

Experience gained in implementing ImagePlus

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An ImagePlus™ internal use program (IUP) was established in IBM to assist users inside the company with their initial application selection and their training, procedure definition, and prototype system installation, as well as their initial use of the system on a regular working basis. This paper discusses the experience gained from identifying, selecting, and preparing several areas within IBM for an ImagePlus system. The experience begins with establishment of IUP objectives and guidelines, continues through the account nomination and selection process used to identify and select the application, and ends with identification of the justification or business case process and some of the major elements considered in the justification for the purchase of a system. A detailed description of several internal operations that have installed an ImagePlus system is given. In conclusion, ImagePlus as an application enabler is discussed.

Today's image processing technology provides cost-effective system solutions for the improvement of paper-intensive business procedures. With paper-intensive procedures, the flow of paper documents is a major factor in determining the amount of time required to complete the processing of information in an enterprise and thus to arrive at business decisions. Paper handling lends itself to lost, misplaced, and misfiled documents (papers) and can inject errors into a paper-intensive procedure. The ImagePlus™ system can improve the quality of the procedure by decreasing the number of errors inherent in the handling of paper, thus improving the "information flow speed" in a procedure. The timeliness with which information enters into the decision support system is improved, leading to more timely business decisions.

Business procedures that involve assets such as contracts, invoices, legal records, patent and copyright records, or chemical records, for example, represent the revenue of a corporation. Handling such records in electronic form through image processing improves the quality of a procedure by decreasing the number of misplaced or misfiled papers, and shortens the time for accessing information from hours and days to seconds and minutes. Electronic records also permit better management of procedures through improved auditing and automatic work flow.

The growth of business has been accompanied by increases in the volume of paper to the point where using paper has become an impediment to automating the business procedures any further. Processing a transaction often involves the use of one or more coded data, or computerized, applications in conjunction with paper documents. Using paper with coded data applications also limits the possibilities for automation that are practical or that can be justified for the coded data applications. ImagePlus provides not only a cost-effective means of reducing or eliminating the use of paper, but it also unlocks opportunities to improve the automation of associated coded data applications.

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Numerous business procedures exist in IBM that involve the use of paper to a varying extent. Within IBM we are using the ImagePlus products to automate paper-intensive portions of selected key-asset busi-

Only key-asset line-of-business applications are selected for the program.

ness procedures. Our objective is to improve user satisfaction by improving the efficiency and effectiveness of these selected business procedures.

This paper contains a detailed description of several applications used inside IBM for which an ImagePlus system has been ordered or installed. They include the contracts management application for the IBM US Marketing & Services Business Systems Contract Management organization, the import and export records management application for the International Purchasing Office, the research and development application for IBM US Marketing & Services Business Systems Research and Development, and the applicant-for-employment records management application for Personnel Records.

ImagePlus internal use program objectives and guidelines

An ImagePlus internal use program (IUP) was set up in IBM during the early ImagePlus product availability period. With the implementation of this program, the following guidelines and objectives were established to ensure that the product would be utilized in selected internal areas, or accounts, where the resources for its use were available.

The objective of the IUP is to have a means to work with users in internal organizations to the point where the ImagePlus system is installed and running. At this point, their education and training is considered complete. Thus, they can execute the phase of installation leading to full-scale production on a regular basis and act as a focal point for image

processing knowledge at their site and for the identification and implementation of other ImagePlus applications.

Organizations selected must have executive-level support. Such support is a critical and necessary element to ensure that management is informed of the project status and is responsible for commitments and expedient decisions.

Only key-asset line-of-business applications are selected. The efficiency and effectiveness of these applications has an immediate and direct effect on delivery of IBM products and services to IBM's customers, thus directly affecting customer satisfaction. Because these key-asset procedures are important, the measurements for the flow of their applications and the flow of paper within them are readily available. Having the measurements contributes to the timeliness with which the justification can be completed. These important applications are auditable at the overall procedure level and at the individual department level.

To meet these requirements, the individual departments keep a copy of their input and output in the form of paper document file folders. The file folder may also contain papers that were used in decisions and that are necessary for the identification of audit trails. The file folder may further contain computer printouts from coded databases, forms, image documents, signatures, and quality check-off sheets. The computer printouts are kept in the file folder because the databases from which they were generated are large. Thus, archiving snapshots of the database is not cost-effective. An example of such a database is one containing product prices.

The file folders are maintained in an organization referred to as a data bank. The data bank also registers new documents and retrieves file folders on request. It has records management and retention responsibilities. Each new document coming into the organization is registered in the data bank. This registration process may involve receiving mail from the mail room, opening the mail, removing the contents, visually scanning the document for content and then, based on content, keying the keywords as search arguments into a relational database. The system then records date, time, and point of receipt for the document. Next, the distribution list is determined on the basis of document content and identifies the number of copies that are made and distributed. Thus, the copies exit the data bank and enter

into the active work flow (also referred to as in-process work) of the organization. The original document is maintained in a file folder in the data bank where copies are provided upon request.

Organizations selected must have a paper-intensive procedure and the skilled resources necessary to cost-justify new products. Also, they must have the skilled resources to identify their procedure before and after the ImagePlus starter system is installed and to install a prototype system and integrate it into their application. End-user procedure knowledge, I/S or system integration skills, and ImagePlus product knowledge and skills are required within the organization.

Account nomination and selection process. The following paragraphs identify the activity and sequence of events we performed in starting up several internal IBM accounts. This process was developed through actual experience and use.

Accounts interested in using ImagePlus first contact the IUP project manager. In a telephone conversation the application is discussed and verified to be a potential ImagePlus application. An appointment is made to visit the site, meet the group that will be using the application, present a course on ImagePlus, and tour the area where the application is thought to apply.

ImagePlus 101 is the name adopted for the course, which varies from one to four hours, depending on the number of questions and the size of the audience. The course is taken largely from chapter one of the *IBM ImagePlus Presentation Guide*⁷ and from the *IBM ImagePlus Justification Guide*, the latter of which is provided only to the internal accounts that will use ImagePlus.

At the first meeting with the group, the IUP objectives and guidelines are presented with the sequential steps that provide guidance on how to proceed. The steps are identified in Appendix A. We ask the group to read chapter one in the presentation guide and to review the justification guide, which contains the forms and questions that assist in identifying the application, in presenting the business case, and in system sizing. These publications have proved to be an excellent aid in facilitating the teamwork that brings together the disciplines of system integration, project management, and application development and the end-user process knowledge for a particular business application. As an example, some of the typical questions and forms contained within the

justification guide address, from an end-user's perspective, how many times a particular document is used and retrieved per day. From the system integration or I/S perspective, the questions translate into system communications and storage requirements. At the end of this visit we tour the end-user work area for each of the potential applications.

By the end of the first visit, the group has been advised that the cost-justification phase is approaching and will require the time and talent of their organization. Therefore, management and executive support are needed. Executive commitment is necessary to allocate the people resources for each of the required disciplines and to anticipate purchasing an ImagePlus system. People will be appointed to make up the ImagePlus project team. A team project manager is appointed and is responsible for all communications to the IUP program manager and for all communications within the team's own organization.

Throughout the application selection process we frequently review the key ImagePlus application selection list of questions that are given in Appendix B. This quick reference list of reminders was developed from actual use.

Over the next few weeks the people with the appropriate skills are selected and form the ImagePlus project team. Then the second visit to the site is scheduled, by which time the team has reviewed the potential application, discussed its value to their organization, and obtained executive approval and support. During the second visit we attempt to select a starting point within the overall application. With procedures involving numerous departments, the purpose is to find when the paper documents first arrive in the corporation. From this point of origin, the paper flow is briefly mapped through the departments to identify service units, to the point where the paper processing is completed and the paper is archived. When the flow for the procedure is completely determined, the most likely place to use the ImagePlus starter system is identified within the overall procedure. Typically, this system will replace the paper document file folders in the data bank. This initial application is a starting point that serves to be productive and to assist in putting the organization on a learning curve. This prototype system is extendable (preserving the investment of the organization) to provide for future requirements such as remote communications and new product and technology enhancements. At this point the major ele-

Table 1 Reduction of paper storage costs

On-Site Storage (Two years or less)		Long-Term Off-Site Storage (Seven years or more)
Stored on site for convenience of access		Typically through vendor service
Amount of on-site storage space is a determining factor		High ongoing stor- age costs High retrieval costs
In-Process Work	Completed Work	Retrieval rate less than rate experi- enced during on- site storage period
Work is active from several days to several months depending on application type	Paper is retrieved from data bank and is used for reference only Retrieval rate is less than the rate for in-process work	Period determined by application, records manage- ment system, and business require- ments

ments in the business case are known and quantified. The ImagePlus starter system is configured and sized. The business case is complete when executive approval is obtained. The information-gathering activity for individual elements within the business case is completed to a common-sense level and is not an exhaustive exercise. The intent is to bring the opportunity to a decision point in an expedient manner and to meet the needs of the business.

