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EBAP/84/281

December 28, 1984

To: Members of the Executive Board

From: The Secretary

Subject: Fund Computing Services - Three-Year Outlook

This paper provides background information to the paper requesting additional budget appropriations for mainframe computing services, which was circulated as EBAP/84/276 on December 13, 1984 and has been tentatively scheduled for discussion on Friday, January 11, 1985.

If Executive Directors have technical or factual questions relating to this paper prior to the Board discussion, they should contact Mr. Minami, ext. 7500.

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INTERNATIONAL MONETARY FUND

Fund Computing Services: Three-Year Outlook

Prepared by the Administration Department and
the Bureau of Computing Services
in consultation with
the Executive Committee for Computing Services

Approved by R. Tenconi and W. N. Minami

December 28, 1984

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1. Introduction

Executive Directors have requested additional information on computing services in the Fund to supplement the seminar on electronic data processing (EDP) given on April 23, 1984 and the administrative budget discussions for FY 1985. This information is being provided through two related papers. The first one focuses on mainframe computer requirements (EBAP/84/276, 12/13/84). This paper provides background information on current and projected computing services in the Fund, including those requiring mainframe computers, together with estimates of their associated costs and benefits.

Assuming that no major changes take place in the nature and volume of Fund activities over the next three years, the scenario presented is highly probable. In particular, EDP production levels should not vary significantly from the projections. With respect to new systems, however, changes in the distribution of Fund work load and in relative priorities, as well as submissions of projects with higher priorities or better cost/benefit ratios than those submitted in FY 1985, could alter the amount and distribution of EDP expenditures.

2. Projected expenditures for EDP over the FY 1985 - FY 1987 period

EDP services in the Fund can be separated into those utilizing or relating to mainframe computer equipment and those related to nonmainframe equipment. Mainframe computers are large computer systems typically used for managing large quantities of data and for complex, time-consuming calculations. The Fund currently has two mainframe computers, Burroughs 7800 models, and is requesting (EBAP/84/276) funds for an IBM-compatible mainframe computer, model 3081 K or equivalent. Nonmainframe equipment includes smaller computers and related equipment usually utilized for specialized or local applications. Presently, in the nonmainframe category the Fund has 6 minicomputers and approximately 200 microcomputers and 275 word processors. It should be pointed out that communication can take place among mainframe computers, minicomputers, microcomputers, and word processors; in fact, some automated applications in the Fund require such communication and the trend in this direction is growing.

Based on users' projections submitted with FY 1985 EDP budget requests and on the underlying costs of supporting these requests, the expenditure level required for EDP activities over the FY 1985 - FY 1987 period is estimated at $98.4 million. This expenditure level includes the one-time investment costs described in EBAP/84/276, wherein $6.1 million is requested for an IBM 3081 K computer or equivalent and $0.2

million is requested to initiate the process of establishing a new computer facility with a preliminary cost estimate of $9.5 million. It also includes the on-going costs of supporting EDP activities in the Fund, projected to total $82.6 million over the FY 1985 - FY 1987 period. Table 1 gives the overall picture of expenditures for data processing and related activities, breaking down on-going costs into mainframe and nonmainframe components, compared with FY 1984 and FY 1985 expenditures.

Table 1. Projected EDP Costs for FY 1985 - FY 1987 Period 1/
Compared With FY 1984 and FY 1985

(In millions of U.S. dollars)

Type of Expenditure	FY 1984	FY 1985	FY 1985 - FY 1987
Mainframe/facility costs	--	6.3	15.8
IBM-compatible mainframe purchase	--	6.1	6.1
Building costs	--	0.2	9.7
On-going costs	16.0	25.2 2/	82.6
Mainframe-related	10.3	15.6	52.5
Nonmainframe-related	5.7	9.6	30.1
Total	16.0	31.5	98.4

1/ If the Fund were to use capital cost accounting procedures, many of these costs would be spread out over a longer period.

2/ This estimate includes $24.9 million approved in the administrative budget in April 1984 plus $0.3 million for the general salary adjustment approved in July 1984.

The remainder of this paper describes in further detail on-going EDP activities for FY 1985 - FY 1987, presently projected to total $82.6 million. It should be noted that, while most of the associated expenditures are operational in nature and include primarily staff and

equipment usage costs, some investment costs are also covered, such as the purchase of equipment and software packages, and development costs for replacement systems.

2.1 Expenditures related to mainframe equipment

Over the FY 1985 - FY 1987 period, it is estimated that $52.5 million will be required for automated systems utilizing the Fund's mainframe computers. This amount includes the costs for systems analysts and programmers, mainframe utilization charges, 1/ and other related equipment costs. Approximately half of the total amount is projected for staff costs with the remainder for equipment-related expenditures. As shown in Table 2, about $37.6 million of the $52.5 million will be for the support and on-going operations of existing production systems. The remaining $14.9 million will be required to replace three existing systems that are costly to maintain and no longer meet user requirements. These three replacement systems, which require IBM-compatible equipment, are described briefly in EBAP/84/276 and in more detail in Section 2.1.2 of this paper.

Table 2. EDP Cost Summary for Activities Related to Mainframe Systems

(In thousands of U.S. dollars)

Category of System	FY 1984 Expenses	FY 1985 Estimated Expenses	FY 1985 - FY 1987 Projected Expenses
Production	8,493	10,047	37,605
Replacement	1,781	5,581	14,944
Total	10,274	15,628	52,549

1/ Mainframe utilization charges are based on costs directly related to the operations of the Fund's mainframe computers. These include expenditures for technicians and operators, equipment lease and maintenance, utilities, and supplies. These costs are apportioned at the project level based on the actual relative utilization of the mainframe computers by each project.

2.1.1 Production systems

Production systems using the Fund's mainframe computers relate to the following broad areas: (1) activities related to the Fund's main statistical database, (2) support for the Fund's financial transactions, (3) analytic activities, (4) administrative functions, and (5) general EDP support.

Maintenance and publications activities related to the Fund's main statistical database, the Data Fund System (DFS), comprise one major area of current mainframe computer utilization. DFS contains about 550,000 time series pertaining to some 150 countries and territorial entities. It is estimated that the three-year production costs associated with DFS and with its replacement, the Economic Information System (EIS), will amount to $6,147,000. These costs represent mostly mainframe computer usage charges (about 75 percent of the total) and EDP staff costs required to maintain the database and produce the four statistical publications (International Financial Statistics, Direction of Trade Statistics, Balance of Payments Statistics, and Government Finance Statistics) and the Annual Report.

Support for the Fund's financial transactions constitutes another major area of mainframe production activity. Various computerized systems operating on one of the Burroughs mainframe computers are used to maintain historical and accounting records of these operations and to produce vouchers, journals, financial statements, and numerous predefined managerial reports. A computerized system is used to generate cables to notify member countries about their repurchase obligations and to carry out the necessary transactions or operations. The total cost of these systems is estimated at $5,310,000 for the FY 1985 - FY 1987 period. Much of this cost reflects the increasing expense for the maintenance of the Treasurer's Department's present accounting database until its planned replacement in FY 1988.

A third major area of mainframe production activity involves the support of the Fund's analytic work. This activity includes the use of computing facilities to carry out the analysis and reporting of economic data presented in Article IV consultations and other country mission reports. Computational activities cover preparation of standard statistical tables and charts, simple transformation of data, such as seasonal adjustment and regression analysis, as well as econometric models used in carrying out sensitivity analyses for the preparation of staff reports. Automated systems facilitate the storage, classification, and retrieval of exchange rate data for policy decisions approved by the Executive Board. Recent new activities include computerized systems to prepare monthly reports to the Executive Board on movements of real effective exchange rates of member countries in connection with Fund surveillance of exchange rates. Automated systems are utilized in connection with the compensatory financing facility. Also included in the category of analytic support are activities relating to the

collection and calculation of data, and the development of medium-term scenarios needed for the World Economic Outlook exercise, for the econometric models on world trade and commodity prices, and for the Fund quota reviews. Significant mainframe resources are needed to assist the Fiscal Affairs, Research, and Treasurer's Departments in carrying out research work requested by the Executive Board and in support of on-going Fund activities. The IMF Institute also utilizes mainframe computers for its training programs. The mainframe-related costs for support of the Fund's analytic work are projected to total $11,024,000 during the FY 1985 - FY 1987 period.

