

Managing Documents with Imaging Technology

***A Review of the Imaging Software and Hardware
Evaluated by the Alaska Judicial Council***

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I. Introduction

A. The Alaska Judicial Council and This Report

The Alaska Judicial Council is a small state agency charged by law with: (1) screening and nominating judicial applicants; (2) evaluating the performance of judges and making recommendations to the voters on whether the judges should be retained; and (3) conducting studies and making recommendations to improve the administration of justice in Alaska. Despite its small size--currently eight employees--the Council has generated tens of thousands of documents over the thirty years of its existence. Filing, storing and finding these documents has become increasingly difficult, time consuming and expensive.

Because of the Council's increasing difficulties with paper records, Council staff began investigating computer systems for electronically storing and retrieving documents in the fall of 1991. These systems consist of imaging software to electronically organize and view the documents, as well as related equipment such as a scanner to enter the documents on the system and an optical drive to store the documents. By the summer of 1992 the Council had completed a thorough evaluation of small-scale imaging systems and related components. An imaging system was installed in August 1992 with the help of a grant from the State Justice Institute (SJI).

This report is intended to inform courts and other agencies of the information and criteria needed to evaluate imaging equipment, as well as specifics about the imaging software and hardware available. Please feel free to contact the Council's executive director, William Cotton, for more details.

The Council emphasizes that this report is necessarily based on its staff's evaluation of the products reviewed within the context of the Council's work. Most of the Council's work in the selection and retention of judges is analogous to the work that an employment agency or personnel bureau might perform: performing background checks on judicial applicants, writing summaries of applicants' strengths and weaknesses for the Council members, checking employment histories, etc. Persons who work for agencies with different needs, might reach different conclusions. Further, the report is based on the perspectives of end users rather than specialists in the imaging field.

Finally, the list of imaging products evaluated certainly is not complete. First, the Council was concerned with relatively inexpensive systems. (As a general rule, the imaging software reviewed could be purchased for a five-station network for under \$20,000.) Second, this area is one in which technology is rapidly advancing. New imaging software is appearing monthly and existing products can disappear almost as fast. Even products which are available when this report is read probably will have substantially new features.

We will discuss next a general process for evaluating imaging systems. Chapter II provides an overview of the capabilities of imaging software. Chapter III reviews specific imaging software products. Finally, Chapter IV provides an overview of imaging peripherals such as scanners, monitors and optical drives.

B. The Process of Evaluating Imaging Systems

In the process of evaluating imaging systems, the Council has identified several steps that potential users should take to assure success. The first is to acquire a basic understanding of imaging technology. A review of this report should help in that process. In addition, interested users should join the Association for Information and Image Management (AIIM).¹ Numerous informative publications are available through the AIIM bookstore. Finally, a trip to an AIIM conference to attend seminars and to view a wide variety of imaging products is extremely useful.

The second step is to evaluate and consider your own imaging needs. An in-depth knowledge of how you use and process documents is an absolute prerequisite to an informed choice. Further, a user must know which features are important to the user, such as workflow or optical character recognition, before evaluating particular imaging software.

The third step is to evaluate imaging software. Start by evaluating as many products as possible to get a feel for the range of options. Try to evaluate as many as possible in your offices, as well as in trade shows or at vendor offices. Consider how well the software fulfills your needs. One factor which will be relevant to all users is how easy a product is to use.

The most important advice for evaluating imaging software and indeed the entire process is to talk to current users of the leading systems. No matter how thoroughly you try a product, imaging is complex enough so that you will only really have a full understanding of the pluses and minuses of a product after you have purchased it and used it for several months. The best way to

¹ 1100 Wayne Avenue, Suite 1100; Silver Spring, MD 20910-5699; 301-587-8202; Fax: 301-587-2711.

minimize the risk of unpleasant surprises is to talk to several current users before purchasing the product.

The fourth step is to evaluate and purchase compatible hardware and associated software after deciding on imaging software. By doing this the user can maximize the chances that the many complex parts of an imaging system will work together.

II. Imaging Software: An Evaluation Guide

A. Introduction

The central component in an electronic document managing system is its imaging software. It allows the user to store, retrieve and view electronic images of documents.

The imaging software reviewed by the Council generally was available as a separate product—in other words, it was not necessarily tied to and sold with other components of an imaging system such as scanners and optical drives. This ability to mix and match standard components has been a major advance in imaging technology, that promotes flexibility and lower prices.

However, it is important to understand that this ability to mix and match components has only advanced so far. Any particular imaging software product is only compatible with a limited number of other components. Thus, it is absolutely critical to evaluate and select imaging software before purchasing other imaging equipment.

This section of the report will first summarize the various components of imaging software. As will be apparent, imaging is only a small part of the products' capabilities. Second, the section will discuss how to evaluate imaging software. Separate sections of the report discuss each of the imaging software products that the Council evaluated, and the basics of evaluating imaging related hardware.

B. An Overview of the Components of Imaging Software

Imaging software allows paper documents to be stored, retrieved and viewed electronically. However, this capability is only a small part of most of the imaging software now available. Thus, before discussing how to evaluate the software, it is useful first to discuss briefly these various components.

1. Document Management

Imaging software is perhaps first and foremost a computerized system for organizing and keeping track of documents. This component is not necessarily related to "imaging," and could be useful even if all documents were to remain paper files in filing cabinets. The software allows the user to find documents by which folder/drawer/cabinet the file is in (whether electronic or not), as well as find documents by keywords, dates or other special index fields.

Adding the folder/drawer/cabinet as well as keywords and other information to the computerized document management system is a necessary but difficult and time consuming part of establishing an imaging system. This task requires a great deal of effort to be spent reviewing the organization of current files and deciding how the files can be referenced better by a computerized document management system.

However, the time spent designing and implementing a computerized document management system can be well worth the effort. Council staff have become tremendously more familiar with Council records through this process. We not only know much more about the documents we have, but can use this knowledge to better complete our day-to-day tasks.

2. Database of Information in Documents

This second component of imaging software, just as the first, is not necessarily related to electronic storage and retrieval. Here the objective is to create a database of information in documents--not to find them as was the case with the document management component, but primarily to answer questions that arise without having to look at a document. Very few imaging systems include the ability to create such a database. We concluded that it was an important feature, however, because all imaging systems require that labor be expended to create keywords and to index documents. If the program builds a database simultaneously, the usefulness of the indexing effort has been multiplied several times, because the database can serve a variety of management and forecasting purposes.

In practical terms this database creates the capability to store information in user-created fields at the file folder rather than document level. For example, the Council has many documents for each judicial applicant that are organized into file folders named for the applicant. The Council's imaging software, Imara, allows information to be saved about each applicant in a separate database. We hope to minimize the need to look up multiple documents, which even on the computer will be more time-consuming than looking in the database. Also, we should be able to statistically analyze the information about applicants and use the database to automatically

produce the summary sheet on each applicant for the nomination process that now is done by hand.

3. Imaging

The actual imaging component of the software is relatively straightforward. Once a document is located using the "document manager," and assuming we still need to see the document itself rather than the information also on the "database," an imaging capability allows the user quickly to view an image of the document. Documents are entered into the system by scanner, fax or importing image files. The electronic documents usually are stored on optical disk storage devices. The imaging capability saves both staff time to retrieve paper files, and storage space.

4. Text (as Opposed to Image) Storage

The imaging component of the software stores and retrieves images of documents. However, many imaging products also will store and retrieve application files containing text or data, and automatically launch the software that created the document when it is retrieved. For example, most of the Council's current documents are created by Council staff using WordPerfect for Windows. Imara allows us to store and retrieve these documents as WordPerfect files, saving considerable disk space and scanning time, and allowing us to easily update documents when, for example, a judicial applicant applies for a second vacancy.

5. Optical Character Recognition (OCR)

OCR allows images of documents (or parts of documents) to be converted into text. The only alternative, assuming this conversion is necessary, is to retype the document. OCR can be used by imaging software in three ways.

First, OCR can allow small zones in a document to be converted into text for index fields so that the document does not have to be indexed by hand. This can be a tremendous timesaver if an organization uses forms in which zones for fields can be standardized. The technology for this type of OCR works fairly well.

Second, OCR can allow all or part of a document to be converted into text so that a full text search capability can be used to find information. While OCR will make many mistakes even on relatively clear documents, it is accurate enough to constructively use in this regard.

Third, OCR theoretically can replace an image of a document with text. However, the document should be in near perfect condition with a standard layout. Otherwise, it is almost always easier to retype the document if it must be mistake-free.

6. Networking

While imaging software can be installed on a standalone computer, imaging technology is much more useful when available on a network. More than one user can have access to documents, even simultaneous access, at the user's desk. A network also allows the utilization of other applications such as E-mail and workflow, which are discussed below.

7. Electronic Mail

In most organizations, documents are not simply retrieved and refiled by individual users. Rather, a document must go through a process of review by multiple users, each of whom may have comments about the document. Imaging software with an E-mail component allows documents to be shared electronically. Such software, in addition to allowing documents to be electronically routed, usually allows written or even spoken notes to be attached to documents.

8. Fax

This capability in imaging software allows documents to be electronically shared with others outside the office much like E-mail allows sharing within the office. Further, the component allows documents to be entered into the system directly by faxing, rather than by submitting paper documents that then must be scanned.