Training is provided by the ImagePlus system design and implementation classes and given to an end-user representative and technical representative, selected from the ImagePlus project team. These classes provide the opportunity for the students to verify their application.

The ImagePlus project team develops a system installation plan to ensure that the system is ordered and installed and that the physical environment meets the system requirements.

Most of the internal applications reviewed to date are characterized by end users who are professional administrators. Judgment is used in their daily work and may involve the use of one or more coded data applications. The emphasis on the use of ImagePlus is to *remove the drudgery from the end-users' work that is directly attributable to the handling, movement, and inherent delays in the use of paper*. In this

environment, the ImagePlus starter system is first used to service a department. Then the department becomes the teacher for the remainder of the organization. The automation of a manual process within the organization becomes a standard for other measured and planned improvements.

Justification phase. During the justification phase we define the major service units within the current and new process, the major business case elements, and the initial ImagePlus system topology.

We approach the process flow of an application from the view that paper represents key-asset information and that it flows through a process similar to that of goods on a production line. The output of the process, in the form of information, enters into the decision support system of the organization and has value associated with it. With image processing, the inherent delays in the use of paper can be reduced or eliminated, thus improving the timeliness of the decision support system and reducing the need to make risky decisions.

Our business cases emphasize the initial application and its displaceable costs. The follow-on extensions to this system, as they relate to the application, are also developed in the form of scenarios or as a "view of the future." This method provides assurance that the investment will be preserved with new technology and application advancements; also, these exercises provide the view of an initial investment to which logical extensions can be made as they are developed.

The business case exercises have consisted of first identifying the objective elements, listed in Appendix C. This set of elements makes up the displaceable costs that are visible and easier to quantify than the subjective elements. Following is an example of some major displaceable elements that were addressed.

- Reduction of on-site paper storage costs (Table 1): After the file folder is closed (processing is completed, and the folder comes off the active work queue), such as when the conditions of a contract have been met, the frequency of access will also decrease. For some period of time up to two years, the paper is kept on site. As this paper ages, its frequency of access decreases, and it is moved to off-site storage. With ImagePlus, on-site paper storage is reduced or eliminated because the image data are available on line.

The time required to retrieve information on paper from the data bank can be determined by surveying the end user, and the frequency of retrieval is usually maintained in the statistics maintained by the data bank manager. With ImagePlus the image data are available on line, thus reducing the retrieval costs and improving the rate of information flow.

- **Reduction of off-site paper storage costs (Table 1):** Paper files are usually archived off site but within close proximity to the place of business for speedy retrieval. If the place of business is in an area of high-cost real estate, paper storage costs are correspondingly high. With the availability of on-line image data, the storage cost is reduced because the paper can be maintained in an area of less expensive real estate when it is necessary to keep the original paper. For applications in which it is not necessary to keep the original paper, paper storage and retrieval costs are eliminated beginning at the point in the process where the paper is scanned.

Most line-of-business applications are under pressure for quick turnaround time, requiring the use of expensive overnight mail delivery to move papers quickly. Networks for transmission of image data may reduce these costs and improve the rate of information flow.

In complex paper-flow processes it takes time to manually track down and locate a piece of work that is in-process. With ImagePlus work-flow management, the location of in-process work can be determined by a system query. As paper flows through the service units, completion is identified by a check mark on a paper or by making an entry into a relational database. With ImagePlus this action is automatically performed by the system, complete with time stamps and routing information that is available for process management reporting.

The above description is intended as an example of areas within the business case that we have considered. In most situations, the measurements for the objective elements are already available or can be easily determined by a simple task analysis such as described in the following paragraph.

What is the length of time required to retrieve a contract from the data bank? The subtasks are: walk to the data bank, complete a request form and place it in the in-basket of the data bank, then return to the place of work. After the designated data bank

retrieval time has passed, return to the data bank and obtain the copy, and return to the place of work.

If an organization can apply metrics to the value of information in relation to time for one of their operations, the improved rate of information flow can also be used as an objective element in the business case. We have found this set of metrics to be application-dependent. To develop the scenarios for these metrics, we use the question: What is the negative value of a lost transaction? In other words, what is the cost of a lost or misplaced invoice or contract? The loss of the paper document is a direct loss of business and therefore lost revenue. The question is, what is the value in improving the turnaround time for information, thereby improving the time within which the information is available for business decisions? Improved information flow contributes to the quality of decisions, thereby reducing risk.

Our findings have determined that in processing applications organizations do not copy and archive a paper copy of the original paper. With ImagePlus, the key-asset data can be archived on a second copy of the storage media and stored off site in a vault. Thus, the data management portion of the disaster recovery system for an organization is improved.

Contract management application description

The contract management business procedure of IBM's US Marketing & Services organization is responsible for the effective and efficient processing of IBM's customer contracts. Figures 1, 2, and 3 depict an overview of term lease agreement (TLA) processing, which is the first production application using ImagePlus within the contract management procedure. Figure 1 illustrates today's paper process, and Figures 2 and 3 show use of ImagePlus first within the local term lease department and then as the strategic method for remote branch offices. The strategic system will not only provide term lease processing but will also provide a records management system and support numerous ImagePlus applications.

In today's business world one of the key drivers to continued success is the ability to produce, distribute, process, retrieve, and store paper efficiently. IBM's contracts are produced, signed, processed, distributed, and retained as paper originals and copies. This paper process has become a major inhibitor to business efficiency and growth. Paper volumes continue