Most of the data analysis for the above work is currently performed on one of the Fund's Burroughs mainframe computers using the information contained in the Data Fund System (DFS) and the computational capabilities offered by the Research Analysis Language (RAL) software system. This involves an extensive usage of mainframe computer time and a significant level of Bureau of Computing Services (BCS) staff support.

Growth in usage of the Burroughs computers for analytic work is expected to continue until economists begin transferring some of this work to the requested IBM-compatible computer and/or to microcomputers. The availability of microcomputers will permit the transfer of statistical data from mainframe computers to microcomputers; it is expected this will reduce time spent by economists on data compilation as well as their dependency on research assistants. This will also enable economists to devote more time to effective research work, to absorb a possible expansion in the work required for the World Economic Outlook, and to refine simulations on world trade scenarios or any other project of Fund interest.

Current administrative functions utilizing mainframe resources include the personnel database, the administrative expenditure system, support for the Office of the Internal Auditor, and the Annual Meetings System. Over the FY 1985 - FY 1987 period, administrative functions on mainframe computers are expected to cost $3,149,000.

The personnel database system, which is being maintained on a Burroughs computer, is used to control budgeted staff positions, to issue notices of personnel actions, to keep track of leave entitlements and of job applications, to produce the Fund telephone directory and individual staff benefit statements, to support the Fund-wide merit exercise, and to provide some 500 periodic or ad hoc statistical reports every year. There are plans to further enhance the system by adding to it subsystems on the staff pension plan, life insurance, job evaluations, career stream exercise, medical benefits plan participation, and the administration of experts.

The primary administrative expenditure system is supported by several subsystems which are run separately on one of the Burroughs

mainframe computers: payrolls of staff and retirees, tax allowance calculations, and staff retirement plan accounting functions. It is expected that these systems will continue to grow in line with increases in the volume of such transactions until they start being replaced during FY 1986 by the Treasurer's Integrated Financial System, which is currently being developed (see Section 2.1.2).

The Office of the Internal Auditor now has a comprehensive automated auditing system running on a Burroughs mainframe computer. This system is used by the Auditor's staff and by the accounting firm which works on behalf of the External Audit Committee. Moderate growth in usage is anticipated over the next few years.

Another current mainframe production system is the Annual Meetings System. Functions which are presently automated through this system include registration, hotel accommodations, transportation, social events, security, requests for information on participants, delegation lists, special guest lists, and visitor lists. Some of these functions are also provided for the meetings of the Interim Committee and the Development Committee. The automated system uses 25 remote terminals connected to one of the Burroughs computers at Fund headquarters. In order to support and extend this production system to include other administrative functions, the three-year cost to the Fund is estimated at $381,000, including $145,000 in FY 1985.

General EDP support, provided by BCS, represents the last major area of the Fund's mainframe production activities. Included in this category are support for computer equipment, data communications, Fund-wide software, data entry, and BCS administrative overhead. The total cost of these activities is projected at $11,975,000 for the FY 1985 - FY 1987 period.

The support and maintenance of mainframe computer equipment involves coordination with the World Bank of the day-to-day operations of the present Burroughs computer center. Under the current arrangement, the World Bank provides staff support for most of the operations of the center; these staff costs are reimbursed by the Fund.

A substantial BCS effort will be required over the next two financial years with regard to data communications. Data communications support includes equipment and work necessary to maintain the network that links workstations (computer terminals and microcomputers) with mainframe computers and minicomputers in the Fund. The central component of the present network is a data communications switching mechanism, installed in FY 1984, which allows a user to access more than one computer from the same terminal. In addition, data communications support includes activities required to initiate or change a terminal-to-computer connection, diagnostic testing of data communications equipment and lines, and general "trouble shooting." Data communication support needs are expected to increase in line with a projected

expansion in the number of microcomputers and terminals. Data communications staff will also need to develop a high-speed data link between Burroughs and IBM-compatible equipment. This will be especially critical when the Data Fund System replacement, the Economic Information System (described in Section 2.1.2), is operational on IBM-compatible equipment, while the Fund's primary analytical tool is still RAL, available only on Burroughs computers.

The support of Fund-wide software involves mainly the maintenance of RAL. This software, which was originally developed by the Federal Reserve Bank of New York and enhanced by Fund staff, is widely used in the Fund for entry, retrieval, manipulation, analysis, and presentation of economic data, primarily in time series form. It has extensive facilities for the analysis of data including approximately 50 statistical/econometric routines. It can be used to provide on-line retrieval of time series from the DFS for manipulation or presentation and it also can be used to create data files to be stored and managed by RAL. Currently, approximately 400 Fund staff have been trained in the use of RAL. An average of 250 RAL jobs are run on the computer daily and processing carried out through RAL accounts for more than 50 percent of the work load of one of the two mainframe Burroughs computers utilized by the Fund. Support for the RAL system consists of training, newsletters, documentation, user consulting on the use of the RAL system, and maintenance of user data files. As Fund analytical work migrates to microcomputers or to econometric programs available on IBM-compatible systems, RAL support needs are expected to level off, but this will be offset by the need for support of new systems.

Data entry support primarily involves keypunching computer data. Approximately 1.2 million cards are punched and verified each year, mostly for the Bureau of Statistics, to enter data obtained from reporting countries in printed form into the DFS computerized data files. A moderate increase is foreseen for the data entry activity in the next two years. There will be a shift from keypunching to direct terminal entry to parallel the projected additional volume of data and demand for more frequent updates.

BCS administrative overhead includes data processing planning, resource management, staff training activities, and overall managerial and clerical support. These activities are expected to grow in parallel with that of the development effort and with the Fund's proposed move toward IBM-compatible technology. Additional planning will be required to effect a smooth transition from Burroughs to IBM-compatible equipment as well as to coordinate the Fund's overall data processing development effort. Resource management activities will continue to grow in proportion with the increasing level of data processing development. Furthermore, training needs will be fairly high over the next three years as Fund staff need to be trained in IBM-compatible equipment and programs.

2.1.2 Replacement systems

In addition to the costs associated with on-going production work, significant mainframe resources and related expenditures will be required for the development, implementation, and testing of three major replacement systems. These systems are to replace existing systems developed 10-15 years ago that can no longer meet current user requirements and that have become increasingly difficult to modify without introducing inefficiencies or errors. In addition, the maintenance and operational support costs for these older systems are quite high compared to current standards. A complete redesign of these systems is required in order to meet user requirements efficiently and cost-effectively. Furthermore, it will be advantageous to develop these replacement systems for IBM-compatible equipment. 1/

For each of the replacement systems discussed below (and in Section 2.2.2), estimates are given of the costs over the FY 1985 - FY 1987 period along with the corresponding expected benefits and the pay-back periods for the replacement work. It should be noted that in each case the financial benefits quoted are based on comparison of the new replacement system to the existing system, assuming it could be kept operational indefinitely with costs growing at the current rate. The benefits do not reflect the avoidance of any exceptional or "break-down" costs which would most probably eventually occur if the current, aging systems were required to continue to support the Fund's work.

