Administration Division
  - Directorate of Financial Services.
  - Directorate of Budget.

- Directorate of Costing Services.
- Directorate of Pay Services.

Each Directorate was analyzed separately and is addressed separately in SHL's Current Situation Report. The Directorates of Financial and Personnel Accounting Systems and Materiel and Technical Accounting Systems are discussed jointly, because of the similarity of their function and operations. The Directorate of Pay Services is divided into three sections which are discussed separately, because of their sheer size and production volumes.

The three sections are called:

- Pay Procedures, Financial Arrangements, and Administrative Services Section.
- Terminal Benefits Section.
- Central Pay Accounting Section.

In Winnipeg, the focus of the study at both the Air Command Headquarters and Canadian Forces Base Winnipeg was the comptroller's organizations, with a few interviews also conducted with staff in the senior executive offices and administrative groups.

Systemhouse used both interviews and analysis of questionnaire responses to prepare:

- ▷ A description of each organization and its particular office communication problems.
- ▷ A description of the various constraints imposed by the DND environment which could affect design and implementation of the Field Trial system.
- ▷ A discussion of relevant concerns expressed by DND staff about the project.

These topics are briefly summarized below for each location.

1. Financial Policy and Procedures Division

Within the Financial Policy and Procedures Division (DGFPP) of the Financial Services Branch, the Directorate of Financial and Personnel Accounting Systems (DFPAS) and Materiel and Technical Accounting Systems (DMTAS) are small Directorates with responsibilities for reviewing approximately 400 Departmental accounting and control systems. This includes reviewing the current functioning of the systems on a regular cyclical schedule, revising them when necessary, developing new systems as required, and responding to frequent inquiries.

The Directorate of Financial Procedures and Policy Analysis (DFAPA) has responsibility for upholding and interpreting Departmental financial policy and overseeing the documentation of Departmental financial policies and procedures in the Financial Administration Manual. The Directorate actually writes the entire first (of five) volumes and two additional chapters, as well as editing and supervising the production of the entire Manual. It also carries out a number of tasks related to Departmental signing authorities, grants and contributions, and financial coding.

All three Directorates in the Financial Policy and Procedures Division perform a considerable amount of document creation and filing, as well as retrieving information from files to respond to enquiries. Everyone in the Division, which is primarily a staff organization, can be characterized as a "knowledge worker." The major problems are related to the text creation, retrieval of information from files, and paper burden.

2. Financial Administration Division

The Directorate of Financial Services (D Fin S) is a fairly large organization which performs a wide variety of services. Two sections of the

Directorate are located in Europe and were excluded from this study. The other three sections are concerned with financial agreements and arrangements between the Canadian Forces and foreign governments, accounting for departmental revenue, providing Command Comptroller services to independent units, operating the Financial Information System (FIS) and other tasks. The Directorate also includes a special team dedicated to developing a new, on-line version of the FIS. The Directorate handles a high volume of transactions and some of its components operate in a production-type environment. The tasks related to financial arrangements and NATO common-funded programs, on the other hand, involve more special correspondence and communication. The Directorate's main office communication problems relate to paper burden, processing an enormous amount of data received from the field, accessing files and manipulating financial data.

D Fin S indicated, at the beginning of the project, that the lack of "service" facilities would inhibit their likely use of the system.

The Directorate of Budget (DB) is responsible for administering the Department's budget by compiling budget estimates, tracking cash balances, preparing public accounts, and other tasks. The annual budget is approximately $10 billion, and it is allocated among a large number of organizations and geographic areas.

Administering the budget calls for a diverse set of activities, from the mathematical manipulation needed to combine budget estimates, to the setting of budgetary policies for the Department, to the publication of annual financial reports. Manipulation of financial data is a major activity and gives rise to some problems, mostly due to limitations of manual spread sheets and desk calculators. Document creation is not without problems, due to the shortage of support staff and the frequent need to change tables and charts embedded within documents.

The Directorate of Costing Services (D Cost S) is responsible for providing Department wide costing standards, carrying out special costing studies and projects, and doing cost analysis of standard documents such as Program Change Proposals and Treasury Board Submissions. As the Departmental authority on costing, the Directorate also receives and responds to a large volume of enquiries from within DND and interacts frequently with outside organizations such as TB and the Conference Board of Canada. The Directorate has purchased a microcomputer to help in operating its Economic Model and accessing commercial data bases, and is considering acquiring additional support equipment. As in DB, data manipulation, production of large documents and retrieving information to address enquiries, present problems in the office. Another problem common to both D Cost S and DB is that the time required to access, manipulate and disseminate information leaves insufficient time for reflection, planning and original analysis. The result is that the decisions supported by their services may not be optimized.

As with D Fin S, D Cost S had some concerns regarding the lack of service facilities.

The Directorate of Pay Services (DPS) is distinguished by its sheer size and high production volumes. The Directorate does all accounting related to pay and benefits for all active and former members of the Forces and Reserves. It is organized into 3 sections.

The Pay Procedures, Financial Arrangements, and Administrative Services Section is concerned with establishing pay policies and procedures, administering the insurance programs for members, and providing a variety of administrative services to the Directorate as a whole. Like the other two Pay Services sections, the work involves maintaining and updating large volumes of records and responding to numerous enquiries.

The Terminal Benefits Section does all accounting for benefits paid during and after a member's leaving the Forces, including exit and severance

pay, pensions, and survivor's benefits. Much of this work is routine processing of transactions and maintenance of voluminous files (e.g., 100,000 Pension File Dockets). In addition, the Section staff are called upon to respond to enquiries, advise members who are choosing among several exit options, and make determinations in cases relating to survivor benefits, some of which may be extremely complex.

The Central Pay Accounting Section is responsible for all accounting related to member's semi-monthly pay and allotments. The Section computes all pay transactions, prepares and transmits pay guides to the field each quarter, responds to pay guide "observations" (enquiries), and reconciles pay expenses with central financial systems such as the FIS. This section is directly responsible for input and output from the Department's Central Computation Pay System, although the other components of the Directorate also make frequent use of the system.

The problems observed in the Directorate of Pay Services offices relate to word processing, data processing and office communication. The most severe problems concern information storage and retrieval and data manipulation, due largely to the tremendous volume of information being maintained in the Directorate and the number of transactions and enquiries processed. The three word processors in use in the Directorate are unable to meet its document creation and updating requirements. Scheduled work is often interrupted and delayed by incoming enquiries. The size of the staff and volume of routine tasks makes task management a critical function. Current BF and scheduling systems are very labour intensive. A related problem concerns the amount of work required to manually maintain the numerous logs and ledgers in use. Finally, all three Sections experience problems with the current indirect methods of accessing the Central Computation Pay System, which resides off-site.

3. Comptroller's organization at AIRCOM HQ

The Comptroller's organization at Air Command Headquarters (AIRCOM HQ) is divided into four groups:

- Accounts and Finance;
- Organization and Establishment;
- Management Information Systems;
- Management Consulting Services Unit.

Except for the system development work of the Management Information Systems Group, the scope of these groups' activities is the 37 Air Command bases and stations, as well as several independent units. The Accounts and Finance Group conducts financial management and public funds accounting services for the entire Command, conducts non-public funds accounting services for the organization assigned to each Command base and station, and recommends revisions as necessary. The MIS group develops small, on-line automated applictions for "client" groups at the Command Headquarters and CFB Winnipeg, and operates the systems on a time-shared DEC minicomputer. The Management Consulting Services Unit carries out a variety of studies and analyses for groups throughout the Command.

SHL interviewed the Headquarters Commandant, who is responsible for the Orderly Room and a variety of administrative functions, and the Staff Officer for Administration, who develops personnel policies. Most groups experience problems with document creation, and have adopted responses ranging from preparing reports (e.g., Establishment Change Proposals) by hand to storing documentation on magnetic discs (MIS) manuals). Communication is a constant and essential activity, and some problems are experienced in communicating with Ottawa by telephone and with Air Command bases and stations via the message system. A lack of adequate photocopying capacity was among the other problems noted.

4. Canadian Forces Base — Winnipeg

At Canadian Forces Base Winnipeg, the focus of our study was the Comptrollers's organization, which is divided into three parts: Base Accounting

Services Office (responsible for public funds accounting); Non-public Funds Accounting Office; and Base Internal Audit Office. Normal accounting functions and tools (i.e., ledgers journals, pay guides, invoices, cheque requisitions) play a major role in the operation of these groups. Other than a small IBM System 32 computer used by the Non-Public Funds Accounting Office, no automated equipment is available to the Comptroller's organization. Data manipulation, filing and document creation pose some problems in the organization's offices. Requirements for original signatures are also onerous. Perhaps the major problem, however, is communication -- internally, with AIRCOM HQ, with Ottawa with Supply and Services Canada, and with several remote units for which the Base provides accounting services. SHL also interviewed the Base Personnel Administration Officer and the Base Chief Clerk, whose chief problems are paper burden and the large volume of files to be maintained.

B. DEMOGRAPHIC CHARACTERISTICS OF THE PARTICIPANTS

Candidates for participation in the OCS Field Trial were initially identified by Systemhouse based on data gathered for the "Current Situation Report." Suitable individuals were defined as those whose work would be facilitated by an office automation system. Candidates who responded negatively to Systemhouse's recommendation that they participate in the field trail were excused from any further involvement with the system.

The participant roll compiled by DND in May of 1984, and updated by Abt Associates the following June, identified 236 individuals as Field Trial participants. Demographic data on these people were gathered from responses to the baseline measurements. In all, 208 participants completed the baseline data collection instruments, for a "response rate" of 88%. The demographic data below are therefore based on an 88% "sample" of the participant population taken in June of 1984. There is no reason to believe that this sample is unrepresentative of the "population" of Field Trial participants.

Data were collected on participant age, sex, tenure with CFS, and level of formal education. Level within the organization (supervisory or non-supervisory) and military rank (commissioned officer, non-commissioned officer, private or civilian) were post coded into the records from other sources.

Exhibit III-1 presents a basic breakdown of the demographic variables. The participants are shown to be predominantly male (by a ratio of 2:1) and, within each sex, the other demographic variables differ considerably. Whereas 83% of the males are over 30 years of age, 52% of the females are 30 or under. Similarly, 52% of the males completed university, compared to 28% of the females. In terms of level and rank, 43% of the males were in supervisory positions compared to 12% of the females, while 41% of the males were civilians compared to 85% of the females. As might be expected in a military organization, males occupy the majority of the technical and managerial positions, while the female staff are predominantly in clerical support positions.

Exhibit III-2 presents sketches of each of the seven organizational sub-units for which the participants' demographic data were analyzed. As is apparent from this exhibit, there is considerable variation among the sub-units in terms of the staff characteristics. For example, DB is 94% male, while DFINS is 70% female; DGFPP is 82% civilian, while Air Command is 88% military; and, CFB is 68% under 36 years of age, while DGFPP is 68% over 45 years of age.

Shortly before the system was introduced, a brief survey was administered to the participants aimed at determining the extent to which they had prior experience with computers. A copy of the survey form is appended to this report. A total of 193 completed forms were analyzed for a response rate of approximately 82%.

Our analysis of these data revealed that the majority of the participants in the Field Trial had some prior experience with computers. Specifically:

- 65% had used a computer before the OCS Field Trial.

EXHIBIT III-1 Basic demographic breakdowns

MALES (63% OF TOTAL)

Age:	83% over 30
Education:	52% completed university
Level:	43% supervisory
Tenure:	59% over five years
Rank:	44% officers, 11% NCO's, 5% privates, 41% civilians

FEMALES (33% OF TOTAL)

Age:	52% 30 or under
Education:	28% completed university
Level:	88% non-supervisory
Tenure:	70% five years or less
Rank:	3% officers, 8% NCO's, 4% privates, 85% civilians

EXHIBIT III-2 Demographic sketches of organizational subunits

	DGFPP	DFINS
Sex:	77% male	30% male
Age:	68% over 45	73% under 36
Education:	55% completed university	45% completed university
Level:	32% supervisory	27% supervisory
Tenure:	40% less than 6 years	90% less than 6 years
Rank:	82% civilian	67% civilian
Number surveyed:	22 of 24	11 of 12

	DB	DCOSTS
Sex:	94% male	88% male
Age:	67% under 45	75% under 41
Education:	53% completed university	80% completed university
Level:	33% supervisory	36% supervisory
Tenure:	29% less than 6 years	67% less than 6 years
Rank:	50% officers and NCOs	72% military
Number surveyed:	18 of 21	25 of 28

- 37% had used a computer in some educational or training environment.
- 47% had received prior formal training in the use of computers.
- 36% had used a computer at work in the past.
- The types of computers used most frequently were large mainframes (30%) and home computers (24%).
- The types of functions performed most frequently in the past using computers were data entry or inquiry using a terminal (46%), computer programming (25%) and word processing (22%).
- 66% had used a computer within the previous six months.
- 81% described themselves as beginners, while 17% were intermediate and 2% were advanced in their self-described level of expertise as computer users.

It is apparent from these data that there existed among the Field Trial participants a limited but widespread familiarity with computers. Most had had some contact with computers prior to the introduction of the XIOS system at DND. Only one person in five described him or herself as possessing an intermediate or advanced level of computer expertise.

IV

THE DND OFFICE COMMUNICATION SYSTEM

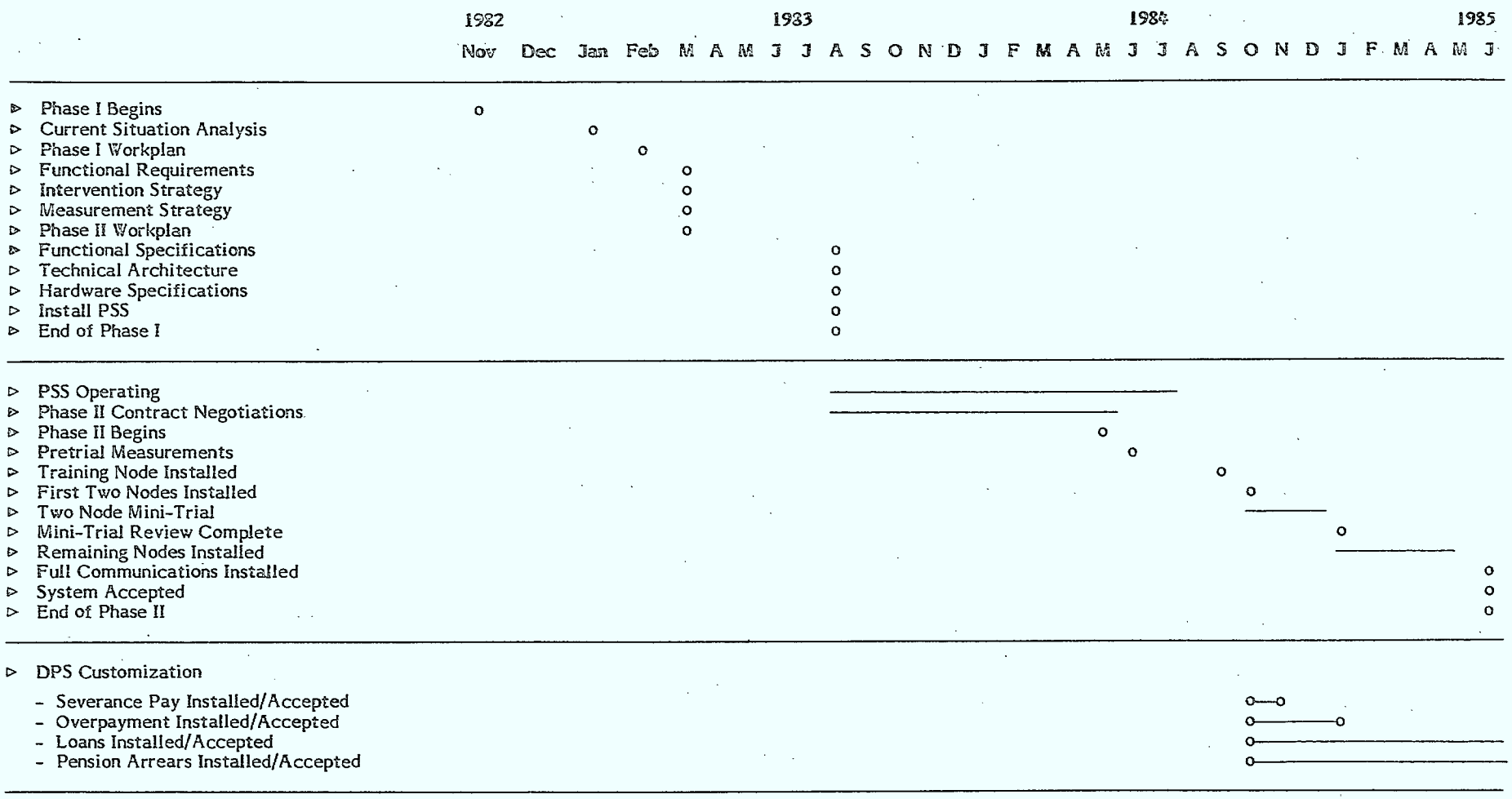
A. PROJECT HISTORY

This section summarizes the major events and timing of the DND OCS Field Trial beginning from the start of Phase I through to the end of Phase II. The composition of these two phases is described in the material which follows. The time period covered is from November of 1982 up until June of 1985.

Our principal medium for presenting this information is through the use of a chart. Exhibit IV-1 lists the major project events which occurred in Phases I and II and identifies the point or period of time during which they occurred. The text accompanying the chart briefly explains the nature of the milestones identified. These major events are described in the order listed as follows:

- **Phase I begins.** Phase I of the Field Trial was defined as consisting of pre-trial planning and site preparation. The specific components of Phase I are described below.
- **Current Situation Analysis.** The report prepared on the basis of this analysis presented information on the organization, objectives, activities, and office communications procedures and equipment of DND offices which were potential system sites.
- **Phase I Workplan.** The topics covered in the report were: project management, requirements analysis, general systems design, intervention definition and Field Trial plan.
- **Functional Requirements.** This report describes the knowledge gained about the current situation and provides an assessment of the office communication system functions and features required by each office, as well as the associated ideal set of equipment requirements. This material was intended to portray 100% of the OCS features which could be used in each trial location.

EXHIBIT IV-1 History of Field Trial



- **Functional Specifications.** This report describes the "real world" match of the proposed system with the DND requirements defined earlier. The functional specifications describe what the Field Trial system should look like and do. This report defines a product which was envisioned as meeting 70% of the requirements identified in the Functional Requirements report.

- **Intervention Strategy.** This report outlines the strategy to ensure that disruption and concerns related to the implementation of the office information system are anticipated and either minimized or prevented.

- **Measurement Strategy.** This document presents the proposed research methodology to be followed by Systemhouse to carry out its responsibility for the evaluation issues identified within the overall evaluation plan.

- **Install PSS.** The Project Support System was a small scale system designed to introduce and demonstrate some of the features to be implemented in the DND/OCS Field Trial System. It consisted of twenty-two terminals distributed among eight buildings and two cities (Ottawa and Winnipeg). The terminals were linked via communications lines to a node operating at the vendor's site. The PSS operated from August of 1983 until July of 1984.

- **Phase II Contract Negotiations.** Phase II was initially intended to begin on January 31, 1983. It was defined as consisting of the field trial implementation and operation. Due to various delays in system development, and the perceived need on the part of DND to introduce modifications to the Phase II contract, a protracted period of negotiations ensued. The outstanding issues were not resolved until May of 1984.

- **Pre-Trial Measurements.** In June of 1984 Abt Associates and Systemhouse conducted a number of measurements intended to establish a baseline for the subsequent evaluation of system impacts. The findings of these measurements are reported in detail in the baseline reports submitted in early 1985.

- **Training Node Installed.** The first training node at NDHQ was installed in September of 1984. It consisted of five terminals located in one large room adjacent to the PM OCS's offices.

- **First Two Nodes Installed.** The first two operating nodes were installed in DFAPA and D COST S, both located in NDHQ.

- **Two Node Mini-Trial.** A number of software and hardware problems were experienced by users in the first two nodes. This led to a decision by PM OCS to forestall further installations until the system performance at these first two nodes could be brought up to a

satisfactory level. It was decided to closely monitor system performance and use in these two nodes for a thirty-day period at which time a decision to continue with installation would be made. Difficulty in bringing the system up to a steady state level resulted in the delay of this thirty-day observation period until late November of 1984.

- **Mini-Trial Review Complete.** In mid-January of 1985 the decision was taken to begin the installation of the remaining nodes.

- **Remaining Nodes Installed.** The remaining nodes in the system were installed over a three-month period ending in April of 1985. The last nodes to be installed were in the Winnipeg locations.

- **Full Communications Installed.** In June of 1985 all nodes were able to communicate with all other nodes, both in Ottawa and in Winnipeg.

- **System Accepted - End of Phase II.** In June of 1985 the system was formally accepted by PM OCS.

- **DPS Customization.** The Field Trial contract called for four distinct pieces of customized software to be written by Systemhouse for the Directorate of Pay Services. These four systems were called Severance Pay, Recovery of Overpayment, Posting Loans/Furniture Advance Loans and Pension Arrears. The installation of the first of these systems occured in October of 1984. To date, three of these systems have been accepted by DND. The remaining system is still being modified to meet DND's needs.

B. EVOLUTION OF THE SYSTEM

In this section, we present an overview of the evolutionary process that has taken place regarding the hardware and functional design of the DND Office Communications System. This process covers a period of time of approximately three years -- from 1982 to 1985.

In many respects, the OCS system, as accepted in June 1985, varies significantly from that which was originally anticipated. This is not unusual. In fact, one may consider this to be quite typical of a project of this nature. An objective of the Field Trial was to develop an office communications system. The final make-up of this system was determined and affected by a number of

factors including available budget, user needs, organizational priorities, available technology, etc.

In this section, we do not dwell on the reasons for system changes. We are concerned primarily with what changes took place. From an evaluation perspective, it is important to note these changes as they have had a direct impact on user expectations. Also, they help to explain some of the issues regarding system usage and user acceptance, which we discuss in Chapter VI.

1. Hardware changes

From the beginning, the DND Office Communications System was perceived as a distributed network of UNIX-based micros. Each of these micros is referred to as a node and supports a range of peripheral devices.

This concept has not changed. It remains very much the same as was initially conceived.

The main hardware changes made to the architecture relate primarily to the numbers and types of peripheral devices to be linked to the user node micros.

Exhibit IV-2 identifies the numbers of planned peripheral devices in comparison to actual. In July 1983 (Technical Architecture Report, 1983), it was anticipated that the OCS system would consist of nine user nodes as follows:

- Five user nodes in NDHQ Building, Ottawa;
- Three user nodes in Narono Building, Ottawa;
- One user node in Winnipeg.

However, by May 1984, an extra node was added in Winnipeg -- bringing the total number of user nodes to 10. With the addition of an extra node, an

additional 4 workstations were added to accommodate the extra users. This included one Displayphone and 3 video display terminals (VDTs).

EXHIBIT IV-2 Changes in Hardware

	Planned		Implemented
	July, 1983	May, 1984	June, 1985
User nodes	9	10	10
Displayphones	17	18	18
Visual Display Terminals (VDT's)	91	94	69
Word Processor's	15	15	17
Personal Computers	3	3	20
Node Printers	14	14	14
Total	149	154	148

Some significant hardware changes occurred between the 1984 planned configuration (as outlined in the Phase II contract) and the actual system that was accepted in June, 1985. The major changes included:

- A drop in the number of visual display terminals (from a planned 94 to actual 69) and an increase in the number of personal computers (from 3 to 20). This change stemmed primarily from functional design changes in the vendor's RENAISSANCE product (formerly referred to as EXPRESS).

- In 1984, it was anticipated that the word processors would be AES Alphaplus 14 machines and that the personal computers would be Dynalogic Hyperion machines. However, prior to implementation, IBM PC's with the MULTI-MATE software package was substituted for the proposed AES word processors. Shortly after the start of the Mini-Trial, IBM PC's with the LOTUS 1-2-3 software package replaced the Hyperion personal computers.

The DND Office Communications System consists of a number of hardware and software products linked together through a communications network. For the purposes of this report, we refer to the "system" as including all hardware and software implemented within the Field Trial. Where distinctions need to be drawn, we will refer to specific components of the system. In general, we consider the OCS System as consisting of four major products or components. These are:

- The RENAISSANCE product, including the software, the SPECTRIX user node micros, displayphones, visual display terminals (i.e. VT220220) and the communications network.
- IBM PC's with MULTI-MATE as the word processing machines.
- IBM PC's with LOTUS 1-2-3 for spreadsheeting.
- IBM PC's with customized application software.

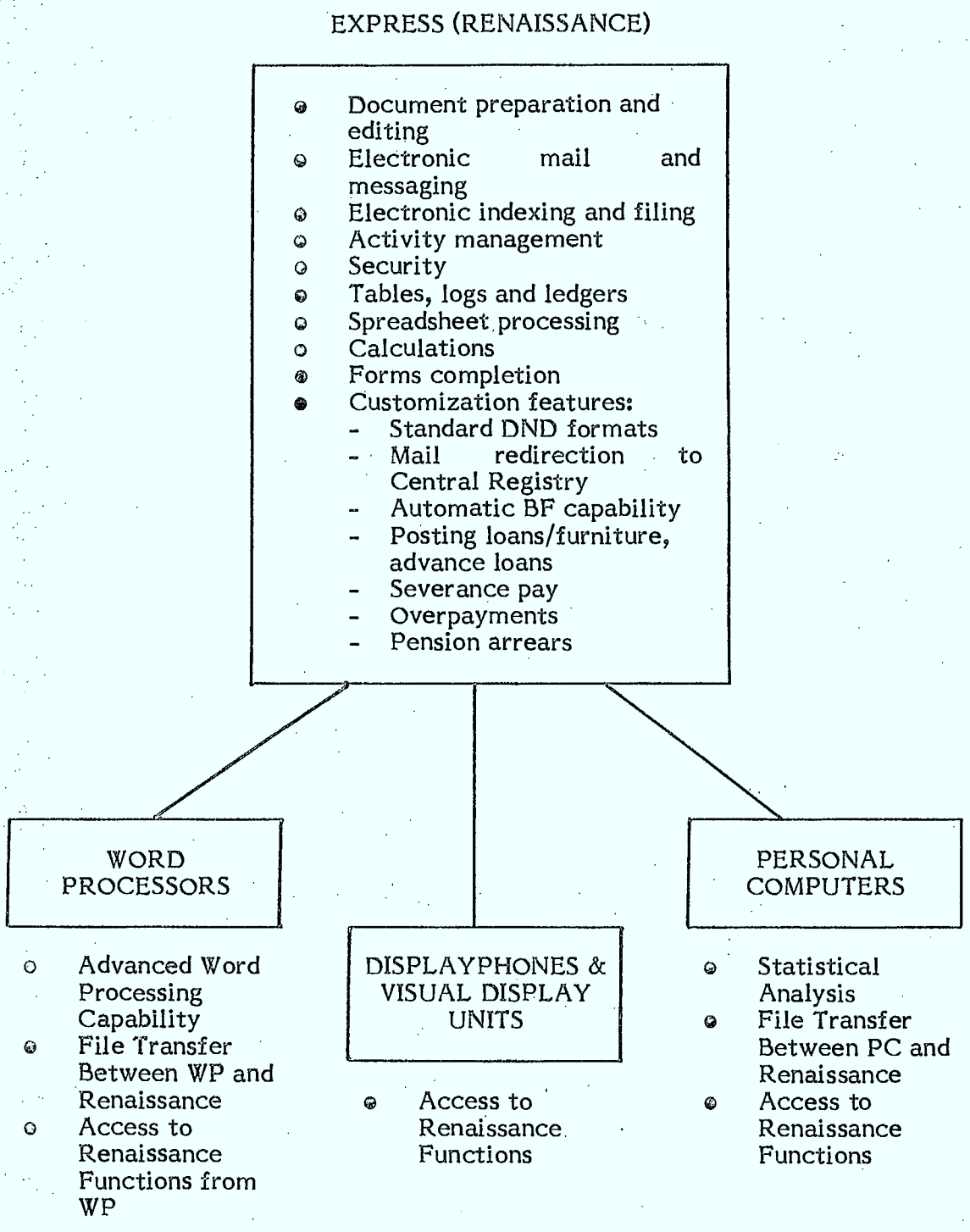
2. Functional design changes

In March 1983, after extensive investigations in the client environment, the vendor presented DND with a Functional Requirements document outlining the total user requirements of an office communications system, in an ideal situation. However, it was understood by all interested parties that the proposed OCS system would not address all of the requirements -- but only a certain percentage of those identified.

Later in 1983, the vendor presented DND with the functional specifications for the proposed OCS system. It was estimated that the specifications addressed approximately 70 percent of the user identified requirements. It was upon these specifications that the design of the OCS system was based.

Exhibit IV-3 illustrates the level of functionality that was proposed for the system in 1983. The basic premise was that the DND OCS Field Trial

EXHIBIT IV-3 System functions as proposed in 1983



System would be based upon the vendor's product, EXPRESS (RENAISSANCE). The majority of system functions would be provided by this product. This included the generic functions that would normally form part of the product as well as some modifications and customizations to satisfy specific DND needs in certain areas.

A brief description of each of the system functions that was to be included in RENAISSANCE follows:

a) Document preparation and editing

This function would allow users to create, review, edit and store text documents, memos, etc. It was to include basic features such as word wrap and paragraphing, document printing, search and replace, vertical scrolling, page break control, annotation, horizontal scrolling, cut and paste, etc.

b) Electronic mail and messaging

This function would allow users to send and receive memos, letters, text documents and other information items to and from other users. Some of the features to be included in this system function were:

- message status display on receipt
- distribution lists
- mail review by secretary
- mail redirect

c) Electronic indexing and filing

This function would allow users to create, maintain and access local indices and files to support the filing and recordkeeping activities of the office and facilitate general access to information. Specific features were to include:

- accessing of documents by file name
- accessing documents using keywords
- displaying an index of documents
- sharing documents among users
- publishing documents

d) Activity management

This function would allow users to create and maintain records of personal time, schedules and activities. It was to include features such as:

- day-at-a-glance calendar display
- calendar access by secretary
- record of future events
- a "to do" list for each calendar page
- "to do" list rollover to next day

e) Security

This function would protect against unauthorized access and display of information kept in the system. It was to include features such as:

- user name/password verification on sign-on
- private document
- restricted read and/or modify access to shared documents

f) Tables, logs and ledgers

This function would allow users to create and maintain tabular representations of data and was to include features such as:

- 40 x 40 cell table format
- descriptive header fields (i.e., titles and footnotes)
- calculation/formula specification per cell
- selecting and sorting entries of logs and ledgers
- format definition per column
- basic arithmetic operations
- automatic recalculation when changes applied

g) Spreadsheet processing

This function would allow users to perform user-definable operations on the rows and columns of a table, as is commonly performed in a spreadsheet or worksheet. This function would include features such as:

- 40 x 40 spreadsheet format
- descriptive header fields for the spreadsheet
- formatting capabilities
- formula specification per cell
- format definition per column
- basic arithmetic operations

h) Calculations

This functon would allow users to perform arithmetic manipulation of data.

i) Forms completion

This function would allow users to complete previously defined forms in accordance with pre-defined instructions.

j) RENAISSANCE customization features

In addition to the generic functions described above, the RENAISSANCE product was to be enhanced to provide certain modifications and customizations to satisfy specific DND needs. Some of these customizations would be made available to all users of the RENAISSANCE product; others would be restricted to specific organizational units. The major enhancements or customizations that were proposed, included:

- Incorporating standard DND formats for memos, letters, minute sheets and messages.
- Mail redirection to the Central Registry.

- An automatic bring forward capability for DPS-4.
- Posting loans/furniture advance loans application for DPS-3.
- Severance pay calculation capability for DPS 4-6.
- Recovery of overpayment capability for DPS 4-4.
- Pension arrears calculations capability for DPS 4-3.

In addition to the functions to be performed by the RENAISSANCE product, the Field Trial System would also include a number of word processors and personal computers for certain specialized functions.

Operating as independent units, the word processing machines would be used to perform advanced word processing tasks. The word processors could also be used as workstations to access RENAISSANCE functions. In addition, a capability would exist to allow a two-way transfer of files between the word processing machines and the RENAISSANCE product.

The Field Trial System was to include three personal computers -- two in D COST S and one in D BUDGET. These machines would operate primarily as independent units. However, a capability would be provided to allow basic file transfers between the personal computers and the RENAISSANCE product. The personal computers would contain commercially available software products to allow the users to conduct advanced spreadsheeting and statistical analysis functions.

Between 1983 and 1985, a number of changes were made to the overall functionality of the OCS Field Trial System. Exhibit IV-4 presents an overview of the functionality of the system as implemented in June 1985. Exhibit IV-5 shows the difference between the system as planned and as implemented.

In summary, the most noteable changes were as follows:

- Some of the proposed customized system functions, such as mail redirection to the Central Registry and an automatic bring forward capability for DPS-4, were not implemented.