Figure 1 Asset management TLA/IPA processing

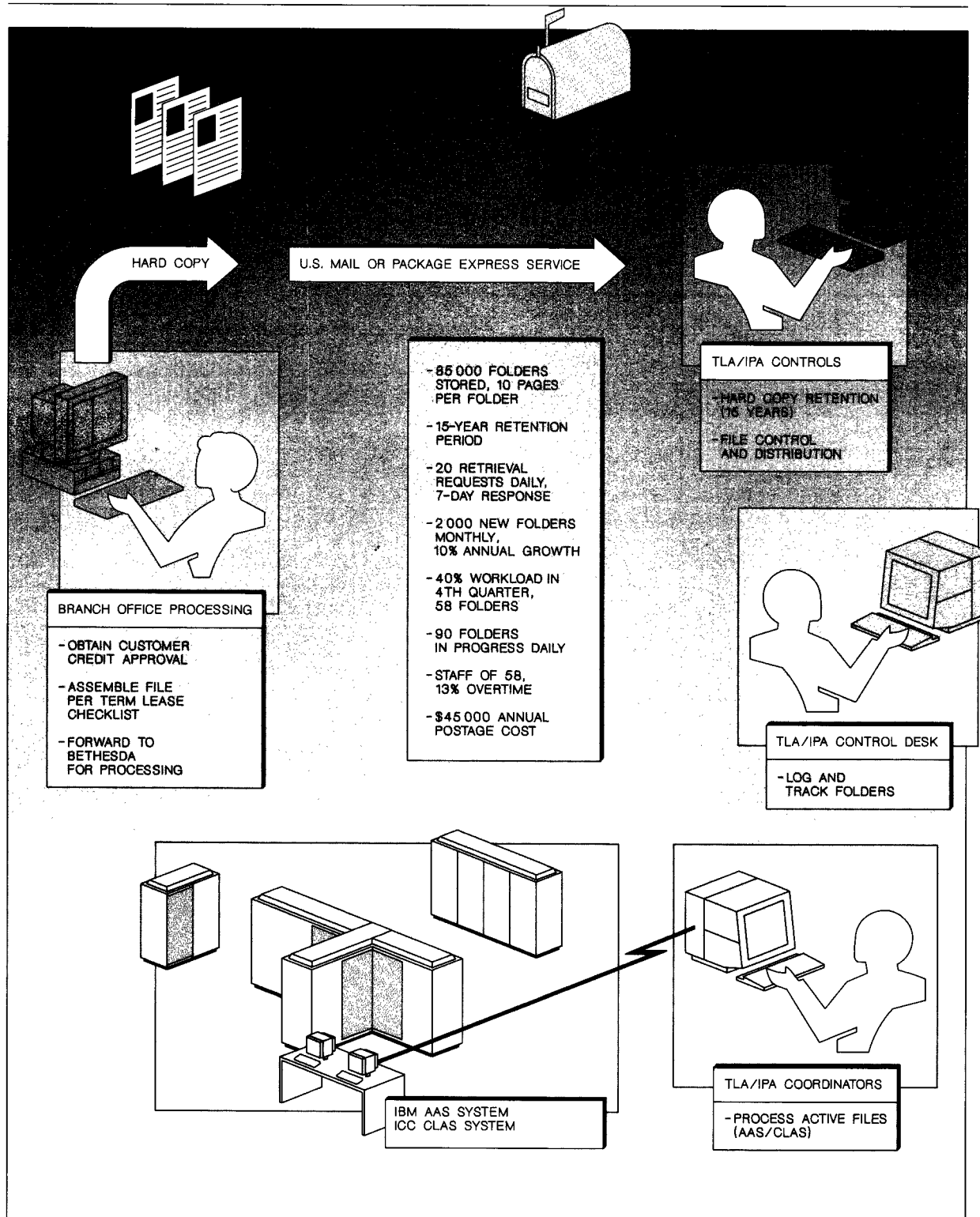


Figure 2 Asset management TLA/IPA processing—tactical image installation

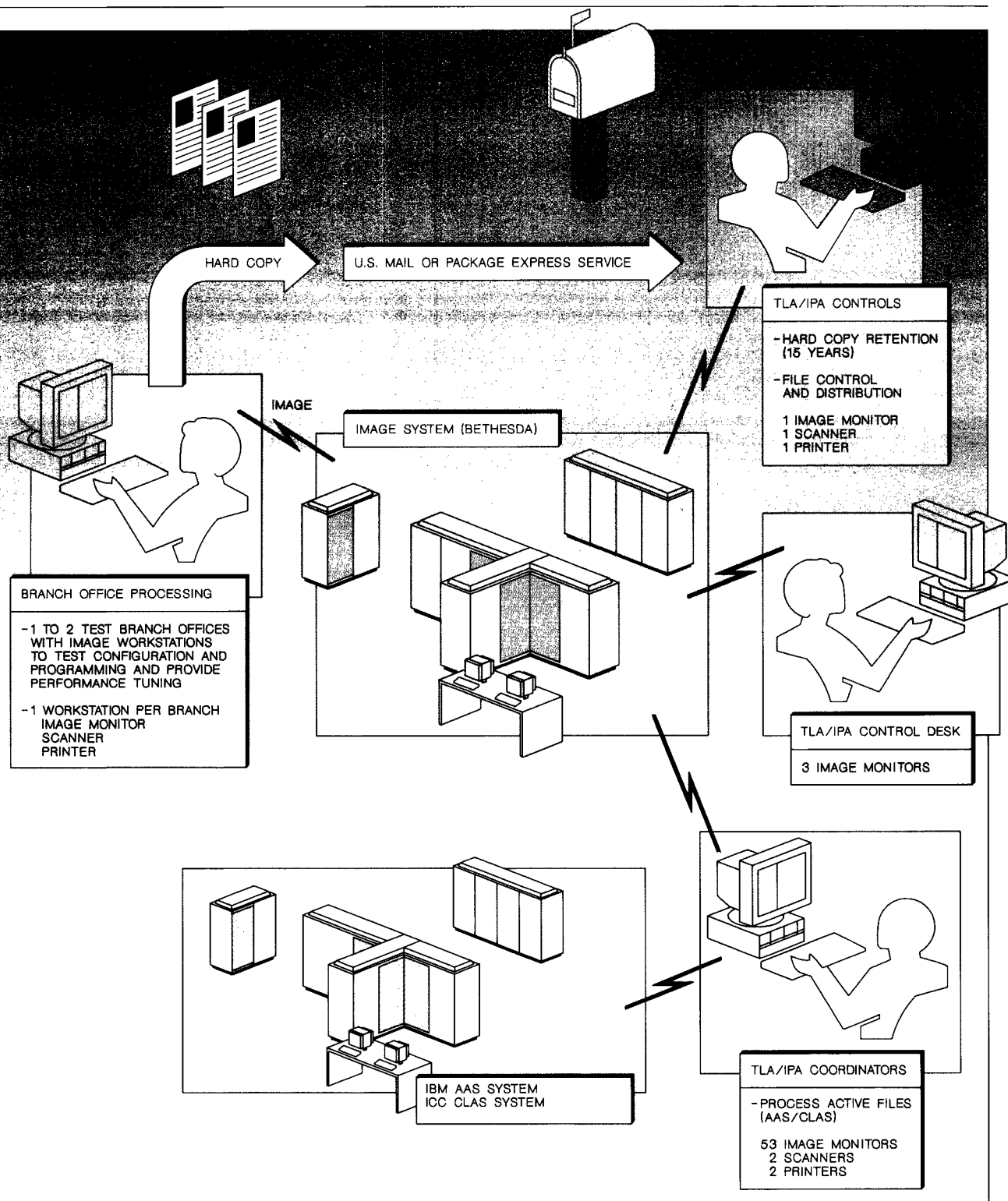
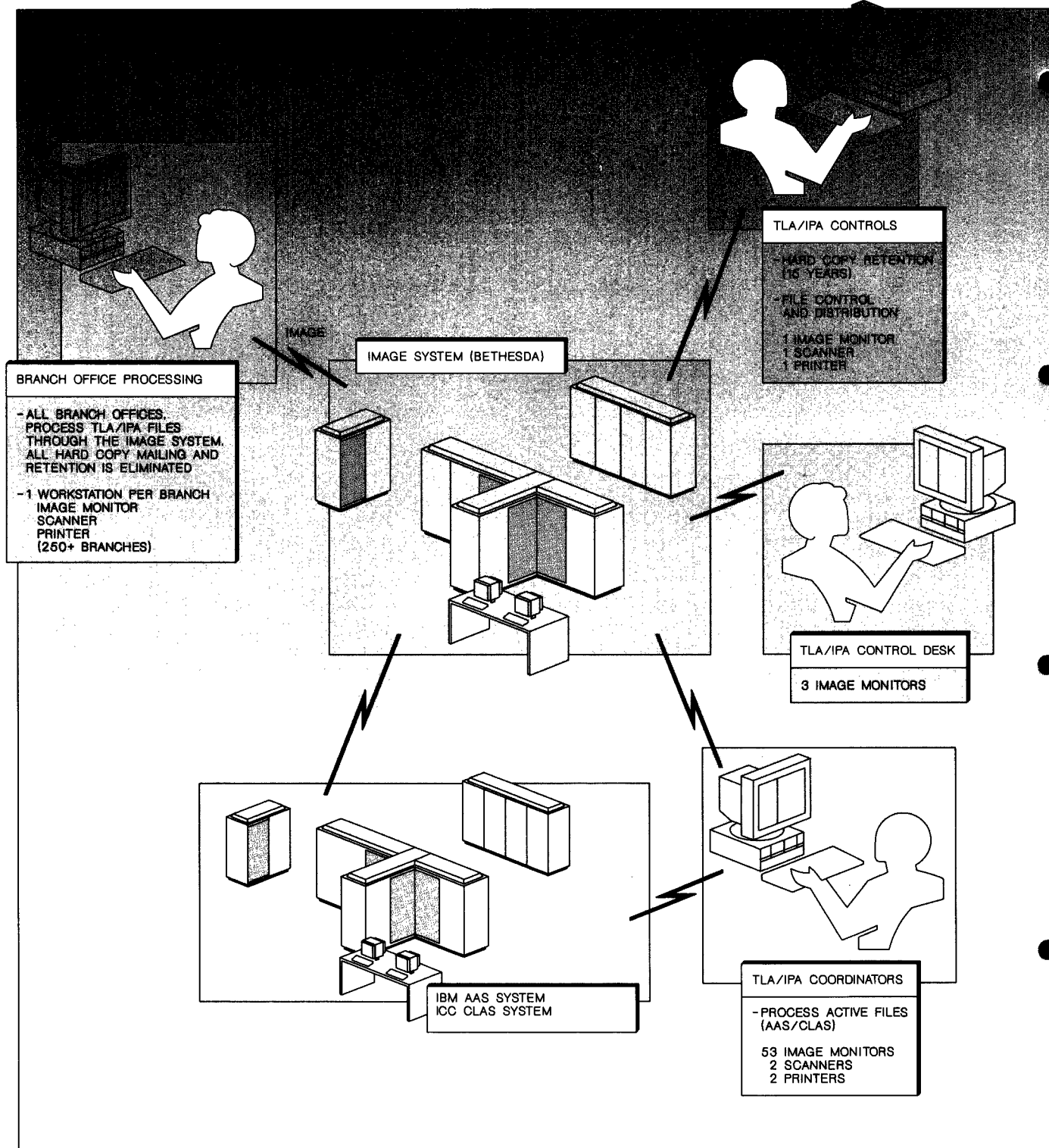


Figure 3 Asset management TLA/IPA processing—strategic image installation



to grow with many duplicates stored in multiple locations. In addition, legal requirements cause continued growth in storage and retrieval expenses. ImagePlus promises to provide a cost-effective alternative and allows Contract Management to expand beyond the boundaries of where all of this paper is located.

Business problem being solved. The Contract Management people began an effort in August 1988 to identify methods to improve the distribution and retention of paper within their organization. To ad-

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minister a typical customer contract a paper file is created, which includes paper copies or originals of signed contracts, supplements, customer correspondence, invoices, and supporting documentation of any kind that might be needed to ensure complete management. For most files these contracts are kept in the branch offices that create them, and the information they contain is difficult to access from other branch offices or locations. Data contained within the contract is loaded into data processing systems to track fulfillment and to bill for products and services rendered.

In many cases, to provide control for key-asset procedures such as term lease processing or for a national account where many branch offices may be involved, the complete paper file is mailed to a central headquarters department for processing. In this case, a copy is maintained in the branch as well as in the headquarters department. Since the branch can no longer view the current file, good communications must exist to ensure timely processing and notification.