The first major replacement system being developed is to replace the current DFS. Most of this system is more than ten years old and lacks many useful features. First, in addition to continuing to support the publication activities of the Bureau of Statistics and the cross-country analyses performed by Research and other functional departments, there is a need to provide a more useful set of data for individual country analyses in the area departments. This would permit the elimination of duplicate databases maintained by other departments, which are costly to update and prone to inconsistencies. Second, there is a need to make direct access easy and efficient for economists and research assistants in the Fund. Third, there is a need to provide for a supporting dictionary--a centralized repository of information about data in the system which would define meaning, relationships among data, origin, usage and format. Such a dictionary would permit users to review the contents of the database and allow better assessments of the utility of data for specific applications. Fourth, there is a need to update the data more frequently so as to reduce the 1-2 week delay inherent in the update of the current system. Finally, there is a need

1/ The rationale for choosing IBM-compatible equipment over the in-house Burroughs computers for new mainframe applications is detailed in Section III of EBAP/84/276.

to reduce the time required to receive data from member countries by moving toward the transfer of statistics by tape and eventually to direct transfer by telecommunications.

In the preliminary planning phase, it was recognized that EDP staff resources required to develop and maintain a system which would meet these requirements would be significantly reduced if the existing DFS could be converted to a modern database management system. In addition, such software can be more easily adapted to future changes in data requirements. The software which could best handle the desired system was not readily available for Burroughs equipment but was available for "IBM-compatible" equipment. Since other factors in the Fund's computing strategy pointed also toward the selection of IBM-compatible equipment, a new system, called the "Economic Information System" (EIS), is being developed to operate on an IBM-compatible computer. The estimated total cost of development of EIS over the FY 1985 - FY 1987 period is $3,994,000. For FY 1985, time-sharing and staff costs represent, respectively, two thirds and one third of the total expenditure. On the benefits side, it has been estimated that the annual staff time savings could amount to 17.5 man-years per annum (or $1,656,000) when EIS reaches production level, to give benefits of $2,484,000 over the three-year period. Staff time savings would be distributed throughout the Fund but would be concentrated in the area departments where the amount of time spent on collecting, analyzing, and calculating data for operational purposes could be substantially reduced. It is expected that these financial benefits will start accruing in the second half of FY 1986, when the development of the new system is completed and when the users have become familiar with it. In all, it is expected that this investment will be paid back by FY 1988, i.e., four years after the beginning of the development phase (FY 1984). However, it should be noted that the figures quoted above represent the potential savings that an automated system could produce. Actual savings will depend on the extent to which desk economists will rely on standardized time series for their country work.

Closely related to the replacement of DFS is the automation of the international banking and external debt statistics database. This project is considered a very high priority 1/ in view of the increasing resources which will have to be devoted to the expansion of this database and to its inclusion in EIS. This database, which is now critical for the Fund's operations, is expected to grow to be around one third the size of the present Data Fund System. It is clear that manual collection, manipulation, and computation of international banking and

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1/ See "Seminar on Questions Related to External Indebtedness," December 12, 1983, Chairman's Concluding Remarks. See also, "Discussion of the FY 1985 Administrative Budget," (EBAP/84/64, 3/13/84, page 3, paragraph 30).

external debt statistics would be such a large and extremely costly task that it would not be a practical alternative to an automated system. The cost of this project, which mainly includes mainframe computer charges, is estimated at $1,670,000 for FY 1985 - FY 1987. Financial benefits will clearly exceed the costs but, for the purpose of this paper, they are conservatively estimated to be at least as great as the costs.

Also closely tied to EIS is the tape receipt and electronic data transfer project, which will permit additional direct input into the database from tapes and ultimately by direct communication links. Without such facilities, member countries would find it difficult to improve the timeliness of data required by area departments, one of the major objectives of EIS. There are presently no purely financial benefits to this project other than those already attributable to the greater utility of EIS. However, it is hoped that in the future a greater share of information received without hard copy would be presented in Fund format, thus offsetting partially the projected increase in data entry induced by a larger volume of data. The total cost of this project is estimated at $303,000 for FY 1985 - FY 1987.

The second major replacement system is the Treasurer's Integrated Financial System which is being developed to meet present and anticipated requirements and to be better able to satisfy requests for information by the Executive Board, management, and the staff. Although the existing systems provide support for most of the Fund's financial operations, their capabilities are limited because they are not sufficiently adaptable to changing needs and do not provide easy-to-use facilities for nontechnical staff to access and analyze the system data in any but the most elementary way. This forces the Treasurer's Department staff to be dependent on technical support for production of ad hoc reports. There is no automated general ledger and routine changes to the format of the financial statements frequently require complex changes in the programs.

Large segments of the existing systems are over 12 years old and are difficult to change further without a high risk of introducing errors. As a result, the costs associated with production, maintenance, and even minor enhancements for the present systems are high by normal standards (some $1,216,000 in FY 1985). In addition, there is little integration of the various databases and therefore time-consuming manual checks are necessary to ensure that data updates have been carried through the relevant reports and are consistently used in the different applications in the Department. Based on anticipated work loads and demands for faster access to information, these systems will become increasingly prohibitive to use in terms of maintenance expenses. They already require extensive use of staff time, and it is only the heavy utilization of microcomputers that is enabling the life cycle of these systems to be lengthened somewhat. Even the introduction of additional staff would not be sufficient to provide adequate response to demands

for faster and more comprehensive information required for major decisions, such as the rates of remuneration, quota increases, projections of income, designation plans, etc. In addition, the new system will provide the opportunity to automate further financial operations and planning.

As described above, the need for the replacement of the Fund's financial systems arises from operational requirements, since the old systems can no longer respond to the present and future information demands in a consistent and accurate manner. In addition, a number of intangible and tangible benefits are anticipated from the implementation of the Treasurer's Integrated Financial System. The intangible benefits are mainly related to improved information availability for policy formulation and financial reporting. The expected tangible benefits are primarily in the area of improved staff productivity, that is, the cost avoidance associated with the absorption of approximately one half of the projected 5 percent per annum increase in work load without additional staff.

The estimated cost of the new system over the FY 1985 - FY 1987 period would be $6,501,000. In FY 1985, manpower costs represent more than three quarters of the total. The value of benefits derived from the three-year expenditure includes an estimated annual avoidance of three man-years in FY 1985, three man-years in FY 1986, and five man-years in FY 1987. The cumulative value of savings is estimated at $1,888,000 for the three-year period under review, with further savings in the FY 1988 - FY 1990 period of $6,138,000. On this basis, the investment will be paid back by FY 1990, i.e., six years after the beginning of the project (FY 1984). The alternative course of not replacing the current system would involve considerable risk and expense, and could also result in a noticeable slowdown of the financial transactions, operations, and information flow within the Fund.

The new system is being developed on IBM-compatible equipment using program development aids and end-user products widely available for this type of equipment. The development aids will significantly reduce the resources required for development and maintenance of the new system. End-user products, such as data access, analysis, and report generation packages, will provide noncomputer staff with the capability to access and analyze data in order to improve management of the Fund's financial resources.

A closely related project in the Treasurer's Department involves the establishment of a database of daily data on exchange rates, interest rates, and gold prices. These data are currently collected by the Treasurer's Department for production of daily reports to management and for analytic purposes; they are also maintained in a somewhat different format in the DFS. The proposed system would provide a central database for use by all Fund departments. The cost of developing this system over the three-year period is estimated at

$132,000. It is expected that the elimination of the present data redundancy would reduce overall annual staffing requirements by around one man-year ($97,000) starting in FY 1987. Because of its close relationship to EIS, this effort has been postponed beyond FY 1985 so that it can be more effectively incorporated in the EIS facility.

