

Developing An Office Automation Plan For The REA

BY M. DEMARCO JOHNSON

Executive Summary

The office automation plan addresses the feasibility of integrating, upgrading and augmenting existing hardware and software systems. The plan ensures compatibility, flexibility and portability of automated systems among all information customers. This document is also a blueprint used to secure funds for continuing the design, development, implementation and operation of the selected solution.

This article details how the Rural Electrification Administration worked through all phases of the information engineering life cycle from 1988 to 1992. It reviews the alternatives facing the REA and how a decision was made regarding which automation plan to implement.

The information in this article is a summary of an extensive work effort over a period of time and completed in 1988 as an office automation plan for the Rural Electrification Administration (REA) in the U.S. Department of Agriculture (USDA). The approval is for a system life of seven years, an acquisition cost of \$4,616,000 and a system life cost of \$12,757,000.

The system will use microcomputers from the USDA central acquisition contract, augmented with CD-ROM technology for data storage in a distributed processing environment. The department's agency-wide network (DEPNET) and its follow-on services will be used for telecommunications.

The conditions associated with this approval are as follows:

1. The new office automation system will include the capability to directly access and retrieve information from the Department-wide Financial Information System (DFIS) at the Office of Finance and Management's National Finance Center located in New Orleans, LA.
2. The "Statement of Applicable Standards" should include the U. S. Office of Management and Budget (OMB) Circulars A-127 (Financial Management Systems) and A-123 (Internal Controls).
3. The documentation should include a statement indicating that all proposed finan-

cial software systems will be developed in compliance with generally accepted accounting principles and standards as prescribed by the Financial Accounting Standards Board and the comptroller general, of the United States.

Background

The office automation (OA) plan for the Rural Electrification Administration (REA) addresses the feasibility of integrating, upgrading and augmenting existing REA hardware and software systems. The OA plan ensures compatibility, flexibility and portability of automated systems among all users, and includes — in narrative and chart form — a description of all the requirements for improving current manual systems. It lists all identified areas that are candidates for improvement and development through OA, and it provides a description of user needs and organization objectives in quantifiable form.

The OA plan considers future developments in OA technology and provides for a reasonable level of adaptability to incorporate new technology. It includes equipment and software recommendations for presentation to the OMB's Agency Application Review Board (AARB) for REA budget approval, and to the Department of Agriculture for technical approval. The plan is prepared

in the format described in USDA Departmental Regulation 3130-1, Technical Approval of IRM Products and Services.

The Rural Electrification Administration is a credit agency of the U.S. Department of Agriculture that assists rural electric and telephone organizations in obtaining the financing required to provide electric and telephone services in rural areas.

REA has a line and staff organizational structure. Both the electric and telephone programs have separate line offices, known as the Northeast, Southeast, Southwest and Northwest Area Offices. The area offices administer their respective programs regarding loans, engineering design, and construction, management and operation of borrowers' rural electric and telephone systems for an assigned geographical area.

Staff offices perform the development of proposed policies, standards and procedures concerning loans and operations, engineering and accounting aspects of the programs. Also included are agency fiscal accounting, personnel, budget, public information services, administrative management, program analysis and statistical and general services activities of the agency. This study was conducted to explore REA's options for implementing the office automation technologies required to effectively support these programs.

Proposed System Requirements

Conclusions are presented based on the analysis of the system requirements, USDA cost benefit spreadsheets, and technology assessments. The basic systems architecture consists of several major components as follows:

- REA minicomputer facility
- Departmental mainframe computer facility
- Multi-use personal computers
- Information access
- Output process system
- Open system connectivity between all levels: work group connectivity of sub-local area network (a work group consists of a branch, area or a division); departmental backbone (local area network); departmental national telecommunications network (wide area network); secure access.

These major components are present in all configuration alternatives. The relative distinction between each component is the degree to which they present foundations for effective and efficient solutions to current and future REA mission objectives.

REA Minicomputer Facility

The minicomputer component of the proposed REA office automation plan contains the nucleus of applications, case status and project management activities. This design includes an electronic calendar to keep executives in the work group organized and on schedule. This system tracks management objectives and goals, coordinates meetings, sends reminders of deadlines and warns when a case falls behind.

