EB/CAM/86/21

March 26, 1986

To: Members of the Committee on
Executive Board Administrative Matters

From: The Committee Secretary

Subject: Electronic Data Processing (EDP) Support for
Executive Directors' Offices--Requirements Study

Early in 1985 the Committee requested a detailed study of the EDP requirements of Executive Directors' offices. The attached report has been prepared by consultants working under the direction of the Bureau of Computing Services and the Secretary's Department. This report, together with the accompanying Summary of Main Issues (EB/CAM/86/20, 3/26/86) has been reviewed by other departments. Both papers will be brought to the agenda of the Committee for discussion on a date to be announced.

Att: (1)

Other Distribution:
Members of the Executive Board
Heads of Departments, Bureaus, and Offices

INTERNATIONAL MONETARY FUND

Electronic Data Processing (EDP) Support for the Offices of the Executive Directors--Requirements Study

Prepared by the Staff

March 25, 1986

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APPENDICES

1. INTRODUCTION

1.1 Purpose of the study

As a result of numerous requests and inquiries made by Executive Directors' offices with regard to the acquisition of new automated systems, the Committee on Executive Board Administrative Matters (CAM) commissioned the Secretary's Department, and the Bureau of Computing Services, to perform a detailed study of Executive Directors' electronic data processing (EDP) requirements.

The study was to include all Executive Directors offices and to address their requirements for (i) office support systems, (ii) research and analysis capabilities, and (iii) access to Fund data. [1/] The study involved the following basic activities:

1. Identification of EDP requirements of Executive Directors' offices.

2. Development of options for satisfying the requirements identified, together with an analysis of the perceived advantages and disadvantages of each option.

3. Assessment of the probable costs and benefits of the options.

1.2 Methodology

The methodology employed in the execution of the study consisted of a number of data collection and analysis tasks classified under four general headings as follows:

-- Analysis of user requirements
-- Access to Fund and external EDP systems
-- Cost/benefit data
-- Vendor data

The activities performed in each area are described below.

1.2.1 Analysis of user requirements

To arrive at an understanding of the requirements of Executive Directors' offices, the staff devised a three-phase interview process,

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1/ EBAP/85/15, 1/18/85; EB/CAM/85/19, 2/22/85; EB/CAM/Meeting/85/2, 2/28/85; EB/CAM/Meeting/85/3, 6/27/85/ EB/CAM/85/50, 9/17/85.

supplemented by logs and other techniques for estimating and the time spent by support staff on their various duties. The data collected with these techniques were primarily used in defining the functions which the proposed automated systems should provide, in determining system specifications, and in assessing the costs of the current manual systems.

Twenty-two interviews were conducted (ten with Executive Directors, ten with Alternate Executive Directors and two with Assistants to the Executive Director, hereafter referred to as Technical Assistants) to obtain a high-level view of perceived requirements. In addition, thirty-two Secretarial Assistants and sixteen Technical Assistants were interviewed. List of those interviewed are provided in Appendices A-1, A-2, and A-3. Staff from some offices declined to participate because of workload considerations. The intent of the interviews was to collect detailed information on the kinds of tasks performed, estimates of the volume and frequency of those tasks, and areas where the staff saw opportunities for making the office function more efficiently. A questionnaire was distributed in advance of the interviews and was completed by 63 percent of the offices where secretarial staff were interviewed. Thirteen of the sixteen Technical Assistants who were interviewed also completed questionnaires.

Subsequent to the completion of the secretarial interviews, activity logs with instructions were distributed and Secretarial Assistants were instructed to record the kind and volumes of certain activities as they were performed. Approximately forty-five percent of the offices to which the logs were distributed completed the exercise. A number of offices which did not return the sheets noted that the coincidence of the sample period with preparations for the Annual Meetings made it impossible to comply. Although the sample size was less than desired, responses from 23 Secretarial Assistants in 10 offices (approximately 34.8 percent of the total support staff) provided an additional base for drawing conclusions about the frequencies and volumes of the selected activities.

1.2.2 Access to Fund and external EDP systems

The second major data collection effort involved determining the feasibility of providing Executive Directors' offices with direct, on-line access to the following major EDP systems:

- The Economic Information System (EIS)
- The Treasurer's Integrated Financial Systems (TIFS)
- The Joint Library Information System (JOLIS)
- Document Management Facility (DMF)
- The Cable Room System
- The World Bank Debt Statistics Database

With the exception of the World Bank system, all of the systems listed above are in varying stages of development. This complicated the task of preparing a list of technical specifications for accessing these systems, and arriving at some understanding of how the systems would be used and what data could be made accessible to Executive Director's offices without violating agreements with the sources of the data regarding safeguarding confidentiality.

1.2.3 Cost data

The staff endeavored to identify as accurately as possible the potential cost/benefit impacts of the options identified from the study. For the most part, the costs would result directly from the procurement, installation, training and support of multifunctional office systems and would apply to all the options which derive from the proposed office systems. Where appropriate, the cost/benefit impact of individual options were also identified.

The cost to the Fund of current methods of performing certain tasks and activities was calculated on the basis of the time analysis information collected, together with salary and overtime rates, equipment lease charges, communications costs and any other identifiable costs. Assumptions regarding potential cost saving from the various options are described in the main body of the study. To the extent possible, the intangible advantages and disadvantages of each option were identified; it is recognized that these considerations are often at least as important as the dollar-denominated costs and benefits.

1.2.4 Vendor data

The office system configurations considered in this report were based on proposals solicited from three major vendors. The vendors were selected from among the many office system firms for the following reasons. First, all three are major developers and suppliers of office systems equipment in the U.S. market with well established marketing and support facilities for their customers. Second, the Fund already has considerable experience with their equipment which will be used in the long-term office systems and EDP strategy defined by the Bureau of Computing Services.

2. FINDINGS

2.1 General Office Environment

Although the work of Executive Directors' offices is highly complex and specialized, the basic activities [2/] are, for the most part, common to all office environments and the principles of automation can be applied.

2.1.1 Activity Profiles of Professional and Support Staff

In the following two sections we describe the general composition of work for the average Secretarial and Technical Assistant, in terms of the kinds and relative importance of these activities. In section 2.2, Office Systems Tasks and Activities, we present a detailed analysis of each of these activities.

2.1.1.1 Secretarial Assistants' Profile

Exhibit 2-1, Secretarial Assistant Activity Profile, illustrates the average percentage of time spent by support staff in the primary activities of the Executive Directors' offices. These results represent the combined data from 37 activity logs and estimate sheets.[3/] On the basis of our analysis of this activity profile, we have drawn a number of conclusions which are reflected in our recommendations. These conclusions are as follows:

The Support Staff Activity Profile Exhibits Excessively High Manual Typing and Document Distribution Components

Both our common experience and detailed comparative studies have shown that manual typing (i.e., electronic typewriter) is an inherently less efficient process than automated word processing, due to the simple fact that revisions to manually typed documents are more time consuming, and with any substantial body of changes, such as insertions and deletions, usually requires the retyping of the original document. In addition, input and formatting are facilitated through use of the CRT screen, with certain aspects of text entry, for example, using pre-defined, or stored, text and forms, being entirely automated. National Archives and Records Service (NARS) studies indicate that the productivity gain from conversion of manual to automated text processing systems ranges

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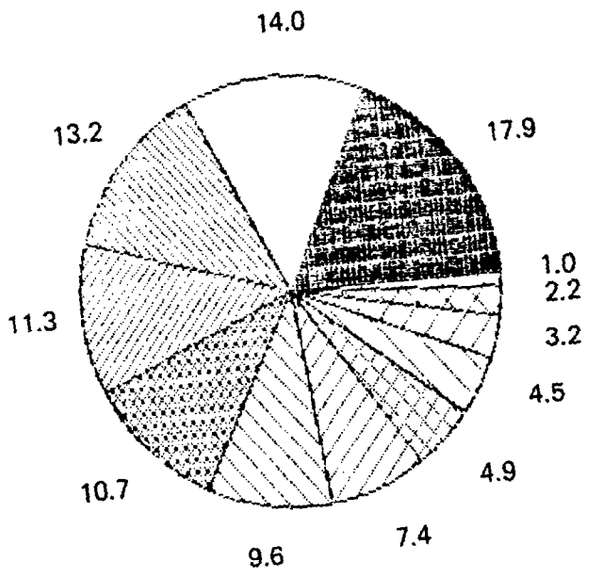
2/ For example, reading and analyzing documents, preparing reports and correspondence, consulting and liaising, preparing for and attending meetings.

3/ Separate results for the activity logs and the estimate sheets are compared with the combined results in Appendix C-1.

SECRETARIAL ASSISTANT ACTIVITY PROFILE



- Word Processing
- Telephone
- Mail Hand./Doc. Distribution
- Manual Typing
- Miscellaneous
- Filing/Retrieval
- Copying
- Editing/Proof Reading
- Personal
- Shorthand/Dictation
- Scheduling
- Waiting

EXHIBIT 2-1

from 75% to 122% on the average.[4/] In this light, the 11.3% of total support staff time spent on manual typing appears susceptible to significant reduction.

The high document distribution component (13.2%) appears equally susceptible to automation by reducing the manual labor associated with distributions of Fund documents from the Executive Directors' offices to member countries. With the provision of the ability to create and maintain mailing lists from the Executive Directors' offices, the actual physical distribution could be effected from a centralized location, thus providing equivalent services to constituent countries with a substantial reduction in the workload of the support staff in the Executive Directors' offices. [5/]

The Activity Profile Demonstrates a High Degree of Fragmentation of Continuous Work Time

While a casual review of the overall distribution of support staff activity reveals a rough equilibrium among five or six major activities, the actual situation is far different. Two of the largest components of secretarial work are telephone activity -- answering, making calls -- and "miscellaneous" activities. Together these components comprise almost a quarter of the total work time available to Secretarial Assistants.

The major characteristics of these activities are their brevity, unpredictability, and the their negative effect upon productivity as they intrude upon other ongoing work. According to our study, the average secretary receives 23 calls per day, which last, on average, for less than 3 minutes. Miscellaneous activities, which include such tasks as: scheduling, preparing courier envelopes, delivering documents, ordering supplies, soliciting instructions, etc., have a similar effect on the ability to concentrate upon the completion of work at hand.

Copying, at 7.4% of the total work time, is another contributor to this fragmentation of work time, as the average secretary makes approximately 7 trips to the copier per day, each trip lasting, on average, slightly more than 5 minutes.

4/ Cited in U.S. National Bureau of Standards Special Publication 500-72, December 1980.

5/ There would be a partially offsetting increase in workload for the staff of the Secretary's Department.

The Average Secretarial Assistant Works a Substantial Amount of Overtime Each Week

In CY 1984 each secretary worked an average of 30 minutes overtime per day at a total cost of $177,303.28 to the Fund, reflecting a consistent imbalance in the relationship between available staff and the current work load. Current projections, based on year-to-date data through October, suggest that this imbalance will increase by 22% in CY 1985, with average daily overtime per secretary of 38.4 minutes.

Secretarial estimates of current overtime derived from our interviews produce even higher projections, showing an increase of almost 42% over CY 1984, or an average of 44 minutes per secretary per day. This higher estimate may be a distortion attributable to a non-representative sample population (i.e. the busiest offices provided estimates) or it may simply indicate that the perceived amount and frequency of overtime is greater than the amount actually worked. Refer to Appendix C-2 for a comparison of overtime projections.

While not all overtime can be attributed solely to the volume of work -- for example, some overtime is attributable to provision of office coverage after normal working hours --eliminating the necessity to work even a portion of this overtime may produce cumulative savings for the Fund and improve the working environment for support staff within the Executive Directors' offices.

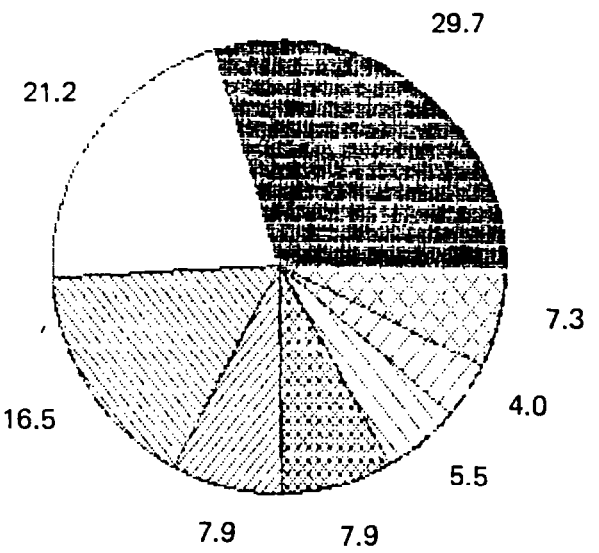
2.1.1.2 Technical Assistants' Profile

Exhibit 2-2, Technical Assistant Activity Profile, illustrates the average percentage of time spent by Technical Assistants in the primary activities performed by professional personnel in the Executive Directors' offices. It is understood that in a number of offices, the Advisor(s) may perform a somewhat similar set of activities, but the statistical information collected by the study only reflect the work of Technical Assistants per se. The conclusions drawn from the profile of activities are incorporated into the options in section 3.

The Productivity Enhancing Benefits of Automation Are Limited with Respect to the Technical Assistant

The profile resulting from our study is in most respects typical of professional office workers with analytical responsibilities, with the bulk of time, over 67.4%, spent in reading and analyzing textual information, writing and meeting. Based on our analysis of this profile, the scope for enhancing the productivity of these professional staff is in providing more efficient means of searching for information and analyzing numerical data, which together constitute 15.8% of the

TECHNICAL ASSISTANT ACTIVITY PROFILE



Reading/Analyzing Text. Mat.
Writing
Meeting
Calculating/Analyzing Num Data
Searching for Info
Telephone
Editing
Miscellaneous

EXHIBIT 2–2

Technical Assistant's total work time. A number of our most significant recommendations address precisely these capabilities.

However, it is unlikely that any proposed automation will substantially reduce the amount of time worked by Technical Assistants. On the contrary, it is just as likely that improved research and econometric capabilities will, by enhancing the possibilities for analysis, result in more time being spent to execute more detailed and sophisticated studies of the various issues which may come before the Board. We draw this conclusion from the fact that Technical Assistants interviewed did not identify significant instances of repetitive analytical functions. In other words, the "mechanization" of the analytical process, in the crudest sense, is not feasible in the current, highly reactive mode of operation. Moreover, from a cost perspective, since Technical Assistants do not earn overtime pay, new or enhanced automated capabilities will not result in cost savings, even were we able to project significant time savings in the proposed automated environment.

The Impact of Proposed Automation for Professional Staff Will Be Largely Qualitative or Intangible

Our expectation, based on the preceding analysis, is that the major impact of any automated facilities applied to the research and econometric activities of Technical Assistants will have as their justification, where adopted by the Committee, a qualitative impact on the timeliness, completeness, accuracy and reliability of information. The implicit judgement which will be required of the Committee is to balance the relative value of the improved access to information against the cost of the system which delivers this information.

There May Be a Cost Benefit From Providing Text Processing Capabilities to Professional Staff

The only exception we see to our general conclusion regarding the intangibility of benefits for professional staff lies in the possibility of providing text processing capability to Technical Assistants for generation of the initial drafts of their statements, reports, etc. Based on our interviews we estimate that 54% of the Technical Assistants indicated that they would be willing to compose their own drafts using a CRT screen if they were provided such equipment (In a few cases, Technical Assistants are now using typewriters for drafts). While the impact on the productivity of Technical Assistants would be limited -- for those who do not type well, the time required for on-line formatting and composition should be more or less equivalent to handwriting due to the ability to revise without rewriting -- the impact on the support staff could be significant if such practices become established.

Our study indicates that revision of documents within the Executive Directors' offices requires a minimum of 20% less time per page compared with original typing from handwritten and other sources.[6/] If even half of the typing that support staff now receive in handwritten form were received from the Technical Assistants in machine readable form for printing, distribution and final typing, a real productivity gain would be realized, in this example, equivalent to 18% of the average daily overtime worked by support staff.

2.1.2 Exceptional Situations

A number of possible exceptions from the general description of the environment which we describe in section 2 deserve mention.

The most important of these potential exceptions arises in connection with the requirements of joint offices, where the Executive Director and some portion of his staff serve both the Fund and the World Bank. In our efforts to understand the work done in the Executive Directors' offices, we made no systematic attempt to differentiate between those activities performed in joint offices on behalf of the Fund and those performed on behalf of the Bank. And on the other hand, we made no special effort to identify activities which may be special requirements of joint offices. All of our statistics, however, including those relating to the costs and benefits of our recommendations, are based on the number of Fund staff, except where explicitly noted.

Another exceptional situation arises with respect to work performed in Executive Directors' offices which may not be derived from the obligations of these offices to the Fund. As we have noted above with reference to the joint offices, no attempt was made to identify such activities or even their relative frequencies. The salient point is that our cost/benefit projections may, on this account, overstate the value to the Fund of the proposed automated systems.

2.1.3 Existing Level of Automation

Of the 22 Executive Directors' offices, 20 were employing some form of automation, chiefly standalone word processors at the time of our survey, including NBI (40%), IBM Displaywriter (35%), Lexitron (20%), CPT

6/ Based on estimates of the average volumes of automated original and revised typing supplied by the Secretarial support staff in participating offices. See Appendix C-3, Activity Incidence Analysis.

(15%) [7]. A number of offices have acquired personal computers on loan from BCS or, permanently in lieu of a standalone word processor. The personal computers are being used as vehicles for spreadsheet software, word processing in languages not available on the aforementioned machines, and communications with remote computer systems.

This equipment has been procured over a period of time using a variety of procurement techniques. [8] Annual lease and maintenance costs associated with hardware in Executive Directors' offices amounts to approximately $95,648, or an average of $4782 for the 20 offices which were using automated systems. Separate software lease costs are unavailable.

2.1.3.1 Usage of Automated Systems

Based on our interviews with both the support and professional staff, it is clear that in a number of offices less than optimum usage of the existing technology is occurring. By this we mean to indicate a range of situations, from those in which the system is used only rarely, to those in which some of the system's productivity enhancing features are not being used, for example, use of stored keystroke features, automation of cable formats, spelling check, etc. In view of the available equipment, this observation applies primarily to text processing functions, but also to a lesser extent, to the use of personal computers.

2.1.3.2 Support and Training

In the case of the text processing systems, the cause of the under-utilization may be found in certain inadequacies of a particular system; for example, the inability to support one of the "working" languages of the particular office. This would imply that the selection of the hardware and software configuration was inappropriate. In some offices this may in fact be a contributing cause.

However, our interviews point also to another cause; that is, the lack of support for the installation of the equipment in the office, through training and assistance in converting from a manual to an automated mode of operation, as well as a need for on-going training/support for new staff. In the context of the sophisticated

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7/ Two offices have more than one vendor's equipment. One additional office is currently in the process of installing a new system which will bring the total number of offices with automation to 21.

8/ This report will not be concerned with costs associated with wholly-owned equipment, since such costs -- for internal support, supplies, etc. -- will be incurred with any system and therefore do not represent potentially offsetting cost benefits.

capabilities proposed for Executive Directors' offices in this report, we feel that it is extremely important to be aware of the need for more extensive support of any additional automation.

The Committee should also note that for this support to be effective, the Executive Directors' offices must be prepared to encourage the participation of their staff in the process of adopting new automated facilities. For example, in our interviews we heard from a number of individuals that while training was available, they could not afford to take sufficient time from their duties to attend the training classes. The most effectively planned program of implementation cannot succeed where the end-users will not make the required commitment to learn the system. A number of our recommendations in the area of implementation planning are directed at this problem.

2.1.4 Summary of Perceived Requirements

In this section we present summaries of the functional requirements for automation of Executive Directors' offices as identified by Executive Directors, office professionals, and support staff. Our detailed findings and analyses follow in sections 2.2 to 2.4.

2.1.4.1 Executive Directors and Their Representatives

Exhibit 2-3 presents a graphic illustration of the requirements of the Executive Directors' offices as perceived by the Executive Directors or their representatives in the initial phase of interviews conducted by the staff. It should be noted that due to differences in the format and length of some of the interviews and the interest or lack of interest of the interviewee in particular aspects of automation, certain offices' requirements may have been omitted from the matrix. The matrix thus represents a conservative view of the perceived requirements at the highest levels of the Executive Directors' offices.

It should also be pointed out that among those offices which are shown as not interested in a particular aspect of automation (i.e. a blank space on the matrix), a smaller number of offices expressed active opposition. While the specific concerns expressed will be discussed in the context of the related recommendations described in section 3, these offices generally stated that the current system was satisfactory, or, at least, could not be materially improved upon by providing automated systems in their offices. Many offices also expressed misgivings about the costs of additional automation.

As the matrix indicates, between two thirds and three quarters of the offices expressed either active or strong interest in automated systems which would satisfy requirements in the following areas:

FUNCTIONAL REQUIREMENTS
EXECUTIVE DIRECTORS

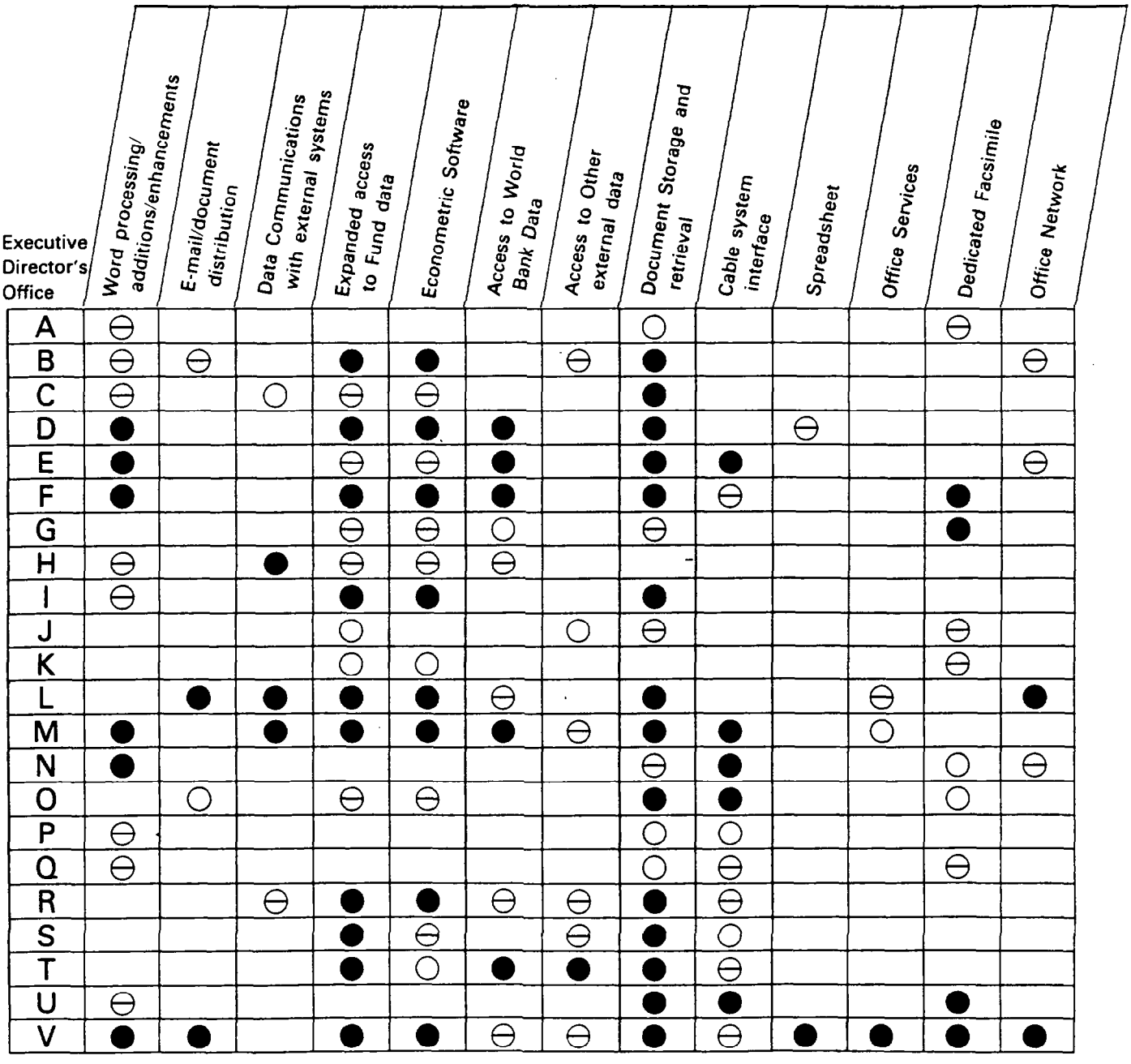

EXHIBIT 2–3

- on-line access to Fund data and econometric software
- access to a system under development in the Secretary's Department, i.e., the centralized

  Document Management Facility (DMF)
- additions and/or enhancements to current word processing capabilities

In addition, between one third and one half the offices expressed active or strong interest in:

- a dedicated facsimile system
- access to World Bank data, particularly the Debt Statistics.
- access to the another system under developement in the Secretary's Department, i.e., the Cable Room system

Fewer than 25% of the Executive Directors' expressed a a strong or active requirement for automation of communications to their staff, other Executive Directors' offices, Fund staff or the systems of organizations external to the Fund via electronic mail or file transfer capabilities. An even smaller percentage of offices expressed an interest in the office services functions: calendar maintenance, scheduling, tickler files, etc.

2.1.4.2 Secretarial Assistants

In general, the requirements perceived by the Secretarial Assistants related to the day-to-day problems they experience in their work. Eighty-three percent of the Secretarial Assistants interviewed expressed a need for additional or improved word processing systems to rectify a number of problems stemming mainly from the sharing of workstations. Inadequate or incomplete training on the current systems was cited by a surprising 56% of the sample. Copying was mentioned as an area needing improvement by 78% of the secretaries, with most of these suggesting the installation of a small office copier to supplement the shared machines now available. Approximately one third of the secretaries also expressed concerns with current methods of filing and retrieval, the volume of telephone activity, and frequent overtime.

2.1.4.3 Technical Assistants

Exhibit 2-4 presents a summary of the requirements of the Executive Directors' offices as perceived by the Technical Assistants interviewed in phase II of the study. Note that the range of questions asked of the Technical Assistants was somewhat narrower than the range of questions asked of the Executive Directors and dealt more specifically and

FUNCTIONAL REQUIREMENTS
TECHNICAL ASSISTANTS

Executive Director's Office	Word processing/ additions/enhancements	Expanded access to Fund data	Econometric Software	Access to World Bank Data	Access to Other external data	Document Storage and retrieval	Cable system interface	Spreadsheet	Dedicated Facsimile
A		●	⊖			●		●	
B	●					●			⊖
C									
D	⊖	●	●			●			
E	●	●	●			●			
F		●	⊖			●			
G	●	●	⊖					●	
H		⊖							
I		●	⊖		⊖				
J		●	●	●					
K	⊖	●	⊖						
L	⊖	⊖	⊖						
M		●	●						⊖
N	●	●	●		●	●			
O	●					⊖			
P		●	●			●			●

Legend:
○ = mild interest
⊖ = active interest
● = strong interest

EXHIBIT 2–4

in more detail with the research and analysis functions of their work. For purposes of comparison, however, the same matrix was used to present our summary of the results.