9. Workflow

Workflow is a component of certain imaging software systems which allows repetitive tasks requiring document routing to be standardized. For example, the Council regularly screens and nominates judges. Workflow components allow an electronic message to be sent to a staff member whenever a task needs to be completed. The message can include instructions, a copy of any documents necessary to complete the task, and a deadline.

Much of the literature on imaging systems emphasizes the workflow component of imaging as more important than everything else put together. While this conclusion depends on the type of tasks an organization has, workflow allows an organization not only the opportunity to perform

those tasks more effectively, but also the opportunity to review and improve the organization's work processes.

C. General System Standards

Before focusing on the features of imaging software applications, it is helpful to discuss the general system factors that will guide the choice of imaging software. These factors are: the size of the system, the type of operating system, whether the system is proprietary or open, component compatibility, and ease of use.

1. System Size

a. Standalone Systems: Several excellent standalone (single user) imaging products are available. While E-mail and workflow of course are not available with standalone systems, some sophisticated products include all other features for under \$1,000. A standalone system might be appropriate for a very small office. The key here is to fully consider whether the system can be upgraded if necessary.

Imara Lite sells for under \$300 and includes all the features of the regular version of Imara, except of course the network features such as E-mail. However, Imara Lite cannot be upgraded to have the documents available on a network in the future.

Single user versions of File Magic (formerly Imagic) and Keyfile are other examples of Windows imaging software available for under \$1,000. One important advantage of these products is that they can be upgraded to a network version. Paper Less Filer is an excellent example of DOS imaging software available for under \$500 that can be upgraded to a network.

The Canofile 250 is a very different example of a standalone system. It includes all associated software and hardware including a built-in scanner, monitor and computer for \$15,000. While its solely proprietary hardware and software are a drawback because it cannot interact with other computer systems in an office, it does have excellent capabilities as a standalone unit.

b. Network Systems: All of the systems we reviewed, except for Imara Lite and the Canofile 250, can be used on a network. Thus, all users have simultaneous access to the same document. The Council's focus was on small network systems rather than standalone systems. Our network currently contains six workstations.

The first variable to consider is how large a network the product is compatible with. Some products are probably not a good choice for networks with more than about five to eight workstations. On the other hand, software packages such as Imara, Keyfile and DocuPact, that run on an OS-2 server, can support many more workstations. The key to evaluating a system's capabilities is to talk to a customer who uses the system on at least as large a network as you would use.

Second, make sure that the imaging software supports the network you wish to use. Note that peer network systems such as Lantastic probably are impractical for other than quite small networks, given the sheer size of imaging files.

2. Operating Systems

The Judicial Council focused on imaging applications that run under DOS and Windows. We also reviewed several OS-2 systems, but did not attempt to review MacIntosh systems.

a. DOS vs. Windows: One of the first choices which a user must make is whether to acquire a DOS or a Windows imaging application. The Council decided on a Windows product--Imara--after concluding that Windows was the clear choice for our needs. However, DOS systems do have advantages.

Windows currently appears to be the interface of the future, not only with imaging systems, but with software generally. Further, most new imaging software is written for Windows. Windows imaging software is, as a general rule, easier to learn and use. The Windows graphical interface works better for manipulating and viewing images. Finally, and this point is quite significant, Windows imaging applications are preferable to their DOS counterparts because they can use standard Windows drivers for such things as monitor resolution and printing. A user must be much more careful that a DOS system is compatible with related imaging components, although this is a real concern even for Windows systems.

DOS imaging applications, however, do have significant advantages. They will run on less powerful computers and, other factors being equal, they probably will run faster than a comparable Windows program. Further, a DOS system can be designed to be as easy to use and even as graphical as a Windows system. The Council reviewed several DOS systems, including Data Flow, Laser Fiche, Paper Less Filer, Paper Tamer and UniDoc, all of which had their strong points.

b. OS-2: The Council reviewed only one system designed to run on OS-2 workstations--Imara. Currently, there is a lack of software for OS-2 versions 1.3 and 2.0. More

importantly, given the compatibility problems with different imaging components that are likely to arise, we would be wary of attempting to set up an imaging system on OS-2 workstations.

However, the ability to run OS-2 on a server, found in Imara, Keyfile, Frequent Filer, and DocuPact, has advantages. Microsoft's version of OS-2 should be upgradable to Windows NT. Further, such a server is probably more stable and can handle more traffic than its DOS or Windows counterparts. Also, a small organization like the Council can combine a network OS-2 server such as Lan Manager with the imaging server. This brings considerable savings for small users.

c. MacIntosh: The Council did not review Mac systems. We did, however, run across two. The first, called MARS, is produced by Micro Dynamic Ltd. [(301) 589-6300]. Company personnel were quite helpful to us even after they found out we were only interested in PC-based systems. Their product does start at about \$30,000. The second product was Optix produced by Blueridge Technologies [(703) 675-3015].

3. Proprietary vs. Open Systems

Users should choose imaging applications that do not rely on proprietary hardware and software components for several reasons. The price of open systems will generally be lower, and the user will be less dependent on a particular company that could go out of business. Open systems permit more flexibility in the choice of components and greater compatibility with hardware and software already installed.

Most small scale imaging products are quite open in many regards. They are designed to run on any PC with sufficient processing power and can work with a variety of peripherals such as scanners, optical drives and monitors. The proprietary Canofile 250 is the obvious exception.

One aspect in which the software differed significantly was the use of a proprietary database. It is cheaper for imaging software to use a proprietary database that is accessible only from that company's software. One can be crafted, such as Keyfile's, that is particularly tuned for images. However, a proprietary database, even when coupled with various utilities such as provided by Keyfile, is an inferior solution compared to Imara's use of Oracle or Microsoft's SQL Server, or Navigator 2000's use of the Gupta database. An open database means that more tools will be able to access it and that the user is not dependent on a relatively small imaging company for these tools.

Another important reason for a system to use open systems is the compression method imaging software uses. However, most products we reviewed did allow use of the industry standard CCITT III and IV.

4. Component Compatibility

As mentioned elsewhere in this report, it is critical to choose imaging-related hardware and software compatible with the imaging software selected. Of course, imaging software that is compatible with a larger variety of peripheral equipment is a major plus for the imaging product. Refer to the sections, *infra*, on hardware and software peripherals for more information.

5. Ease of Use: The Interface

This report emphasizes that imaging products should be evaluated in terms of how easy they are to use. It bears repeating that ease of use will depend on the particular needs of each user and how these unique needs blend with product features.

One general aspect of ease of use concerns the software interface. Keyfile exemplifies an interface that is sophisticated, but appears relatively simple to the user. Interestingly, Keyfile has so many options that it is actually much more complex to set up than it appears to the casual user.

This area is so subjective that it is difficult to offer general advice. However, we can advise users to try several imaging systems in their own offices before committing to any one. Viewing products at trade shows or at a vendor's office simply cannot give enough hands-on experience to make a fully informed decision. Council staff evaluated products by having five employees spend a minimum of several hours apiece with different software packages. Staff used the Council's own documents to get as much of a feel as possible for the qualities of each product under actual working conditions.

In this regard, note that several products such as Paper Tamer and Fileflo are available on free demonstration disks. These disks are worth trying, to get a general feel for imaging products even if you believe you probably are not interested in purchasing those particular products. Also, many vendors are willing to allow serious potential customers to try their system for 30 days.

D. Document Organization and Access

The features and capabilities of imaging software that relate to document organization and access (the "document management" component discussed above) are probably the most critical part of the software for most small users. The methods of organizing documents and permitting access to them generally fall into five areas: (1) hierarchical structures; (2) index fields and keywords; (3) full text search capability; (4) hyperlinks; and (5) simulated desktop.

1. Hierarchical Structures

a. Introduction: The most common method of allowing access to electronic documents is to organize them in hierarchical levels, usually mimicking a traditional paper filing system. Documents are grouped into "folders," "drawers" and then "filing cabinets." This structure is simple and intuitive, and can take advantage of existing file organization. While products such as Paper Gate can access any document relatively easily without using a hierarchical structure, this approach can be more confusing for the casual user.

b. Presentation: A hierarchical structure can be presented in several different ways. The best way seems to be an expandable or contractible tree structure much like that used in the Windows 3.1 File Manager. This approach, used by Paper Tamer, allows easy access through the hierarchical structure, while at the same time giving the user an overview of the file organizational structure.

A second means of presenting the organizational structure uses descending boxes. A box listing the different file cabinets is presented initially. Selecting one particular cabinet brings up a new box showing the drawers in that cabinet. Selecting a drawer brings up a list of its contents and so on. This presentation of the structure is probably the most common (Imara is an example) and it is certainly more than adequate. Its drawbacks are that the overall structure can become confusing for the casual user and that it takes slightly longer to navigate around in the structure.

A third means of presenting the file structure is through use of a spreadsheet type table. A product named Fileflo uses this option to list the cabinet, drawer, folder and document name for each document. While this method is a bit different and takes getting used to for users not familiar with database software, it does offer sort options that are not available in the presentation methods discussed above.

c. Levels: Imaging software varies in the number of hierarchical levels it allows the user to set up. The most sophisticated allow a virtually unlimited number of levels. Documents can be placed directly in cabinets or alternatively in folders, nested in other folders. A good example of such a system is Keyfile.