This component will contain the newest time slice of agency information and will complement information that is distributed to the lowest level of use via the information access component. The different REA work groups, upon demand through the open system connectivity component, will be able to access the REA minicomputer facility.

The functional capability of the office automation minicomputer is based on the software operating system (Unix) used in the private sector for many years. In terms of the federal government standard term POSIX is used as described in the Federal Information Processing Standards Publication 151. This standard is not an operating system standard but a definition of the interface at the func-

tional level between an operating system and application software. POSIX is a purchasing requirement for environments where application portability extends the user system payback beyond the hardware life cycle acquisition process. POSIX is the definition of a generic way for operating systems and applications to communicate, and defines how an application should request specific services from an operating system.

The significant benefit of this functional capability to the federal government is the broad interface definition and the design of any operating system and software in any language that can conceivably be modified for compliance to this standard, thus opening up the prospect of true cross-architectural and cross-system portability. This allows users to port their software from one vendor's architecture to another without the need for costly and time consuming conversions.

The Unix operating system, an industry standard, is a multi-use timesharing facility. This timesharing capability provides each user with the illusion of having capabilities of the mini at the remote location. Work group computing is an application in which multi-user timesharing systems serve as team computers, acting as file servers (depositories), hubs of electronic mail and print stations for small groups. When used in these capacities, work group computers provide the same types of functions rendered by local area networking products, capable of being networked to groups of PCs over local area network facilitates. Backup storage for all users is provided. The major applications on the REA Minicomputer will be the Borrower Information System, Borrower Operating Report Processing System, remote batch access to the National Computer Center, Kansas City (NCC-KC) and the National Finance Center (NFC), backup storage facility for work group personal computer local area networks, application development and testing resource, and an output staging area for current information to be published.

The minicomputer facility will no longer be a shared word processing resource, since this function will be handled on the multi-use personnel computer (MUPC) and the work group personal computer local area networks (PC-LAN).

Departmental Mainframe Computer Facility

The main applications on the departmental system are:

- Fiscal Accounting
- Statistical Applications
- Conversions
- Report Preparation

There are three departmental mainframe computer facilities. They are the National Computer Center in Kansas City (NCC-KC), the National Computer Center in Fort Collins (NCC-FC) and the National Finance Center in New Orleans (NFC). REA currently uses NCC-KC for its agency accounting systems and special management project computing resources. REA has an ongoing project to upgrade its outdated agency accounting system into an integrated on-line accounting system with reporting capabilities accessible to more agency personnel. The recommendation provides a method for all authorized users to access the accounting system. REA currently does not use NCC-FC, but the agency does use NFC for its departmental electronic processing administrative management systems, and this recommendation provides a method for authorized users to access these systems.

Multi-Use Personal Computer (MUPC)

Undoubtedly accepted as the current mainstay of office productivity, the multi-use personal computer continues to provide exceptional benefits to the REA professional and support staffs. The inclusion of this component in the overall system design provides the greatest amount of flexibility, reliability and compliance with open system standards. The capability of word processing, spreadsheets, database, off-the-shelf financial, statistical and software graphics is available. Major off-the-shelf software packages that will be on the MUPC and will aid in increasing user productivity are as follows:

- *Word processing* capability with built-in spelling, thesaurus, glossary, macro and outline functions.

- *Spreadsheet* capability with macro, import and export functions.

- *Data base* capability with programming, import and export functions.

- *Communications* capability, which will allow access to the work group, agency, user field staff and departmental computing, storage and printing resources.

- *Graphics* capability with import and

export functions.

While the MUPC will provide increased capability for users to create new and innovative work, major productivity gains can only be realized through the user's ability to access, use and analyze agency information in a machine-readable form. This agency information can be staff instructions and bulletins, commonly used language for various branch, division or agency documents, individual borrower information, and agency-acquired information from other government and non-government organizations.

The MUPC will be IBMPC-compatible, and allow the use of various agency, departmental (such as the Time and Attendance System) and industry-specific application packages generated by REA employees, borrowers or other industry organizations.

Information Access — CD-ROM

Compact Disk-Read Only Memory (CD-ROM) is a publishing and storage medium, the center of a new genre of computer applications and an information management tool of unprecedented power. A section of optical disk technology, from which both CD audio and CD-ROM have risen, is now firm in the consideration of system architectures for new solutions. CD-ROM is the first practical product to enable almost any agency to package and distribute large digital databases.