The Budget and Procurement System, begun in FY 1985, represents the third major replacement effort under way. This is a comprehensive administrative budgeting system incorporating an improved procurement subsystem. Today, the preparation of the administrative budget and control of administrative expenditures is essentially a manual operation. The purpose of this project is to respond to comments made by Executive Directors and the External Audit Committee, to improve the budget process by giving greater responsibility to line managers in the departments, by associating expenditures more directly with services rendered, by speeding up and improving the accuracy of expenditure review, and by making available to management and the Executive Board more detailed budget analyses as well as medium-term projections. It is estimated that such improvements, if at all feasible under a manual system, would require the addition of at least five or six staff positions. A recent study by a management consulting firm concluded that the introduction of a commercially available data management system, operating on IBM-compatible equipment, would make it possible to provide all the desired features without any increase in staff. This study further suggested that it might be possible to divert some staff time now spent on gathering budget information to additional analysis and to administrative planning.

The present procurement system, which is currently maintained on the Basic 4 minicomputer, is able to produce routine documents and data. The system does not provide an easy-to-use facility for producing ad hoc reports and analyses required for an improved budget system and a speedy and more cost-effective procurement service. Furthermore, budget and expenditure data are not well integrated. The consultants have advised that an improved system eliminating these deficiencies should be built into the proposed new administrative budget system. It is estimated that the development of the combined system would cost $2,344,000 over the next three years, almost half of which would be spent on manpower. Reductions in manpower required to administer the present system and avoidance of extra manpower for system improvements are estimated to amount to 11.6 man-years (equivalent to $979,000) during this period. Another $910,000 in savings over the three-year period could be derived from a more efficient procurement process (prompt payment and quantity discounts, lease versus purchase analysis, and improved quality control of supplies purchased); these expected improvements could eventually generate an estimated 3.5 percent savings of the procurement base. In all, it is expected that this project would pay back in FY 1989, i.e., five years after the beginning of the development phase in FY 1984.

The cost/benefit data for mainframe replacement systems are summarized in Table 3.

Table 3. Cost/Benefit Summary of Mainframe Replacement Systems

System	FY 1984 Costs	FY 1985 Costs	FY 1985 - FY 1987 Costs	FY 1985 - FY 1987 Benefits	FY 1985 - FY 1987 Net Costs (-) or Net Benefits (+)	Break Even Year
	(In thousands of U.S. dollars)					(FY)
Economic Information System	859	2,182	3,994	2,484	-1,510	1988
Tape Receipt and Electronic Data Transfer	55	183	303	--	-303	...
International Banking and External Debt	182	509	1,670	1,670	--	1987
Subtotal	1,096	2,874	5,967	4,154	-1,813	
Integrated Financial System	541	2,196	6,501	1,888	-4,613	1990
Exchange and Interest Rates, and Gold Prices Database	113	--	132	97	-35	1988
Subtotal	654	2,196	6,633	1,985	-4,648	
Budget and Procurement System	31	511	2,344	1,889	-455	1989
Total	1,781	5,581	14,944	8,028	-6,916	

2.2 Expenditures related to nonmainframe equipment

Over the FY 1985 - FY 1987 period, costs of approximately $30.1 million are projected for the support of automated systems operating on nonmainframe equipment; approximately 30 percent would be for manpower and 70 percent for equipment. As shown in Table 4,

$19.8 million of this amount is associated with current production activities, $3.1 million with replacement systems, and $7.1 million with new applications approved in the FY 1984 or FY 1985 administrative budgets.

2.2.1. Production systems

Nonmainframe production activities expected to continue during the FY 1985 - FY 1987 period utilize (1) minicomputers, (2) microcomputers, (3) word processing equipment, or (4) relate to general EDP support services.

Table 4. EDP Cost Summary for Activities Related to Nonmainframe Systems

(In thousands of U.S. dollars)

Category of System	FY 1984 Expenses	FY 1985 Estimated Expenses	FY 1985 - FY 1987 Projected Expenses
Production	3,508	5,445	19,831
Replacement	685	1,433	3,132
New approved	1,503	2,675	7,114
Total	5,696	9,553	30,077

There are presently six minicomputers in the Fund: one Basic 4, one Hewlett Packard, three VAX, and one Data General. All but the VAX machines are presently supporting production work, while the VAX machines are being utilized for new areas of development. The cost of supporting production work on minicomputers is estimated to be $2,720,000 over the FY 1985 - FY 1987 period.

The Basic 4 minicomputer is utilized by the Treasurer's Department for the administrative expenditure accounts, which were automated in their present form in 1977. This system processes payments relating to administrative expenditures and provides complete accounting records. In total, some 20,000 entries are processed each year in connection with the production of vouchers, journals, ledgers, and subledgers. The Administration Department also uses the Basic 4 for the operation of the procurement system as well as for the other

administrative support functions. The current procurement system is linked to the administrative expenditure accounts system and is used to record requisitions, prepare purchase orders, maintain property records, and generate invoices.

The Hewlett Packard minicomputer is primarily used for text processing applications. One of the major production systems on the Hewlett Packard is the automation of the Joint Library. Capabilities which are provided include a system allowing Fund and Bank users to search the Joint Library collection through remote terminals, a system for handling book and periodical acquisitions and loans, and a system for cataloging library assets. The search services have already proved valuable for Fund and Bank staff, and their usage is growing rapidly. The Hewlett Packard is also used to maintain the Exchange and Trade Information System for the Exchange and Trade Relations Department, a central banking legislation database for the Central Banking Department, the IMF Glossary System for the Bureau of Language Services, and a database for the Legal Department.

The Data General minicomputer is presently supporting the operations of the Cable Room, but is scheduled to be replaced when the automation of the Cable Room project currently under way is completed; at that time VAX minicomputers will be utilized.

Presently, around 200 microcomputers are in use throughout the Fund. Microcomputers were first acquired in 1983, mainly for use on missions for which they have proved to be highly useful. They have facilitated an expansion of the scope and the depth of analyses, faster responses to changing assumptions, additional simulations, preparation of medium-term projections on external debt, and presentations of multiple scenarios. In addition to mission work, microcomputers are being utilized for a broad range of analytic applications and for the maintenance of relatively small, local databases; this has allowed some work to be moved off the mainframe computers and this trend is expected to continue. As mentioned earlier, the Treasurer's Department is making extensive use of microcomputers to help meet its processing requirements prior to the completion of the Treasurer's Integrated Financial System; microcomputers will continue to play an important role in the work of the department afterwards. It is expected that the preparation of data and the sensitivity analyses performed by economists involved in the technical assistance program will be performed primarily on microcomputers. The financial analysis and policy courses of the IMF Institute will make greater use of microcomputers for econometric analysis. Finally, certain specialized functions such as office space planning and the production of charts will also be supported by microcomputers. During the FY 1985 - FY 1987 period, it is expected that approximately $6,891,000 will be required for microcomputers, as well as other small computing devices; this amount includes both equipment acquisition and significant EDP support staff costs.

Word processors were first introduced in the Fund in 1975 and have allowed the absorption of a considerable increase in the typing work load without commensurate increases in secretarial staff. 1/ Currently, around 275 word processors are utilized throughout all organizational units of the Fund, including 20 in the Offices of the Executive Directors. In FY 1984, $1.1 million was spent on word processors and their support. In the three-year period FY 1985 - FY 1987, it is projected that expenditures on word processors will total $4,742,000. This does not include equipment associated with integrated office automation systems described in Section 2.2.3 under new development. Should the office automation pilots not be extended to provide Fund-wide office automation, it will be necessary to increase the production expenditures for word processing equipment beyond the present estimates. Alternatively, should the implementation of integrated office automation systems described in Section 2.2.3 be accelerated, it may be possible to reduce the above projection for word processor production costs.

Finally, associated with the Fund's nonmainframe production are general EDP support activities provided by BCS and relating to the maintenance of equipment (microcomputers, minicomputers, terminals, and word processors), data communications, BCS staff training and resource management, and BCS managerial and clerical services. In addition, the amount of equipment BCS will require is projected to increase, reflecting a growing work load and also, to some extent, as a result of acceptance tests conducted in BCS on new equipment before release to users. A pool of microcomputers maintained by BCS for loan to users and the remote job entry terminals operated by BCS for production work requested by users will continue to be maintained. The cost of EDP support for nonmainframe equipment is estimated at $5,478,000 over the FY 1985 - FY 1987 period.