The June 1988 announcement of ImagePlus provided the approach that was needed to truly revolu-

tionize the way business information is stored and processed. The advantages of ImagePlus are derived from the capability of storing information in its electronic form. It allows simultaneous access to the correct level of information for all users. Multiple copies are no longer needed. Mail costs and delays are eliminated or reduced. All additions to the image file are immediately available to all users. Multiple location retention is no longer necessary, and the cost of paper storage is reduced or eliminated.

In addition, the processing workload can be balanced by allowing the file contents to be worked on at many locations, not just at the location where the paper resides. Today, personnel must be moved to the paper to handle peak workloads. The contracts management operation has unique workloads that peak at the end of each month and also during November and December of each year; thus the improved portability of the procedure can have high value.

Integration approach. The contracts management procedure spans many different locations and organizations. We choose to start with a small part of the business procedure, preferably self-contained within one department, rather than integrate ImagePlus into the line of business, determine how best to utilize it, and then put it into use globally.

The processing of term lease agreements or contracts was selected to provide a pilot installation of ImagePlus. Activities of the procedure were reviewed in detail, and line-of-business personnel were involved to determine the applicability of image processing for the line of business.

Term lease administration process description. Term lease administration provides administrative support for the IBM Credit Corporation, a wholly owned subsidiary of IBM that is a third-party financier. The application is distributed across different locations and organizations. It begins in an IBM branch office, where customer proposals are negotiated by marketing representatives. When a proposal is accepted, a contract is signed and then preprocessed by account administrators. This preprocessing consists of providing necessary information such as credit, pricing, and customer demographic data. Once this information is assembled into a paper file, it is mailed to a centralized processing location.

The two key primary functions of term lease administration are to generate applicable billing for all IBM

Credit Corporation lease contracts and maintain the contract files for all processed contracts. Major activities include time-stamping, logging receipt of contracts, providing billing, billing adjustment, accounts receivable processing, and management and storage of the contract to the end of the lease, and finally, archiving the completed contract.

Measurement of the current business unit procedure. To establish a benchmark measurement for performance improvement, the business procedure was mapped in detail with each activity timed.

After three months of using the pilot system at production level, without using paper, each activity is timed and compared against the benchmark. Performance improvement conclusions can then be drawn and a decision to continue with a global installation can be made.

Support structure. As with any data processing system, adequate support must be provided to ensure integrity of the line-of-business application. Plans should address initial installation activity, configuration, performance tuning, system administration (security, database maintenance, and education), software maintenance, problem determination, data integrity (backup and recovery), and future system needs.

At the time of this writing, we had completed the upgrading of the ImagePlus system to an Application System/400® (AS/400™) to take advantage of new software function and for the additional computing power. The upgrade was completed during January 1990, and we have begun to include additional workstations in the term lease organization.

IPODC Import Operations Services procedure application description

IBM's International Purchasing Office Distribution Center (IPODC) in Boulder, Colorado, has integrated an ImagePlus system solution into the import and export records procedure application. This section describes the application and how we accomplished the objective of improving the efficiency and effectiveness of this key-asset line-of-business application through the use of new technology.

IPODC is responsible for managing the business systems and operational procedures that process all import and export transactions for the IBM Corporation. This responsibility includes ensuring compli-

ance with all U.S. Customs regulations, tracking the movement of goods, triggering payment of IBM's import/export brokers, ensuring correct tender for imported goods, and handling the movement of household goods for employees embarking on international assignments. Figures 4 and 5 depict respectively the current paper-intensive process and the ImagePlus system that will serve as the solution to our records management and control dilemma. ImagePlus will provide an on-line records management system as well as automated work flow for various departments that are downstream users of key-asset data.

IPODC is being driven toward a paperless environment by numerous requirements of U.S. Customs, other governmental agencies, and various Business Partners of IBM. Efforts are running in parallel in the area of electronic data interchange in order to find the most efficient means of information exchange. IPODC felt that ImagePlus would provide a significant solution to the problem of paper proliferation within our line of business.

IBM's international trade business is an extremely paper-intensive operation. For every import transaction, numerous paper documents are generated. These documents (e.g., commercial invoices, bills of lading, government regulatory forms, etc.) are collected at IBM's broker locations and then forwarded to IPODC. If this paper-intensive procedure were left unchecked, it would cause future problems in such areas as data integrity, data redundancy, storage space, and accessibility. ImagePlus will provide a cost-efficient alternative to these problems.

Business problem being solved. In November 1988 IPODC started to identify methods to improve the management and control of paper records. A typical import transaction was initiated by one of our brokers sending a "copy" of all related documentation to the IPODC in Boulder. This package was "copied" and distributed to several functions within IPODC. After each of these areas performed an activity on their respective piece of the package, the annotated sections were sent back to the file room. Here the package was merged into a "complete" package. All of the documents were collected into a manila folder and stored on a shelf for future reference. Any group that wanted access to a particular folder or document had to submit a written request to the file room and then wait for a period ranging from 8 to 24 work hours. Once a folder was checked out, no one else had access to that particular folder. Also, a folder