EXHIBIT IV-4 System functions as implemented in 1985

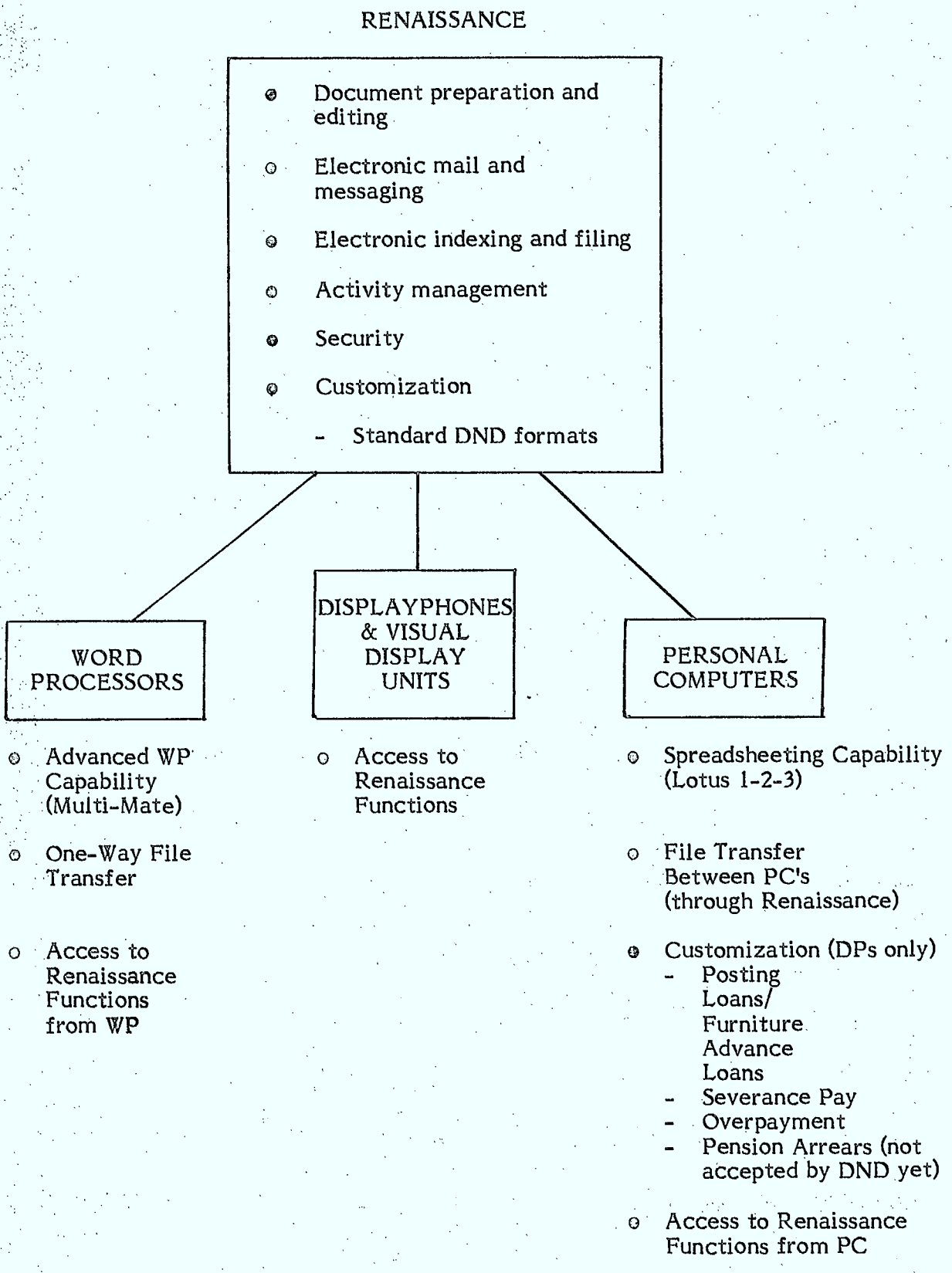
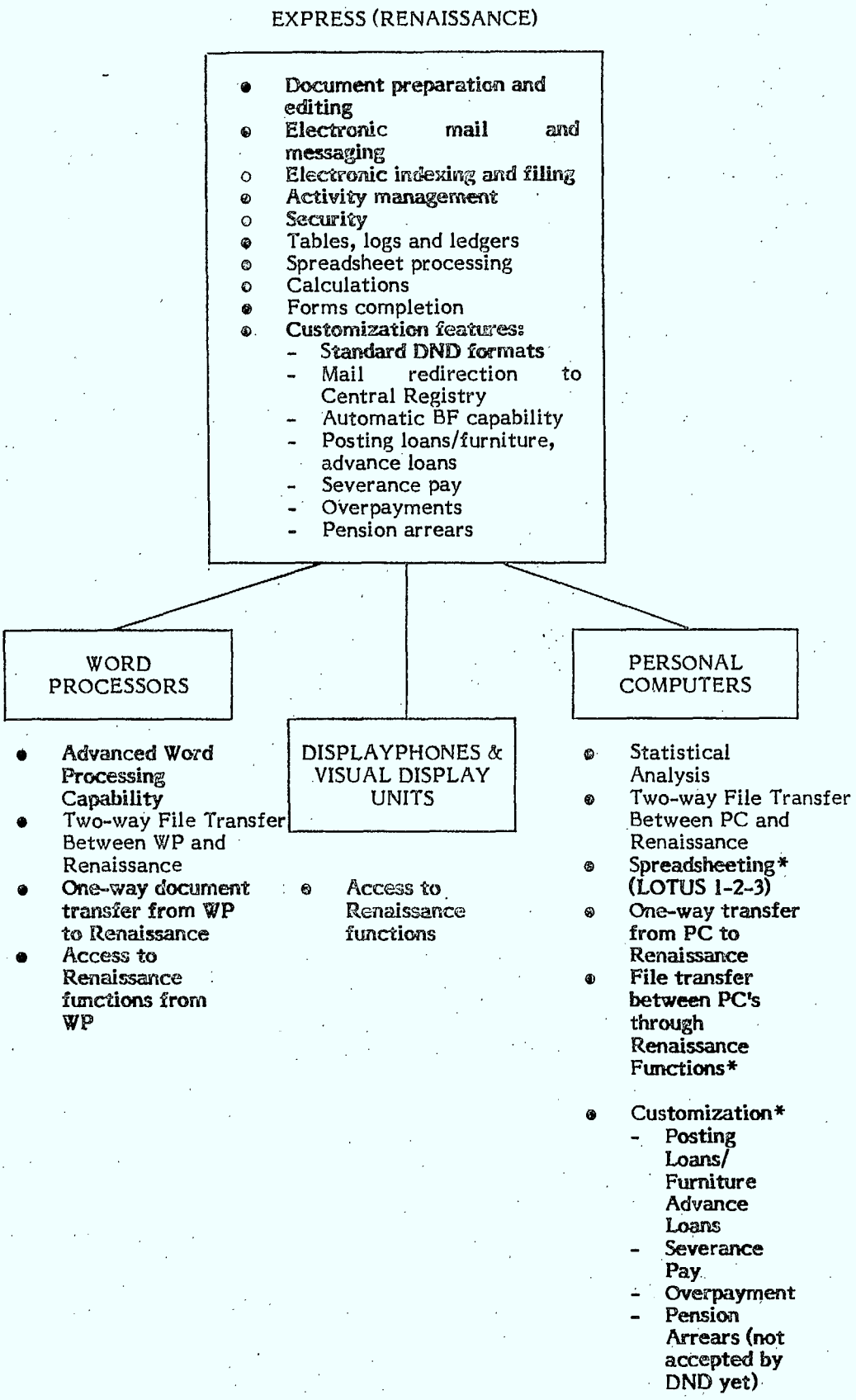


EXHIBIT IV-5 System functions as implemented in 1985, compared to 1983 plan



NOTE: Functions actually implemented are shown in bold print. Functions with "•" were not planned for this component in 1983.

- Certain features of proposed RENAISSANCE system functions were not implemented. For example, the "Document preparation and editing" function in RENAISSANCE does not include annotation, cut and paste and forms completion features.

- A number of system functions that were initially proposed to be provided by the RENAISSANCE product are now operating on personal computers and are not a part of RENAISSANCE. These include:

  - Tables, logs and ledgers
  - Spreadsheet processing
  - Calculations
  - Customization features (i.e., posting loans/furniture advance loans, severance pay, overpayments and pension arrears)

  This change resulted in a decrease in the number of visual display units in use and an increase in the number of personal computers. It also reduced the number of system functions accessible to Displayphone and VDT users.

- A one-way file transfer capability exists between the personal computers and RENAISSANCE -- as opposed to a two-way transfer capability. Documents prepared on the personal computers can be transferred to RENAISSANCE, but not vice versa.

As previously mentioned, the changes that have occurred between 1983 (i.e. the proposed system) and 1985 (the system as actually implemented) have had a significant impact on user expectations and system use. These issues are explored in some depth in Chapters VI and VII.

V

IMPACT ASSESSMENT METHODOLOGY

In this chapter we describe the methodology used to assess the impacts of the OCS Field Trial at DND. Our assessment activities were performed in three distinct phases. In the first phase, baseline data were collected prior to the introduction of the system. The baseline measurements were taken in June of 1984. The second phase of data collection ran from October of 1984 to November of 1985. During this time, "participant observations" of system implementation and use were made throughout the Field Trial site. Finally, in October of 1985 we conducted our final set of post-implementation measurements. Detailed descriptions of these three phases of data collection are presented in the following sections of this chapter.

A. THE BASELINE DATA COLLECTION

This section presents a brief description of the instruments and procedures employed to collect the baseline data. A complete set of copies of the various survey instruments and data logs is available in the appendix to this report.

Six main approaches were used to collect baseline data. These were:

- On-site observation and interviews with Field Trial participants.
- Survey of Organizations (SOO), a machine-scored, standardized instrument describing organization conditions and practices. Norms have been developed for the public service and the military.
- Organizational Assessment Instruments (OAI), a set of questionnaires looking at the context, structure, and behaviour of an organization, work groups and jobs. We selected several subscales and appended them to the SOO.

- Attitudes Towards Office Technology, a short instrument that assesses respondents' attitudes towards computers, and expectations of how a system will affect them and their work.

- Communications diary that captured mode usage, time for each use, and incompletions of attempts at communications.

- Information source log, which was implemented in the Financial Policy and Procedures Division only. This instrument was intended to be of primary use in helping us measure the productivity impacts of the system.

More detail on the "instrumented" data collection approaches is presented below.

1. The Survey of Organizations

The Survey of Organizations (SOO) is a machine-scored, standardized instrument developed as a descriptive survey of organizational conditions and practices. It has been used in over 4,000 organizations over the last 18 years, including many government departments and agencies. Over 500,000 instruments have been administered in the U.S. military. E

The instrument consists of 125 items, plus answer spaces for 75 additional questions. Exhibit V-1 lists and briefly describes the conditions tapped by the SOO.

The SOO was administered in large groups to all participants in the Field Trial prior to system implementation. According to the original plan, each participant was to have been resurveyed in the post implementation measurement phase. As it turned out, this second SOO administration did not occur for reasons which are discussed in Section C below.

Analysis of the baseline data from the SOO involved comparing scores against norms, as well as across groups.

Exhibit V-1 1980 SOO INDICES

Domain, Index & Item	Conceptual Definition	Conditions Tapped
ORGANIZATIONAL CLIMATE		
GUIDANCE SYSTEM		
1. Communication Flow 5-7	Effectiveness of information flows in the organization.	Upward receptivity. Downward communication. Lateral communication.
2. Decision-Making Practices 11-12	Participative character of the way in which the organization makes decision.	Persons affected asked for ideas. Decision makers have access to available know-how.
3. Concern for People 8-10	Importance of human resources in the organization's overall scheme.	Interest in welfare and satisfaction. Commitment to improved working conditions. Conditions encourage effective work.
4. Influence and Control 13, 15-16	The total fund of predictability built into the system by interpersonal control.	Say or influence by middle managers, first-line supervisors, and non-supervisory employees.
JOB DESIGN		
5. Job Challenge 90, 93-95	Extent to which the work is designed so as to be challenging and stimulating.	Enjoy performing activities. Variety of tasks. Uses, skills, and abilities. Lets you learn new skills.
6. Job Reward 96-98	Extent to which the work is designed so as to provide equitable rewards.	Performance leads to monetary rewards. Performance leads to recognition and respect. Performance provides opportunity tor advancement.

Exhibit V-1 1980 SOO INDICES (continued)

Domain, Index & Item	Conceptual Definition	Conditions Tapped
JOB DESIGN		
7. Job Clarity 99-101	Extent to which the work is designed so that expectations are clear.	Clarity of job expectations. Absence of conflicting expectations. Reasonable expectations.
SHAPE		
8. Organization of Work 1-4	Clarity and effectiveness of the organization's work structure.	Clear and reasonable goals. Quickness to innovate in work methods. Work activities sensibly organized. Decisions made at right levels.
9. Absence of Bureaucracy 105-107	System not characterized by costly internal bureaucratic practices.	Absence of red tape, endless referrals and unexplainable rules.
10. Co-ordination 108-110	Degree to which work among units is co-ordinated.	Units plan together and co-ordinate. Units receive co-operation and assistance from one another. Problems among units are effectively resolved.
CO-ORDINATION MODERATORS		
11. Work Interdependence 111-112	Extent to which inter-unit co-ordination is necessary.	Unit's work requires information from other units. Unit's success is affected by other units.
12. Emphasis on Co-operation 113-114	Extent to which the system fosters co-operation.	Co-operation encouraged by organizational climate. Co-operation encouraged by upper management process.

Exhibit V-1 1980 SOO INDICES (continued)

Domain, Index & Item	Conceptual Definition	Conditions Tapped
SUPERVISORY LEADERSHIP FOUR-FACTOR INDICES		
Supervisory Support 24, 26, 28	Extent to which supervisor's behaviour enhances subordinates' feelings of self-worth.	Friendly and easily approached. Willing to listen. Pays attention to what you say.
Supervisory Team Building 30, 32	Extent to which superisor's behaviour encourages team work.	Encourages group to work as a team. Encourages exchange of ideas and opinions.
Supervisory Goal Emphasis 34, 36	Exent to which supervisor's behaviour generates contagious enthusiasm for effective performance.	Encourages best effort. Maintains high standards.
Supervisory Work Facilitation 38, 40, 42	Extent to which supervisor's behaviour helps remove roadblocks to effective performance.	Provides help, training, and guidance. Helps schedule work. Offers ideas for solving job problems.
NON-FOUR FACTOR INDEX		
Encouragement of Participation 44-46	Extent to which supervisor's behaviour encourages participation and involvement.	Provides information before decisions are made. Asks opinions and ideas. Presents problems for decisions by the group.
PERCEIVED CAUSES OF SUPERVISORY LEADERSHIP		
Interpersonal Competence 47-49	Extent to which supervisor has knowledge, values, and skills appropriate to interpersonal competence.	Knowledge of what it takes to be a good leader. Attitude encourages participation and commitment. Skills for getting along with others.

Exhibit V-1 1980 SOO INDICES (continued)

Domain, Index & Item	Conceptual Definition	Conditions Tapped
PERCEIVED CAUSES OF SUPERVISORY LEADERSHIP		
Involvement 50-51	Orientation toward subordinates.	Information about how subordinates see and feel about things. Interest in and concern for subordinates.
Administrative Scope 52-53	Administrative latitude which supervisor has.	Has necessary administrative skills. Situation which allows him to be a good leader.
PEER RELATIONSHIPS FOUR-FACTOR INDICES		
Peer Support 60, 62, 64	Extent to which behaviour of subordinates encourages their own feelings of self-worth.	Friendly and easily approached. Willing to listen. Pay attention to what you say.
Peer Team Building 66, 68, 70	Extent to which behaviour of subordinates encourages team work among themselves.	Encourage each other to work as a team. Encourage exchange of ideas and opinions among themselves. Emphasize team goals to one another.
Peer Goal Emphasis 72, 74	Extent to which behaviour of subordinates generates contagious enthusiasm for effective performance.	Encourage best efforts. Maintain high standards.
Peer Work Facilitation 76, 78, 80	Extent to which subordinates help each other remove roadblocks to effective performance.	Help each other find ways to do a better job. Help each other schedule work. Offer each other ideas for solving job problems.

Exhibit V-1 1980 SOO INDICES (continued)

Domain, Index & Item	Conceptual Definition	Conditions Tapped
END RESULTS		
Group Functioning 82-87	Group's ability to function well as a collective entity.	Plans and co-ordinates well. Makes good decisions, solves problems well. Shares relevant information. Feels responsible for meeting objectives. Flexible, adaptable. High level of trust.
Satisfaction 17-23	Overall level of satisfaction.	Satisfaction with: Work Group — Pay Supervisor — Advancement history Job — Advancement prospects
Goal Integration 119-120	Effective motivation; identity of individual and organizational interests in success.	Extent organization meets your needs and gets you to meet its objectives. (Score for match as well as level.)

Non-Indices Items, All Domains:

Supervisors' upward relationships
Career planning and development
Crisis reactions
Confidence and trust
Freedom, feedback, and ability to complete a whole piece of work
Involvement in goal setting

Exhibit V-2 shows how the SOO Indices relate to the assessment issues.

2. Selected items from the organization assessment instruments (OAI)

The Organization Assessment Instruments are a set of questionnaires and survey procedures for measuring characteristics of the:

- Context.
- Structure.
- Behaviour.

of the overall organization, work groups and jobs (Van de Ven and Ferry, 1980).

For the purposes of the OCS Field Trial, we selected the following subscales of the OAI to be appended to the SOO. Selection was based on whether the information to be acquired was supplementary to that provided by the SOO and dealt with areas likely to be affected by the OCS. The areas assessed by the OAI items were:

- Task difficulty.
- Co-ordination of job and unit activities with others.
- Unit organization and work flow.

Analysis of these data involved comparing values on composites of items across work groups. As with the SOO, the plan called for comparisons to be made within groups between the pre- and post-implementation measurements. However, again as with the SOO, the OAI was not administered in the post implementation phase (as discussed below).

EXHIBIT V-2 The SOO and the evaluation issues

Issues being addressed	Relevant SOO Indices
User Acceptance	
Support to decision-making	Decision making practices Communication flow Influence and control.
Reduction in inefficiencies	Co-ordination Organization of work Absence of bureaucracy
Human/Social	
Quality of working life	Influence and control Job clarity Confidence and trust Career planning and development Involvement in goal setting Goal integration
Incentives/rewards/sanctions	Job challenge Job reward
Moral/motivation	Concern for people Job satisfaction
Organizational	
Job design	Job challenge Job reward Job clarity
Organizational effects	Organization of work Absence of bureaucracy Co-ordination

Exhibit V-3 links the OAI measurements to the evaluation issues.

EXHIBIT V-3 **Linkage of OAI areas to evaluation issues**

Evaluation Issues	Relevant OAI Areas
Organizational	
Job design	Job standardization Task difficulty Task variability
Organization effects	Co-ordination of job and unit co-ordination with others Unit organization and work flow

3. The Attitudes Towards Office Technology questionnaire

The Attitude Towards Office Technology (ATOT) questionnaire is a brief (25 item) instrument consisting of 5-point scale ratings (strongly agree to strongly disagree) of statements related to office technology. Although not a widely-used instrument, it produces data with a reasonably strong factor structure.

An appendix to the core instrument (15 items) assessed respondents' expectations of how the system would affect them and their work.

This instrument was administered to large groups of Field Trial participants one or two days after the administration of the SOO and OAI items.

Exhibit V-4 links the ATOT measures to the evaluation issues.

EXHIBIT V-4 **Linkage of ATOT measures to evaluation issues**

Evaluation Issues	Relevant ATOT Measures
User Acceptance	
Attitudes	Attitudes to advanced office technology
Expectations	Expectations of system impacts

4. Communications diary

The communications diary, (a copy is available in the appendix), was designed to provide a variety of data, including those needed to support the Hypergraph Structural Analysis (discussed in the Impact Assessment Plan). Once the post data became available for comparison, these data were to have been analyzed in three broad areas:

a) Mode usage

The diaries to be employed after the system installation were to be adjusted to include specific machine modes of communication (formal document mailing, memos). Then we planned to examine overall patterns of mode usage to determine whether any substitution effect has occurred, and if so, which modes have been most effected.

b) Time

Time was to have been used as an adjunct to the analysis of mode patterns above. If substitution effects had occurred (as we expected),

were there particular combinations of mode and time categories where the effect was most acute (such as long distance telephone calls, short face-to-face meetings, etc.)? And, at a more aggregated level, did computer-aided messaging affect the average time per interaction at all?

c) Incompletions

A frequently stated objective for office automation systems implementation is the ability to circumvent various types of communication failures, particularly those involving the telephone. Again, using the pre-post design, the frequency of incompletions was to have been examined to determine whether the anticipated result of fewer failures is indeed found. In addition, we planned to adjust the diary for the post tests to include computer-aided actions taken as a result of failures to determine whether such responses become prevalent.

These diaries were to have been administered at three points in time, for a period of one week, to all participants in the trial. As it turned out, they were only administered once, prior to system implementation. The reasons for this change of plans are discussed in section C of this chapter.

Exhibit V-5 links the data to be provided by the communications diary to relevant evaluation issues.

EXHIBIT V-5 Evaluation issues to be addressed by the communications diary

Evaluation Issues	Mode Usage	Time	Incomp-letions
User Acceptance			
- Functionality vs. needs	x		
- Support to decision making	x		
- Reduction in inefficiencies		x	x

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5. Information source log

There are two general methods to determine productivity improvement in work groups. The first is to rely on established performance measurement systems in the hope that they contain sufficient input and output detail from which to draw conclusions. The second is to perform an in-depth task analysis, trying to establish the relationships among work actions, work objects, and work outputs in a meaningful manner for each worker. Only then can changes in work actions and objects be related to changes in work outputs, enabling one to draw inferences about productivity. Such an analysis is difficult enough on the factory floor; it is enormously more difficult within the office, where actions are often mental and outputs are hard to measure.

Given the scope of this assessment, it was not possible to perform an adequate task analysis for all participants in the trial. It would have required a time commitment on the part of the assessment team and on the part of the participants that neither could afford. We had hoped that the "Current Situation Report" would provide a substantial base of task information, but we found the descriptions of work products too broad and generic to be reasonably measured and that useful descriptions of work actions were not available.

Thus, we decided, with the approval of the OCS Program Manager (PM/OCS), to focus our assessment of productivity impacts to one subgroup of the trial, the Directorate General of Financial Policy and Procedures (DGFPP). One advantage of using DGFPP is that it is a small, relatively autonomous unit. A second is that, for the most part, it is made up of "knowledge workers" who may be expected to use almost all the system's capabilities. A third is that they describe themselves as being heavy communicators, where any improvement brought about by new technologies would be welcome. Finally, all 24 staff members of DGFPP were to have their own workstations (non-shared) and would not be receiving any specialized, application software.

To gather productivity data, we designed an "information source log", similar to the communications diary, with the assistance of members of DGFPP. A copy of this instrument is presented in the appendix. The log collected data in six primary areas:

1. Information Sources

   - know the answer off-hand
   - referred to files/notes on-hand
   - referred to files in other locations
   - contacted someone else for particular information

2. Elapsed time to retrieve information

3. Mode used to initiate any search

   - face-to-face , telephone, etc.

4. Mode information provided on

   - face-to-face, telephone, etc.

5. Major activity that information is needed for

   - based on workplan categories

6. Particular task being performed.

The exact taxonomies within each area were determined with the assistance of the DGFPP participants, to reflect the precise nature of their major activities and the tasks performed to complete them. We used the major activities as listed in each directorate's workplans. The task list was developed from existing taxonomies (such as Booz-Allens and Exxon's), in consultation with members of DGFPP.

The log was designed to be administered in a pre-post design. The post instrument was adjusted to take into account the new system-aided activities.

B. PARTICIPANT OBSERVATION

Participant observations were conducted over a period of approximately 13 months -- from October 1984 to November 1985. This period of time included the Mini-Trial (initial two nodes), implementation of the remaining eight user nodes and five months of the official Field Trial (from June 1985 to November 1985).

The participant observations involved the completion of a series of activities that were designed to collect data related to most of the evaluation issues under consideration. Some of the observation activities continued throughout the project. Others took place at specific times during the Field Trial period.

The participant observations consisted of six main sets of activities. A brief description of each activity follows.

1. The Daily Diary

The participant observers maintained a chronological record of significant project events and other relevant information collected during their site visits.

The observers used three instruments to record information. These were:

a) Significant events log.

b) DND/OCS participant observations (by evaluation issue.

c) End of Visit Review.

Examples of these instruments are presented in Appendix H.

In total, the observers conducted approximately 30 on-site visits. Discussions were held with 55-60 system users. Approximately 15 users were interviewed twice or more during the course of the project.

2. "Hands-on" reviews

The observers spent time in hands-on sessions with users to review the users' understanding of the system and obtain direct feedback of their reactions to the system and its features. For the most part, hands-on reviews were conducted in an unstructured fashion and were performed in conjunction with the user to illustrate issues raised in discussion.

3. Training assessment

The participant observers attended formal training sessions provided by XIOS personnel. They also conducted follow-up interviews with attendees of particular training sessions to determine how the participants felt about the training received and determine their reactions to their first on-the-job exposure to the system.

4. Physical environment review

The participant observers conducted two formal reviews of the physical environment. The first review was conducted prior to the installation of the system. The other was completed in October 1985 (i.e., four months after the start of the official Field Trial). In addition, informal environmental reviews were conducted as part of the ongoing site visits.

5. Customization review

The observers conducted a formal review of the applications that were customized specifically for the DND Field Trial. This review was conducted in October 1985 (i.e., four months into the official Field Trial).

6. System record monitoring

During their site visits, the participant observers reviewed the logs that were maintained for each node by the node manager and vendor staff. These logs recorded performance and availability information for each node.

In addition, the observers reviewed the log maintained on an ongoing basis by the DND System Manager.

C. POST-IMPLEMENTATION DATA COLLECTION

In approaching the final phase of this project, we were guided by two documents. The first was the Detailed Impact Assessment Plan for DND/OCS Field Trial prepared by Abt Associates in May of 1984. This document represented our best estimate at the time of its writing of the work which needed to be done in order to address DOC's interests in the impact assessment. Since that time, our Baseline Report was submitted and we spent considerable time on-site in the role of participant observer. Based on the information gathered in that time, we suggested a number of modifications to the work plan originally described in the Impact Assessment Plan. These changes are discussed below.

The Impact Assessment Plan described six major post-implementation data sources which would contribute to our understanding of the impact of the OCS Field Trial at DND. These were:

- System generated data.
- Technical opinion.
- The Survey of Organizations (SOO) and a number of Organization Assessment Instrument items appended to the SOO.

- Survey of user attitudes towards office technology.
- Communications diary.
- The information source log to be used in the Directorate General of Financial Policy and Procedures only.

In some cases we recommended adherence to the original workplan. In others, we suggested changes.

1. System-generated data

XIOS agreed to provide us with various types of system use data generated by the system. To be included here were several standard reports which they were to make available to us. The content of these reports was to have been as follows:

- Frequency of system use by command/by node/by type of terminal.
- Frequency of use of help by command/by node/by terminal type.
- Document size by node/by document type/by terminal type.
- System response time by command/by node/by time of day.
- System load (commands executed per minute) by node/by time of day.

Termination of XIOS's evaluation activities meant that their reports would not be prepared. However, XIOS agreed to provide us with the raw data from the usage log.

Our use of these data was very limited. We were unable to create a "clean" data file, from the raw data from XIOS, for computer analysis. Instead, we prepared a simplified analysis by clerical review of a printout of these data. Even had we been able to use SPSS to analyse these data the number of active users would not have been sufficient to support any sophisticated statistical procedures.

2. Technical opinion

We recommended that this aspect of the Impact Assessment Plan be retained as originally envisioned. According to the original plan, the technical opinion review was to:

- Examine the system and its documentation.
- Carry out hands-on tests of the system and its facilities.
- Match the facilities delivered to the needs identified in the project documentation prepared by the vendor for DND.
- Consider the relationships between system facilities, equipment used, physical locations and general environmental conditions.
- Assess the implications of the experimental nature of the Field Trial in comparison to the expectations of the full production system, and
- Discuss, with the vendor, significant issues identified.

3. The Survey of Organizations and OAI items

In reviewing and discussing the Baseline SOO findings with DND, we came to the conclusion that a post-implementation measurement using the SOO would not yield useful information. There were two reasons for this. The first was that the observed level of system use is obviously not sufficient to have any measurable impact on the types of indicators assessed by the SOO. In addition, the realities of the military environment, such as the rigid rank structure and formal communication protocols, make it virtually inconceivable that the introduction of any automated support system would have a substantial effect on the organizational structure and climate.

As a result, the post-implementation administration of the SOO was not conducted.

4. Survey of participants

We conducted a detailed survey of OCS Field Trial participants early in October of 1985. The areas covered in this survey were as follows:

- Extent of system use.
- Functions used.
- Positive system features.
- Negative system features.
- Suggestions for system improvement.
- System impacts.
- Level of user support received from XIOS.
- Level of user support received from PM OCS.
- Degree of encouragement from superiors to use system.
- Experience with training.
- Extent to which user expectations were met and not met by the system.
- Demographic and occupational descriptive data.

A copy of this survey instrument is appended to this report.

5. Communications diary

The findings of the participant observers strongly indicated that very few users were relying on the system as a communications medium. In view of this situation, we recommended that a second administration of the communications log not be done. Completion of communications logs places a substantial response burden on system users. Communications logs also produce data of limited reliability. Given our relatively greater interest in the results of the survey of users, we were very reluctant to alienate and irritate users by

requesting them to complete communications logs when we had reason to believe that the systems communications functions were receiving little or no use.

Given approval to drop the second administration of the communications log, it was no longer possible to perform the Hyper-Graph Structural Analysis proposed in the Detailed Impact Assessment Plan. This analysis was to be based on the results of the communications log. Hence, without these data the HSA could not be performed.

6. Information source log

We recommended that the Information Source Log be retained as originally envisioned. Consistent with the Impact Assessment Plan, the post-implementation administration of the Information Source Log took place in the Directorate General of Financial Policy and Procedures (DGFPP).

We modified the Log to take into account system-aided activities and administered the post instrument in October of 1985. A copy of the log is appended to this report.

VI

FINDINGS: SYSTEM PERFORMANCE

Chapters VI through XI present the detailed findings of our Impact Assessment. Unless otherwise indicated, the data presented were obtained from one of three sources:

- The post-implementation survey of participants
- System-generated data for two week-long periods supplied by XIOS.
- Participant observation.

The survey data base consists of 159 completed questionnaires. This number of completions represents an effective response rate of approximately 80%. We can only be approximate here because of the uncertainty as to exactly how many individuals were actually on the "participants' roll" when the survey was administered. As well, a number of "participants" were recent arrivals to the Field Trial site and had had no training on, or experience with, the system. Hence, they did not complete the questionnaire.

A. UTILIZATION BY FEATURE

1. Survey data

The post implementation survey asked respondents how often they had used each of a list of RENAISSANCE functions over the preceding 10 working days. E zes the responses to these items separately for VT220/Displayphone users and PC users.

EXHIBIT VI-1 Reported extent of use of RENAISSANCE functions over ten working days

Renaissance Functions	VT220/DPhone users(N=107)			PC users (N=52)		
	Never	1-10 times	11+ times	Never	1-10 times	11+ times
Sign on to RENAISSANCE	33%	50%	16%	65%	25%	10%
Change your password	96	4		94	6	
Check your IN file for incoming mail	40	51	9	71	23	6
Log non-electronic item in your IN or OUT file	83	17		94	6	
Create a letter	79	20	1	87	12	2
Create a memo	66	32	2	81	15	4
Create a text document	66	27	8	90	8	2
Create a minute sheet	83	17		94	6	
Create a telephone message	99	1		100		
Create an answer to a memo	82	18		90	10	
Create or update a calendar or TO DO list	89	9	2	98		2
Cut and paste editing feature*	89	8	3	98	2	
Send a document to another user	77	23		88	12	
Receive a document from another user	73	27		87	13	
Publish a document	85	12	3	94	6	
View a public document	76	23	1	92	8	
Print a document	61	35	4	80	18	2
Perform a document search using keywords, filecode, date, etc.	66	28	6	90	10	
Include a PC-created file (LOTUS 1-2-3, MULTIMATE or other file) in a RENAISSANCE document	99	1		98	2	
Send or receive a PC-created file to or from another PC, using RENAISSANCE	100			94	6	

* This function did not exist at the time of the survey.

The key survey findings related to system utilization by feature are:

- About 67% of the VT220/Displayphone participants make some use of RENAISSANCE, but only about 16% could be considered to be moderate to heavy users.

- Many of the less frequent users appear to use the system mainly to check for incoming mail.

- Only a very few of the PC-based users, make use of the file transfer and document systems capabilities. And by RENAISSANCE, only a few (about 35%) make any use of RENAISSANCE. This group appears to operate mainly in a "standalone" manner.

- Total document creation and memory traffic is very low, with about 90% of respondents creating less than 1 document (if any typed) every two days.

- Features not used (either nil, or very low response).

  - telephone messages.
  - calculations and/to-do lists
  - PC/RENAISSANCE file merge
  - PC to PC communication

In examining the detailed contents of Exhibit VI-1, readers' attention is drawn to the 11% of VT220/Displayphone users who reporting using the cut and paste editing feature." As indicated in the footnote, this feature did not exist at the time of the survey. It appears that our survey respondents may be overstating their level of use of system functions. As well, note that survey results apply only to RENAISSANCE system functions and do not include specific features operating on stand-alone word processors and personal computers (e.g., Multi-Mate and Lotus 1-2-3 features).

2. System-generated data

a) Levels of activity

As discussed in Chapter V, the system-generated data available to us were very limited. Despite extensive efforts by our technical staff, we

were unable to carry out any computer analysis of the raw data provided to us by X10S.