As the matrix shows, the Technical Assistants expressed strong or active interest in satisfying the same set of requirements as the Executive Directors. Where the Executive Directors had expressed a strong interest, the Technical Assistants did likewise. In the areas of access to data and econometric software, 81% and 75% of the Technical Assistants respectively expressed a strong or active interest. At least half the Technical Assistants also expressed an interest in improved word processing and in access to the Document Management Facility.

2.2 Office System Tasks and Activities

In this section of the report we present our detailed findings on certain key tasks and activities performed largely by the support staff in the offices of the Executive Directors. These tasks are manual typing, word processing, filing and retrieval, document distribution, and copying. We also provide a brief summary of the many miscellaneous activities performed by support staff and which contribute to the overall character of the support staff profile.

2.2.1 Manual Typing

In all of the offices where we conducted interviews with support staff, each secretary had an electric typewriter located at his/her own desk. On the average, secretaries spend 11% of their day using a typewriter. This includes approximately 8% original typing and 3% revision typing.

The purpose and frequency of typing varies from office to office, with some offices using typewriters for all document preparation and others using them on a very limited basis for certain types of documents. This range is primarily determined by the availability of word processors and the level of secretarial proficiency in using this equipment. Three of the Executive Director offices interviewed are currently using typewriters for preparation of all documents, except those that are finalized in handwritten form. Two of these offices have no word processing equipment, while the third has a word processor that has never been used.

Offices that make heavy use of word processors use electric typewriters mainly for short (one page or less) memos, cables, letters or telephone messages which are not expected to be revised; for Fund forms, and for back-up when a word processor is not available. In a few instances, sheets for document distribution or correspondence control logs

are also prepared on electric typewriters. Yet, in many of these offices one or more secretaries may rely on an electric typewriter due to lack of training or opportunity to become sufficiently familiar with the word processing equipment. Additionally, in at least two offices, professional staff are using typewriters to prepare their own document drafts.

Most of the secretaries indicated that they used their typewriter less, as they became more proficient with their word processing systems. Their main reasons for using a typewriter at all are: contention for a word processor; the convenience factor of the typewriter located on their desks; and the need to prepare documents such as Fund forms, or in some cases, cables, which require formats they cannot or do not know how to set up on the word processor.

Secretaries who still rely heavily, if not exclusively, on electric typewriters indicated that too much of their time is devoted to typing and in particular retyping, given the multiple revisions most documents go through. Among the offices that do not have word processing equipment, there is a definite interest in acquiring this capability. In offices where word processor equipment is underutilized, many secretaries expressed a need for additional training.

Clearly, use of typewriters is not the most efficient means of document preparation. The types of documents produced are prone to multiple revisions. For secretaries using typewriters this results in unnecessary time and effort expended in retyping whole documents rather than just keying changes, as is possible on a word processor. According to our findings, a minimum of 20% less time is spent revising documents on a word processor than on a typewriter. Other studies have shown even greater improvements in efficiency when typing is replaced by word processing. Additional opportunities to increase secretarial efficiency could be achieved by assisting secretaries to develop cable formats and standard Fund form templates on their word processing systems. In the long term, the goal of the Fund should be to replace electric typewriters with word processing workstations at each secretary's desk.

2.2.2 Word Processing

All but two of the Executive Directors offices currently have word processing equipment.[9/] Most offices have one or two terminals that are being shared by three to four support staff. Joint Offices may have as many as three terminals which are usually shared by four or five support staff. Because there are fewer word processors than secretarial users, in all but a few cases, the terminals are centrally located within

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9/ Another office is in the process of installing new equipment at the time of this writing.

the office to facilitate sharing. Most offices have installed telephones at each word processing station to accommodate secretaries being away from their desks; however, in a few offices this need has not yet been addressed. The types of word processors found in the Executive Directors offices are: CPT, IBM Displaywriter, Lexitron and NBI. Part of the reason for this variety of equipment is that certain systems have been found to accommodate the particular language requirements of an office better than others.

According to our activity measurement data, secretaries spend an average of 18% of their time using a word processor. Approximately 10% of this time is for original typing and 8% is for revisions. Within the offices, however, there are wide individual variations in the frequency of usage. This is due in part to contention for the shared machines and a subsequent need to set priorities for use (e.g. longer documents) and, additionally, to the differing levels of secretarial proficiency on the equipment. Offices that have most fully integrated word processing into their work flow tend to keep their terminals in almost constant use, preparing Board statements and long cables as a first priority, and other shorter documents (excluding Fund forms) as time and access permits. As described above, work that does not have priority is delayed or prepared on a typewriter.

On the average, each office prepares six Board statements and from 5 to 10 cables per week. While the lengths of these documents average approximately 5 pages, each may be revised as often as 3 times before it is completed. Most original material for word processing is provided to secretaries in handwritten form by professionals. A small percentage is dictated, and in only a few cases (1-2 offices) is it typed. For the most part, the material consists of straight text typing with little incidence of columns, data, tables, extensive footnotes, etc. Secretaries indicated spending, on average, 3% of their time editing and proofing the documents they prepare. The majority of this time is for interpreting and editing the original handwritten material of professional staff. A number of secretaries noted that, given the volume and pace of work, they do not have time to adequately proofread and/or edit the documents they prepare.

In one office, professionals are occasionally using the word processors to prepare their own document drafts. While this would appear to facilitate document preparation, it also creates the problem of displacing secretaries from terminals they may need to be using. The solution is to provide text processing capabilities to professional staff who wish to draft and edit their documents on a terminal. Fifty percent of the Technical Assistants interviewed indicated interest in having ready access to a text editor that is compatible with their secretaries' equipment. Secretaries also, on occasion, share the responsibility for preparing a document with other secretaries, making it desirable to provide for compatibility in an automated environment.

Secretaries in offices making extensive use of word processing, indicated that this capability enables them to do more work in less time. One noticeable result has been giving professionals more opportunity to revise their documents. Additionally, several offices indicated that using word processors has considerably reduced the amount of overtime worked. However, based on our study findings, it is apparent that the current word processing situation does not fully meet the needs of Executive Directors' offices.

- o Sixty one percent of the secretaries interviewed indicated a need for more equipment to support their office's word processing needs. Secretaries (and in at least one case, professionals) are often contending for terminal use. This condition causes document preparation delays or requires secretaries to resort to manual typing.

- o Forty percent of the secretaries interviewed requested having a terminal at their desk. Centrally located, shared terminals are inconvenient for secretaries, requiring them to leave their desks to perform word processing tasks. Secretaries find it difficult to work without proximity to material on their desks, particularly as they often need to alternate between different tasks. For professional staff this is also a problem as they rely on secretaries to be at their desks to answer telephones and tend to their requests for assistance as needed.

- o At least 50% of the secretaries interviewed expressed interest in more word processing training. Lack of or inadequacy of word processing training has prevented many secretaries from making full use of their word processing system capabilities.

Based on our findings it is our conclusion that Executive Directors offices are in need of both more word processing equipment and more training. Given that only 40% of the secretaries have requested word processors located at their desks, providing individual terminals need not be the most immediate concern. Rather, actions geared toward establishing a minimum capability and taking better advantage of existing resources should be considered as a first priority. Also, training, with a focus on the particular applications relevant to Executive Directors office functions, should be made available to all secretaries in need, as soon as possible. As these more immediate concerns are addressed, it is expected that word processing proficiency will improve and reliance on this equipment will increase. As there are clearly efficiencies to be gained by maximizing the use of word processors and reducing or eliminating reliance on typewriters, longer-term plans should provide for a one-to-one ratio of workstations to secretaries in those offices which wish to expand their use of automated systems.

2.2.3 Filing and Retrieval

All Executive Directors offices maintain their own central files for storing Fund documents, correspondence, reports, and other material accumulated to support their information needs. While half of the offices request material from outside sources such as the Joint Library, the Secretary's Department, or the World Bank, most information used by professionals to prepare statements and reports or respond to country authority requests, apart from current Fund documents, is maintained in the central office file.

The file structures vary from office to office; however, information is generally categorized in terms of countries, subjects, Board documents, and correspondence or chronological documents. Twenty-two percent of the offices interviewed indicated having an index for their filing system. The remainder rely on extensive cross-filing or on the memory of secretaries or staff familiar with the structure. Documents contained in Executive Directors' office central files date back, on average, 5 years; the range for document retention is reportedly from 1-20 years, depending on how long the office has been in existence, how much filing storage space is available, and the procedures the office has established for purging information. Generally, information pertaining to an office's constituent countries is not discarded.

Central files are maintained by the office secretaries. According to our findings, in 73% of the offices secretaries designate where documents are to be filed; in the remaining offices this is done by the Executive Director or professional staff. Generally, secretaries have responsibility for retrieving information as requested as well as refilling documents after use. In some offices, however, Technical Assistants are familiar enough with the filing system to retrieve their own information. Approximately 22% of the offices indicated that professional staff also maintain their own personal files. Most often this is information of immediate relevance to the subject area(s) they are working on. Though staff files often contain copies of documents marked with personal notes and comments, to a large extent they duplicate information already stored in central files.

Based on our activity measurements, secretaries spend slightly less than 10% of their time filing and retrieving documents. Technical Assistants, according to their activity estimates, spend an average of 8% of their time searching for information. Approximately half of all interviewees (including secretaries, Technical Assistants and Executives Directors) contended that locating documents in their filing systems is a problem. According to our study, the specific difficulties include the following:

- o In many offices only the secretaries know the filing system structure. Thus professional staff must rely heavily on secretaries to locate needed information; if a secretary is unavailable to provide assistance, the professionals must either wait for the information or spend time searching the files.

- o Few of the offices indicated using any type of sign-out system for tracking documents; thus documents often disappear or are misfiled.

- o For lack of storage space, there is a limit to how much information an office can retain; yet, professional staff often need historical data. These documents must be reordered from Document Distribution, entailing further delay in access to needed information.

In terms of addressing these problems, 91% of the Executive Directors expressed interest in accessing the Fund Document Management and Facility (DMF), currently in a preliminary stage of operation. This system is viewed as a more efficient approach to identifying documents and material by subject matter as well as a means to reduce the volume of information stored in their office files.

Our analysis of this data points to two opportunities for improving Executive Directors office filing and retrieval activities. First, providing Executive Directors offices access to the DMF system should be a priority. Second, automated facilities for indexing locally generated documents and non-Fund material should be made available to Executive Directors offices in an effort to help them organize information that will not be readily accessible on the new system. The net effect of these actions would thus be to:

- o Significantly reduce the need for physical cross-referencing of documents.

- o Reduce physical space requirements.

- o Improve information retrieval capabilities.

- o Provide professionals with easier and more direct access to both Fund documents and office central file information.

2.2.4 Document Distribution

A major function of all Executive Directors offices is distribution of Fund documents and other relevant information to their respective constituent countries. Distribution of Fund documents is a

routine secretarial activity involving; receipt of documents from the Fund's central document distribution center; sorting documents for various recipients and destinations; preparing envelopes (and in some cases mailing labels) for mail pickup; and maintaining some type of record or log for tracking copies sent out. Distribution of other material is generally done on an ad-hoc or request basis to provide country authorities with articles, reports, etc, of interest. In some offices these mail handling/document distribution tasks are rotated among secretaries; in others the responsibility is permanently assigned to one individual.

According to our findings, mail handling/document distribution activity is very time consuming, constituting, on average, 13.2% of support staff time. Of the key activities measured, document distribution is the third most time consuming activity after document production and telephone activity. For all 22 Executive Directors offices, the equivalent of 10 person years is expended annually on the activity of mail handling/document distribution alone. According to secretarial interviewees, at least 50% of the total time, or five person years, is specifically for distribution of Fund documents to member countries.

Each of the Executive Directors' offices has developed a set of procedures for sorting and mailing out Fund documents, the complexity of which depends on the number of recipients and the extent to which mailing lists must be varied for different distributions. Generally, each office has one or more mailing lists to specify how many and to whom copies of each Fund document issued are to be sent. Most offices have notified Document Distribution of the required number of copies needed for their standard mailings. If deviations from a standard count are necessary, secretaries must either notify Document Distribution to change their count or else separately request any additional copies. The required number of Fund documents, which reportedly ranges from 1 to 40 copies, is delivered by messenger to each Executive Directors' office.

Fund documents are received in Executive Directors offices as often as three to four times a day. Some of these copies are for office professional staff and must be sorted for internal distribution. The rest of the copies are prepared for distribution to member countries; this is done by each office an average of 2-3 times a week. A few offices have developed mailing lists on their word processing system and use these to generate mailing labels. Other offices use envelopes, complete with pre-printed addresses, that are ordered from the Addressing Unit of the Communications Division. Prepared documents are sent out by one or a combination of delivery services including regular mail, air mail, courier, and diplomatic pouch. Which service is used depends on the urgency of the distribution, the reliability (or unreliability) of the different services to certain countries, and in some cases specific instructions of country authorities. Unless diplomatic pouch is employed,

all documents are routed back through internal mail to a central Fund location to be sent on to their destinations.

The current Executive Directors office mail handling/document distribution situation is reason for concern on several accounts. First, the current process is inefficient, considering that documents are sorted in a centralized location, routed to each Executive Directors office to be further sorted and packaged, and then picked up from each Executive Directors' office to be routed back to a centralized Fund facility for mailing. These conditions essentially duplicate the sorting process and result in back and forth internal mail runs that would not be necessary if documents were sent out from their point of origination.

Second, many of the Executive Directors and professional staff expressed concern that their authorities do not receive Fund documents with enough time to review and respond in advance of related Board meetings. To the extent that the process within the Fund can be streamlined to reduce distribution preparation time, there is opportunity to improve the speed with which documents are disseminated to member countries. Any such effort will have to take into account Executive Directors' offices needs for flexibility in determining document recipients and for tracking the status of outgoing documents. It is our conclusion that significant efficiencies may be gained by automating the distribution of Fund documents. Considering the number of intermediaries involved in current document handling and distribution procedures, it is also possible that an automated system would provide a more secure environment for distribution of important Fund documents. Our recommendation is presented in section 3.8 of this report.

2.2.5 Copying

According to secretarial interviewees, at least one copy must be made of any document produced or received, including statements, memos, cables, news articles, and incoming correspondence. The number of multiple copies needed varies depending on the nature of the material and its destination(s).

According to our study data, an average of 39 minutes per day, or 7.4% of each secretary's time is devoted to using a copy machine. Secretaries report making between 2 and 12 daily trips, (with an average duration of 5.5 minutes) to a hallway copy machine and producing, per office, an average of 50 copies per day. The average size of documents copied are approximately 1-10 pages. A few offices stated that larger documents are sent to Graphics to be reproduced or to the high-speed copying facilities in the Communications Division.

Seventy-eight percent of the secretaries interviewed stated that the current copying arrangement posed difficulties. The need to make

frequent, though usually brief, trips to a copy facility outside of the office was cited as a major source of interruption in the flow of work; this requires secretaries to leave their desks and suspend other work in progress. The remaining support staff are left to cover additional telephone lines and take messages during this absence. When the nearest copier is busy, the secretary either waits, searches for a free copier, or returns to the office without making the copies.

Twenty-eight percent of the offices indicated that a small copy machine for their office would be very useful. The main justification is to provide a convenient means of handling the frequent, low volume copying activity described above, without leaving the office. While our observations suggest that small copier equipment in individual offices would be of potential benefit, no specific recommendations are being made as a result of this study. A more detailed analysis of activity patterns, availability, and levels of usage would be necessary before an assessment of costs and benefits could be made in this area. 10/

2.2.6 Miscellaneous Administrative Activities

A substantial amount support staff time is spent on a variety of activities not individually measured in our study. overall, an average of 11%, or approximately one hour per day, of each secretary's time is spent on these miscellaneous tasks and activities; a number of those reported are listed below:

- Drafting memos and reports
- Packing boxes
- Preparing courier envelopes
- Delivering documents (to other locations in the Fund)
- Watering plants
- Making coffee
- Locking and unlocking office files

10/ If the Committee and the Board are interested in pursuing a solution to the copier bottleneck, we would first recommend that the costs of obtaining inexpensive office copying equipment be compared with the likely costs and inconvenience of commissioning a detailed study. In the light of continuing improvements in price/performance ratios for copying equipment, it may prove more economical to forego the study.

- Opening cupboards
- Running errands
- Hand carrying cables to the cable room
- Ordering supplies
- Taking care of visitor itineraries and accommodations
- Ordering Fund documents
- Logging Correspondence
- Reading or reviewing material
- Word processing training
- Conferring or meeting with their superiors
- Organizing papers (e.g. in/out box)
- Creating mailing labels
- Doing personal work for their superior
- Clipping news articles
- Filing medical or travel forms
- Shredding "burn material"
- Translation
- Research

This list illustrates the diversity of tasks, both regular and irregular, which are performed by Executive Directors office support staff. Viewed in light of the other findings presented in this section, the varied and ad-hoc nature of these activities serves to emphasize the need to provide for better management and more efficient use of support staff time. This may be achieved by eliminating interruptions, by more extensive planning and scheduling of office work, by redesign of work spaces, and by increasing use of automation as suggested in Section 3 of this report.

2.3 Communications

The exchange of information with member countries is an integral part of Executive Director offices' day-to-day operations. All of the Executive Directors' offices have responsibilities for distributing documents and reporting on matters of concern to their constituent countries. Executive Directors also rely on information input from their national authorities, making it equally important that their constituent countries be able to receive, review and respond to material provided them as quickly as possible. Effective communication capabilities to support this information exchange are thus of major importance, in terms of performing substantive work and managing the offices' work flow efficiently.

The means of communication currently used by Executive Directors' offices include telephone, telex/cable, courier shipment, air mail, and facsimile. Except for telephones, these services are currently available to Executive Directors' offices through the Fund Communications Division where all facilities and equipment for handling official Fund communications traffic are centralized. In addition, a few Executive Directors' offices are supplementing these services with Embassy diplomatic pouch couriers supported by their national authorities. In this section we present our findings regarding Executive Directors' offices use of telex, air mail, courier, and facsimile communications.

2.3.1 Cable and Telex

Based on Communications Division data, all 22 of the Executive Directors' offices use telex/cables services. Our estimates for CY 1985 show the number of transmissions per office ranging from a low of 2 to a high of 2,819, with an estimated total of 18,855 transmissions for all offices combined. CY 1985 annualized traffic for all 22 Executive Directors' offices is estimated to average 857 transmissions per office, a volume that is considerably higher than any other means of communication. At the Fund's average combined cost per cable/telex transmission of $19.00, the total estimated cost of Executive Directors' office traffic for CY 1985 is $358,239.

A majority of the Executive Directors' offices indicated using cables/telexes on a routine basis with an average frequency of three messages per day. As reported by secretaries, documents averaged five pages in length, but may range anywhere from less than a full page to a sizeable 20-25 page document. The types of documents typically sent include: summaries of Fund documents, reports on the results of board meetings, and short messages. Incoming telexes from country authorities generally convey instructions or responses related to Fund documents.

Telex and cable messages must be prepared according to Fund Communications Division guidelines. Following these guidelines, documents are typed in all uppercase letters on a standard Fund official message form. Text must be keyed using an IBM 210 element (manual typewriter) or printed onto the Fund official message form with an OCRB font print wheel (word processor). This process makes telex/cable documents OCR readable and avoids the need for re-keying by a Cable Room operator. An authorizing signature is also required on the form. These instructions are intended to streamline the preparation process and provide the standardization and controls necessary for the Communications Division to operate a centralized Cable Room facility.

Based on Executive Directors' office interviews, a significant amount of secretarial time is devoted to preparing and dispatching or retrieving messages All but four of the offices generally prepare cables and telexes on a word processor. While this makes the process of document revision less burdensome, most of the word processing systems require the typist to change the pitch and the printwheel as well as feed the appropriate form paper through the printer each time a message is prepared. For offices using electric typewriters, only the element must be changed; however, since the cable form is multi-part, if revisions need to be made, the form will usually need to be retyped. Completed messages are routed via the Fund internal mail service or hand-carried to the Cable Room for transmission. During business hours some secretaries are apt to send messages through the mail, but many indicated a preference to hand-carry them. After 5:30 p.m., however, when the majority of messages are likely to be prepared (e.g. post board meeting summaries) they must be hand-carried to the Cable Room if they are to go out that evening.

Of the offices that commented on the message process, many expressed interest in seeing the existing services improved. Reasons for dissatisfaction include:

- Languages requiring characters not in the TTY character set cannot be telexed, i.e. Chinese, Japanese; other languages requiring accents or special characters are less legible in all upper case letters.

- Preparation is time consuming -- a special element or print wheel must be used; format and margins for the cable form must be set; secretaries must often leave their offices to hand-carry documents to the Cable Room; and occasionally secretaries wait in the Cable Room for responses to be received.

- o According to a number of offices, manual pick-up and delivery services to the Cable Room cause delays in transmission and receipt of messages.

- o Several offices noted that occasional problems with the international telex systems sometimes adversely affect the legibility of messages.

As a step toward improving the current cable/telex system, 12 of the Executive Directors' offices expressed some level of interest in a telex system interface that would allow messages to be electronically transmitted from their office systems to the Cable Room.

2.3.2 Air Mail

To send documents by air mail, Executive Directors' offices must prepare appropriate envelopes and labels. In all but a few offices, pre-printed labels (provided by the Fund) are used for document distribution; each office then handles the sorting and packaging of documents for shipment. These parcels are picked up by the internal mail service at regular intervals during the day.

Many of the Executive Directors' offices using air mail find they must contend with slow and unreliable mail services to their countries. Interviewees indicated delivery time lapses ranging from one to four weeks for material sent by air mail to reach constituent country destinations. Both Executive Directors and Technical Assistants expressed concern that authorities do not receive documents with enough time to review and respond in advance of board meetings. Only one office indicated using air mail for the majority of communications. For the other offices, given the urgency assigned to most of their communications, air mail is usually regarded as an alternative of last resort. Its primary use at present, in all 22 Executive Directors' offices, is for distribution of Fund documents.

To the extent conditions can be controlled at the Fund end, Executive Directors have expressed interest in improving and/or developing alternative means for transmitting Fund documents. Our recommendations on facsimile systems and Fund document distribution in section 3 address this requirement.

2.3.3 Courier Shipments

Preparation of courier shipments involves completing a standard Fund form and routing or hand-carrying the parcel to the Communications Division front office.

For CY 1985, Communications Division data shows 16 Executive

Directors' offices using courier services. The number of shipments per office ranges from a low of 1 to a high of 158, with a total of 406 shipments for all 16 offices. The average cost per shipment is calculated at $69.55 [11/]. The total estimated cost of all shipments made by Executive Directors' offices comes to approximately $29,087.

Executive Directors' offices generally recognize courier shipment as an expensive service. For this reason, the majority of offices employing couriers attempt to minimize their use of this service, relying on it only for urgent communications when no viable alternative is available. The few offices using courier shipments as frequently as once or twice a week, must contend with particularly slow mail services and at present do not have the option of using facsimile. Courier services are most likely to be used for large bulky documents or urgent delivery of Fund documents.

2.3.4 Facsimile

According to the Communications Division data, 12 Executive Directors' offices are using the Fund's facsimile systems. For CY 1985, the number of calls (line connections) made by a single office ranged from 8 to 507, with a total of 1,266 calls recorded for all 12 offices. The average number of transmissions thus being 106 per office [12/]. Facsimile transmissions for all 12 offices averaged 6 minutes in length at $10.87 per call. Annualized for CY 1985, the total average cost per office is estimated at $1,048 and the total cost for all 12 offices at $12,580. The Secretary's Department expects that usage of this service will continue to grow.

Currently, all facsimile equipment is operated and maintained by the Communications Division. Executive Directors' offices using the Fund's facsimile system, prepare a standard Fund cover sheet which serves as a control form to be attached to the document to be sent. As with telexes, these communications are routed by internal mail or hand carried to the Cable Room for transmission.

A majority of secretaries who commented on the use of facsimile indicated that they usually prefer to hand-carry facsimile messages, send their own document, and wait to obtain confirmation that the document was received. If the transmission is completed without problem, this process

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11/ At this cost, several hundred pages can be shipped within 2-3 days. Special rates for shipments of up to one pound were made available to the Fund in 1985, with costs of between $20 and $36 worldwide. Further negotiations are in progress, which may reduce rates for these small parcels even further.

12/ For the 12 offices currently using facsimile.

will take only a few minutes in addition to the walk back and forth to the Cable Room. However, at times, there may be transmission difficulties requiring the secretary to wait in the Cable Room for however long it takes to successfully transmit the message.

Most offices employing facsimile indicated using this service primarily for their more urgent communications. Their sparing use of this communication mode appears to be due to the limited number of their constituent countries that have facsimile capabilities and a general misconception that facsimile is more expensive than telex [13/]. Among the several offices making more extensive use of facsimile are those communicating in languages that cannot currently be prepared in a form suitable for telex transmission. Staff of Executive Directors' offices using facsimile indicated considerably greater satisfaction with the preparation efficiency, speed and reliability of facsimile by comparison to telex even though telexes are more heavily used.

According to Communications Division records, the Fund currently exchanges facsimile communications with 66 different locations in 34 member countries. This count includes 12 locations that are World Bank facsimile addresses. Excluding facsimile links to World Bank agencies, the profile of Fund facsimile links to member countries, grouped by Executive Director Office constituencies is as follows:

- Seven Executive Directors' offices currently have a facsimile link, with at least one address, in all of their constituent countries. (This includes offices representing only one country).

- Eight additional (total of 15) Executive Directors' offices currently have a facsimile link with at least one of their constituent countries.

- For seven Executive Directors' offices there is no facsimile link with their constituent country authorities.

Based on the above information, 15 out of the 22 Executive Offices have existing facsimile communication capabilities with agencies in one or more of their respective constituent countries. There is thus

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13/ It should be noted that while transmission and equipment costs of facsimile compare favorably with the average Fund cable/telex costs, distribution of facsimile capability will entail additional labor costs for staff involved in setting up/monitoring the transmission.

reason to believe, from a technical perspective, that there are opportunities to expand the use of facsimile.

Given the perceived advantages of facsimile communications, eight offices now using facsimile and one additional office expressed interest in obtaining their own facsimile equipment. A direct link with their countries is favored for reasons of convenience and control, as a means to: reduce the time and interruption involved in delivering and retrieving messages from the Cable Room; extend the times of transmission beyond regular Cable Room hours; and increase transmission security.