2.2.2 Replacement systems

There are two systems currently under development to replace existing systems: the Cable Room System and the Fulfillment System. Both will be utilizing equipment other than the Fund's mainframe computers.

The new Cable Room System is being developed to replace a partially automated one operating on a Data General minicomputer. The new system will provide significantly increased capacity, more reliability, and greater security. In addition, it will be better suited to the Fund's medium-term strategy for office automation. The system will be based on two interconnected VAX minicomputers, with

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1/ The ratio of secretarial staff to F and above staff has decreased from 1:2.1 to 1:2.5 in the last ten years.

mutual back-up capability, which have recently been acquired and which will replace the present Data General equipment. The system will provide immediate confirmation to the originator and will have the capacity for automated filing, search, and editing. In addition, it will automatically distribute incoming cables to addressees. No savings in staff will be achieved in the Communications Division, but it is estimated that in the rest of the Fund a total of 14.5 man-years could be saved over the FY 1985 - FY 1987 period in time spent on distributing, filing, and searching for cables or telexes once the system is fully operational. The corresponding financial benefit would amount to $702,000, but the main benefits would be qualitative in terms of faster distribution and the potential for integration into a Fund-wide office automation network. It is expected that the system will cost $2,495,000 to put into production. In FY 1985, manpower costs represent only 35 percent of the overall expenditure due to substantial hardware investments; in the next two financial years, manpower costs will represent a much higher share. This project, which includes the cost of developing a Fund-wide network for electronic communication of messages within the Fund, is expected to pay back in FY 1992, i.e., eight years after the beginning of the development phase (FY 1984).

The second nonmainframe replacement system is the new Fulfillment System begun in FY 1985. The present system performs the basic function of maintaining a subscription list to the Fund's publications. However, the increased work load resulting from the growth in the number of volumes and issues published could be performed more economically if additional accounting, clerical, and some managerial functions were automated. The design of the present system does not permit the incorporation of such new functions at a reasonable cost. The proposed new system will maintain and fulfill book orders and periodical subscriptions within one single system; and provide accounting support, promotional action, and income documentation. The system will utilize a software package already developed and will run on an outside computer. The cost of adapting and operating this system over three years is estimated at $637,000 (most of which will be for equipment and time-sharing expenses), compared with financial benefits of $1,116,000 in the same period. Benefits include staff time savings, equipment cost avoidance, and elimination of usage of the Burroughs computers, thereby releasing time for other users.

The cost/benefit data for nonmainframe replacement systems are summarized in Table 5.

Table 5. Cost/Benefit Summary for Nonmainframe Replacement Systems

System	FY 1984 Costs	FY 1985 Costs	FY 1985 - FY 1987 Costs	FY 1985 - FY 1987 Benefits	FY 1985 - FY 1987 Net Costs (-) or Net Benefits (+)	Break Even Year
	(In thousands of U.S. dollars)					(FY)
Cable Room Automation	450	1,145	2,495	702	-1,793	1992
Fulfillment	235 1/	288	637	1,116	+479	1985
Total	685	1,433	3,132	1,818	-1,314	

1/ Production costs of the old system to be replaced.

2.2.3 New approved systems

In addition to production work and replacement systems operating on nonmainframe equipment, there are a number of new systems (funded in the FY 1984 or FY 1985 administrative budgets) that have been requested by user departments to meet changing needs and growing work loads. These new systems include: (1) office automation pilots and the development effort to support these pilots as well as potential future office automation implementations, (2) an economist workstation project, (3) a Fund-wide document management system, (4) a Fund legal document system, (5) a locator system, (6) microcomputer applications for the Secretary's Department, (7) a cable translation system for the Bureau of Language Services, and (8) additional automation of the Joint Library.

Growing Fund work loads and recent cost-effective technological advances have made office automation an attractive undertaking with considerable potential for long-term financial benefits. Since the introduction of word processors in the Fund in 1975, the Fund has spent approximately $6 million on office automation equipment. Investment will continue to meet user demands in this area and to upgrade capabilities as new technologies become available. Developing well-integrated and automated office information systems is necessary if the growing complexity of Fund activities and decisions is to be supported at reasonable cost. The automation of Fund functions is a long-term undertaking, which requires integration in the operational and procedural structure of the organization.

The Fund has taken a conservative approach to office automation and has begun with two pilot projects in the Asian and External Relations Departments. The pilot systems are now operational and consist of electronic workstations--word processors and microcomputers--implemented and integrated into departmental networks. These systems provide full-function word processing, electronic retrieval and transfer of documents, access to data processing systems, analytical software, and managerial tools.

The decision to initiate the Asian Department pilot project was taken early in 1983. The evaluation of this pilot by a management consulting firm has shown that productivity gains arise from faster access to word processing and typed documents, faster document printing, shorter turn-around time for corrections and more effective work-sharing. 1/ Pending their actual realization, financial benefits have been conservatively estimated. Based on an overall cost of $760,000 spent over the FY 1985 - FY 1987 period (of which about one third would be for manpower), savings generated during the period could amount to $500,000 and the last investments would be paid back in FY 1989.

The second office automation pilot for the Fund is in the External Relations Department. The total cost of this project is estimated at $567,000 over FY 1985 - FY 1987; one third of this cost would be for manpower. The financial benefits of this project are estimated to be $518,000 over the same three-year period. Benefits would accrue through a reduction of staffing requirements of around 3.5 staff annually for photocopying documents, operating facsimile systems, typing and distributing memoranda, verifying references in documents for publications, plotting data, and preparing graphic representations. Other financial benefits would include reduction in equipment, graphics typesetting, and contractual staff costs.

In addition to the two pilot projects, $750,000 was set aside in the FY 1985 budget for office automation in other departments. This amount is being used to automate two additional departments in FY 1985.

1/ This evaluation indicated that the implementation costs for the word processing component of the office automation pilot in the Asian Department could be recovered in as little as 16 months. Actual productivity gains and financial benefits for present office automation efforts will continue to be closely monitored and the results presented in future budget discussions.

Utilizing the estimates of potential benefits of a Fund-wide office automation program, 1/ the benefits corresponding to this expenditure would amount to $436,000.

In order to support the current office automation pilots and to provide the necessary foundation for potential future office automation efforts in other departments, an office automation development project was begun in FY 1984. Activities for this project include mostly staff time needed to test and evaluate data transfer techniques and new software packages, to develop a network which would facilitate interdepartmental exchange of internal documents, to define requirements for local area networks, and to prepare training courses.

If the office automation effort were to be extended Fund-wide (see Section 3), it is projected that costs for office automation development to support this effort could total $1,639,000 for the FY 1985 - FY 1987 period, about 80 percent of which would be for manpower. Based on the estimates of potential benefits cited previously, the corresponding benefits for this project could reach $954,000 over the same period. Should the Fund-wide office automation effort be reduced in scope from what is currently envisaged, the costs for this support project would be correspondingly reduced.

Another new project closely related to the office automation effort is the economist workstation project. This project involves development of an integrated facility to retrieve data, perform econometric analyses, and prepare graphs and statistical tables using the microcomputers selected for the office automation projects. The first reports from a small group of desk economists who helped design the prototype indicate that there is a potential for sizable reductions in work load and for improvement in timeliness and comprehensiveness of information processed. If continued and cost-justified, this project would be carried out in conjunction with the office automation effort. Pending further evaluation, expenditures for the economist workstation project are presently estimated at $451,000 over the three-year period, two thirds of which would be for manpower.