Using printouts of the raw data we did analysethe overall levels of usage across all nodes for a period of 10 working days. The periods of data collection covered the weeks beginning October 21 and November 12. The data used was based on logging of commands issued by users. The data files included only comments issued under RENAISSANCE. No comparable data were available from the use of PC's in "standalone" mode.

The usage of the system across all nodes (except Node 101 --the PM OCS's node) is summarized in Exhibit VI-2. From this summary, it can be seen that, in the 10 day period:

- Only about 46% of the possible users were active.
- On average, the active users issued about 2 commands in a working day.
- Usage varied across nodes:
  - the percentage of active users varied from 9% at node 105, to about 90% at node 102.
  - the average number of commands per active user per day varied from 1.2 (nodes 104 and 105) to 3.3 (node 103).

Related findings not shown in Exhibit VI-2 are:

- The most active 15 users accounted for 49% of all commands issued.
- Of the 75 recorded users, 41 (55%) recorded fewer than five commands, suggesting only one or, at most, two sessions on RENAISSANCE during the recording periods.

EXHIBIT VI-2 User commands issued over 10 working days

NODE	LOCATION	TOTAL COMMANDS	ACTIVE USERS	POSSIBLE USERS	% ACTIVE	DAILY AVERAGE No. CMDS/ACTIVE USER
102	DFPAS/DMTAS	412	9	10	90%	2.7
103	DFAPA/DGFPP	487	8	11	73%	3.3
104	DB	306	12	23	52%	1.2
105	DCOSTS	47	2	22	9%	1.2
107	DPS3	333	12	16	75%	1.6
108	DPS4	135	5	27	19%	1.7
109	DPS4/5	220	9	42	21%	1.5
111	CFB WPG	287	13	30	43%	3.1
112	SOAF	77	5	18	28%	2.6
	TOTALS	2,304	75	199	46%	2.1

NODE 101 EXCLUDED BECAUSE WAS USED FOR TRAINING, AND BY PM OCS

b) Use of specific commands

We also analysed the use of specific commands. This is summarized in Exhibit VI-3. While it is not possible to identify the specific functions carried out by users, we can draw some general conclusions:

- Approximately 62% of all commands are related to accessing and reviewing files and documents (i.e. all SHOW commands). This indicates high searching activity.

- The SEND command is used to electronically send a mail document to other users. During the 10 working days, only 30 electronic mail documents were sent. Further analysis of the data indicated that two nodes (Nodes 102 and 103) sent 60% of the electronic mail documents. Three nodes didn't send any. Using existing data, we were unable to determine the percentage of electronic mail sent to other users on the same node compared to users on different nodes.

- During the two week period, only 9 documents were published. Only two of the ten nodes published documents during this period.

- The PRINT command is used to print documents on a specified printer. This was the second most active command (behind the combined SHOW commands). The number of documents printed varied considerably from one node to another. It ranged from 4 documents on Node 112 to 74 documents on Node 102.

In summary, analysis of the command frequency data indicates that, in a typical session, a user would log-on the system to see if there were any messages in his or her "in" basket or view a particular document and, possibly, print a copy of the document.

3. Participation observation

We had expected participant observations to be a key source of usage information. Because of the lack of good system-generated data, this has become of even greater significance.

EXHIBIT VI-3 Command frequency of use over 10 working days

Command	Number	%
Show Number	686	30
Show	675	29
Create	109	5
Print	276	12
Move	71	3
End CMD	193	8
Remove	125	5
Show places	57	2
Show file	30	1
Attributes	10	0.4
Send	30	1
Copy	12	0.4
Claim	7	0.3
Margin	7	0.3
Publish	9	0.4
Other	4	0.2
TOTAL	2,304*	

*Excluding Node 101 used for training, and by PM OCS.

a) Overall usage

Certain components of the OCS Field Trial System are used more frequently than others. In general, the word processors and personal computers are used extensively. In some area, such as D COST S and D BUDGET, the personal computers (i.e., IBM PC's with Lotus 1-2-3) are in constant use. It is not uncommon for the personal computers on many nodes to be in use for six or more hours a day.

On average, the RENAISSANCE product is not used to the same extent as word processors and personal computers. The frequency of use of RENAISSANCE varies from one node to another. For example, D COST S uses RENAISSANCE less than DMTAS and DFPAS. Also, within any given node, the frequency of use will vary from one user to another.

b) Factors affecting the level of use

A number of factors affect the level of use among the various users. As reported, these include:

- The response time of the product (including log on and other system commands).
- The level of functionality provided and its applicability to the needs of the user.
- The availability of the product to the user when he or she needs it (i.e., being able to logon when needed).
- The degree to which middle and senior management personnel use the product.
- The preferences of the individual users.
- The availability of a terminal/input device (for individuals on a shared terminal).

c) Usage of specific features

RENAISSANCE is used primarily for creating and editing text documents. For the most part, correspondence and documents are prepared in draft form on RENAISSANCE. The draft documents are then printed and given to the secretary for rekeying and final production on the word processing equipment. This process is required because of the inadequate final formatting capabilities on RENAISSANCE and the lack of a file transfer capability going from RENAISSANCE to the word processors.

The electronic indexing and filing function is used for storing and accessing information. However, only in a few cases are the users employing the electronic filing function in the same way that they used the manual filing and record keeping system (i.e., using the same file naming conventions). Most users print copies of their documents and store them in their manual files. This practice stems from timeliness problems in accessing information on RENAISSANCE and the reluctance of users to maintain two filing systems -- one automated and one manual. A full commitment to electronic filing may not have been forthcoming from some users because of the perception that the OCS Field Trial is of a temporary nature. Hence, the system is not seen as a long term solution to their filing and record-keeping needs.

Two major functions provided by RENAISSANCE are experiencing low usage. These are:

- Electronic mail and messaging.
- Activity management.

In some areas, such as DFPAS and DPS-3 the electronic mail and messaging function is being used to send and receive memos, documents, etc. to and from users on the same node. However, there appears to be little communication between separate nodes. Many users have noted that

organizations and individuals that they would normally communicate with, on a regular basis, are not part of the Field Trial and as such do not have access to system communications facilities.

Some users feel that the electronic mail facilities of RENAISSANCE are somewhat hampered by the internal communications procedures within the DND organization. Normally, all text based communications going to a different organization within the department or outside of the department must be approved and signed by the unit head. Poor annotation capabilities on the RENAISSANCE product make it cumbersome for drafting and revising memos going outside the directorate. For example, using RENAISSANCE an individual can prepare a memo that will eventually be sent outside of the directorate and submit this memo electronically to the unit head for review and editing. The problem occurs when the document is returned to the original author. The lack of an annotation function prevents the author from readily identifying changes that have been made to the document by the unit head. In practice, the original authors produce draft paper copies of their documents and submit them to unit heads in order that they may readily see what changes have been made. Many users also noted that their unit heads were sporadic users of the system in general. This also limited the extent to which RENAISSANCE could be used as a viable medium for reviewing drafts of correspondence.

The activity management feature of RENAISSANCE, including calendaring and "to do" lists are not being used very much. A number of users made an initial effort to use this function. However, after a brief experimental period, most users reverted to manual desk calendars and "to do" lists.

In general, RENAISSANCE appears to be used more frequently in environments such as DFPAS and DPS-3, where the preparation of policies, procedures and other types of text documents form a major part of the work of the organizational unit (as compared to organizations such as D COST S where much of the work performed involves numerical calculations).

B. EASE OF USE

1. Survey data

The post survey asked five questions related to ease of system use. Respondents were asked to express their level of agreement with the following statements:

- I found the system easy to learn.
- The system documentation is clear and complete.
- The system is easy to use.
- Editing of documents using RENAISSANCE (not Multi-Mate) is easy.
- The keyboard on my terminal is well-designed and comfortable to use.

The responses to these five questions are summarized in Exhibits VI-4 through 8 below.

EXHIBIT VI-4 Extent of agreement with statement: I found the system easy to learn

	Terminal Type		
	VT 220/ DPhone	PC	All
Strongly agree	7%	6%	7%
Agree	72	61	69
Disagree	7	4	6
Strongly disagree	2		1
No opinion	12	29	18

EXHIBIT VI-5 Extent of agreement with statement: The system documentation is clear and complete

	Terminal Type		
	VT 220/ DPhone	PC	All
Strongly agree	3%	6%	4%
Agree	61	33	52
Disagree	11	6	9
Strongly disagree	4	4	4
No opinion	22	50	31

EXHIBIT VI-6 Extent of agreement with statement: I found the system easy to use

	Terminal Type		
	VT 220/ DPhone	PC	All
Strongly agree	4%	4%	4%
Agree	67	48	61
Disagree	11	8	10
Strongly disagree	2		1
No opinion	16	40	24

EXHIBIT VI-7 Extent of agreement with statement: Editing of documents using RENAISSANCE (not MultiMate) is easy

	Terminal Type		
	VT 220/ DPhone	PC	All
Strongly agree	2%	-	1%
Agree	35	21	31
Disagree	12	10	12
Strongly disagree	9	8	9
No opinion	42	60	48

EXHIBIT VI-8 **Extent of agreement with statement: The keyboard on my terminal is well designed and comfortable to use**

	Terminal Type		
	VT 220/ DPhone	PC	All
Strongly agree	6%	6%	6%
Agree	68	54	63
Disagree	9	8	8
Strongly disagree	3	-	2
No opinion	15	32	21

In summary, these exhibits indicate that:

- Approximately three quarters of the participants surveyed reported that the system was easy to learn.
- Approximately half of the survey respondents found the documentation clear. It is worth noting, however, that of the PC users surveyed, 50% had no opinion on the clarity of the system documentation. This may reflect either a true lack of opinion, or on the other hand, it may be that these individuals never examined the documentation. This observation is consistent with our finding reported above that individuals assigned to PCs were infrequent users of RENAISSANCE.
- Approximately 66% of survey respondents reported finding the system easy to use. As with the question on system documentation, a substantial (40%) of individuals assigned PCs reported having no opinion on whether the system was easy to use. Again, this likely reflects the relatively low frequency of RENAISSANCE use by individuals with PC terminals.
- Almost half of the survey respondents had no opinion as to whether or not editing of documents using RENAISSANCE was easy. Of those with an opinion, most reported agreement with this statement.
- Only 10% of the survey respondents reported that they did not find their keyboard well designed and comfortable to use. The breakdown of responses to this question was similar for both PC users and users of the remaining terminal types.

2. System-generated data

This data source did not provide any information relevant to ease of system use.

3. Participant observation

In discussion, most users reported that RENAISSANCE (with its simple command structure and pre-defined screen format) is an easy product to learn and use. The built-in "help" function and diagnostics are considered useful features. Also, most users feel that the RENAISSANCE Reference Guide is sufficient for their needs. It is well indexed and the reference materials appear to be covered in sufficient detail. However, some users noted inaccuracies in some of the documentation items.

The Multi-Mate and Lotus 1-2-3 software products, on the word processors and personal computers, are considered more difficult to learn and use than RENAISSANCE. However, no major problems were reported regarding these packages. Of course, the user groups for the PC applications are more specialized, and likely to take the time to learn and use these packages. The documentation for both of these software packages is considered sufficient for user needs.

Several users reported that their equipment was not ergonomically positioned or physically located in such a way as to enhance ease of use of the system. Some users of shared terminals indicated that the system would be easier to use if they had their own dedicated terminal. They felt that, given easier access, they would use the system more.

Some users noted problems with the placement of the terminal on or near their desks. For example, a few users used books or other means to elevate their terminals in order to obtain the optimum viewing angle. In one particular case, a user had placed his terminal on a telephone stand behind his desk.

Apparently, there was not enough cable to allow the terminal to be placed on the user's desk. This resulted from the movement and condensing of office space that had recently taken place within this particular organizational unit. The problem was eventually resolved. However, in the intervening period (about 4 weeks), the user did not use the system very much because of this cumbersome arrangement.

C. RELIABILITY

1. Survey data

Survey respondents were asked six questions related to the issue of system reliability. The questions probed the respondents' extent of agreement with each of the following statements:

- The system is reliable.
- The system is generally available when I need it.
- The system responds promptly to my commands.
- The system response time is satisfactory.
- Access to printers is rarely a problem.
- Access to system terminals is rarely a problem.

Exhibits VI-9 through 14 summarize the responses to these items. The major findings presented in these exhibits are as follows:

- Regardless of terminal type, only approximately 20% of the respondents rate the system as reliable. It should be noted that 44% of PC users have no opinion with respect to system reliability. This likely reflects the low level of use of RENAISSANCE by individuals assigned to PCs.

EXHIBIT VI-9 Extent of agreement with statement: The system is reliable

	Terminal Type		
	VT 220/ DPhone	PC	All
Strongly agree	-	2%	1%
Agree	17	22	18
Disagree	29	20	26
Strongly disagree	28	12	22
No opinion	27	44	32

EXHIBIT VI-10 Extent of agreement with statement: The system responds promptly to my commmands

	Terminal Type		
	VT 220/ DPhone	PC	All
Strongly agree	-	2%	1%
Agree	18	29	21
Disagree	44	18	36
Strongly disagree	26	16	23
No opinion	13	35	20

EXHIBIT VI-11 Extent of agreement with statement: The system is generally available when I need it

	Terminal Type		
	VT 220/ DPhone	PC	All
Strongly agree	3%	6%	4%
Agree	39	35	37
Disagree	33	16	28
Strongly disagree	12	6	10
No opinion	14	37	22

EXHIBIT VI-12 Extent of agreement with statement: System response time is satisfactory

	Terminal Type		
	VT 220/ DPhone	PC	All
Strongly agree	-	2%	1%
Agree	16	22	18
Disagree	35	10	27
Strongly disagree	35	31	33
No opinion	14	35	21

EXHIBIT VI-13 Extent of agreement with statement: Access to terminals is rarely a problem

	Terminal Type		
	VT 220/ DPhone	PC	All
Strongly agree	26%	14%	22%
Agree	43	38	41
Disagree	9	8	9
Strongly disagree	8	8	8
No opinion	15	33	20

EXHIBIT VI-14 Extent of agreement with statement: Access to printers is rarely a problem

	Terminal Type		
	VT 220/ DPhone	PC	All
Strongly agree	19%	24%	21%
Agree	50	38	46
Disagree	7	4	6
Strongly disagree	3	6	4
No opinion	22	28	24

- Similarly, only 20% of survey respondents reported finding that the system responds promptly to their commands. Again, the proportion of "no opinions" is substantially higher among PC users (35% versus 13%).

- Approximately 40% of survey respondents reported that the system is generally available when they need it. A similar percentage disagreed or strongly disagreed.

- When questioned with respect to whether they found the system response time satisfactory, approximately 20% of the survey respondents replied in the affirmative. However, 60% were not satisfied by system response time. Again the proportion of PC users expressing no opinion was substantially higher than the corresponding proportion for users of other terminal types.

- Only about 20% of the survey respondents reported finding terminal access a problem. As might be expected, this problem was more acute for individuals sharing terminals.

- Printer access was also a minor problem. Only 10% of the survey respondents reported difficulty in this area.

2. System-generated data

Based on a hand tabulation of a sample of commands issued in the 10 day period of system-generated data recording, we found wide variations in response times across the ten nodes. The average for node 112 (Air Command) was a relatively low 3.9 seconds. At the other end of the scale were nodes 104 and 108 (DB and DPS4) with average response times of 10 seconds. Overall, only 34% of the commands sampled had response times of five seconds or less. It is apparent that system response time is slow in comparison to what would be considered an acceptable standard of 3-5 seconds for maximum response times.

3. System manager's log

The DND System Manager maintains a log of all major problems reported by the node managers. For example, the log notes when particular nodes failed to do automatic backup during the previous night. It also notes when particular nodes were down. However, the log records only those major

problems that have been encountered by node managers and reported to the System Manager. It does not record small system failures or problems that have been encountered and corrected by the node managers themselves. As such, the System Manager's log represents a very conservative view of the problems encountered in the OCS system.

Our analysis of the log entries indicates that, for all nodes, backup failed 6.6% of the time (i.e., backup failed 66 times out of a possible 1,000 "backup" nights). Also, the average downtime over the five month period was approximately 3%.

It should be noted, however, that the above averages change dramatically depending upon the particular node examined. For example, some nodes (such as nodes 104-D Budget and 107-DPS-3) only failed to backup twice over a period of five months. Similarly, the downtime on these two particular nodes was minimal. On the other hand, node 109 failed to backup 23 times out of a possible 100 times, for a failure rate of 23%. Similarly, the downtime for this particular node was high (between 6 and 10%).

Overall, three out of the ten nodes experienced significant downtime problems (ranging from 6 to 10%). The remaining nodes experienced downtimes of approximately 1 to 5%.

4. Participant observation

Certain components of the OCS System have been more reliable, in terms of user availability, uptime, etc. than others. For example, the word processors and personal computers with their associated software packages have proven to be reliable products. The amount of downtime on these devices has been minimal.

During the eight months prior to the start of the Field Trial, the RENAISSANCE product had experienced a number of performance problems. To

the users, this meant excessive wait time. Examples of some of the performance related problems which were encountered include:

- Terminal and node crashes.
- Poor response time.
- Taking down the system to implement software upgrades, correct hardware problems, etc.
- Failure to perform automatic backups.

Some user nodes were affected more than others. For example, the two Mini-Trial nodes experienced more performance related problems during the implementation than did the remaining user nodes.

Much work has been done to correct the performance problems of the product. Improvements have been made in a number of areas including response time, automatic backups and node crashes. However, many users still do not see it as a dependable, stable product. Problems still exist regarding response time and terminal crashes.

The performance problems of the system have had an impact on the use of the product. Many users have been reluctant to put information into RENAISSANCE because of the likelihood that the product may not be accessible when the information is needed, at a later date. Many users have been reluctant to make a full commitment to the product because of its reliability problems. This is particularly acute in those areas where the node is experiencing ongoing reliability problems, such as node 109 (DPS-5).

D. ADAPTABILITY

Our findings in this particular area relate primarily to participant observations.

The users identified a number of events that illustrate the lack of flexibility or ease of modification in the RENAISSANCE product. For example early in the operational phase, the DND Project Manager (PM/OCS) used up all of the work space that was available to him. It took several months for the vendor (XIOS) to provide facilities to correct this type of situation.

An extensive amount of effort is also required to make changes to the basic user and role identification parameters that are stored in the system. It appears that the System Manager must spend a lot of time making required changes in this area. In one recent situation, the System Manager spent approximately two weeks making changes to basic user and role identification data on the various nodes. This is compounded by the fact that the System Manager must visit each of the node sites to make the changes.

VII

FINDINGS: USER ACCEPTANCE

A. ATTITUDES AND EXPECTATIONS

1. Survey data

The Attitudes Towards Office Technology Survey (ATOTS) was administered on two occasions. The first administration occurred prior to the introduction of the OCS equipment. The second administration was incorporated into the follow-up survey of participants. Exhibit VII-1 summarizes the responses across the twenty-five items of the survey for both the pre- and post-measurements.

These data support several conclusions regarding Field Trial participants' general attitudes towards office technology. These are:

- Prior to the implementation of the system, participants' attitudes were for the most part either positive or undecided. With few exceptions, at least 50% of the respondents expressed agreement with positive items and disagreement with negative items relating to technology. Across all items the average percentage of respondents who reported being undecided was approximately 21%.

- The results of the post-measurement showed a consistent shift of attitudes towards a more positive orientation regarding office technology. Of the twenty-five items, seventeen showed positive changes of at least 5%, while six showed no noticeable change and only two showed changed in the negative direction. These data suggest that despite the arguably mixed success of the Field Trial overall, the exposure to office technology which the trial provided served to make the participants more positive in their general attitudes towards office technology and to reduce the level of uncertainty regarding office technology in their workplace.

EXHIBIT VII-1 Comparison of pre and post responses to attitudes to office technology scale items

ITEM	PRE			POST			Direction of Change
	% Agreeing	% Undecided	% Disagreeing	% Agreeing	% Undecided	% Disagreeing	
The idea of sitting down in front of a computer and working with it frightens me.	8	16	77	4	6	90	+
I use a computer any chance I get.	49	18	34	54	18	28	+
I feel helpless around a computer.	16	23	61	4	12	84	+
Using a terminal makes me confused.	15	24	61	4	9	87	+
I would like to have a computer in my home.	69	18	13	70	15	15	NC
I have to "psych myself up" before I use a computer.	9	17	75	7	4	90	+
I enjoy tinkering with mechanical things.	55	23	22	51	20	29	NC
I would not know what to do on the computer if people weren't there to help me.	25	25	50	16	10	75	+
I feel tense about using a computer before I even start.	14	13	73	7	4	90	+
I see computer skills as being an absolute necessity.	65	20	15	63	18	19	NC
It gets really frustrating trying to speak a computer's language.	23	32	46	16	22	63	+

EXHIBIT VII-1 Comparison of pre and post responses to attitudes to office technology scale items (cont'd)

ITEM	PRE			POST			Direction of Change
	% Agreeing	% Undecided	% Disagreeing	% Agreeing	% Undecided	% Disagreeing	
I am afraid of touching the wrong button by mistake.	20	12	67	10	4	86	+
I like to know how things work and why.	86	10	4	80	9	11	NC
If the computer is going to break down, it will do it on me.	15	16	69	8	14	79	+
I really want to be involved in the computer culture: I don't want to be left out.	80	17	4	69	23	8	-
Having a machine ask me questions intimidates me.	6	14	80	1	6	92	+
The computer frightens me when it does things I don't understand.	16	18	66	11	5	83	+
It makes me feel left out and a little stupid when others know so much more about computers than I do.	30	16	54	23	12	66	+
The computer manuals are so over my head that I get lost.	17	34	49	11	18	72	+
Using a computer gives me a sense of control.	40	37	23	35	36	29	NC

EXHIBIT VII-1 Comparison of pre and post responses to attitudes to office technology scale items (cont'd)

ITEM	PRE			POST			Direction of Change
	% Agreeing	% Undecided	% Disagreeing	% Agreeing	% Undecided	% Disagreeing	
Before I ever approach a computer, I know I'm gong to be frustrated.	8	19	74	7	6	88	+
When I use a computer, I can't seem to get the right information out of it.	6	34	60	8	10	82	+
I go out of my way to learn about computers.	30	34	36	31	31	39	NC
I am afraid people will think I am stupid for the questions I ask.	8	15	77	5	4	92	+
Not being able to type keeps me from being really competent on the computer.	10	16	74	20	4	76	-

The post-implementation survey also asked two specific questions regarding users' expectations of the Field Trial System. Exhibit VII-2 presents a breakdown of their responses to this item.

EXHIBIT VII-2 Prior expectations of the system

	Terminal Type		
	VT220/ DPhone	PC	All
Positive	57%	43%	52%
Neutral	26	31	28
Negative	5	14	8
No opinion	13	12	12

The responses of participants to this item revealed that they were overwhelmingly positive or neutral in their expectations. Only 8% expressed negative prior expectations of the system. The user group most frequently reporting negative prior expectations was composed of individuals receiving PCs with the Multi-Mate package.

Participants were also asked whether the system had in general exceeded, met or not met their expectations. Exhibit VII-3 presents the responses to this item (excluding those expressing "no opinion" regarding their prior expectations) cross-tabulated against their initial level of expectation.

EXHIBIT VII-3 **Cross tabulation of prior expectations and extent to which expectations were met for VT220/Displayphone users and PC users**

VT220/Displayphone users

Expectations were:

Prior Expectations	Exceeded	Met	Not Met	No Opinion	Row Total
	%	%	%	%	%
Positive	-	6	51	-	57
Neutral	2	3	13	8	26
Negative	2	1	1	1	5
No opinion	-	1	3	9	13
Column Sub-Total	4	11	68	18	

Expectations were:

	Exceeded	Met	Not Met	No Opinion	Row Total
	%	%	%	%	%
Positive	4	12	22	4	42
Neutral	6	8	10	4	28
Negative	4	4	2	4	14
No opinion	-	2	2	8	12
Column Sub-Total	14	26	36	20	
Overall Total	7	16	58	19	

Analysis of the data in Exhibit VII-3 revealed that:

- Overall, 58% of survey respondents reported that their expectations of the system has not been met. Users of VT220s and Displayphones were nearly twice as likely to hold this view than were PC users. In particular, among users of dedicated PCs with MultiMate, 0% reported that their expections had not been met.

- Of those with positive prior expectations, 78% reported that their expectations had not been met.

- Only 7% of the participants surveyed reported that the system had exceeded their prior expectations. Almost all of these individuals' prior expectations had been neutral or negative.

- Of users of dedicated PCs with MultiMate, 91% reported that their expectations had either been met or exceeded.

Based on these data, we conclude that the system as implemented failed to live up to the predominantly neutral or positive prior expectations of Field Trial participants. The only notable exception to this general finding was uses on dedicated PCs with MultiMate. These people made a dramatic "about-face" from negative expectations to positive views of the system.

2. System-generated data

The system-generated data will not provide any information regarding user attitudes toward the OCS System.

3. Participant observation

Users' attitudes appear to vary depending upon how well the functions provided by the system match their needs.

In general, users of the word processors and personal computers feel that the system has met and, for many, exceeded their expectations.

However, mixed reactions have been expressed by RENAISSANCE users. A number of users indicated that they went into the Field Trial with an open mind in terms of their expectations (i.e., a neutral position). They recognized the experimental nature of the Trial and tried not to be too optimistic regarding its outcome. In general, this groups of users appear to be satisfied with the product or, at least, continue to maintain a neutral position.

Conversely, however, a number of individuals had formulated some basic expectations of the product based on early discussions with vendor and project staff. For many of these individuals, RENAISSANCE has not met their expectations. The product does not contain a number of functions and features that were expected to be included. The major missing functions or features that were mentioned include:

- A spreadsheeting capability.
- The tables, logs and ledgers function.
- Adequate formats for DND correspondence.
- Basic "word processing" features such as underlining, tabbing, and cut and paste.

A number of these individuals also expressed disappointment with the performance of the product. They expected the product to be faster in terms of response times, logging on, etc.

During the past thirteen months, there have been some noticeable changes in user attitudes within D COST S, one of the two Mini-Trial nodes. Initially, many of the users were quite negative towards the system because it had not properly addressed their primary need -- the need for a spreadsheeting capability. Over time however, a number of visual display units linked to RENAISSANCE were replaced with personal computers (with Lotus 1-2-3). A change in user attitudes resulted from this move. Today, most of the users in

D COST S are quite positive in their attitude towards this change in configuration of the OCS Field Trial system. However these PC users are positive about the standalone capabilities -- not towards the RENAISSANCE system.

No appreciable changes in overall expectations have been noted in other user nodes.

B. FUNCTIONALITY VERSUS NEEDS

1. Survey data

The post-implementation survey asked two questions related to the match between system functions and the job demands of Field Trial participants. These items asked for level of agreement with the two following statements:

- ▷ Functions which the system performs are well suited to the demands of my job.
- ▷ Documents produced on the system conform to DND standards.

The responses to these items are tabulated in Exhibit VII-4 and 5 below.

It is apparent from these data that only a minority (approximately 22%) of survey respondents perceived a good match between their job demands and the functions provided by the system. The only exception to this finding was participants using a dedicated PC with the MultiMate package, 75% of whom agreed that the functions performed by the system were well suited to the demands of their jobs.

EXHIBIT VII-4 **Extent of agreement with statement: The functions which the system performs are well suited to the demands of my job**

	Terminal Type		
	VT 220/ DPhone	PC	All
Strongly agree	1%	-	1%
Agree	22	25	23
Disagree	28	18	25
Strongly disagree	31	14	25
No opinion	19	43	27

EXHIBIT VII-5 **Extent of agreement with statement: Documents produced on the system conform to DND standards**

	Terminal Type		
	VT 220/ DPhone	PC	All
Strongly agree	-	2%	1%
Agree	31	25	29
Disagree	29	19	26
Strongly disagree	11	15	12
No opinion	30	40	33

One of the factors limiting system use was the lack of conformity to DND standards of documents produced on the system. This situation is reflected in the finding that only 29% of the survey respondents reported that, for their purposes, documents produced on RENAISSANCE could be used for anything other than drafts.

2. System-generated data

System-generated data did not provide any useful information regarding the match between system functionality and job needs or demands.

3. Participant observation

The OCS Field Trial System provides varying levels of functionality to users, depending upon the type of work station that has been made available to the user. For example, users with personal computers can perform spreadsheeting functions or custom applications (at DPS) in addition to accessing the various functions of RENAISSANCE. Secretaries can perform advanced word processing activities on their PCs and also access RENAISSANCE. Displayphone users can access RENAISSANCE and also use the "direct dial" and basic calendaring built into the Displayphone. VT220 users can only access the RENAISSANCE functions.

Most users of personal computers and word processors feel that the OCS system has satisfied their primary needs for spreadsheeting and word processing, respectively. However, they make little use of available RENAISSANCE functions.

Most VT220 and Displayphone users are not satisfied with the level of functionality provided by RENAISSANCE. For most people, the product does not go far enough in terms of the functionality it provides in relation to the job functions the users perform. The product is not appropriate for areas or job

positions that are not involved, to a great extent, in text production. For example, in areas such as D COST S, where most of the daily work revolves around the manipulation and calculation of numbers, RENAISSANCE has limited use. On the other hand, in units such as DFPAS and DPS-3 where much of the work involves the preparation of text documents, RENAISSANCE has had more reasonable acceptance and use.

A number of concerns were expressed about the functions that currently exist in RENAISSANCE. For example, some functions such as calendaring and telephone messages are not very useful. Most people continue to perform these tasks manually. Other functions offered by RENAISSANCE restrict user flexibility by not including certain basic required features. For example, the document preparation and editing function does not include tabbing, cut and paste, underlining and other useful and, (in today's technology) "standard" word processing features. The lack of an annotation capability also restricts, to a certain extent, the amount of electronic communications that take place.

C. SUPPORT TO DECISION MAKING

1. Survey data

Survey respondents were asked the extent to which use of the system allowed them to make better decisions. Exhibit VII-6 summarizes their responses to this item.

EXHIBIT VII-6 **Extent of agreement with statement: Allowed you to make better decisions**

	Terminal Type		
	VT 220/ DPhone	PC	All
Very much	4%	4%	4%
Somewhat	14	38	21
Very little	21	27	22
Not at all	61	31	52
No, just the opposite is true	1	-	1

Examination of the exhibit above reveals that the system was of little assistance in enabling Field Trial participants to make better decisions. Almost 75% of the survey respondents reported that the system was of little or no assistance to them in this regard. This finding was true across terminal types.

2. System-generated data

The system-generated data did not provide any useful data in this area.

3. Participant observation

Participant observations indicate that the OCS Field Trial System has not had a major impact on the decision making process within the DND Trial environment. Few management personnel (i.e., Displayphone users) use their workstations on a regular basis to access incoming messages or to direct work. Some management personnel have forgotten (through the lack of regular use) how to properly access and use the system.

A few organizational units, such as DFPAS, indicated that the RENAISSANCE product has helped in a small way as a support to the decision making process. RENAISSANCE allows these node users to prepare initial drafts of documents and use the communications capability for review and comment on draft material.

In other areas, such as D COST S, the flexibility provided by the spreadsheeting capabilities on the personal computers has assisted management in making decisions. The spreadsheeting capability allows staff to conduct "what if?" analyses and develop alternative models as required. The information obtained through this exercise is useful to the decision-making process.

D. REDUCTION IN INEFFICIENCIES

1. Survey data

Respondents to the post-implementation survey were asked three questions regarding impacts of the system on their work efficiency. Two of the questions asked them to assess whether the system:

- Saved them time in completing their work.
- Helped them to be more efficient in their work.

Exhibits VII-7 and 8 summarize the breakdown of responses to these items.

EXHIBIT VII-7 **Extent of agreement with statement: Saved you time in completing your work**

	Terminal Type		
	VT 220/ DPhone	PC	All
Very much	13%	35%	20%
Somewhat	19	30	22
Very little	15	13	14
Not at all	50	17	40
No, just the opposite is true	4	4	4

EXHIBIT VII-8 **Extent of agreement with statement: Helped you to be more efficient in your work**

	Terminal Type		
	VT 220/ DPhone	PC	All
Very much	7%	36%	16%
Somewhat	25	31	27
Very little	22	13	19
Not at all	46	20	38
No, just the opposite is true	-	-	-

Our analyses of responses to these two items revealed dramatic variation in expected efficiency gains according to terminal type. While two thirds of individuals assigned VT220's or Displayphones reported that the system increased their efficiency either very little or not at all, fully 80% of participants working on a dedicated PC using Multi-Mate reported that their efficiency was increased very much, and two thirds of Field Trial participants assigned a dedicated PC with Lotus 1-2-3 reported that their efficiency was increased very much or somewhat. Responses to the question as to whether or not the system saved them time in completing their work followed a similar pattern.

Survey respondents were also asked whether the system enabled them to replace their paper files with electronic files, or whether they were maintaining duplicate paper and electronic files, or whether they are continuing to maintain only paper files. Exhibit VII-9 summarizes the responses to this question.

EXHIBIT VII-9 Extent of substitution/duplication of paper and electronic files

	Terminal Type		
	VT 220/ DPhone	PC	All
Replaced paper with electronic files	6%	8%	6%
Keep duplicate electronic and paper files	37	33	36
Stayed with paper files only	57	60	58

Analysis of this item revealed that, regardless of terminal type, only 6% of the survey respondents reported replacing their paper files with electronic files. Roughly a third of the individuals surveyed were maintaining duplicate files, with the remainder (approximately 60%) sticking with their paper files exclusively. These data suggest that if anything, the system has had a net negative effect on the efficiency of individuals' filing procedures.