Several other offices, however, indicated concerns that acquiring their own dedicated facsimile machine would result in more work for secretarial staff to operate and maintain equipment, taking them away other critical tasks.

2.3.5 Summary and Conclusions

Most offices indicated that mail services to their countries are slow and uncertain. Thus as a matter of necessity, telex/cables, courier, and facsimile are critical communication factors.

Based on data provided by the Communications Division for the twenty-two Executive Directors' offices, the comparative use of communication services (excluding mail) for CY 1985 is as follows:

SERVICE	NO. OF OFFICES USING SERVICE	% OF TRAFFIC BY VOLUME
Telex Transmissions	22	86.75%
Courier Shipments	16	2.57%
Facsimile Transmissions	12	10.68%

The average annual quantities and costs of the Executive Directors' offices communications based on the usage and time period shown above are as follows:

SERVICE	AVG. ANNUAL QTY. PER OFFICE	AVG. COST PER TRANSMISSION
Telex Transmissions	857.0	$19.00
Courier Shipments	25.4	$69.55
Facsimile Transmissions	105.5	$10.87*

* Excludes cost of equipment

Including the annual lease cost of a typical mid-level facsimile machine (Refer to Appendix D-3), the actual cost to the Fund of the average facsimile transmission, based on current patterns of usage, would be $21.05, or roughly equivalent to the cost of an average cable/telex transmission. Of course, as volumes increase with respect to the Fund equipment costs, the cost of facsimile on a per transmission basis will decline. For example, if 10% of the current traffic were shifted to facsimile, the cost per facsimile transmission would fall to $16.49, representing a net savings of 13% to the Fund.

Recognizing that there are factors limiting the use of facsimile, there still is reason to conclude that expanded use of this technology would well serve the communication needs of Executive Directors' offices.

2.4 Research and Analysis

To satisfy their need for information to be used as input to analyses of issues which come before the Board, the professional staff of the Executive Directors' offices currently rely on a variety of sources including:

- Staff reports and policy papers
- Fund publications
- Requests to Fund staff
- Publications of external organizations
- Physical files

Our findings with respect to the use of these sources is discussed below.

2.4.1 Staff Reports and Policy Papers

For the majority of analyses performed by professional staff in Executive Directors' offices related to Board agenda items, the primary source of information -- both textual and numerical -- is the report or paper prepared by the responsible Fund staff organization. In the case of country matters, this is supplemented by the RED for the member country.

In most offices, these documents are the primary source of information used to frame the office's position. According to the Technical Assistants we interviewed, most analysis of these documents is currently performed on a policy level, with little statistical or econometric work. The reasons for this approach varied: some Technical Assistants stated that it was not consistent with the role of the Executive Director to perform substantive econometric analysis; more offices simply observed that there was no time to do more mathematically

oriented analysis; and others stated that while they had attempted to do more analysis of data, they had concluded that without an automated means of entering the required data, it was impractical to continue these efforts.

Within the offices that desired to do more mathematical analysis of staff reports, the professional staff, almost without exception, felt that the work of the Fund staff was excellent. However, despite the praise for the quality of the work, many expressed reservations concerning their inability to independently verify the conclusions in the staff reports insofar as they depend on the econometric assumptions, criteria for selection of relevant numerical data and textual sources, and the extent of estimation employed by the staff.

In each of the 22 offices, the Executive Director and his staff were asked to state their position on this issue, and where appropriate, the level of access to data and other information which would be required to remedy any perceived deficiencies. While each office framed its response in the light of its own requirements, several fundamentally different positions emerged.

The Executive Directors' Offices Require Access to Data On the Same Basis as the Fund Staff

This point of view was expressed by a small group of offices which felt that it was essential that they have the ability to independently verify the work of the Fund staff, examine the results using other models and/or assumptions, and construct alternative econometric scenarios justifying results which may be at substantial variance with the recommendations proposed in the staff documents.

These offices variously defined the desired level of access, but most offered examples of both published and unpublished data derived from the Data Fund System, the Treasurer's Department, and the desk economists' data, as exemplified by the tables contained in the RED.

Implicit in this position, even where it was not stated, is that access to RAL would be required to provide for comparability of results.

Executive Directors' Offices Require Access to A Subset of Fund Data

Another common position was that, no matter what technical capabilities were provided, time limitations would prevent professional staff in the Executive Directors' offices from regularly performing large-scale modelling, simulation or other sophisticated analyses. Furthermore, these offices were also likely to have stated that econometric analyses

would not be very useful, on a regular basis, even were sufficient time available.

However, these offices did express a requirement for access to selected data and automated systems which would allow them to perform an intermediate level of analysis including cross-country comparisons, sensitivity analyses and other manipulations of published and unpublished data at a local level. In this view, the analytical capabilities are intended to supplement the work of the Fund Staff, and provide the opportunity to view data in different contexts.

The offices which expressed this point of view were also more likely to note that certain data should not be made more widely available, due to the sensitivities of the member countries.

Executive Directors' Offices Require Access to Pre-Defined Outputs

This view was often expressed in conjunction with the preceding view and differs from it in emphasizing the need for specific items of information rather than general analytical capability. For example, a system which satisfied this requirement might provide a series of formatted reports, tables, rates, etc., available for viewing or printing. A number of offices noted that this capability would help them satisfy requests from constituent countries in a more timely manner, in addition to supplementing the published sources of data with more current information.

Executive Directors' Offices Do not Require Access To Fund Data and Econometric Capability

This view was expressed by a minority of offices, and is based on the premise that econometric research represents a costly and inefficient duplication of the work of the Fund staff. Additionally, these offices felt that any pronounced trend toward detailed examination of the statistical aspects of Staff papers, entailed in the presentation of alternative models, etc., could seriously diminish the ability of the Board to conduct its business in a timely manner.

2.4.2 Fund Publications

Second only to the Staff reports and papers distributed in conjunction with meetings of the Executive Board, the professional staff of the Executive Directors' offices employed a wide range of Fund publications as sources of data for their information needs. These publications include:

- the Bureau of Statistics series, IFS, BOP, DOT, GFS etc. as well as the "Grey" and "Blue" books, i.e., International Financial Statistics; Transactions of the Fund and Financial Statements of the General Department and Accounts Administered by the International Monetary Fund: SFF Subsidy Account Trust Fund,
- the Annual Report,
- the World Economic Outlook,
- the IMF Memorandum, particularly its table of Standby Arrangements
- the Exchange Restrictions Report,

Usage of these sources varied widely from office to office, with a majority of the Technical Assistants interviewed stating that the Fund data contained in these publications was not used on a regular basis. A general criticism of Fund publications containing country data and aggregates of country data was that the data lacked currency. A number of offices also noted that for their constituencies, these sources were not regarded as consistent with similar RED data. Several of the Technical Assistants also observed that even when the data themselves might be useful, the process of manually extracting data for use in analyses of large constituencies was extremely time consuming, and as often as not, could not be performed in the time available.

2.4.3 Requests to Fund Staff

All of the Executive Directors' offices reported making requests of the Fund staff for data and for analytical assistance. Our findings in this area revealed a considerable dichotomy with respect to the value of this assistance. On the one hand, some offices claimed to use this vehicle almost exclusively and to be entirely satisfied with both the timeliness and the quality of the response of the staff. Other offices claimed to be very dissatisfied with this method, due to the considerable delays experienced in obtaining a response and their lack of satisfaction with the results. As might be expected, there was a clear correlation between an office's view of the responsiveness of the Fund staff and their desire for independent means of access to data. However, even among offices which expressed some degree of satisfaction with this procedure, our interviews revealed a certain amount of unhappiness with the element of dependency inherent in this relationship.

2.4.4 External Sources of Data

Our interviews revealed a widely divergent, if relatively infrequent, use of external sources of data employed by professional staff of Executive Directors' offices. These include:

- data and analyses performed by institutional sources in a constituent country
- OECD publications
- World Bank reports and publications
- United Nations publications
- UNCTAD
- publications of other regional organizations and authorities

In most cases, the information derived from these sources appeared to be obtained on an intermittent or random basis, and thus was not a major factor in the current work of the Executive Directors' offices.

However, a number of suggestions were made for attempting to obtain access to indices of such publications, indicating that the professional staff felt that there existed a potential for more consistent exploitation of these resources. Our conclusion is that while such external sources of information may have potential, it is important for professional staff in the Executive Directors' offices to know that these sources are accessible on a regular and continuing basis. Under the existing time constraints, professionals in the Executive Directors' offices cannot afford the luxury of attempting to identify and locate publications which may or may not prove to be of value in the particular instance.

2.4.5 Physical Files

An integral element of the research performed by the professional staff of the Executive Directors' offices is the identification of precedents and historical documents bearing upon particular issues under discussion. In the current manual environment, this task is accomplished by maintaining numerous largely redundant sets of physical files containing Fund documents, cables, etc. In addition to the Central files maintained by the Records Division, Executive Directors' offices maintain subsets of the central files which are limited only by the available space. These office files are also supplemented by personal files maintained by the professional staff, which are effectively a subset of the office files.

The replication of all these files, with their more or less effective systems for indexing and maintaining an accurate inventory of their contents, represents a major investment on the part of the Fund, for duplication, transportation, physical file cabinets, the costs of space occupied by physical files, and the labor of staff required to maintain these files. And yet, despite the effort and the cost, retrieval of required information is problematic. The ability to

quickly retrieve all the relevant source documents and only the relevant documents from a manual filing system is impossible without extensive cross-referencing and indexing. While most offices practice a certain amount of primitive cross-referencing by establishing duplicate sets of "country" and "subject" or "chronological" files, the retrieval efficiency of manual systems is inherently inferior to automated systems.

The provision of an automated system to quickly and accurately identify a comprehensive set of historical Fund documents related to the matter under discussion is a prerequisite to more effective use of the time of professional staff.

2.5 Summary of Findings

Our study of the Executive Directors' offices has revealed what we consider to be a number of areas in which substantial improvements may be made in the current methods of operation. Our most significant findings may be summarized as follows:

- the current work load, on average, is borne by a relatively lean staff, requiring considerable overtime on the part of both professional and support personnel. This has implications for both the quantity and quality of work done in these offices: professional staff forego the additional research they would like to do; support staff have limited time to proofread or edit their work; the office as a whole is selective in making its views known on issues of importance to its constituency. This situation points in a general way to opportunities for automation to enhance the productivity of both professional and support staff.

- the Executive Directors' offices have not taken full advantage of the quality-enhancing capabilities of automation, especially for support staff. The contention for word processing workstations, and reliance on manual systems for document and forms production, Fund document distribution, filing and retrieval, and searching for information are areas where automation could significantly improve the quality of work possible in the current environment, by providing more efficient automated methods and procedures, as well as new capabilities.

- the current research and analytical capabilities of the professional staff in those offices which desire

independent means are limited by the current methods and procedures. The capability for automated access to Fund data, text, and other electronic sources of information which may be developed would provide an opportunity to fill this information gap. The suggested terms of this access are defined as a series of options for the major databases in section 3.3.

- current means of communications with constituent countries, for both Fund documents and ad hoc messaging could be improved by automation, principally by providing increased access to facsimile facilities and an automated Fund document distribution system;

- the level of support provided to the Executive Directors' offices in connection with the training and installation of their existing automation must be augmented. If automation is to successfully deliver its promised benefits, ongoing support to Executive Directors' offices must be provided, in order to ensure that the evolution of automation in these offices is consistent with both their changing needs and with the general EDP strategy of the Fund.

3. OPTIONS

In this section we outline a series of options for the consideration of the Committee. These options are based on our findings as described in section 2 and address the following:

- the acquisition of additional office equipment and software
- access to Fund databases
- implementation

3.1 Acquire Additional Office Equipment and Software

As the report of our findings has shown, it is clear that the Executive Directors' offices could benefit from the implementation of additional office systems hardware and software to meet the requirements of both the support and the professional staff. This hardware and software will provide wider access to existing automated capabilities in the Executive Directors' offices as well as new automated capabilities which we believe will have an impact on both productivity and the quality of work.

3.1.1 Principles

The principles which have guided us in moving from our analysis of the findings of the study to specifications for office system configurations are defined below.

Systems Installed in Executive Directors' Offices Should Be Locally Controlled

Early in the study, it was deemed advisable that each Executive Director's office have local control of its own system and storage media, which may contain sensitive documents and data created by staff of these offices. The adoption of this principle eliminates the option of installing a centrally located system which would be large enough to accommodate all 22 offices. The terms of reference for the study incorporate this principle. However, if consideration were to be given to a shared system, a substantial cost reduction would be realized in the cost of the proposed systems. Please refer to Section 4.4 for an analysis of the cost impact.

Systems Proposed for Executive Directors' Offices Must Provide the Same Automated Capabilities to All Offices

We have devised two proposed system configurations for the consideration of the Committee and the Executive Board. The first configuration, referred to as the "baseline" system, is a single-user system which will provide a common set of automated capabilities to all offices at a minimum cost. The baseline system will thus satisfy the major requirements of these offices -- access to Fund databases and systems, econometric and statistical analytical capabilities, additional word processing -- and will be shared by staff of these offices.

The second configuration, referred to hereafter as the "multi-user system," will, by definition, bring the benefits of automation to a larger and variable number of users in the office, and will as a consequence provide some additional capabilities and benefits to that office including electronic mail within the office, shared access to documents, less contention for access to workstations, a more sophisticated and user-friendly software environment, etc. Refer to section 3.1.5 for a more detailed description of the technical differences between these proposed system configurations.

In view of the current Office Automation Guidelines for Executive Directors' Offices, which provide for a rigorous allocation of automated systems based on the number of workstations, the Committee may wish to consider whether the variable number of workstations implied in the multi-user proposal raises issues of equal treatment of Executive Directors' offices.

The Baseline Configuration Must Provide a Migration Path to the Multi-User Environment

This principle states that it must be possible to upgrade from the baseline system into a multi-user system with no requirement to discard hardware or to effect major changes in software. For example, the workstation proposed as the baseline system shall be capable of functioning as a workstation on the multi-user system. Furthermore, there must be a degree of compatibility of system and application software such that offices may move from the baseline environment to the multi-user environment without retraining personnel in the use of the system's major functions. Of course, where the multi-user system provides additional capabilities, training in those new capabilities is to be expected. The purpose of this requirement is to provide for flexibility in the scope and pace of any initial implementation authorized by the Committee and the Executive Board, while not sacrificing functionality in the longer term.

The System Proposed for the Executive Directors' Offices Must Be Consistent With the Fund's Data Processing Strategy

While the EDP strategy of the Fund as a whole is in an evolutionary phase, in a number of areas the general directions of this emerging strategy are clear enough to exert substantial weight in our recommendation of systems for the Executive Directors' offices and the phasing of their implementation. The specific strategic considerations which are important in this respect will be discussed below in our analysis of the vendors' proposals. But, in general, our recommendations are consonant with the work being done on the Economic Information System (EIS), Economists' Work Station (EWS), Fund Document Management Facility (DMF), Cable Room System, and on-going developments related to the Fund's emerging data communications architecture.

We have also made a substantial effort to communicate with personnel responsible for similar EDP projects underway in the World Bank, with a view toward achieving the compatibility of systems provided to the Fund's Executive Directors and their counterparts in the Bank. [14/]

3.1.2 Hardware Components

14/ Our current understanding is that the Bank intends to provide its Executive Directors' offices with IBM PC XT workstations and Digital Equipment Corporation's ALL-IN-ONE software on a VAX 11/780 minicomputer. The recommendations made later in this section are consistent with this approach and will provide a technical foundation for communication between Executive Directors' offices.

3.1.2.1 General Baseline System

The general hardware specifications provided to the three vendors from whom the Fund has solicited proposals for the baseline systems would be satisfied at the workstation level by the IBM PC XT or PC AT, which is consistent with the Fund's direction for acquisition of intelligent workstations. Vendors were, however, permitted to propose any other system which met these requirements:

- a single IBM-compatible workstation consisting of CRT monochrome monitor, keyboard, CPU, fixed disk of at least 5 megabytes and one 5.25 inch floppy disk drive
- an operating system capable of running software designed for IBM's PC-DOS
- asynchronous communications up to 9600 Baud
- SNA/SDLC bisynchronous communications capability
- ability to upgrade the system to support vector or raster color graphics display and hardcopy output to a plotter
- programmability for customization of menus and other interfaces and applications software
- dot matrix printer

3.1.2.2 General Multi-User System

The general hardware specifications provided to the three vendors from whom the Fund has solicited proposals for the multi-user system are as follows:

- ability to support a small cluster of users in a fully integrated system consisting of from two to 10 users who would have access to shared disk storage, system printers, communications ports and system/applications software
- ability to attach the vendors' proposed intelligent baseline workstations to the system as fully functional terminals or network devices, allowing the workstations to function in both standalone and terminal/network modes

- ability to transport files from shared storage to local storage and vice versa without loss of information, including text, data, or formatting information

- programmability for customization of menus, communications interfaces, and applications software

- asynchronous communications up to 9600 baud

- SNA/SDLC bisynchronous communications capability

- letter quality printer

3.1.3 Software Features

The general software features to be provided by the proposed systems are defined below. For the most part, the requested software capabilities of the baseline system will constitute a subset of those provided with the multi-user system proposals. This was in keeping with our principal that the ability to migrate from the baseline environment to the multi-user environment should be as nearly transparent as possible to the user. However, it is expected that the multi-user system proposals will provide an additional level of functionality inherent in the greater complexity of these systems. These capabilities will be discussed in our analysis of the vendors' proposals.

Requirements for the following software capabilities exist in the Executive Directors' offices, as determined by our findings.

3.1.3.1 Communications and Terminal Emulation

As determined by our study of the Executive Directors' offices, the most significant requirement of these offices is the ability to access Fund databases and systems. Thus the proposed office systems must be capable of communicating with these Fund systems. According to our discussions with the technical personnel responsible for these systems, the technical requirements for access include asynchronous communications and terminal emulation of a DEC VT220 or VT100. [15/] However, it should

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15/ "Asynchronous communication" describes a common data link protocol which allows a workstation or terminal to communicate with another device or host computer. "Emulation" of a DEC VT220 or VT100 -- de facto industry standards for asynchronous terminals -- refers to a hardware and/or software simulation of the functional characteristics of these workstations by another vendor's equipment, permitting communications between incompatible devices of different vendors.

be carefully noted that the communications aspect of access to these systems from intelligent workstations, especially for downloading of data, is not completely defined. Due both to the evolving state of the Fund's communications architecture and also to the relatively early stage of development of these Fund systems, particularly EIS/EWS and TIFS, it is possible that additional hardware (e.g., communications board) and/or software may be required at the local level to provide access to these systems. For this reason we are also requiring the proposed systems to support SNA/SDLC communications capability for access to the IBM mainframe without the use of protocol conversion. 16/

The EWS project is currently exploring these issues with respect to EIS, and will develop appropriate technical solutions within the next six months (the RAL/EWS link will be operational in FY 1987). Whatever solutions are developed for the Fund economists will also be applicable to the systems provided to the Executive Directors' offices, as a result of the operating system level (PC-DOS) compatibility of the EWS and the workstations proposed herein. In any case, it is not anticipated that additional hardware or software which may be required will significantly affect the overall cost of the proposals.

3.1.3.2 Statistical/Econometric Software

One of the major requirements of the Executive Directors' offices is the ability to download data from a mainframe database and perform statistical and econometric analysis at the local level. This capability will be implemented on the baseline system with the same software selected for the use of Fund economists on the Economists' Workstation (EWS). According to our discussions with the BCS personnel responsible for the EWS project, any system capable of running IBM PC-DOS software will be able to support the selected econometric package. This IBM PC-DOS compatibility is thus a mandatory requirement for the baseline system. In the multi-user environment, we anticipate that the econometric package will be installed on and run from the intelligent baseline workstation, since only professionals require this facility. The actual EWS econometric software will be obtained separately from the vendor of the selected econometric package.

The second aspect of this requirement is the ability to access EIS through RAL and perform the econometric functions which are provided within this system. On a technical level, this requirement entails nothing more than the ability to communicate asynchronously using a TTY

16/ "Protocol conversion" is functionally equivalent to terminal emulation, but is often implemented in a separate hardware unit connected between the network and the incompatible device or devices.

protocol to the Burroughs system. This facility is a requirement of both the baseline and the multi-user system.

3.1.3.3 Programmable, Menu-Driven User Interface

Due to the many new capabilities which may be provided to Executive Directors' offices, the proposed systems will be required to permit the development of a tailored, menu-driven interface to Fund databases and systems or the customization of an existing menu system. These menus will allow the user to indicate the desired system or application, and provide for automatic invocation of the appropriate software. This will spare the user the necessity of remembering numerous commands and log-on sequences which might otherwise be required.

We anticipate that in the baseline systems, the menus and interfaces will have to be programmed by technical staff; whereas in the multi-user systems, existing menu facilities will require customization, i.e., the addition of new menu choices and corresponding command files.

3.1.3.4 Text Processing

Word Processing:

While word processing software is not the most significant requirement for additional automation in the Executive Director's offices - since most offices are already using dedicated word processing systems -- it is nonetheless important. The greater the degree of standardization in this area, the more effective will be the utilization and support of the installed systems. Thus it is important to obtain a highly functional word processing system which may be the basis for future standardization in the Executive Directors' offices (except where special language requirements make standardization impossible).

In terms of standardization, one of the most significant features of the selected word processing software will be its ability to support the many working languages of the Executive Directors' offices. While we do not expect that any one package will address all these requirements in the foreseeable future, it is desirable to provide for as many of these languages as possible.

Based on our discussions with the support staff in the Executive Directors' offices, the word processing requirements which are needed to satisfy current usage are relatively unsophisticated. Documents tend to be primarily short, text-oriented (versus tables), and sparing in their use of footnotes, and other sophisticated features such as paragraph numbering systems, tables of contents, etc. Of course, more sophisticated features, such as the ability to integrate numerical data and equations into the text of a document; footnotes with

automatic tracking; a thesaurus; wide text; support for DCA/DIF text conversion; and integration with document storage and retrieval software would be a strong inducement to select a word processing system.

Apart from the issue of standardization, the most important requirement of the word processing software proposed by the vendor is that it run identically on both the baseline and the multi-user systems. This will simplify the exchange of word processing documents between the standalone baseline systems and the multi-user systems, and permit professionals who wish to create draft documents on their intelligent workstations to transmit the resulting files to secretaries for final typing, printing, revisions, etc. It will also reduce the required training, documentation, and the possible confusion which would ensue if different word processing systems were employed.

Forms Generation and Fill-In:

Our analysis has shown that one of the major uses of the electric typewriters provided to each secretary is the completion of standard Fund forms. In the interests of increasing productivity, the Fund should move to develop on-line form images of the most common forms for on-line entry and printing. It is therefore highly desirable that the vendor's system provide for the ability to generate forms on the screen and provide for forms fill-in and printing.

Spelling Checker:

This feature permits a user to conduct an automated review of the spelling of text, with suggestions for the correct spelling of words not contained in a system dictionary. It will therefore be useful where the user has little or no time to perform proofreading. Despite the probable limitation of this feature to an English language dictionary, the wide-spread use of English will make this a useful feature in most offices.

3.1.3.5 Support for Color Graphics (Display and Hardcopy)

Graphics software capabilities permit the user to create graphic outputs in the form of pie charts, bar charts, etc. representing the results of statistical or numerical analyses and data. While the initial configuration may not include these graphics capabilities, both the baseline and the multi-user systems should be able to support them through hardware and software upgrades. Hardcopy output will be available via a plotter and/or laser printer.

3.1.3.6 Local Document Storage and Retrieval

For those offices which wish to automatically perform searches against a database of locally created or locally filed documents (only a minority of offices expressed such a need), it is highly desirable that the proposed system provide a means of indexing and searching documents on-line. This may be furnished through a variety of means, including full-text retrieval, or keyword indices.

3.1.3.7 Electronic Mail

While this is not a significant requirement of the Executive Directors' offices, in the multi-user environment it is desirable that the system provide for the ability to send and receive electronic mail within the cluster, with the usual features associated with such a capability, including notification of delivery, distribution to predefined lists of users. It is our expectation that this will be accomplished via connection to VAX minicomputers where the users will be provided ALL-IN-ONE electronic mail facilities.

3.1.3.8 LOTUS 1-2-3

Each user should have access LOTUS 1-2-3 for analysis of numerical spreadsheet data. In the multi-user environment, this capability may be installed locally or as a shared facility on a file server.

3.1.3.9 Local Database Software

For those offices which wish to create local databases, the proposed workstations will be capable of supporting R-BASE 5000, the Fund standard database system for personal computers.

3.1.3.10 Office Services

Office services include such capabilities as personal calendar maintenance; scheduling of meetings, conference rooms; bulletin board and broadcast messaging; calculators; and note pads, etc. Once again, the current requirement for such capabilities as determined by our study is not significant. However, for those offices which do require such capabilities it would be desirable to provide these facilities locally. Some of these facilities can probably be provided within the context of the ALL-IN-ONE system residing on the VAX minicomputer.

3.1.4 Summary and Evaluation of Vendor Proposals

3.1.4.1 IBM Proposal

Description

IBM has chosen to offer its IBM PC AT and/or the PC XT workstation as the baseline intelligent workstation, and the IBM PC Network as the hub of a multi-user system linking multiple intelligent workstations (PC ATs/XTs). For the majority of offices, the processing speed of the PC XT would be sufficient. For this reason, we take the PC XT, a lower cost workstation, as the basis of the IBM proposal, although it would be possible to mingle ATs and XTs in the network proposed by IBM.

This configuration is a local area network system which may support eight workstations, and with suitable expansion hardware, up to 72 workstations. The system would consist of a network "translator" unit and associated electronics and any number of IBM PC XT workstations variously configured as network servers for sharing of resources. File, print and communications servers for asynchronous and SNA/SDLC communications could be established on the network. Individual workstations could be configured with or without local disk storage or printers.

Analysis

The IBM proposal is essentially a hardware oriented proposal. The migration path to the multi-user environment is relatively simple, and consists of hardware which allows the user of one workstation to share a disk or printer which is physically attached to another workstation. However, the level of integration falls short of the level of integration one obtains in a shared logic environment. Except for the network software itself, and for the communications software, sharing of software is not a strong feature of this proposal. This means that menus, applications software, customized communications interfaces and other software to which all users require access, would have to be developed and separately maintained on each each workstation.

For example, as a means to provide a menu-driven front end to the system, IBM has proposed its TOPVIEW or EZ-VU software packages. These packages, however, cannot currently be installed or executed at the network level. This means that the value of the multi-user environment is relatively limited and resides mainly in its impact on the cost of system peripherals, with little or no advantages in user friendliness or maintainability.