Each CD-ROM disk can carry at least 550 (some up to 680) megabytes of digital data, with accuracy and reliability as good as those available with the best computer peripherals. This is enough to hold:

- The text content of 150,000 printed pages (enough to fill 250 large books).
 - Sharp images of 15,000 pages of business documents (enough to fill two tall filing cabinets).
 - The contents of 1,200 standard 5.25-inch 360KB floppy disks.
 - A crisp color picture and 10 seconds of narration for each of 3,000 segments of an educational or reference program (almost eight hours of content).
 - All the forms and regulations of REA with room to spare
 - Large amounts of anything else that can be represented digitally; or any combination of any of the above
- Capacity is just the beginning. Any

piece of this vast array of information can be located within one second of asking for it. Retrieval can be supported by a choice of powerful computer methods, starting with database management systems and full-text searching systems. Pre-compiled indexes for either or both of these can be stored on the CD-ROM along with the database itself; there is plenty of room for REA's information access and storage requirements.

When combined with the MUPC, the CD-ROM technology allows agency management to distribute information to agency employees that can be accessed and used by an individual without regard to whether the employee is a Washington or field employee. With this technology, the emphasis can be placed on using information as an agency resource that is very accessible to all agency employees. Some examples: the last 10 years of Annual Statistical Reports (ASR) in data file format; the last two years of ASR bulletins in image format; all of the Personnel Staff Instructions in ASCII format; the current two-year borrower correspondence file as maintained by the area in image format; and special application programs.

In these examples the data file information can be imported into a spreadsheet program for analysis, the ASCII format information can be imported into the word processing program for inclusion in a memo, the image format can be accessed and read (including any handwritten comments in the margins), and the application program can be loaded into the PC and executed.

An important benefit is that the information is accessible to several employees at the same time, and their use of it does not reduce the access capability of others. For example, the borrower file can be reviewed by an area employee while an Administrative Services Division employee is printing it to fulfill a Freedom of Information request. At the same time, employees in all four electric areas are importing ASR information into the spreadsheet program for borrowers in their area. Since they are doing it on their own MUPC or work group PC-LAN, they do not affect the response time of the others.

Other governmental and commercial organizations are using the CD-ROM technology to publish their data bases or programs. Some examples include the U.S. Cen-

sus Bureau, National Oceanic and Atmospheric Administration and the National Institute of Standards and Technology. There is also a special interest group that is looking into publishing a FEDFORM, which will contain Standard Federal Forms. Some commercial publications are Microsoft Bookshelf, a library of 10 useful reference works and tools for writing, and Grolier's Electronic Encyclopedia. REA can review and evaluate these external publications to determine if they would be beneficial.

The use of this technology by several vendors means that REA will not be locked into their solution. Plus, the competition should mean that less expensive equipment with greater capabilities will be available.

REA will produce a CD-ROM on a predetermined schedule. For example, in the beginning CD-ROM may be generated once every six months. The first issue would contain information currently on magnetic media (such as several years' Annual Statistical Reports, Borrower Statistical Profiles and Borrower Operating Reports data) in addition to present revised staff instructions and bulletins. The next publication would update any previously published information and begin to include image files of operating reports in addition to staff instructions and bulletins that had been re-keyed into a word processor.

Output Process Systems

The proposed REA output system contains several important elements. These elements not only include paper (hard copy) output devices in the configuration, but also the formatting of the data/information in preparation for appropriate electronic storage media.

The consideration of the system of operations in transmitting information from the output system is directly related to the availability of information access. This overall information management process generates exponential benefits throughout the system life as the data bases grow and the system's retrieval capability increases. This output system adopts a framework of the IRM records functions, and prepares REA for further incorporation of new technology.

The output system, coupled with the information access component and the connectivity component, produces a dynamic

resource for REA employees. Dynamic routing of output to any node in the network is possible. When the work groups have developed experience, the output routing will often remain in machine-readable form and will not have to be printed to paper.

The following scenarios provide separate examples of the output system in operation. (1) An area office sends a loan recommendation to the assistant administrator for approval by printing the loan recommendation (with agency logo, forms, charts, etc.) on a laser printer in the assistant administrator's office. (2) The administrator signs a revised staff instruction and its word processing file is placed in a special location on the REA minicomputer so that it will be published the next time REA produces a CD-ROM. At the same time, the file is accessible to agency personnel as the most current version of that staff instruction. (3) A time and attendance clerk transfers current information to control office for review and transmission to the National Finance Center.