2. System-generated data

System-generated data did not provide any relevant information with regards to the work efficiency of Field Trial participants.

3. Participant observation

A number of users have reported reductions in inefficiences as a result of the introduction of the OCS System. In particular, the word processors (with Multi-Mate) and the personal computers (with Lotus 1-2-3) have contributed greatly to the reduction in time required to prepare and edit documents and spreadsheets, compared to prior manual processes. In addition, staff are able to respond to management and external requests in a more timely fashion.

In general, the RENAISSANCE product appears to have had less of an impact in terms of reducing inefficiencies. Most users feel that there has been little or no impact on job efficiency. However, in certain node environments, such as DFPAS, DFAPA and DPS-3, a number of users feel that the RENAISSANCE product has definitely contributed to improved productivity. They feel that less time is now required to prepare and edit lengthy documents. A few users in these node areas mentioned that they are able to compose text in a more timely fashion using the new technology as opposed to using pen and paper.

E. USER IDENTIFIED ENHANCEMENTS

1. Survey data

Survey respondents were asked whether they had ever offered any suggestions for system improvement. They were also asked how their suggestions, if any, were received by the vendor. Exhibits VII-10 and 11 summarize the responses given to these questions.

EXHIBIT VII-10 Extent to which suggestions for system improvement were offered

	Terminal Type		
	VT 220/ DPhone	PC	All
More than once	30%	27%	29%
Once	15	11	14
Never	55	62	57

EXHIBIT VII-11 Reception accorded users' suggestions for system improvement

	Terminal Type		
	VT 220/ DPhone	PC	All
Welcomed and implemented	33%	29%	32%
Welcomed but not implemented	25	43	30
Acknowledged but not implemented	33	21	30
Ignored	10	7	9

Examination of these exhibits reveals that almost 60% of the Field Trial participants never offered any suggestions for system improvement. On the other hand, almost 30% offered suggestions more than once. No substantial variation was noted in responses to these items according to the respondents terminal type. Almost a third of the suggestions offered were described as being both welcomed and implemented. A further 60% were either welcomed or acknowledged but not implemented. Significantly, only 9% of the suggestions offered were reported as ignored.

2. System-generated data

We did not find any significant information related to user identified enhancements in system-generated data.

3. Participant observation

Users have identified a number of enhancements that they would like to see incorporated in RENAISSANCE. These include:

- A facility to allow the transfer of RENAISSANCE documents to word processors for final editing and printing.
- Improved response time.
- Approved DND formats for letters, minutes, and memos.
- Cut and paste, tabs, underlining, and annotation features for the document preparation and editing function.
- Elimination of the problem(s) that cause terminal crashes.
- A basic spreadsheeting capability.
- A facility to perform arithmetic calculations, similar to that of a calculator.

A number of enhancements have been made to RENAISSANCE since the beginning of the Mini-Trial. For example, the response time has

improved from that experienced in the initial implementation stages. For example, log on times have been reduced somewhat. Many of these changes have been made in response to user feedback. However, performance-related problems continued throughout the trial.

The Mini-Trial was a vital exercise for the project team and the vendor. Based on user feedback, it identified a number of areas where improvements had to be made and facilitated the implementation of the system in the remainder of the user nodes.

F. PHYSICAL ENVIRONMENT

1. Survey data

Field trial participants were asked to express their level of agreement with the three following statements related to their physical work environment:

- The OCS equipment has increased the heat level where I work.
- The OCS equipment has made my workspace uncomfortably crowded.
- The OCS equipment has increased the noise level where I work.

Exhibits VII-12 to 14 summarize the responses to these items.

Examination of these exhibits reveals that in terms of both increased heat and workspace crowding, 13 to 15% of survey respondents reported problems in these areas. Concerns with heat were somewhat more prevalent among PC users than among individuals assigned other terminal types. In contrast, complaints about increased noise levels were expressed by 26% of the survey respondents.

EXHIBIT VII-12 Extent of agreement with statement: The OCS equipment has increased the heat level where I work

	Terminal Type		
	VT 220/ DPhone	PC	All
Strongly agree	2%	10%	5%
Agree	6	14	8
Disagree	35	18	30
Strongly disagree	26	10	23
No opinion	31	42	35

EXHIBIT VII-13 Extent of agreement with statement: The OCS equipment has made my workspace uncomfortably crowded

	Terminal Type		
	VT 220/ DPhone	PC	All
Strongly agree	2%	-	1%
Agree	13	4	14
Disagree	51	43	48
Strongly disagree	17	8	14
No opinion	17	35	23

EXHIBIT VII-14 Extent of agreement with statement: The OCS equipment has increased the noise level where I work

	Terminal Type		
	VT 220/ DPhone	PC	All
Strongly agree	4%	10%	6%
Agree	19	22	20
Disagree	57	29	48
Strongly disagree	10	4	8
No opinion	11	35	18

2. System-generated data

The system-generated data will not provide any information regarding the physical environment of the OCS System.

3. Participant observation

The OCS Field Trial System has had a minor impact on the physical environment of various organizational units. During our observations, the following items were noted with regard to the physical environment:

- Because of the cabling requirements of the system, there is less flexibility in moving offices or compressing office space to accommodate additional staff.
- The space requirements for work stations and the node micro and printer, reduced the amount of work space available to staff. In some areas, such as D COST S, this further compounded an already cramped working environment.
- Some creative manipulation of existing furniture has been performed by some users in order to make themselves comfortable using their terminals. For example, the System Manager has elevated her screen to eye level and lowered the keyboard below normal desktop level. She feels that this is the most comfortable positioning of the screen and keyboard for her.

4. Physical Environment Review

To supplement our survey and participant observation data, we performed two detailed reviews of the physical environment at the Field Trial site. Specifically, we conducted a pre-installation review of the physical environment at the various test sites. As the trial progressed, we monitored the impact of various environmental factors as part of our participant observation data collection. Then, at the conclusion of our data collection activities, we conducted a post-installation environmental review. The reviews are based on observations, interviews with selected staff, and feedback from our survey data.

We have focused the reviews on the following environmental factors:

- Office layout.
- Office furniture.
- Lighting.
- Noise levels.
- Ventilation and heat levels.

Our findings are summarized below. A brief outline of the pre- and post-physical environment at each site is summarized in Exhibit VII-15.

a) Summary of pre-installation findings

Our pre-installation review did not turn up any environmental conditions that were likely to have a major positive or negative impact on the success of the Field Trial. (Refer to the Pre-Installation sections of Exhibit VII-15 for a summary of our findings.) Two significant pre-installation problems existed, both of which were recognized by the project team. The first involved the secretaries who would be receiving word processing equipment. They did not have desks that would properly accommodate the equipment. To correct this, all secretaries receiving word processing equipment were provided with new desks and tables.

The second problem involved the D Cost S and DB area on the 15th floor, NDHQ-NT. This area was crowded, and individual work areas were cluttered. Problems were anticipated with the installation of the Field Trial equipment, including additional cluttering, heat, and noise. To address this, the office layout was reviewed, with plans for expanding the D Cost S and DB areas. However, additional space was not made available during the life of the field trial.

Exhibit VII-15 Outline of the pre and post physcial environment at each trial site

Site	Office layout	Existing furniture	Lighting	Noise levels	Ventilation
	A. Pre-installation				
NDHQ 8th Floor CBS	▶ Open concept ▶ Eye level fabric dividers, some of different colour and size ▶ Some walled offices on the perimeter ▶ Moderately cluttered	▶ Most people receiving standard terminals have desks with returns, where the terminals can be placed ▶ Secretaries receiving word processors will get new desks	▶ Overhead florescent light fixtures ▶ Some natural light reaches the open concept area ▶ Ambient illumuniation levels appear "typical" ▶ Some users may face a potential glare problem.	▶ Low	▶ No special problems
	B. Post-installation				
	▶ Same as pre-installation	▶ Secretaries with WP's received new desks	▶ Same as pre-installation	▶ Low	▶ No special problem
	A. Pre-installation				
NDHQ 14th Floor NT	▶ Open concept ▶ Eye level fabric dividers of uniform colour and type ▶ Some walled offices on the perimeter ▶ Does not appear cluttered	▶ One or two people may find it inconvenient to locate the standard terminal on their desks ▶ Secretaries receiving word processors will get new desks	▶ Same as 4th Floor	▶ Low	▶ Some staff have complained of poor ventilation caused by room dividers which have no floor level gap
	B. Pre-installation				
	▶ Same as pre-installation	▶ Secretaries with WP's received new desks	▶ Same	▶ Same	▶ Same as pre-installation. Trial had no impact on this floor
	A. Post-installation				
NDHQ 15th Floor NT	▶ Open concept ▶ Crowded and cluttered, but the layout is being revised ▶ Some walled offices on the perimeter ▶ The layout may be a partial detriment to planned equipment sharing	▶ Several people may find it inconvenient to locate the standard terminals on their desks (several desks have small surface areas and are cluttered due to the characteristics of work and the nature of the individuals ▶ Secretaries receiving word processors will get new desks	▶ Same as 8th Floor	▶ Moderately high	▶ No special problems
	B. Post-installation				
	▶ Slightly more crowded and cluttered as a result of trial	▶ Secretaries with WP's received new desks ▶ Some creative space utilization by some users to accommdate their workstation	▶ Same ▶ Some creative positioning of screens to reduce glare	▶ Noise level - moderately higher because of the trial	▶ Some heat problems initially around one node computer located in an open area. Problem partially solved.

Exhibit VII-15 Outline of the pre and post physcial environment at each trial site (cont'd)

Site	Office layout	Existing furniture	Lighting	Noise levels	Ventilation
	A. Pre-installation				
NARONO Building	▶ Open landscape ▶ Some open areas some with eye level partitions ▶ Some walled offices along the perimeter ▶ A production oriented office. More physical travel	▶ Old but solid ▶ May require separate table/ stands for shared equipment	▶ Same as NDHQ 8th Floor	▶ Moderate	▶ Older building ▶ No special problems
	B. Post-installation				
	▶ Same as pre-installation	▶ Same ▶ Additional tables made available for equipment	▶ Same	▶ Same	▶ Same
	A. Pre-installation				
CFB Base Comptroller's Office (Building 84)	▶ Older brick building ▶ Walled offices, some open areas ▶ Moderately crowded ▶ A production oriented office. More physical travel	▶ Old but solid ▶ May require separate tables/ stands for shared equipment	▶ Overhead florescent light fixtures. Some task lighting	▶ Moderate	▶ Older building ▶ No central air conditioning
	B. Post-installation				
	▶ Same as pre-installation	▶ Same ▶ Additional tables made available for the equipment	▶ Same	▶ Same	▶ Some heat problems initially in node area
	A. Pre-installation				
CFB Air Command and HQ Comptroller (Building 13 and 2)	▶ Old frame building ▶ Walled offices narrow corridors	▶ Old but most is solid	▶ Overhead florescent light fixtures. Some task lighting	▶ Moderate	▶ Poor ▶ Possible problem in providing a proper environment for the computer. May need air conditioning
	B. Post-installation				
	▶ Same as pre-installation	▶ Same	- Same	▶ Same	▶ Same heat problems intially in node area

b) Office layout

No major changes in office layout were made in any of the areas during the trial. Consequently, the crowded conditions in the D Cost S and, to a lesser extent, the DB areas were aggravated by the installation of the Field Trial equipment. Many of the workstations in this area ended up as PC's, and many of these were shared. Because of already crowded conditions, several of these PC's and associated printers and plotters were placed on tables in aisles or in "cubby holes" abutting aisles. In addition, space had to be made available in the area for the system node and printer.

Despite these crowded conditions, however, the PC's were used heavily, primarily for spreadsheet modelling. (RENAISSANCE and the other facilities were not, except in a few instances, used to any extent in this area.) From the users' view a spreadsheet modelling capability is well suited as a direct aid to the work that goes on in D Cost S and DB, and had been identified as required for the area before the Field Trial. The additional crowding of the office layout had little or no effect on PC usage in this area, primarily because the users were experiencing benefits that out-weighed the inconvenience of using shared equipment in a crowded environment. The users in this area also tended to be more highly motivated. This illustrates the adaptability of motivated users when direct benefits to themselves are perceived.

No privacy problems were mentioned by users. This aspect of the office layout which in some cases allowed people to view the screens of others, was not considered a problem.

Office layout did not have a significant impact in any other areas of the Field Trial. However, as was mentioned earlier, the cabling requirements of the Field Trial restricted the ability to readily make adjustments to the office layout. This is a major inconvenience in the DND environment, with its regular and frequent staff changes.

c) Office furniture

With a few exceptions, only the secretaries who received word processors got new office furniture to accommodate their workstations. The secretaries were generally pleased with the new desks they received. Aside from the real need by the secretaries for new desks to accommodate the equipment, the act of providing new furniture served as an important factor in some cases in convincing the secretaries to take a more positive attitude toward accepting the equipment.

Most other users had to use their existing furniture to accommodate their workstations, or acquire additional tables from the existing DND furniture stock. This existing furniture stock is diverse, and none of the desks were adjustable (except for some tables acquired for use with existing computer equipment). This caused two types of potential problems:

- Sub-optimal positioning of the keyboards and screens from an ergonomic perspective.
- Crowding of the work area.

Neither of these were identified by the users as major problems. As was mentioned before, this is partly a reflection of the creative manipulation by some users of their furniture to make themselves more comfortable in using their workstations. It may also be an indication that sub-optimal ergonomic conditions have little negative impact for casual users, at least in the short term.

A problem indirectly related to office furniture and experienced by users, particularly in NDHQ, was static electricity. The type of carpet used in NDHQ contributed to this problem. Static was the suspected cause of some early equipment problems, but was primarily a nuisance to the users. To address this problem, anti-static pads were acquired for many of the terminals within NDHQ. In addition, the project team periodically sprayed the carpet with anti-static solution in problem areas. This reduced the static problem to the level of an occasional irritant.

d) Lighting

The NDHQ and Narono buildings use overhead fluorescent lighting at standard illuminance levels. The open concept layout at NDHQ allows natural light to reach most work areas. This is also true, but to a lesser extent, in the Narono building. The older buildings in the Winnipeg locations use overhead fluorescent lighting supplemented by task lighting in some offices.

Glare and reflections from overhead artificial lighting and windows was a problem for some users. Users near windows generally kept the blinds drawn or positioned their equipment to reduce glare.

Glare from overhead lighting was more of a problem for users of VT 220 terminals. This terminal has a low profile screen. It is designed to be placed on a standard desk, with the screen tilted at an upward angle. Depending on its placement with respect to overhead lighting, glare and reflection problems could be experienced. To get around this problem, some users used boxes, books, and other make-shift arrangements to adjust the height and angle of these screens. No filters or screen mats were used.

In summary, users did not identify any problems related to illuminance levels. Some users experienced glare and reflection problems which they were able to partly address through makeshift arrangements. However, these were considered as minor problems by the users, with no direct impact on system usage.

e) Noise levels

Problems with increased noise levels were expressed by about 26% of the users, with about 6% indicating a significant increase in noise levels because of the trial. Equipment contributing to the noise levels included:

- Cooling fan and printer noise at the system nodes, particularily those located in open areas on the 8th and 15th floors, NDHQ.

- Printer noise from the local dot matrix printers and plotters connected to the PC's.
- Fan noise from the PC workstations.

These are discussed briefly below.

The printers located at the system nodes and those attached to the word processors had sound covers. These were effective in reducing printer noise. However, several users with work places adjacent to the system nodes located in open areas on the NDHQ 8th and 15th floors initially complained of noise. This noise was generated in part by the cooling fan and "hum" of the node microcomputers, and in part by the noise occasionally produced by the small printer attached to record system monitoring data. (The small matrix printers used for this function were not enclosed in sound covers.) This noise was not considered a major irritant, particularly on the 15th floor where noise levels were already moderately high because of the open concept layout and crowding.

Printer noise from the local matrix printers and plotters connected to the PC's was mentioned as a problem, particularly in the D Cost S area, where several of these printers were located. People in this area also mentioned the noise generated by the fan noise "hum" of the PC's. This noise, particularly the noise of the printers, contributed to what was already moderately high noise level. However, aside from some mild complaining about noise, the users in this area did not feel that the noise levels impacted system usage, or had a negative impact in general on their overall job performance.

Many of the users who mentioned noise problems at the beginning of the trial considered noise to be less of a problem as the trial progressed. This seems to indicate that, at low to moderate noise levels, abrupt changes in the noise level are far more disruptive than absolute noise levels, which users seem to be able to adapt to over time.

f) Ventilation and heat levels

With a few exceptions, ventilation and heat levels were not significantly impacted by the Field Trial. There were some initial problems with heat levels at the system node areas where the supervisors were located. This caused some hardware problems. These were corrected by redesigning the cabinets enclosing the system node microcomputers, and by improving the ventilation in the node areas.

Increased heat levels were mentioned by a few PC Users in the crowded D Cost S/DB area, and by users located immediately adjacent to one of the system nodes located in an open area. However, for most users, ventillation and heat levels were not a problem.

VIII

FINDINGS: HUMAN AND SOCIAL ISSUES

A. QUALITY OF WORKING LIFE

1. Survey data

The post-implementation survey posed four questions directed at aspects of the possible impact of the system on the quality of working life at the Field Trial site. These questions asked respondents to assess the level of impact of the system with respect to the four following statements:

- ▷ Reduce the number of boring tasks you do.
- ▷ Increase your job satisfaction.
- ▷ Make people less accessible to each other.
- ▷ Improved interpersonal relations.

Exhibits VIII-1 to 4 summarize the responses to these questions.

These data indicate that in terms of reduction in the number of boring tasks required and increased job satisfaction, the Field Trial System substantially improved the quality of working life for PC users. This is reflected in the 39% of PC users (including 73% of users of dedicated PCs with MultiMate) who reported that the system increased their job satisfaction "very much". The same finding does not hold for individuals assigned to other terminal types. For example, 43% of VT220/D-phone users reported that the system did not increase their job satisfaction level at all. Similarly, 56% of these individuals reported that the system did not at all reduce the number of boring tasks they do in their jobs. A comparable figure for PC users is 24% (including 0% of users of

EXHIBIT VIII-1 Reported extent of system impact: Reduced the number of boring tasks you do

	Terminal Type		
	VT 220/ DPhone	PC	All
Very much	4%	27%	11%
Somewhat	16	29	20
Very little	22	20	21
Not at all	56	24	47
No, just the opposite is true	2	-	1

EXHIBIT VIII-2 Reported extent of system impact: Increased your job satisfaction

	Terminal Type		
	VT 220/ DPhone	PC	All
Very much	7%	39%	17%
Somewhat	24	22	23
Very little	25	13	21
Not at all	43	24	37
No, just the opposite is true	2	2	2

EXHIBIT VIII-3 Reported extent of system impact: Made people less accessible to each other

	Terminal Type		
	VT 220/ DPhone	PC	All
Very much	4%	-	3%
Somewhat	8	24	13
Very little	15	17	16
Not at all	67	54	63
No, just the opposite is true	6	4	6

EXHIBIT VIII-4 Reported extent of system impact: Improved interpersonal relations

	Terminal Type		
	VT 220/ DPhone	PC	All
Very much	1%	7%	3%
Somewhat	7	18	10
Very little	30	18	26
Not at all	59	55	58
No, just the opposite is true	3	2	3

dedicated PCs with LOTUS 1-2-3.) It is clear that in these two areas at least, the introduction of PCs has had a substantial effect on the perceived quality of working life reported by these individuals.

The two items related to interpersonal relations showed no appreciable effect of the system on either PC users or users of other terminal types.

2. System-generated data

The system-generated data will not produce any information related to the issue of quality of working life.

3. Participant observation

Many system users feel that the automated functions provided by the OCS System have improved the quality of their working lives. The users of word processors and personal computers, in particular, noted definite improvements. Some of the individuals that use RENAISSANCE on an ongoing basis also noted improvements. However, the majority of infrequent users of RENAISSANCE feel that there has been little or no change in the quality of their working lives. Few have expressed negative opinions.

Secretaries using word processors cited the ease with which documents can now be typed and edited (in comparison to the effort that was required using electric typewriters). Many secretaries also noted that the quality of documents being forwarded for typing has improved, since many draft documents are now prepared by the authors using RENAISSANCE. The improved legibility of these documents has helped the secretaries in their jobs. Some secretaries have noted that they now have more time to attend to other secretarial activities (i.e., other than typing).

The users of the personal computers (i.e., with Lotus 1-2-3) feel that the automated spreadsheeting capability has helped to free up time. In turn, this available time can be used to perform other activities which, before, would probably not get done (or, at least, get done less fre Some users noted that their working life seems to be less hectic. The automated spreadsheeting capability has reduced, to a certain extent, many repetitive, boring tasks.

Some RENAISSANCE users feel that the product has enhanced their ability in creating documents, letters, etc. It has reduced the number of drafts that would normally result in a "hand-writing" environment. A few users mentioned that they seem to be able to compose material better using the document preparation and editing capabilities of RENAISSANCE. However, the majority of users with VT220s and Displayphones feel that the system has had no or very little impact on the quality of their working lives.

There appears to be a direct correlation between the quality of working life and the quality of work products produced. In almost all cases where the users identified a definite improvement in quality of working life, they were also quick to point out that the quality of their products has improved. If users feel that they have become more efficient in their work and the quality of their work has improved, they feel a sense of satisfaction. Hence, the quality of working life improves.

B. HEALTH, SAFETY AND STRESS

1. Survey data

Survey respondents were asked two questions related to health issues. These questions asked them to assess the extent to which the system had impacts as follows:

- Possibly had harmful effects on your health.
- Increased personal stress.

Exhibits VIII-5 and 6 summarize the responses to these items.

EXHIBIT VIII-5 Reported extent of system impact: Possibly had harmful effects on your health

	Terminal Type		
	VT 220/ DPhone	PC	All
Very much	-	2%	1%
Somewhat	1	18	6
Very little	6	16	9
Not at all	93	59	83
No, just the opposite is true	-	5	1

EXHIBIT VIII-6 Reported extent of system impact: Increased personal stress

	Terminal Type		
	VT 220/ DPhone	PC	All
Very much	1%	2%	1%
Somewhat	13	11	12
Very little	18	32	22
Not at all	68	49	62
No, just the opposite is true	1	6	3

Only one of the one hundred VT220/Displayphone users surveyed reported that the system harmed his or her health either very much or somewhat. Fully 93% of these individuals reported that the system harmed their health "not at all". The situation is quite different for PC users. For this group, over 20% reported the possibility that the system had harmful effects on their health either very much or somewhat. We examined these responses to establish whether gender-related differences were present. A more detailed breakdown of the health responses is given in Exhibit VIII-7. No differences existed between male and female VT220 users. However female PC users were significantly more concerned about health related problems -- 36% were somewhat or very much concerned, versus 0% of males. Interestingly, male PC users were somewhat more concerned about health effects than male VT220/Displayphone users (17% very little or somewhat concerned, compared to 6%).

Analysis of the item on increased stress indicates little perception that the system has had a negative effect in this area. In fact, the number of individuals reporting that the system had very much increased the stress of their job was exceeded by the number of individuals who reported an opposite impact of the system. At the same time, 45% of PC users (compared to 32% of VT220/DPhone users) identified some increase in stress. Overall data suggest that introduction of the system has not substantially increased the level of stress experienced by Field Trial participants.

Again, we examined the responses for gender-related differences. The analysis is shown in Exhibit VIII-8. We identified several significant variations. This was consistent across all terminal types. Whereas 71% of males responded not at all or the opposite is true, only 51% of females held this view. Further 21% of females (compared to 10% of males) felt that the system somwhat or very much increased personal stress.

EXHIBIT VIII-7 Possibly had harmful effects on your health — differences in response by gender

	VT220/ Phone		PC		ALL	
	Male %	Female %	Male %	Female %	Male %	Female %
Very Much				4		2
Somewhat	1			32	1	17
Very little	5	5	17	16	7	13
Not at all	94	95	72	48	90	67
No, just the opposite	—	—	11	—	2	—
No. of responses	79	21	18	25	97	46

EXHIBIT VIII-8 Increased personal stress

	Male %	Female %	All %
Very much	1	2	1
Somewhat	9	19	12
Very little	19	28	22
Not at all	69	7	62
No, the opposite is true	2	4	3

2. System-generated data

The system-generated data will not provide any information related to this issue.

3. Participant observation

A few users experienced a little apprehension or stress prior to and during the initial implementation of the system. However, this subsided shortly after the training sessions were completed and the users had an opportunity to get some hands-on experience.

A few users noted that the slow response time of RENAISSANCE in logging on, waiting for commands to finish, and other reliability problems has added an element of stress to their jobs.

The majority of users interviewed during participation observations indicated that there has been no significant impact on personal health, safety, or stress.

C. INCENTIVES, REWARDS AND SANCTIONS

1. Survey data

Four questions on the post-implementation survey provide information on incentives to use the system within the Field Trial. These questions asked:

- Whether the respondents' immediate supervisor encouraged him/her to use the system when it was first introduced.
- Whether the supervisor used the system him/herself at that time.

- Whether the supervisor encourages system use now.
- Whether the supervisor uses the system him or herself now.

The responses to these questions are summarized in Exhibits VIII-9 through 12.

EXHIBIT VIII-9 **Extent to which supervisor encouraged system use when the system was first introduced**

	Terminal Type		
	VT 220/ DPhone	PC	All
Did encourage	75%	70%	74%
Did not	25	30	26

EXHIBIT VIII-10 **Extent to which supervisor was seen to use system him/herself when the system was first introduced**

	Terminal Type		
	VT 220/ DPhone	PC	All
Regularly	32%	27%	30%
Occasionally	22	29	24
Rarely	18	16	17
Never	9	22	13
Don't know	19	7	15

EXHIBIT VIII-11 Extent to which supervisor currently encourages system use

	Terminal Type		
	VT 220/ DPhone	PC	All
Did encourage	45%	46%	46%
Did not	55	54	54

EXHIBIT VIII-12 Extent to which supervisor is currently seen to use system

	Terminal Type		
	VT 220/ DPhone	PC	All
Regularly	20%	12%	18%
Occasionally	19	27	21
Rarely	22	32	25
Never	18	20	19
Don't know	20	10	17

Exhibits VIII-9 through 12 support the following conclusions concerning the extent to which system use was encouraged and modelled by the supervisors of Field Survey participants:

- Most survey respondents (74%) reported being encouraged by their supervisors to use the system at the time of its introduction.
- 54% of supervisors were described as regular or occasional users of the system when it was first introduced.
- At the time of the follow-up survey, only 46% of the respondents reported that their supervisors encouraged use of the system.

- Again at the time of the follow-up survey, only 39% of supervisors were described as regular or occasional system users.

It is clear from these data that both the extent to which system use is encouraged by supervisors, and the extent to which supervisors are themselves using the system has declined markedly from the time at which the system was introduced to the time of the follow-up survey.

2. System-generated data

The system-generated data will not provide information relevant to incentives to use the system.

3. Participant observation

In the initial stages of implementation, a number of supervisory personnel actively promoted the use of the system by using the system themselves and also promoted their subordinates to use the system. However, after a brief period of time, the use of the system by supervisors began to wane. This was seen by some users as a negative or at best neutral position with regard to the OCS System.

A number of users (particularly, amongst civilians) feel that the skills and experience obtained through the OCS Field Trial have, to a certain extent, made them more "marketable". Also, a number of users noted that they are now more aware and knowledgeable of office automation and what this actually entails. From a social standpoint, they are now able to discuss with peers and other interested parties the pros and cons of office automation in general. The OCS Field Trial experience has heightened users awareness of office automation and, to a certain extent, has shed some light on the "mystique" that appears to surround this particular issue.

D. PRIVACY AND SECURITY

1. Survey data

Three questions were asked on the post-implementation survey concerning the issues of privacy and security. The first question asked respondents to express their level of agreement with the following statement:

- The system provides as much security for my work as paper files.

Exhibit VIII-13 summarizes the responses to this item.

EXHIBIT VIII-13 Extent of agreement with statement: The system provides as much security for my work as paper files

	Terminal Type		
	VT 220/ DPhone	PC	All
Strongly agree	6%	8%	7%
Agree	39	18	33
Disagree	14	6	12
Strongly disagree	11	12	11
No opinion	30	55	38

As can be seen in VIII-13, opinion on this issue is fairly evenly divided among those who agree, those who disagree and those who have no opinion to express. Comparisons between those individuals assigned to PCs and those assigned to other terminal types show that VT220 and Displayphone users are relatively more likely to agree with the statement while PC users are likely to have no opinion on the matter one way or another. This may reflect the comparatively low level of use of the RENAISSANCE product by PC users.

The follow-up survey also asked Field Trial participants to assess the extent of impact of the system on their work in terms of whether the system:

- Allowed less control over their work.
- Limited their personal privacy.

Exhibits VIII-14 and 15 summarize the responses to these items.

Examination of Exhibits VIII-14 and 15 indicate that losses of privacy and/or control over their work are not viewed as problems by the survey respondents. Specifically, 90% of the individuals surveyed reported that the system limited their personal privacy either very little or not at all. In terms of reduced control over their work, only 7% of the survey respondents believe that the system had either a very much or somewhat negative effect in this area. Conversely, 81% of the survey respondents reported that the system reduced control either very little or not at all, while 12% reported that the opposite effect was true. It is clear from these data that loss of privacy and loss of control over their work are not seen as problems by the survey respondents.

EXHIBIT VIII-14 **Reported extent of system impact: Allowed less control over your work**

	Terminal Type		
	VT 220/ DPhone	PC	All
Very much	-	2%	1%
Somewhat	5	11	7
Very little	10	13	11
Not at all	70	58	70
No, just the opposite is true	10	16	12

EXHIBIT VIII-15 Reported extent of system impacts: Limited your personal privacy

	Terminal Type		
	VT 220/ DPhone	PC	All
Very much	1%	2%	1%
Somewhat	4	13	7
Very little	11	13	11
Not at all	82	69	78
No, just the opposite is true	2	2	2

2. System-generated data

The system-generated data will not provide any information relevant to the issues of privacy and security.

3. Participant observation

Before the Field Trial began, DND established a policy that classified information was not to be recorded/entered into the OCS System. The RENAISSANCE System was not designed to accommodate classified information. To a certain extent, this limited the use of the system in some areas. Some groups (notably D Cost S and D Fin S) had identified this concern at the beginning of the project.

However, within the established security guidelines for the system, most users expressed satisfaction with the security related aspects of the system. They felt that the proper use of user identification and passwords provided adequate protection to the material kept in the system.

The majority of users felt that the OCS System has had no impact on their personal privacy. However, a few users expressed concern about the general simplicity of user identification and passwords. They felt that it would not be very difficult to access another person's workspace given the common knowledge, understanding and simplicity of the user identification and password structure.

E. MORALE AND MOTIVATION

1. Survey data

Five questions were asked on the post-implementation survey related to the issue of morale and motivation. These questions asked survey respondents to rate the extent to which the system had the following effects on their work:

- Allowed them to be more creative in their work.
- Provided less opportunity for personal achievement.
- Resulted in less job security.
- Made their work day more interesting.
- Because the people they worked with use the system, they were able to be more productive in their jobs.

Exhibits VIII-16 through 20 summarize the responses to these items.

EXHIBIT VIII-16 **Reported extent of system impact: Allowed you to be more creative in your work**

	Terminal Type		
	VT 220/ DPhone	PC	All
Very much	7%	25%	12%
Somewhat	31	36	33
Very little	19	16	18
Not at all	42	23	36
No, just the opposite is true	1	-	1

EXHIBIT VIII-17 **Reported extent of system impact: Provided less opportunity for personal achievement**

	Terminal Type		
	VT 220/ DPhone	PC	All
Very much	-	-	-
Somewhat	3%	4%	3%
Very little	15	18	10
Not at all	75	62	71
No, just the opposite is true	8	16	10

EXHIBIT VIII-18 Reported extent of system impact: Resulted in less job security

	Terminal Type		
	VT 220/ DPhone	PC	All
Very much	1%	7%	3%
Somewhat	4	2	3
Very little	10	23	14
Not at all	82	61	70
No, just the opposite is true	3	7	4

EXHIBIT VIII-19 Reported extent of system impact: Made your work day more interesting

	Terminal Type		
	VT 220/ DPhone	PC	All
Very much	9%	28%	15%
Somewhat	28	39	31
Very little	30	17	26
Not at all	32	15	27
No, just the opposite is true	1	-	1

EXHIBIT VIII-20 **Reported extent of system impact: Because the people I work with use the system, I am able to be more productive in my work**

	Terminal Type		
	VT 220/ DPhone	PC	All
Very much	2%	18%	7%
Somewhat	18	31	22
Very little	20	20	20
Not at all	58	29	49
No, just the opposite is true	2	2	2

Examination of Exhibits VIII-16 through 20 revealed the following findings regarding morale and motivation:

- Many users reported some contribution of the system to their creativity. 61% of PC users reported this impact either very much or somewhat. These positive responses were somewhat more typical of MultiMate users (and therefore female) than of users of LOTUS 1-2-3. In contrast, 38% of VT220/Displayphone users reported no such effect at all. A comparable figure for PC users was found to be 23%. It is evident that the functions offered by the PCs are supporting the expression of more creativity in the work of PC users than are the other terminal types.