The principal advantage of the IBM proposal lies in the inherent capabilities of the baseline workstation and in the fact that the Fund has adopted the IBM family of personal computers as "standards" for Fund-wide use. The IBM PC family is, of course, fully programmable,

which would permit BCS personnel to develop menus, communication interfaces and applications software specifically tailored to ED offices. Furthermore, the speed of the 16 bit PC AT may be useful in those offices which wish to do a significant amount of statistical and econometric analysis. Within the baseline workstation, LOTUS 1-2-3, the EWS econometric software, and other third party software meeting many of the requirements of the Executive Directors' could be run.

IBM has proposed as its word processing software the Displaywrite 3 package, which is similar to the Textpack 6 software which now runs on the IBM Displaywriters installed in a number of Executive Directors' offices. Displaywrite 3 provides a relatively full-featured word processing package with automatic footnoting, outlining, and letter writing; stored keystroke programming, the ability to merge spreadsheet files into text documents, and equation writing/display capability.

The Displaywrite 3 word processing package also offers a spelling checker, forms generation and fill-in and 4 keyboards -- French, German, Italian and Spanish -- for multilingual offices, in addition to English. A conversion utility available from IBM, though not included in this proposal, permits the transfer of Displaywriter and Displaywrite 3 documents between the incompatible disk formats of these machines. This facility would be useful in those offices now using Displaywriters.

On the other hand, the IBM multi-user proposal adds very little to what is available in the baseline environment. The user-friendly aspects of a unified software interface at the multi-user or network level are missing. Calendar, scheduler, bulletin board, and electronic mail software are not provided. All of these functions would have to be located on a centralized VAX were such a system to be installed.

The TOPVIEW and EZ-VU packages proposed by IBM to function as a menu-driven, customizable user interface cannot be executed at the network level, and more importantly, do not support all PC-DOS compatible software. This multi-tasking, windowing software will not be able to support the EWS econometric software package and is therefore not a viable alternative for this purpose. To compensate for this incapacity, BCS personnel would be required to develop its own menu-driven software system for the baseline workstations. While this is quite feasible, the level of functionality one could expect from such an interface will not compare favorably with the functionality inherent in a true unified software interface.

More serious concerns have to do with the method employed to implement access to shared files and data. While the PC network provides for concurrent access to data and record locking, the security features of the system are relatively crude. The three levels of security permitted

-- no access, read only access, and read/write access -- are established at the volume level. This means that the structure of secure user directories and files must be organized by the nature of the desired access privilege, rather than any inherent logic based on the content of the files. In effect, users who wish to secure some or all of their files will be required to maintain multiple directories in multiple volumes reflecting the security privilege assigned to that volume.

Other concerns with this proposal include:

- the IBM proposal will not present a direct interface to the Cable Room System's ALL-IN-ONE component. The necessity to transmit the telex as an ASCII file, log on to the VAX, retrieve the file and attach it to an E-mail message with properly formatted addressee information could be cumbersome and inefficient.

- unlike the NBI or the DEC proposals, there is no way to substitute a less expensive terminal device for an intelligent workstation for support staff who mainly require access to word processing. The PC Network requires the use of an intelligent workstation of the IBM PC family.

- the IBM proposal requires the use of a third party VT220 or VT100 emulator for access to the VAX minicomputors in the Secretary's Department. While there is no doubt that a third party emulator could be acquired, there is some question, based on experience in the Fund to date, about the compatibility of the emulator with the Fund DCA switch. BCS personnel have noted that some emulators appear to have difficulties in this regard.

Summary

While the IBM baseline proposal is a viable alternative, the multi-user proposal based on the PC Network offers little augmentation of user capabilities beyond the sharing of system peripherals. This is a laudable goal, but not sufficient for us to recommend it as our preferred option. The programmability of the baseline proposal makes it superior to and far less expensive than the NBI option, but the absence of network-level software cannot be offset by the opportunity to develop custom software.

3.1.4.2 NBI Proposal

Description

NBI has chosen to submit a single proposal for both the baseline and the multi-user systems. This configuration is essentially a shared logic system and consists of the 64/es controller and either the OASys 4000 or 4000 SC Secretarial Workstations. NBI has also proposed an MS-DOS compatible personal computer, the NBI 4100 series, which could be connected to the 64/es via the Multinet Interface like an IBM PC or PC XT permitting it to operate in both standalone and terminal modes.

NBI can also support the IBM PC or PC XT as a workstation on the 64/es, through the use of the Multinet Interface, and this is duly noted in the proposal. The IBM PC or PC XT can, furthermore, be equipped with an NBI board to perform word processing in standalone mode, providing a migration path on the word processing level from the baseline to the multi-user environment. Due to the cost advantage in favor of the IBM workstations and the lack of any sufficient technical reason to move away from the IBM standard, we have assumed, for the purposed of this analysis, that the intelligent workstation for the NBI proposal will be of the IBM PC family.

Analysis

The NBI multi-user system is a mature technology with well known capabilities and a significant base of both user and support staff experience in the Fund. Its principal advantage is in the word processing area, where it offers a full-featured software package, including the ability to type equations and integrate spreadsheets within the text of a document. The NBI text processing software offers the following additional features:

- forms generation and fill-in
- spelling checker
- multi-lingual keyboard supporting 7 languages

While the NBI proposal is not the least costly of the three multi-user proposals, it does provide some offsetting cost advantages. For example, the NBI proposal would allow those Executive Directors' offices which now have standalone 4000s word processing systems to upgrade these workstations, at a relatively small additional cost. The NBI multi-user system would also provide for the substitution of less expensive workstations in place of intelligent IBM PC workstations. That is, the NBI 4000 could be provided to support staff who wished to perform functions such as word processing and asynchronous communications. Other positive features of this proposal include:

- the ability to store and retrieve MS-DOS files within a DOS partition on the shared disk

- the ability to run LOTUS 1-2-3 from the 64/es, thus avoiding the inconvenience of loading the software from floppy disks at the workstation

On the other hand, a number of other requirements cannot be met with the software features of the 64/es. These include:

- tailored menus
- graphics on all workstations
- office services, such as calendar, and scheduler

Each of these functions would have to be supplied by third party or Fund-developed software running on the intelligent workstations.

Other concerns with this proposal include the following:

- the minimum 38 million bytes of disk storage is far in excess of any reasonable expectation of usage in the Executive Directors' offices.

- the 32 workstation capacity of the Multinet interface for intelligent workstations is similarly oversized for the existing requirement.

- the version of the NBI word processing software available on the baseline system differs substantially from the word processing in the multi-user environment. The Fund in fact has a separate training course for each version of this software.

- the communications capabilities of the proposed system do permit the necessary emulation and communications to function in terminal mode for access to the Fund Document Management Facility but may require additional steps to access the Cable Room system. A telex generated on the NBI system would have to be formatted in a very precise pattern to ensure the correct identification of addressee and distributee information, and then be transmitted to the VAX ALL-IN-ONE system as an ASCII file. Or, alternatively, an NBI user would have to log onto the VAX ALL-IN-ONE system directly and create the cable(s) using the WPS+ word processing software provided with the DEC ALL-IN-ONE system.

A directory of the cables created by that user would then be kept on the VAX system rather than on the NBI system. Operators would have to be familiar with both NBI and WPS+ word processing. Access of this type could be made from either a dedicated word processing station on an IBM XT or the NBI office network.

- the most significant drawback of the NBI proposal, however, is the inability to program the 64/es, in order to fully tailor and automate the system's menus and communications interfaces or to perform other applications development which could then be integrated into the system menus.

Summary

The NBI 64/es is primarily a system addressing the needs of support staff with sophisticated word processing requirements, where applications development activity is not required. As our findings have revealed, word processing is an important, but not the most important, requirement of the Executive Directors' offices. The weaknesses of the NBI proposal are, as discussed above, in the two areas which we deem critical, i.e. its limited ability to communicate formatted text to the VAX ALL-IN-ONE software, and its lack of programming facilities for tailoring of menus, communications interfaces, and interfaces to other applications software. For these reasons we believe that the NBI proposal is not the best option for the Executive Directors' offices.

3.1.4.3 DEC Proposal

Description

Digital Equipment Corporation (DEC) has proposed the MicroVAX II as the basis of its multi-user system proposal. The MicroVAX II is a small minicomputer-based system capable of supporting 2 to 33 simultaneous users on a variety of terminals and workstations, including the IBM PC XT.

The configuration proposed by DEC is a shared logic system which may support up to 8 users, and consists of the following:

- the MicroVAX II minicomputer with 4 MB of memory
- 71 MB of fixed disk storage
- a tape cartridge backup unit

- DECNET communications for interface to other VAX systems

- DECNET/DOS software for support of up to 8 IBM PC XTs
- ALL-IN-ONE integrated office systems software for word processing, electronic mail, calendar/scheduler, and file management

The WPS+ word processing package, which operates under ALL-IN-ONE, is also available for the baseline system in a standalone mode, providing for full compatibility of the baseline and the multi-user proposals' text processing function.

Analysis

The MicroVAX II is a new technology from Digital, but one which implements the same operating system (VMS) and software concepts of the larger VAX line from the VAX 11/730 to the new 8600. Any applications software which runs on a larger VAX system will run on the MicroVAX II and vice versa, thus providing for an unprecedented continuity of software functions and features across an entire spectrum of products.

This software continuity, combined with a flexible networking communications concept which includes a gateway into the IBM mainframe world through both SNA/SDLC and bisynchronous communications, is the principal strength of the DEC proposal. The ability to integrate IBM personal computers into this network through DECNET/DOS with full MS-DOS/VMS file transfer capability and terminal emulation is a further extension of this system's ability to adapt itself to the current Fund environment.

Another strong advantage of this system is the integrated office system software, ALL-IN-ONE. This software provides a menu-driven, customizable means of access to application software and external systems. ALL-IN-ONE is currently a leading candidate as the Fund standard for electronic mail, and is also the basis for accessing the new Cable Room System.

The text editor which runs under ALL-IN-ONE, WPS+, is a full-function word processor with a number of useful features:

- a composite document editor, for creation of documents consisting of both text and graphics, such as equations and spreadsheet data

- forms generation and fill-in

- spelling checker and thesaurus

- country keyboards for English, French, German, Italian, and Spanish

- support for the international and scientific/technical character sets from any keyboard

- sophisticated editing features such as redlining and change bars which permit the identification of edited material

- ability to use a "mouse" for graphics applications

As we have noted above, this text editor will also run on the IBM PC and PC XT, providing both standalone and terminal mode operation.

Other advantages of the DEC multi-user system include:

- a smooth and user-friendly interface with the Cable Room System

- compatibility with the Fund's and the Bank's ALL-IN-ONE systems, allowing exchange of documents and data between users in these institutions

- compatibility with a possible component of Fund's emerging strategy on data communications architecture

- ability to substitute very low cost VT 220 terminals for the more expensive intelligent baseline workstation as the number of users grows

- the option (not yet released) to attach a DEC word processing keyboard to the IBM PC XT for use with WPS+, thus negating the requirement for keyboard templates

Disadvantages of the DEC proposal are as follows:

- Much of the DEC software is relatively new (e.g., WPS+ 2.0 has not been released) thus entailing a risk that the system will require a more extended introduction as problems are identified and corrected

- at least in the short term, the EWS and LOTUS 1-2-3 software will have to reside on the intelligent workstations, although a third party vendor

(Virtual Microsystems) has a hardware solution which allows MS-DOS software to execute on the MicroVAX. This would allow replacement of some personal computers with less expensive VT220 workstations.

- the current function of the file cabinet software which controls access to documents is not well-designed for allowing public access to shared files. The current implementation requires that one user send a document to another user. DEC has proposed a temporary solution for this deficiency, and stated that it will be corrected in version 3.0 of WPS+.

- the 71 MB disk storage is far in excess of any immediate requirement identified by the study team. DEC has stated that a smaller disk, consisting of 31 MB, is available, but that the cost differential is trivial.

Summary

The DEC MicroVAX II is a highly functional, user-friendly system well suited to the variety of uses envisioned in the Executive Directors' offices. Its strengths are in its compatibility with other Fund systems, its high level of integration, and its communications architecture which permits great flexibility in configuration design. Any future systems development activity undertaken by the Fund should be easily accommodated within the VAX environment. If the Committee and the Board believe that the benefits of multi-user systems justify the costs, as defined in section 4, we recommend that the MicroVAX II be considered as the basis of such systems.

3.1.5 Summary of Hardware and Software Options

Baseline System

We recommend that the IBM PC XT be selected as the primary baseline system.

We see the recommended baseline system as a minimum cost, low risk option which will allow the Executive Directors' offices to begin to use a Fund-standard technology to meet the major requirements identified by the study. The baseline system will provide most of the access requirements, failing only to perform efficiently in regard to the Cable Room system, where a DEC document format is required for smooth entry into the ALL-IN-ONE system.

Of course, the single workstation baseline system will also not address the issues of contention for automated systems (where several staff members wish to use the system at the same time), nor will it materially affect the quantities of manual typing performed by support staff. In practice, the installation of a baseline system in the Executive Directors'offices will primarily address the needs of the professional staff.

The baseline system will also provide a far less friendly and functional environment than the multi-user system in which the major software subsystems are endowed with a high degree of integration (refer to the list of multi-user system advantages outlined below). While it will be possible to create a more user-friendly environment, including development of menus and customized communications interfaces, we would recommend that any major development be done in the multi-user environment. We make this recommendation for two reasons: first, it is not possible to predict with any degree of confidence how useful and reliable such software will be; second, if standalone baseline systems were allowed to proliferate over time, the effort of developing and maintaining major applications software on a host of individual systems would prove costly and difficult.

For these reasons we would prefer to see the baseline system implemented on a short term basis, as an interim step toward eventual acquisition of multi-user systems.

Multi-User System

Subject to a successful outcome of the pilot test scheduled to be carried out in FY 87, we propose that the DEC Microvax II be selected as the multi-user system. The multi-user system offers many advantages over the baseline system:

- the multi-user environment is already supplied with a sophisticated menu-driven front end for implementation of easy user access to external systems and applications software. This means that development activity can concentrate on customization to suit the special requirements of the Executive Directors' offices rather than designing totally new software. This will save substantial time for support staff and allow the pace of implementation to proceed more rapidly.

- the multi-user system also offers true hardware and software integration. Not only can peripherals be shared as in a PC network, but software functions have been specifically designed to interact, permitting,

for example, data and text from one application to be made available to, combined with, or modified by another application. This makes the multi-user system a far more efficient and effective environment for both end-users and system programmers.

- the multi-user system will offer a smooth, efficient interface to the Cable Room System, due to its ability to create documents in a format compatible with the ALL-IN-ONE system.

- the multi-user system, by definition, will provide for a wider distribution of the benefits of automation, as a larger number of users in each office will have access to the capabilities of the system. Documents drafted by professionals will be accessible by secretaries for final typing. Documents, data and messages can be transmitted from one user to another. The ability to broadcast distributions to all users will reduce the incidence of copying for documents developed within the system; users will be able to retrieve documents for review on their terminals or for local printing. The greater access to these sophisticated functions will thus serve both the professional and the support staff in equal measure.

- the multi-user system will provide for greater security of electronic mail and telex transmissions, as the office will have its own copy of the ALL-IN-ONE software under local control. The larger VAX in the Secretary's Department will therefore be used only for transit, rather than development and storage of telex messages.

- the multi-user system will permit the substitution of low cost workstations for the far more expensive intelligent workstations of the baseline system. This substitution can be made wherever the end-user does not require local storage or the use of PC-DOS software. This means that support staff who do not require the use of econometric software can be provided access to the system at a very low cost per user.

- the integrated, programmable multi-user system also provides an ideal environment for major system development activity as software may be developed on the larger VAX minicomputer and loaded onto the

local multi-user systems, thus minimizing disruption for both development and end-user staff.

3.2 Access to Fund Databases and Systems

3.2.1 General Information

In this section we present options for providing access by Executive Directors' offices to Fund data and databases. Based on our requirements analysis, the two databases of primary interest to Executive Director's offices are the Economic Information System (EIS), which will replace the current Data Fund System (DFS), and the Treasurer's Integrated Financial Systems (TIFS) which will replace the current Treasurer's Accounting Database (TAD) system.

It is important to note that both of these major Fund databases are, at the time of this writing, under development. This has compounded the difficulty of arriving at definitive formulations regarding the scope of these systems, the degree of their suitability for use in Executive Directors' offices, and the concerns of the Fund staff with the dissemination of data by means of these systems.

Partly in deference to this uncertainty, but more so in explicit acknowledgment of the policy considerations inherent in any options concerning access to Fund data, we have not attempted to dictate a sole course of action in the sections that follow. Rather, we have attempted to outline in each instance a series of viable options which the Committee may wish to consider.

These options for access to Fund data are the product of detailed discussions with both departments that are the custodians of the data and with the BCS personnel responsible for developing and implementing the respective systems. They therefore represent, in so far as possible, a consensus of opinion on the alternative means of satisfying the requirements of Executive Directors' offices for greater access to data under secure conditions.

Each option presented in the pages that follow will consist of two parts: a preliminary but specific definition of the scope of the envisioned access; and an analysis of the relative advantages and disadvantages of the option.

3.2.1.1 Implications of Expanded Access to Fund Data

Apart from the particular mode of providing access to Fund data, some observations of a general nature are warranted. These observations have arisen in discussions with the present custodians of the data and

with other concerned staff, and may provide a useful framework for consideration of the specific options described below.

3.2.1.2 Preservation of the Current Sources of Data

One often expressed concern of the Fund staff responsible for collecting data from external sources is that the current sources of that data may choose to cease, curtail or delay the submission of data in response to what may be seen as an enlargement of access beyond the terms of an original explicit or implicit agreement. Such "agreements" may be understood as interdicting the public release of the raw data or the release of the data in advance of certain future publication dates.

While explicit agreements to this effect are, to our knowledge, infrequent, there is concern that some erosion of the Fund's ability to collect data, particularly from national sources, may occur if these sources interpret the provision of enlarged automated access to data by personnel in Executive Directors' offices as tantamount to "publication."

3.2.1.3 The Sensitivity of Data

In our survey of the information requirements of Executive Directors' offices it became clear that there was no unanimity of opinion among the Executive Directors as to which data relative to their constituent country or countries should be considered sensitive, e.g., not for dissemination or publication. The sensitivity of data appeared to reflect both the individual approaches of the Executive Directors and the current economic interests of the member countries they represent.

This perception, if accurate, entails as a collorary the view that the resolution of the scope of access will necessarily involve a compromise in which the desire of one member for enlarged access will be achieved at the cost of another's sensitivities, or vice versa.

A related issue concerns the ability to control the extent of the circle to which access may be granted, and the consequent responsibility of the "owner" of the data for distribution to unauthorized individuals. The Committee and the Board will need to take into account the possible effects of enhanced access upon the security of that data.

3.2.1.4 Ability to Absorb the Required Training

When considered in the context of the other automated facilities proposed for Executive Directors' offices, it is clear that the staff of these offices will require a significant quantity of training to

take advantage of the proposed access to Fund systems. Such training would be required to familiarize staff with:

- the new database(s) structure, naming conventions, and access software,
- access to the database from the local workstation, including extraction and downloading of data
- the use of econometric tools such as RAL and/or the EWS econometric software package (AREMOS, ESP)
- the use of LOTUS 1-2-3

Even in those offices most supportive of providing enlarged access to data, the current time constraints on personnel will severely strain the staff's ability to absorb the necessary training in the use of the databases and associated software. It is noteworthy that the Technical Assistants were generally restrained in their comments concerning the extent to which such new facilities would be used, almost unanimously citing the lack of time to take advantage of new facilities.

Our conclusion is that actual utilization of new facilities for access to Fund data will be limited, at least in the short term, by constraints upon the time professional staff will have to train on and become familiar with any new systems.

3.2.1.5 Possible Impact on Decision-Making Processes

Notwithstanding the comments in 3.2.1.4 regarding the anticipated usage of new facilities, it is possible, in the long term, that if a number of Executive Directors' offices were to regularly exploit the econometric capabilities of the new facilities to construct alternative econometric scenarios for discussion of agenda items, the focus of the discussions could shift from the policy level to a predominantly technical level.

3.2.2 Access to Bureau of Statistics (EIS) Data

3.2.2.1 Background

As part of the Fund's effort to improve and augment its data processing capabilities, the functions currently performed under the Data Fund System (DFS) will be converted for operations, beginning in March of 1986, to facilities of the new Economic Information System (EIS). Hence, all discussions in this paper concerning access to Data

Fund information will be placed in the context of the EIS.

For typical users of the system, EIS will provide access to essentially the same set of files as the current DFS. Thus, access to EIS will permit users to view the following master files of Bureau of Statistics data:

- INTERNATIONAL FINANCIAL STATISTICS
- MONEY AND BANKING
- NATIONAL ACCOUNTS
- GENERAL STATISTICS
- CABLE RESERVES
- BALANCE OF PAYMENTS
- EXCHANGE RATES
- GOVERNMENT FINANCE STATISTICS
- DIRECTION OF TRADE [17]
- OECD MAIN ECONOMIC INDICATORS
- OECD NATIONAL ACCOUNTS STATISTICS
- OECD QUARTERLY NATIONAL ACCOUNTS STATISTICS
- OECD QUARTERLY LABOR FORCE STATISTICS

It should be noted that in the new EIS environment, as currently with DFS, the International Banking Statistics file will only be available to a very limited number of staff.

The international banking file contains a large amount of confidential data on the external positions of banks at the individual country level, i.e., at a level of detail below the aggregates published in pp. 48-61 of the IFS. Access to this confidential information is restricted to a few staff members of the Bureau of Statistics directly involved in the maintenance and processing of the aggregates. Any breach in the confidentiality of this file would have major adverse consequences for the avilability of data in this field and for the collaboration of the Fund and the Bank of International Settlements.

Access to Fund Accounts data in DFS is similarly restricted. According to the Bureau of Statistics, Fund Accounts transactions are treated as confidential until the date of publication, in accordance with an earlier Board decision. Refer to section 3.2.3. Access to Treasurer's Department Data, for options concerning access to Fund Accounts Data.

In addition to the accessible master files, however, users of EIS will be able to view all other files which are not declared private by the custodians of the data.[18]

3.2.2.2 Options

A series of options for providing access to EIS are presented below for the consideration of the Committee. For each option we have furnished a preliminary definition of the scope of the envisioned access as well as an analysis the relative advantages and disadvantages of each option.

Option 1. Provide access to the same set of files which are now commonly available to Fund economists.

This option would permit Executive Directors' offices to view EIS data on the same basis as the Fund Staff economist and would provide general access to the master files itemized above. Access would also be possible through RAL and a local econometric software package selected as the EWS standard.

Executive Directors' offices would be able to access all public (published and unpublished) data for all member countries as soon as the data were entered into the database. The only Bureau of Statistics data not included under this access option is that private data which is not generally available to Fund Staff economists.

This private data falls into three categories: [19]

17/ To be converted in FY 87.

18/ In its comments on the draft report, the Bureau of Statistics has expressed some additional reservations concerning access to data in the Money and Banking master file. The Bureau notes that financial institutions' statistics are compiled from non-standard national balance sheets. "For some countries, files may therefore carry information at a level of detail which a country may not regard as being available to parties other than those who compile aggregate statistics from them. The extent to which confidential detail may exist in Money and Banking files has so far not been explicitly researched by the Bureau of Statistics . . ."

19/ Since the initial draft of this paper was prepared for circulation to Fund Departments and Bureaus, plans for phase II of EIS have matured. Among other enhancements, these plans call for provision of a capability within EIS to maintain country desk data for area departments. In view of budget constraints, a time frame for implementation of these plans has not been finalized. Moreover, since it is not yet possible to speak authoritatively concerning the nature, volume, and confidentiality of country desk data which may be entered into EIS, no options for access to such data are included in this report. The only data accessible under these options is that data currently available under DFS, subject to the exclusions identified in 3.2.2.2.

1. Data which may not be disseminated by reason of explicit agreement with the provider of the data. This includes data such as the International Banking statistics furnished by BIS and additional country reporters. The masterfile containing this data will be password protected.

2. Data "owned" by another Fund Organization or individual. This includes data maintained in EIS as the personal files of individual desk economists, individual country projections of the WEO, as well as certain data distributed to EIS by the Treasurer's Department such as Fund Accounts, and International Reserves. Options concerning Treasurer's Department data are separately discussed in section 3.2.3.

3. Data maintained in private working files by Bureau of Statistics Staff and containing estimates and other derivative data of a tentative nature developed for the sole use of the Bureau.

The advantages of this option are:

- Immediate access to Fund Data on the same basis as the typical Fund economist.

- Data will be available at all levels of aggregation and disaggregation for all member countries, permitting further analysis and manipulation at the local level, including cross-country comparisons and other regional and supranational aggregations in any time frame for which suitable data is in the possession of the Fund.

The potential disadvantages of this option are:

- The granting of such wide access may not be in the interests of all Executive Directors' offices nor in the interests of all the member countries represented, in terms of the sensitivity of certain series.

- If such access is implemented, the national sources of such data may choose not to furnish the data, or to furnish the data on a less current basis.

Option 2. Provide access to a subset of EIS data through implementation of phase II access security at the series level.

In phase II of EIS system implementation, additional capabilities will permit the specification of access privileges at the level of individual time series. This means that access privileges for each Executive Directors' office, and each user within the office, could be differentiated. The particular subset of data envisioned in this option would exclude access to disaggregated series for any member country not in the Exectuive Directors' constituency. In other words, each Executive Directors' office would have access to disaggregated data for countries in its own consitutency and aggregated data for countries outside of its constituency.

The advantages of this option are that it provides a more confidential environment, and may not appear to the national sources of Bureau data as breaching any implicit understandings concerning the legitimate uses of data provided to the Fund.

The disadvantages of this option are as follows:

- Phase II implementation of EIS, in which the series-level access controls will become operational, is in the planning stages and there is currently no established delivery date, although the current expectation in the Bureau of Computing Services is that phase II will be implemented within FY 87.

- Cross-country comparison outside the constituency of the Executive Directors' offices and other supranational and regional analyses will not be possible below the level of IFS data.

Option 3. Provide access to a subset of EIS data which would be extracted from the major EIS master files.

This option is fundamentally different from either of the first two options, and would require the extraction of an agreed-upon set of series for the use of Executive Directors' offices.

This option, in effect, would require the design and creation of a subsidiary database tailored for the use of the Executive Directors' offices. If the Committee were to recommend this option, it would be implicitly endorsing access to a smaller, but more highly selective set of series. This is so because the daily extraction of updated series would entail a significant overhead in terms of processing time and storage, which could be kept within practical limits only by limiting the number of series. The advantages of this option are:

1. A smaller database, consisting of series selected for their application to Executive Directors' offices would be easier to use and require less training of office staff.

2. The extraction of selected series into a separate set of physical files would permit a greater degree of confidence in the privacy of sensitive data.

The disadvantages of this option are:

1. A new project would have to be established to design and implement such a concept. This would entail a delay in furnishing Executive Directors' offices with access to Fund data as the project's scope and methods are defined and implemented.