Open System Connectivity (WAN/LAN)

This component includes the major area of network connectivity. The highway between each component is based on the communications connectivity of open system standards cited in the National Bureau of Standards Federal Information Processing Standard Publication 146. This standard, known as "GOSIP" for Government Open System Interconnect Profile, provides for the application of international standards in building system networks. This standardization makes it possible to interconnect several different components in a large network, and to encourage growth, flexibility and a mixture of equipment and software types.

The following are the areas of connectivity that are included as part of the recommended REA office automation option:

- Departmental Backbone-LAN
- Departmental National Telecommunications Network WAN
- Work group Sub-LAN
- Secure Access

The open system connectivity recommendations build on and use two existing departmental communications facilities. The facilities are the departmental local area network (LAN) and the departmental wide area network (WAN), which is also called

DEPNET. The LAN will be used within the Washington complex to provide access to a user's work group PC-LAN, the REA minicomputer facility, as a modem pool to access other local computing or information resources (such as the Weather Bureau, Department of Energy and General Services Administration) and the departmental WAN.

With access to the work group PC-LAN, the user can use the work group's shared laser printer, access and update work group tracking systems, and transfer files to other work group users. With connection to the REA minicomputer facility, the user can access the Borrower Information System, connect in a remote batch mode the National Finance Center and the National Computer Center in Kansas City, transfer files to other work groups, use a high-speed laser, line printer or special peripheral (such as a tape drive) and run special agency applications that reside on the minicomputer.

With access to the departmental WAN, the user can connect to TELEMAIL to send and receive information from the field staff, connect in an interactive mode the National Computer Center at Kansas City for information in the agency's accounting system, connect in an interactive mode the National Finance Center in New Orleans for agency information in the departmental Electronic Processing Administrative Management Systems (Procurement, Property, Personnel and others).

By using the departmental communications facility, the agency benefits by not having to spend personnel resources to procure, maintain and upgrade these services. When the department upgrades a facility, such as it is beginning to do for the WAN, the agency will gain increased capabilities. However, these benefits are not without cost. For example, in fiscal 1989 the Green Book estimate for charges to the agency are \$59,200 for Telenet (WAN) and \$36,393 for the LAN.

Examples Of Automation Need

The purpose of this section is to discuss how the proposed system (had it existed) could have benefited the agency in the past, and how it will help comply with recommendations made by the USDA Office of Inspec-

tor General under audit No. 09099-4-At.

The first example involves an REA borrower that is currently in severe financial difficulty. The last financial assistance provided involved the borrower's increasing its indebtedness by \$100,000,000. At the time this financing assistance was approved, REA staff had raised significant concerns regarding the results of the borrower's load-growth projections. Based on the information available, REA staff believed that the borrower's projections were overstated by at least 3% (from 9% to 6%). This change in the projection would have delayed the need to commit to facilities for one year, possibly two.

The information in question was part of a large data base that was only available to the staff in hardcopy. The burden of proof had shifted to the staff, since the borrowers had properly followed REA procedures in the preparation of their load projections.

These two conditions effectively hamstrung the staff in their attempts to bring this information to light in a credible manner for REA management. This inability deprived management of the needed information to comfortably question the timing of the borrower's request. Therefore, the request was approved. With benefit of hindsight and improvements in data access and processing capabilities, the REA staff was able to identify the salient data and present credible arguments to support their findings.

If REA had delayed its approval, actual load data would have confirmed REA staff's argument that the borrower's load projections were indeed severely overestimated (from 9% to 4%), and the borrower would not have incurred an additional \$100,000,000 debt guaranteed by REA. With effective access to the needed information this exposure to financial risk to the government would most probably have not been incurred.

This example is important because the risk taken would have been reduced and the potential financial loss avoided if an information resources management solution had been in place. There is a relatively high risk that these funds may never be recovered.

The second example supports recommendations from a Department of Agriculture, Office of Inspector General (OIG) audit of REA's loan procedures. Recommendation

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No.3 to "Develop or acquire expertise and needed equipment to verify project simulations, assumptions and projections produced by computer-based modeling techniques" is addressed by this OA plan. While this office automation study was initiated independently of the OIG recommendation, the proposed system will provide the necessary informational access and data processing capabilities needed to address the recommendation. However, the proposed plan does not address specific expertise or application software needed.