The Secretary's Department is sponsoring a Fund-wide document management system, which will initially be used to maintain Executive Board documents in a single database. This will allow authorized

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1/ Benefits of office automation in the Fund have been conservatively estimated based on productivity gains of 3-5 percent, depending on the category of staff involved. This is close to what is presently expected for the system developed in the Asian Department (3.1-6.2 percent) and lower than what is usually realized in the private sector (10-20 percent). On that basis, it is estimated that each automated office system would pay back in about three years.

persons to search these documents in a more timely manner and in greater depth than is possible with current manual systems. The system will markedly reduce the time presently spent filing documents and reduce space requirements for storage of documents. As a part of this effort, the Fund has developed a thesaurus, i.e., a detailed listing of words and phrases, to be used in assigning subject headings to documents included in the database. The thesaurus will provide standardized terminology for the indexing, filing, and automated retrieval of information, thereby increasing the efficiency of information management throughout the Fund. The present plans for the FY 1985 - FY 1987 period include provision of 50 terminals to be located in the offices of the Managing Director, Deputy Managing Director, and Executive Directors, and in the immediate office of all departments. It is estimated that the system could thus be available to some 325 users in ranges F and above. Benefits in terms of staff time and storage space saved are estimated to amount to $1,241,000 (including 18 man-years) for the Fund as a whole, compared with a cost of $1,911,000 over the FY 1985 - FY 1987 period, more than half of which would be for manpower. This project is estimated to pay off in FY 1989, i.e., five years after its beginning (FY 1984).

Related to the Fund-wide document system is a project requested by the Legal Department which would provide an on-line full text search and retrieval capability for all Fund legal documents. This would be a subsystem of the document management system of the Secretary's Department. This subsystem is expected to cost $406,000 over the three-year period (one third of which would be for manpower), and the benefits are estimated to be $152,000 during the same period with a pay-back period of six years (FY 1985 - FY 1990).

A "locator" system is being developed to integrate better the information requirements in the Fund. This system will locate any record (name and associated information) on the mailing and distribution lists maintained by the Administration, the Treasurer's, or the Secretary's Departments. This could be the first step toward the integration of some 100 mailing/distribution lists maintained in some 40 different organizational units throughout the Fund. The locator system could also be used by the guards and the front door receptionist as an important source for checking for security purposes. The cost of this project, most of which is for manpower, is calculated at $166,000 in the FY 1985 - FY 1987 period and the savings are estimated at $101,000 for this period. The pay-off period is estimated to be around four years (FY 1985 - FY 1989).

The Secretary's Department will be utilizing microcomputers to improve the effectiveness of certain operations such as high priority document transmission and record keeping facilities for the Executive Board Services Unit. This project is estimated to cost $144,000, mostly

for equipment, and to generate savings of about two man-years ($173,000) within the department during the FY 1985 - FY 1987 period, thereby paying off within three years.

A major new project for the Bureau of Language Services, which translates around 5,000 cables per year, is a cable translation system to interface its machine-assisted translation system for cables received from and sent to Spanish- and French-speaking countries with the Cable Room System. A total of three man-years could be saved over the period under review for an estimated savings of $223,000 compared with a projected cost of $210,000 for the project (mostly for manpower costs) thereby paying off within three years.

A project has also been initiated for the Administration Department to enhance the Joint Library automation system by adding a subsystem which will handle check-in and circulation of periodicals. This project was approved in FY 1985, and the development phase should be completed within this financial year. The net cost to the Fund of developing this system, which also benefits World Bank users, is estimated at $110,000 in FY 1985 - FY 1987; most of this amount is for manpower. Anticipated annual savings on staff time and through reduced book losses due to improved circulation control would amount to around $76,000 (Fund share only) to give a three-year total of $227,000. This enhancement of the recently completed Joint Library system will pay off within one year.

The cost/benefit data for nonmainframe, new approved systems are summarized in Table 6.

2.3 Summary of FY 1985 - FY 1987 EDP projections

A summary of the cost/benefit data for replacement and new approved EDP systems over the FY 1985 - FY 1987 period is presented in Table 7. This table shows that, while the three-year cost of the Fund's EDP effort for replacement and new approved systems with quantified benefits is $24.7 million, the financial benefits to be realized from them over the same period total $14.3 million (including productivity gains equivalent to 150 man-years 1/) for a net cost of $10.4 million. However, after the break-even point for each of these systems is reached, there will be a benefit of approximately $6.7 million annually.

1/ Productivity gains may translate directly into actual savings or avoidance of future costs. However, in some cases they may also result in reduced overtime for professional staff, which would not correspond to a realizable financial gain.

Table 6. Cost/Benefit Summary for Nonmainframe, New Approved Systems

System	FY 1984 Costs	FY 1985 Costs	FY 1985 - FY 1987 Costs	FY 1985 - FY 1987 Benefits	FY 1985 - FY 1987 Net Costs (-) or Net Benefits (+)	Break Even Year
	(In thousands of U.S. dollars)					(FY)
Office Automation Pilot - ASD	326	235	760	500	-260	1989
Office Automation Pilot - EXR	240	--	567	518	-49	1988
Office Automation Implementation	--	750	750	436	-314	1988
Office Automation Development	191	500	1,639	954	-685	1988/ 1990
Document Management System	358	773	1,911	1,241	-670	1989
Legal Document System	--	51	406	152	-254	1990
Locator System	23	140	166	101	-65	1989
Microcomputer Applications - SEC	--	20	144	173	+29	1987
Cable Translation System	--	49	210	223	+13	1987
Joint Library Automation	202	36	110	227	+117	1985
Subtotal	1,340	2,554	6,663	4,525	-2,138	
Economist Workstation	163	121	451	...	...	...
Total	1,503	2,675	7,114	...	...	

Table 7. Summary of Costs, Benefits and Pay-back Periods for Replacement and New Approved Systems

System	FY 1985 - FY 1987 Costs (in $ 000s)	FY 1985 - FY 1987 Benefits (in $ 000s)	Net Costs (-) or Net Benefits (+) (in $000s)	Number of Years Beyond FY 1987 Needed to Recover Investment	Start and End Points of Pay-back Period (FYs)	Annual Savings After Break-Even Date (in $ 000s)
Replacement systems	18,076	9,846	-8,230			3,063
Economic Information System	3,994	2,484	-1,510	1	1984 - 1988	1,656
Tape Receipt and Electronic Data Transfer	303	--	-303	...	1984 - ...	--
International Banking and External Debt Database	1,670	1,670	--	--	1984 - 1987	--
Integrated Financial System	6,501	1,888	-4,613	3	1984 - 1990	2,066
Exchange and Interest Rates, and Gold Prices Database	132	97	-35	1	1986 - 1988	97
Budget/Procurement System	2,344	1,889	-455	2	1984 - 1989	416
Cable Room Automation	2,495	702	-1,793	5	1984 - 1992	402
Fulfillment System	637	1,116	+479	--	1985 - 1985	136
New approved systems	6,663	4,525	-2,138			3,613
Office Automation Pilot - ASD	760	500	-260	2	1984 - 1989	160
Office Automation Pilot - EXR	567	518	-49	1	1984/86 - 1988	98
Office Automation Implementation	750	436	-314	1	1985 - 1988	182
Office Automation Development	1,639	954	-685	3	1985/87 - 1988/1990	598
Document Management System	1,911	1,241	-670	2	1984 - 1989	511
Legal Document System	406	152	-254	3	1985 - 1990	102
Locator System	166	101	-65	2	1985 - 1989	37
Microcomputer Applications - SEC	144	173	+29	--	1985 - 1987	74
Cable Translation System	210	223	+13	--	1985 - 1987	81
Joint Library Automation	110	227	+117	--	1985 - 1985	60
Subtotal 1/	24,739	14,371	10,368			6,676
Economist Workstation	451					
Total	25,190					

1/ For systems with quantified benefits.