2. The actual series to be selected will not be determined until the project is initiated, which means that the informational value of access to this subsidiary database is undefined.

3. Additional costs will be incurred to design and implement this option. Because these costs are design-dependent, it is not possible at the current time to provide an estimate of the required funding.

3.2.3 Access to Treasurer's Department Data (TAD/TIFS)

3.2.3.1 Background

The Treasurer's Department is responsible for all data on the financial operations and transactions in the General Department, the SDR Department, and the Administered Accounts. In this capacity, it maintains the Treasurer's Accounting Database (TAD), other databases, and associated files. Many of the data generated in the Department are carried in IFS and the Data Fund/Economic Information System (DF/EIS) maintained by the Bureau of Statistics in the form of time series. The data coverage can be summarized as follows:

A. Major Categories of Fund Financial Data Carried in the Data Fund/Economic Information System (DF/EIS) [20/]

20/ The list is intended to be indicative of the type of information rather than being exhaustive. The data are available in considerable detail (e.g., purchases by facility, by country, by currency

I. General Department (General Resources Account)

o Quota

o Fund borrowing
  - SFF borrowing outstanding
  - EAR medium-term borrowing outstanding
  - EAR total short-term borrowing outstanding
  - GAB borrowing: available
  - GAB Associated borrowing: available
  - EAR borrowing: available

o Purchases to date
  - Total
  - Currencies purchased
  - Reserve tranche
  - Compensatory financing facility
  - Buffer stock facility
  - Oil facility
  - Credit tranche (ordinary)
  - Credit tranche (SFF)
  - Credit tranche (EAR)
  - Extended facility (ordinary)
  - Extended facility (SFF)
  - Extended facility (EAR)

o Repurchases to date

  - Total
  - Currencies used in repurchases
  - Compensatory financing facility
  - Buffer stock facility
  - Credit tranche (ordinary)
  - Credit tranche (SFF)
  - Credit tranche (EAR)
  - Extended facility (ordinary)
  - Extended facility (SFF)
  - Extended facility (EAR)

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purchased, etc.). EIS includes some 32,000 time series from TAD, which normally are aggregated for publication or other dissemination. In addition to TAD and other databases, Treasurer's maintains administrative accounts and pay and pension rolls.

- o Fund holdings of currency
  - Amount
  - Percent of quota
- o Reserve position in Fund
  - Amount
  - Percent of quota
- o Use of Fund credit
  - Total
  - Total in percent of quota
  - Compensatory financing facility
  - Buffer stock facility
  - Credit tranche (ordinary)
  - Credit tranche (SFF)
  - Credit tranche (EAR)
  - Extended facility (ordinary)
  - Extended facility (SFF)
  - Extended facility (EAR)
- o Stand-by and extended arrangements
  - Date agreed, date expired, amount agreed, undrawn balance
- o SDR holdings by the Fund
- o Fund holdings of gold
- o Gold distribution

II. SDR Department

- o Holdings, amounts held by members
- o Holdings in percent of allocations
- o Holdings by others
- o Net cumulative allocations
- o Payments to and receipts from GRA
- o Transactions with designation
- o Transactions by agreement
- o Transfers of SDRs for currency

III. Administered Accounts

- o Trust Fund loans outstanding
- o SFF subsidy payments

B. TAD and Other Data Presently not Carried in Data Fund/Economic Information System

I. General Department

1. General Resources Account:

- o Periodic charges
- o Remuneration payments
- o Investments of borrowed resources
- o Interest payments on Fund borrowing
- o Overdue repurchases and charges

2. Special Disbursement Account:

- o Resources
- o Investments

II. SDR Department

- o Obligation to provide currency
- o Net charges overdue

III. Administered Accounts

1. Trust Fund:

- o Overdue repayments and interest

2. SFF Subsidy Account:

- o Resources
- o Investments

Currently, the Treasurer's Department's operations and their recording are only partly automated. A combination of a large batch-oriented mainframe system, the Treasurer's Accoutning Database (TAD), local area network applications, micro-computer based applications on disks, and manual records are used to execute, control and record transactions with member countries.

TAD resides on the Fund's Burroughs mainframe and operates mainly in a batch mode. As it is primarily an accounting and financial reporting system, data are comprehensive and complete only once a month for the production of financial statements. The system has limited inquiry capabilities which makes use of the data for analytical purposes difficult or impractical except by those with extensive knowledge of database structures and complex command languages. Moreover, the security software used in the Burroughs mainframe does not provide the ability to allow different classes of users access to different kinds of data.

TAD is scheduled to be replaced by a new system that will be a part of the Treasurer's Integrated Financial Systems (TIFS) which are presently being developed. TIFS will run on the Fund's IBM mainframe and will employ standard database and other software packages as well as customized applications developed specifically for the Fund. The Decision Support Subsystem of TIFS, when completed, is intended to provide for extensive on-line inquiry and reporting capabilities and will allow for control of access down to the level of the individual data element, making it possible to control, at a cost, access to authorized users at very detailed levels.

We describe below both the longer-term option for accessing TIFS when these systems have become operational, and a number of steps that might be considered to enable Executive Directors to access, in one form or another, data collected for the purposes of the Fund's accounting and financial reporting before TIFS becomes fully operational. These options are intended to make available to Executive Directors in electronic form data that at the present time are presented in a variety of documents in the form of hard copy.

3.2.3.2 Options

Three options for providing access to TIFS and TAD data are outlined below for the consideration of Executive Directors. For each option, a preliminary definition of the scope of the envisaged access as well as the relative advantages and disadvantages are described.

Option 1. Automated and systematized access through TIFS to the data listed in Section 3.2.3.1 which now are published or distributed to Executive Directors in hard copy with differing coverage and periodicity.

The advantages of this option are:

- data which presently become available in different formats and at different points in time, would be available on line and fully updated;

- the TIFS environment, when operational, will provide a user-friendly setting that will permit retrieval of data in usable format with a minimum of technical apparatus;

- specifications of the systems will permit the protection of the confidentiality of sensitive data in accordance with agreed guidelines.

The shortcomings or disadvantages of this option are:

- the Treasurer's Integrated Financial Systems (TIFS) are still in the stage of development, and most of the component systems will not be available as an on-line system for another year or two;

- the particular form of inquiry facilities or data output desired by Executive Directors' offices may require additional systems analysis and programming effort;

- the actual implementation of access codes to protect the confidentiality of sensitive information, though technically possible at the most detailed level, may prove cumbersome and costly in practice.

Option 2. Provide access to a set of data which would be extracted from the TIFS database and output into a series of prepared formats for inquiry and display.

This option would require the extraction of an agreed upon set of financial data for access by Executive Directors' offices. The data would be available for viewing and downloading to local storage. Additionally, some part of the extracted data would be accessible in predefined output formats, which might take the form of frequently used tables, reports, and graphics tailored to the use of the Executive Directors' offices.

The option implies creation of a separate database that would be directed towards and specially designed to meet the information needs specified by Executive Directors' offices and would include a more selected set of data. The advantages of this option are:

- a smaller database, consisting of data selected for their relevance to Executive Directors' offices that would be easier to use and would require less training of office staff;

- the extraction of selected data into a separate set of physical files would permit a greater degree of confidence in the privacy of sensitive data.

The disadvantages of this option are:

- a new project would have to be established to design and implement such a concept. This may entail some delay while the project's scope and methods are defined and implemented;

- additional costs will be incurred to design and implement this option. Because these costs are design-dependent, it is not possible at the current time to provide an estimate of the required funding.

Option 3. Until TIFS is fully operational [21/] and it becomes practical to implement either Option 1 or Option 2 above, it would be possible to establish a separate project to provide on-line and inquiry capabilities for data that are now generated primarily for accounting and financial reporting purposes. Most of the accounting data that might be considered relevant by Executive Directors for analytical or other purposes are now stored in the Data Fund/EIS, maintained by the Bureau of Statistics, and additional series could be so stored if such storage improved their accessibility.

This option would entail definition of the data that would need to be extracted from TAD and/or to be made accessible in the Data Fund/EIS, and the development of report/display/download formats that meet Executive Directors' needs. As mentioned, data access could be via TAD or via the Data Fund/EIS, the choice depending on user-experience and user-friendliness of these databases and on relative costs of access.

21/ TIFS (the subsystems that upon completion will be combined in the Treasurer's Integrated Financial Information Systems) presently under development are scheduled to become fully operation by 1988/89. One subsystem, the Rate Maintenance System (RSMS), which maintains and stores a variety of exchange and interest rates used, i.e., for the Fund's operations and transactions and for the determination of maintenance of value obligations, became operational early in CY 1986. It is expected that other subsystems may become operational later in FY 1987 or 1988. TIFS will provide a highly user-friendly environment that will facilitate access to a wide variety of Fund financial data.

The advantages of this option are:

- Executive Directors' offices will be provided with interim on-line access to financial data now available in various forms and media;

- the identification of the requisite data and the development of common output formats will provide a base of experience for the implementation of either of the identified longer-term TIFS options.

The disadvantages of this option are:

- A new project to modify the TAD system will have to be established. This would represent a commitment of resources for what will essentially be a short-term benefit since the TAD system will be replaced by TIFS. To the extent that the project competed for scarce human resources that would otherwise be engaged in developing new systems, this would imply a delay in the completion and becoming operational of the longer-term solution represented by TIFS;

- the costs and actual information value of this option are undetermined.

3.3 Access to the Document Management Facility

The Document Management Facility (DMF) is now in use only within the Records Division. Originally scheduled to be made available to other end-users during 1986, current budget constraints have delayed its availability on a user-friendly basis to late FY 1987 at the earliest. When fully developed the system will provide users with a highly sophisticated on-line search and retrieval capability operating on an index of Fund documents in the following series:

- Committee on Administrative Matters (EB/CAM)
- Committee on Administrative Policies (EB/CAP)
- *Committee on Liaison with the* CONTRACTING PARTIES to the GATT (EB/CGATT)
- Committee on Membership (EB/CM)
- Committee of the Whole on Review of on Quotas (EB/CQUOTA)
- Committee on Rules for the Regular Election of Executive Directors (EB/CREED)

- Committee of the Whole for the Annual Report (EB/CW/AR)
- Committee of the Whole on the Development Committee (EB/CW/DC)
- Executive Board Administrative Papers (EBAP)
- Executive Board Documents (EBD)
- Executive Board Minutes (EBM)
- Executive Board Specials (EBS)
- Informal Documents (ID)
- Informal Session (IS)
- Press Release
- Secretary's Circulars (SEC/CIRC)
- Staff Memoranda (SM)
- Surveillance Documents (SUR)
- Trust Fund (TR)
- Decisions of the Executive Board (DEC)

Currently, documents in the series listed above have been entered into the system for the years since 1983. As budget resources permit, additional years' coverage prior to 1983 will be added. No resources are expected to be allocated in FY 87 for this purpose.

The DMF will run on the Digital Equipment Corporation VAX 750 minicomputer using the BASIS storage and retrieval software package. Authorized users of the system will be able to search the databases of documents and document abstracts using a variety of criteria such as dates, titles, subjects, countries, and time periods. The system also allows the user to query a document or the abstract of a document based on any word which appears in the text of the document or abstract.

The current implementation plan calls for both Executive Board Minutes and Executive Board Decisions to be entered into the database in full-text mode, while all other documents will be entered as a series of indices and associated abstracts. The DMF will thus assist the user in identifying documents relevant to his research objectives and provide an instantaneous option to view the text (EBM and DEC) or the abstract of the selected documents.

Currently, the Executive Directors' offices identify desired documents from their own files, from memory, or with the assistance of a manual index prepared and updated by the Records Division. Copies of any documents are then requested from the Records Division. The Records Division now indexes approximately 30,000 pages of new text each year, consisting of approximately 2000 new documents. Roughly 30,000 requests for documents are made each year. Given the volume of available Fund documents and the inherent limits on file space in the Executive Director's offices, the ability to retrieve all the source

materials relevant to a particular inquiry is clearly limited and unreliable. The DMF thus represents a significant enhancement of the information flow to Executive Directors' offices.

Technically, access to the DMF can be provided at little cost on the user end, requiring asynchronous communications to the VAX minicomputer and the ability to emulate a DEC terminal (VT220 or VT100). Both the baseline and multi-user workstation configurations proposed for the Executive Directors' offices are so equipped.

The benefits of adopting this option are as follows:

- improved confidence in the thoroughness of research based on Fund documents

- more efficient research, permitting a reduction in the time spent searching for information

- the ability to delegate research tasks to properly trained support personnel

- as user familiarity and confidence in the DMF increase with experience, the size of the permanent physical files in Executive Directors' offices (both official and personal files) will decrease, with a proportional reduction in the amount of time required to maintain these essentially redundant and complex filing systems.

The concerns and potentially adverse consequences of this proposal are as follows:

- Once again, DMF is currently in limited use for testing purposes, making it difficult to predict with any confidence how well the system will perform in its initial phase of Fund-wide implementation, both as to its technical reliability and responsiveness. While it will, in time, deliver the promised benefits, it is important to note that service in the initial period may be less than optimal.

- As we have noted, DMF is an extremely sophisticated software system operating on a very large text database. This complexity translates into a requirement for a substantial amount of user training in order to fully realize the system's potential. In order to lessen this complexity and make the system more accessible to the casual user, BCS is developing

additional front-end software which is intended to mitigate some of the technical complexity of the system. Nevertheless, if this option is adopted we suggest that each Executive Director who intends to take advantage of this system's capabilities, be prepared to designate one or two individuals from his professional or support staff to receive the necessary detailed training.

3.4 Access to the Cable Room System

The automated Cable Room System is currently in transition to production status in the Secretary's Department and is scheduled for full implementation during FY 1987.

The purpose of the Cable Room System is to provide automated electronic access to the Cable Room from a workstation in the the user's location for the transmission and reception of telex/cable messages. This facility will eliminate the need to prepare a manual form for delivery to the Cable Room and will therefore provide for a more timely and efficient communications capability as well as increased confidence in the privacy of messages.

When the system is fully implemented, the user will log on to the DEC ALL-IN-ONE environment and select the option to prepare a telex or cable. A standard telex/cable form will then be presented to the user for entry of the destination and other information, and then the user will create the message using the general electronic mail text editor. When the message has been completed, the Cable "form" is attached to the message electronically and sent to the outgoing mailbox in the Cable Room. Confirmation of delivery is processed in the same manner as incoming telexes, as defined below.

In order to receive an incoming telex, the user must be functioning as a terminal on the VAX under the ALL-IN-ONE software. A notification that an electronic mail message is waiting will be displayed on the screen. The user will enter the electronic mail subsystem and enter the command to read mail. The originator and distributees will receive confirmation copies once the recipient has received the telex or cable.

The system configuration required to perform this interface is, once again, DEC terminal emulation (VT220 or VT100) and asynchronous communication, which are specifications of the baseline and multi-user system proposals. Additionally, the workstation must be operating as a terminal under the DEC ALL-IN-ONE software.

The benefits of adopting this recommendation are:

- elimination of the need to create a manual Cable/Telex form, resulting in both a time savings and in the elimination of costs associated with the use of a multi-part form

- elimination of the need to physically deliver the telex to the cable room by messenger or in person, resulting in more timely delivery and receipt of messages, and in corresponding cost savings from the reduction of the staff time.

- an improvement in the privacy of messages achieved by eliminating the human delivery component of the system. The Committee should note, however, that as currently designed, the Cable Room operator will continue to screen outgoing messages to ensure the validity of address information and to perform other quality control functions. While BCS personnel have stated that it would be technically possible to by-pass this review in order to ensure complete privacy within the context of the Fund, this would entail some revisions both to the system software and to the policies and procedures of the Cable Room.

- telexes received in this manner may also be filed under the ALL-IN-ONE text editor, WPS+, for subsequent storage and retrieval.

While there are no inherent disadvantages to this proposal, it must be pointed out that adoption of this recommendation has different implications for each of the proposed multi-user systems:

Option 1. Offices equipped with the DEC Microvax will be able to run ALL-IN-ONE on their own office systems, provided that a DECNET link between their office system and IMX on a VAX 750 in the Cable Room is established.

Option 2. Offices equipped with the baseline system or any of the other proposed multi-user systems must be capable of emulating DEC VT220 or VT100 terminals and logging on to ALL-IN-ONE on VAX mini-computers. All of the proposed systems are so configured. However, it is important to note that the text content of the telex message using these configurations may be composed in one of two ways: it may be composed under DEC's electronic mail text editor, which is functionally identical with its word processor, WPS+; or it may be composed on another word processor using a specified document format and then transferred to ALL-

IN-ONE as an ASCII file. The latter option, it should be noted, will be far more cumbersome and time-consuming than the DEC option.

Option 3. In the event that the Committee does not adopt the proposal to acquire the recommended baseline system or the DEC Microvax system, it may be possible to develop interfaces from existing word processing systems in Executive Directors' offices to the ALL-IN-ONE system on a centralized VAX minicomputer. BCS is currently exploring the feasibility of an NBI electronic mail to DEC electronic mail interface for the NBI OASys 64 system, with initial implementation scheduled for FY 1987. This interface would provide a more user-friendly means of access to the Cable Room system than the file transfer option described above, but would require that a dedicated IBM PC (minus monitor and keyboard) be acquired for each NBI System 64. However, it should be noted that there is no certainty that this will prove to be a satisfactory option. Moreover, given that only standalone NBI systems are currently installed in the Executive Directors' offices, these offices will not find an NBI System 64 link to ALL-IN-ONE of much benefit. BCS currently has plans to explore the feasibility of a similar capability for CPT systems.

Option 4. For those offices which urgently desire to implement an interface to the Cable Room System for reception of incoming telexes, it will be possible in FY 1986 to establish this facility. To do so, a printer can be procured for each office desiring such a capability and attached to the IMX Cable Room network to print telexes routed there by the Cable Room operator. Note that this facility will provide only for receipt of incoming telexes and confirmation copies of outgoing telexes and cables. Given the limited additional wait required to obtain the full benefit of access to the Cable Room System, we do not recommend pursuing this temporary facility, but feel that it should be brought to attention of the Committee to deal with any special requirements which the Staff may have overlooked in its study. The costs of this temporary facility would include approximately $500-$1000 per printer, plus the costs of pulling cable to the Executive Directors' offices.

3.5 Access to Joint Library Information System (JOLIS)

The JOLIS system uses a software product called MINISIS and runs on the Hewlett Packard computer under the jurisdiction of the Joint Library. Users of JOLIS are able to perform sophisticated on-line searching of the publication, periodical and reference holdings of the World Bank and the Fund. Access to JOLIS can be accomplished with virtually no additional cost on the user end, by providing a simple asynchronous TTY communications capability from the individual workstation or cluster controller/server.

Currently, access to JOLIS is largely confined to Joint Library staff. Under the current pattern of system usage, user departments and bureaus relay requests to the Joint Library staff, who perform the actual searches and deliver the results back to the requester. On-line access would gradually change this profile, as users would assume a greater share of actual research activities by interfacing directly with the computer.

In anticipation of such a change, the Joint Library has initiated a major expansion of the system's ability to support additional users, primarily to address an urgent requirement for access by satellite libraries, and secondarily to begin expanding access to users in other departments and bureaus. Substantial modifications to the system software are also in progress, in order to make this sophisticated system a less complicated tool for casual users.

The management of the Joint Library staff is pleased that the success of the system thus far is creating demand for access to its services, and fully supports the wider provision of access to other departments and bureaus, including the offices of the Executive Directors. However, some concern has been expressed that the current instability of both the hardware and software environments, as system development continues into the Spring of CY 1986, will make it difficult to predict how well the system will perform if a large class of new users are introduced to the system before substantial experience with the new system has accrued.

The benefits of on-line access include:

- greater and more efficient use of Fund and Bank resources invested in the holdings and facilities of the Joint Library

- more complete identification of sources of information related to research conducted by Executive Directors' offices

- more rapid response to the need for information, since no intermediary will be required to record, execute and deliver the results of the requested research

- a gradual increase in the amount of time available to Joint Library reference staff to support more complicated research requests, due to the reduction in the number of requests for routine searches of the library network's holdings.

The concerns and potentially adverse consequences of on-line access are as follows:

- Due to the lack of experience with the new hardware environment, it is impossible to predict with any degree of certainty whether the existing number of communications ports into the system will be sufficient to ensure the ability to log-on to the system at will and to get prompt response to commands. The current plan is to meet the requirements of the Executive Directors' offices using the available rotary dial-up ports. If an unacceptable incidence of contention for access develops, the solution would require the procurement of additional hardware to provide for more communications ports.

- While BCS is developing a user-friendly interface to JOLIS for the convenience of casual users of the system, there will still be a need to train each user. The Joint Library staff has estimated that at least 1 hour is required for training. While this will impose only a small additional burden of training on users of the system in the Executive Directors' offices, it will strain the training resources of the Joint Library staff, which currently has only one staff member budgeted for training.

3.6 Access to World Bank Debt Statistics Data

The External Debt Division of the World Bank is responsible for compilation of statistics on the external debt of member countries and projections of debt statistics based on historical data. Aggregate debt statistics for member countries are published on an annual basis in the World Bank's Annual Report on External Debt, and in three supplements issued at irregular intervals between annual issues.

The data provided in the Annual Report represent aggregations of member country external debt by type of debt and creditor. While this historical data may lag by as much as two years of the publication date, the Bank's projections provide estimated data with a lag of roughly 8 to 12 months. More current data (avoiding the delay inherent in the publication process) is also available on magnetic tape. This tape is generated on a nominal monthly basis and made available to Fund staff through the Data Fund System. This electronic data is also provided at a lower level of aggregation (e.g., more detail) than is available in the published sources.

With the conversion of the Data Fund System to EIS, this data will become part of the EIS system and should therefore be accessible to Executive Directors' offices, provided that the Committee adopts the

option to permit on-line access to EIS. No additional cost to the Fund will accrue from adopting this option.

While our discussions with the World Bank staff did not reveal any major obstacles to such access on the part of the Fund's Executive Directors, as of the date of this writing the consent of the Bank's management had not been secured. The Bureau of Statistics and BCS are actively pursuing institutional agreement regarding the proposed access to the debt statistics.

3.7. Acquisition of Facsimile Systems

The cost, speed, and preparation efficiencies of facsimile provide an opportunity to improve the communication capabilities of Executive Directors' offices. Once parties at both ends have the appropriate equipment, messages that are typed, hand-written, or graphic in format, can be transmitted across any distance in a matter of minutes. Preparation efforts and the chance for error are reduced, while information exchange can be almost immediate. Furthermore, with recent developments facsimile equipment has become essentially standardized, easier to use and less costly relative to the functions and features available.

Yet, there are complexities and costs to employing this technology, including: equipment/vendor selection; compatibility with member country systems; international communication regulations; and adaptation of the technology to the workflow in Executive Directors' offices. Installing facsimile systems in Executive Directors' offices will certainly impose additional labor on the support staff who will be responsible for operating such systems. In view of these factors, it is not possible to anticipate all the conditions that might arise nor the value of the convenience and control afforded by having facsimile equipment in individual offices. Thus, we recommend a limited implementation of this technology on a pilot basis in one or a few selected offices. Our detailed recommendations follow.

3.7.1 Options

1. If this option is adopted, it is recommended that the Fund lease a *number of facsimile systems and install machines in several* Executive Directors' offices on a pilot basis as a means to test and evaluate the costs and benefits of this technology. The following criteria are suggested as a means of selecting the pilot site or sites:

   A. The primary language or languages used to communicate with the office's constituent countries cannot be prepared for telex transmission.

B. The office currently makes extensive use of the Fund's centralized facsimile facility as a means of communication.

C. The office is aware of the benefits of facsimile systems and has expressed an interest in acquiring its own facsimile equipment.

2. Six months after the pilot equipment has been installed, an assessment of the costs and benefits of the Executive Directors' office facsimile machines should be made, including tangible and intangible factors. A report of the findings and recommendations for further action should then be made to the Committee. This report should address the following:

- o Criteria to be employed in assessing the need for office facsimile systems.
- o Identification of equipment requirements and standards.
- o Guidelines and procedures for acquiring equipment.
- o Definition of the required resources and responsibilities for support of equipment procurement, installation, training, and operation.
- o Assistance to be provided to offices whose member countries are interested in acquiring facsimile machines, to insure equipment compatibility and coordination of efforts with overseas vendors.
- o Guidelines for identifying and controlling the costs of facsimile as well as other means of communication so that offices are aware of how to best take advantage of their available alternatives.

3. Based on a preliminary review of facsimile equipment options and our general knowledge of Executive Directors' office communication needs, it is suggested that the Panafax 400AD facsimile system be selected for offices participating in the proposed facsimile pilot study. [22/] A summary of our reasons for this selection follows. A more detailed analysis is provided in Appendix D-1.

22/ Due to the limited selection of models reviewed in conjunction with this study, we recommend that the equipment adoption criteria be reviewed in more detail by the Communications Division.

High Functionality at a Relatively Low Cost

- The Panafax 400AD is the least expensive of the mid-level systems reviewed. For a small monthly cost differential from the low-end products, this system provides the additional functionality we believe is best suited to Executive Directors' office needs. The major advantage of the mid-level equipment over the low-end models is its more extensive level of automation, simplifying functions and enabling the facsimile machine to automatically send, as well as receive, transmissions in an unattended mode. Specifically the features believed to be of advantage include: autodialing, autoredialing and an auto-timer. These features are briefly described below.

  - Autodialing enables the operator to enter telephone numbers with the touch of a single button (up to ten phone numbers) or by using two-digit abbreviated dialing (for an additional 100 phone numbers).

  - With autoredialing, the facsimile device will automatically retry the call if a busy signal or bad connection is experienced.

  - The auto-timer used in conjunction with the two features described above, makes it possible to automatically activate unattended transmission at a specified later time.

- The low-end machines, while only slightly less expensive, require manual operation and user attendance for performing most functions. These conditions present certain disadvantages including the potential for creating more work for secretaries and the inability to perform unattended transmissions. For these reasons, we believe the small cost saving of the low-end equipment is not worth the tradeoff of more efficient and flexible system operation.

- The high-end systems, by comparison, are more than double the monthly cost of the proposed mid-level equipment. For this additional expense, the user gains a memory feature enabling the facsimile machine to store and forward, or broadcast, messages. Despite some potential advantages of these functions for offices communicating with multiple locations, the considerably greater cost of the high-end equipment is not believed to justify a memory feature for the purpose of an initial pilot test and evaluation of facsimile technology.

Time and Cost Saving Potential

- o The features characteristics of mid-level equipment, such as autodialing/autoredialing and an auto-timer provide for efficiencies conducive to saving operating time and costs. For instance, the functions of autodialing and autoredialing, as described above, relieve the operator from having to enter a full telephone number for each transmission and from retrying a connection each time a busy signal is reached. Using these features in conjunction with an auto-timer, it is also possible to set up an automatic delayed transmission to take advantage of lower off-peak phone rates and accommodate time zone differences without the need for operator attendance at either the sending or receiving end.