Our interpretation of the OIG recommendation highlights the necessity to maintain relative parity with the planning capabilities of its borrowers and the industry as a whole. The proposed OA plan will provide REA with the needed resources to meet this goal at a fraction of the OIG estimated cost, and with improved capabilities over a system installed in the early 1980s.

The proposed system will benefit the agency through a more thorough and independent review of the information and studies submitted by REA's borrowers as demonstrated by the first example discussed herein. The system will also address concerns of the OIG discussed in example two.

Major Information Management Issues

In determining how best to design a system that would meet all of the mandatory requirements and the most cost-effective mix of the desirable requirements, multiple alternatives were considered, both in designing the specific systems and in the overall records management procedures within which the system would be used. From these alternatives several major design issues were defined, and for each issue, multiple design options that represent the principal ways of meeting the desirable requirements.

Data Management

- Deals with possible methods of configuring the system database to define a hierarchy of access and control and regulation of data storage and retrieval. The alternative options were defined as a single common database or personal databases for each staff member.

Indexing Techniques

- Defines the different means of indexing documents for storage on an optical disk-based system. The alternative options are limited indexing (e.g., cover information, table of contents); selected indexing (e.g., relevant keywords); and, full-text indexing (e.g., index all keywords found in text).

Physical Access

- Relates to the physical distribution of the system resources among the staff at REA. The alternative options were defined as personal access (e.g., access from each analyst's office) and central access (e.g., access only in a central location such as the library).

Accessibility

- Relates to the accessibility of agency information. The agency should make more information available in electronic form to its staff and borrowers. Some examples include REA bulletins and staff instruction, borrower operational data, material lists, field staff access to the Borrower Information System and loan application status, and microcomputer programs for borrowers to collect data such as borrower operating report data.

Reliability

- The system must be very reliable and provide for a backup that is easily and quickly accessible.

Flexibility

- The system must allow for the integration of special purpose electric and telephone industry software, such as financial analyses and power planning software. In addition, the system must allow for easy movement of equipment such as terminals, printers and personal computers.

Quality Improvements

- The system must provide a means to access and analyze data in an easy-to-use process while also allowing the user the tools to analyze the information in a new manner without need of a computer specialist to develop new programs.

Building Alternatives

During the first phase of the project, the internal consultant completed a series of facilitation sessions and interviews with the staff at REA and reviewed relevant docu-

ments to assess the information management procedures in place. Through the sessions with analysts, division directors and branch chiefs, the internal consultant acquired a broad understanding of the ways that information customers file and retrieve their documents, the lack of guidelines for retention and storage of information, and the methods for improving access to documents retained.

Based on the existing information management procedures in REA, and needs expressed by the staff, the internal consultant defined a number of key products that benefit by this office automation effort. The key products analysis supports the following for inclusion in each component:

- Increase access to information.
- Load and store source documents.
- Support a method of indexing.
- Provide efficient search and retrieval capabilities.
- Enable storage of documents that already exist in ASCII form.
- Reduce volume of storage space needed at REA.
- Establish a data management hierarchy within REA.
- Implement and enforce practical indexing standards.
- Provide personal and common storage space.
- Complement planned document storage procedures.

Components Related To The Alternatives

Each alternative contains components that are given elements of the overall recommendation. This means that some system configuration components must be priced and included in all the alternatives. For example, "Telenet, Telemail" and output systems.

The office automation alternatives available to REA have been reduced to four groups. Alternative 1 is the *central system*, which has the capacity to process all databases and to control terminals for the entire REA staff. Alternative 2 is the *distributed system*, featuring personal computers with capacity to download needed information

and processes in a stand-alone mode. Alternative 3 is the *central system with a write-once, read-many (WORM) component* as part of the mainstream system. Alternative 4 is the *distributed system with compact-disk, read-only memory (CD-ROM) optical information management technology*. This includes the functional capability of mass storage enhanced with retrieval mechanisms driven by artificial intelligence.

The highest cost for each individual element is used to evaluate the four alternatives proposed in this report. In this way the planning process is assured of providing sufficient capacity and justification to balance the benefits side of the spread sheet.