Software such as Laser Fiche for DOS that only allows a two-level structure, and even Imagic which is limited to three levels, is extremely limited. However, software that allows four levels (cabinet/drawer/folder/document) probably is more than adequate for most users. Imara and Navigator 2000 are examples.

d. Filing: Imaging software allows users to place a document in the filing structure using several different methods. Shortcuts to the arduous task are discussed below under document entry. It is important to emphasize that this step is one of the most time-consuming parts of imaging and thus shortcuts are critical.

2. Index Fields and Keywords

a. Introduction: All imaging software we reviewed, whether or not the software allowed hierarchical filing, contained some capability for entering index information about documents. This information sometimes could be placed into separate fields on a form and sometimes could be entered as keywords in a single field. Note that the dividing line between a hierarchical structure and index fields can be quite fuzzy. For example, Fileflo has four index fields that can be called cabinet, drawer, folder and document, as well as the ability to add other index fields and keywords.

b. Index Fields: Ideally, imaging software lets users define the number, titles, and types (for example, text, numerical, etc.) of index fields. Imara and Paper Gate, for example, let the user design a form that can be tailored exactly to the organization's needs. File Magic allows a limited number of fields, but more than enough for most users. Other software only allows a very limited number of fields whose titles are preset by the manufacturer. Note that some products allow different fields for different types of documents. This clearly is preferable to a product that requires the same fields for everything.

c. Keywords: Many systems provide a preset index field called "keywords" in which the user can enter multiple words or phrases to identify a document. While this approach is much less sophisticated than the ability to design multiple index fields, it may well be sufficient for many organizations. The Council, for example, uses Imara's keyword capability for much of the routine indexing, rather than its more sophisticated index field capability.

d. A Spreadsheet or Database Format: Two products reviewed, Frequent Filer and Fileflo, while allowing documents to be organized with user-definable index fields, had a very different look and feel from other products. The index information is presented in a database spreadsheet format. In fact, the Frequent Filer product in particular seemed more of a database with an imaging capability than a pure imaging product. For example, a possible application for the software used by the manual was a bike shop inventory. The capability to show an item in the inventory or an order form seemed almost incidental to the database function of keeping the inventory. On the other hand, a focus on the database as opposed to imaging function may be exactly what many users want.

e. Search Capability: The usefulness of index fields or keywords is only as good as the search capability of the software. Does the user have to remember the exact wording of the keyword or are wildcards and drop-down lists available? Are searches case sensitive? Are boolean searches allowed? One of the best examples of a capable product in this regard is Paper Gate.

3. Full Text Search

One way to retrieve documents requires no organization at all when entering the document. If the full text of the product can later be searched (in effect every word in the document is a keyword) index fields and a hierarchical structure may be unnecessary (although a hierarchical structure and keywords are still a good idea in most situations). Of course, a full text search ability requires the capability to accurately enter documents using OCR. OCR is not possible with poor quality documents, and re-entering the text, or typing each document manually, is expensive. Further, using OCR to create a text version of an image is very slow, as are full text searches.

A hierarchical structure or index fields provide easier access to documents, assuming the points of access can be anticipated. For example, the Council would not rely on OCR and full text search instead of associating a document to a particular judicial applicant and vacancy. Nevertheless, access to documents by a full text search can be extremely useful in some cases. Court cases or similar reference materials contain too many possible issues to reference solely with index fields. (Prime examples are the Lexis and Westlaw legal research computer systems.) The Council has scanned its reading files into the imaging system without any indexing or keywords because retrieval will not be done often enough to justify the time required to index the files. They currently are organized hierarchically by year and month. Eventually we hope to access information in the reading files using full text searches.

Full text search software products are not created equal. None of the imaging products we reviewed is as sophisticated as some of the software specifically written for this function. Laser Fiche is probably the most capable imaging product with full text search capability. For example, it allows the users to quickly review the context of search results (the sentence in which the words searched on were found appears on-screen and allows what are called "fuzzy searches" for better results).

4. Hyperlinks

One product, DocuPact (recently marketed by Laser Data as "Group File"), allows an innovative method of accessing documents described as hyperlinks. A small portion of a document can be shaded and linked to any other document. Clicking with the mouse on this shaded area (the shading could be hidden or removed) brings up the linked document without regard to whatever index fields or hierarchical structure were present. Such a feature is not necessary, but it certainly could be useful and we hope other software adapts this feature.

5. Simulated Desktop

The four document retrieval methods listed allow the user to, in effect, walk out to the filing room, find a document and bring it back to the office. This is sufficient if the user only needs a page or two at his or her desk at a time, but most people's desks have many documents and folders on them. It is inconvenient to have to go to the file room every time you need to refer back to a document, even if the file room is available through a hierarchical structure or index field.

Imara and Keyfile implement a system that allows users to leave icons representing documents, folders (including search results folders) on the computer screen, thus simulating a desktop. This feature, though easily overlooked, can be quite convenient for a user who works with many files at once.

E. Document Entry

Documents can be entered into document imaging systems by several different means: scanning, faxing and importing. Application files such as WordPerfect files can sometimes be imported, and some systems allow image files to be converted to text files using OCR. The most critical issue involving document entry is the ease and speed with which documents can be entered into the imaging system and indexed (or filed in hierarchical structure).

1. Methods of Document Entry

a. Scanning Documents: All the imaging systems reviewed allowed documents to be scanned into the system. The procedures for doing so differed as did the number of scanners that the software supported. At a minimum, the imaging software should support a Fujitsu 309X or similar scanner.

b. Faxing In Documents: Many of the systems reviewed worked with a fax card to allow faxed documents to be entered into the system without scanning. (A fax machine is really only a scanner that has the added ability to send or receive an image on a phone line.) As discussed above, such a capability could reduce the need for paper documents.

c. Importing Documents:

1. Importing Image Files: Most of the software reviewed allowed at least a few types of image files to be imported directly from a hard or floppy disk on the computer. If this is useful for a particular organization (it would not be for most), be sure that the software supports the image type you wish to import. Also, the ability to import files (including application files discussed below) should be coupled with a "file manager" or "browse" function. Otherwise, the user will have to remember the exact file name to import the document.

2. Importing Text Documents: A much more useful capability is the ability to import application files, as emphasized above in the text storage component (see page 7). Over half of the current documents the Council wishes to put on its imaging system fall into this category. Products such as Imara allow application files to be imported easily, and start the applicable software (such as WordPerfect) when the file is retrieved. However, an ability to view the document in its native format without starting the underlying software also would be useful. Keyfile recently implemented this added capability.

Applications that allow text importing sometimes save a copy of the text file with their image files, and sometimes simply record where the application file has come from. The former method is preferable because the file will be permanently stored (probably on an optical disk) with the image files on the same subject. Ideally, however, the user should still be able to access the text file without using the imaging software. Imara allows this option, although only with some difficulty. Keyfile has another useful feature. It intercepts the save command from Windows applications and allows the user to save the document in Keyfile.

Several systems such as Paper Tamer allow application files to be imported, but only save the file as ASCII text. While this is better than no ability to import applications at all, the inability to save formatting can be annoying at best.

d. Optical Character Recognition: OCR is a means of entering a text version of a document into the system after the image version has been scanned, faxed or imported into the system. This would be done to allow a full text search capability or to try to replace the image with

a text version that requires much less storage space. As discussed above, the latter purpose is impractical if the image is not in virtually perfect condition with minimal formatting.

Since converting image files to text files is a very time-consuming process, the imaging software should be able to complete this step automatically after normal work hours. As discussed above, Laser Fiche is probably the best example of OCR-capable imaging software. However, File Magic has a useful ability to OCR a limited portion of a document with surprising accuracy.

2. Ease of Document Entry

Even small scale imaging projects such as the one at the Judicial Council involve the entry of tens of thousands of documents. In evaluating imaging software, it is easy to overlook the speed with which documents can be entered onto the system and indexed. The fact that one system takes a couple of minutes more to enter and index a document does not stand out in an evaluation in which only a couple of documents are scanned or imported. But multiply the difference by perhaps 100,000 documents and the impact clearly is huge.

The first aspect on which to focus is how many steps and how much time it takes to scan and import a document. Is the interface logical? Are necessary steps kept to a minimum? Is at least a medium speed scanner such as a Fujitsu 309X supported? Is batch scanning of multiple documents supported?

The second aspect, and perhaps the more important, involves the ease of placing the document into the hierarchy and adding index information or keywords. This evaluation should be conducted in the context of how the user wishes to organize and index documents, and what organizational options the product allows.

Documents can be placed in a hierarchy, first, by typing in the cabinet/ drawer/folder information. Such systems ideally should have shortcuts such as drop- down lists from which selections can be made. Another shortcut is referred to as sticky fields. This allows, for example, the cabinet/drawer/folder fields to retain their settings while different document names are entered. Imara's Scan Flow software effectively uses both drop-down lists and sticky fields.

Second, some software such as Keyfile and Imara allow a document to be dragged and dropped in the appropriate hierarchical box using a mouse. A third option is to allow a document to be imported or scanned from a particular level in the hierarchy, then automatically placed in that level. Imara allows this option for importing application files.

File Magic uses an innovative method of hierarchical filing that requires considerable effort to set up, but once set-up makes filing automatic. In most systems, folders are a level in the hierarchy where documents are placed. They are created simply by naming them. File Magic folders, however, are defined to include any documents whose index fields correspond to a query defined when the folder is created. Thus, a document later scanned and indexed which meets the query terms is automatically placed in the folder.