- o Between the two mid-level machines [23/] reviewed, the Panafax 400AD is the less expensive, and additionally includes a built-in handset, eliminating the need to acquire another telephone for the facsimile system.

Appendices D-2, D-3, and D-4 provide matrices comparing facsimile system costs, functions, and features by low, mid, and high level equipment categories for each of the three vendors whose products we reviewed for this study.

3.8 Distribution of Fund Documents to Constituent Countries

It is suggested that a detailed study should be performed to determine the feasibility of establishing an automated function within the Fund for distribution of regularly issued IMF documents to recipients in member countries. Such a facility would be established in the Secretary's Department and would largely replace the current system of manual distribution from the Executive Directors' offices.

The system would operate as follows. Secretaries in the Executive Directors' offices would enter their mailing lists on an automated mailing list system in the Secretary's Department. They would maintain their own lists from these terminals, updating and changing them as needed. They would also enter instructions for mailing regularly issued documents to individuals on their lists. These instructions would tell personnel within the Secretary's Department who should receive how many copies of which documents, and by what means they should be mailed. Confirmation of shipment, including addressees and quantity of copies,

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23/ One of the vendors presented only low and high end systems indicating that the low-end model is essentially considered a low to mid level product.

would then be made on a predefined schedule. This system would provide a number of immediate benefits:

- Documents would be distributed only once, unlike the current system in which Fund documents are sorted and moved from Document Distribution to Executive Directors' offices, from the Executive Directors' offices (after more sorting) to the mailroom and from there to member countries, with all the delays entailed in such a system.

- Since document distribution to countries represents at least 5 person years of effort in Executive Directors' offices there is a potential cost saving involved. (It should be noted, however, that some part of any actual cost savings will be offset by the need to obtain additional staffing for the distribution function as described below).

- Mailing lists will be easier to maintain on line.

There are also some concerns that must be taken into account in developing an automated system. These issues deserve careful consideration and should be a focus of any study authorized by the Committee and the Executive Board. These are:

- Because the Secretarial Assistants will no longer be required to perform the physical labor of sorting, stuffing, logging and addressing documents for distribution, the physical constraints imposed on the number of requested documents will not be operative. As a result, mailing lists may have the tendency to grow. If that happens, initial manpower projections for automated distribution may increase together with the costs of distribution. In order to ensure that excessive demands are not put on the new service, policies and procedures regarding automated distribution of Fund documents may have to be considered.

- Executive Directors' offices need to have complete discretion over their mailing lists and who should get which documents; however, it may be expected that an automated system will entail some limitations with regard to special handling of individual documents.

- Names on mailing lists may be confidential, and should be protected from access except by the Secretary's Department and the Executive Director's office which entered it; however, some loss of privacy regarding Executive Directors' decisions relating to distribution of Fund documents may be unavoidable.

- o Additional personnel would likely be required in the Secretary's Department to handle the increased workload. While definitive estimates of the increase would have to await the results of a more detailed investigation of such a system, on a preliminary basis it appears reasonable to assume that the required augmentation of staff would entail not less than two additional staff members.

3.9 Implementation

In this section we examine possibilities for implementation of access to Fund data and systems and acquisition of office systems equipment. Our general approach is that a phased or graduated implementation is required. This approach is based on the following:

- many of the Fund systems to which Executive Directors' offices may want access are in development or early operational stages. Therefore, a phased approach to providing access will ease the introduction and associated learning process for the use of these systems.

- in addition to training in the operating system and applications software provided with the systems installed in the Executive Directors' offices (word processing, LOTUS 1-2-3, econometric software, etc.) the number and complexity of the many Fund systems to which users in these offices may be granted access will require a significant amount of training which could very well overwhelm already busy staff, unless the introduction to these systems and corresponding training are carefully calibrated with individual staff needs and available time. We believe that the significance of this problem cannot be overstated.

- the need for a high level of installation and continuing support for the implementation of these systems in the Executive Director's offices will mandate a more specific organizational focus for this responsibility than now exists. The graduated approach to implementation will thus allow time to properly create the necessary support apparatus to plan and coordinate implementation and development with an adequate level of staff support.

In view of the above considerations, phased implementation of systems in Executive Directors' offices would include the following basic steps:

1. install the recommended baseline workstation in all 22 Executive Directors' offices which wish to receive this technology

2. establish up to three pilot projects for testing and evaluation of the recommended multi-user system

3. provide access to Fund databases and systems in a phased approach in accordance with a published implementation plan to which Executive Directors or their representatives have had input.

4. establish formal mechanisms for implementation and continuing support of automation in these offices, including a vehicle for ensuring the participation of Executive Directors' or their representatives.

Each of these recommendations is discussed below.

3.9.1 Implement the Baseline System in All Executive Directors' Offices

We recommend that the baseline system be installed in the offices of all Executive Directors who wish to take advantage of the capabilities of the baseline configuration. These capabilities satisfy most of the major requirements of the Executive Directors' offices as identified in our findings, including communications, access to EIS, RAL, local econometric software, JOLIS, LOTUS 1-2-3, word processing, etc. The baseline system lacks the menu-driven interface, a smooth and efficient interface to the Cable Room system, and, of course, the office services software available only in a shared system environment.

This configuration is a suitable first step for any subsequent automation which may occur. The principal benefits of beginning with this limited step in most offices is that the level of functionality is high relative to the cost of a single workstation, and therefore does not represent a significant risk to the Fund, especially since the recommended baseline system is a Fund standard workstation.

The baseline system will also provide an opportunity for the staff, particularly the professional staff, of these offices to acquire experience in the application of automated tools in their day to day work activities. In conjunction with the proposed multi-user pilots described below, this experience would also prove valuable in evaluating the merits of further automation.

3.9.2 Establish A Pilot Project To Evaluate the Multi-user System

Our analysis of the vendor proposals in section 3.1 has shown that the recommended multi-user system provides a far greater level of functionality than the baseline system. This enhanced functionality includes:

- a menu-driven user interface for simplified and user-friendly access to applications and external Fund systems
- true integration of system hardware and software for sharing of system peripherals and applications software
- a smooth, efficient interface to the Cable Room system
- distribution of the benefits of automation to a greater number of professional and support staff, resulting in significant cost savings to the Fund and elimination of contention for automated systems
- a sophisticated programming environment for development of tailored interfaces to Fund-wide systems and other applications software addressing the specific current and potential future needs of the Executive Directors' offices
- the ability to substitute low cost secretarial workstations for support staff in place of the much more expensive intelligent workstations required in the baseline proposal

If the Committee and the Board agree that such functionality justifies the cost, we recommend that up to three multi-user systems be procured as a means to test and evaluate the costs and benefits of this system under the actual working conditions of the Executive Directors' offices. However, we believe that these three systems should not be procured until the pilot test, planned to be carried out in FY 1987, has been evaluated. The following criteria are suggested as means of selecting the pilot site or sites:

- the Executive Director has expressed a commitment to pursue advanced automation and is willing to invest the time and effort of his staff in assisting the implementation staff and in receiving

the required training.
- the staff of the office are willing to participate in the pilot project.

- the staff of the office have experience with automated systems, and feel comfortable in general with automated solutions

- the staff of the office understand the test basis of the pilot implementation and are willing to cooperate with reasonable measurements of system effectiveness required as part of the evaluation process

Within 12 months of the last pilot installation, an assessment of the costs and benefits of the multi-user systems should be made, including tangible and intangible factors. A report of findings and recommendations for further action should then be made to the Committee as the basis of a decision concerning possible extension of the multi-user system concept to other Executive Directors' offices. This report should address the following:

- an analysis of the actual costs and benefits of the system

- identification of the criteria to be employed in assessing the need for the multi-user system

- formalization of equipment requirements and standards

- guidelines and procedures for acquiring equipment

- definition of the required resources and associated responsibilities for support of equipment procurement, installation, training, and operation.

3.9.3 Phased Implementation of Access to Fund Databases and Other Fund Systems

With the input of the Executive Directors' offices, a plan should be established for the gradual introduction of access to Fund databases and systems as these databases and systems are developed and made user-friendly. This phased approach would permit the coordination of end-user training, software development which may be required for customization of user interfaces, and establishment of appropriate database/system security profiles for new users.

As we have noted above, it will be all but impossible for users

in the Executive Directors' offices to absorb all the required training needed to effectively exploit these systems in the short term. And in the initial period of implementation, most training will be directed by necessity at the acquisition of skills needed to use the local hardware and software. This makes it mandatory in our opinion to schedule the introduction of these new systems over a period of time, taking into account:

- the stage of development or operational functionality of the respective Fund databases and systems
- the desires of the Executive Directors' offices with respect to the importance of these many new systems and databases
- the confidence of the staff in their ability to proceed with additional training and the availability of training time
- the availability of training resources within the Fund (staff and facilities) and/or from the appropriate vendor

The actual length of the phase-in period will thus depend on a number of factors which cannot be defined until the Committee and the Board have had an opportunity to review and comment upon these options.

3.9.4 Develop an Implementation Support Plan and Define Organizational Responsibilities

It is essential in our view that the Committee and the Board be apprised of the nature of the short term and long term impacts that adoption of these options will have on the Executive Directors' offices.

In the short term, an implementation plan will have to be developed for effecting those options adopted by the Committee and by the Board. The implementation plan will, in turn, define a schedule of activities and associated budget requirements for the following:

Procurement Activities

Procurement activities include identification of final hardware and software components, negotiation of delivery schedules and vendor installation assistance, selection of maintenance plans, and preparation of requisitioning documentation.

Site Preparation

The support team will have to perform a review of each office to determine suitable equipment locations, electrical requirements, requirements for additional cabling and telephone wiring, furniture, etc.

Training Plans

A comprehensive plan for accomplishing the required training will have to be prepared and coordinated with the delivery schedule to ensure that the proper training is made available to users at the proper time. Support will also be required on a continuing basis to provide for training of new staff.

Installation Schedule

A schedule for delivery and installation will have to be coordinated with the vendor(s) and the Executive Directors' offices. Delivery checklists and acceptance testing procedures will have to be defined to ensure that the equipment, software and vendor documentation is delivered as ordered and in good working condition.

Application Software Development

A plan identifying a prioritized list of development work for customized menus, communications interfaces, and other applications software will have to be prepared with schedules for testing and implementation.

Pilot Project Evaluation

If any of the recommended pilot projects are authorized by the Committee, a plan for administering the pilot(s) and evaluating the results will have to be prepared.

. . .

To support these activities, the Committee can expect that additional staff will be required. It is not, however, possible to provide definitive estimates until the desires of the Committee and the Board have been made clear with respect to the extent and pace of the required automation.

Organizational Issues

As should be clear from the preceding list, without adequate planning for the management of these activities, the likelihood of the

systems delivering their promised benefits declines dramatically.

Our recommendation regarding the organizational requirements for supporting the implementation of these systems are as follows:

- coordination of automation in Executive Directors' offices should be centralized in one organization, including: implementation planning, day to day management of the implementation effort and pilot programs, and supervision of support staff

- a committee or other vehicle for obtaining the coordinated input of Executive Directors' offices needs to be established in order to ensure that the users of the systems are provided an ongoing opportunity to participate in the shaping of the automated environment in their offices.

4. COSTS AND BENEFITS

This section describes the potential cost savings and benefits associated with adoption of our options relating to hardware and software. We have attempted to provide as objective an analysis as possible of their potential cost/benefit impacts. However, our intent in this section is not to provide a "cost justification" for any of the options we have defined in this report. As is made clear in the following paragraphs, our conclusion is that any cost savings realized by automation in the Executive Directors' offices will be offset by expenditures for equipment, training and support, and that the benefits provided by these systems are largely qualitative.

4.1 Benefits Analysis

Support Staff Overtime

Executive Directors have sought to restrain the growth of staff in their offices. This supports one of the primary cost justifications for automation, i.e., enhancing the productivity of existing staff to avoid the cost of securing additional personnel. The staff of the Executive Directors' offices compensate for existing imbalances in staff and work load by working overtime. Support staff overtime results in additional labor costs to the Fund. The Secretarial Assistants in the Executive Director's offices worked 8961.5 hours of overtime in CY 1984 at a cost to the Fund of $177,303; CY 1985 overtime is projected to increase by almost 22% to 10,924.6 hours for a total estimated cost of $206,366 (See Appendix C-2). Note that some portion of this overtime is attributable to support for office functions after normal working hours and is not the result of the workload per se.

This overtime is one of the principal area of potential cost savings considered in this section. Over five years, conservatively assuming that overtime holds constant at the current annual amount, the potential undiscounted cost savings is $1,031,830.

Termination of Leases on Existing Equipment

Termination of leases on obsolete systems currently in the Executive Directors' offices would also yield a cost savings. The latest cost data for this inventory show $95,648 in annual lease costs for existing word processing equipment. This cost savings would only be realized in those offices which replaced existing leased equipment with a multi-user system. Over five years the undiscounted cost savings from replacing all of this equipment would equal $478,240. This assumes that existing lease agreements do not prohibit termination, e.g., third-party installment leases and GSA type lease-to-purchase contracts.

4.1.1 Baseline System Benefits

The baseline system will provide professional staff with important new capabilities in the areas of research, information retrieval, econometrics, and text processing. It is possible that these capabilities will result in a productivity gain for professional staff, but, as we have noted elsewhere in this report, it is equally likely that these new capabilities will entail additional work on the part of professional staff, as it becomes possible to perform more extensive research and econometric analysis on issues which come before the Board. However, since professional staff do not receive overtime pay, even were such a productivity gain to be realized, no cost savings would accrue to the Fund.

Insofar as support staff have access to these single-user baseline systems, some actual cost savings may be realized, for example, in the areas of automated document distribution, and replacing typing with more efficient word processing. However, we believe that in practice, if professional staff begin to make substantial use of these systems, support staff will have only limited access, at best. For this reason, we cannot confidently project cost savings attributable to support staff functions in the baseline configuration.

4.1.2 Multi-User System Benefits

Because the multi-user system will provide for a wider distribution of automation to both professional and support staff in the Executive Directors' offices, this configuration may have a more significant impact on productivity and cost savings than the baseline system, apart from its other qualitative advantages over the baseline

system. The following paragraphs identify the activities where the most significant productivity gains may be achieved.

Automate Distribution of Fund Documents

Our data show that approximately 9.4 person years, or $257,891, are expended annually in the Executive Directors' offices in mail handling and document distribution activities [24]. Interviews with the support staff suggest that at least 50% of this time is spent distributing Fund documents to member countries. Automating this function could thus produce an undiscounted annual saving of approximately 9776 hours, or $644,727, over five years. However, pending a study of this proposal, we assume that the number of additional staff members which may be required in the Secretary's Department to support this expanded service will be not less than two. Thus, the net cost savings to the Fund would not exceed 5616 hours per year, or $370,375 over five years.

Reduce Incidence of Manual Typing and Revision

Our data show that creating documents on a manual (or electric) typewriter is inherently inefficient. Improvements in efficiency of between 30% and 50% can be expected from the conversion of all manual text production to automated word processing (NARS studies show average productivity gains of almost 90%, for a time savings of 47%) [25]. Currently, support staff of Executive Directors' offices spend 11% of their time creating and revising documents and forms on typewriters, for a total of 16,302 hours annually. Conservatively assuming a 30% increase in efficiency (time saved given a constant volume of work) and a ratio of one workstation per secretary, the net annual time savings is projected at 4891 hours, or $322,535 over five years.

Provide Text Editing Capability to Technical Assistants

Approximately 50% of Technical Assistants interviewed indicated a willingness to create their own draft documents and/or to edit their own documents on a workstation with text processing capabilities. In some cases this willingness was the result of actual experience, and in others it seemed to be an expression of a willingness to experiment with such a capability. While we can not therefore estimate how many hours might be saved in support staff typing from handwritten drafts, our study shows that support staff revisions of word processing documents

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24/ Based on Administration Department's calculations of the average hourly rate for Secretarial Assistants, i.e., $13.19 in CY 1984.

25/ Cited in U.S. National Bureau of Standards Special Publication 500-72, December, 1980.

are at least 20% more efficient than typing original material.

Summary of Tangible Benefits

These potential cost savings are, of course, estimates. The actual experience of the Fund may be quite different. For example, certain functions required to operate and maintain the system --backing up/purging files, ordering supplies, training -- will no doubt negate some of the potential productivity gains. Additional staff will also be required for installation support, applications software development, and continuing support as described in 4.2.1 and 4.2.2. It is equally likely that new applications with positive or negative affects on productivity will also be created over time as users gain experience with the system. Nevertheless, the few examples of potential productivity gains cited above may be used as a guideline to the magnitude of the impacts we foresee. Insofar as these potential productivity gains are realized, support staff overtime attributable to the volume of work may be eliminated, resulting in a labor cost savings to the Fund.

4.1.3 Qualitative Benefits

The qualitative benefits of the baseline and multi-user systems are more likely to be achieved and are probably more significant than any cost savings which may accrue. These benefits include:

- improved availability of information and enhanced research capabilities through on-line access to Fund data and information systems such as EIS, TIFS, JOLIS, and DMF

- ability to perform econometric and statistical analysis using RAL, local econometric software and LOTUS 1-2-3

- faster and more secure communications with member countries through a Cable Room system interface and facsimile systems

- more rapid distribution of Fund documents to member countries

- faster turnaround of text documents within the office

- ability to delegate more research tasks to support staff, e.g., searching for precedents, library information, etc.

4.2 Cost Analysis

In this section we present a summary of the first year costs of the recommended baseline proposal and each multi-user system proposal, with an explanation of our assumptions and any special circumstances which may affect the comparability of the proposals. Following the cost summaries, a five year cash flow analysis of the discounted costs and benefits of a fully implemented multi-user system proposal for all 22 offices is presented. A preliminary cash flow analysis of an alternative shared, multi-user system is also presented.

4.2.1 Recommended Baseline System Cost

The IBM PC XT proposal described in section 3.1.4.1 would require a one-time expenditure of $8041.50 per workstation including software, maintenance and a dot matrix printer. For all 22 offices, the total first year procurement cost of this recommendation is $159,852. Estimated first year project management and installation support costs -- applications development, training costs -- are $215,000, and are based on the following:

- equivalent of two full-time BCS staff members for management, applications development, and support ($149,600)

- training of two Technical Assistants and 1 Secretarial Assistant in each office at an average of $1000 per user ($66,000)

Total first year costs are thus estimated to be $374,852.

4.2.2 Multi-User System Proposal Cost Comparison

Exhibit 4-1 presents our cost analysis of the three multi-user system proposals received from IBM, NBI and DEC. For each proposal we have provided an analysis of the first year costs of the system in two configurations. These costs include purchase of hardware and vendor software as well as first year maintenance for a single pilot site and for three pilot sites.

The two workstation configuration consists generally of a shared processor and/or network hardware and two intelligent workstations in the baseline configuration, i.e., the IBM PC XT with fixed disk and 1 floppy disk drive. A shared dot matrix printer is also included.

The five workstation configuration consists of the two workstation configuration plus three secretarial workstations and a shared

MULTI-USER SYSTEM
FIRST YEAR COST COMPARISON

VENDOR	TWO WORKSTATION SYSTEM		FIVE WORKSTATION SYSTEM	
	1 PILOT SITE	3 PILOT SITES	1 PILOT SITE	3 PILOT SITES
IBM PC XT	13,464	40,391	33,204	99,612
NBI 64/es	48,250	144,750	61,184	183,552
DEC Micro-Vax II	54,022	149,988	75,160	214,560

EXHIBIT 4-1

letter quality printer. This configuration corresponds to a one to ratio of workstations to Secretarial and Technical Assistants in th average Executive Director's office, e.g., an office-wide implementation. In the NBI and DEC proposals, the additional secretarial workstations are less expensive terminal devices. In the IBM propo three IBM PCs with two floppy disk drives each have been added. Re Appendix E for representative configuration diagrams.

As Exhibit 4-1 shows, the IBM PC XT proposal is clearly t least expensive. The NBI 64/es and DEC Micro-Vax II are closer in with the NBI having the advantage.

Estimated first year project management and installation costs - applications development, training - are $194,600 and are t the following:

- equivalent of two full-time BCS staff members for project management and support ($149,600)

- training of 15 additional users at $3,000 each ($45,000).

Total first year costs for the multi-user pilot project using the preferred DEC system is thus estimated at $382,354.

4.3 Cashflow Analysis of A Full Multi-User System Implementation

Exhibits 4-2, Proposed System Differential Costs, and Ex 3, Cashflow Analysis, attempt to project the maximum cost impact c multi-user system on the Fund. This means that we have employed t costs for the five workstation system, and assumed a full 22 offic implementation over 2 years, including the costs of the baseline systems. In order to arrive at this projection, a number of addit assumptions have been made and are reflected in Exhibit 4-2. The:

- 19 baseline systems are installed in year 1

- 3 multi-user systems are installed in pilot sites for a 1 year duration

- 19 additional multi-user systems are budgeted in yea and installed the following year

- project management, application development, and installation support staff requirements have been estimated at the equivalent of 4 full-time BCS staff members

PROPOSED SYSTEM DIFFERENTIAL COSTS
22 INDEPENDENT MICROVAX II SYSTEMS (ASSUMES BASELINE & 3 MVII PILOTS)

ESCALATION RATES
Personnel Rate = 0.0350
General Rate = 0.0400

CATEGORY	YEAR 0	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	TOTAL
IFFERENTIAL PERSONNEL COSTS							
Productivity Gains (-)	0.00	-103183.00	-206366.00	-213588.81	-221064.42	-228801.67	-973003.90
Planned Reductions (-)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Planned Additions (+)	0.00	54870.00	56790.45	58778.12	60835.35	62964.59	294238.50
Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ECURRING EQUIPMENT COSTS							
Leases	0.00	0.00	-95648.00	-95648.00	-95648.00	-95648.00	-382592.00
Rentals	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maintenance	0.00	51050.50	182245.50	189535.32	197116.73	205001.40	824949.45
Supplies	0.00	900.00	6600.00	6864.00	7138.56	7424.10	28926.66
Usage Charges	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00
THER RECURRING COSTS							
Project/Pilot Management	0.00	74800.00	74800.00	74800.00	74800.00	74800.00	374000.00
Appl. Dev. & Install. Spt.	0.00	149600.00	74800.00	74800.00	74800.00	74800.00	448800.00
Continuing Support	0.00	74800.00	74800.00	74800.00	74800.00	74800.00	374000.00
External Communications	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Continuing Training	0.00	0.00	74800.00	74800.00	74800.00	74800.00	299200.00
Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NE-TIME COSTS							
Purchase-Only Items	331303.30	1193106.90					1524410.20
Planned Upgrades	0.00						0.00
Consultants	0.00						0.00
Media Conversion	0.00						0.00
Application Development	0.00						0.00
Initial Training	15000.00	95000.00					110000.00
Other	0.00						0.00
ACILITIES							
Floor Space	0.00						0.00
Modifications	25000.00						25000.00
Furniture	0.00						0.00
Moving	0.00						0.00
Utilities	0.00						0.00
Other	0.00						0.00
OTAL COSTS	371303.30	1590944.40	242821.95	245140.63	247578.22	250140.42	2947928.92

EXHIBIT 4-2

CASHFLOW ANALYSIS
22 INDEPENDENT MICROVAX II SYSTEMS (& BASELINE/3 PILOT SYSTEM COSTS)

	UNDISCOUNTED NET BENEFITS				******NET PRESENT VALUE******		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
YEAR	COSTS	BENEFITS	NET BENEFIT	DISCOUNT @ 7%	COSTS	BENEFITS	NET BENEFIT
0	371303	0	-371303	1.00000	371303	0	-371303
1	1694127	103183	-1590944	0.93457	1583281	96432	-1486849
2	544836	302014	-242822	0.87343	475876	263788	-212088
3	554378	309237	-245141	0.81629	452533	252427	-200106
4	564290	316712	-247578	0.76289	430491	241616	-188875
5	574590	324450	-250140	0.71298	409671	231326	-178345
TOTAL	4303525	1355596	-2947929		3723156	1085590	-2637566

NET PRESENT VAL 7% = (2,637,566)
RETURN ON INVESTMENT= -0.71 %

EXHIBIT 4-3

- two staff members are added in the Secretary's Department to handle the additional workload incurred in centralizing distribution of Fund documents

- all leased equipment is shown as terminated without penalty, with no residual value assumed for owned equipment

- funds for cabling the 22 offices are included under modifications

- initial training is estimated at $1000 for each of 110 new users.

- differential personnel costs are subject to escalation at the rate of 3.5%.

- maintenance and supply costs are escalated at the rate of inflation, which is assumed to be 4%.

- for calculation of the net present value, a discount rate of 7% is used, on the advice of the Administration Department

Exhibit 4-2 shows the projected differential costs of the proposed multi-user system over five years, with benefits accruing from productivity gains and termination of lease agreements represented as negative values. Based on these cost/benefit estimates, Exhibit 4-3 shows that the net present value of the system after five years is -$2,637,566.

4.4 Cashflow Analysis of an Alternative, Shared, Multi-user System Implementation

As one of the principles for hardware configuration defined in section 3.1.1, it has been assumed that Executive Directors' offices would wish to have exclusive physical control over any systems installed for their use. This, of course, has a substantial impact on the cost of the resulting full-scale implementation as defined in section 4.3. In order to provide a better perspective on the cost implications of this assumption, we believe that it would be useful to present the costs of an alternative, shared configuration using the same vendor's software and workstations, but a larger, centralized processor as the hub of a shared system.

This alternative configuration would consist of the same workstations (IBM PC XTs, VT220s) and the same software proposed for the "independent" multi-user systems proposed by DEC, i.e., the VMS operating system, ALL-IN-ONE, WPS+, etc. The difference would be in the

minicomputer hardware, and could be one or more larger MicroVAX II systems, or more likely, the VAX 8600 minicomputer, which would be centrally located with communications to each office. The greater capacity of this shared hardware environment would permit the shar resources among Executive Directors' offices and, consequently, lo costs relative to the "independent" office system concept presente this study.

The assumptions used in estimating these costs are the s in section 4.3, with the following exceptions:

- 1 larger (16 user) MicroVAX II is procured for a sha pilot of the multi-user system
- a DEC 8600 system is budgeted in year one and installed the following year
- the pilot system is retained as a development environment, or made available for use elsewhere in the Fund during year two

Preliminary cost/benefit estimates of such a shared syst employing the VAX 8600 processor, and full 22 office implementatio presented in Exhibit 4-4, with a revised cashflow analysis in Exh 5. As these exhibits show the shared environment is significantly costly than 22 independent systems. The net present value of the system is -$1,675,367, representing an increase of $962,199, or 3(compared to the independent systems. In terms of undiscounted co: shared system will produce a relative savings of $1,116,132 compa: the indpendent systems, with lower staff costs accounting for $22(reduced hardware, software and annual maintenance costs accountin; remainder i.e, $891,732. It should be noted, however, that no ad(costs have been assessed for new facilities to house the shared s: If new facilities were required to house a new system, significan additional costs could be incurred by the Fund.