The cost benefit model was completed following the guidance provide by the USDA to project the outcome (net value to REA in terms of productivity increases after the associated investment) of distributing the workstations at varying ratios among the users. The internal formulae of the model, designed by the USDA, summarizes and weighs input on costs (for hardware, software, maintenance, installation, connectivity, communications, general project overhead, etc.), and compares them to the benefits (productivity gain converted to dollar based on salary of specified users).

Two additional scenarios were then explored: (1) a three-quarters maximum productivity increase which, at 13%, the agency average corresponds to the industry standard of 12% (for the anticipated gain from office automation); and, (2) a one-half maximum productivity increase which, at an 8% agency average, represents a conservative view of the benefits of office automation. Industry projections for benefits provided assurance that the REA solution for information management should definitely be pursued further. Therefore, the USDA cost benefit model was used to formulate appropriate comparative analysis. Regardless of the scenario, realizing these productivity increase rates is dependent upon the achievement of workstation distribution and information access to each user.

Early analysis of the cost benefit model provided insight about the exceptional benefits of Alternative 4, the distributed system with CD-ROM. Based on this notion, Alternative 4 underwent a conservative allocation

on the benefit side of the model. Additionally, on the cost side of the model, Alternative 4 contains conversion and development cost that could just as well be entered in the models of the other alternatives but were not.

Further analysis of additional cost entry for the other alternatives would not result in a significant change in the recommendation. Therefore, if the more extensive cost would be entered into alternatives 1, 2 or 3, they would be presented as even less desirable.

Alternative 1: Central System

This alternative is based on the concept of centralization of resources and controls. For REA this means that the REA minicomputer facility is configured with multi-CPU's and proprietary connections to disk-less terminals. This configuration requires a large and specialized computer staff to manage, operate and provide service to the agency.

The REA mini stores all software, terminal accesses, central resources and data. For example, word processing software resides on the REA mini and is therefore not available to the terminal whenever the central resources are down.

The minicomputer component of the proposed REA office automation plan contains the nucleus of applications, case status and project management activities. This design includes an electronic calendar to keep executives and all employees in the work group organized and on schedule. This system tracks management objectives and goals, coordinates meetings, sends reminders of deadlines and warns when a case falls behind.

This component contains some agency information and has a limited information access component. This is due to the central demand for office automation services and traffic at the central node (mini). The greater portion of funds, hardware and software, and services is directed to basic office automation activities rather than available information management technology.

As noted earlier, the functional capability of the office automation mini is based on Unix in terms of the government standard for POSIX, Federal Information Processing Standards Publication 151. The major applications on the REA minicomputer will be word processing, project tracking, the Borrower Information System, Borrower Oper-

ating Report Processing System, Remote Batch access to NCC-KC and NFC, application development and testing resource. The output process system is dedicated to the central node (mini) and accessed through the mini.

Cost/Benefit Analysis

The major cost items of this alternative are the purchase of two large minicomputers, terminals, remote job entry software, data base management system, project management and control software. It should be noted that in the fifth year both mini computers will reach their maximum terminal capacity.

The major benefits for this alternative are increased productivity for employees working with automated tools and the availability of information in structured data bases.

Alternative 2: Distributed System

The REA minicomputer facility houses one of the major output process system elements. This element is the staging of REA products for subsequent storage or publication in machine readable form. Once REA products are properly formatted, routing to other facilities for processing, storage or publication can be accomplished.

The MUPC contains various degrees of power and storage. The minimum configuration contains one megabyte of random access memory (RAM), at least 40 megabytes of mass hard disk storage, one or more LAN boards, color monitor high resolution, and keyboard. The maximum configuration at this time contains 16 megabytes of RAM, 130 megabytes of hard disk storage, one or more LAN boards, 14-inch color monitor and keyboard.

The output process system, in addition to providing staging capability for formatting and synchronizing REA products, contains the software and hardware for daily printing to output devices via the open system connectivity component to any location in REA. This provides REA with the capability of printing within the work group, to other work groups, or to specific individual output devices. For example, a memorandum can be created in one work group and passed around to other work groups in draft form. It can be edited several times and a final sent out, all without being printed to hard copy. Then, copies can be printed at any output device as required.