- Most respondents (71%) reported no reduction in opportunity for personal achievement associated with the introduction of the system. In fact, 10% of Field Trial participants reported that the system increased opportunities for achievement. This finding applies to users of all types of terminals.

- 88% of the survey respondents reported either very little or no effect of the system in terms of reducing job security. Interestingly, responses from PC users were more varied. While almost 7% of PC users perceived the system as having increased their job security, another 7% reported very much reduced job security.

- System impact on the participants' interest in their work day was generally neutral to positive. The level of reported system-induced increase in work interest varied depending on terminal type. More than two thirds of PC users reported that the system increased their interest in their work either very much or somewhat. Again, the most positive responses came from users of MultiMate. In contrast, two thirds of VT220/Displayphone users reported either very little or no such increase.

- The extent to which co-workers use of the system helped respondents to be more productive in their own work also varied according to terminal type. This effect was reported to be either very much or somewhat the case by almost 50% of PC users. In contract, 78% of VT220/Displayphone users reported that this impact occured either very little or not at all.

2. System-generated data

The system-generated data will not produce any information relevant to the issues of morale and motivation.

3. Participant observation

The implementation of the OCS Field Trial System has not had an identifiable impact on staff turnover or absenteeism.

In the pre-implementation stages of the OCS System, potential users expressed a relatively high degree of enthusiasm towards the Field Trial. However, after a lengthy implementation period and persistent reliability problems with the equipment and software, users became frustrated and expressed concerns regarding the potential usefulness and benefits that the trial would bring. During the past five months (i.e., from the official start-up of the Field Trial), the level of frustration has dropped considerably from that which was previously observed.

Most users indicated that levels of group morale have not been significantly affected by the implementation and ongoing operation of the OCS System. On an individual basis, a few users noted that the system has provided

an incentive to come to work. They view system products as being something new, challenging and worthwhile to their job function. To this extent, individual morale for a few users of RENAISSANCE has been positively influenced.

A number of efforts have been made to motivate individuals to use the system. For example, shortly after the inter-node communications capability was installed, PM OCS and other project personnel began sending memos to various users to encourage the use of this facility. In addition, management personnel in some organizational units have been very supportive of the system and encouraged its use. By these actions, they have, to a certain extent, encouraged the use of the system. However, in recent months these activities have been somewhat curtailed.

IX

FINDINGS: ORGANIZATIONAL ISSUES

A. DEMOGRAPHICS VERSUS ISSUES

1. Survey data

The data from the post-implementation survey were extensively analyzed for possible relationships between participant characteristics and system impacts. The only potentially interesting set of relationships identified through this analysis was found in cross-tabulations of participant sex and level of use, harmful health effects, personal and increases in job skill requirements. Female participants were significantly more concerned about health issues and somewhat more concerened about increases in personal stress. The health related differences were specifically related to the use of PCs, and largely to those women who are word processing users (as were the comments regarding increased skill improvements).

We concluded that none of the participant characteristics we measured including sex, tenure in current position, age, level of formal education, rank and supervisory responsibility are reliably associated with differential perceptions of system impact other than described above.

2. System generated data

System generated data will not provide any information relevant to demographic issues.

3. Participant observation

Our participant observation activities did not produce any information relevant to the interaction between participant demographics and perceptions of system impact.

B. JOB DESIGN

1. Survey data

Information on system-related changes in job design were obtained from three questions on the post-implementation survey. Two of the questions were partially open-ended. They were:

- Has the system changed the content of your job (that is, what you do)? If so, please describe.
- Has the system changed how you do your job? If yes, please describe.

Exhibits IX-1 and 2 summarize the responses to the yes/no components of these items.

EXHIBIT IX-1 Percentage of participants who see the system as having changed their job content

	Terminal Type		
	VT 220/ DPhone	PC	All
Job content changed	5%	15%	8%
Not changed	95	85	92

EXHIBIT IX-2 **Percentage of participants who see the system as having changed how they do their jobs**

	Terminal Type		
	VT 220/ DPhone	PC	All
How job done changed	17%	28%	20%
Not changed	83	72	80

Our findings with respect to reported changes in job content can be summarized as follows:

- Whereas 15% of PC users reported change in job content, only 5% of VT220/Displayphone users also reported any such change. The user groups most often reporting changes in job content were users of PCs with the MultiMate package, 21% of whom reported such a change. Specific changes reported by PC users included improved productivity reflected in both volume of output and quality, the fact that more drafts of text material are prepared (presumably due to the availability of advanced word processing capabilities) and the fact that, since professional staff are preparing drafts of their text and correspondence using the system, it is easier for the secretary doing the final typing to read the draft material. Only one type of change in job content was pointed to with any frequency by VT220/Displayphone users. This was the observation that professional staff are now doing some of their own typing.

- With respect to changes in how they do their jobs, PC users were again much more likely to report changes than were VT220/Displayphone users. Specifically, 28% of PC users reported a change in how they do their jobs as opposed to only 17% of users of other terminal types. The user group most often reporting these changes were users of dedicated PCs with MultiMate (55%). Types of changes most frequently reported concerned the use of the system to perform some functions more efficiently (for example, data analysis) than was previously possible.

Survey respondents were also asked to rate the extent to which the system had increased the skill requirements of their jobs. Exhibit IX-3 summarizes the responses to this item.

EXHIBIT IX-3 Reported extent of system impact: Increased the skill requirements for your job

	Terminal Type		
	VT 220/ DPhone	PC	All
Very much	2%	24%	9%
Somewhat	27	24	26
Very little	29	20	27
Not at all	41	31	38
No, just the opposite is true	1	-	1

Exhibit IX-3 shows that almost 50% of PC users regard the skill requirements of their jobs as having been increased by the system. This finding was most frequently reported by individuals using Multi-Mate on a dedicated PC. Fully 90% of these Field Trial participants reported that the system increased their job skill requirements either very much or somewhat. In contrast, 70% of individuals using VT220s and Displayphones reported either very little or no increase in their job skill requirements associated with the introduction of the system.

2. System-generated data

The system-generated data will not provide any information relevant to the issue of job design.

3. Participant observation

Many users feel that the products provided through the Field Trial have added an extra element of challenge to their jobs. A number of users

noted increased skill requirements to perform their job functions. A higher proportion of word processor/personal computer users made this comment as opposed to users of VT220s and Displayphones. The skills required to use personal computers and word processors are clearly higher than those associated with other terminal types. The most frequently cited examples of increased skill requirements include:

- Typing skills.
- Knowledge of how to use certain software products, such as Multi-Mate, Lotus 1-2-3 and RENAISSANCE
- Operation of equipment/devices.

A few node managers also mentioned the increased knowledge and skills associated with being assigned the role of node manager.

C. TRAINING

1. Survey data

Of the respondents to the post-implementation survey, 79% reported having attended training on system use. The survey examined the extent to which these individuals believe that they were ready to use the system after completing training. Exhibit IX-4 summarizes their responses to this item.

It is apparent that the general reaction to the training provided on system use was for the most part quite positive. Fully 88% of the survey respondents reported that they were either completely, or with help, ready to use the system after training. It is worth noting however that of the participants surveyed, 21% had not attended the training sessions. Some, but not all of these individuals would be fairly recent arrivals at the Field Trial site. However, a substantial proportion of individuals who were considered to be system participants but had not in fact received training pointed to the need for some systematized approach to training individuals who were not in their current positions when the system was first introduced.

EXHIBIT IX-4 **Extent to which participants saw themselves as ready to use system after training**

	Terminal Type		
	VT 220/ DPhone	PC	All
Completely ready	19%	10%	16%
Ready with help	57	59	58
Not really ready	8	12	9
Not at all ready	1	2	1
Not trained	16	18	16

Questions were also asked regarding the follow-up support provided by the vendor and PM OCS personnel after training. Exhibits IX-5 and 6 summarize the responses to these items.

EXHIBIT IX-5 **Reaction to XIOS follow-up support**

	Terminal Type		
	VT 220/ DPhone	PC	All
Very helpful	17%	20%	18%
Adequate	42	46	44
Less than needed	5	6	5
No help at all	4	-	3
Not applicable	32	28	31

EXHIBIT IX-6 Reaction to PM OCS follow-up support

	Terminal Type		
	VT 220/ DPhone	PC	All
Very helpful	24%	38%	28%
Adequate	55	47	52
Less than needed	4	4	4
No help at all	18	11	16

Exhibits IX-5 and 6 indicate that, for the most part, the follow-up support provided by both XIOS and PM OCS was favourably regarded. Particularly, XIOS follow-up support was rated as either very helpful or adequate by 62% of the survey respondents. A comparable figure for follow-up support provided by PM OCS was 80%. Readers should note that almost one participant in three replied "not applicable" to the question of XIOS follow-up. Presumably, these people had no follow-up contact with vendor staff. These findings were consistent across terminal types. (Note: we speculate that in some cases participants may not have been clear as to what follow-up was handled by XIOS and what by PM OCS.)

2. System-generated data

The system-generated data will not yield any information relevant to the issue of training.

3. Participant observation

In general, most users feel that the training they received on the system was sufficient. However, mixed reactions were expressed regarding the

training on the Multi-Mate and Lotus 1-2-3 software packages. Some users felt that the training sessions on these packages were too technical. As a result, they reported problems following the material content of the course. Other users felt that the training was satisfactory. It is interesting to note that in general, the users who had an opportunity to experiment with the software (on their word processor or personal computer) before taking the training, found the training to be more satisfactory than those without any prior experience. Some secretaries noted that their word processors were not operational when they came back from training. A number of weeks elapsed between the completion of training and actual hands-on experience using their own equipment. As a result, some of the users had to go through another learning period using primarily the reference manuals.

Most of the non-Mini Trial RENAISSANCE users (i.e., eight of the ten user nodes) expressed satisfaction with the training they received. The one and one half day formal training sessions, complemented with follow-up visits by XIOS personnel were considered quite satisfactory.

However, many of the Mini-Trial users were dissatisfied with the overall training process. Hardware problems were experienced on the training node when the training session for D COST S was in progress. In addition, the D COST S user node did not become fully operational until approximately three weeks after training was completed. The users were unable to practice and apply their newly learned skills after the training period. As a result, additional time was needed to get back up to speed on the use of RENAISSANCE.

D. EMPLOYMENT AND LABOUR RELATIONS

None of our data collection activities yielded any suggestion of system impacts with respect to either employment or labour relations issues.

PM OCS had contacts with union representatives throughout the project. While a number of specific issues were discussed, no formal greviances were filed, related to the project, during the trial.

Also DND's policy on job classification was that, given the temporary nature of the field trial, no classification changes would be considered, unless the system was installed permanently.

E. ORGANIZATION EFFECTS AND STRUCTURE

The Detailed Impact Assessment Plan called for the Survey of Organizations to be administered both prior to and following the introduction of the Field Trial system. As discussed in Chapter V, we concluded on the basis of our participant observations that there was no potential benefit to be derived from using this instrument to look for possible organizational effects of the system. This decision was based on our belief that the OCS Field Trial simply did not constitute a dramatic enough intervention into the operating environment of the Field Trial site to cause changes of this nature. Our views in this regard have not changed. Consequently, we have no information to report with respect to system impacts on the organization as a whole.

F. POLICY

Our investigation has not yielded any indication of system impacts in terms of formal policy at the Field Trial site.

X

FINDINGS: PRODUCTIVITY

This chapter is divided into two sections. In the first section we present the limited amount of information gathered from the survey of participants and the participant observant activities relevant to the issue of productivity. The second section of this chapter presents our analysis of the data gathered through the Information Source Log completed only by participants in the Directorate General of Financial Policy and Procedures (DGFPP). As indicated in Chapter V, and consistent with the Impact Assessment Plan, it was the administration of the Information Source Log in DGFPP which constituted our principal investigative activity relevant to the issue of productivity in the Field Trial Site.

A. GENERAL FINDINGS

1. Survey data

Information on system related changes in productivity were obtained from two questions on the post-implementation survey. We asked survey respondents to rate the extent to which the system had the following effects on their work:

- Improved office productivity.
- Helped you to improve the quality of your work.

Exhibits X-1 and 2 summarize the responses to these items.

EXHIBIT X-1 **Reported extent of system impact: Improved office productivity**

	Terminal Type		
	VT 220/ DPhone	PC	All
Very much	11%	38%	20%
Somewhat	24	30	26
Very little	22	11	18
Not at all	40	17	33
No, just the opposite is true	4	4	4

EXHIBIT X-2 **Reported extent of system impact: Helped you to improve the quality of your work**

	Terminal Type		
	VT 220/ DPhone	PC	All
Very much	8%	35%	16%
Somewhat	29	35	31
Very little	13	13	13
Not at all	50	17	40
No, just the opposite is true	-	-	-

Examination of Exhibits X-1 and 2 reveals the following findings regarding productivity.

- Many users reported some contribution of the system to office productivity. This was particularly true of participants assigned to PCs. Specifically, 68% of PC users reported that the system had improved office productivity either very much or somewhat. A comparable figure for VT220/D-phone users is 35%. Users of Displayphones and shared VT220s responded

most negatively to this item while users of dedicated PCs were the most consistent in reporting positive impacts. Not surprisingly, the responses given to this item mirror the survey findings with respect to system use. In general, participants who were the most active users of the system also were most likely to report positive effects of the system on office productivity.

- System-related improvements in work quality were also reported more often by PC users than by users of other terminal types. Specifically, 100% of the participants assigned to dedicated PCs with the Multi-Mate package reported that the system improved their work quality either very much or somewhat. The comparable figure for individuals on dedicated PCs with Lotus 1-2-3 was 83%. In contrast, almost 2/3rds of VT220/D-phone users indicated that the system had improved their work quality either very little or not at all. As with the previous item, the most consistently negative responses to this question of improved work quality came from Displayphone users. Of these individuals, fully 82% reported that the system had improved their work quality not at all. Again, as with the previous item, the patterns of response to this item appear to reflect variations in levels of system use by terminal type.

2. System-generated data

The system-generated data will not provide any information relevant to the issue of productivity.

3. Participant observation

Although productivity improvement was not planned as a major item for investigation or consideration as part of the participant observer role, some relevant observations were made in this area. The majority of PC users (i.e., users of Multi-Mate and Lotus 1-2-3) indicated that productivity improvements had been realized through the use of automated tools. In particular, secretaries noted that the quality and quantity of typed material had improved. Similarly, the production of financial spreadsheets and analyses of various financial figures required less effort using the Lotus 1-2-3 package than the prior manual methods. This has freed up time. The extra time has been spent doing additional analyses and other work duties.

Frequent RENAISSANCE users also noted some improvements in productivity. Many of these users feel that they are now able to compile and edit initial draft documents in a more timely fashion. A few RENAISSANCE users also noted that to a small extent, the communications capability has reduced the amount of "travel" and face-to-face discussion time that previously went into the production of documents.

B. PRODUCTIVITY EFFECTS - MICROCOMPUTER-BASED CUSTOMIZATION

In the next chapter, we discuss the customization aspects of the project. However, we summarize briefly below those areas where customized applications provided productivity effects.

1. The applications

a) Recovery of overpayments

This system is very effective. In effect, it reduced the time to process any transaction from 35 minutes to 10 minutes -- saving some 25 hours in a month.

b) Severance pay

According to users' estimates this application saved about 20 hours per month.

c) Posting loans/furniture advance loans

This system was never fully implemented. No benefits were achieved.

d) Pension arrears

This system has not been implemented successfully despite several attempts by the vendor.

2. General comments

Thus some benefits were achieved through the use of stand-alone group-level computer systems. This is a well established approach, assuming appropriate techniques for application specification and development are followed. The failure of two of these projects may indicate that the development process was not appropriate. We discuss this further in the next chapter.

C. FINDINGS FROM THE INFORMATION SOURCE LOGS - DGFPP ONLY

1. Introduction

The Information Source Log was employed in a pre-test/post-test manner within one small group of DND -- DGFPP. The log was designed to capture data regarding how information necessary to the performance of a task was retrieved. Data were collected in five major categories:

- Where the information was located (SOURCE).
- How it was requested and retrieved (METHOD).
- The major activity that was being performed (ACTIVITY).
- The task that was being performed within the activity (TASK).
- How long it took to retrieve the information (TIME).
- Who retrieved the data (PERSON).

Data were collected for a five-day period in both the pre-test and post-test. Fourteen people completed the logs during the pre-test for a total of 304 information retrieval events; 13 people recorded 399 events during the post-test.

2. General results

A summary of the raw data collected appears in Exhibits X-3 through X-7. Exhibits X-8 to X-10 provide additional analysis. Key findings are presented below.

a) Source (Exhibit X-3)

The large majority of retrieval events involved only one source location. Of those, the major difference between the two tests is a shift in accessing one's own files in other locations to one's own files on hand. This is undoubtedly due to their use of RENAISSANCE as an extension of the desk (files that were in other locations previously have been put on-line and are considered at hand).

b) Task (Exhibit X-4)

The major differences in tasks are drops in time spent in "consulting" and "analysis" and increases in "reviewing drafts" and "maintaining records." The latter are most likely due to the use of RENAISSANCE for text processing and record keeping.

c) Method (Exhibit X-5)

Respondents were asked to indicate on the logs those events where they requested information in one way and then received it in another. These events are indicated in the exhibit as "S-FF R-Other," "S-Tel R-Other," etc.; "S-FF R-Other" represents events where the request was made face-to-face ("sent") and received in some other way ("received").

EXHIBIT X-3 Distribution of events by source

Source	Pre-test Frequency	Pre-test Percent	Post-test Frequency	Post-test Percent
Not indicated	1		11	
(1) Files on hand	108	35.6	193	49.7
(2) Other files	93	30.7	68	17.5
(3) Someone else's files	90	29.7	124	32.0
(1) and (2)	6	2.0		
(1) and (3)	4	1.3	2	0.5
(2) and (3)			1	0.5
(1), (2) and (3)	2	0.7		

EXHIBIT X-4 Distribution of events by task

Task	Pre-test Frequency	Pre-test Percent	Post-test Frequency	Post-test Percent
Not indicated	4		46	
Planning	43	14.3	34	9.6
Consulting	76	25.3	46	13.0
Assembling data	2	0.7		
Analysis	73	24.3	40	11.3
Draft reports	48	16.0	71	20.1
Review draft	31	10.3	82	23.2
Approving	5	1.7	8	2.3
Maintain records	6	2.0	59	16.7
Multiple tasks	16	5.3	13	3.7

EXHIBIT X-5 Distribution of events by method

Method	Pre-test		Post-test	
	Frequency	Percent	Frequency	Percent
Not indicated	9		20	
Face-to-face	187	63.4	172	45.4
Telephone	58	19.7	62	16.4
Internal mail	6	2.0	5	1.3
External mail	8	2.7	2	0.5
Hand-delivered	5	1.7	4	1.1
OCS system			109	28.8
S-FF R-other	18	6.1	8	2.1
S-Tel R-other	2	0.7	3	0.8
S-Mail R-other	11	3.7		
S-Any R-OCS			14	3.7

EXHIBIT X-6 Distribution of events by person

Method	Pre-test		Post-test	
	Frequency	Percent	Frequency	Percent
1	13	4.3	30	7.5
2	27	8.9	48	12.0
3	24	7.9		
4	11	3.6		
5	24	7.9	38	9.5
6	14	4.6		
7	21	6.9	27	6.8
8	12	3.9	12	3.0
9	29	9.5	14	3.5
10	21	6.9	10	2.5
11	14	4.6		
12	54	17.8	80	20.1
13	11	3.6		
14	29	9.5	41	10.3
15			11	2.8
16			29	7.3
17			42	10.5
18			17	4.3

EXHIBIT X-7 Distribution of events of day

Method	Pre-test		Post-test	
	Frequency	Percent	Frequency	Percent
1	65	21.4	96	24.1
2	56	18.4	71	17.8
3	66	21.7	85	21.3
4	55	18.1	74	18.5
5	62	20.4	73	18.3

EXHIBIT X-8 Average time per event

Method	Pre-test		Post-test	
	Frequency	Percent	Frequency	Percent
All respondents	257	10.74	370	7.82
Common respondents	197	11.55	282	8.68

EXHIBIT X-9 Paired test of average time per event

Person	Pre-Mean	Post-Mean	Difference in Means
1	11.6250	8.6207	3.0043
2	11.0370	17.5610	-6.5239
5	2.8696	3.6970	-0.8274
7	14.6429	12.1200	2.5299
8	22.5000	3.5833	18.9167
9	8.8000	2.2857	6.5143
10	17.3684	11.0000	6.3684
12	14.5400	8.4430	6.0970

EXHIBIT X-10 Paired comparison of average event time — OCS system usage removed

Person	Pre-Mean	Post-Mean	Difference in Means
1	11.6250	12.5000	-0.8750
2	11.0370	14.6154	-3.5783
5	2.8696	4.7000	-1.8304
7	14.6429	12.2083	2.4345
8	22.5000	7.2000	15.3000
9	8.8000	2.2857	6.5143
10	17.3684	11.1111	6.2573
12	14.5400	9.3830	5.1570
14	7.7692	5.4783	2.2910

The major difference between tests appears to be the use of RENAISSANCE itself; the gross usage of other methods remained relatively stable after it was introduced. Its heavy use alone can account for the gross increase in the number of events that were recorded. In addition, it is the second most frequent source of information, next to physically retrieving it oneself.

d) People (Exhibit X-6)

A major problem was introduced into this analysis by the long elapsed time between pre-test and post-test. The result was that some of the original respondents left DGFPP (persons 1 to 14 in Exhibit X-3) and were replaced by others (persons 15 to 18). This has the unfortunate effect of reducing the sample size available for paired comparisons to only nine people. Of those people who were common to both studies, their relative need for information, as indicated by the proportion of total events they recorded, remained approximately the same.

e) Time use

One of the major expectations of the trial was that the use of RENAISSANCE would improve productivity. Time to complete an information retrieval event then is an important indicator as to whether that goal was accomplished. As shown in Exhibit X-8, at a gross level, we can say that the average time per information event was indeed reduced.

For this analysis, events that either had no time recorded or were considered "outliers" were removed. It should be noted that there were fewer outliers in the post-test than in the pre-test; in the pre-test there were 16 events lasting longer than 45 minutes whereas in the post-test there were only 5 events longer than 30 minutes. This in itself may indicate that RENAISSANCE is having some effect with exceptionally long information retrievals; however, the evidence is entirely circumspect and would have to be better supported.

Assuming that each information event is an independent event, simple T-tests were performed on the means shown in Exhibit X-8, one for events recorded for all respondents, and the second only for events recorded by respondents common to both tests. In each case the results were highly significant (prob .1%) indicating that for the total sample of information retrieval events, the average time had indeed been reduced after the introduction of RENAISSANCE.

A second set of tests was performed, assuming that the information events are not independent, but depend on the person retrieving the information. A paired comparison was made between the average event time in the pre-test versus the post-test for each person common to both studies. Exhibit X-9 shows the results. A Wilcoxon signed-rank test showed a marginally significant drop in average time per person (prob. 6.5%).

This test was repeated after removing events that involved the use of the RENAISSANCE system itself. We were interested in discovering

whether RENAISSANCE was reducing the average time per event simply through its own use or whether there was indeed a substitution effect being seen, i.e. that people were using RENAISSANCE to do things that took longer previously. By removing RENAISSANCE events we could test this conjecture. Exhibit X-10 shows the results; a Wilcoxon signed-rank test yielded slightly more significant results than previously (prob. 4.9%).

This test suggests that indeed a substitution effect has taken place. Individuals are now substituting or replacing previously manual activities with system based activities. For example, this may include the replacement of some telephone inquiries, manual searching of files for information, face to face discussions and so on with "equivalent" machine based activities. And significantly, the tests indicate that the substituted system based activities take less time than the previous manual activities. In general, the substitution effect has resulted in improved productivities.

3. Additional investigation

Clearly, according to the above data, the introduction of the field trial system within DGFPP has had a significant impact on "productivity". To further substantiate and verify these data, we conducted some additional investigations. We compared these data with an analysis of the system-recorded data for DGFPP. Also, we conducted additional discussions with a small group (4 persons) of DGFPP staff to clarify and expand on our findings. The results of these additional activities are as follows.

a) System-recorded data for DGFPP

The two nodes used by DGFPP staff accounted for approximately 40% of all user commands issued during the sampled ten working days. This indicates that DGFPP staff, in general, were much more active users of RENAISSANCE than other nodes.

It is also interesting to note that DGFPP users accounted for 60% of all electronic communication activities over the ten working days. Also, the two DGFPP nodes had higher percentages of active users than the other nodes.

b) Discussions with DGFPP staff

We discussed our major findings from the Information Source Log data with four active users within DGFPP. These included two users from DFAPA (Node 103) and two users from DMTAS/DFPAS (Node 102). All four users participated in both the pre and post administering of the Information Source Log. A summary of these discussions as they pertain to our major findings follows.

i) Distribution of events by source

Analysis of the Information Source Log data indicated that there was a shift in accessing files in other locations to accessing files on hand (see Exhibit X-3).

DGFPP staff agreed with this finding. At the time of the pre-test, it was standard office practice to file all documents related to completed work in the Directorates' central files or in the library. Very few documents were kept in the individual's immediate workspace. Later, when some information in these documents was required, a physical search of the centralized files or library material had to be conducted. This accounted for the pre-test activity volumes for "referring to files in other locations."

Following the introduction of the OCS system, DGFPP staff continued to forward documents related to completed work to the centralized files. However, they were also able to keep duplicate copies of these documents on the OCS system, using the electronic filing capabilities.

Over the length of the Field Trial, many staff members built up sizeable collections of documents in their electronic files. Consequently, when information related to prior activities was required, the staff could more easily access this information through the OCS system. They could access the information without having to leave their workspace. This resulted in higher volumes of "on hand" sources.

Two of the DGFPP staff members noted that, with the OCS system, they placed less emphasis on the Directorate's centralized files for accessing information. There are always occasions when one would have to search the centralized files. However, the number of physical searches of the centralized files have decreased considerably. Much of the information normally required from the centralized files is maintained in duplicate on the OCS system, and is more easily accessable.

ii) Distribution of events by task

The Information Source Log data indicated drops in "consulting" and "analysis" related tasks and increases in the number of "reviewing drafts" and "maintaining records" tasks (see Exhibit X-4).

DGFPP staff also agreed with this finding. In the pre-test environment, staff spent more time consulting with their peers and analyzing data before actually putting pen to paper to write initial drafts of reports and documents. This was due, in part, to the long wait time required to get documents typed and edited.

The text preparation capabilities of the OCS system provided much greater flexibility regarding the preparation of documents. It greatly reduced the length of time required to type and edit documents.

Because of the ease in which documents could be typed and edited, this naturally led to more drafts being prepared. In general, staff now take less time preparing the initial drafts of a document. Typically, in the first draft, the originator concentrates on getting his or her basic ideas on paper. They are not particularly concerned with the formatting, precise wording or structure of the document. In turn, this draft is forwarded to other individuals to get their comments and input. Through an iterative process of reviewing, commenting and editing, the final document gets produced.

The OCS system has brought about some changes in work patterns or flows. Less time is spent in "up-front" consultations with other staff before preparing initial drafts. Input from other staff is obtained by "reacting to" or reviewing of multiple drafts. Staff noted, however, that although more drafts are now being produced, the overall length of time to produce a final document has decreased.

DGFPP staff also agree that the OCS system has brought about an increase in the number of tasks related to "maintaining records". Using the OCS system, staff are now keeping more files on hand (i.e. electronic filing). As a result, more time and tasks are required to maintain these "electronic" records.

In addition, two cases were cited where individuals are now maintaining (in electronic form) files which were not maintained in the pre-test environment (or at least, not maintained to the same extent). One of these files contains "historical" records for a number of financial related resource codes. The other file contains cross referencing data for the Department's Financial Administrative Manual (FAM). Both of these files are accessed frequently for information. Undoubtedly these and other similar activities has resulted in an increase in the number of tasks relating to the maintenance of records.

iii) People

Information Source Log data indicated the relative need for information remained approximately the same for those people who were common to both, pre- and post-tests.

DGFPP staff agreed with this finding. The nature and urgency of the work performed during the post-test was very much the same as that of the pre-test.

iv) Time use

The Information Source Log data indicated the average time per information event decreased between the pre- and post-tests. Also, the data indicated that some substitution of events had resulted.

DGFPP agreed with both of these findings. A number of examples were mentioned where information retrievals require less time now than before the OCS system was installed. As mentioned earlier, many of the documents in the centralized files also reside in electronic form on the system and are accessed in a more timely manner. Substitution has occurred in that manual searches of the central files are now replaced to a great extent by terminal access to electronic files.

The maintenance of an electronic cross reference file for the Department's FAM also reduces the amount of time to find required information in the manual.

To a limited extent, the "electronic mail" facilities of the system has substituted for requesting information by telephone and other methods.

XI

FINDINGS: TECHNICAL ANALYSIS

A. TECHNICAL REVIEW AND OPINION

1. Introduction

The functions provided as part of the DND Field Trial System can be grouped into three categories:

- The functions provided as part of the RENAISSANCE system as installed, including the RENAISSANCE facilities, networking, and file transfer between RENAISSANCE and the personal computers.
- The functions provided by "off-the-shelf" software packages for the personal computers, including word processing and spread sheet modeling.
- The functions provided by custom software written by System-house and running on personal computers for applications in the Directorate of Pay Services (DPS).

In this section, we provide a technical opinion of the RENAISSANCE system as installed. We also briefly review the functions provided by 'off-the-shelf' software packages for the personal computers. In the next section (Section B, Customized Applications), we review the custom applications developed for DPS.

The technical opinion we present in this section is a commentary on the functionality provided by the system, and the way this functionality is delivered to the users. The opinions we present are based on current literature on office system design in conjunction with our experience gained in reviewing other products and pilot projects.

We have organized our discussion according to the basic functions provided by RENAISSANCE, the Personal Computers (PC's), and the "off-the-shelf" software package as follows:

- Word processing, including the document preparation and editing features of RENAISSANCE and the PC-based word processing.
- Electronic mail and messaging, including directory and distribution list management.
- Electronic indexing and filing.
- Activity management.
- Spreadsheet modelling on the PC's including file transfer via RENAISSANCE.
- Training, user manuals, and system documentation.

We finish this section with a concluding discussion on the capability of the node processors to handle large numbers of concurrent users.

2. Word processing

a) The installed system

The Field Trial system provided word processing capabilities at two levels:

- Full function word processing was provided to the secretaries via dedicated IBM Personal Computers with Multi-Mate word processing software and letter quality printers. These workstations were also connected to the RENAISSANCE network.
- Basic document preparation and editing capabilities were provided to all workstations via RENAISSANCE.

In theory, this arrangement offered a good mix of full function word processing for heavy text processing and basic capabilities for casual and ad-hoc use. However, in practice, several shortcomings prevented users from realizing the expected benefits. The reasons for this include:

- The way typing support has been organized within ADM (FIN).
- The lack of a fully compatible document transfer capability between the dedicated word processors and RENAISSANCE.
- A lack of certain text processing features on the RENAISSANCE system.

These are discussed briefly below.

b) Typing support within ADM (FIN)

Prior to the Field Trial, typing support within ADM (FIN) was organized as follows: Staff at the Directorate level and above and some Section Heads had secretaries who did their typing using typewriters. Larger typing jobs in DGFPP were sometimes sent to an external typing pool. More junior staff had their typing done by the secretary within the Directorate or Section when time was available, or sent it to one of the local typing pools. Typing generated by staff to be sent out of the Section or Directorate normally is sent under the signature of the Section Head or Director, and was usually typed by the appropriate secretary.

Consequently, staff below the Section Head level did not usually get prompt typing support. With the advent of the Field Trial, secretaries provided with word processors were able to provide more effective typing support to their principals. Many of the other staff were provided with terminals to RENAISSANCE. However, the lack of compatibility between RENAISSANCE and Multi-Mate (word processor created) documents, and several shortcomings within RENAISSANCE text processing prevented these people from realizing all of the potential text processing related benefits.

c) Compatibility problems between the word processors and RENAISSANCE

The system as installed only supported the one-way transfer of Multi-Mate documents from the word processors to RENAISSANCE. Some of the formatting was lost in this transfer, and documents, once in RENAISSANCE, could not be sent back to the word processors for further revision. The system, therefore would not allow documents created on RENAISSANCE to be sent to the word processor for final editing, formatting, and printing.

This is a major restriction. It prevents staff from using RENAISSANCE to create drafts which can be electronically sent to the Director or Section Head's secretary's word processor for printing, final editing, and production of final copy under the Director's (or Section Head's) signature. It also prevents the final consolidation on a full function word processor of sections of a report that several people may have worked on using RENAISSANCE.

d) Lack of text processing capabilities within RENAISSANCE

Because of the lack of compatibility between the word processors and RENAISSANCE, users have been using the document preparation facility of RENAISSANCE for word processing jobs that they might otherwise have transmitted to the word processor (for final formatting and production). However, the document preparation and editing facility of RENAISSANCE lacks several features which limit its use as a word processor. These include:

- No "cut and paste" facility.
- No tabs, underlining, or annotation features.
- No flexibility for controlling page breaks -- the system inserts page breaks when printing the document. There is no ready way to determine where the page breaks will occur prior to printing the document.
- Limited formatting flexibility.

In addition to the lack of these features (the document preparation facility is only really suited for use in creating messages for transmission via electronic mail), the system has another serious shortcoming -- erratic response times. The system can provide very slow response times, to the extent that even people with no keyboard skills can type ahead of the system. The system does remember and eventually processess all keystrokes. However, this can be very disconcerting to the user, especially those that are only casual typists. This problem is compounded because the response times appear to the user to fluctuate randomly.