PROPOSED SYSTEM DIFFERENTIAL COSTS
8600 SYSTEM (ASSUMES BASELINE & 1 SHARED MVII PILOT)

ESCALATION RATES
Personnel Rate = 0.0350
General Rate = 0.0400

CATEGORY	YEAR 0	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	TOTAL
IFFERENTIAL PERSONNEL COSTS							
Productivity Gains (-)	0.00	-103183.00	-206366.00	-213588.81	-221064.42	-228801.67	-973003.90
Planned Reductions (-)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Planned Additions (+)	0.00	54870.00	56790.45	58778.12	60835.35	62964.59	294238.50
Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ECURRING EQUIPMENT COSTS							
Leases	0.00	0.00	-95648.00	-95648.00	-95648.00	-95648.00	-382592.00
Rentals	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maintenance	0.00	34394.50	105986.00	110225.44	114634.46	119219.84	484460.23
Supplies	0.00	900.00	6600.00	6864.00	7138.56	7424.10	28926.66
Usage Charges	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00
THER RECURRING COSTS							
Project/Pilot Management	0.00	74800.00	74800.00	74800.00	74800.00	74800.00	374000.00
Appl. Dev. & Install. Spt.	0.00	149600.00	74800.00	37400.00	37400.00	37400.00	336600.00
Continuing Support	0.00	74800.00	74800.00	37400.00	37400.00	37400.00	261800.00
External Communications	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Continuing Training	0.00	0.00	74800.00	74800.00	74800.00	74800.00	299200.00
Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NE-TIME COSTS							
Purchase-Only Items	261423.10	711744.43					973167.53
Planned Upgrades	0.00						0.00
Consultants	0.00						0.00
Media Conversion	0.00						0.00
Application Development	0.00						0.00
Initial Training	15000.00	95000.00					110000.00
Other	0.00						0.00
ACILITIES							
Floor Space	0.00						0.00
Modifications	25000.00						25000.00
Furniture	0.00						0.00
Moving	0.00						0.00
Utilities	0.00						0.00
Other	0.00						0.00
OTAL COSTS	301423.10	1092925.93	166562.45	91030.75	90295.95	89558.85	1831797.03

EXHIBIT 4-4

CASHFLOW ANALYSIS
9600 SYSTEM (& BASELINE/SHARED PILOT SYSTEM COSTS)

	UNDISCOUNTED NET BENEFITS				******NET PRESENT VALUE******		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
YEAR	COSTS	BENEFITS	NET BENEFIT	DISCOUNT @ 7%	COSTS	BENEFITS	NET BENEFIT
0	301423	0	-301423	1.00000	301423	0	-301423
1	1196109	103183	-1092926	0.93457	1117848	96432	-1021416
2	468576	302014	-166562	0.87343	409269	263788	-145481
3	400268	309237	-91031	0.81629	326735	252427	-74307
4	407008	316712	-90296	0.76289	310502	241616	-68886
5	414009	324450	-89559	0.71298	295180	231326	-63854
TOTAL	3187393	1355596	-1831797		2760956	1085590	-1675367

NET PRESENT VAL 7% = (1,675,367)
RETURN ON INVESTMENT= -0.61 %

EXHIBIT 4-5

APPENDIX A

List of Staff Interviewed

List of Interviews With Executive Directors and Their Representatives

Interviewee	Title	Date
Mr. Zhang	Executive Director	7/10
Mr. Clark	Alternate Executive Director	7/16
Mr. Leonard	Alternate Executive Director	7/16
Mr. Ismael	Assistant to Executive Director	7/18
Mr. Alhaimus	Alternate Executive Director	7/18
Mr. Jayawardena	Alternate Executive Director	7/23
Mr. Suraisry	Alternate Executive Director	7/24
Mr. Perez	Executive Director	7/24
Mr. Nebbia	Executive Director	7/25
Mr. Polak	Executive Director	7/25
Mr. Sugita	Alternate Executive Director	7/30
Mr. de Maulde	Executive Director	7/31
Mr. Salehkhou	Executive Director	7/31
Mr. Jaafar	Alternate Executive Director	8/1
Mr. Grosche	Executive Director	8/7
Mr. Zecchini	Executive Director	8/8
Mr. Rye	Executive Director	8/12
Mr. Fugmann	Alternate Executive Director	8/12
Ms. Walker	Assistant to Executive Director	8/14
Mr. Abdallah	Alternate Executive Director	8/15
Mr. Schneider	Alternate Executive Director	8/19
Mr. Kafka	Executive Director	8/23

List of Secretarial Assistants Interviewed

Staff Member	Date
Mr. Salada	08/21
Mrs. Atkinson	08/21
Ms. Frambes	08/22
Miss Toussaint (Bank)	08/22
Mrs. Schirmer	08/23
Ms. Vollerthun	08/23
Mrs. Machado	08/26
Miss Kiwunaka	08/27
Ms. Ryan	08/27
Miss Harris	08/27
Miss Watson	08/27
Ms. Herbert (Bank)	08/27
Ms. Mouyal	08/28
Ms. Cullinane	08/28
Mrs. Marshall	08/28
Mrs. Shatila	08/29
Mrs. Straub	08/29
Mrs. Chacon	08/29
Mrs. Calderon	08/30
Miss Di Placido	08/30
Mrs. Miller	08/30
Mrs. Ohal	09/04
Mrs. Myers	09/04
Miss Makagiansar	09/04
Miss Van den Broek	09/04
Miss Jotikasthira	09/04
Mrs. Clague	09/04
Miss Alfaro	09/05
Miss Okumura	09/10
Mrs. Maroney	09/18
Mrs. York	09/18

List of Assistants to Executive Director Interviewed

Staff Member	Date
Mr. Orleans-Lindsay	09/05
Mr. Salinas	09/05
Mr. Ercel	09/06
Mr. Flamant	09/06
Mr. Tregilgas	09/10
Mr. Geadah	09/10
Mr. Chatah	09/10
Mr. Reddy	09/10
Mr. Munthali	09/11
Mr. Bengs	09/12
Mr. Yasseri	09/12
Mr. Angeloni	09/13
Mr. Almeida	09/17
Mr. Hodgson	09/19
Mr. de la Herran	09/19
Mr. Isleifsson	09/19

APPENDIX B

Interview Guidelines and Activity Measurement Instruments

Executive Directors' Interview Guideline

Key Activities

1. What Fund activities typically consume a significant amount of your time? your alternates/advisors? technical assistants? secretaries/clericals? For example:

   - o Reviewing Documents
   - o Preparing Documents
   - o Meetings
   - o Collecting Information/Data
   - o Analyzing Data
   - o Communicating with Others
   - o Planning/Coordinating
   - o Maintaining Records

2. Are you or your senior staff now performing any administrative functions that could be delegated to a lower level of staff if automated support were available? For example:

   - o proofreading
   - o copying
   - o calculating
   - o looking for information

3. What repetitive activities do you or your staff perform (e.g. record keeping, computations, data analysis) that could be done more effectively using automated tools? Please describe.

4. Do you or your staff encounter any bottlenecks or delays in the completion of your day-to-day work; e.g. typing, photocopying, filing/retrieval, obtaining information.

Data Requirements

1. What sources of information do you regularly use in your work?

   - o How do you get access to this information?
   - o In what format do you receive this information?
   - o Does this information have to be reformatted or reorganized? How?
   - o Is this information accurate and timely?
   - o Are there specific Fund data or databases that you now use or would like to use?

2. Are there other sources of information to which you would like to have access? For example:

- o Fund sources
- o External sources such as on-line databases, news services
- o World Bank

Communications

1. What proportion of your time is spent communicating with a constituent country or countries? with Fund staff? with others?

2. What methods of communication are employed?

   - o Mail
   - o Telephone
   - o Cable
   - o Facsimile
   - o Memorandum
   - o Computer

3. How effective are these methods? How could your communications capabilities be improved?

4. Do you usually receive communications from others in the Fund in time to act on the message?

   - o Questions from other Executive Directors
   - o From Fund staff
   - o Notice of meetings

5. Do you see any value in an electronic mail system or other automated messaging system linking your staff? Your office and other offices or departments of the Fund?

Secretarial/Administrative Support

1. Are you satisfied with the timeliness, quality, and appearance of documents leaving this office?

2. Do revisions cause problems in meeting due dates?

3. Do you maintain in your office any large, active files of data or text which are accessed on a frequent basis? For example:

   - o Board Documents
   - o Correspondence

4. Are these files current, accurate?

5. Can you find information filed within your office when you need it?

6. Is the current method of maintaining your schedule and schedules of senior staff adequate?

7. Does your office need general computing/spreadsheet capability for analyzing data?

Secretarial Assistant Interview Guideline

1. General Office Description

   - o Who do you work for?
   - o How many other secretaries are there and who do they work for?
   - o Approximately how many hours do you and the other secretaries work a day?

2. Logistics of Activities and Tasks

   - o Do you have a typewriter at your desk?
   - o Do you have a word processing terminal at your desk?
     If yes, do you share it with others?
     If no, do you have access to a word processor? Where is it located? Who else uses it?
   - o What activities/tasks require you to leave your desk? (i.e. copying, telex, document retrieval)

3. Overview of Activities and Tasks

   - o What are the major activities/tasks you perform on a daily basis?
   - o What other tasks do you perform on a regular basis (specify weekly, "x" times/week, monthly, annually)?
   - o Do other secretaries perform basically the same tasks? If not, how do their activities/tasks differ?

4. Document Preparation

   - o What documents/work do you do on a manual typewriter?
     - Number and types of documents
     - Document size and form of original (handwritten, typed. dictated, logging info from another source)
     - Frequency (daily, weekly, etc.)
     - Time spent each day - originals/revisions using manual typewriter
   - o What documents/work do you do on a word processor
     - Number and types of documents
     - Document size/form of original
     - Frequency (daily, x times a week, weekly, monthly)
     - Time spent each day using word processor original text/revisions
   - o Shorthand/Dictation
     - Types of documents
     - Size of documents

- Frequency of use
- Time spent each day

o Translation

- Number and types of documents
- Range of document sizes
- Frequency of translation
- Time spent each day

o Editing and proofing

- Do you edit and/or proof documents?
- How much time do you spend a day doing this?

o Telex preparation

- What is the procedure for preparing and sending telexes?
- How many and how frequently are telex messages sent? (number sent each day, week, etc.; number of times per day messages)
- Time spent each day preparing and sending telex, including any time spent physically delivering the telex

5. Copying, Duplicating, Distribution

o Outgoing documents--What are your responsibilities for copying and distributing documents?

- Making a file copy (type(s) of document(s))
- Internal office distribution
- Making copies for distribution outside of Executive Directors office? outside of IMF?
- Range of document sizes you copy
- Time spent copying each day
- Time spent distributing/mailing each day

o Incoming documents/mail--What are your responsibilities for handling incoming mail?

- What is the process for sorting and distributing mail?
- What portion of the mail would you estimate is internal? What portion is from external sources?
- Time spent each day sorting and distributing mail

6. Document Filing, Storage, and Retrieval

o How is your office filing system organized? Who maintains files?

o Approximate quantity of documents on file

- How far back (dates) do documents go?
- How often do you purge files?

o How is filing system used?

- Secretaries retrieve and refile info
- and/or staff take info as they need

o Is the space you have to file/store documents sufficient?

o Time spent filing each day

o Information retrieved outside of office

- Do you request or retrieve documents/information from other IMF offices? or from outside of IMF?
- What types of documents/information (and for what purposes)

o Time spent retrieving information each day

7. Communications

o Telephones

- How many telephone lines do you cover?
- How many staff are serviced by these lines?
- What system/procedures do you use for answering phones and taking messages?
- How many incoming calls do you get a day?
- Are you regularly asked to place calls for staff?
- Time each day spent answering phones, taking messages, and placing calls

o Facsimile preparation

- Procedure
- Type and frequency sent
- Time spent preparing facsimile and physically transporting the document and monitoring transmission

8. Office Services

o Scheduling/calendar maintenance

- Do you maintain any calendars for staff?
- What are the procedures for maintaining calendars? (where is calendar?)
- How much time do you spend in this activity each day?

9. Major Areas Needing Improvement/Expectations

Technical Assistant Interview Guideline

1. Background

   o General overview of responsibilities

      - Types and quantities of documents prepared.

      - Types of research and/or analysis done.

   o Interaction with other office and Fund staff regarding research, writing, analysis.

2. Process Overview

   o Can you describe the process you go through to perform these analyses in terms of collecting information, analysis, review, decision points, approvals?

      - How often do you perform these analysis/research activities? Which of these analyses do you perform on a regular basis; which are performed only occasionally?

      - What is the output of the work/tasks you perform? (i.e. a document, data used by someone else, a decision)

      - Who is the recipient of the output?

   o Do you informally share information with other Directors or Fund offices?

3. Information Sources

   o Can you please identify the sources of information you use to do your work including documents and data bases?

      - Primary sources of information; other sources of information.

      - Kinds of information, i.e. specific time series, tables, etc.

      - Where is this information located?

      - How is it obtained? How long does it take?

      - Is this a standardized procedure or an ad hoc process?

      - How often is it obtained? (regular basis or as needed)

- If this data pertained to one of your constituent countries, would you consider it sensitive?

4. Statistical Functions And Uses Of Information

o What kinds of analysis, calculations and/or statistical functions do you perform? Indicate the appropriate percentage of each type?

- Cross country comparisons?
- Modelling?
- Simulation?
- Exchange rate calculations?
- Other?

5. Additional Requirements

o What information do you not now have access to that you would like to have? Provide same information as in Item #3, where applicable.

o What types of statistical functions are you not currently able to perform that you would like to have the capability to perform?

- What are your priorities in this respect?
- How would this improve/enhance the work you are currently doing?

Activity Questionnaire For Secretarial Assistants

Please indicate the percentage of time you typically spend performing each of the following, and typical volumes where appropriate:

ACTIVITY	PERCENTAGE	VOLUME
MANUAL TYPING (ORIGINAL)	_____	_____
MANUAL TYPING (REVISION)	_____	_____
WORD PROCESSING (ORIGINAL)	_____	_____
WORD PROCESSING (REVISION)	_____	_____
EDITING/PROOFREADING	_____	_____
SHORTHAND/DICTATION	_____	_____
TRANSLATION	_____	_____
COPYING/DUPLICATING	_____	_____
MAIL HANDLING/DISTRIBUTION	_____	_____
FILING	_____	_____
RETRIEVAL OF FILED INFORMATION	_____	_____
TELEPHONE CALLS/MESSAGES	_____	_____
PERSONAL TIME	_____	_____
WAITING	_____	_____
OTHER (DEFINE)	_____	_____
OTHER (DEFINE)	_____	_____
OTHER (DEFINE)	_____	_____

NAME_____

OFFICE _____

Activity Questionnaire For Technical Assistants

Please indicate the percentage of time you typically spend performing each of the following, and typical volumes where appropriate:

ACTIVITY	PERCENTAGE	VOLUME
READING/ANALYZING TEXTUAL INFO	_____	_____
CALC./ANALYZING NUMERICAL DATA	_____	_____
SEARCHING FOR INFORMATION	_____	_____
WRITING	_____	_____
DICTATING	_____	_____
EDITING/PROOFREADING	_____	_____
GRAPHIC ILLUSTRATION	_____	_____
MEETING	_____	_____
TELEPHONE	_____	_____
FILING	_____	_____
PERSONAL TIME	_____	_____
OTHER (DEFINE)	_____	_____
OTHER (DEFINE)	_____	_____
OTHER (DEFINE)	_____	_____

NAME _____

OFFICE _____

Code Sheet For Secretarial Time Log

ACTIVITY CODE	DESCRIPTION
MT/O	MANUAL TYPING (ORIGINAL)
MT/R	MANUAL TYPING (REVISION)
WP/O	WORD PROCESSING (ORIGINAL)
WP/R	WORD PROCESSING (REVISION)
E	EDITING/PROOFREADING
S	SHORTHAND/DICTATION
TR	TRANSLATION
C	COPY/DUPLICATING
M	MAIL HANDLING/DISTRIBUTION
F	FILING
R	RETRIEVAL OF FILED INFORMATION
T	TELEPHONE CALLS/MESSAGES
P	PERSONAL TIME
W	WAITING
X	OTHER (DEFINE)
Y	OTHER (DEFINE)
Z	OTHER (DEFINE)

Code Sheet For Technical Assistants

ACTIVITY CODE	DESCRIPTION
R	READING/ANALYZING TEXTUAL INFORMATION
C	CALCULATING/ANALYZING NUMERICAL DATA
S	SEARCHING FOR INFORMATION
W	WRITING
D	DICTATING
E	EDITING/PROOFREADING
G	GRAPHIC ILLUSTRATION (TABLES, CHARTS, ETC.)
M	MEETING
T	TELEPHONE
F	FILING
P	PERSONAL TIME
X	OTHER (ITEMIZE)
Y	OTHER (ITEMIZE)
Z	OTHER (ITEMIZE)

TIME LOG

NAME _____ ORG. NO. _____ DATE _____

TIME	CODE/VOL	TIME	CODE/VOL	TIME	CODE/VOL	TIME	CODE/VOL	TIME	CODE/VOL	TIME	CODE/VOL	TIME	CODE/VOL	TIME	CODE/VOL
7:00		8:30		10:00		11:30		1:00		2:30		4:00		5:30	
01		31		01		31		01		31		01		31	
02		32		02		32		02		32		02		32	
03		33		03		33		03		33		03		33	
04		34		04		34		04		34		04		34	
05		35		05		35		05		35		05		35	
06		36		06		36		06		36		06		36	
07		37		07		37		07		37		07		37	
08		38		08		38		08		38		08		38	
09		39		09		39		09		39		09		39	
7:10		8:40		10:10		11:40		1:10		2:40		4:10		5:40	
11		41		11		41		11		41		11		41	
12		42		12		42		12		42		12		42	
13		43		13		43		13		43		13		43	
14		44		14		44		14		44		14		44	
15		45		15		45		15		45		15		45	
16		46		16		46		16		46		16		46	
17		47		17		47		17		47		17		47	
18		48		18		48		18		48		18		48	
19		49		19		49		19		49		19		49	
7:20		8:50		10:20		11:50		1:20		2:50		4:20		5:50	
21		51		21		51		21		51		21		51	
22		52		22		52		22		52		22		52	
23		53		23		53		23		53		23		53	
24		54		24		54		24		54		24		54	
25		55		25		55		25		55		25		55	
26		56		26		56		26		56		26		56	
27		57		27		57		27		57		27		57	
28		58		28		58		28		58		28		58	
29		59		29		59		29		59		29		59	
7:30		9:00		10:30		12:00		1:30		3:00		4:30		6:00	
31		01		31		01		31		01		31		01	
32		02		32		02		32		02		32		02	
33		03		33		03		33		03		33		03	
34		04		34		04		34		04		34		04	
35		05		35		05		35		05		35		05	
36		06		36		06		36		06		36		06	
37		07		37		07		37		07		37		07	
38		08		38		08		38		08		38		08	
39		09		39		09		39		09		39		09	
7:40		9:10		10:40		12:10		1:40		3:10		4:40		6:10	
41		11		41		11		41		11		41		11	
42		12		42		12		42		12		42		12	
43		13		43		13		43		13		43		13	
44		14		44		14		44		14		44		14	
45		15		45		15		45		15		45		15	
46		16		46		16		46		16		46		16	
47		17		47		17		47		17		47		17	
48		18		48		18		48		18		48		18	
49		19		49		19		49		19		49		19	
7:50		9:20		10:50		12:20		1:50		3:20		4:50		6:20	
51		21		51		21		51		21		51		21	
52		22		52		22		52		22		52		22	
53		23		53		23		53		23		53		23	
54		24		54		24		54		24		54		24	
55		25		55		25		55		25		55		25	
56		26		56		26		56		26		56		26	
57		27		57		27		57		27		57		27	
58		28		58		28		58		28		58		28	
59		29		59		29		59		29		59		29	
8:00		9:30		11:00		12:30		2:00		3:30		5:00		6:30	
01		31		01		31		01		31		01		31	
02		32		02		32		02		32		02		32	
03		33		03		33		03		33		03		33	
04		34		04		34		04		34		04		34	
05		35		05		35		05		35		05		35	
06		36		06		36		06		36		06		36	
07		37		07		37		07		37		07		37	
08		38		08		38		08		38		08		38	
09		39		09		39		09		39		09		39	
8:10		9:40		11:10		12:40		2:10		3:40		5:10		6:40	
11		41		11		41		11		41		11		41	
12		42		12		42		12		42		12		42	
13		43		13		43		13		43		13		43	
14		44		14		44		14		44		14		44	
15		45		15		45		15		45		15		45	
16		46		16		46		16		46		16		46	
17		47		17		47		17		47		17		47	
18		48		18		48		18		48		18		48	
19		49		19		49		19		49		19		49	
8:20		9:50		11:20		12:50		2:20		3:50		5:20		6:50	
21		51		21		51		21		51		21		51	
22		52		22		52		22		52		22		52	
23		53		23		53		23		53		23		53	
24		54		24		54		24		54		24		54	
25		55		25		55		25		55		25		55	
26		56		26		56		26		56		26		56	
27		57		27		57		27		57		27		57	
28		58		28		58		28		58		28		58	
29		59		29		59		29		59		29		59	

APPENDIX C

ACTIVITY PROFILE WORKSHEETS

Activity Profile Comparison
Secretarial Activity Profile Percentages

Activity	Actual % Time	Estimate % Time	Combined * % Time
Manual Typing (orig)	7.53	8.95	8.07
Manual Typing (rev)	3.46	2.85	3.23
Word Processing (orig)	7.65	14.50	10.23
Word Processing (rev)	6.68	9.39	7.70
Editing/Proofing	3.14	7.74	4.87
Shorthand/Dictation	1.76	5.50	3.17
Translation	0.29	1.62	0.79
Copying	6.69	8.69	7.44
Mail Handling/Doc. Dist.	14.65	10.84	13.22
Filing	6.69	6.28	6.54
Retrieval	2.69	3.56	3.02
Telephone	13.95	14.11	14.01
Personal	7.02	0.38	4.52
Waiting	1.50	0.37	1.07
Scheduling	1.93	2.63	2.20
Other	14.38	2.58	9.93

Note: Combine percentages represent an unweighted average of data sheets consisting of 23 actual weekly time logs and 14 estimates.

Overtime Projection Comparison

Source	Average Annual Hours Per Office	Total Annual Hours	Pct. Chg.
CY 1984 Actuals	407.34	8961.5	NA
CY 1985 Projections*	496.57	10924.6	21.9
1985 Support Staff Estimates**	577.20	12698.4	41.7

* Based on projections of CY 1985 YTD data through October.

** Compiled from estimate sheets prepared by secretarial staff and from interview notes.

SELECTED INCIDENCE ANALYSIS

Category	=	Secretary
Sample Size	=	14.00
Number of Days in Sample	=	NA
Avg Hourly Rate	=	$13.19

Activity	Avg Hrs Per Day	Avg Hrs Per Incidence	Avg Unit Cost Per Incidence
Manual Typing (Orig.)	0.78	0.13	$1.67
Manual Typing (Rev.)	0.25	0.09	$1.15
Word Processing (Orig.)	0.27	0.07	$0.87
Word Processing (Rev.)	0.82	0.05	$0.62
Editing	0.68	0.05	$0.64
Shorthand/Dictation	0.48	0.12	$0.64
Telephone	1.23	0.04	$0.47

*Based solely on estimates by secretaries. Note that the raw numbers are probably understated in terms of the average number of hours per pages (or per call for telephone activity). This exhibit does, however, show the relationships between these activities as perceived by the support staff.

APPENDIX D

FACSIMILE SYSTEMS

FACSIMILE EQUIPMENT ANALYSIS

Introduction

To identify a range of available facsimile equipment opt meetings were held with the three vendors who currently have fax e installed in the Fund's Communication Division. These vendors -- Ricoh, and Xerox -- were selected because they are already familia Fund environment and are major vendors of facsimile technology.

Each of the three vendors was asked to present facsimile categorized as low, medium, and high-end products. These categor to provide a frame of reference for comparison of features and pr appendix provides our analysis of the facsimile equipment reviewe matrices showing a comparison of the costs, functions, and featur vendor's equipment across the product level categories.

Required Features

Based on the findings of this study with regard to the requirements of Executive Directors' offices, certain features an characteristics have been identified as critical to the effective facsimile technology; these include:

- o Systems designed to meet CCITT Group 3 standards to p high speed (less than one minute per page) transmissi
- o Compatibility with CCITT Group 2 and Group 1 North Ar minute FM standards to insure that equipment will be communicate with older, slower machines that may be member countries.
- o Desktop configuration and built-in handset to minimi requirements.
- o Automatic modem speed adjustment capability to assur transmission even when quality telephone connections available.
- o Automated features to allow for sending and receivin without operator attendance.
- o Built-in security ID protocol.
- o Capability of machine to perform in a copy mode.
- o Desired capabilities included as standard equipment minimize the need for equipment modification or upg

- o Ability to add an RS232C interface to provide for connection to a computer or encryption unit.

- o Vendor worldwide distribution and service to insure availability of equipment and coordination of procurements with member countries.

- o Availability of GSA price scheduling.

Characteristics of Low, Mid, High Level Facsimile Machines

The various facsimile models shown by the vendors within each of the three ranges (low, mid, high) are all high speed, Group 3 machines. This means each device is designed to international standards for transmitting at the rate of one minute or less per page depending on telephone line quality and the size and density of a document. These machines employ digital technology but are designed (as a standard feature or by modification) to be compatible with analog machines classified as Group 2 and in most instances with still slower Group 1 machines. All of the facsimile systems reviewed are thus able to communicate with older models and due to prevailing standards should be compatible with future machines.

As group 3 machines, the low, medium and high end facsimile models all share certain basic characteristics; these include:

- o Transmission speeds ranging from 15-25 seconds for a standard letter size document (single page) sent over good quality telephone lines at 9600 bps.

- o Compatibility with Group 2 and Group 1 standards either built-in or optional.

- o An automatic answer and disconnect feature, allowing the unit to receive incoming calls and accept remote transmissions, without need for attendant intervention.

- o Automatic stack feed, with a 30 document stack feed capacity.

- o Polling capability, whereby a machine can call a remote unit and request a transmission.

- o Error detection, to provide codes identifying reasons for malfunction or transmission failure.

- o Terminal identification to provide remote and transmitting terminal ID and security code verification and thereby avoid sending communications to wrong terminals.

- o Copy mode enabling the machine to operate as a photocopier.

- o Voice coordinator or voice standby, allowing for conve take place with the receiving station over the same li connection as the message transmission.