Table 8 contains a summary of the projected EDP expenditures for FY 1985 - FY 1987, separated into the categories of production, replacement, and new approved systems.

At the time of the budget presentation for FY 1985, it was indicated that further expenditure increases were expected for the next two financial years. Of the total anticipated expenditure, the amounts allocated for production and replacement systems are to a large extent unavoidable. As can be derived from Table 8, such costs are estimated at $53 million for the FY 1986 - FY 1987 period, for an average of $26.5 million per year. This represents an increase of about 18 percent over the corresponding budget appropriation for FY 1985 ($22.5 million) and reflects a rising work load as well as temporary cost increases due to continued use of old systems while replacements are being tested and installed.

New systems, funded in the FY 1984 or FY 1985 administrative budgets, are projected to cost $4.4 million over the FY 1986 - FY 1987 period, for an average of $2.2 million per year. Compared with $2.7 million in FY 1985, this amounts to a decrease of 18 percent. The budget reviews for FY 1986 and FY 1987 will give the Executive Board an opportunity to review these new systems; some of them could be slowed down, reduced in scope, or even canceled. While such actions would serve to reduce annual EDP expenditures, albeit by a relatively small margin, in the long run this would be likely to lead to higher overall costs and to loss or delay of benefits.

3. Potential additional areas for EDP effort

All of the expenditures discussed in the preceding section relate to current production systems, replacements of current systems, or new systems which have been approved in the FY 1984 or FY 1985 budgets. There are, in addition, other potential areas in which new systems may be requested that would need funding in the FY 1986 - FY 1987 budgets. These areas include servicing the EDP needs of the Executive Board and extending office automation Fund-wide.

3.1 EDP needs of the Executive Board

A recent survey of 19 out of 22 Executive Directors' offices has indicated that their EDP needs and interests differ widely. The results of this survey are summarized in Table 9.

Table 8. Summary of On-going Three-Year Costs by Category of System Compared With FY 1984 and FY 1985

Category of System	FY 1984		FY 1985		FY 1985 - FY 1987	
	In US$ millions	In percent of total	In US$ millions	In percent of total	In US$ millions	In percent of total
Production	12.0	75	15.5	61	57.4	69
Mainframe	8.5	53	10.0	40	37.6	45
Nonmainframe	3.5	22	5.5	21	19.8	24
Replacement	2.5	15	7.0	28	18.1	22
Mainframe	1.8	11	5.6	22	15.0	18
Nonmainframe	0.7	4	1.4	6	3.1	4
Subtotal	14.5	90	22.5	89	75.5	91
New systems	1.5	10	2.7	11	7.1	9
Mainframe	--	--	--	--	--	--
Nonmainframe	1.5	10	2.7	11	7.1	9
Total	16.0	100	25.2	100	82.6	100

Table 9. Summary of Survey of Executive Directors' Offices

Responses	Office Systems Capabilities		Analytic Capabilities		
	Require additional capabilities	Require Network	Require PC	Require Direct Access to Databases 1/	Require Terminal
Yes	8	6	5	13	11
No	9	9	12	4	2
Maybe	1	2	--	2	1
No view expressed	1	2	2	--	5

1/ Of those Executive Directors' offices that expressed interest in having direct access, several wished only to be able to retrieve IFS data. Some were interested in accessing the Document Management System. Few wished to access other Fund economic or financial databases.

Possible future developments could include improved word processing capabilities, electronic retrieval and transfer of documents, provision of analytical software for the analysis of economic data, and access to Fund data processing systems. It is intended that a more detailed review of Executive Directors' requirements will be carried out early in FY 1986. Upon completion of the detailed review, Executive Directors may wish to consider, perhaps in the Committee on Executive Board Administrative Matters, what amendments should be made to the present Guidelines for EDP Support (EBAP/83/207, 12/12/83). Pending these actions, no estimates of the costs and benefits of potential efforts to meet Executive Board needs have been made at this time.

3.2 Fund-wide office automation

As discussed in Section 2.2.3, the Fund has taken some conservative first steps in the area of office automation, primarily through pilot projects in the Asian and External Relations Departments. 1/ Pending a review of these projects, it may be recommended that the office automation effort be extended Fund-wide.

Preliminary estimates indicate that it would be feasible to implement office automation in about 60 percent of the Fund by the end of FY 1987. The cost of this effort is projected to be $6.2 million over the next two financial years. Based on industry-wide figures and the experiences to date with the Fund pilot projects, the benefits which could be realized from extending office automation in the Fund would be $3.6 million over the same period. This corresponds to a pay-back period for each automated system of about three years.

3.3 Other new areas

Due to constantly changing user needs, it is impossible to predict all potential new requests for EDP services even over the relatively short time frame of two years. Three additional areas should be mentioned, however: the Publications Editorial System, the provision of IBM-based analytic capabilities, and a review and update of the WEO system.

The Publications Editorial System was requested by the External Relations Department in its FY 1985 budget submission, but was postponed pending a full cost/benefit analysis. This system, estimated to cost $240,000, would minimize the use of external typographic services required for publications and would thus reduce the cost of these services by eliminating the need for rekeying and reproofing manuscripts.

1/ As noted previously, funds were also set aside in the FY 1985 budget for possible additional office automation efforts based on the pilot results; two more departments are now scheduled for automation in FY 1985.

With the implementation of the Fund's new statistical database (EIS), the Treasurer's Integrated Financial System, and the Budget and Procurement System on IBM-compatible mainframe equipment, there will most probably be considerable demand for analytic capabilities on IBM-compatible equipment. It would be consistent with the Fund's overall strategy of shifting gradually to IBM-based technology that investigations be begun to identify, evaluate, and select IBM-based analytic software packages to replace RAL, which is Burroughs-based. The effort in this area would include not only the selection and implementation of these packages, but also training and other support required to allow users to shift their current analytic work in the most efficient and cost-effective manner. No cost or benefit estimates have been made as yet with respect to this area of activity.

An additional project that may have to be undertaken soon is the review of the existing computer system supporting WEO and the development of a new system on IBM-compatible equipment which would draw on data maintained both by desk economists and by the Bureau of Statistics.

4. Conclusion

This paper has attempted to present an overview of the Fund's present computing services and an outlook for the FY 1986 - FY 1987 period. It also provides background information to support EBAP/84/276 requesting appropriations related to the Fund's mainframe requirements. Table 10 summarizes the three-year projected costs for EDP in the Fund.

Table 10. Summary of Three-Year EDP Costs

(In millions of U.S. dollars)

Type of Expenditure	FY 1985 - FY 1987
Initial facility costs	15.8
On-going costs for production and replacement systems	75.5
Subtotal	91.3
On-going costs for new systems	7.1
Total	98.4

Existing production systems have been described and placed in the context of the Fund's work. The resources needed to continue to support these systems over the FY 1985 - FY 1987 period have been analyzed and translated into projected expenditures. In addition, critically needed systems to replace current ones which can no longer meet users' needs have been described and their projected costs presented for the three-year period. The total cost to continue to support the Fund's on-going production work and to develop, test, and implement the replacement systems has been estimated at $75.5 million for FY 1985 - FY 1987. In addition, as detailed in EBAP/84/276, approximately $15.8 million will be required to establish a new computer facility to support these necessary systems, bringing the total minimum cost to $91.3 million. This cost should be considered as a basic level of EDP expenditure that cannot be reduced significantly without adversely affecting the Fund's essential operations.

New areas of automation for which development has been approved and begun are also described, together with their projected costs and benefits. For those new systems funded in the FY 1984 or FY 1985 administrative budgets, the three-year costs are estimated at $7.1 million. While these systems will need to be thoroughly evaluated during the FY 1986 and FY 1987 EDP budget discussions, massive curtailments of development presently in progress would not be advisable since this would lead not only to the forfeit of much of the past investment but also to the delay or loss of anticipated benefits.