3. Electronic mail and messaging

a) Introduction

The Field Trial system provides electronic mail and document and file transfer capabilities via the RENAISSANCE system and network. The architecture and configuration of this system are described in Chapter IV. In this sub-section, we focus our comments on the system's functionality as delivered to the users.

We have organized the first part of our discussion as a review of the following aspects of the electronic mail and messaging function:

- System parameters, including directories and distribution lists.
- Security, including password access control.
- Sending features.

We then discuss how the electronic mail system was set-up as a vehicle primarily intended for formal messaging. We go on to present our views as to the impact this restriction had on use of the electronic mail function, particularly by staff at middle levels and below.

b) System parameters, including directories and distribution lists

System parameters, including directories and distribution lists, are managed at the node level, rather than at the system level. Global changes to the directory (and other systems parameters) have to be made at each node via terminals physically connected to that node. This was a major inconvenience to the project team, particularly during the early stages of the trial, when the directory structure was changed several times.

The system supports two directory alternatives for designating users: names or roles. This allows messages to be addressed to people's names or to their roles. This feature is particularly appropriate for DND, where correspondance is often formally addressed to the position or role. There were some initial problems in setting up the directories using names and roles, and limiting these to properly formatted signature blocks in the various document types. However, after some trial and error (and the resulting inconvenience caused by the need to make directory changes at the node level), a workable arranged suited to DND's formal messaging structure was set-up.

The system also provides a flexible system for addressing mail. It allows users to enter abreviated forms of names and roles (either the first few characters of the name or role, or the person's initials. The system then inserts the missing letters or, if there are 2 or more users with the same initials, asks for more information. This was mentioned as a useful feature.

c) Security, including password access control

The system as installed was not cleared for use in processing, storing, or transmitting classified material. However, with a few exceptions, most of the material handled by the users of the system was not in itself

classified. Despite this, parallel systems still had to be maintained for handling classified material. This acted, to some extent, as an impediment to convincing users to use the system for all of their non-classified message traffic.

The system provided standard log-on password access control. This was considered adequate by most users. The system also had an option for automatically logging off users who had no system activity over a defined time period. However, this option was turned off by the project team after certain users pointed out that they wanted to remain logged on all day because the log-on process was very time consuming, and they didn't want to have to go through it several times per day. The users were not concerned about the security aspects of being logged on all day. This reflects in part the physical security already in place at DND buildings, and also the fact that classified information was not to be put on the system.

d) Sending features

The system supports four customized message formats which were created to correspond to the formats used by DND. These are:

- Letter
- Memo
- Minutes
- Telephone

These can be sent using one of four nodes: normal, personal, urent, and urgent personal. Urgent mail is flagged "urgent" both in the header of the message and on the line displaying the number of unread pieces of mail. The "personal" option also flags the mail. Neither of these options were used to any extent.

The system also offered a means of processing mail where copies were to be sent to recipients who were not part of the system network.

The system did this by flagging all recipient addresses that did not match with those in the main directory. These addresses were then assumed to be external recipients. When this mail was sent, the system would then display a message reminding the user to print paper copies for the external recipients, and to mail these via the regular mail system. This link to the paper-based mail system can be considered in theory as a valuable feature of the system. However, flaws in the way it was implemented caused it to be viewed more as an inconvenience by the users than as a link to the paper mail system. (The main problem was the system's automatic assumption that all recipients that could not be found in the directory were "external"; including those system recipients whose names the user may have mis-spelled.)

e) Formal vs. informal messaging

The letter, memo, and minute formats supported by the system were all created with the intent that they be used for formal messages. They were designed to duplicate in appearance their paper versions. For more junior users, this meant that their superior's signature block was automatically inserted in any letters or memos that they created. There was no mechanism for sending short, informal, unformatted messages. This was the result of deliberate design specifications by DND. Because of this, users tended not to use the system as a vehicle for the sort of informal communications for which they would not normally have used a letter or memo.

4. Electronic indexing and filing

The RENAISSANCE product as implemented in the Field Trial supports a variety of file types and methods for searching for files. File types supported by the system include:

- DESK -- the desk file is the default storage file. The system automatically stores all files created by the user or brought into the work space in the desk file, unless the user specifies otherwise.

- IN -- the system places all incoming mail in the in file. The user can also use this file to log in details of non-electronic mail items.

- OUT -- the system places a copy of each piece of outgoing mail in the out basket. Users can access documents in this file to reread what has been sent. However, no indication is given as to whether the receipients have read the mail or not. Users may also use this file as a mail log to record details about non-electronic mail items.

- PROFILE -- this file contains details about the users profile including user parameter and password information.

- OFFICE -- the office file is a file shared by all users. It can be used as a public bulletin board, and controls are available for restricting access.

- WASTE -- all deleted documents are placed in the waste file before final disposal by the system. There is a facility for retrieving discarded documents from the waste file within a defined period of time.

- PERSONAL FILES -- users may create and label their own personal files.

The procedures for creating and deleting files, copying documents and moving documents from one file to another are clear and straightforward.

The RENAISSANCE product offers a variety of facilities for searching for filed documents. It is possible to search using criteria based on any of the document header information, including file name, key words, file code, date, title, subject, "from" field, document type, date last modified, name of last modifier, and document identification number. The procedures for searching appear clear and straightforward.

About 1/3 of the users made some use of the electronic indexing and filing capabilities. This corresponds closely to the number of users making some use of the document creation and mailing facilities. In addition, in several cases users were making creative use of the electronic indexing and filing capabilities for maintaining cross-referenced data files. (See Chapter X.)

5. Activity management

The RENAISSANCE product offered a calendaring feature for activity management. This function allowed users to enter and time and date stamp events, maintain "to do" lists, display these events in the calendar format, and send entire calendars to others. However, the calendaring function did not support the simultaneous search of other peoples' calendars to determine mutually free time slots for meetings. Without this feature, the calendaring function did not, in the view of most users, offer any advantages over manually keeping a paper calendar. Because of this, over 90% of the users did not use this function.

6. Spreadsheet modeling and PC file transfer via RENAISSANCE

Spreadsheet modeling proved to a valuable tool in the areas in which it was implemented, including D Cost S, DB, and the Base Comptrollers office in Winnipeg. It was also used in DPS, partly as a tool to compensate for shortcomings in some of the custom software that was developed for DPS 3-3-2. (This is discussed more fully in Section B of this Chapter.)

The spreadsheet modeling tool was initially used primarily for local applications, assisting the work of one or two individuals. Because of this, there was intially little need to transfer spreadsheets or spreadsheet data files between users. Consequently, the PC to PC file transfer capability of RENAISSANCE was not explored by most users. However, as use of the spreadsheet applications matures, some users predict an emerging need for file sharing and file transfer capabilities over and above physically sharing diskettes.

7. The inability of the node supermicrocomputers to handle large number of users

The performance or response time of a particular system is usually the by-product or reflection of a combination of factors. Such factors include:

- Design of the application system.
- Type of operating system used.
- Speed and design of particular hardware components.
- Sizing of the equipment in relation to workload/throughput volumes.

While many factors are involved, it appeared (throughout the Field Trial) that the node supermicrocomputers were undersized for the required usage levels. The response times on the RENAISSANCE product were poor, overall. In a number of situations, response times were observed to be slower than the generally accepted maximum of three to four seconds. It was not uncommon to experience command response times in excess of ten seconds.

The response time problem became worst as more users logged onto the system. The system appeared to operate reasonably well when only three to four users were logged on to a node. However many nodes were configured to support 12-15 terminals. Based solely on our observations, system response times degraded to a totally unacceptable level when seven or more users were on the system.

Judging from the present performance ratings of the node microcomputers, one wonders what the performance problems would have been if previously planned applications, such as spreadsheeting, were actually implemented on the node microcomputers. We can only speculate about the possible results. However, it is reasonable to assume that more serious performance problems would have occurred.

B. CUSTOMIZED APPLICATIONS FOR THE DIRECTORATE OF PAY SERVICES

1. Introduction and background

The Requirements Study conducted by Systemhouse as part of Phase I of the Field Trial indicated that, within the Directorate of Pay Services (DPS), there were requirements for more extensive data processing capabilities than those provided by the RENAISSANCE product. According to the study, the primary automation needs at DPS were for:

- On-line access to the pay information stored on the Central Computation Pay System (CCPS).
- An ability to extract and manipulate data from various files in a number of structured accounting situations.

These types of requirements were considered to be supported by the kind of customization traditionally supplied by specialized data processing systems. The Office Communications System to be installed as the main stream Field Trial system would not directly support these types of applications. It was therefore decided to implement, as part of the Field Trial, customized systems to address some of the accounting requirements within DPS. Four applications were selected:

- Recovery of overpayments.
- Severance pay.
- Posting loans/furniture advance loans.
- Pension arrears.

At that time, it was determined that the first three of these applications, each of which would be used primarily by a single person, were suited to the stand alone environment of the personal computer. The fourth

application, Pension Arrears, required sharing of the processing software between several groups of users, but did not require the sharing of data files. This application could be satisfied via a personal computer system or via customized software running on the RENAISSANCE node super micros. However, in order to standardize the customizations and ensure future compatibility, it was decided that all customizations would be developed on personal computers. The IBM Personal Computer was selected as the hardware in order to maintain consistency and compatibility with the other equipment being installed as part of the RENAISSANCE system for the Field Trial. A programming tool called INFORMIX was chosen for use in developing these customized applications.

In the remainder of this section, we discuss these four customized applications. Our discussion of each is organized as follows:

- Proposed system functionality.
- Discussion of the system implementation.
- System usage and perceived benefits.

2. Recovery of overpayments

a) Proposed system functionality

This application involves calculating the monthly recovery rate for Canadian Forces Superannuation Act (CFSA) and Supplementary Retirement Benefit Act (SRBA) overpayments. DPS 4-4 is the section responsible for the calculation of CFSA and SRBA overpayments. DPS 4-4 receives a notice from SSC advising of overpayment of a pension. Historical data is entered into the personal computer (name, SIN, annuity number) and the amount of overpayment of CFSA and/or SRBA. The system then calculates the monthly recovery rate, using figures from the Canada Life Pension Table. Forms are printed and this information is used to advise the annuitant and SSC of the overpayment and method of recovery.

b) Discussion of the system implementation

Customized software was developed and one IBM PC was installed in DPS 4-4 for this application. The users were satisfied with the implementation process, training and documentation.

c) System usage and perceived benefits

The system is currently used to calculate the recovery process for all overpayments. About 60 overpayments are currently processed per month. This is down from the 300 per month which were processed during the time the initial requirement study was conducted. With the old manual process, it took approximately 35 minutes for each recovery of overpayment, including about 20 minutes to enter the information on a worksheet and do the calculations, and 15 minutes of audit time. With the new system, it takes approximately 10 minutes for each recovery of overpayment, which is primarily the time needed to input the information and initiate the calculation process. The computer takes approximately four minutes to do the calculations. However, several transactions can be input at once and the operator can be doing other things while the computer runs through its calculation process. There is therefore a net savings of about 25 minutes per transaction. This translates into a savings of about 25 hours per month at current volumes.

The users were generally satisfied with the system when it was first installed, their biggest complaint being the lengthy computer run-time needed to process the transactions. This lengthy run-time is apparently caused by the need to do table look-ups for each calculation. It may be possible to reduce the run-time by using algorithms to calculate the various factors, rather than retrieving them from the pension tables. Users would also like to be able to file, retrieve, and search at a much faster rate.

In addition to speeding up the processing time, at least two additional enhancements have been identified:

- A procedure for calculating age at recovery date.
- A procedure for determining error rates for input of amounts and dates.

The users have identified the following general benefits from use of this system:

- Improved speed and accuracy of calculations.
- Reduction of what was previously a heavy typing requirement.
- Maintain past records for future reference.
- Eliminates duplication of records.
- Constant and accurate search of Canada Life tables.
- Reduced time used for audit of calculations.
- Provides additional man hours for additional research.

3. Severance Pay

a) Proposed system functionality

DPS 4-6 is responsible for the administration of Severance Pay which is due to an individual upon termination of his/her employment with the Canadian Forces. The administration tasks include:

- Creating a severance pay record for each member in the release stream who elected severance pay.
- Tracking the various forms that are required to process the severance pay.
- Issuing cheque requisitions to SSC.
- Summing each month's severance pay activities into a single page report.

The automated system which was developed for this application allows users in DPS 4-6 to set up a record for each member in the release process, update this record as additional information becomes available, and automatically perform calculations of gross severance pay, tax, and net severance pay. In addition, the system generates a monthly report from the severance pay records.

b) Discussion of the system implementation

The system is implemented on an IBM PC and printer. The users were satisfied with the implementation process, training, and system manuals.

c) System usage and perceived benefits

The system is used to assist in processing all Severance Pay transactions. With the exception of some enhancements which the users have identified, they are satisfied with the system and are realizing the following benefits:

- Improved speed and accuracy of calculations.
- Ready availability of reports on payment statistics.
- More efficient maintenance of records of past payments.
- Reduction in manual errors and in the need for manual controls.
- Elimination of duplicate records.
- An improved computation format and quality of product.

Approximately 900 severance pay transactions are processed per month. Users estimate that use of the system saves them at least 20 hours per month in setting up the records and doing the calculations, plus significant additional time savings through the reduced need to handle and manipulate paper records.

Users have identified several enhancements/modifications which they would like to have made to the system. These include:

- Increased storage capacity to allow the maintenance of 3 prior months worth of data. The system currently has capacity to store only 1.5 months of data.
- A capability to use the terminal while the printer is in use.
- Better response time, particularly for file searches.
- More explicit error messages. The system currently uses error codes to indicate many problems, and the users must now refer to the manuals to determine what the error codes mean.

4. Posting loans/furniture advance loans

a) Proposed system functionality

DPS 3-3-2 is responsible for maintaining accounts for posting loans and furniture advances. This involves establishing new loan/advance records, keeping the records up-to-date, and providing information to the field on an as required basis. The accounts must also be reconciled.

A customized system was designed as part of the Field Trial to automate this application. Functionally, there were two parts to the design of this system. The first part involved setting-up and maintaining the ledgers. This included supporting a descriptive block of information (to identify the DND member and the terms or re-negotiated terms of the loan), and allowing the automatic recording of a ledger entry from data in this descriptive block upon command by the user. The calculations within the ledger entries, and the maintenance of running balances were also specified. The second part of the customized design involved producing monthly reports based on the data recorded in the ledgers.

b) Discussion of the system implementation

The design and specifications for this application were signed off by DPS in June, 1984. The system was then programmed and was ready for testing in October of that year. During that time there were staff changes in the programming development team at Systemhouse and in DPS 3-3-2. During testing of the system, some major shortcomings were identified by the new staff at DPS 3-3-2. These problems were worked on by Systemhouse from November, 1984 to March, 1985. From the users perspective, there was some improvement, but the system was still not satisfactory in their view. However, Systemhouse was able to demonstrate that the original functional design specifications had been met, and the system was installed on an IBM PC with printer.

The users were still not satisfied with the system. They stopped using the customized software in July, 1985. The reasons for this include:

- The system response time was excessively slow. When DPS 3-3-2 stopped using the customized software, they had 1600 records in the data base, and the posting run took at least 16 hours to complete. At this point, they had at least another 1100 records to add to the database. They felt that with these additional records, the posting run would take too long to be useful.

- When the system was originally specified, the maximum number of ledger records was estimated at 2,000. However, because of recent changes in Canadian Forces policy, including an increase in forces strength in Europe, the maximum number of ledger records is now estimated to be about 6,000. The system as installed cannot accommodate this increase in size.

- A major problem was encountered when loading the existing manual records into the system.

- The system did not calculate amortization or relate the amortization variables that were entered to check for consistency.

- The system did not satisfy some audit trial requirements.

c) System usage and perceived benefits

The customized system is not being used. In its place, the users have developed a partially automated system using the IBM PC and spread-sheet modeling software (Multi-plan). This partial solution is providing the following benefits:

- Amortization schedules for each individual loan/advance ledger are produced.
- Errors are reduced by the production of record detail that is clear as compared to the hand-written detail previously kept on the ledgers.
- The system automatically generates most of the monthly calculations, providing a time savings to staff of at least 15 hours per month.
- The system allows better conformance to the defined completion sequence for the ledgers.

The users are therefore getting real benefits from this partial system. However, several areas of improvement have been identified. Deficiencies with this system include:

- No automatic monthly detail updating.
- Manual review of each individual account and annotation of the ledger for payments is required.
- A manual list of errors or ommissions must be maintained.
- There is no automatic total of the value of account ledgers.
- The records must be manually reconciled to the financial information system.

- Queries must be reviewed singly through the manual ledgers and forecast of future payments and balances must be calculated manually.

To address these deficiencies and take advantage of other opportunities for improvement, a new post loan/advance application is currently being developed independently of the Field Trial as part of the on-line pay system.

5. Pension arrears

a) Proposed system functionality

DPS 4-3 manages the Pension Arrears function. This section is responsible for processing the completed Canadian Forces Superannuation Act forms (CFSA 100), determining the amount of arrears, and costing the election. Elections are received, checked for validity, entered into the Control Register and passed to Arrears Clerks for processing and costing. There are up to 25 different scenarios which could be followed in processing and costing the election. In order to determine the outstanding arrears, 9 basic forms and related calculations may be needed, and financial statements must be completed in a sequential manner to determine outstanding balances.

The customized system to address this application can be broken down into three functional areas:

- Data manipulation.
- Report generation.
- Table maintenance.

The system was designed to operate in stand-alone mode on several identically configured IBM PC's. Each Pension Arrears team would maintain their own records on the system assigned to them.

b) Discussion of system implementation

The system specifications were signed off by DPS and system development began in 1984. During 1985, the system was repeatedly installed for testing and rejected by DPS because of problems. As of November, 1985, there had been five attempts at acceptance testing, all of which had failed. DPS has given Systemhouse one more chance to address the problems and deliver a workable system. If this doesn't happen by the end of 1985, DPS 4 will abandon the project. Problems encountered in previous acceptance testing include:

- High error rates in the more complicated scenarios.
- Tedious data entry procedures.
- Complex process for moving through screens to fix errors.
- Some audit requirements not satisfied.
- Inconsistencies in the way the system handles some situations.

c) System usage and perceived benefits

To date, the customized Pension Arrears system has not been accepted and is therefore not being used. However, the opportunity remains for automating this application. If the system under development by Systemhouse is not acceptable by December 31, 1985, DPS 4-3 will pursue other options for automating this application. Perceived benefits include:

- Significant potential time savings through increased speed and accuracy of calculation.
- Significant savings in audit time.
- Automated production of reports should eliminate much of the typing currently done.
- More consistent application of the rules for handling different scenarios.

- Ready access to historical data.
- The ability to handle an expected increase in the volume of computations.

6. General discussion of the customized applications

The severance pay and recovery of overpayment applications are straightforward and well defined, and have been implemented relatively successfully. The other two applications are more complex, both in terms of identifying the real user needs and in developing an effective solution to address these needs. Neither of these applications has been developed or implemented in a way that is satisfactory. This is in part a reflection on the inadequacies of the traditional life-cycle approach to systems development, particularly when this approach is used in a semi-structured office environment.

It is interesting to note that, in DPS 3-3-2, where the traditionally developed posting loan application failed, users were still able to make good use of the personal computer to satisfy some of their needs. This reinforces the notion that the users are capable of taking a more participatory role in systems development at the local level. More active user involvement seems to be both feasible and desirable in developing local data processing systems. Recent experiences are showing that this approach can be far more effective than the traditional life cycle development approach.

XII

DISCUSSION OF OUR FINDINGS

A. THE REASONS FOR THIS CHAPTER

In the preceeding six chapters, we have described, in detail, our study findings. To meet the mandate given to us as the assessors of the DND OCS field trial, we think it important to go beyond the simple analysis and reporting of our findings and to attempt to interprete and extrapolate these findings to assist in the preparation of the overall assessment of all OCS projects.

In preparing this chapter, we draw upon:

- Our own findings in the DND field trial.
- Input gained from discussions with assessment teams from other field trials and from the OCS office staff.
- Our experience in other project evaluations.
- Our experience as office systems designers and implementers.

Some of our comments made in this chapter can be viewed as negative towards the vendor and the field trial site. No such criticism is intended. This project, in common with the other field trials, was, in part, an experiment. Neither the user nor the vendor had had previous experience in the area. And, as pioneers, "failures" were to be expected. Indeed, it is from such failures of commission and omission that the most can be learned.

Thus, in this section, we do not attempt to allocate responsibility, credit or blame. Many complex factors, including project schedules, vendor resources, project budgets and staff availability, influenced the progress of the project. In this chapter we focus on the end results only.

B. A SUMMARY OF THE FINDINGS

Our study findings are summarized below, under the major headings established by the OCS project office.

1. System performance

The overall use of the RENAISSANCE system was very low. Only some 16% of participants became regular users, and nearly 1/3 of participants made no use at all of the system.

The "established" office technology applications were reliable and used. The most successful applications were those that depended on well-established and proven office technology -- namely, word processing and personal computer (mainly Lotus 1-2-3) packages used on personal computers.

If these systems had been implemented in a standalone manner, without RENAISSANCE, the impact is likely to have been similar. Indeed, given the lack of a facility such as RENAISSANCE, it is likely that other features, implemented in RENAISSANCE, would, in fact, have been implemented on the PC's.

The "downside" of the success of these PC's is that it reduced the incentive to use the "integrated" system originally conceived for the field trial.

The "integrated" applications, in particular electronic mail and messaging, and activity management, were little used.

Where the system was used, participants, in general, found it easy to use.

A major issue, throughout the study, was that of reliability. Reliability of the system varied considerably during the project, and from node to node. Most users were, to a greater extent, dissatisfied with the reliability of

the system. In addition, almost all users were unhappy with the response time of the system.

Despite the problems encountered during the project and the limited use of the field trial system, the field trial had a significant positive effect on people's attitudes towards technology. The majority of survey and participant observation results which related to people's perceptions of technology and their work were positive. Thus, this may indicate that exposure to technology, in almost any form, can be a positive, rather than negative, experience.

2. User acceptance

Most participants, prior to the Field Trial, were neutral or positive towards the use of technology in the office. Despite the mixed success of the system, as implemented, overall user acceptance of office technology continued to be high and, indeed, in most cases, actually improved during the study.

Interestingly, users with low or negative expectations, prior to the system being installed, tended to be most positive in assessing the degree to which the system met their expectations. Those who had high expectations were, in general, not satisfied that their expectations had been met.

The system did not appear to have a high degree of match to the demands of the user group and their organization. Only some 22% of respondents perceived a good match between their job demands and the functions provided by the system. Additionally, few participants felt the system provided a high degree of conformity to DND standards.

Similarly, only a few individuals felt that the system made any significant contribution towards better decision making.

However, in certain "pockets", the system had greater impact, most often in areas where extensive use was made of personal computers either as

word processors or for professional support. There were few strong positive or negative reactions to the physical environment surrounding the trial. While some participants identified problems with heat, crowding and noise, overall, these were not major problems during the trial.

Underlying many responses to our work throughout the study, was a perceived lack of commitment to the field trial by many of the participants. The combination of the significant delays in delivery, along with the perception of the field trial as a "temporary" facility, likely combined to make users reaction to the system and commitment to it much less than might otherwise have applied.

3. Human social impacts

The Field Trial system had a positive impact on the work life of many of the participants. Again, the impact was greatest on the PC users. Very few negative impacts were identified.

Again, relatively minor impacts in the health, safety and stress areas were identified. Few participants perceived any real health impact, caused by the system. Where these effects were noted, they were most frequently in the heavier used PC areas. However, female participants were more concerned about health related problems.

Little impact was noted on stress levels. Again females were more concerned.

Impacts on morale and motivation were generally neutral to positive. The system did contribute to increased creativity, had some positive impacts on opportunities for personal achievement and, with one exception, was not perceived as threatening job security (7% of PC users did perceive their job security as being very much reduced).

Some users also felt that the interest in their workday had been increased through the implementation of the system.

4. Organizational impacts

The system had comparatively little impact on job content and organization structure. Changes in job content were primarily limited to those of the secretarial workers.

Otherwise the only noticeable change was the increased use of keyboarding by professional staff.

However, there was a general feeling that the use of the Field Trial products did increase the skill requirements or challenges of jobs. However, these were limited.

C. FACTORS WHICH CONTRIBUTED TO THE LOW USE OF THE SYSTEM

Despite the limited success of the facilities implemented in certain areas, the overall assessment of the impact of the field trial on the operations of the trial site has to be largely negligible. The system was not extensively used and did not become, except for the word processing and personal computer applications, an integral part of the trial site's information processing activities.

While it could be assumed that the low usage is, in fact, due to the advantages and disadvantages of office technology, in general, there are specific reasons identified in this study which have had a more direct impact. We describe below, under three main headings, some of the factors that we believe have contributed to the low usage of the system in this specific case that may not apply in general. (However, the lessons learned from these specific issues can be generalized and be of significant use in other projects.)

1. Design "failures"

There are several areas where we have identified significant "design failures" that were likely to minimize system use.

a) Heavy use of "standalone" facilities for "difficult" functions

At various stages in the project, the vendor chose to implement required functions in "standalone" devices rather than as part of RENAISSANCE. RENAISSANCE, as originally conceived, was far more "function-rich" than RENAISSANCE as implemented. This may have had three impacts on the user population.

First, the transfer of facilities from RENAISSANCE to standalone devices reduced the need for a central facility. Second, the availability of the standalone features reduced the need for users to learn how to use the RENAISSANCE facilities that were available. Third, the introduction of "off-the-shelf" components, which were not compatible with RENAISSANCE, contributed to problems in use.

b) Lack of file transfer capabilities

During the trial, it was not possible to transfer files from RENAISSANCE to the personal computers. Thus, the easy flow of text and text-related documents from professional to support staff (for their production in final form) was not possible. The importance of this as a disincentive to use cannot be over-emphasized.

c) The lack of customization

One of the results of the "simplification" of RENAISSANCE was a significant reduction in the degree of customization and tailoring that was carried out to meet the needs of the trial site. Part of this, as described above,

related to the transfer of functionality from RENAISSANCE to the PC's. However, this also applied in terms of customization or modification of the package to meet the specific organizational and structural needs of a group such as ADM(FIN). The inability to customize the document preparation cycle in a way that matched the (very hierarchical) approach adopted within DND, was another major disincentive for system use.

d) Limited match to functionality

Despite the extensive work carried out prior to the implementation of the system, it was clear that, at least in the perceptions of the users, there was a very limited match between the system, as implemented, and the operational needs of the trial site.

e) Undersizing of node microcomputers

The node microcomputers appeared to be undersized for the Field Trial requirements. They did not have the necessary "power" or capability to perform required tasks and usage activity in an acceptable, timely fashion. Response times were frequently cited by users as a major problem. Response times degraded as more users logged onto the system.

2. Structural problems

By "structural" problems we mean problems that were caused by both the nature of the DND group chosen and the fundamental nature of OCS-type field trials.

a) A poor mapping of the field trial groups to the facilities implemented

There may have been only a limited mapping between the kind of facilities being offered and the group chosen for their use. For example, one

of the major facilities offered by the RENAISSANCE system was the electronic mail network. In discussions with users, however, it became clear that there was not a good match between the members of the communication network, of which the trial group formed part, and the availability of electronic mail facilities to individuals. (As an instance, many of the communications carried out by members of the field trial group were with individuals outside the group -- who did not have access to the electronic mail.)

b) The impact of "classified" material

A specific issue that was unlikely to occur in other field trial sites was the much heavier security-related requirements of DND. At the beginning of the field trial, it was decided that only non-classified material would be handled by the system. While this was a valid and appropriate decision, given the state of technology and the implications of providing a system that would meet current standards for handling secure data. However, given the nature of the work groups under study, this re-emphasized the need for "parallel" systems -- again minimizing the potential for use of the system.

3. Implementation and operational problems

There were also a series of events during the implementation and operational periods which may have acted as disincentives to use of the system.

a) Extended delays in implementation

The actual implementation of the project took much longer than expected. As a result, the actual period of operation was much less than had been hoped. Not only did this reduce the time available for the users to become "mature" users of the system, but is likely to have contributed quite significantly to the lack of commitment observed from many users.

b) Performance-related problems

For much of the field trial, the system was dogged with poor response times and comparatively low reliability.

Response times achieved by the system during the project ranged from very poor in the mini-trial environment and, despite improvement, were significantly below user expectations at the end of the study.

The overall reliability of the system improved throughout the project. However, specific nodes encountered downtime and reliabilty problems which were sufficient to discourage use of and commitment to the system.

c) Limited user commitment

This is already mentioned under other headings. However, the limited commitment by most users to the system, particularly at senior management levels, may have contributed towards its non-use by them and by others. Also, given the problems encountered during implementation, initial enthusiasm may have faded quickly.

d) Lack of flexibility within the system

There were at least two areas within the system where lack of flexibility had a negative impact on system use.

- The tailoring of the system to support formal messaging formats only.
- The lack of a flexible interface between the word processors (PC's with word processing software) and the text processing function in RENAISSANCE.

The messaging capabilities of the system were specifically tailored at DND's request to support formal messaging formats only. All users of a certain rank/position and below had their superior's signature block associated

with their user ID for messaging purposes. The system automatically attached the superior's signature block to all messages sent by the more junior user. (This is the procedure for formal letters and memos in the paper-based system.) Because of this, junior level users were more reluctant to use the system for peer-to-peer informal communications.

During the assessment period, the system also lacked a flexible interface between the word processors and the text processing function in RENAISSANCE. Only the one-way transfer of word processing documents from the word processors to RENAISSANCE was supported. Some of the formatting was lost in the transfer, and documents, once in RENAISSANCE, could not be sent back to the word processors for further revision. The system therefore did not permit users to create draft documents on RENAISSANCE, and sent them to word processing for final editing, formatting, and printing.

D. LESSONS LEARNED IN THE PROJECT

Despite the somewhat limited impact of the system, there are many good lessons that can be learned and generalized. These findings are important to all future projects planned in similar environments.

1. The importance of "pre-trialing" new technology

In this field trial, the vendor was implementing new (arguably "prototype") technology. The decision to carry out a "mini-trial" turned out, in hindsight, to be critical to what successes were achieved by the project. Other organizations planning to implement experimental technology (whether it is experimental in terms of systems design or use in that specific environment) would be well advised to ensure that initial trials of the system be carried out in a relatively small user group. We understand from other field trials that initial implementation with any group more than 15 or 20 individuals, prior to extending the system, is likely to cause problems.

2. The difficulty of matching systems to user needs

In this field trial, as with the others, the techniques used to define user needs and to determine system matches to those needs were evolving rapidly and lack the experience of the field trials (and of other parallel office automation activities going on in other organizations). It has become very clear that large scale systems definitions studies (using, to a large degree, study techniques derived from information system's methods) are not appropriate. The inability of users to articulate their needs clearly and the difficulty of outside analysts identifying of the work in the office under question, combine to cause this. In future studies, it is essential, that the concept of needs definition and systems implementation be treated as a cyclical process with continual feedback and that the elapsed time from initial needs definition to implementation be kept as short as possible.

3. The need for heavy support

It is also clear that during the implementation of these new systems, that significant levels of support in both training and "handholding" after implementation are necessary. The initial user training proved satisfactory, and users were generally satisfied with the quality and timeliness of support when they requested it. However, after the initial training and follow-up, user support was primarily provided on a reactive rather than a pro-active basis. While this may be suitable for supporting traditional data processing implementation of "systems", it does not seem to be effective when implementing discretionary tools in the unstructured office environment. Users seem to need more active support to encourage use of the system and bridge the gap between the analyst, who has expert knowledge of the tools but limited knowledge of the user environment, and the user who is and expert in his/her work but has limited knowledge of the capabilities of the tools. The use of representatives or OPI's in each area was intended to help bridge this gap, but except in a few cases, this did not prove effective. More proactive user support was needed.

4. The evolutionary nature of the system

Expanding on the comments above related to matching system to needs. What is also clear is that there is not a simple "before" and "after" in system implementation. Rather, implementation of office facilities appears to be an evolutionary process. As users gain more experience in the capabilities and drawbacks of the systems implemented, they will identify new requirements and alternative approaches to meet their needs.

5. The importance of observation versus survey approaches

In determining the real impacts of office systems, it became clear during this study, that participant observation techniques are much more appropriate to determine the real and perceived impacts of new technology than more detached analytical tools such as questionnaires and surveys.

6. "Ease of use" is not sufficient criteria for system selection

An interesting finding in our study was that almost all participants found the system easy to learn and use. Despite this, the system was not extensively used. The literature makes a great play on the need for "user friendly" systems. It is clear, from our study, that more than this is needed to match user needs. It is also interesting that those areas judged least easy to learn and use (namely the PC-based operation) were the most used facilities.

7. The difficulty in meeting pro-technology expectations

There seems to be some misconceptions among some potential users regarding the capabilities of today's office automation technology. Many users are overly optimistic regarding its capabilities, and underestimate the level of involvement required of them.

In future studies, attempts should be made during the initial planning stages to educate potential users as to what to expect and not expect from the incoming technology. Such measures may distill some of the perhaps unrealistic and idealistic beliefs of many potential users about what technology can do for them.