- o Activity reporting to provide a hard copy document wit information on each transmission.

Refer to Appendix D-2 for the matrix of features charact the low-end facsimile machines reviewed.

The distinguishing features of the medium and high level devices are recognized in terms of the higher level of automation them to perform certain functions without operator attendance. (Appendices D-3 and D-4 for the matrices showing the characteristi and high-level facsimile machines respectively). The mid-range u characterized by additional features such as: automatic dialing, redialing; an autotimer; auto page reduction or changeable receiv sizes; and more sophisticated polling capabilities.[17/] In additi level units provide the option of connecting an RS232C interface, facsimile unit to communicate through other digital equipment suc multiplexers, and encryption devices.

High end facsimile machines incorporate the features of mid levels and offer the additional option of memory capability, unit to automatically store and forward message. This feature ma possible for the facsimile machine to store documents in a memor then sequentially broadcast them to selected remote locations. feature also enables the unit to receive information from other then transmit this information to selected addresses. These hig are generally intended to serve as a hub for heavy traffic that sending and receiving information from multiple locations.

Comparing the costs and operating requirements of facs at the different levels shows:

- o Low-end machines leasing for an approximate average per month plus one-time installation charges ranging $100. Use of the low-end machines requires an opera individually dial numbers (and codes) and repeatedly documents for each transmission to a separate locati machines will automatically switch on and off to rec transmissions without operator intervention, but can programmed to send documents automatically.

17/ Refer to Appendix D-5 for a glossary of terms used in analysis.

- Mid-range machines leasing for an approximate average cost of $108 per month plus one-time installation charges ranging from $75 to $100. With these units, and operator can automatically dial any one of 10 numbers at the touch of a single button. An additional 60 to 90 numbers (depending on the vendor model) can be accessed through two-digit abbreviated dialing. When a number is busy, the machine will automatically redial twice. The mid-range facsimiles also feature an autotimer making it possible to automatically activate unattended transmission at a later time. This allows the user to take advantage of lower off-peak phone rates and accommodate various world time zones without the need for operator attendance at either the sending or receiving end.

- The high-end facsimile machines lease for an approximate average cost of $268 per month with installation charges ranging from $100 to $250. The memory capability of these devices provides an automatic message store and forward feature. This enables the machine to "memorize" documents and sequentially broadcast them to different receiving locations. The units can also store information received and then transmit that information to other selected locations. All of these functions can be performed without an operator in attendance.

LOW END FACSIMILE EQUIPMENT

VENDOR	RICOH	PANAFAX	XEROX
MODEL	Rapicom 120	UF-400	Telecopier 295
PRICING			
Purchase	$2,600 (GSA) +$100 instl.	$2,145 (GSA) + $75 inst., incl. paper roll	$2,645 (GSA), no instl. charge
Lease	$ 80/mo.+$100 instl. incl. ser.	$ 79.50/mo. +$75 instl, incl. paper roll + serv.	$ 145/mo. + $70 instl, incl. serv.
Service	$ 180/yr.	$ 300/yr.	$ 480/yr.
CONFIGURATION	Desktop transceiver	Desktop	Desktop
FAX SIGNAL	Digital	Digital	Digital
TRANSMISSION SPEED (8 1/2" x 11" document)	20 seconds standard	25 seconds standard	25 seconds standard
MODEM SPEED	9600 bps step-down	9600 bps step-down	9600 bps step-down
DOCUMENT FEED TYPE	Auto stack feed	Auto Stack feed	Auto Stack feed
STACKFEED CAPACITY	30 documents	30 documents	30 documents
OPERATING FEATURES			
Auto dialing	None	None	None
Polling	Standard (turnaround)	Standard (Turnaround)	Standard
Autoanswer/disconnect	Standard	Standard	Standard
Store & Forward (memory)	None	None	None
Error Detection	Standard	Standard	Standard
Error Test	Standard	Standard	Standard
Security ID Protocol	Standard	Standard	Standard
Remote Terminal ID	Standard	Standard	Standard
Transmit Terminal ID	Standard	Standard	Standard
Built-in handset	None	None	None
Other	Copy mode, activity log, voice coordination, auto reduction remote diagnostics, transmit to R5000 with SAF-PAK, tone sound verifying delivery	Copy mode, activity log, header print, vVoice coordination, auto reduction, diagnostics, verification stamp	Copy mode, activity log, header print, auto speed selection, diagnostics, optional RS232-C interface
Compatability	CCITT G3+G2-Standard G1, N. America 6 min. FM-Standard	CCITT G3+G2-Standard No G1	CCITT G3-Standard CCITT G2-Optional G1, N. America fm 4/6 mn-optional

MID LEVEL FACSIMILE EQUIPMENT

VENDOR	RICOH	PANAFAX
MODEL	Rapicom 210	UF 400 AD
PRICING		
Purchase	$3,000 + $100 instl.	$2,695 + $75 instl., incl. paper roll
Lease	$ 125/mo. + $100 instl., incl. serv.	$ 89.50/mo. +$75 instl, incl. paper roll
Service	$ 425/yr (nonGSA)	$ 400/yr.
CONFIGURATION	Desktop transceiver	Desktop
FAX SIGNAL	Digital	Digital
TRANSMISSION SPEED	15 second standard	20 second standard
MODEM SPEED	9600 bps stepdown modem	9600 bps stepdown modem
DOCUMENT FEED TYPE	Auto stack	Auto stack
Stack Feed capacity	30 documents	30 documents
OPERATING FEATURES		
Auto dialing	Standard (60 station)	Standard (100 stations)
Polling	Standard (multi-station realtime + delayed)	Standard (reverse + delayed)
Auto answer/disconnect	Standard	Standard
Store + Forward (memory)	None	None
Error Detection	Standard	Standard
Error Test	Standard	Standard
Security ID Protocol	Standard	Standard
Remote Terminal ID	Standard	Standard
Transmit Terminal ID	Standard	Standard
Built-in handset	None	Standard
Other	Copy mode, autotimer, autoredial, activity log, changeable receive paper sizes, 16 level half tone, voice coordination, transmit to R5000 with SAF-PAK, optional RS232 interface	Copy mode, autotimer, autoredial, activity log, autopage reduction, superfine resolution setting, voice coordination, optional RS232C interface and two wire lease line
Compatability	CCITT G3+G2-Standard G1, N. American 6 min. FM-Standard	CCITT G3+G2-Standard G1, N. American 6 min. FM-Standard

HIGH END FACSIMILE EQUIPMENT

VENDOR	RICOH	PANAFAX	XEROX
MODEL	RAPICOM 230	PX-200	Telecopier 495-1
PRICING			
Purchase	$4,000 +$100 instl.	$6,510 w/memory + $250 instl.	$6,300, no instl.
Lease	$150/mo. + $100 instl.	$ 353.50/mo. w/memory + $250 instl.	$ 300/mo. + $130 instl.
Service	$625/yr. (non-GSA)	$ 600/yr. w/memory	$ 79/mo.+
CONFIGURATION	Desktop transceiver	Desktop plus separate memory unit	Floor console transceiver
FAX SIGNAL	DIGITAL	DIGITAL	DIGITAL
TRANSMISSION SPEED	15 seconds standard	25 seconds standard	28 seconds standard
MODEM SPEED	9600 bps stepdown modem	9600 bps stepdown modem	9600 bps stepdown modem
DOCUMENT FEED TYPE	AUTO STACK	AUTO STACK	AUTO STACK
Stack Feed Capacity	30 documents	30 documents	50 documents
OPERATING FEATURES			
Auto Dialing	Standard (60 station)	Standard (90 station)	Standard
Polling	Standard (multi-station, realtime+delayed)	Standard	Standard
Auto Answer/Disconnect	Standard	Standard	Standard
Store & Forward (memory)	Standard 14 pg. (28 pg. option)	Optional 40 pg.	Optional (need Faxmaster#link)
Error Detection	Standard	Standard	Standard
Error Test	Standard	Standard	Standard
Security ID Protocol	Standard	Standard	Standard
Remote terminal ID	Standard	Standard	Standard
Transmit terminal ID	Standard	Standard	Standard
Built-in handset	none	none	none
Other	Autotimer, autoredial, activity log, changeable receive papersizes, 16-level half tone, eight grouplists referencing up to 70 stations, real time + delayed broadcasting, safety substitute reception in memory	Autotimer, autoredial, activity log, copy mode, mark skip feature to 'omit' selected confidential sections; sequential broadcasting realtime+delayed, auto resolution setting, memory hard storage disk, 16 level half-tone scrambler option, optional RS232 interface	Copy mode, autoredial autoliner, activity log, optional RS232C links to PC storage & power with fax master, store & forward sequential broadcasting
Compatibility	CCITTG3 G2-Standard G1,N. American 6 min FM-Standard	CCITT G3 & G2-Standard	CCITT G2, G1-optional, N. American 6 min. FM-Optional

GLOSSARY OF FACSIMILE TERMINOLOGY

AUTO ANSWER/DISCONNECT: Allows a fax unit to receive incoming calls (requests for transmission) and automatically accept remote transmissions without operator intervention. When the transmission is finished (incoming or outgoing), the call is automatically disconnected.

AUTO DIALING: Ability of unit to dial telephone numbers in an unattended mode.

AUTO PAGE REDUCTION The ability of the facsimile device to automatically reduce the original document if the remote facsimile unit can not receive the document in its original size.

AUTO REDIAL If a busy signal or bad connection is experienced, the facsimile device will automatically redial the telephone number; most machines will automatically redial the same number two times before disconnecting.

AUTO SPEED SELECTION: Before transmitting, the facsimile device will match modes with the receiving unit and then select the fastest transmission speed that will produce a clear transmission.

ACTIVITY LOG/JOURNAL PRINT: The machine automatically keeps a running record of all transmissions and receptions, with call durations, authorization codes, dates, times, and operating status information. An activity log summary is usually printed automatically every 25-32 transactions or demand.

AUTO TIMER: Facsimile device includes an automatic timing feature allowing the operator to pre-set the transmission start time by the hour and minute; transmission will then automatically take place at the specified pre-set time.

BROADCASTING: This denotes the forwarding function performed by a facsimile unit with memory capacity; operating with auto dialing, real-time broadcasting means the unit will automatically

transmit a document in a specified se
multiple locations without operator a
(e.g. the document does not need to l
the telephone numbers will not need
manually dialed for each transmissio
the use of an auto timer it is possi
machine to perform unattended delaye
broadcasting such that the transmiss
start automatically at a pre-set tim

BUILT-IN HANDSET: Indicates telephone handset comes ir
and is attached to the facsimile uni

CCITT GROUP 2 Indicates facsimile machine is buil
international standards for three m
page transmissions.

CONFIGURATION: Indicates whether unit is a desk to
console, and if it is a transmitter
or transceiver (transmitter and rec
unit).

COPY MODE Facsimile unit can be switched to a
enables it to serve as a back-up of
and enables the operator to test c
before transmission. It should be
facsimile machines use thermal pap
different than regular bond paper)
generally not intended for heavy v

DOCUMENT FEED TYPE: Indicates whether documents are fe
machine manually or automatically
mode.

ERROR DETECTION: The ability of a facsimile machine
interference over the telephone li
monitor the accuracy of transmissi
usually means the sending unit wi
the line goes down or the line co
poor that a transmission cannot b
more sophisticated digital machin
detection feature can automatical
signals and rescan or resend the
document that could not be transm
interference.

ERROR TEST: The ability of a facsimile machine to run a test copy to evaluate the performance of the unit without going to outside telephone lines. Machines that have self-diagnostic capabilities will display a trouble code to identify any problems or abnormalities.

FAX SIGNAL: Designates whether machine is analog or digital.

GROUP 1: Refers to the low speed analog facsimile machines designed to meet North American FM 4/6 minute standards. This means the machine can transmit documents at the rate of 4 to 6 minutes per page.

HEADER PRINTER: Every received page has the date, time, transmitting ID, and page number automatically printed at the top; this is to insure there is no uncertainty about where the document came from.

MODEM SPEED: Indicates the maximum baud rate in bps (bits per second) that can be used for transmission and whether the device has a step down modem (or automatic fallback) to lower baud rates. If automatic, the connection will first be attempted at 9600 bps and automatically fall back to lower rates if the connection can not be made.

OPERATING FEATURES: Characteristics of the machine that affect what an attendant must do to operate the unit. Ten such features are listed separately and denoted as: "standard" if feature is included with the basic model; "optional" if feature can be added as an option; or "none" if feature is not available for a particular model. The "other" category identifies further characteristics features which are standard unless indicated as optional.

POLLING: Ability of machine to call a remote unit and request a transmission from that unit. In a polling situation, the remote unit must be able to operate in an unattended mode. With an automatic dialer, the requesting unit may poll

in an unattended mode. Reverse or mul polling allows a unit to receive docun without an operator present at either an automatic timer, delayed polling i: possible, whereby the machine can be a connection at a specified time. Th features are useful for taking advant. lower off-peak phone line rates or fo accommodating various world time zone requiring an operator to be at either sending or receiving.

PRICING: Unless otherwise noted, prices are ba listings. These would apply to equip or purchased by the Fund, but may wel for equipment purchased in member cou Service costs apply only if equipment purchased, as monthly lease costs inc service.

REMOTE TERMINAL ID: An ID code and/or telephone number a display of the transmitting and rece terminals to verify correct link-up.

RS232C INTERFACE: When this communication interface is added-on to a facsimile unit, it is link the facsimile device with anoth device such as a personal computer o encryptor.

SECURITY ID PROTOCOL: The facsimile device includes a spec coding feature as part of its transm protocol. Generally this allows use preprogram codes that must be acknov both sending and receiving ends in c transmission to be completed.

STACKFEED CAPACITY: For machines with automatic stack f identifies the maximum size of a do (number of pages) that may be fed a

STEP DOWN MODEM: Before transmission, the device aut matches modes with the receiving un selects the fastest transmission sp produce a clear transmission. If t lines will not permit the fastest s selected, the fax will automaticall the transmission rate so copy clari maintained without need for retrans

STORE & FORWARD: Fax machine operates with a mass memory unit allowing documents to be stored and automatically forwarded to selected multiple locations. Combined with autodialer and auto timer features, the memory unit will automatically call pre-programmed telephone numbers and start transmission at a specified pre-set time. The memory feature also allows the unit to receive information from other machines, store it in memory, and then transmit this information to selected addresses. Some models have memory built-in, others require connection of a separate memory unit or connection to a personal computer to perform memory functions.

TRANSMIT TERMINAL ID: Provides for the logging of time, date, transmitting terminal location and page number on each copy for accurate tracking of transmitted documents.

TRANSMISSION SPEED: Time it takes to send a standard 8 1/2" x 11" document page. Note that depending on the quality of the line used this speed may vary. Also, for different size documents or for a fine detail setting the speed will vary.

VERIFICATION STAMP: After an original document is successfully transmitted, the sending unit stamps the back or the front of the page to verify that the document has been received at the other end. On some machines a tone, instead of a stamp, is used for this function.

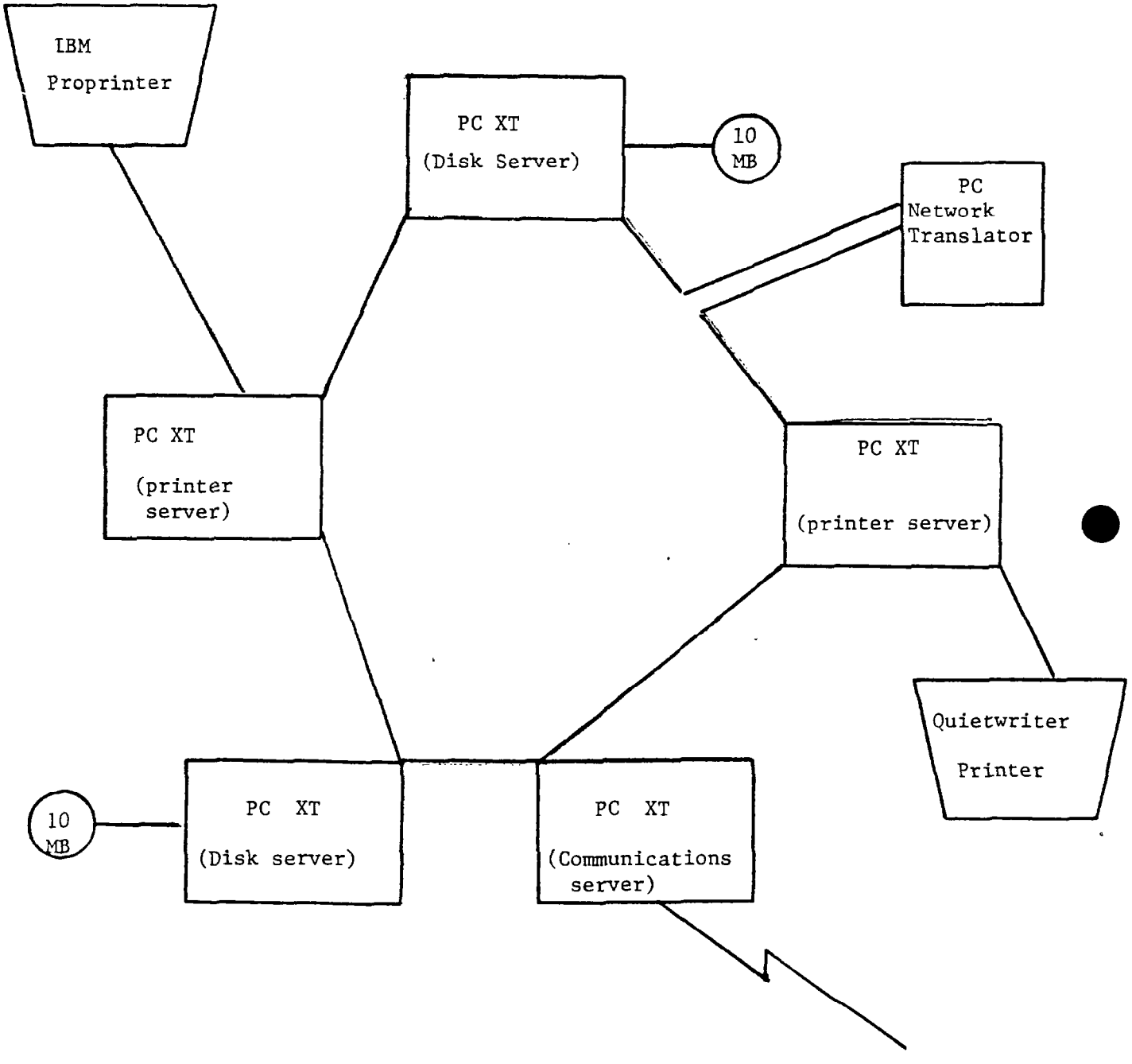
VOICE COORDINATION: Telephone contact between the parties at the sending and receiving ends is possible over the same line connection used for the document transmitted. This means there is no need for an additional telephone call to be made to talk to an operator at the opposite end.

16-LEVEL HALF-TONE: Indicates fine degrees of resolution settings used in particular for transmitting photographs.

APPENDIX E

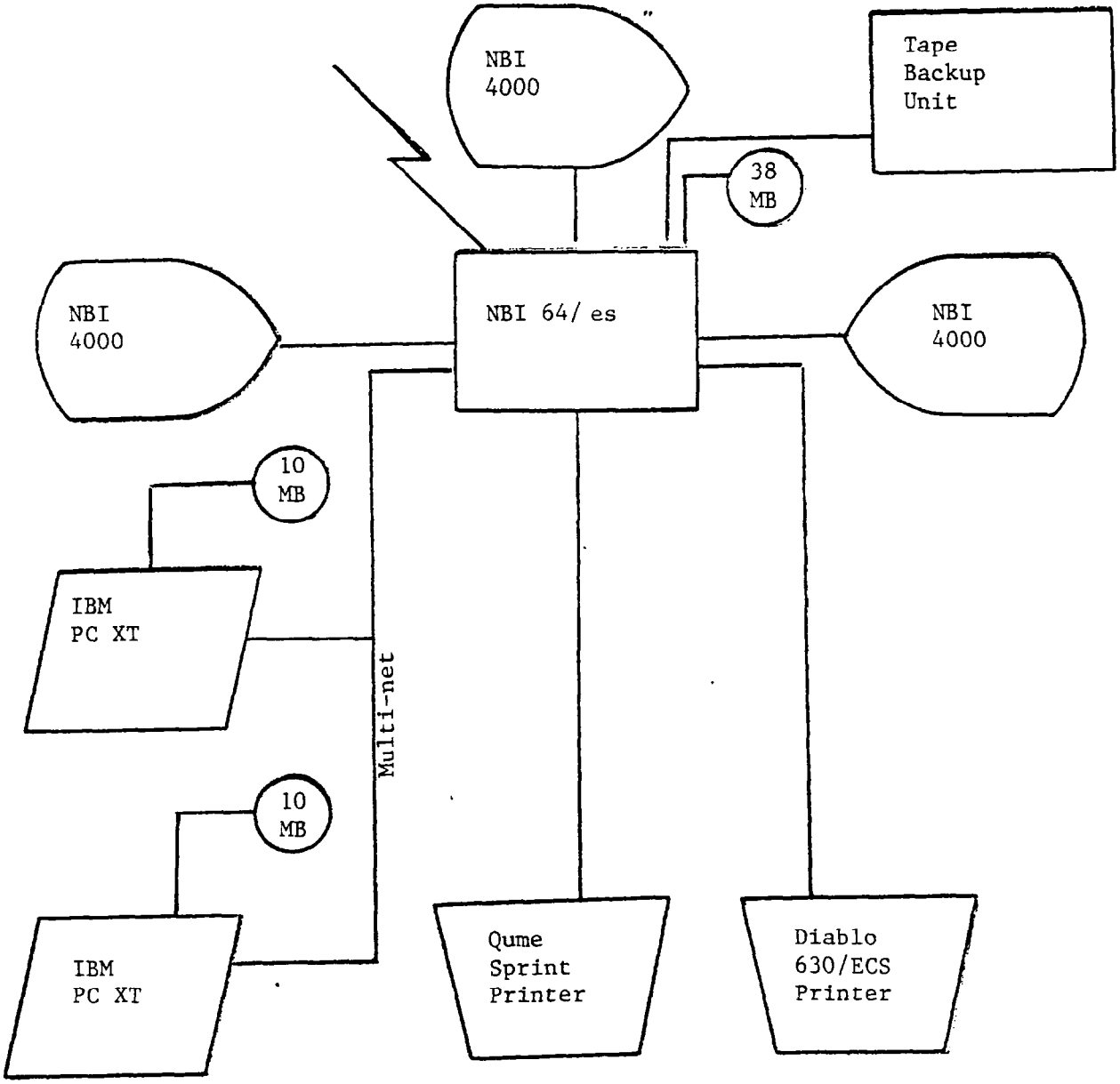
SYSTEM CONFIGURATION DIAGRAMS

IBM MULTI-USER SYSTEM CONFIGURATION



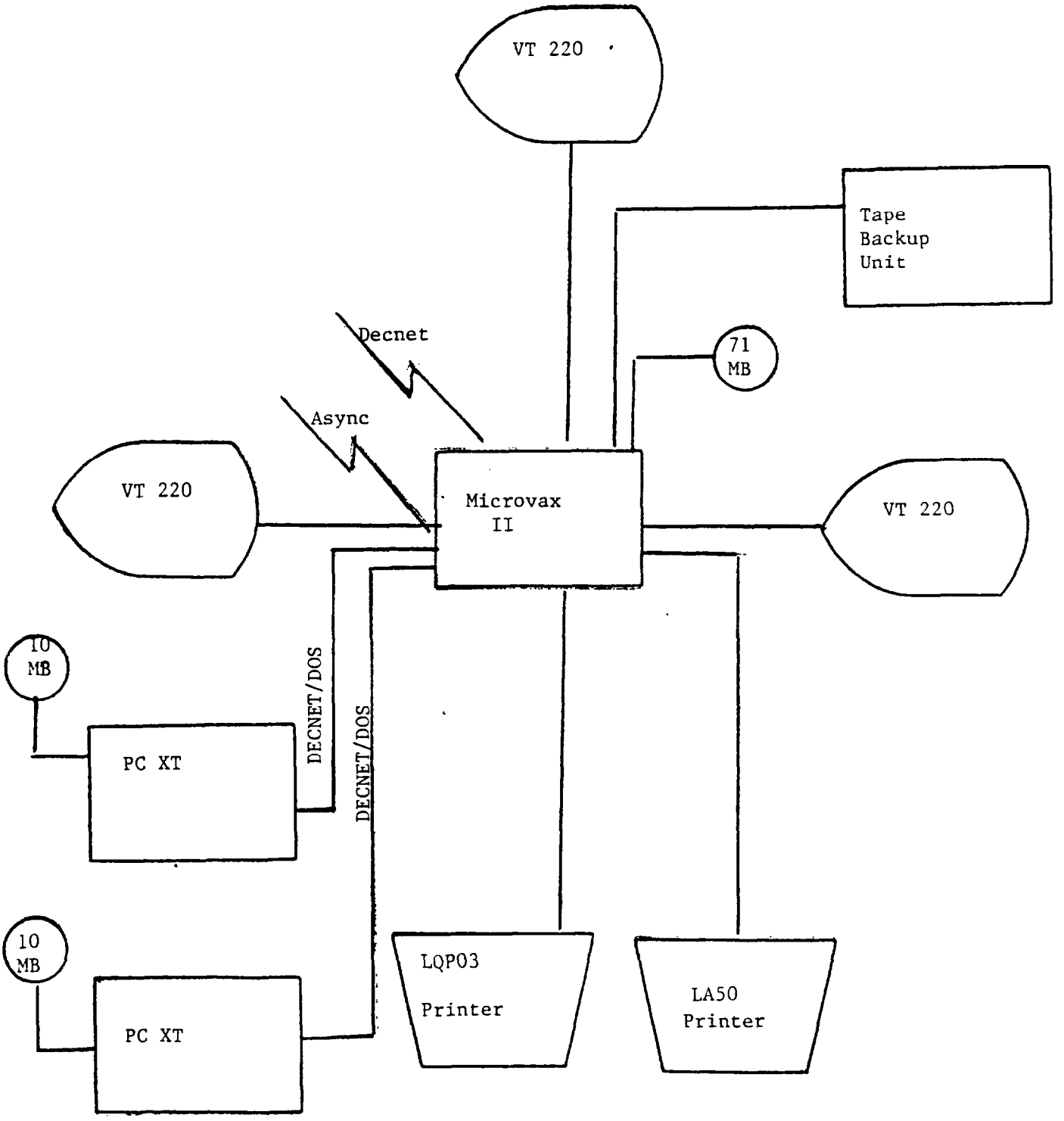
APPENDIX E-1

NBI MULTI-USER SYSTEM CONFIGURATION



APPENDIX E-2

DEC MULTI USER SYSTEM CONFIGURATION



APPENDIX E-3