Figure 4 IPODC import transaction processing

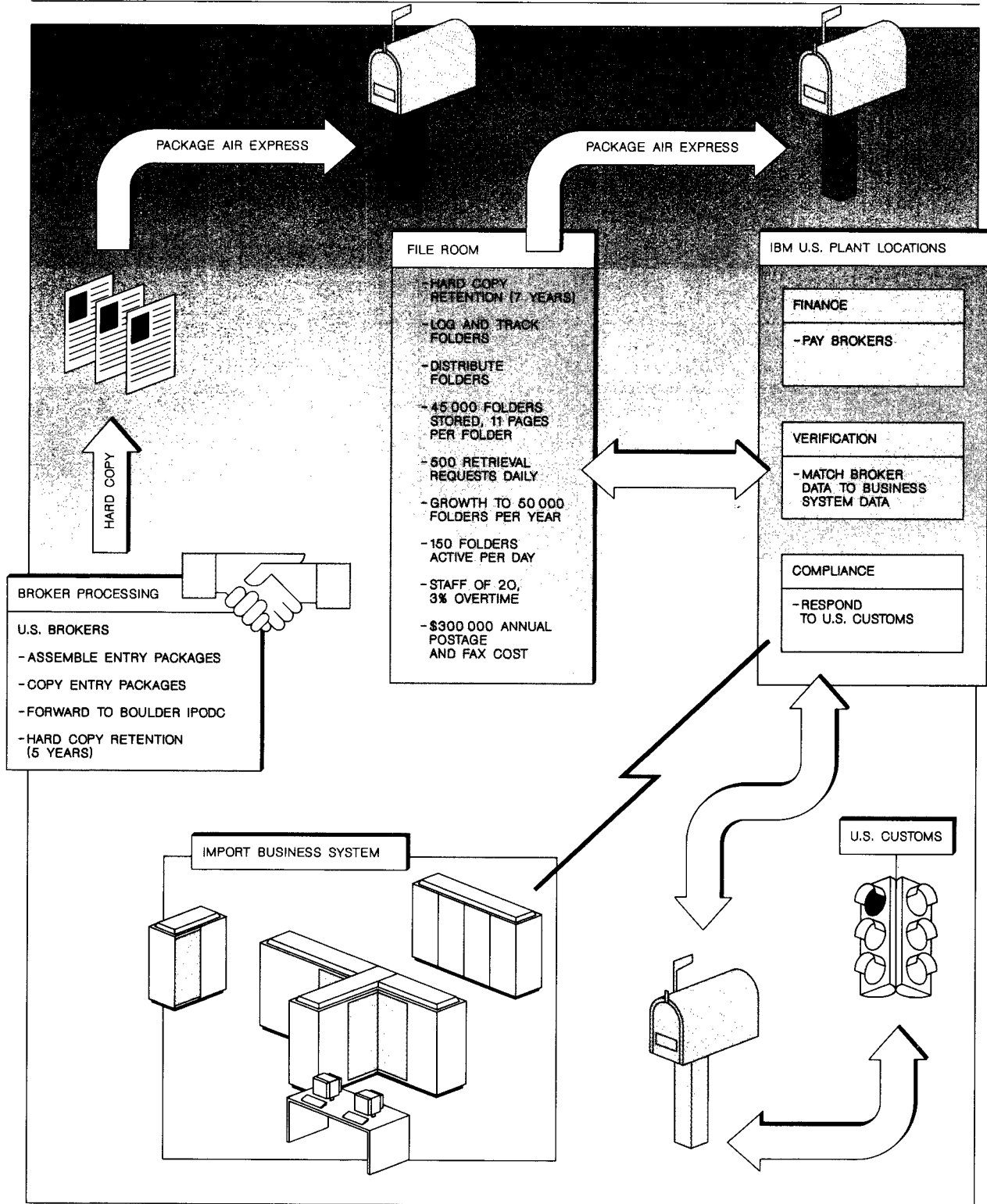
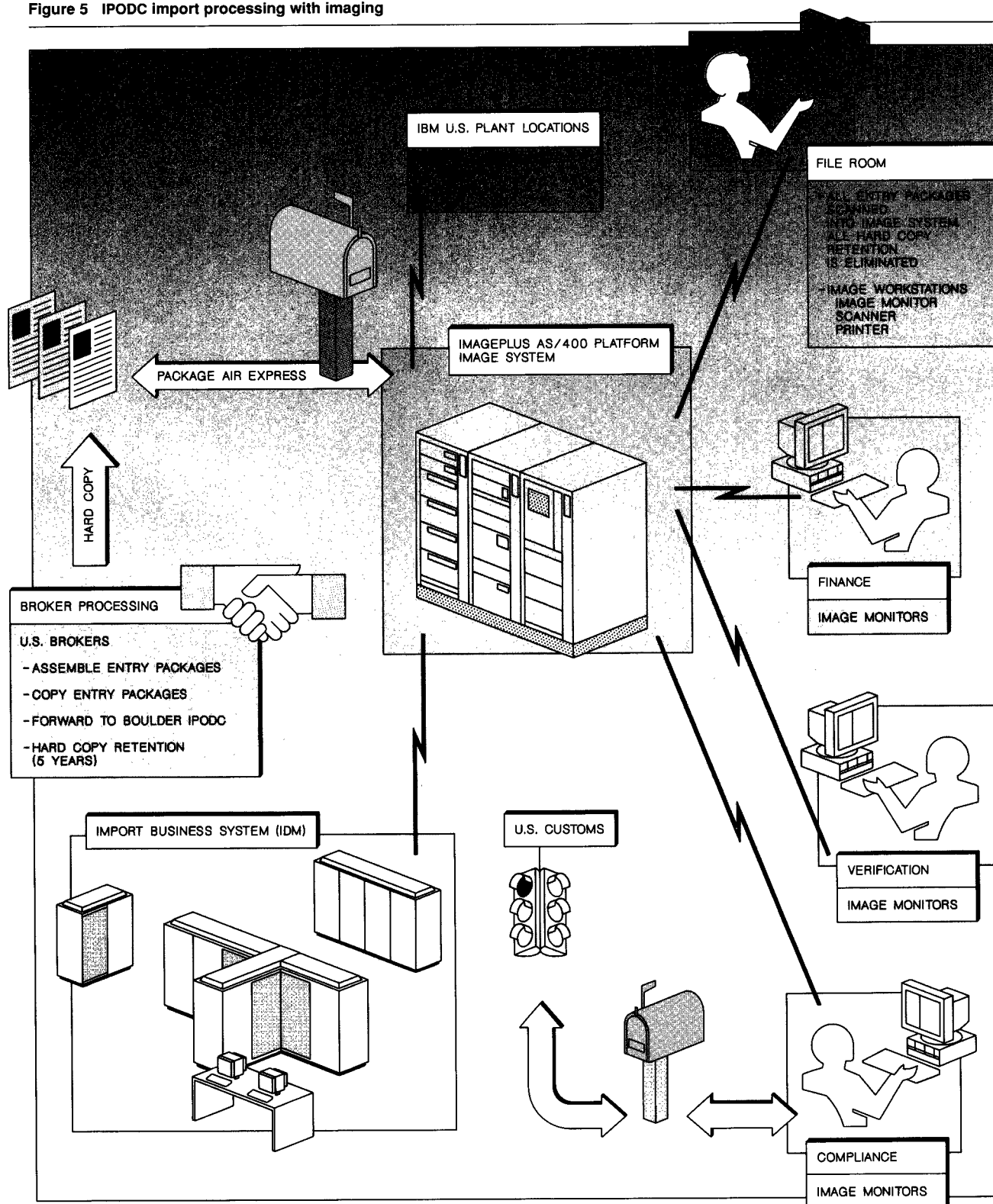


Figure 5 IPODC import processing with imaging



would often be returned with missing or annotated documents. In such a case, the file room would have to call the broker and request another copy of the

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respective document. ImagePlus allows information to be stored and retrieved as electronic images, and provides the capability to eliminate paper stored in hanging folders.

The planned objective for integrating image processing into the business procedure was to improve the capability to manage the procedure. In the electronic representation of a paper document, its image can be viewed simultaneously by all users. Also, multiple copies will no longer be needed, and mail costs and delays will be reduced or eliminated. Additions made to the image file will be immediately available to all users, thus ensuring that all users are employing the correct level of information for their process. Entry package data integrity and control is assured through the capability of the ImagePlus systems to timestamp the entry package and all updates to the electronic file. This capability also improves the audit trails and provides for improved accessibility to the audit tracking and recording information. The risk that would result from loss of valuable customs documentation has been eliminated, and the information is accessible within minutes and seconds compared with the old process that provided access within hours or days. In general, we have found that the capability to manage the process has been enhanced through the integration of new image processing technology into the line of business. Errors and delays that were injected into the old manual process by the handling and movement of large volumes of paper are eliminated or reduced.

Integration approach. IPODC decided to install ImagePlus in a phased manner. We chose to narrow

the scope of the project to just the business unit for Import Operations Services and then provide installation over a period of time to other IPODC business units.

IPODC Records, a business unit within Import Operations Services, had already expressed a need to "automate" their procedure and, as such, validated the target application for ImagePlus.

Our reasons for choosing to automate the import operations procedure was to control the need to add more people for the records management tasks that increased each year with the growth and proliferation of paper.

A joint effort was initiated between Import Operations Services and IPODC Architecture and Design. Work flow was analyzed, key activities identified, and service units profiled.

A decision was made initially to ignore cooperative processing since coded data were presently available on the Import Data Management (IDM) business system. These data would not be integrated into the ImagePlus electronic folders as this integration appeared to be a duplication of data.

IPODC Import Operations Services process description. Import Operations Services consists of three service units: IPODC Records, Import Operations, and Import Control.

IPODC Records currently files all entry packages that come from IBM's import trade brokers as hanging folders in a file room. The entry packages are filed according to entry package number. An entry package can contain numerous other documents (e.g., invoices, U.S. Customs 7501 forms, air waybills, governmental agency forms, and any supplemental information that may be related to the aforementioned documents). Because of the nature of the import business, many people require access to these documents at various times. The retrieval and distribution of entry package documents is presently a manual and time-consuming process. The major problems are the transmission of package components to requesting parties and the inability to retrieve an entire package without having to search through numerous on-line screens of the current import business system (IDM).

Even after all of the applicable documentation has been secured from IDM, the requestor does not know

if all of the data are accurate. This phenomenon results from the fact that they do not have the "hard copy," or paper, invoices available. Also, IDM cannot accommodate all of the annotations that may be attached to a paper invoice. This restriction results in additional work being done to get the hard copy invoice in order to validate the data.

The mission of Import Control is to ensure that each import transaction was conducted in accordance with guidelines defined by various governmental agencies. U.S. Customs originates the vast majority of all guidelines with which Import Control checks on compliance. Import Control receives direction from the Import Compliance Services. This latter business unit is in constant contact with governmental agencies in Washington, DC, and makes certain that IPODC has processes in place that will assure compliance with governmental regulations.

The key functions performed by the Import Control area are verification, adjustment, and records management. Verification is the process of comparing the data that a broker enters into the import business system with the corresponding data listed on commercial invoices that pertain to an entry transaction. The verification process ensures that the imported goods were valued correctly, the amount tendered to customs was correct, and the amount that the site was billed is correct. The adjustment process is initiated when a discrepancy between the IDM invoice and the site billing is manifested during verification. In general, all adjustment activity is researched by the sites and reflected on the hard-copy billings, and the updated documentation is sent back to IPODC in Boulder. The updated documentation may result in an additional amount tendered to customs or the filing of a petition for an overpayment of duties.

Records management is the responsibility of the IPODC Records business unit and is implemented through the maintenance of a file room at IPODC. This group keeps all entry packages that have completed the verification process and, if necessary, the adjustment process. These packages are indexed by entry number and consist of hanging folders. Once the package has been filed, Records services all requests for either entry packages or individual documents or both that are contained within folders.

Import Operations Services is part of a larger conglomerate at IPODC. This group, along with the other business units, provides a centralized center of competency that supports the importation process within

IBM. This center alleviates each company site or vendor from having to have an analogous local group. Thus, IBM realizes efficiencies by eliminating redundant function, providing consistency, and assuring compliance with U.S. Customs regulations regarding the importation of goods into the United States.

The key input to Import Operations Services is an entry package. This package is an aggregate entity that contains a number of documents, but the primary documents that it contains are commercial invoices and U.S. Customs 7501 forms.