Finally, other potential areas of EDP effort over the next two years have been described. While no investments would be lost if resources were not to be budgeted for these new areas in FY 1986 and FY 1987, there would be a substantial loss of potential benefits. These, and any other new EDP efforts that might be proposed in future budgets, will need to be thoroughly evaluated to determine whether they are critical to Fund work, compatible with the Fund's technology plan, and produce sufficient benefits to justify their costs.

To summarize in financial terms, $91.3 million represents the absolute minimum expenditure for EDP services in the Fund over the FY 1985 - FY 1987 period. In order to continue the current development effort, an additional $7.1 million may be required for the three-year period, bringing the total projected EDP expenditure level to $98.4 million; this total excludes new high-priority projects which might be approved in FY 1986 or FY 1987.

SUMMARY OF METHODOLOGY USED FOR COST/BENEFIT ANALYSIS OF AUTOMATION SYSTEMS

A. Types of cost

Automation systems involve four broad types of cost:

(1) Manpower (staff or consultants) required for systems analysis, programming and maintenance, etc.

(2) Commercially available software packages as an alternative to programming by Fund staff or consultants. Such packages can be rented but are usually purchased.

(3) Use of the Fund's mainframe computers and data communications systems. Alternatively it may be necessary to rent time on computers which are not owned by the Fund.

(4) Acquisition of ancillary equipment such as minicomputers, microcomputers, terminals linked to mainframe computers and minicomputers, word processors, etc.

Automation systems have a basic life cycle involving two phases: a development phase including design, construction and testing; and then after completion of the development phase, a usage phase, which includes production and maintenance. Generally speaking, the developmental phase tends to have a high proportion of the cost associated with manpower, and with acquisition of software and ancillary equipment. The production phase, on the other hand, often has a high proportion of its costs associated with usage of the mainframe computers.

B. Types of benefit

Automation systems provide two broad types of benefit:

(1) A more comprehensive, better quality, and/or more timely product. It is difficult to put a monetary value on this type of benefit.

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(2) Increased productivity, expressed either as reduction in input to achieve the same level of output as before, or an increased level of output for the same level of input as before, or for a smaller increase in input than would otherwise have been necessary.

Most benefits relate to increased manpower productivity; however, there are in addition other types of benefits, e.g., more timely payment of bills which results in more discounts and ability to identify more cost effective alternatives. Estimates of benefits are generally based on less precise information than estimates of costs, especially those benefits which are attributable to smaller increases in input than would otherwise be necessary in order to achieve an increase in output. This is especially true when the benefit consists of a small amount per person multiplied by a large number of people (i.e., where it is perhaps more theoretical than real in some cases). Bearing this in mind, the emphasis has been put on "conservative" estimates of benefits.

(4) When the above analysis of costs and benefits are brought together, the result is the following table which shows net costs during the period of development and the net annual operating benefit thereafter, which when divided into the total net cost of development, gives a payback period of 1.1 years 1/ after completion, i.e., FY 1989.

	Development Phase				Production Phase Each Suceeding Year	Payback Period (Years)
	FY 1985 (a)	FY 1986 (b)	FY 1987 (c)	FY 1985-1987 (d)	(e)	(f)=(d)÷(e)
Costs						
Development	-$483,000	-$1,223,000	-$200,000	-$1,906,000	--	
Production	- 28,000	- 127,427	- 282,502	- 437,929	-$482,402	
Subtotal	- 511,000	- 1,350,427	- 482,502	- 2,343,929	- 482,402	
Benefits	265,200	724,400	899,400	1,889,000	899,400	
Net	-$245,800	-$ 626,027	$416,898	-$ 454,929	$416,898	1.1

1/ As the payback will be in the second year (FY 1989) after the completion of the development phase (FY 1987) Table 7 quotes a payback period of two years.

(2) The estimated cost of production by the system is as follows:

Type of Expense	Production During the Development Phase 1/ FY 1985	FY 1986	FY 1987	Total FY 1985-1987	Production Phase Each Succeeding Year
Manpower	$13,400	$ 20,000	$ 50,000	$ 83,400	$200,000
Computer usage	7,000	30,000	200,000	237,000	250,000
Hardware	6,600	70,427	27,502	104,529	27,502
Software	1,000	7,000	5,000	13,000	5,000
Total	$28,000	$127,427	$282,502	$437,929	$482,502

1/ The system will start to produce benefits even before it is completed.

(3) The benefits to be derived from the system are estimated as follows:

Type of Benefit	Development Phase FY 1985	FY 1986	FY 1987	Total FY 1985-1987	Production Phase Each Succeeding Year
Manpower 1/					
A-E 2/	$ 48,400 (1.0)	$ 48,400 (1.0)	$ 48,400 (1.0)	$145,200 (3.0)	$ 48,400 (1.0)
F-I	$151,800 (1.57)	$286,000 (2.95)	$396,000 (4.09)	$833,800 (8.61)	$396,000 (4.09)
Subtotal	$200,200 (2.57)	$334,400 (3.95)	$444,400 (5.09)	$979,000 (11.61)	$444,400 (5.09)
Other Benefits					
Procurement saving 3/	$ 65,000	$390,000	$455,000	$910,000	$455,000
Total	$265,200	$724,400	$899,400	$1,889,000	$899,400

1/ Man-years are in parentheses.

2/ The Budget and Planning Division currently has 11 full-time positions and 1 half-time, and the Procurement Unit has 9 full-time positions and part of the supervising time of the Section Chief and his assistant. The system will reduce the need for manpower in the Budget and Planning Division which would otherwise have been needed to carry out additional functions by 0.5 man-years in FY 1985, 2.0 in FY 1986 and 3.0 in FY 1987; and in the Procurement Unit by 2.0 man-years per annum.

3/ More timely payment of bills, additional quantity discounts, better analysis of lease versus purchase options, improved quality control of supplies purchased. Estimate based on procurement value of $13 million (amount in FY 1984). Estimated savings 0.5 percent (FY 1985), 3.0 percent (FY 1986) and 3.5 percent (FY 1987).

C. Dollar amounts attributed to costs and benefits

(1) Manpower (staff and consultants) - Standard unit costs have been used which take account of average Fund salaries, benefits and overheads such as office space, furniture and supplies. Non salary factors vary depending on the seniority level of the staff, but on average amount to 98 percent of salary cost. Standard annual costs used in the study are as follows:

(i)	BCS staff	$101,200
(ii)	Other departments	
	A-E staff	$48,400
	F-I staff	96,800
	J and above	149,600

(2) Hardware and software - are charged at either purchase cost or annual lease cost, together with the annual maintenance cost, if any.

(3) Computer usage (incl. data communication) is an expense shared by many projects and users. A standard unit cost is established with a view, in aggregate, of recovering, on the basis of estimated usage, the estimated annual cost of the computer center. The unit costs vary depending on the quality of services provided, e.g. priority rating.

(4) Constant dollar - All costs and benefits are expressed in constant FY 1985 dollars, i.e., no allowance is made for inflation in FY 1986 and FY 1987. This approach tends to make for a cautious presentation of benefits in relation to costs: benefits are generally saved manpower, where historically prices have gone up in line with inflation, whereas costs also include expenditures for computer equipment and usage, where historically prices have fallen in relation to inflation.

D. Example of cost/benefit analysis: budget and procurement system

To illustrate the principles described in the above paragraphs there is shown below the calculation of the costs and benefits associated with the Administration Department's budget and procurement system.

(1) The estimated cost of developing the system is as follows:

Type of Expense	FY 1985	FY 1986	FY 1987	Total FY 1985-87
Manpower	$270,000	$610,000	$150,000	$1,030,000
Computer usage	180,000	280,000	50,000	510,000
Hardware	30,000	28,000	--	58,000
Software	3,000	305,000	--	308,000
Total	$483,000	$1,223,000	$200,000	$1,906,000