The open system connectivity component contains an additional element beyond the central system in Alternative 1. This element depends on the use of LAN connectivity technology. This is found in the DEPNET and the REANET defined as a sub-LAN for work groups, or a PC net.

The REA minicomputer facility processes and stores only limited volume and dated data. The MUPC is power-driven for "stand alone" use, but can connect to use resources in REA or USDA. Critical software and data is stored locally at the lowest level. Special use or shared software resides on the REA mini facility.

Cost/Benefit Analysis

The major cost items in this alternative are the purchase of a small minicomputer, file servers and personal computers. The emphasis is placed on the personal computers and connectivity. The minicomputer, file server and 33 personal computers are purchased in the first year. Software on the minicomputer provides remote job entry access to the National Computer Center in Kansas City and the National Finance Center in New Orleans. A data base management system, project management and correspondence control software are also purchased. In the second through fifth years, additional personal computers, file servers and laser printers are purchased.

The major benefits in this alternative are the increased productivity of employees working with automated tools, an increase in reliability because of the distributed nature of the computing resources, and the flexibility the personal computers add to the ability of a functional information customer to analyze and add value to data.

Alternative 3: Central System Plus WORM

Information access is built on the basic distributed system concept. The central information access component (WORM) includes the full IRM area of records creation, storage and retrieval, leading a specific area of technology. However, long-term implications of this type of information access system generally lead to a central storage dependency.

Cost/Benefit Analysis

The major cost items in this alternative are the same as Alternative 1, plus WORM equipment, software and data preparation.

The major benefits in this alternative are the same as those in alternative one in addition to availability and completeness of data.

Alternative 4: Distributed System Plus CD-ROM

The main high-volume software and critical data resides on the MUPC. Records management of REA's "corporate" information is controlled and distributed to the lowest point of use. Critical tools are also at the lowest possible point, for example, word processing. This results in a high degree of accessibility to a large amount of information.

Cost/Benefit Analysis

The major cost for this alternative are the same as the second alternative in addition to CD-ROM equipment, software and data preparation.

The major benefits for this alternative are the same for the second alternative in addition to increased availability of data (information access), completeness of data, flexibility of systems architecture and ability of REA borrowers to also derive benefits.

Recommendation

A distributed system with distributed information access, Alternative 4, is recommended as the best option for REA's office automation effort. This recommendation applies the strength of Alternative 2, which places information management power at the strongest levels of organizational activity, and adds the excellent benefits of optical CD-ROM as the vehicle for mass storage and advanced information retrieval capability.

The essence of this recommendation consists of careful architecture planning and balancing for each critical component. Each component in the distributed system with distributed information access is optimized for short-term service while providing a firm foundation for embracing continued information management developments.

The distributed system provides greater productivity, encourages strong potential for adaptability, provides a posture for growth and incorporates new technology, tools and techniques. The relationship between costs and benefits for the short term does not favorably support Alternative 3 (the central system with WORM) at this time. However, the CD-ROM approach has a high pay-back advan-

tage from both the short- and long-term point of view.

The design of the recommended solution embraces key common steps inherent in the optical media preparation process. This position will give REA the opportunity to utilize the WORM technology in the long term. The specific preparation steps are: information engineering architecture design, data capture; database building; and file organization.

For the long term, the REA will be positioning itself to take advantage of future automated capabilities by performing two major steps: first, the training of employees in the use of automated tools; and second, the converting of REA information to an electronic media. Both of these steps will allow future automated capabilities to be investigated with reduced expenditures of time and money. This will allow quicker movement to the most cost beneficial capabilities in the future.

Continuous Process Based On A Funded Architecture

REA worked through all phases of the information engineering life cycle from 1988 to 1992. Information resource products are mainstreamed into the information collector, also referred to as the repository, for subsequent use by the functional information customers.

Based on the solution architecture constructed in 1988, the benefits of the system continue to be noted in addition to an unusually high degree of user acceptance. The five-year planning cycle is updated each year and further funding is secured. Strategic quality leadership methods conducted with facilitated sessions promoted by the functional information customers is a critical factor in this success story. JSM

M. Demarco Johnson is director, functional integration architecture for the U.S. Department of Defense. He serves as a member of top management with responsibility for the planning and assessment of information resources and the associated convergence of the separate technologies. Active in ASM since 1978, he is currently a member of ASM's international board of directors.