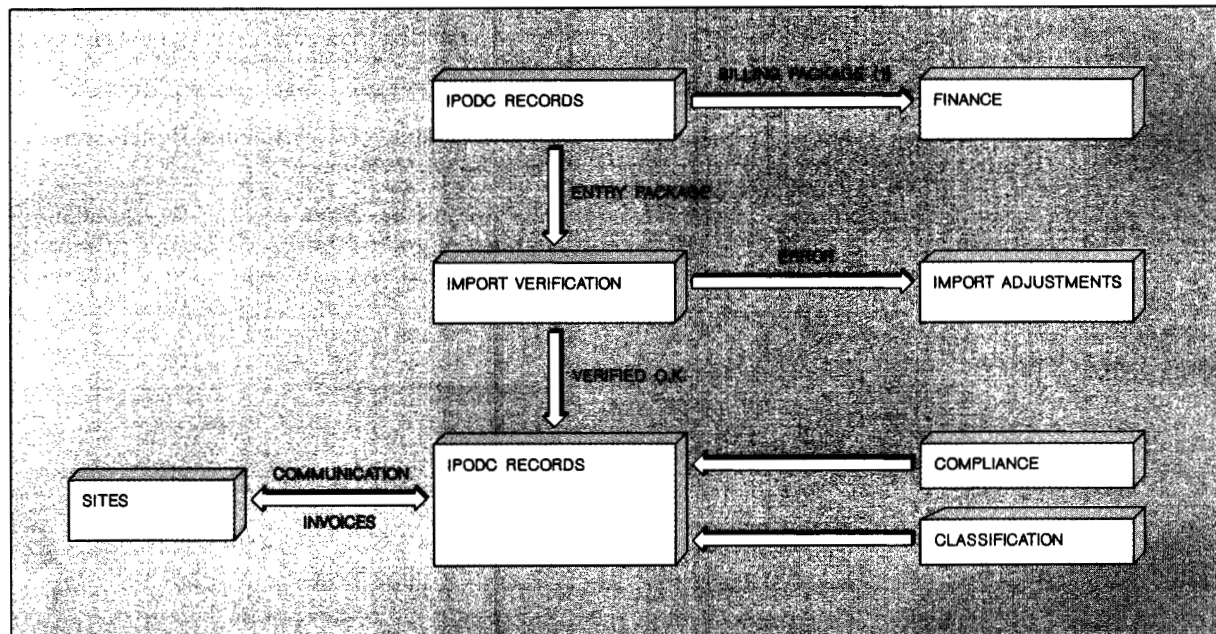
There may be other documents in an entry package, depending on the origin of the goods, nature of the goods, and method of shipment. Documents may be required by various governmental agencies such as the FCC, EPA, FDA, etc. These documents are collectively referred to as other governmental agency (OGA) forms. Entry packages originate at IBM broker locations and are mailed via an air express service to IPODC daily. Once the entry package arrives, IPODC Records makes copies of its contents and distributes documents to other business units in IPODC.

The primary output that Import Operations Services produces is a verified entry package. The verified package is filed in the file room as a hanging folder that is indexed by entry number.

During 1987 approximately 39 000 entry packages were mailed to IPODC from various broker locations. On average, each entry package contains 11 pieces of paper, indicating that about 430 000 pieces of paper were handled by IPODC during that year. The volume grew in 1988 to approximately 45 000 packages. It is projected that the number of packages will grow to 50 000 packages in 1990 and stay constant in subsequent years.

Presently the Import Control group consists of over 35 people. Approximately 20 of these are devoted to the maintenance of the file room. They are dedicated to filing, retrieving, and distributing entry package documents to various requestors within IPODC or at IBM sites. A typical request for one or more documents may take anywhere from 15 minutes to one day to satisfy, depending on whether the documentation is hand-delivered or delivered via internal mail. On the average, information is only unavailable about 20 percent of the time because of its absence from a file folder.

Figure 6 Process flow through Import Operations Services



Access to entry package data is obtained by either physically passing a package among personnel or copying and mailing needed documents.

Import Data Management (IDM) is the business system of record for all import activity within the IBM Corporation. This application is based on the Information Management System (IMS) and runs under the Multiple Virtual Storage (MVS) operating system. All import activity is processed through the IDM system. Embedded in IDM are such entities as tariff rates, letter of credit data, and invoice data. For the importation of goods IDM calculates, among other things, the applicable duties. All of the key application areas within IPODC utilize the IDM system to reconcile import transactions.

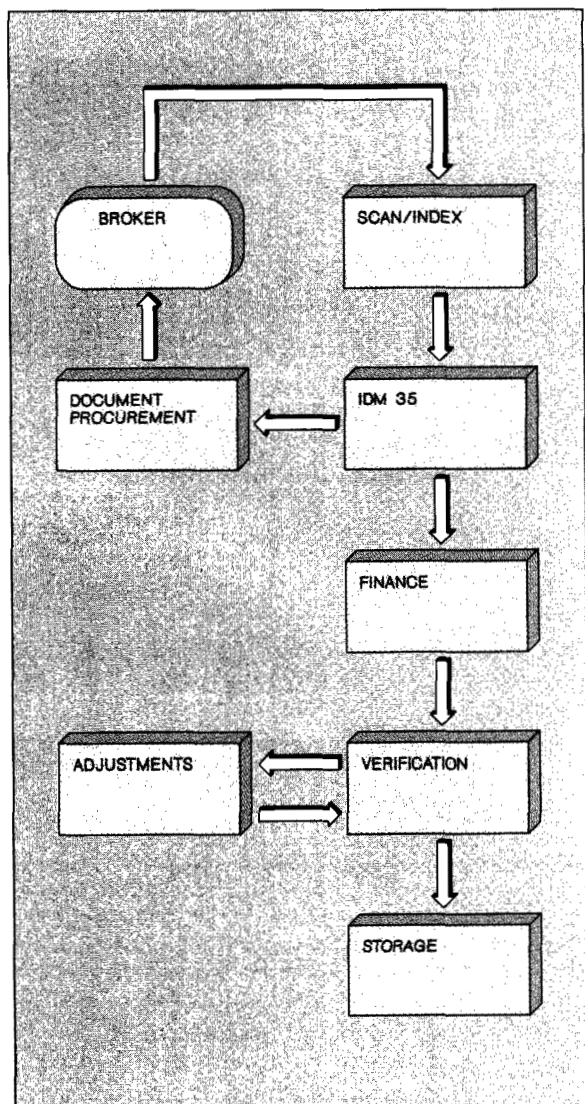
Import Control uses IDM to match commercial invoice data that the brokers enter on the original commercial invoices. The different sites utilize the IDM system to reconcile their ledger entries to commercial invoice data. This process is performed to ensure that nothing was done that would change the amount of duty paid by the broker at the time he or she secured the release of goods. A transaction is initiated in the IDM system when the broker opens an entry number and enters commercial invoice data

into the system. After all of the invoice data are entered, an entry summary (U.S. Customs form 7501) is printed via IDM. The entry summary and any other relevant forms are sent as an entry package to IPODC where they are further processed.

Figure 6 illustrates the process flow through the major functions of the Import Operations Services area. Figure 7 illustrates the process flow we defined for the integration of ImagePlus.

Executive commitment. When ImagePlus was chosen as the solution, a business case was developed, approval obtained for capital commitment, and equipment procured for the Phase I system. This consisted of an IBM System/36 host processor, a 9246 optical library unit, and five PS/2 Model 70 workstations for image processing. This system was the prototype used to validate the process changes and approach to the integration of ImagePlus with the process we developed. During January 1990 we upgraded to an AS/400 for the increased software function and computing power. The AS/400 came into the first stage of production during January 1990 and replaced the use of the library (paper) and provided work flow for a departmental audit function.

Figure 7 ImagePlus work flow



Since January we have added workstations to bring other departments on line (Figure 8). These 49 workstations are necessary to recognize the full value of ImagePlus for the line of business.

For its applications, the IPODC organization plans to attach remote workstations to the AS/400 for scanning and communicating with the brokers and for communicating with numerous IBM sites. Their experiences in working with this exciting new image tech-

nology have provided them with hands-on experience. They plan to work with the other application organizations and serve as image consultants to assist them in enabling their applications to incorporate images.