Shortcuts for entering index field data and keywords also should be available. Several systems such as Keyfile and Imara will automatically enter the document's date of entry. Ideally, however, this date should be changeable so that the dates of old documents can be correctly entered. Neither system currently allows this.

Drop-down lists are particularly important for index fields, not only for ease of entry, but also to ensure index information is entered accurately and consistently. Index information that is misspelled, or ordered differently, and, if the software is case sensitive, not capitalized consistently, makes documents effectively disappear on the system. Paper Gate is the best example of how each user-created and -titled index field can have a drop-down list with all values previously entered into the field. Sticky fields such as those used by Frequent Filer, also are useful.

While a keyword field also could have a drop-down list, the number of entries would quickly become too long to be practical. Imara allows a drop-down keyword master list limited to 100 values. This is especially useful, both for ease of use and consistency, because each user can have a different list. The Council, for example, has one for "judicial selection" and another for "judicial retention."

File Magic makes use of OCR to enter index field information easily. A word, paragraph, or even page can be highlighted with the mouse and then linked to an index field. The characters then are OCRed automatically and placed in the index field. There may be inaccuracies which must be corrected, but the procedure works quite well.

File Magic has the much more useful capability of pre-selecting and shading several areas on a form. Each shaded area can then be associated with a particular field. Thus, a whole stack of forms could be scanned and automatically indexed with negligible effort. Expect this feature to be standard on all successful imaging software. Imara and DocuPact currently are working on it.

F. Document Viewing

Imaging software, in addition to allowing the user to organize logically and enter files easily, must also allow files to be viewed easily and clearly. The first issue is whether the software supports drivers for the appropriate high resolution monitors. Second, software should have a sufficient number of controls to aid viewing and these controls should be easily accessible. Third, other miscellaneous features such as an ability to overlay notes on a document are useful.

1. Drivers

Windows imaging software has a tremendous advantage in this regard. Basically, a Windows product will support all the necessary drivers, because the video card and monitor companies already have developed the necessary drivers for Windows. DOS imaging software producers, on the other hand, must ensure that their product is compatible with different monitors, video cards and resolutions. The Council ruled out one product, Paper Tamer, because although it was a very good low-end product otherwise, a lack of drivers meant that documents simply could not be viewed easily and clearly.

When considering a DOS system, be sure to try it with the monitor, video card and resolution, and even the other system components, you plan to use before purchasing the system. The same advice applies to OS-2 systems. The Council, for example, was unable to get a Cornerstone Dual Page monitor, the industry standard, to adequately perform on our OS-2 server running Lan Manager. The monitor's drivers, after some tweaking, worked with Imara. However, it was impossible to run Lan Manager's administrative utility on the monitor.

2. Controls

Imaging software should have adequate controls to easily view various types of documents. First, paging controls should allow turning to the next or previous page, the first or last page, or anywhere else in the document. Second, sizing or zoom controls should allow the user to zoom in or out, and allow the image to be automatically sized to the window width or length. Once the user has properly sized a page for review, the next page should appear with the same sizing. Several systems allow the user to outline a particular area of the document with the mouse and automatically zoom in on this area.

Third, there should be an easy means to slide a page around on the screen so that the user can review the whole page even if the resolution prevents it from fitting on the screen all at once. Imara uses the right mouse button to do this and alternately uses a shaded area on a thumbnail view of the document.

Fourth, there should be an ability to rotate and flip images. Documents inevitably will be scanned in upside down. Keyfile and other software has an ability to either temporarily or permanently turn the file right side up. Imara even allows pages to be mirrored right to left or up and down, although we can think of no use for such an ability.

These controls must not only be present, they should be designed so they are easy to access and use. Some type of a button bar helps when using the controls with a mouse. Further, at least paging and sizing controls also should be controllable from the keyboard. However, systems such as Data Flow that rely solely on the keyboard can be awkward to use in viewing documents.

3. Features

There are several additional viewing features available with some of the imaging software. The first, an ability to overlay memos or notes on the document, is quite useful. A few systems such as DocuPact, Imara and Keyfile also allow the user to attach a voice (recorded) note to a document. DocuPact includes a feature which allows the user to, in effect, highlight text in a document with various colors.

Imara has a page preview feature that can help find a particular page in a document. A thumbnail view of the image can be activated to appear beside a box listing the pages. While text cannot be read in this view, the general outline of a page can be determined. Since the thumbnail image comes up immediately (as opposed to the full view which takes several seconds), this feature helps the user quickly locate a page if the user knows its layout.

Imara requires an extra step to view a document. Selecting the document opens a box listing the pages in the document. A particular page has to be selected for viewing. Most systems allow the user to open the first page of a document by selecting the document. Further paging can be done from there.

Several systems such as Imara and Image Fast allow the user to view several pages at once. While this ability is limited by the size of the monitor, it is nonetheless very important.

4. Speed

How long a system takes to display a document on the screen after it is selected is something that vendors often emphasize. However, it is a factor which is exceedingly difficult for the purchaser to evaluate until a system is installed and running for several months. Further,

depending on the volume of documents to be displayed, the speed at which documents are displayed may be of very little importance.

The display speed is difficult to evaluate because it depends on so many factors. The imaging software is only one of these factors. Two things, however, can give clues to the software's speed. First, it can use a caching system like Optika to anticipate which document will be viewed next. Second, it can use an imaging adapter card to assist the computer in image manipulation. Note, however, that some software like Imara uses an imaging adapter card solely as a scanner and printer interface, and does not use its imaging ability.

Other factors that significantly affect display speed include the power of the computer, the use of an accelerated display adapter, network selection and traffic, how many documents and users are on the system, and whether the documents are stored on hard disks, single optical disks, or optical disk jukeboxes. Also, the first page displayed in a large document may take a significant amount of time, while viewing the next page may be virtually instantaneous.

The Council concluded, especially given the difficulties of evaluating display speed, that display speed was not of critical importance to us. We do not plan to view a large volume of documents every day. Because of this, we probably did not purchase one of the speedier systems available. For example, displaying the first page of a 300-page document stored on an optical drive over the network, even on a 486/50 Mhz computer and assuming the correct disk is in the drive, takes about 20 seconds. However, even this is much faster than trying to find a paper file. Further, subsequent pages in the electronic document can be displayed in about three seconds.

G. Document Output

1. Printing

Despite the association of imaging technology with the term "the paperless office," paper documents are, and will continue to be necessary in a multitude of circumstances. All the imaging software the Council reviewed provided for printing documents. The common problem that the software faces is the large size of image pages which, even with compression, are at least ten times the size of text pages.

Nevertheless, the software we observed seemed to allow relatively fast printing (our on-site tests did not involve printing). Printing speed will depend of course on the printer and printer interface adapter discussed *infra*. Generally, a product using an adapter that includes a video cable

interface with the printer will print faster. We found, however, much to our surprise that the industry standard adapter we purchased did not work with network print jobs.

Printer controls are relatively consistent for the different imaging products. Some products do allow the option of printing overlaid notes. It also would be useful to be able to print the hierarchical organization that the user has implemented, as well as lists of index field values and keywords. We did not find these features in any software.

2. Faxing Out

Many imaging applications allow a document to be faxed directly from the imaging application. The imaging software relies on a third party fax board, but the actual operation is seamless.

Several of the packages we reviewed included a "smart" cover sheet that the user could customize and that automatically displayed the date and user's name. Several of the products, such as Keyfile and Imara, also included the ability to add a directory of frequently used numbers.

3. Electronic Mail

Several of the imaging software products integrated at least a primitive E-mail system by which documents could be routed to other users of the system with short notes. DocuPact, Imara and Keyfile included a voice memo option as well. An E-mail system should include, at minimum, an easily selectable list of users, as well as the ability to group those users for standard messaging. We expect imaging products to develop from proprietary E-mail systems with limited usefulness, to more widely used general E-mail systems with greatly enhanced capability.

4. Exporting

Most of the systems that allow the user to import image (or text) files also permit files to be exported. The Council has not needed this feature, at least in the first months of operation of its system.

Laser Fiche and Keyfile include special export features that allow a user to use the image files on a laptop. We understand that DocuPact also is developing such a capability. The Council did not evaluate these features, but they appear potentially useful.

H. Other Features

1. Workflow

Workflow was discussed briefly above. It permits an organization to rethink and then automate its repetitive work processes. For organizations with significant repetitive work processes, this feature can overshadow all other aspects of imaging in terms of potential benefit. The most frequently cited example is the insurance claims process, but the processing of legal documents by courts could fit into this category as well.

Large and expensive imaging systems have focused on workflow for years. The small-scale PC systems the Council reviewed are just beginning to implement such systems. The Council did not focus on this feature in its initial evaluation; however, we hope to implement it in the future when Imara adds this feature.

Keyfile is an example of a PC-based system with a workflow capability. While we did not extensively test the feature, Keyfile's system did seem completely capable of automating the Council's selection and retention processes. Another system, Navigator 2000, recently added a workflow component as well. However, we were only able to briefly review this feature at the 1992 imaging trade show.

2. Database

Imaging software in many ways is simply database software with an image viewing capability thrown in. The software keeps track of document names, locations, and attributes in a database, either proprietary or open.

This section, however, focuses on the ability of an imaging application to keep track of information found in documents (discussed above as the "database" component of imaging). The Council is interested in this feature to keep information about judicial applicants such as bar survey scores, education and experience.