8. The importance of system-collected data

It also has been clear, both from our perspective as assessors, and looking at the needs of the project implementation team, that good system-recorded data about system usage (and non-usage) is an essential tool. Systems which do not provide a good level of system usage reporting (in a way that relates to the actual functionality of the system and not just cycles and instruction usage) make it difficult for the assessor to determine impact and for the implementation team to determine problems and opportunities.

Vendors and user support groups tend to underestimate the usefulness of such data, perhaps because of fears that weaknesses in the system will be identified too visibly. Thus they miss a major opportunity to improve the chances of success.

9. There may be "hidden" findings

Because of the very limited use of the system, and the special circumstances of the field trial, there may be impacts of office technology that were not detected in this study. Specifically, we would not recommend that the "null hypothesis" developed in this study -- that office automation has a very limited impact on job content and on organization structure, are, in fact, generalizable. It does, however, raise the interesting issue of whether these impacts are less likely to occur in government organizations than they are in private sector organizations.

10. We are not convinced that the DND field trial results are necessarily "typical" of all office automation projects

It cannot be assumed, from the field trial results, that office automation cannot have a major impact on an organization. All that can be assumed, in this case, is that a system of the type implemented by XIOS has a limited impact upon an organization such as ADM(FIN), when implemented as a field trial. As a learning experience, the field trial has been significant. It points out many areas of problem and opportunity that should be addressed in any future office automation project -- whether in public or private sector organization. However, researchers should avoid focussing on the negative issues.

IMPACT ASSESSMENT OF THE DND OCS FIELD TRIAL:

TECHNICAL APPENDIX

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APPENDIX A

Survey of Prior Computer Experience

PRIOR COMPUTER EXPERIENCE

Abt Associates and the Department of National Defence are conducting this brief survey as part of the evaluation of the OCS field trial. This questionnaire is designed to enable us to identify field trial participants who have had prior computer experience.

Please note that we refer to the term "computer" in a generic sense. By "computer" we mean all types of electronic computing equipment. This includes stand-alone or dedicated word processing equipment as well as home computers, business, microcomputers, etc.

Name: _____ Position: _____

Group: _____

1. Have you used a computer before?

   Yes _____ No _____

2. Did you use a computer in high school, college, university or at other educational or training facilities?

   Yes _____ No _____

3. Have you ever received formal training in the use of computers?

   Yes _____ No _____

   If yes, please indicate where you received your training and briefly describe the nature of this training.

	Where training received	Nature of training
1.	_____	_____
2.	_____	_____
3.	_____	_____

4. Have you used a computer during your past work experience?

   Yes _____ No _____

5. Please indicate which of the following types of computers you have used.

_____ Home computers

_____ Business microcomputer

_____ Word processor

_____ Minicomputer

_____ Large computer mainframe

_____ Other (please specify):

_____

_____

6. Please indicate which of the following functions you performed using the computer:

_____ Computer programming

_____ Data entry or inquiry using a terminal

_____ Word processing

_____ Preparing spreadsheets

_____ Modelling or forecasting

_____ Graphics

_____ Other (please specify):

_____

_____

7. How long has it been since you last used a computer?

_____ Within the last six months

_____ Six months to one year

_____ One to two years

_____ Three to five years

_____ Six years or more

8. How would you rate your level of expertise as a user of computers?

_____ Beginner

_____ Intermediate

_____ Advanced

APPENDIX B

Survey of Organizations

SOO

THE UNIVERSITY OF MICHIGAN/INSTITUTE FOR SOCIAL RESEARCH
RENSIS LIKERT ASSOCIATES, INC.

ANN ARBOR, MI 48104

SURVEY OF ORGANIZATIONS

We appreciate your answering the questions in this booklet. The questionnaire is designed to collect information about how people in your organization work together. The purpose is to provide information to help make your work situation more satisfying and productive. Therefore, it is important that you answer each question as thoughtfully and frankly as possible.

This is not a test, and there are no right or wrong answers. Your individual responses will not be identified. The completed questionnaires are processed by automated equipment. Responses are summarized in statistical form by group. To ensure *complete confidentiality* please do not write your name anywhere on the questionnaire.

There are several questions that request basic employee information such as age, sex, amount of education, and length of time with the organization. Your responses to these personal items will not be used to identify you. Rather, they will be used to study how different groups of people respond to the questions.

(This edition is derived from the 1974 edition of the Survey of Organizations and the 1976 edition of the Organization Survey Profile.)

UNIVERSITY ASSOCIATES, INC.
8517 PRODUCTION AVENUE
P.O. BOX 26240
SAN DIEGO, CALIFORNIA 92121

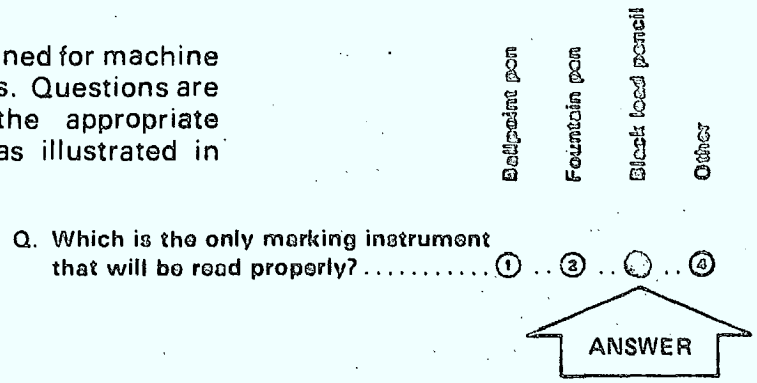
INSTRUCTIONS

I. Most questions have five possible responses. Please record your answers by filling in one of the numbered circles next to each question. If you do not find the exact answer that fits your needs, use the one that is closest to it.

II. Please use a #2 black lead pencil, and observe these requirements:

- Make heavy black marks that fill the circle.
- Erase clearly any answer you wish to change.
- Do not make any stray marks.

III. This questionnaire is designed for machine scanning of your responses. Questions are answered by marking the appropriate answer spaces (circles) as illustrated in this example:



IV. In this questionnaire, the following terms have these definitions:

Organization — The company, agency, or institution which employs you. In large organizations this ordinarily means the division, plant, or office site where you work.

Supervisor — The person to whom you directly report.

Work group — All the persons who report to the same supervisor.

Department or *unit* — A part of the organization which carries out a single function or related activities, and which usually involves more than one work group.

(If these definitions are not clear, please ask the survey administrator.)

V. In order to provide confidentiality, all persons who report to the same supervisor use the same five digit code. Your group's code is located next to your supervisor's name on the **Supervisor's Code List.**

Write the Supervisor's Code Number in the code boxes to the right. Below each box, fill in the circle that is numbered the same as the number in the box. If your supervisor's name is not on the list, please ask the survey administrator.

Print the name of your supervisor in this space:

_____

SUPERVISOR'S CODE NUMBER

0	0	0	0	0
1	1	1	1	1
2	2	2	2	2
3	3	3	3	3
4	4	4	4	4
5	5	5	5	5
6	6	6	6	6
7	7	7	7	7
8	8	8	8	8
9	9	9	9	9

NOTE: Read over these answer categories carefully. Then answer each of the following questions by blackening in the numbered circle under the answer you want to give.

	To a very little extent	To a little extent	To some extent	To a great extent	To a very great extent
1. To what extent is this organization generally quick to use improved work methods?	①	②	③	④	⑤
2. To what extent does this organization have goals and objectives that are both clear-cut and reasonable?	①	②	③	④	⑤
3. To what extent are work activities sensibly organized in this organization?	①	②	③	④	⑤
4. In this organization, to what extent are decisions made at those levels where the most adequate and accurate information is available?	①	②	③	④	⑤
5. How adequate is the information your work group gets about what is going on in other departments or units?	①	②	③	④	⑤
6. To what extent does this organization tell your work group what it needs to know to do the best possible job?	①	②	③	④	⑤
7. How receptive are people above your supervisor to ideas and suggestions coming from your work group?	①	②	③	④	⑤
8. To what extent does this organization have a real interest in the welfare and overall satisfaction of those who work here?	①	②	③	④	⑤
9. How much does this organization try to improve working conditions?	①	②	③	④	⑤
10. To what extent are there things about working here (such as policies, practices, or conditions) that encourage you to work hard?	①	②	③	④	⑤
11. When decisions are being made, to what extent are the persons affected asked for their ideas?	①	②	③	④	⑤
12. People at all levels of an organization usually have know-how that could be of use to decision makers. To what extent is information widely shared in this organization so that those who make decisions have access to such knowledge?	①	②	③	④	⑤

NOTE: Read over these answer categories carefully. Then answer each of the following questions by blackening in the numbered circle under the answer you want to give.

IN GENERAL, HOW MUCH SAY OR INFLUENCE DOES EACH OF THE FOLLOWING GROUPS OF PEOPLE HAVE ON WHAT GOES ON IN YOUR DEPARTMENT?

	Little or no influence	Some	Quite a bit	A great deal	A very great deal of influence
13. First-line supervisors	①	②	③	④	⑤
14. Top management	①	②	③	④	⑤
15. Non-supervisory employees	①	②	③	④	⑤
16. Middle managers (department heads, area managers, etc.)	①	②	③	④	⑤

NOTE: Read over these answer categories carefully. Then answer each of the following questions by blackening in the numbered circle under the answer you want to give.

	Very dissatisfied	Somewhat dissatisfied	Neither satisfied nor dissatisfied	Fairly satisfied	Very satisfied
17. Overall, how satisfied are you with the persons in your work group?	①	②	③	④	⑤
18. Overall, how satisfied are you with your supervisor?	①	②	③	④	⑤
19. Overall, how satisfied are you with your job?	①	②	③	④	⑤
20. Overall, how satisfied are you with this organization?	①	②	③	④	⑤
21. Considering your skills and the effort you put into your work, how satisfied are you with your pay?	①	②	③	④	⑤
22. How satisfied are you with the progress you have made in this organization up to now?	①	②	③	④	⑤
23. How satisfied are you with your chances for getting ahead in this organization in the future?	①	②	③	④	⑤

NOTE: Read over these answer categories carefully. Then answer each of the following questions by blackening in the numbered circle under the answer you want to give.

	To a very little extent	To a little extent	To some extent	To a great extent	To a very great extent

THE FOLLOWING QUESTIONS APPLY TO YOUR SUPERVISOR, THE PERSON TO WHOM YOU DIRECTLY REPORT (THE PERSON YOU IDENTIFIED ON PAGE 2). MOST QUESTIONS HAVE TWO PARTS: HOW IT IS NOW AND HOW YOU WOULD LIKE IT TO BE. PLEASE ANSWER BOTH PARTS.

How friendly and easy to approach is your supervisor?

24. This is how it is now . . . . . ① ② ③ ④ ⑤
25. This is how I'd like it to be . . . . ① ② ③ ④ ⑤

When you talk with your supervisor, to what extent does your supervisor pay attention to what you are saying?

26. This is how it is now . . . . . ① ② ③ ④ ⑤
27. This is how I'd like it to be . . . . ① ② ③ ④ ⑤

To what extent is your supervisor willing to listen to your problems?

28. This is how it is now . . . . . ① ② ③ ④ ⑤
29. This is how I'd like it to be . . . . ① ② ③ ④ ⑤

To what extent does your supervisor encourage the persons who work in the group to work as a team?

30. This is how it is now . . . . . ① ② ③ ④ ⑤
31. This is how I'd like it to be . . . . ① ② ③ ④ ⑤

To what extent does your supervisor encourage people who work in the group to exchange opinions and ideas?

32. This is how it is now . . . . . ① ② ③ ④ ⑤
33. This is how I'd like it to be . . . . ① ② ③ ④ ⑤

How much does your supervisor encourage people to give their best effort?

34. This is how it is now . . . . . ① ② ③ ④ ⑤
35. This is how I'd like it to be . . . . ① ② ③ ④ ⑤

To what extent does your supervisor maintain high standards of performance in the group?

36. This is how it is now . . . . . ① ② ③ ④ ⑤
37. This is how I'd like it to be . . . . ① ② ③ ④ ⑤

To what extent does your supervisor provide help, training, and guidance so that you can improve your performance?

38. This is how it is now . . . . . ① ② ③ ④ ⑤
39. This is how I'd like it to be . . . . ① ② ③ ④ ⑤

To what extent does your supervisor provide the help you need so that you can schedule work ahead of time?

40. This is how it is now . . . . . ① ② ③ ④ ⑤
41. This is how I'd like it to be . . . . ① ② ③ ④ ⑤

To a very little extent | To a little extent | To some extent | To a great extent | To a very great extent

To what extent does your supervisor offer new ideas for solving job-related problems?

42. This is how it is now . . . . . ① ② ③ ④ ⑤
43. This is how I'd like it to be . . . ① ② ③ ④ ⑤

WHEN IT IS NECESSARY FOR DECISIONS TO BE MADE THAT AFFECT YOUR WORK GROUP, TO WHAT EXTENT DOES YOUR SUPERVISOR DO THE FOLLOWING BEFORE FINAL DECISIONS ARE MADE?

44. . . . provide the members of your work group with information about the decisions in advance? . . . . . ① ② ③ ④ ⑤

45. . . . ask for opinions and ideas from members of your work group? . . . . . ① ② ③ ④ ⑤

46. . . . meet with members as a group, present problems that must be solved, and work with the group to find solutions? . . . . ① ② ③ ④ ⑤

IN ORDER TO BE AN EFFECTIVE LEADER, A SUPERVISOR NEEDS CERTAIN KINDS OF INFORMATION, SKILLS, VALUES, AND SITUATIONS. PLEASE ANSWER QUESTIONS 47 THROUGH 59 WITH YOUR SUPERVISOR IN MIND.

47. To what extent does your supervisor have knowledge of what it takes to be a good leader? . . . . . ① ② ③ ④ ⑤

48. To what extent does your supervisor's attitude encourage participation and commitment from work group members? . . . . . ① ② ③ ④ ⑤

49. To what extent does your supervisor have skills for getting along with others? . . ① ② ③ ④ ⑤

50. To what extent does your supervisor have information about how work group members see and feel about things? . . ① ② ③ ④ ⑤

51. To what extent does your supervisor have an interest in and concern for work group members? . . . . . ① ② ③ ④ ⑤

52. To what extent does your supervisor have the necessary administrative skills? . . . . . ① ② ③ ④ ⑤

	To a very little extent	To a little extent	To some extent	To a great extent	To a very great extent
53. To what extent does your supervisor have a work situation which allows your supervisor to be a good leader?	1	2	3	4	5
54. To what extent does your supervisor have confidence and trust in you?	1	2	3	4	5
55. To what extent do you have confidence and trust in your supervisor?	1	2	3	4	5
56. To what extent does your supervisor understand the problems you face in your job?	1	2	3	4	5
57. To what extent does your supervisor follow through in carrying out decisions?	1	2	3	4	5
58. To what extent is your supervisor allowed to work without excessive control from his or her supervisor?	1	2	3	4	5
59. To what extent does your supervisor effectively represent the needs, goals, and ideas of your work group to his or her supervisor?	1	2	3	4	5

THE FOLLOWING QUESTIONS APPLY TO YOUR WORK GROUP — YOU AND ALL OTHERS WHO REPORT TO YOUR SUPERVISOR.

How friendly and easy to approach are the persons in your work group?

60. This is how it is now	1	2	3	4	5
61. This is how I'd like it to be	1	2	3	4	5

When you talk with persons in your work group, to what extent do they pay attention to what you are saying?

62. This is how it is now	1	2	3	4	5
63. This is how I'd like it to be	1	2	3	4	5

To what extent are persons in your work group willing to listen to your problems?

64. This is how it is now	1	2	3	4	5
65. This is how I'd like it to be	1	2	3	4	5

How much do persons in your work group encourage each other to work as a team?

66. This is how it is now	1	2	3	4	5
67. This is how I'd like it to be	1	2	3	4	5

How much do persons in your work group emphasize a team goal?

68. This is how it is now	1	2	3	4	5
69. This is how I'd like it to be	1	2	3	4	5

	To a very little extent	To a little extent	To some extent	To a great extent	To a very great extent
To what extent do persons in your work group exchange opinions and ideas?					
70. This is how it is now	1	2	3	4	5
71. This is how I'd like it to be	1	2	3	4	5
How much do persons in your work group encourage each other to give their best efforts?					
72. This is how it is now	1	2	3	4	5
73. This is how I'd like it to be	1	2	3	4	5
To what extent do persons in your work group maintain high standards of performance?					
74. This is how it is now	1	2	3	4	5
75. This is how I'd like it to be	1	2	3	4	5
To what extent do persons in your work group help you find ways to do a better job?					
76. This is how it is now	1	2	3	4	5
77. This is how I'd like it to be	1	2	3	4	5
To what extent do persons in your work group provide the information or help you need so that you can plan work ahead of time?					
78. This is how it is now	1	2	3	4	5
79. This is how I'd like it to be	1	2	3	4	5
To what extent do persons in your work group offer each other new ideas for solving job-related problems?					
80. This is how it is now	1	2	3	4	5
81. This is how I'd like it to be	1	2	3	4	5
82. To what extent does your work group plan together and coordinate its efforts?	1	2	3	4	5
83. To what extent does your work group make good decisions and solve problems well?	1	2	3	4	5
84. To what extent is information about important events and situations shared within your work group?	1	2	3	4	5
85. To what extent does your work group feel responsible for meeting its objectives successfully?	1	2	3	4	5
86. To what extent is your work group able to respond to unusual work demands placed on it?	1	2	3	4	5

To a very little extent — To a little extent — To some extent — To a great extent — To a very great extent

97. To what extent do you have confidence and trust in the persons in your work group? ..... ① .. ② .. ③ .. ④ .. ⑤

98. If unusual problems or crises arise, to what extent does your work group try to find new ways to deal with them? ..... ① .. ② .. ③ .. ④ .. ⑤

99. In general, how much say or influence do you have on what goes on in your work group? ..... ① .. ② .. ③ .. ④ .. ⑤

90. To what extent do you enjoy performing the actual day-to-day activities that make up your job? ..... ① .. ② .. ③ .. ④ .. ⑤

91. To what extent does doing your job well give you a feeling of personal satisfaction? ..... ① .. ② .. ③ .. ④ .. ⑤

92. To what extent does your job give you the opportunity to find out how well you are doing? ..... ① .. ② .. ③ .. ④ .. ⑤

93. To what extent does your job let you do a number of different things? ..... ① .. ② .. ③ .. ④ .. ⑤

94. To what extent does your job let you learn new things and new skills? ..... ① .. ② .. ③ .. ④ .. ⑤

95. To what extent does your job use your skills and abilities — let you do the things you can do best? ..... ① .. ② .. ③ .. ④ .. ⑤

96. To what extent does doing your job well lead to things like pay increases and bonuses? ..... ① .. ② .. ③ .. ④ .. ⑤

97. To what extent does doing your job well lead to things like recognition and respect from those you work with? ..... ① .. ② .. ③ .. ④ .. ⑤

98. To what extent does your job provide good chances for getting ahead? ..... ① .. ② .. ③ .. ④ .. ⑤

99. To what extent are you clear about what people expect you to do on your job? ..... ① .. ② .. ③ .. ④ .. ⑤

To a very little extent — To a little extent — To some extent — To a great extent — To a very great extent

100. To what extent are there times on your job when one person wants you to do one thing and someone else wants you to do something different? ..... ① .. ② .. ③ .. ④ .. ⑤

101. To what extent do people expect too much from you on your job? ..... ① .. ② .. ③ .. ④ .. ⑤

102. To what extent does your job allow independence and freedom in how you do the work? ..... ① .. ② .. ③ .. ④ .. ⑤

103. To what extent does your job let you do a whole piece of work (as opposed to doing part of a job which is finished by someone else)? .. ① .. ② .. ③ .. ④ .. ⑤

104. To what extent are you involved in setting goals for your work? ..... ① .. ② .. ③ .. ④ .. ⑤

105. To what extent do you get endlessly referred from person to person when you need help? ..... ① .. ② .. ③ .. ④ .. ⑤

106. To what extent do you have to go through a lot of "red tape" to get things done? ..... ① .. ② .. ③ .. ④ .. ⑤

107. To what extent do you get hemmed in by longstanding rules and regulations that no one seems to be able to explain? ..... ① .. ② .. ③ .. ④ .. ⑤

108. To what extent do different units plan together and coordinate their efforts? .... ① .. ② .. ③ .. ④ .. ⑤

109. To what extent does your unit receive cooperation and assistance from other units? ..... ① .. ② .. ③ .. ④ .. ⑤

110. How are problems between units resolved?

① Nothing is done.

② Little is done about these problems.

③ The problems are discussed at length in the organization — but often still are not resolved.

④ The problems are appealed to a higher level in the organization — and are usually decided there

⑤ The problems are worked out at the level where they appear, through mutual effort and understanding.

	To a very little extent	To a little extent	To some extent	To a great extent	To a very great extent
111. To what extent does your unit's work require information from several other units?	1	2	3	4	5
112. To what extent is the success of your unit affected by the activities of other units?	1	2	3	4	5
113. To what extent is cooperation between your unit and other units encouraged by the behavior of unit supervisors?	1	2	3	4	5
114. To what extent is cooperation between your unit and other units encouraged by the actions of upper level management groups?	1	2	3	4	5
115. In this organization, to what extent is there an active interest in your career development?	1	2	3	4	5
116. To what extent are current employees given fair consideration for job openings in which they are interested?	1	2	3	4	5
117. To what extent are there adequate career paths for you in this organization?	1	2	3	4	5
118. To what extent is your pay equitable to the pay of others doing the same type of work?	1	2	3	4	5
119. To what extent is this organization effective in getting you to meet its needs and contribute to its effectiveness?	1	2	3	4	5
120. To what extent does this organization do a good job of meeting your needs as an individual?	1	2	3	4	5

121. Your sex:
- 1 Male
- 2 Female

122. How long have you worked for this organization?
- 1 Less than 1 year
- 2 1 through 5 years
- 3 6 through 10 years
- 4 11 through 15 years
- 5 16 through 25 years
- 6 26 years or more

123. How old are you?
- 1 25 years old or less
- 2 26 years through 30 years
- 3 31 years through 35 years
- 4 36 years through 40 years
- 5 41 years through 45 years
- 6 46 years through 55 years
- 7 56 years or over

124. How much formal education have you had?
- 1 Up to some high school
- 2 Completed high school
- 3 Some college
- 4 Completed college
- 5 Some graduate school
- 6 Completed graduate school

125. Is your job primarily:

in the U.S., "non-exempt" employees
- 1 Non-supervisory production or maintenance
- 2 Non-supervisory technical or service
- 3 Non-supervisory clerical or inside sales

in the U.S., "exempt" employees
- 4 Non-supervisory outside (field) sales
- 5 First-line supervision — production or maintenance
- 6 First-line supervision — technical or service
- 7 First-line supervision — clerical or sales
- 8 Professional or senior technical
- 9 Middle management/senior administrative
- 10 Top management

ON SEPARATE SHEETS YOU WILL FIND ADDITIONAL QUESTIONS. PLEASE ANSWER THEM IN THE FOLLOWING SPACES. (126 - 200)

126.	1	2	3	4	5
127.	1	2	3	4	5
128.	1	2	3	4	5
129.	1	2	3	4	5
130.	1	2	3	4	5
131.	1	2	3	4	5
132.	1	2	3	4	5
133.	1	2	3	4	5
134.	1	2	3	4	5
135.	1	2	3	4	5
136.	1	2	3	4	5
137.	1	2	3	4	5
138.	1	2	3	4	5
139.	1	2	3	4	5
140.	1	2	3	4	5

APPENDIX C

Selected Items from the Organization Assessment Instrument

SUPPLEMENTARY QUESTIONS

Note: Please record the answers to these questions on Page 7 of the printed questionnaire booklet. Be careful to ensure that the number on the answer sheet matches the number of the supplementary question you are answering.

126 **How easy** is it for you to **know** whether you do your work correctly?

Very Difficult	Quite Difficult	Somewhat Easy	Quite Easy	Very Easy
1	2	3	4	5

127 **What per cent of the time** are you **generally sure** of what the **outcomes** of your work efforts will be?

40% or less	41-60%	61-75%	76-90%	91% or more
1	2	3	4	5

128 In the past 3 months, **how often** did **difficult problems arise** in your work for which there were no immediate or apparent solutions?

Once a week or less	About 2-4 times a week	Almost once a day	About 2-4 times a day	5 times or more a day
1	2	3	4	5

129 About **how much time** did you spend solving these **work problems**?

Less than 1 hour/ week	About 1-4 hours/ week	About 1 hour/ day	About 2-3 hours/ day	4 hours or more per day
1	2	3	4	5

QUESTIONS 130-150 SHOULD BE ANSWERED BY NON-SUPERVISORY STAFF ONLY

IN GENERAL, YOUR JOB AND YOUR WORK GROUP DO NOT EXIST IN ISOLATION FROM OTHER PEOPLE IN THIS ORGANIZATION. THE FOLLOWING QUESTIONS ASK HOW MUCH YOU DEPEND UPON AND CO-ORDINATE WITH OTHERS TO DO YOUR WORK.

To obtain the materials, clients, or information needed to do your job, how much do you have to rely on each of the following people:	NOT AT ALL	A LITTLE	SOME	QUITE A BIT	VERY MUCH
130 Your work group supervisor?	1	2	3	4	5
131 Other work group members or co-workers?	1	2	3	4	5
132 People outside of your work group?	1	2	3	4	5
While doing your assigned tasks, how much do you have to depend on each of the following people:					
133 Your work group superivsor?	1	2	3	4	5
134 Other work group members and co-workers?	1	2	3	4	5
135 People outside of your work group?	1	2	3	4	5
After you finish your part of the work, how much do you have to rely upon each of the following people to perform the next steps in the process before the total task or service is completed:					
136 Your unit supervisor?	1	2	3	4	5
137 Other unit members or co-workers?	1	2	3	4	5
138 People outside of your unit?	1	2	3	4	5

During the past 3 months, to what **extent** did you experience **problems** in co-ordinating these work activities with each of the following people:

		TO NO EXTENT	LITTLE EXTENT	SOME EXTENT	LARGE EXTENT	VERY GREAT EXTENT
139	Your work group supervisor?	1	2	3	4	5
140	Other work group members or co-workers	1	2	3	4	5
141	People outside of your work group?	1	2	3	4	5

During the past 3 months **how often** did you receive or send **written reports** or **memos** related to your work from or to each of the following people:

		NOT ONCE	ABOUT 1-3 TIMES A MONTH	ABOUT 1-3 TIMES A WEEK	ABOUT 1-3 TIMES A DAY	ABOUT EVERY HOUR
		HOW OFTEN RECEIVED OR SENT WRITTEN REPORTS OR MEMOS IN PAST 3 MONTHS				
142	Your supervisor?	1	2	3	4	5
143	Other work group members or co-workers?	1	2	3	4	5
144	People outside of your work group?	1	2	3	4	5

HOW OFTEN HAD WORK DISCUSSIONS IN PAST 3 MONTHS

During the past 3 months **how often** did you have work related **discussions** (**face-to-face** or by **telephone**) with each of the following people:	NOT ONCE	ABOUT 1-3 TIMES A MONTH	ABOUT 1-3 TIMES A WEEK	ABOUT 1-3 TIMES A DAY	ABOUT EVERY HOUR
145 Your work group supervisor?	1	2	3	4	5
146 Other work group members or co-workers?	1	2	3	4	5
147 People outside of your work group?	1	2	3	4	5

HOW OFTEN WERE MEETINGS HELD IN PAST 3 MONTHS

During the past 3 months **how often** were you involved in special group problem-solving meetings with:	NOT ONCE	ABOUT ONCE A MONTH	ABOUT EVERY 2 WEEKS	ABOUT ONCE A WEEK	TWICE A WEEK OR MORE
148 Two or more people from your work group?	1	2	3	4	5
149 Two or more people from outside of your work group?	1	2	3	4	5
150 How **often** were regularly scheduled staff meetings held among people in your work group?	1	2	3	4	5

QUESTIONS 151-175 SHOULD BE ANSWERED BY SUPERVISORY STAFF ONLY

THE NEXT FOUR QUESTIONS ARE ABOUT THE INTERNAL FLOW OF WORK BETWEEN YOUR IMMEDIATE SUBORDINATES. LISTED AND DIAGRAMMED BELOW ARE FOUR COMMON WAYS THAT THE WORK PERFORMED IN YOUR WORK GROUP CAN FLOW BETWEEN YOUR IMMEDIATE SUBORDINATES. (YOU, AS THE WORK GROUP SUPERVISOR, SHOULD CONSIDER YOURSELF OUTSIDE THE BOXES BELOW.)

Please indicate **how much** of the **normal work** in your work group **flows** between your **immediate subordinates** in a manner as described by **each** of the following cases:	HOW MUCH WORK NORMALLY FLOWS BETWEEN MY IMMEDIATE SUBORDINATES IN THIS MANNER				
	ALMOST NONE OF THE WORK	LITTLE	ABOUT 50% OF ALL THE WORK	A LOT	ALMOST ALL OF THE WORK
151 **Independent work Flow Case,** where work and activities are performed by your immediate subordinates separately and do not flow between them?	1	2	3	4	5
152 **Sequential Work Flow Case,** where work and activities flow between your immediate subordinates but mostly in only one direction?	1	2	3	4	5

		ALMOST NONE OF THE WORK	LITTLE	ABOUT 50% OF ALL THE WORK	A LOT	ALMOST ALL OF THE WORK
153	**Reciprocal Work Flow Case**, where work and activities flow between your immediate subordinates in a back-and-forth manner **over** a **period of time**?	1	2	3	4	5
154	**Team Work Flow Case,** where work and activities come into your work group and your immediate subordinates diagnose, problem solve, and collaborate as a group at the same time in meetings to deal with the work.	1	2	3	4	5

To obtain the information and materials needed to do their work, **how much** do work group members have to **rely** upon each of the following people:	NOT AT ALL	A LITTLE	SOME	QUITE A BIT	VERY MUCH
155 You, the work group supervisor	1	2	3	4	5
156 Other members in your work group?	1	2	3	4	5
157 People outside of your work group?	1	2	3	4	5
How much do work group members have to **depend** on each of the following people **while doing their respective jobs:**					
158 You, the work group supervisor?	1	2	3	4	5
159 Other members in your work group?	1	2	3	4	5
160 People outside of your work group?	1	2	3	4	5

After work group members finish their part of the task, **how much** do they have to **rely** on each of the following people to **perform** the next **steps** in the process before the total task or service is completed:	NOT AT ALL	A LITTLE	SOME	QUITE A BIT	VERY MUCH
161 You, the work group supervisor?	1	2	3	4	5
162 Other members in your work group?	1	2	3	4	5
163 People outside of your work group?	1	2	3	4	5

During the past 3 months, to what extent did you experience problems in co-ordinating work activities:	TO NO EXTENT	LITTLE EXTENT	SOME EXTENT	LARGE EXTENT	VERY GREAT EXTENT
164 Between you and work group members?	1	2	3	4	5
165 Among work group members?	1	2	3	4	5
166 With people outside of your work group?	1	2	3	4	5

To co-ordinate the work of your work group during the past 3 months, how often were written reports or memos sent or received?	NOT ONCE	ABOUT 1-3 TIMEs A MONTH	ABOUT 1-3 TIMES A WEEK	ABOUT 1-3 TIMES A DAY	ABOUT EVERY HOUR
	HOW OFTEN RECEIVED OR SENT WRITTEN REPORTS OR MEMOS IN PAST 3 MONTHS				
167 Between you and work group members?	1	2	3	4	5
168 Among work group members?	1	2	3	4	5
169 Between you and people outside of your work group?	1	2	3	4	5

During the past 3 months, how often did work-related discussions (face-to-face or by telephone) occur on a one-to-one basis:	NOT ONCE	ABOUT 1-3 TIMES A MONTH	ABOUT 1-3 TIMES A WEEK	ABOUT 1-3 TIMES A DAY	ABOUT EVERY HOUR
	HOW OFTEN HAD WORK DISCUSSIONS IN PAST 3 MONTHS				
170 Between you and work group members?	1	2	3	4	5
171 Among work group members?	1	2	3	4	5
172 Between you and people outside your work group?	1	2	3	4	5

		HOW OFTEN MEETINGS WERE HELD IN PAST 3 MONTHS				
		NOT ONCE	ABOUT ONCE A MONTH	ABOUT EVERY 2 WEEKS	ABOUT ONCE A WEEK	TWICE A WEEK OR MORE
173	How frequently did did you conduct regularly scheduled staff or work group meetings with your immediate subordinates during the past 3 months?	1	2	3	4	5
	During the past 3 months, how frequently were you involved in impromptu, unscheduled meetings to solve specific work problems:					
174	With two more of your subordinates	1	2	3	4	5
175	With two or more people from outside of your work group?	1	2	3	4	5

APPENDIX D

Attitudes Towards Office Technology Survey

OFFICE TECHNOLOGY

We would like to know what computers mean to you personally and how you feel they might affect your work over the course of the field trial. Please circle the appropriate number to indicate whether you agree or disagree with the following statements. Even if you have never used a computer, we are interested in how you think these statements would apply to you.