Business Systems Research and Development application description

Business Systems Research and Development is comprised of approximately 200 people. Their mission is to provide applied research and development

**Business Systems Research
and Development
uses a matrix concept
for a major portion of their work.**

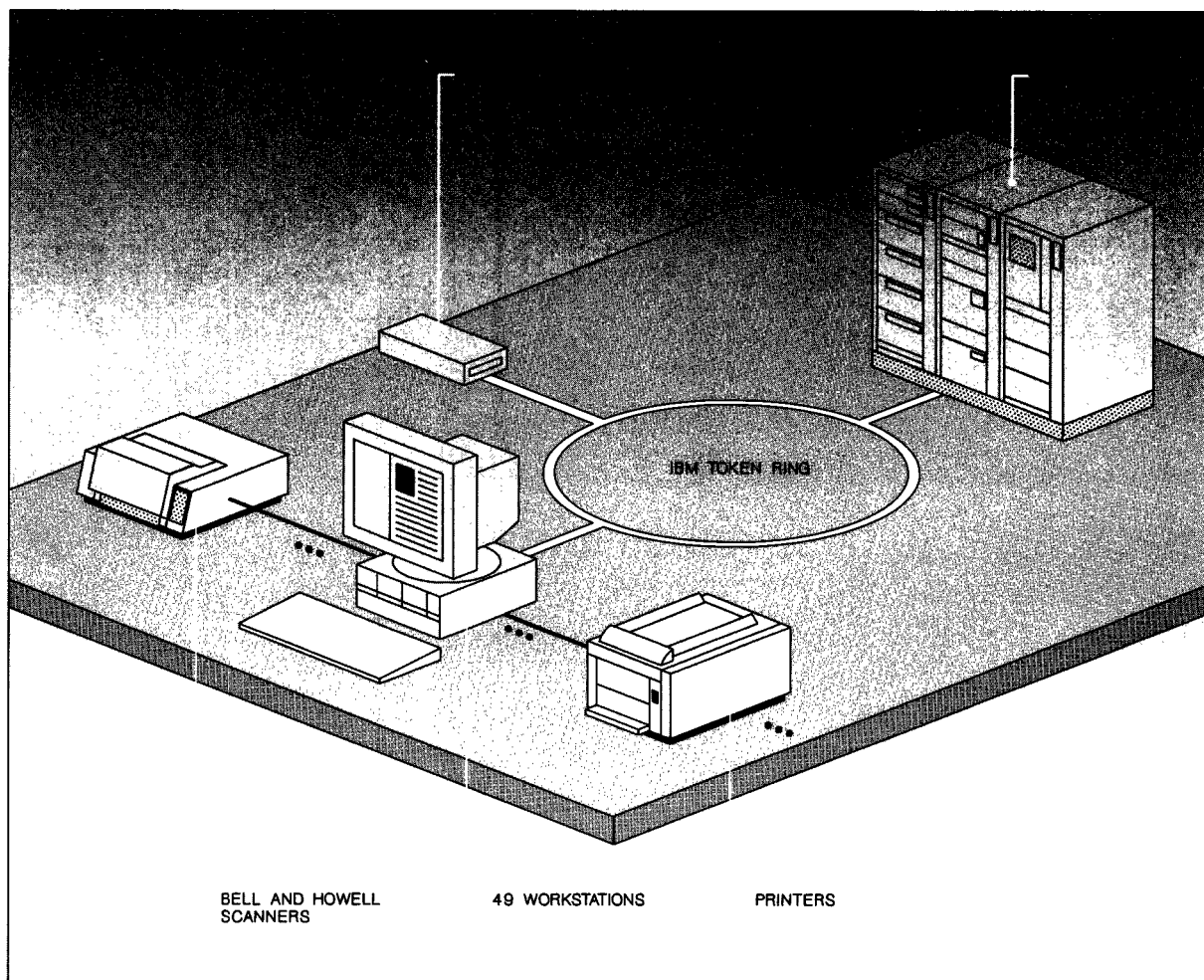
support to IBM's US Marketing & Services organization. The mission includes opportunity analysis, technical assessments, prototype development and enabling, systems integration, and operations.

To pursue this mission aggressively, this organization has developed a business procedure and operating environment that is unique. As a research and development site, it is important to establish the scope of the work performed. The typical research and development cycle has six steps or phases (Figure 9).

The major portion of activity falls in the explore, investigate, and prototype steps. Occasionally, when the organization is "uniquely qualified" or is the "developer of choice," work is performed in the develop, implement, or support steps.

Primarily, the business of the organization is matching technologies to business opportunities and capitalizing on the synergism. They have developed a matrix concept that proves to be a useful paradigm for communicating their procedure and managing the selection process.

Figure 8 IPODC ImagePlus configuration



Opportunities are plotted on the horizontal axis of the matrix. To identify an opportunity they collect information on the business, such as strategies, executive requests, field visits, task analysis, and the results of prototypes, from a variety of sources. They identify areas of opportunity that can significantly improve the effectiveness and efficiency of marketing and service.

Data gathering done over the past year has focused on opportunities in the following areas:

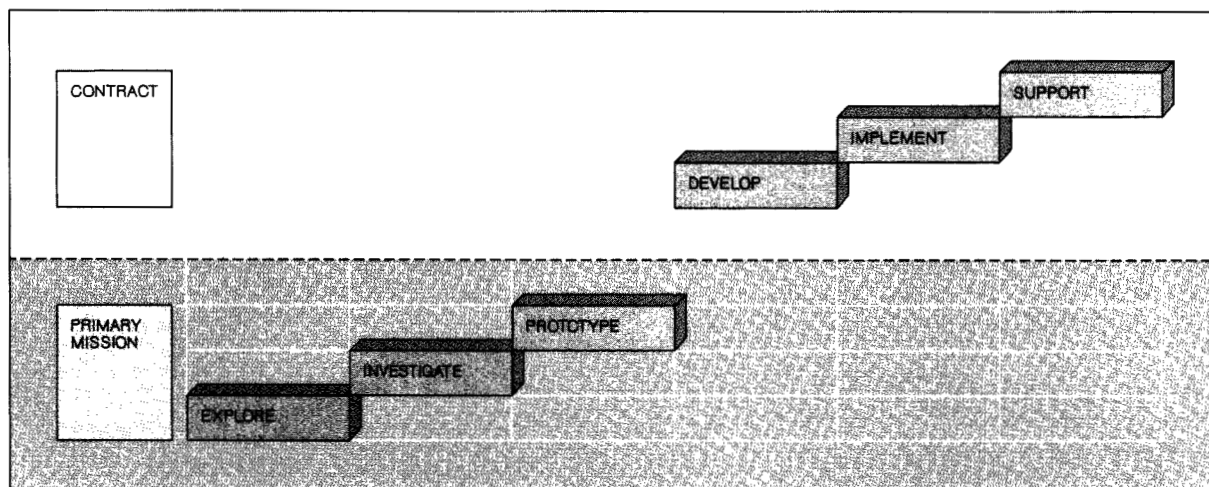
- Customer contact quality
- Competitive advantage

- Information overload
- Business procedure quality
- Business procedure productivity

Technologies. Technologies are plotted on the vertical axis of the matrix. The word "technology" is used in the broadest sense. It can be hardware, software, a discipline or procedure, or even a science, such as behavioral science.

A technology watch is maintained to monitor, understand, and advance the state-of-the-art in the following areas: automated operations, communications, data management, decision support, devel-

Figure 9 Research and development cycle



opment productivity, human-machine interface, management science, office systems, and workstations.

A common theme is held in assessing technology, that is, an orientation toward the end user.

Mapping opportunities and technologies. After an opportunity-technology match is made, the prototype development step begins.

It was found that "prototyping" has many different definitions, leading to some confusion in the I/S community. For clarification, the following definitions are provided:

- *Proof viability prototype or research prototype*—This prototype may be either a "paper" prototype or a demonstrable prototype. It provides direction for further applied research and displays credible solutions to the problem.
- *Field prototype*—This prototype displays good performance based on evaluation in the users' environment. It provides direction for solving the problem and provides data for a business assessment/case.
- *Production prototype*—The prototype exhibits high quality and reliability, and satisfactorily solves the problem in the users' environment. It provides tactical relief while the overall business process is updated.

Prototype development is an iterative process as used here. In close cooperation with the user, the application is placed in a test environment where experience gained can be built on. Quite often the prototype developer and the typical user work together, trying various approaches until a good solution to the opportunity is found.

System development and integration. In the recent past, projects were developed that provided an advanced solution not easily implemented in the current operating environment. For instance, to demonstrate the validity of the remote support development effort, the Research and Development organization installed a data processing complex to remotely operate 12 area information centers for IBM's National Service Division. This operation has been an IBM showcase, serving as host to over 145 customer visits in an 18-month period. This operation has been refined, and the remote operations production system has been transferred to the IBM Lexington I/S site.

Business Systems Image Technology Project Office. An image is "noncoded data" on paper, and in that form it is most used in the office environment. Text, signatures, company logos, and other markings on paper are in noncoded form.

Image technology, although not new, is now considered affordable in an office environment. The cost

of memory and storage devices has been steadily decreasing, whereas the cost of office space and personnel has continued to rise. These two factors now make an image management system a viable solution to a business opportunity.

Business Systems Research and Development sees this as an opportunity-technology match. They have commissioned a project office to promote the understanding and the use of image technology within the IBM US Marketing & Services organization.

As with all projects in Business Systems Research and Development, the focus for image technology will be on the human-machine interface and the effects on the business environment.

Working with the term lease agreement process owner, they supported an analysis to establish a benchmark study. This analysis provides a reference point for the time it takes today to process the paper copy of the agreement. From that, an assessment of the impact the ImagePlus application has on the process when fully implemented can be made.

The human-machine interface is also of particular importance to the behavioral science department in the Research and Development group. Image processing will have a direct impact on the productivity of the term lease agreement process, as well as a potential impact on the individuals performing the task.