Imara allows the user to design a database form on the folder level to contain this information. Imara acts as a simple database front end for Microsoft SQL Server or Oracle. The emphasis here is on "simple." Imara's front end lacks many database features found on even low-end databases. We hope to use a Windows front end such as Approach to gain greater access to the data.

Frequent Filer focuses on database applications and contains many more database type features than are in Imara. Its focus, however, is on the document level. See discussion, *supra*, at page 6.

The alternative to trying to use an imaging product as a database is to choose a real database designed for the job. The Council could, for example, simply use Approach to design and implement a judicial applicant database application. The advantage, however, of our current approach is that the information will be seamlessly available in Imara. We will be able to go to one location for data, whether that information is in a document or the database.

3. Security

The majority of the imaging software we reviewed included a capability to limit access to the system, and in many cases to limit access to specific documents. While this is not a feature that was important to us, it may be critical for many users.

I. Price, Product and Company

1. The Price

The price of PC-based imaging software varies tremendously. Quite capable software is available for a five-station network for under \$2,000, for ten to twenty times that amount (and more), and for anywhere in between. Further, the price of the software in many cases has very little to do with its quality, probably because the PC-based imaging field is so new and volatile.

Price comparisons must be done very carefully. Pricing depends on whether a company charges a flat fee for a network installation (File Magic and Paperless Filer), a fee for every workstation connected to the server and a server software fee (Keyfile), or a fee for the maximum number of workstations that can use the imaging server at one time (Imara). Such variations mean that comparative prices depend on the number of users and the level of use.

Further, the same company may offer two types of servers. For example, Keyfile has a Windows server for \$1,995 and an OS-2 server for \$4,595 (the OS-2 server is for use with Windows workstations). Certain charges can be hidden. For example, Imara charges \$6,000 extra for more efficient scanning software. (The Council initially decided to rent this Scan Flow software for six months to scan our document backlog, but eventually purchased the additional module.)

The pricing of imaging software becomes even more complex because different products may require purchase of extra hardware. Some systems require imaging cards (with varying amounts of memory). A fax capability requires a fax card. Imara, for example, needs one that costs about \$800. An OCR capability generally requires that the user buy separate OCR software. File Magic is the exception.

Finally, be sure to include the costs of installation and technical support. Imaging is a new and complex technology. Users will have problems installing anything more than a standalone system (and probably some even then). Even sophisticated users will want assistance. The difficulties lie in the linkages among the many different packages and pieces of hardware needed, as well as in the relative youth of imaging applications.

2. The Product

As emphasized above, imaging is a relatively new field, and certainly a complex one. Imaging software must seamlessly integrate the many complex functions discussed above and be able to work with many types of hardware. It should be no surprise that new imaging products will have numerous bugs to work out. Even more established products, meaning those with about one to two years on the market, still have problems to resolve.

The bottom line here is not to be a guinea pig for a new product. At least wait for the second release, even if the new product appears to be superior. On the other hand, do not be overly conservative. The problems inherent in the relatively new PC- based imaging systems can be overcome and the payoff can be substantial.

3. The Company

Users should be concerned about the company that produces the product they purchase, because many of the companies in the market today will be out of business two years from now. There currently are far more imaging software products than can survive over the long term, and new ones appear on the market regularly. The PC- based imaging market is likely to expand greatly over the next few years. Large software companies such as Borland or Microsoft could enter the field, which now is dominated by small ventures.

The only possible advice is to be wary. Look for a company that has a track record, one that has a good and improving product, one that markets its product well, and one that has established relationships with other companies in the imaging field. Remember also that owning a product whose producer has gone out of business is not the end of the world. The product may

still do what you purchased it for. Further, a portion of the imaging industry already focuses on helping users switch systems without losing their electronic files. This should not be particularly difficult, especially if the original software uses a non-proprietary database.

Users also should evaluate the company that produces their imaging software, and the company that sold them the software, for an ability and willingness to provide technical support. Imaging software is very different from a spreadsheet or a word processor. Its newness and complexity means you will spend many hours on the phone with technical support.

III. Imaging Software: Product Evaluations

The previous section reviewed imaging software in general terms. This section reviews individual products. It begins with a review of Imara and Keyfile, the Council's first choices, and continues with a review of other products in alphabetical order.

It bears reiterating that because of the rapidly changing nature of this field, product evaluations may be out of date almost before they can be put on paper. In fact, a product that has not rapidly improved will rapidly be off the market. Nevertheless, this report should give users a solid background in what is available. It should not be considered completely up-to-date or comprehensive.

A. Imara

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Imara is the software that the Judicial Council concluded had the best combination of power, flexibility, ease of use and price. We viewed the product in trade shows, used the standalone OS-2 version on a 30-day trial basis, and finally purchased the Windows version with an OS-2 server. (We use OS-2 v.1.3 from Microsoft, but IBM's OS-2 v.2.0 also is supported.) Imara, in addition to its OS-2 and Windows workstation software, offers software that allows a MacIntosh to be connected to an Imara network, and a standalone Windows version, Imara Lite.

The network version of Imara is available very reasonably at \$1,995 per simultaneous user (with volume discounts). There is no separate charge for the server software. The standalone OS-2 version is \$1,995 and Imara Lite sells for only \$295. Imara Lite's price, coupled with a 30-day

money-back guarantee and features comparable to the network version (except without E-mail and with a proprietary database) make it an ideal way to review Imara (and imaging in general).

We have been particularly impressed with Imara's sales and technical personnel. They have been knowledgeable and gone out of their way to assist us on numerous occasions. This is critical with imaging systems, all of which will have bugs.

We also believe that Imara is a company, unlike many others, that still will be in business several years from now. In addition to a strong, and improving product, Imara recently signed a cooperative marketing agreement with Microsoft that should lead to early implementation of Imara with Windows NT.

Imara uses a four level (set/category/folder/document) hierarchical filing system viewed as descending boxes (see page 14, *supra*). It offers a keyword field with a drop-down list to speed and make consistent keyword entry. It also allows the user to create virtually unlimited index fields on either the document or the folder level. Search capability is generally good, except query results are presented only by document names. Since the user may have many documents with the same name in separate folders, this is extremely confusing. Hopefully, the problem will be corrected by including the path (folder, category, set) beside the document name.

Documents can be entered into the system by scanning, faxing or importing. Application, as well as image, files can be imported. An additional scanning module, Scan Flow (available for \$6,000), allows faster scanning with additional indexing shortcuts. The scanning software is necessary for all but very low volume users.

Viewing controls are excellent, although a button bar for viewing controls would be helpful in the Windows version. In addition, the user should have the option of going directly from the document name to the first page of the document, without first listing all pages.

In addition to fax capability, Imara includes an E-mail capability and is working on implementing OCR with full text searches and workflow. Its ability to index at the folder level is a unique opportunity for the user to organize information as well as documents (see page 6, *supra*). Finally, it is worth noting that Imara has excellent online help.

Imara is compatible with Novell networks, Microsoft's Lan Manager and IBM's Lan Server. It uses a variety of client/server databases such as Oracle and Microsoft's SQL Server. The user can receive a runtime version from Imara or purchase the database separately.

In conclusion, Imara seemed the best product for our needs. This does not mean that we have not discovered shortcomings and bugs in the software or that the product is right for all users. Nevertheless, the product is relatively powerful, relatively inexpensive, quite feature-rich, produced by a company that responds to its customers and is apparently well-placed to survive.²

B. Keyfile

Keyfile

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Keyfile is a Windows product that was one of the two final choices that the Council considered. It is excellent software, similar in many ways to Imara, and in some ways clearly better. We were able to try Keyfile in our offices and became quite familiar with it. Keyfile is available in a single user version for \$600. Server software is available in a Windows version for \$3,000 (for up to five-station networks) and an OS-2 version for \$5,000. Network stations are priced at \$995 each.

Keyfile personnel were well informed about their product and helpful to Council staff. We believe that the company is one that will survive the coming shakeout in imaging products. Unlike most imaging products, it has been reviewed by the mainstream computer magazines several times.³

The first feature that is apparent with Keyfile is its well-designed interface. It, probably more than any other system, tends to "feel right" for a user from the beginning. Keyfile included an extremely thorough attention to detail, especially for a first release. Subsequent releases have made further improvements. For example, not only will it rotate an upside-down image, it will ask you whether you wish to view the document inverted in the future. This diversity of features means that Keyfile is not as easy to use as it first seems. In fact, it takes longer to set up and configure than many others. The product needs the maturity that subsequent releases probably will provide.

Keyfile has virtually unlimited versatility for filing documents in a hierarchical structure. It allows the use of cabinets, and folders where folders can be nested in other folders. Documents

² Imara was favorably reviewed in the March 1993 issue of WINDOWS SOURCES magazine, at page 441.

³ PC MAGAZINE, "Keyfile: Desktop Metaphor Helps Workgroups Manage Documents," February 11, 1992 at 46; PC WORLD; "The Less-Paper Office," October 1992 at 186; BYTE; "Profiles in Document Managing," September 1992 at 198 (comparing Keyfile favorably with Imara).

can be placed (dragged and dropped) either directly in a cabinet or in any level of folder. A major flaw in the first release--we believe now corrected-- was that the user could not search for documents which were put in folders (rather than directly in cabinets). Another annoyance is that it takes three or four steps to list the contents of a cabinet.

Keyfile has an adequate index system with three prenamed fields plus an unalterable date-of-entry field. The company will work with users to install a Visual Basic fix to allow the user to define approximately ten index fields. Keyfile has excellent search abilities using the index field. It allows the user to get a listing of all entries in a particular field. Thus, the user does not have to remember, or even type, the exact field name.