(1) Strongly Disagree	(2) Disagree	(3) Undecided	(4) Agree	(5) Strongly Agree

1.	The idea of sitting down in front of a computer and working with it frightens me.	1	2	3	4	5
2.	I use a computer any chance I get.	1	2	3	4	5
3.	I feel helpless around a computer.	1	2	3	4	5
4.	Using a terminal makes me confused.	1	2	3	4	5
5.	I would like to have a computer in my home.	1	2	3	4	5
6.	I have to "psych myself up" before I use a computer.	1	2	3	4	5
7.	I enjoy tinkering with mechanical things.	1	2	3	4	5
8.	I would not know what to do on the computer if people weren't there to help me.	1	2	3	4	5
9.	I feel tense about using a computer before I even start.	1	2	3	4	5
10.	I see computer skill as being an absolute necessity.	1	2	3	4	5
11.	It gets really frustrating trying to speak a computer's language.	1	2	3	4	5
12.	I am afraid of touching the wrong button by mistake.	1	2	3	4	5
13.	I like to know how things work and why.	1	2	3	4	5

(1) Strongly Disagree	(2) Disagree	(3) Undecided	(4) Agree	(5) Strongly Agree

14.	If the computer is going to break down, it will do it on me.	1	2	3	4	5
15.	I really want to be involved in the computer culture: I don't want to be left out.	1	2	3	4	5
16.	Having a machine ask me questions intimidates me.	1	2	3	4	5
17.	The computer frightens me when it does things I don't understand.	1	2	3	4	5
18.	It makes me feel left out and a little stupid when others know so much more about computers than I do.	1	2	3	4	5
19.	The computer manuals are so over my head that I get lost.	1	2	3	4	5
20.	Using a computer gives me a sense of control.	1	2	3	4	5
21.	Before I ever approach a computer, I know I'm going to be frustrated.	1	2	3	4	5
22.	When I use a computer, I can't seem to get the right information out of it.	1	2	3	4	5
23.	I go out of my way to learn about computers.	1	2	3	4	5
24.	I am afraid people will think I am stupid for the questions I ask.	1	2	3	4	5
25.	Not being able to type keeps me from being really competent on the computer.	1	2	3	4	5

In the next few months, you will begin to use an electronic office system. Please indicate whether you expect that this system will:

26.	Reduce the number of boring tasks you do.	1	2	3	4	5
27.	Possibly have harmful effects on your health.	1	2	3	4	5
28.	Allow you to be more creative in your work.	1	2	3	4	5
29.	Increase personal stress.	1	2	3	4	5

(1) Strongly Disagree	(2) Disagree	(3) Undecided	(4) Agree	(5) Strongly Agree

30.	Improve office productivity.	1	2	3	4	5
31.	Allow less control over your work.	1	2	3	4	5
32.	Increase your job satisfaction.	1	2	3	4	5
33.	Save you time in completing your work.	1	2	3	4	5
34.	Increase the skill requirements for your job.	1	2	3	4	5
35.	Make people less accessible to each other.	1	2	3	4	5
36.	Provide less opportunity for personal achievement.	1	2	3	4	5
37.	Improve interpersonal relations.	1	2	3	4	5
38.	Result in less job security.	1	2	3	4	5
39.	Allow you to make better decisions.	1	2	3	4	5
40.	Limit your personal privacy.	1	2	3	4	5

Thank you for your cooperation.

APPENDIX E

Communications Diary (Pre)

D N D COMMUNICATION LOG

NAME _____ DATE _____ Page ___ of ___

	OTHER PARTY		INITIATED BY		METHOD								INCOMPLETIONS			
							PERSONAL CORRESPONDENCE						CAUSE		ACTION TAKEN	
	NAME AND DEPARTMENT	Substitute for Person's Name	Self	Other	Face-to-Face	Telephone	Mail - Internal	Mail - External	Hand Delivered	Telex	Other	Duration (in minutes)	Busy	Not There	Left Message - Will Call Back	Left Message - With Control	Will Try Later	Accepted Substitute (Note on Next Line)
1																		
2																		
3																		
4																		
5																		
6																		
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INSTRUCTIONS FOR THE DND COMMUNICATIONS LOG

I. INTRODUCTION

Abt Associates, in co-operation with the Department of Communications, are conducting this communication audit as part of the evaluation of the OCS field trials. This log is designed to enable us to better understand the organizational communication within DND, and as a consequence, to aid us in analyzing the impact of new office communication technologies.

II. WHAT SHOULD BE LOGGED

- All telephone calls that you place or are directed to you.
- All face-to-face visitors received (formally or informally) or visits made (including meetings).
- All correspondence received or sent -- letters, memos, requisitions, reports, instructions, etc. Consider each batch from one source as one contact regardless of the number of pages.

III. WHAT SHOULD NOT BE LOGGED

- Do not record personal, non-business related communications.
- When you are an intermediary in a communication, you should not record it. Examples would be someone transferring a call to the intended party, or receiving mail just to deliver it to someone else, or directing a person to someone else's office. However, if you had to carefully read mail before passing it on, then please record the communication.
- Secretaries should only record communications intended for them. Communications which are either intercepted or re-directed to others should not be recorded.

IV. FILLING IN THE LOG

Please make an entry in the log immediately after participating in each communication. This should only take a few seconds. The log is divided into sections as follows:

- **"Substitute for previous line"** -- See explanations for "Accepted Substitute."
- **"Other Party"** -- Record the identification of that person in the left-hand column. If the person belongs to DND, then record that person by name (if known) and division/directorate. If the person is outside of DND but part of the federal government, record the department/division (name is not needed). If the person is outside of the federal government, then simply record "External."
- **"Initiated By"** -- In this area, you should place a check underneath who initiated the interaction; a "self" indicates that you placed the phone call, letter, etc., while an "other" indicates that you received the phone call, letter, etc.
- **"Face-to-Face"** -- Check here if the communication is face-to-face. If the communication is a meeting with more than one person, please record each person's name/directorate in the **"Other Party"** column. Then, record the communication details of the meeting (**"Initiated By"**, **"Face-to-Face"**, and **"Duration"**) against the first person in the list only. Draw a line down for each column that you check to the last person in the list of meeting attendees.
- **"Telephone"** -- Check here if the communication is via the telephone.
- **"Correspondence"** -- Check either **"Mail Internal"**, **"Mail External"**, or **"Hand Delivered"** for any paper communication that you receive or send. Do not include general mailings (such as newletters etc.); only include material that comes from a known sender and is either addressed to you or specifically routed to you, or is specifically addressed by you to a person or group.
  - **"Mail External"** -- Check if you received or sent mail through Canada Post or a non-government courier service.
  - **"Mail Internal"** -- Check if you received or sent mail through the internal mail service.
  - **"Hand Delivered"** -- Check if you hand delivered a piece of correspondence or if someone other than the person who regularly delivers the mail hand delivered correspondence or paper communication to you.
  - **"Telex"** -- Check here if you received or sent a Telex message.
- **"Other"** -- Check here if you conducted a communication using a method other than face-to-face, telephone, mail, hand delivered, or Telex. Please briefly describe the **"Other"** communication at the bottom of the log.
- **"Estimated Time"** -- Next, you should record how long it took you to complete the interaction. For written material, only record how long it took you to read it (if received), or to actually prepare the material (if sent); do not include time spent acting on a request, or gathering information to include in a document.
- **"Incompletions Cause"** -- If the attempted communication fails, please record the reason why it failed. Failures can only occur for communications that you initiate ("Initiated By Self"). There are only two reasons for a failure -- either the other party is **"Busy"** or **"Not There."**
- **"Incompletions, Action Taken"** -- Four actions can be taken if you can't complete the communication:
  - **"Left Message - Call Me Back"**
  - **"Left Message - With Content"**
  - **"Will Try Later"**
  - **"Accepted Substitute"** -- Check this column if you tried to contact someone, couldn't because they were either busy or not there, but you were able to contact someone else as a substitute. Please record the substitute on the next line of the log, and place a check in the column just to the right of the name (**"Substitute for Previous Line"**).

V. ABSENCE

Please fill out a separate log sheet(s) for each day during the week of June 4. If you are absent from the building for a full working day, please fill in a log sheet, write "absent for the day" and the reason for the absence on the sheet and submit it the next day you are back in the building. If you are absent from the building for part of the day, either because of a business trip, illness, or holidays, please record the reason and the fraction of the day that you are gone, on the log sheet for that day. If you are away for one or more full working days during the week of June 4, please fill in the log for extra days the following week. We require logs for five working days from each participant.

VI. THANK YOU

If you have any questions, please contact your group representative (OPI/OCS) for the field trial. We thank you. We are dependent upon [illegible] for the success of the study. Please help us by tallying as accurately as possible.

APPENDIX F

Information Source Log (Pre)

D N D. INFORMATION SOURCE LOG

NAME _____ DATE _____ PAGE ___ OF ___

	INFO. SOURCE				MAJOR ACTIVITY CATEGORY	PARTICULAR TASK								METHODS used for SEARCH & RETRIEVAL						ESTIMATED TOTAL TIME FOR RETRIEVAL		
	Referred to Filed	Notes on Hand	Referred to Files	In Other Locations	Contacted Someone Else for Information	Planning	Consulting	Evaluating Sifting and Analysing	Preparing Drafts	Reviewing and Revising Drafts	Approving	Maintaining Records	In Person	Telephone	CORRESPONDENCE: Mail - Internal	Mail - External	Hand Delivered	Telex	Days	Hours	Minutes
1.																					
2.																					
3.																					
4.																					
5																					
6.																					
7.																					
8.																					
9.																					
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26.																					
27.																					
28.																					
29.																					

INSTRUCTIONS FOR COMPLETION OF DND INFORMATION SOURCE LOG

A. INTRODUCTION

Abt Associates, in co-operation with the Department of Communications, is conducting this information source audit as part of the evaluation of the OCS field trials. This log is designed to enable us to study how various information sources are used in the conduct of day-to-day business, and as a consequence, to aid us in analyzing the impact of new office communication technologies.

B. WHAT SHOULD BE LOGGED

During the course of your day-to-day activities whenever you must seek out some piece of information, you should make an entry in the log. For example, suppose you are reviewing a draft of a report; if you must stop that task to refer to some manual for the correct wording of some guideline, you should record that search for information on the log.

C. WHAT SHOULD NOT BE LOGGED

Generally, only searches that you initiate should be recorded. For example, if someone asks you to locate and send a document to them without reading it, you would not record this as an information search. However, if they asked you a question which required <u>you</u> to refer to the document, this should be recorded as an information search <u>by you.</u>

D. FILLING IN THE LOG

Please make an entry in the log immediately after completing an information search. This should only take a few seconds. The log is divided into sections as follows:

- **Information source**

  In this area, you should record the source of each piece of information you require in one of the following categories.

  - "Referred to files/notes on hand" -- if you were able to find the information in files or notes that you keep at your desk, then place a check in the space.

  - "Referred to files in other locations" -- check this category if you were able to find the information in files stored at some other location, e.g., a library or some departmental files. Another example is calling someone to send you a file that you know he/she has.

  - "Contacted someone else for info" -- check this category if you had to contact someone else (by telephone, etc.) for the information. Only use this category if the other person is able to give you the information directly, either over the phone, or in a memo, etc. You should check the appropriate category above if the person simply sends you a file, in which you must find the information yourself.

- **Major activity category**

  In this area, record the number associated with the project/workload/activity that your department uses to account for the time spent on your current task. For example, DFPAS uses separate project numbers and general workload categories. Choose the number whose particular task you were working on that you had to interrupt to find some information.

- **Particular task**

  In this area, you should record the task you were performing when you needed each item of information.

  - "Planning" -- Formulating an idea to be expressed in written or graphic form that lays out a method for achieving an end (e.g., scheduling).

- "Consulting" -- Giving advice or exchanging opinions with colleagues (superiors, peers, or subordinates) to discuss or consider a wide range of viewpoints. Consulting might be accomplished by telephone, a meeting, or an individual face-to-face encounter.

- "Evaluating, sorting and analyzing" -- Examining and judging material to assess its value.

- "Preparing drafts" -- Transferring thoughts from one's mind into another medium (usually paper) either with a writing tool or by use of mechanical or electronic means (for example, by machine dictation).

- "Reviewing and revising drafts" -- Performing a critical evaluation of work (yours or others) with the expected outcome of change in format, grammar, or content.

- "Approving" -- Requesting approval of a decision maker to proceed with an action, document, or response to inquiry.

- "Maintaining records" -- Assembling and holding materials in some container in an orderly manner that assists in quick recovery. For the professional, it may be a desk drawer, notebook, file folder, or small container.

► **Methods used for search and retrieval**

In this area you should record the physical method you used to search for the information and retrieve it. Note that the method used to search may be different than the actual way the information was retrieved. For example, if you call someone to send you a file, the method used for search would be "telephone", while the method used for retrieval might be "mail-internal." In this case, place an "S" under the category used for the search, and an "R" under the category by which the information was actually retrieved. In cases where the two methods are the same, you can either place both "S" and "R" in the same category, or a single checkmark. The particular methods are:

- "In Person" -- record here if you seek and/or receive the information in person. For example, if you walk to someone's office to get a file, then you would place a "SR" or a check in this category.

- "Telephone" -- record here if you seek and/or receive the information using the phone.

- "Correspondence" -- record either "Mail Internal", "Mail External", or "Hand Delivered", for any information that you

seek and/or receive as a result of the search. For example, if you write a memo to someone requesting that he/she send you a file that you need, place "SR" (or a check) under the "Mail Internal" category. Or if your secretary delivers the memo, and returns with the file, record under "Hand Delivered."

- o "Mail External" -- record here if you seek and/or receive information through Canada Post or a non-government courier service.
- o "Mail Internal" -- record here if you used the internal mail service.
- o "Hand Delivered" -- record here if you hand delivered the written request or if someone other than the person who regularly delivers the mail hand delivered either the request or the information you sought.
- o "Telex" -- record here if you seek and/or receive information using Telex.

▶ **Estimated total time for retrieval**

In these categories, record the total time that it took you to retrieve the information. In most cases, you will be able to record the actual time it took you to retrieve the information you needed (in minutes, and perhaps hours). Include the time it took to find where the information resides, and then to retrieve it. In some situations, you may have to estimate the time, when there is some substantial delay in receiving the information. For example, if you call someone outside of DND to mail you some information you need, you should record the amount of time it should take to receive that information, based on your past experience (the time may be several days).

APPENDIX G

Information Source Log (Post)

D.N.D. INFORMATION SOURCE LOG

NAME _____ DATE _____ PAGE ____ OF ____

	INFO. SOURCE				PARTICULAR TASK								METHODS used for SEARCH & RETRIEVAL						ESTIMATED TOTAL TIME FOR RETRIEVAL		
															CORRESPONDENCE						
	Referred to Filed Notes on-Hand	Referred to Files in Other Locations	Contacted Someone Else for Information	MAJOR ACTIVITY CATEGORY	Planning	Consulting	Evaluating Scrutiny and Analysing	Preparing Drafts	Reviewing and Revising Drafts	Approving	Maintaining Records	In Person	Telephone	Office Communication System	Mail - Internal	Mail - External	Hand Delivered	Days	Hours	Minutes
1.																				
2.																				
3.																				
4.																				
5.																				
6.																				
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  - "Contacted someone else for info" -- check this category if you had to contact someone else (by telephone, etc.) for the information. Only use this category if the other person is able to give you the information directly, either over the phone, or in a memo, etc. You should check the appropriate category above if the person simply sends you a file, in which you must find the information yourself.

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  - "Telephone" -- record here if you seek and/or receive the information using the phone.
  - "Office Communication System" -- record here if you seek and/or receive the information using your or someone else's OCS terminal or personal computer.
  - "Correspondence" -- record either "Mail Internal", "Mail External", or "Hand Delivered", for any information that you seek and/or receive as a result of the search. For example, if you write a memo to someone requesting that he/she send you a file that you need, place "SR" (or a check) under the "Mail Internal" category. Or if your secretary delivers the memo, and returns with the file, record under "Hand Delivered."
    - "Mail External" -- record here if you seek and/or receive information through Canada Post or a non-government courier service.
    - "Mail Internal" -- record here if you used the internal mail service.
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APPENDIX H

Participant Observation Protocols

DND/OCS PARTICIPANT OBSERVATIONS

Node: _____

Date: _____ By: _____

Day: _____ Time: From _____ To _____

Evaluation Issues	Comments/Notes	Add. Doc. (X Ref)	Need for Further Investigation
A. SYSTEM PERFORMANCE			
1. Frequency of use			
2. Ease of use (ergonomics, help, diagnostics, documentation, ease of use)			
3. Reliability (time lost, time waiting)			
4. Adaptability (expandability, ease of modification, compatibility)			
B. USER ACCEPTANCE			
1. User attitudes (expectations, changes in expectations)			
2. Functionality vs needs (work station functions)			
3. Support to decision-making (decision confidence, amount communicated)			
4. Reduction in inefficiencies (actual/perceived efficiency)			
5. User identified enhancements (additions, deletions, implementation)			
6. Physical environment (pre-implementation			

Evaluation Issues	Comments/Notes	Add. Doc. (X Ref)	Need for Further Investigation
C. HUMAN/SOCIAL			
1. Quality of working life (changes)			
2. Health, safety, stress (changes in introduction, VDT issues)			
3. Incentives/rewards/ sanctions (economic, social, use of functions and work stations, performance assessment)			
4. Privacy/Security (policies, changes)			
5. Morale/motivation (morale, management actions, turnover, absenteeism)			
D. ORGANIZATIONAL			
1. Job design (challenge, rewards)			
2. Training (adequacy, consultations, time and costs)			
3. Labour relations (union involvement and concerns)			
4. Organization effects (structure)			
E. GENERAL COMMENTS:			

END OF VISIT REVIEW

Date: _____ **Day:** _____ **By:** _____

A. GENERAL ENVIRONMENT

1. Group visited (check one)

_____ Financial and Personnel Accounting Systems (DFPAS)
_____ Material and Technical Accounting Systems (DMTAS)
_____ Financial Authorities and Policy Analysis (DFAPA)
_____ Financial Services (D Fin S)
_____ Budget (D Bud)
_____ Costing Services (D Cost S)
_____ PAY Services (DPS) Section: _____

2. General Comments on staffing levels available:

3. External events which might influence observations:

4. Changes in physical environment:

B. SYSTEM USAGE

1. To what degree was the system in use:

None _____ Light _____ Med. _____ Heavy _____ Very Heavy ____

2. Variations by area:

3. System logs reviewed? (Is documentation attached?)

C. USER ACCEPTANCE

1. User's general attitude:

Very Neg. _____ Neg. _____ Fair _____ Pos. _____ Very Pos. _____

2. Variations by area:

3. Reactions by Node Manager:

D. PROJECT SUPPORT

DETAILS

1. Support staff on-site:

____ DND _____

____ System-house _____

____ Other _____

2. Comments from support staff:

E. SYSTEM RELIABILITY

Comments (No. of times down, length of time, reasons, etc.)

DND/OCS FIELD TRIAL

SIGNIFICANT EVENTS LOG

DATE	EVENT	SOURCE OF INFO. (LOGGED BY)	COMMENTS	PROBLEM RESOLUTION + DATE (SOURCE)	X-REF (IF ANY)

APPENDIX I

Post-Implementation Survey of Participants

DND OCS FIELD TRIAL

FOLLOWUP SURVEY OF PARTICIPANTS

The purpose of this survey is to collect information on your experiences as a participant in the Office Communications System Field Trial. Questions are asked about the extent to which you use the system, and your reactions to it. Our purpose in collecting this information is to describe the general attitudes and experiences of field trial participants towards the system. This is one part of a larger research project to determine the impacts of the system on your organization. Please be assured that it is the performance of the system that is being evaluated, and not the work performance of system users. We ask you to complete this questionnaire frankly and carefully. Thank you for your assistance.

OFFICE USE ONLY

(1-3)

I EXTENT OF SYSTEM USE

Please think back over the past ten work days (not including vacation, sick leave or work outside of your normal duties) and estimate as best you can the number of times you used each of the Renaissance system functions listed below. Put a check mark (✓) in the colums which best describes your use of each function.

Renaissance Functions	Number of times used in previous ten working days					COL
	0	1-5	6-10	11-15	15+	
1. Sign on to Renaissance						4
2. Change your password						5
3. Check you IN file for incoming mail						6
4. Log non-electronic items in your IN or OUT file						7
5. Create a letter						8
6. Create a memo						9
7. Create a text document						10
8. Create a minute sheet						11
9. Create a telephone message						12
10. Create an answer to a memo						13
11. Create or update a calendar or TO DO list						14
12. Cut and paste editing feature						15
13. Send a document to another user						16
14. Receive a document from another user						17
15. Publish a document						18
16. View a public document						19
17. Print a document						20
18. Delete a document						21
19. Perform a document search using keywords, filecode, date, etc.						22
20. Include a PC-created file (LOTUS 1-2-3, MULTIMATE or other file) in a Renaissance document						23
21. Send or receive a PC-created file to or from another PC, using Renaissance						24

OFFICE USE ONLY

II Please read the following statements and indicate for each whether you strongly agree, agree, disagree, strongly disagree or have no opinion. Circle the number which best describes your experience.

COL

	(1) Strongly Agree	(2) Agree	(3) Disagree	(4) Strongly Disagree	(5) No Opinion	
A. The OCS equipment has increased the heat level where I work.	1	2	3	4	5	25
B. Access to printers is rarely a problem.	1	2	3	4	5	26
C. Access to system terminals is rarely a problem.	1	2	3	4	5	27
D. The system provides as much security for my work as paper files.	1	2	3	4	5	28
E. System response time is satisfactory.	1	2	3	4	5	29
F. The system responds promptly to my commands.	1	2	3	4	5	30
G. The system documentation is clear and complete.	1	2	3	4	5	31
H. I found the system easy to learn.	1	2	3	4	5	32
I. The OCS equipment has made my work space uncomfortably crowded.	1	2	3	4	5	33
J. The quality of material printed on the system is good.	1	2	3	4	5	34
K. Documents produced on the system conform to DND standards.	1	2	3	4	5	35
L. The OCS equipment has increased the noise level where I work.	1	2	3	4	5	36
M. Editing of documents using Renaissance (not MultiMate) is easy.	1	2	3	4	5	37
N. The keyboard on my terminal is well designed and comfortable to use.	1	2	3	4	5	38
O. The functions which the system performs are well suited to the demands of my job.	1	2	3	4	5	39
P. The system is reliable.	1	2	3	4	5	40
Q. The system is generally available when I need it.	1	2	3	4	5	41
R. The system is easy to use.	1	2	3	4	5	42

OFFICE USE ONLY

IV ONGOING SUPPORT

COL

A. When your terminal experienced a hardware or software failure, did you find the response by X10S personnel to these situations to be (check all that apply)

Prompt	_____	50-1
Efficient	_____	51-1
Friendly	_____	52-1
Helpful	_____	53-1

B. Did you ever offer any suggestions for system improvement?

Yes, more than once	_____	54-1
Yes, once	_____	-2
No, never	_____	-3

If yes, was your suggestion

Welcomed and implemented	_____	55-1
Welcomed but not implemented	_____	-2
Acknowledged but not implemented	_____	-3
Ignored	_____	-4

C. When you first received your terminal, did your immediate supervisor encourage you to use the system?

Yes	_____	56-1
No	_____	-2

And did he/she use the system him or herself at **that time**?

Yes, regularly	_____	57-1
Yes, occasionally	_____	-2
Rarely	_____	-3
Never	_____	-4
Don't know	_____	-5

D. Does your supervisor encourage you to use the system **now**?

Yes	_____	58-1
No	_____	-2

And does he/she use the system **now** himself or herself?

Yes, regularly	_____	59-1
Yes, occasionally	_____	-2
Rarely	_____	-3
Never	_____	-4
Don't know	_____	-5

OFFICE USE ONLY

V YOUR CURRENT ATTITUDES TOWARDS OFFICE TECHNOLOGY

We would like to know what computers mean to you personally. Please circle the appropriate number to indicate whether you agree or disagree with the following statements.

COL

(1) Strongly Disagree	(2) Disagree	(3) Undecided	(4) Agree	(5) Strongly Agree

1.	The idea of sitting down in front of a computer and working with it frightens me.	1 2 3 4 5	60
2.	I use a computer any chance I get.	1 2 3 4 5	61
3.	I feel helpless around a computer.	1 2 3 4 5	62
4.	Using a terminal makes me confused.	1 2 3 4 5	63
5.	I would like to have a computer in my home.	1 2 3 4 5	64
6.	I have to "psych myself up" before I use a computer.	1 2 3 4 5	65
7.	I enjoy tinkering with mechanical things.	1 2 3 4 5	66
8.	I would not know what to do on the computer if people weren't there to help me.	1 2 3 4 5	67
9.	I feel tense about using a computer before I even start.	1 2 3 4 5	68
10.	I see computer skill as being an absolute necessity.	1 2 3 4 5	69
11.	It gets really frustrating trying to speak a computer's language.	1 2 3 4 5	70
12.	I am afraid of touching the wrong button by mistake.	1 2 3 4 5	71
13.	I like to know how things work and why.	1 2 3 4 5	72
14.	If the computer is going to break down, it will do it on me.	1 2 3 4 5	73
15.	I really want to be involved in the computer culture: I don't want to be left out.	1 2 3 4 5	74
16.	Having a machine ask me questions intimidates me	1 2 3 4 5	75
17.	The computer frightens me when it does things I don't understand.	1 2 3 4 5	76
18.	It makes me feel left out and a little stupid when others know so much more about computers than I do.	1 2 3 4 5	77
19.	The computer manuals are so over my head that I get lost.	1 2 3 4 5	78
20.	Using a computer gives me a sense of control.	1 2 3 4 5	79
21.	Before I ever approach a computer, I know I'm going to be frustrated.	1 2 3 4 5	80
22.	When I use a computer, I can't seem to get the right information out of it.	1 2 3 4 5	81
23.	I go out of my way to learn about computers.	1 2 3 4 5	82
24.	I am afraid people will think I am stupid for the questions I ask.	1 2 3 4 5	83
25.	Not being able to type keeps me from being really competent on the computer.	1 2 3 4 5	84

OFFICE USE ONLY

VI SYSTEM IMPACTS ON YOUR WORK

Please read each of the statements below and indicate for each whether you have experienced those impacts of the system in your work. Circle the appropriate number to record your answer.

		Very Much	Somewhat	Very Little	Not at all	No, just the opposite is true	COL
A.	Reduced the number of boring tasks you do.	1	2	3	4	5	85
B.	Possibly had harmful effects on your health.	1	2	3	4	5	86
C.	Allowed you to be more creative in your work.	1	2	3	4	5	87
D.	Increased personal stress.	1	2	3	4	5	88
E.	Improved office productivity.	1	2	3	4	5	89
F.	Allowed less control over your work.	1	2	3	4	5	90
G.	Increased your job satisfaction.	1	2	3	4	5	91
H.	Saved you time in completing your work.	1	2	3	4	5	92
I.	Increased the skill requirements for your job.	1	2	3	4	5	93
J.	Made people less accessible to each other.	1	2	3	4	5	94
K.	Provided less opportunity for personal achievement.	1	2	3	4	5	95
L.	Improved interpersonal relations.	1	2	3	4	5	96
M.	Resulted in less job security.	1	2	3	4	5	97
N.	Allowed you to make better decisions.	1	2	3	4	5	98
O.	Limited your personal privacy.	1	2	3	4	5	99
P.	Made your work day more interesting.	1	2	3	4	5	100
Q.	Helped you to be more efficient in your work.	1	2	3	4	5	101
R.	Helped you to improve the quality of your work.	1	2	3	4	5	102
S.	Because the people I work with use the system, I am able to be more productive in my job.	1	2	3	4	5	103

OFFICE USE ONLY

COL

In general, before the system was introduced were your expectations of the system.

Positive	_____	104-1
Neutral	_____	-2
Negative	_____	-3
No opinion	_____	-4

And since the system has been in operation has it in general:

Exceeded your expectations	_____	105-1
Met your expectations	_____	-2
Not met your expectations	_____	-3
No opinion	_____	-4

In terms of your work, has the system enabled you to replace your paper files with electronic files, are you maintaining duplicate paper and electronic files, or are you continuing to maintain only paper files.

Replaced paper with electronic files	_____	106-1
Keep duplicate electronic and paper files	_____	-2
Stayed with paper files only	_____	-3

For some people, the introduction of automated office equipment has caused major changes in the content of their job and/or how they do their work. Please think back to the time before the system was introduced and answer the questions below. If you were not in your current position when the system was introduced, please skip the questions below and go to the next page.

Has the system changed the content of your job (that is, **what you do**)	Yes	_____	107-1
	No	_____	-2

If yes, please describe

Has the system changed **how** you do your job	Yes	_____	108-1
	No	_____	-2

If yes, please describe

OFFICE USE ONLY

COL

How would you describe your level of system use? Would you say you are a

constant system user	_____	109-1
regular but not constant system user	_____	-2
infrequent system user	_____	-3
non-user of the system	_____	-4

The system was designed to meet many of the needs of its users at DND. What characteristics of the system prevent you from using it more than you do now?

Please describe:

How could the system be changed to make it more useful to you in your current position?

Please describe:

OFFICE USE ONLY

VII USER CHARACTERISTICS

COL

In order to thoroughly analyze your answers to the questions in this survey, we need a few pieces of information about you and your position. This data will only be used to classify answers to the questions in the other sections of this survey. No individuals' responses will be linked to that individual either by name or position.

A. Your sex:

Male	_____	110-1
Female	_____	-2

B. How long have you been in your current position with CFS?

Less than 6 months	_____	111-1
Between 7 months and 1 year	_____	-2
1 through 5 years	_____	-3
6 through 10 years	_____	-4
11 through 15 years	_____	-5
16 through 25 years	_____	-6
26 years or more	_____	-7

C. Were you working in your current position prior to the introduction of the OCS equipment in your workplace?

Yes	_____	112-1
No	_____	-2

D. How old are you?

25 years old or less	_____	113-1
26 years through 30 years	_____	-2
31 years through 35 years	_____	-3
36 years through 40 years	_____	-4
41 years through 45 years	_____	-5
46 years through 55 years	_____	-6
56 years or over	_____	-7

E. How much formal education have you had?

Up to some high shool	_____	114-1
Completed high school	_____	-2
Some college/university	_____	-3
Completed college/university	_____	-4
Some graduate school	_____	-5
Completed graduate school	_____	-6

F. Is your position supervisory (you are responsible for the work of one or more other individuals) or non-supervisory (no other person reports to you)?

Supervisory	_____	115-1
Non-supervisory	_____	-2

G. Are you a

commissioned officer	_____	116-1
NCO	_____	-2
private	_____	-3
civilian (with previous military service)	_____	-4
civilian (no previous military service)	_____	-5

OFFICE USE ONLY

H. What part of CFS do you work in?

		COL
DMTAS	_____	117/8-1
DFPAS	_____	-2
DFAPA	_____	-3
DFinS	_____	-4
DBudget	_____	-5
DCostS	_____	-6
DPS3	_____	-7
DPS4	_____	-8
DPS5	_____	-9
Air Command	_____	-10
CFB Winnipeg	_____	-11

Finally, please indicate the type of workstation that you use **most often** in the Office Communications System Field Trial.

Displayphone	_____	119-1
VT 220 (assigned only to you)	_____	-2
VT 220 (shared with others)	_____	-3
IBM PC with Multi Mate (assigned only to you)	_____	-4
IBM PC with Multi Mate (shared with others)	_____	-5
IBM PC with LOTUS 1-2-3 (asigned only to you)	_____	-6
IBM PC with LOTUS 1-2-3 (shared with others)	_____	-7

Thank you very much for your assistance.

OFFICE USE ONLY

VII USER CHARACTERISTICS

COL

In order to thoroughly analyze your answers to the questions in this survey, we need a few pieces of information about you and your position. This data will only be used to classify answers to the questions in the other sections of this survey. No individuals' responses will be linked to that individual either by name or position.

A. Your sex:

Male	_____	110-1
Female	_____	-2

B. How long have you been in your current position with CFB Winnipeg or COMPT AIRCOM?

Less than 6 months	_____	111-1
Between 7 months and 1 year	_____	-2
1 through 5 years	_____	-3
6 through 10 years	_____	-4
11 through 15 years	_____	-5
16 through 25 years	_____	-6
26 years or more	_____	-7

C. Were you working in your current position prior to the introduction of the OCS equipment in your workplace?

Yes	_____	112-1
No	_____	-2

D. How old are you?

25 years old or less	_____	113-1
26 years through 30 years	_____	-2
31 years through 35 years	_____	-3
36 years through 40 years	_____	-4
41 years through 45 years	_____	-5
46 years through 55 years	_____	-6
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Non-supervisory	_____	-2

G. Are you a

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NCO	_____	-2
private	_____	-3
civilian (with previous military service)	_____	-4
civilian (no previous military service)	_____	-5

OFFICE USE ONLY

H. What part of the OCS Trial site do you work in?

		COL
DMTAS	_____	117/8-1
DFPAS	_____	-2
DFAPA	_____	-3
DFinS	_____	-4
DBudget	_____	-5
DCostS	_____	-6
DPS3	_____	-7
DPS4	_____	-8
DPS5	_____	-9
Air Command	_____	-10
CFB Winnipeg	_____	-11

Finally, please indicate the type of workstation that you use most often in the Office Communications System Field Trial.

Displayphone	_____	119-1
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VT 220 (shared with others)	_____	-3
IBM PC with Multi Mate (assigned only to you)	_____	-4
IBM PC with Multi Mate (shared with others)	_____	-5
IBM PC with LOTUS 1-2-3 (asigned only to you)	_____	-6
IBM PC with LOTUS 1-2-3 (shared with others)	_____	-7

Thank you very much for your assistance.

DND OCS FIELD TRIAL IMPACT ASSESSMENT:
FINAL REPORT