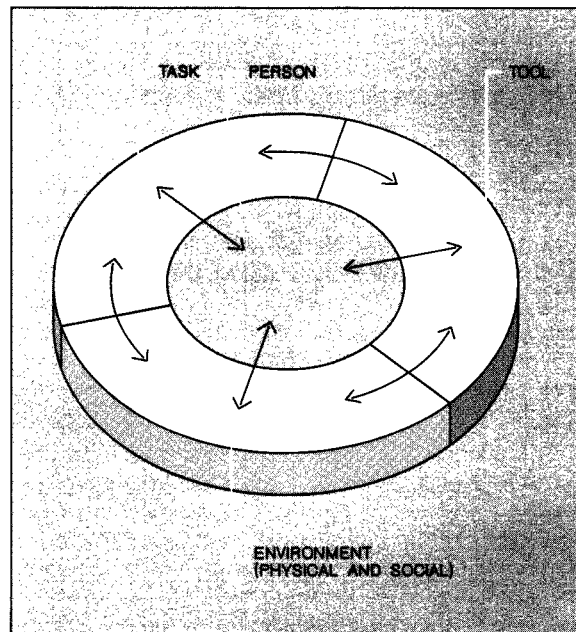
The behavioral science department utilizes a modeling technique called the "system of work." This model was developed by Dr. Frank Hawkinshire, former chief scientist for the Knowledge Engineer Curriculum (1983 to 1985), while under contract with IBM (Figure 10).

All aspects of the environment are taken into consideration: the person, the task, the tools used, and the social and physical setting. This approach, or technique, for looking at the way all of these aspects play on one another has brought success in several prototypes and production systems developed by the Research and Development group.

Personnel Records management application description

Applications for employment are submitted to the personnel department of a site. The procedure in this case is represented by a file folder containing

Figure 10 System of work (from F.B.W. Hawkinshire)



previous work history, letters of reference, resume, diplomas, education history, college records, and application for employment for each candidate applying for a position. The file folder increases in size as the candidate is selected for interviews and for an offer. Initially the average size of the folder is 10 pages. As the candidate proceeds through the selection process, the folder size increases to an average of 30 pages.

Approximately 15 000 applications are processed each year. The folders are stored on site for one year in 15 five-drawer file cabinets, and then they are stored in records retention.

The benefits offered by image processing are to improve the turnaround time for candidate selection and to eliminate time-consuming paper-handling, provide concurrent on-line access to multiple recruiters and administrators, and improve information availability by eliminating lost or misplaced folders.

An AS/400 ImagePlus system with 13 workstations and a stand-alone optical drive has been ordered with installation of workstations in each personnel department planned to occur during the second quarter of 1990.

Concluding remarks

In the course of our application definitions and justification exercises, we develop a "view of the future" for each application. We would like to share these views as examples, in the form of application and technology enhancements.

A current records management system (RMS) uses a relational database that is primed with keywords that have been typed into the system. The keywords are typically determined by reading the content of a document and are then keyed into the system. Also, the paper document is stored in a file cabinet or box for retrieval on demand based on business needs, and its location is identified in the RMS for retrieval purposes. With ImagePlus the paper can be scanned into the system so that the RMS contains the actual document and not simply a pointer to its physical location. As technology advances and becomes practical, the addition of optical character recognition (OCR), forms processing, scanning, and indexing by content will provide the scanning and indexing processes with application enablers for the use of artificial intelligence and knowledge-based systems in the coded data application and in the image application. Scanning can be intelligently driven by document content that identifies relational database search arguments. The coded data application information can also be available to the RMS, in conjunction with the image data. Given this type of RMS and assuming a line-of-business application such as contracts management, we can ask a question such as: How many widgets did we sell to company X in the 199X to 199Y timeframe? This type of query would create a new electronic file folder on-the-fly that can be printed, displayed, or further refined in content.

Key-asset line-of-business information and applications will have audit requirements. The auditing process can become another contender on the queue for paper file folders. With ImagePlus, users can concurrently access the same copy and have assurance that they are all using the same image. As a first stage of automated auditing, the auditing can be accomplished through a workstation. As a second stage of automation, the auditing can be enhanced through the use of knowledge-based systems for the purpose of removing the burden of mundane decisions from the person performing the audit.

We view OCR and bar-code recognition as application enablers. With OCR the converted image data can be intelligently interrogated for keywords and strings

that can be stored in a relational database for retrieval purposes. In this application of OCR, the cost of entering new documents into the image system would be reduced.

Within an organization the value of having "one copy" in the records management system can be a significant improvement in quality for the process. With paper, multiple copies of different levels of information are available because they are kept for reference material by individuals. With image processing, the same level of information is simultaneously available to all users; thus the quality of information available to an organization can be improved.

The arrival of cost-effective image technology may be the best opportunity that has occurred in the last three decades for the improvement of our business processes. The challenge of this future is viewed with excitement and enthusiasm because the possibilities are limited only by the imagination itself. We live in an age where the basic system building blocks have matured to the point where technology provides for anything to be "wired together." Thus the next challenge is the question: At what cost?

Acknowledgments

There are numerous organizations within IBM that have developed their own image prototypes and image applications. Some were started several years ago on first-generation image technology and are used in production today. These leadership organizations have served as focal points within the internal IBM community to demonstrate image processing. Such organizations are used as references for demonstrations and training purposes on image processing. Some of the leaders frequently mentioned are Jim Gallagher, with the IBM Suggestion Department in Endicott, New York, and Jon Carrier, with the Program Office Databank Application in Owego, New York.

ImagePlus and AS/400 are trademarks, and Application System/400 is a registered trademark, of International Business Machines Corporation.

Appendix A: Getting started

- Visit customer's site
- Introduce *IBM ImagePlus Presentation Guide*
 - One-to-four-hour presentation

- Read Section One
- Read the *ImagePlus Justification Guide*
- Tour end-users' work area
- Establish project ownership and commitment
 - Obtain management and executive support
 - Establish communications focal point
- Gain an understanding of the full scope of the application
 - Find the origin of the paper
 - Identify work-flow characteristics
 - Learn when the paper is archived
 - Identify coded data applications
- Determine a starting point
 - Define the minimum functional requirements (scan, index, file folder, work flow, display, print) for a starter system
- Complete the *ImagePlus Justification Guide*
- Obtain approval for account
- Attend ImagePlus system design class
 - Validate selected solution and system configuration
- Develop installation plan
 - Place order
 - Assess physical environment
 - Install

All of these items lead to the maxim, "Get on the learning curve through the work itself."

Appendix B: ImagePlus application identification questions

- What is the paper flow in your application or line of business?
- Is paper all or part of the input to your process?
- Is your process a key asset?
- If your archive is a key asset, do you have multiple copies for disaster recovery?
- Is your paper-driven process accompanied by a coded data application?
- What is the interface between these papers or documents and users, microfilm systems, and the I/S system?
- Where are these papers stored? How are the papers referenced?
- What type of document storage is used?
- Do you have a distributed paper work flow?
- Does your paper process have audit requirements?
- Do you have a records management system?
- Do you have problems storing and retrieving papers?
 - Does it take too long?
 - Is it hard to find papers—resulting in slow response to answering customers' questions?

- Are papers misfiled?
- Are papers missing?
- Do you need multiple access to the same papers at the same time?
- Must you send original to another location?
- Are your business decisions delayed by manual retrieval of paper?
- Do you need to electronically store information that cannot be readily coded (e.g., contracts, customer letters)?
- Do you have an electronic or manual tracking system for work in process?

Appendix C: Business case

- Identify objective business case elements
 - Paper storage cost (on site, off site)
 - File folder storage, retrieval cost
 - Mail
 - Paper handling
- Identify subjective business case elements
 - Improved rate of information flow
 - Removal of auditing as a contender for paper
 - Automated auditing (KBS)
 - Statistical analysis
 - Improved project management and control (automated work flow and reporting)
 - Records management system improvements through automation
 - Value of "one copy"

The goal is improved customer satisfaction.

Cited reference

1. *IBM ImagePlus Presentation Guide*, G320-9752, IBM Corporation; available through IBM branch offices.

General references

Architectures for Object Interchange, GG24-3296-00, IBM Corporation (1988), pp. 20-67; available through IBM branch offices.

"Digging Out with Image Technology," *Datamation* 35, No. 8, 18 (April 15, 1989).

"IBM Exposes Image Network," *Computerworld* XXII, No. 22, 39 (May 30, 1988).

"IBM Plunges into Imaging Waters," *Computerworld* XXII, No. 27, 66 (July 4, 1988).

Image Object Content Architecture (IOCA) Reference, SC31-6805-00, IBM Corporation (1990); available through IBM branch offices.

"Image of Success," *Computerworld* XXIII, No. 39, 14 (September 25, 1989).

"Veterans Administration Benefits from Optical Storage," *Management Information Systems Week* (December 12, 1988), p.25.

"WORM-Winchester Marriage Speeds Optical Systems," *Mini-Micro Systems* XXII, No. 7, 23 (July 1988).

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