The product includes an add-in OCR capability with several popular OCR packages, as well as an excellent simulated desktop for working with documents.

Keyfile allows documents to be entered into the system by scanning, faxing or importing. Application as well as image files may be imported. Application files can even be viewed without opening the application software. However, shortcuts to indexing documents, except for drag and drop filing, are lacking.

Keyfile has an excellent viewing capability. Buttons allow easy paging through documents, or to the next or previous document. Sizing options are extensive and include a magnification feature that can focus easily on small details. Unlike most products Keyfile has, a grey scale viewing option that can improve the quality of an image significantly in certain cases. In addition, typed, written or even dictated notes can be associated with the document. More than one page can be viewed simultaneously, but multiple pages tend to disappear behind other windows.

Keyfile includes an E-mail capability and also has a workflow component that allows the user to automate repetitive work processes. If the Council had placed more emphasis on this feature, as many organizations should, we would probably have chosen Keyfile.

One of Keyfile's principle drawbacks is its use of a proprietary database. However, this drawback is offset to a certain degree by Keyfile's development of database access tools. The software is also configurable (through Visual Basic) to a much greater degree than other products.

In conclusion, Keyfile is an excellent product that we expect will get even better with subsequent releases. A bit lower pricing, a few more standard indexing fields and better indexing shortcuts could raise Keyfile to the top of the field.

C. Canofile 250

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The Canofile 250 produced by Canon is not primarily an imaging software product. Rather, it is a combined software and hardware system that includes a combined computer (running on a proprietary operating system), monitor, magneto optical drive, scanner, and a separate printer. We watched a demonstration of the Canofile 250 at a trade show and reviewed product literature, but did not examine the product closely because of its proprietary nature. The Canofile 250 is list-priced at \$15,000.

The primary advantages of the Canofile 250 are based on the fact that it is an integrated single purpose system. A major problem with component systems is getting all of the pieces to work together. This should not be a problem with the Canofile. Further, the system, because it has only a single purpose, can be tuned to optimize imaging. The scanner was fast (forty pages per minute according to Canon) even with double-sided pages, and printing appeared to be fast as well.

The major disadvantages of the Canofile also relate to the fact that it is an integrated system. The scanner, printer, optical drive and built-in computer are proprietary devices that can be used only with the Canofile. Further, the system is primarily a single-station solution to imaging. While software and hardware will apparently be available at extra cost to make Canofile images accessible on PCs, the system is designed as a single electronic filing and viewing station.

The Canofile uses a simple index field scheme to organize documents, allowing the user to identify a document's name, number and date (the date is automatically entered as the file date. The display is small but adequate (5-1/5" x 10-2/5" LCD). Maximum scanning resolution is 200 dpi, again adequate if not ideal.

In conclusion, the Canofile appears to be a relatively well designed single purpose imaging station. However, we believe most users would be well advised to use a PC and network system as illustrated by the other products reviewed. Such systems are harder to set up, but ultimately much more versatile and useful.

D. Data Flow

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Data Flow is a DOS imaging product targeting high volume users. We were able to view the product in the Data Flow office in Dallas. The product is available for \$7,500 for the server software and an additional \$2,500 for a five workstation license.

Documents can be organized hierarchically into three levels (database/tables/ documents). Nine user-definable fields also are available to categorize documents, including a date field that automatically is filled with the date of entry but can be changed. A sticky field option is available to ease indexing. Searching for documents by their fields is easy because the user can display a list of field values.

Data Flow has only adequate document viewing. This is primarily because changing views is awkward without a mouse. Multiple pages cannot be viewed simultaneously, although a future release will add this feature.

Data Flow has fax support, and OCR and full text retrieval are in development. There is no ability to import application documents. E-mail is not included, although a Data Flow "database" could be labeled "E-Mail" and serve as a primitive E-mail system.

Data Flow uses the B-Trieve database. The imaging software has been on the market since fall of 1991 and we found Data Flow's personnel to be especially knowledgeable about their product and imaging in general. In conclusion, the product seemed well able to provide a fast although basic imaging capability to the high volume uses it targets. Adding mouse support should be the company's top priority.

E. Desktop Document Manager *Alacrity Systems, Inc.*
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The Desktop Document Manager (DDM) is a Windows imaging software application and associated hardware. Alacrity was not willing to send us a demonstration version so we only reviewed product literature and a February, 1992 review in Windows Magazine (at 46). The software is priced for a single station at \$1,995.

DDM allows the user to file scanned and faxed documents, find and view those documents, OCR the documents, fax them out and print them. It has only a very primitive file index system

and apparently no hierarchical filing structure. In conclusion, DDM does not appear to have either the features or the sophistication of most of the other products we reviewed.

F. DocuPact

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5920 Plantation Dr.
Roswell, GA 30075*

DocuPact is a new Windows system that in many ways resembles Keyfile and Imara. We reviewed a beta version of the software in our offices. DocuPact is priced at \$4,995 for server software (which runs on an OS-2 server) and \$995 per node for workstation software. A separate voice capability is available for \$195 per node. The software is now available through Laser Data under the name "Group File."

DocuPact allows unlimited hierarchical filing, much like Keyfile, by permitting folders to be nested within other folders. Its presentation of the structure is better than Keyfile in that it allows the structure to be viewed in a tree format (see page 14, *supra*). Unfortunately, the window for viewing the hierarchical structure is quite small.

DocuPact has excellent viewing capabilities. One very innovative feature called hyperlinks allows an area of a document to be shaded and linked to another document. The other document can be viewed by clicking on the shaded area with a mouse. Several documents can easily be viewed at once.

The software allows notes to be overlaid on documents better than any other reviewed. In addition to typed, drawn or voice notes, text in a document can be highlighted.

The company has recently added a fax-in and fax-out capability, E-mail, text importing, and OCR. It is working on workflow. The software can use several SQL databases such as SQL Server and Oracle, and can be used on standard networks such as Novell and Lan Manager. The OCR module should be particularly effective given Docu Pact's ability to link an index field to a particular area of a document or form.

In conclusion, DocuPact is very promising software. But its newness convinced us to go elsewhere.

G. Fileflo

*Newport Canyon Associates
2082 Business Center Drive
Suite 245
Irvine, CA 92715
(714) 833-0333*

Fileflo is a Windows imaging product which, while somewhat limited, may be more than adequate for many users. We used a demonstration version of the software (available from the company without cost) and later reviewed a full working version. The software was priced at \$895 for a single user version. Server software was \$2,595 with a five-station workstation license included.

Fileflo organizes documents by up to eight index fields. These can be set as cabinet, drawer, folder and document or any other combination. Keywords can be added, and are searchable using boolean commands. The documents and their fields are presented in a spreadsheet format. This presentation has some distinct advantages in that it is very easy to sort documents to include particular fields or combinations of fields. Unfortunately, there are few shortcuts for entering field information.

Fileflo did not allow application files to be imported and did not include fax, E-mail, workflow or OCR capabilities. The company is planning on adding fax, OCR and text application capabilities. In conclusion, it was a good basic imaging system with a straightforward and logical interface, but lacked the features and sophistication found in other products.

H. File Power (Optika)

*Optika Imaging Systems, Inc.
North Creek II
5755 Mark Dabling Blvd.
Colorado Springs, CO 80919
(719) 548-9800
Fax (719) 531-7915*

Optika is a company that positions its Windows imaging software as an alternative to IBM and Filenet systems, rather than as comparable to the products reviewed here. However, at least a stripped-down version of the software for a five workstation network was offered to us for a bit less than \$20,000. (Company literature states that a single user version is available for under \$20,000 and a small workgroup solution for under \$80,000. Part of the confusion is due to the fact that Optika sells its product as many different software components.) We tried Optika in our offices for several days and viewed a demonstration at the local vendor's office of a more recent version of the software.⁴

⁴ Financial Systems Products Corp., 701 W. 41st Avenue, Anchorage, AK 99503, (907) 562-5551, Fax (907) 563-0656.

Optika has a four-level hierarchical organization, but the version we tried was difficult to use because selecting a cabinet entry did not bring up a list of drawers. The user had to remember the choices--a far from ideal solution. Further, there were no shortcuts for indexing. Optika is available with numerous different modules which allow expanded functions. These modules include workflow and OCR.

Optika targets a larger installation than we were considering. Its strengths, such as the ability to handle large systems, experience in such installations and general imaging speed, may well make it a good choice for larger installations. However, on the scale we considered, it is expensive and not as functional as other products.

I. Frequent Filer

*TEAMWorks Technologies, Inc.
33 Boston Post Road West, Suite 250
Marlboro, MA 01752*

Frequent Filer is Windows software produced by TEAMWorks Technologies, using base imaging software produced by Laser Data. We were able to try the software in our offices for 30 days. It is available for \$3,750 for a single-user version and \$5,200 for the network server software. Network workstation software is \$450 for each simultaneous user.

Frequent Filer is an imaging system that feels much more like a database application (with imaging) than the other products reviewed. It is most like Fileflo, although Frequent Filer is more sophisticated. Both use a database spreadsheet metaphor rather than the file cabinet metaphor used by most imaging products. Frequent Filer has no real hierarchical organization although it has recently added the ability to group documents in folders. Rather, users create a "database" with up to fifty user-defined fields for each item. The fields can then be viewed and sorted in a spreadsheet format. Of course, three of Frequent Filer's indexes could be titled cabinet, drawer and folder and thus used to simulate a hierarchical structure.

Frequent Filer's more purely database origins give it superior index entry, sorting and search abilities. Default values, sticky fields and pop-down lists all are available to ease index field entry. The database can be sorted with the sophistication one would expect in a database, but which is usually lacking in imaging applications. The same is true for searching for particular indexing combinations.

Viewing options are also excellent. The user can view several pages at once. An E-mail capability, and an ability to add notes and highlighting to documents, was recently added.

Frequent Filer lacks many of the associated features found in other products. Neither image nor application files can be imported. Full text search ability and workflow are not included. Documents can be faxed in or out. The software can use several databases, including Gupta and SQL Server.

In conclusion, users who do not need the extra capabilities sometimes associated with imaging software, especially those who are familiar with database software, will be impressed with Frequent Filer's ability to index, sort and search for documents. On the other hand, the way that conventional imaging software represents the hierarchical structure will appeal more to other users.

J. FYI

*IdentiTech, Inc.
1333 Gateway Drive, Suite 1000
Melbourne, FL 32901
(407) 951-9503
Fax (407) 951-9505*

FYI is a new Windows product at the top end in price of the systems we evaluated. (One source lists the price range from \$77,500 - \$400,000.) We saw the system demonstrated at an imaging show in June 1992, but have not evaluated the product further.

FYI is limited to a two-level hierarchy (folder/document), but does allow what seemed to be very flexible index fields. It allows application files to be imported and employs sticky fields to ease index entry. OCR and fax capability are included and the company is developing a workflow module.

FYI is compatible with Net Bios networks and allows the user to choose from a variety of SQL databases. While we did not investigate the product fully, it appears to be a promising, although expensive, alternative. We note that the Brevard County Court in Florida uses an FYI imaging system.

K. Group File

*Laser Data
5201 Great America Parkway
Santa Clara, CA 95054
(408) 562-6140
Fax: (408) 982-2531*

Laser Data introduced this Windows based imaging software at the 193 AIIM show. It is the same (or at least substantially the same) as a product separately marketed as DocuPact.⁵ Both products have excellent features, but both are untested.

⁵ See page 37, *supra*.

L. Image Fast

*Benson Computer Research Corp.
7926 Jones Branch Dr., Suite 260
McLean, VA 22102
(703) 442-4545
Fax: (703) 893-7499*

Image Fast is a Windows imaging product that includes the seamless integration of fax and OCR capabilities. A single-user version of the software sells for only \$195 and the network software for five simultaneous users is \$9,500.

Image Fast has a limited two level hierarchical filing system. It also has an ability to create index fields, however this ability is on the page rather than the document level. This would make it difficult to use Image Fast with documents longer than a single page.

Image Fast does include a broad array of features and the ability to import text or data documents. The user can OCR zones on forms and full text searches are possible. More than one document can be viewed simultaneously. In summary, Image Fast has many components that other products lack, but its focus on the page level may rule it out for many users.⁶

M. File Magic (formerly Imagic)

*Westbrook Technologies, Inc.
22 Pequot Park Rd.
P.O. Box 910
Westbrook, CT 06498-0910
(800) WHY-FILE
(203) 399-7111
Fax (203) 399-7137*

File Magic, formerly known as Imagic, is a Windows product which could bring document imaging to many small users not targeted by other companies. It stands out as the company with the most effective marketing of the companies we reviewed. We were allowed to review Imagic on a trial basis in our offices. The single-user version was available for \$895 and the network version (unlimited license) for \$1,895. (These prices have changed somewhat recently.)

Two things stand out about File Magic. First, it is as close to a shrink-wrapped imaging product as is now available and is effectively marketed as such. For example, it recently appeared in a Microwarehouse software booklet beside Quicken. Second, the product, despite its low price, has quite a few very innovative features.

⁶ Image Fast 1.1 was favorably reviewed in the March 1993 issue of WINDOWS SOURCES magazine, at page 441.

File Magic's hierarchical filing system is the first of these innovative features. Folders are set up by defining a search routine (see page 20, *supra*). Documents later entered into the system are filed automatically depending on whether their index fields meet the search criteria. While setup time is significant and the concept is at first confusing, this feature is quite worthwhile. Unfortunately, hierarchical filing is limited to three levels (drawer/folder/document).

The user can set up and define twenty fields (ten are indexable) to categorize documents. Field information must be typed in without shortcuts such as drop-down lists. There is one exception. A very innovative use of OCR allows several words (or even the whole document) to be highlighted and easily inserted into a particular field. This feature can even be pre-configured to index several fields on a stack of forms. The OCR capability in File Magic is especially noteworthy because it does what it does very accurately, and the OCR component is included in the base price of File Magic.

File Magic has a fax-in and fax-out capability. It does not, however, allow application files to be imported. (However, a new version of the product shown at the 1993 AIIM show will add this feature.) Also, the search routine (as well as index entry) would be significantly improved if the user could see a list of the existing entries in a particular field.

In conclusion, File Magic is an excellent product. Assuming that importing text documents is not critical, it may be the best choice for small scale users. Given this niche in the market, and its effective marketing, the company is likely to be one of the ones that survive.

N. Laser Fiche

*Compulink Management Center, Inc.
370 S. Crenshaw Blvd., Suite E-106
Torrance, CA 90503
(310) 212-5465
Fax (310) 212-5064*

Laser Fiche is a DOS imaging product configured for Novell networks (although it is compatible with Net Bios systems) that offers full text search ability. A Windows version that appears to correct the shortcomings of the DOS version has been in beta testing and should be available when you read this report. We examined the DOS version extensively in the offices of Compulink's Dallas distributor⁷ and viewed the Windows beta version in an imaging trade show. Laser Fiche sells for \$2,495 for a two-user pack and \$4,995 for a five-user pack. A notebook version is available for \$495.

⁷ Orbit Document Management Group, 5001 Infomart, 1950 Stemmons Freeway, Dallas, Texas 75207, (214) 746-4860, Fax (214) 746-4346.

Laser Fiche's strength is its emphasis on full text searches. Unlike other products where this ability has been added almost as an afterthought, Laser Fiche was designed with this feature paramount. For example, full text search results can be viewed in context of the sentence where the hits occurred. Further, the Windows version allows "fuzzy" searches which can be set to, for example, find misspellings of a word--a useful feature given the lack of perfect accuracy for OCR.

Laser Fiche only allows hierarchical filing on two levels, although the Windows version will expand this by allowing folders to be placed within other folders. The DOS version does include a quite adequate number of user-configurable index fields. Document indexing is made a bit easier by the use of sticky fields.

Documents can be entered on the system by faxing and scanning. A batch scan ability, with the OCR done at the end of the day, is well designed. However, application files cannot be imported--a shortcoming that the Windows version will overcome. One very useful feature is the ability to down load folders of images to a laptop. We hope other vendors will add this ability.

Viewing controls are adequate although only one page at a time can be viewed. The required Kofax imaging card means that printing as well as general system speed is good. Only rather primitive fax and E-mail components are included, but these may be improved in the Windows version. The system uses the Paradox database.

In conclusion, Laser Fiche should be seriously considered for a user for whom the ability to do full text searches is paramount. The new Windows version is very promising and may reach a wider market.

O. Navigator 2000 DSM

*i Levy Associates, Inc.
1633 Des Peres Road, Suite 205
St. Louis, MO 63131
(314) 822-0810
Fax (314) 822-0309*

Navigator 2000 DSM is Windows imaging software produced by i Levy. We were given a several hour demonstration at a trade show, discussed the system in some detail with i Levy representatives, and reviewed a demonstration version of the software in our offices. We found the i Levy representatives to be exceptionally helpful and well informed. Unfortunately, the local Wang representatives who would have sold and serviced the product were less informed and helpful.

While i Levy has experience in larger-scale imaging systems, Navigator was just released when we viewed it in Spring 1992. In spite of this, it appeared to be very logically designed. It did not include such functions as fax and OCR, but probably will in the future. (An OCR module was shown at the 1993 AIIM show.) A workflow module has already been added. We were quoted a price of about \$20,000 for software for a five-station network, plus about \$5,000 for installation (\$1,000 per day). This had dropped to \$15,000 by early 1993. This is expensive compared to such systems as Keyfile and Imara, but less than products such as FYI.

Navigator organizes documents into a four-level hierarchy that is well-thought out and implemented. It provides the user with several pre-configured basic index fields and also the capability for the user to create virtually unlimited indexing with what Navigator calls "cross references."

Batch scanning is allowed, and application as well as image files can be imported into the system. The use of drop-down lists makes filing and indexing easier. Similarly, searching for documents is easily done because of the well-designed hierarchical structure and use of drop-down lists. Viewing controls are good, but a button bar would make manipulating images easier.

The system can be used with any Net Bios compatible network. It does require a second database server. (Navigator uses Gupta SQL database software.) This is in addition to the network server, and would of course add to the total cost of the system.

In conclusion, we liked the Navigator system and were impressed by its logical design. Despite its price, it is a system which users should at least view. Also, there may be a demonstration version available.

P. Paper Gate (formerly Marvin) *Image Tech*
29444 Northwestern Hwy,
Suite L-500
Southfield, MI 48034
(313) 353-7900
Fax (313) 353-8444

Paper Gate is Windows based imaging software that excels in its use of index fields. We reviewed a beta version of the software at the 1992 AIIM Convention and an earlier version of the software (then known as Marvin) in our offices. The network version is available for \$2,495 with a five-station simultaneous user license priced at \$9,500.

Paper Gate has no hierarchical filing structure. While this may be a drawback for many users, the product does make excellent use of index fields to categorize and find documents. Not only can the user define a virtual unlimited number of different types of fields, but the product makes admirable use of drop-down lists to make document filing and querying fast and consistent. Other developers should copy this ability. Default values for fields also can be used to speed document filing.

Paper Gate includes a fax in and out capability. However, it does not include OCR or workflow modules. Only ASCII text documents can be imported. It does have a button bar for viewing controls and the ability to simultaneously view more than one page. In summary, Paper Gate may be an excellent alternative for users who can live without a hierarchical structure and the ability to import application documents. We would be a bit wary however, until users of Paper Gate (rather than Marvin) confirm its stability.

Q. Paper Less Filer

*Paper Less Corp.
1750 N. Collins Road, Suite 104
Richardson, TX 75080-3551
(800) 658-6486
(214) 235-4008
Fax (214) 480-5408*

Paper Less Filer is an inexpensive DOS system with many of the capabilities of software selling for several times its cost. We reviewed the product extensively in the company's Dallas area office and reviewed the product manuals later in our office. The standalone version of the software is sold for \$495 and workstation licenses are \$795 each.

Paper Less allows hierarchical filing only in two levels (cabinet/document), but does allow six user-defined index fields of up to sixty characters each.

Documents may be scanned, faxed or imported (as images only) into the system. Batch scanning is supported and a sticky field option eases index field entry in this mode.

Viewing controls are only adequate, at least partially because the software does not support a mouse. Notes cannot be overlaid on a document, but can be entered in a separate notes field.

The company reports that it is working on developing OCR, E-mail and application file importing capabilities. It also is considering a Windows version.

In conclusion, Paper Less is a capable product for the low-end DOS market at which it is aimed. It might be better off forgetting about a Windows version and concentrating on its current focus where it leads the competition.

R. Paper Tamer

*Visitel
830 South Main Street
Cottonwood, AZ 86326
(602) 634-5100
Fax (602) 634-0100*

Paper Tamer is DOS-based imaging software aimed at single users or small networks. We reviewed a demonstration disk, as well as a full version of the software. It is very reasonably priced at \$995 for a single station and \$2,995 for the network version with an unlimited number of users.

Paper Tamer uses an effective graphical interface to present a tree view of its four-level hierarchical filing system. A document is scanned or imported at a particular place in the hierarchy

so that cabinet/drawer/folder information does not have to be separately entered. Text documents (at least text documents created by a DOS word processor) can be imported.

The product also has a keyword field in addition to its hierarchical structure. However, boolean searches are not allowed. (Keywords really are just an extension of the document name.)

The principle drawback of Paper Tamer is its poor document viewing capability. Drivers for high resolution monitors were not available and viewing controls were poor. Also, there was no driver for a Postscript printer.

While Paper Tamer has its strong points, it seems a bit amateurish compared to other systems. However, its reasonable price and availability of a free demonstration disk make it worthwhile to review. Paper Tamer does have a fax capability and works with several OCR DOS products. It uses a proprietary database.

S. Quick View

*Seabreeze Engineering
442 S. North Lake Blvd., Suite 1000
Altamonte Springs, FL 32701
(407) 331-1996
(800) 277-3086
Fax (407) 331-1589*

Quick View appears to be a relatively primitive DOS imaging software. We reviewed product literature and viewed a demonstration disk. The product retails for \$2,495. The developer's package starts at \$795 for a single-user version and is \$1,595 for a multi-user package.

Quick View allows only two hierarchical levels. The user can then use ten fields to categorize documents. There are no indexing shortcuts. The lack of mouse support makes the documents inconvenient to view.

The advantage of Quick View is that it allows the user to add an imaging capability to a variety of DOS databases. This ability to interface with software such as Paradox does give Quick View a real usefulness.

The software has fax capability but lacks other abilities such as E-mail, workflow, and text importing. In conclusion, users may find other products that better fit their needs, but Quick View's ability to interface with DOS databases may make it the preferable choice for some.

T. Syntax Filer

Syntax Inc.

11400 Commerce Park, Suite 220
Reston, Virginia 22091
(703) 620-0550

We very briefly reviewed this Windows imaging software at the 1993 AIIM show. It is a new product and reasonably priced.

Syntax Filer uses a well designed hierarchical structure in a tree format. It includes OCR, full text search, E-mail and fax capabilities. It also apparently includes the ability to work with text as well as image files. The product uses a proprietary database.

U.

Summit Software Corp.
430 Tenth Street NW, Suite N-202
Atlanta, GA 30318
(404) 888-0700
Fax (404) 888-0502

Summit Software does not sell the type of pre-configured imaging software which this report covers. Rather the company designs workflow imaging solutions in Windows using the Oracle database. We mention Summit for two reasons. First, they have done extensive work with the Charlotte County court system in Florida, as well as other courts in Florida and elsewhere. The case management system that has been developed (functions are continuing to be added) allows the court to combine imaging technology with managing cases.

Second, Summit was quite willing to work with us to design a specialized system for the Judicial Council for little more than many of the pre-configured systems we considered. Summit is an attractive alternative to those users whose specialized workflow needs exceed the scope of the small-scale imaging software on which we have focused.

V. UniDoc

UniDoc Corporation
204 West Main Street
Monroe, Washington 98272
(206) 794-5690

UniDoc is a DOS imaging product with an OCR capability. It sells for \$495 for a single-user version and \$9,495 for the network version plus \$495 per workstation. A full text search module is available for an addition \$3,000 plus \$20 per workstation.

UniDoc has only limited filing and retrieval capabilities. It has a one level hierarchical structure; documents can be placed in folders. A document name field is long enough to include keywords and several other fields can be set up by the system administrator. However, the fields cannot vary by folder. Boolean searches are possible.

UniDoc has an OCR capability using Kurzweil software. In addition, the user can import application files and the software automatically starts the application when the document is selected. There are no fax, E-mail, or workflow capabilities.

UniDoc appears to be a functional imaging product. Its OCR abilities are useful. However, its primitive filing capability and interface are serious drawbacks.

IV. Imaging Peripherals

While the focus of electronic document management tends to be on the imaging software, there are at least a dozen other necessary software and hardware components that make up an electronic imaging system. These include regular computer hardware on which the imaging system must run such as computers, monitors and printers; specialized imaging hardware such as scanners, optical storage devices and imaging cards; network hardware and software; and miscellaneous other items such as fax cards and database software.

One of the greatest problems with today's imaging systems is to get these components to work together properly. Be assured that success will take a great amount of time and technical assistance. The critical first step is to purchase peripheral components that are compatible with the imaging software selected. As emphasized earlier, particular imaging software products are not compatible with all components.

This review of imaging peripherals is much less detailed than the Council's review of imaging software. This is partially because our choices were limited to products compatible with Imara. Also, discussion of such issues as computers, monitors and networks practically must be limited since these areas are so broad.

The choices for operating systems were discussed *supra*, at page 10, and are not repeated here. However, keep in mind that the workstation operating system--either DOS, Windows, OS-2 or Mac--is really the first imaging peripheral to consider.

A. Computers

The Judicial Council purchased its computers by mail order from Gateway 2000. The server is a 486 DX2 50 EISA machine. The six workstations include two 386/33s, one 486 DX2 50, two 486 DX2 50 EISA computers and one 486/33 EISA. The server has 16 MB RAM and the workstations have 8 MB each.

The small price differential between 386 and 486 computers, coupled with the load that imaging puts on a system, means that anyone purchasing computers now should buy a 486. An existing 386 (with probably additional RAM--8 MB) should be adequate for a workstation. A 286 is probably adequate as a stopgap measure for DOS imaging software. In deciding how powerful a computer to buy, check the imaging software literature. However, recognize that the requirements stated there sometimes are adequate only for minimal usage.

The server should be a 486, particularly if the user intends to use it as an image and network server as the Council does. The server (particularly the network server) probably should be an EISA machine. There does not appear to be a current cost justification for EISA workstations. Finally, purchase a tower model with room for multiple cards for the server or other machines that will have to hold network, imaging, fax and other cards.

The Council purchased computers from Gateway 2000 because we concluded this mail order company could give the most value at a very inexpensive price. Very generally speaking, computers fall into three categories: very good and expensive name brands such as IBM and Compaq (which, however, are getting relatively less expensive all the time); very good and inexpensive name mail order firms such as Dell, Gateway 2000, Northgate, and Zeos; and very inexpensive mail order brands of variable quality. Gateway's quality probably is as good as any and its prices are inexpensive, even compared to other name mail order companies. However, expect to spend some time on hold if you need to call technical support. Further, their quality control seems to have suffered during their recent phenomenal growth. Gateway will politely and promptly fix or replace defective components.

B. Monitors and Video Adapters

1. Monitors

The Council uses an ordinary 14" monitor running at VGA resolution (640 x 480) on its server. Five of the workstations use NEC 5FG 17" monitors running at a resolution of 1024 x 768. The final workstation has a Cornerstone Dual Page 120 black and white monitor running at 120 dots per inch and a resolution of 1600 x 1200. These three setups represent the three main options which users can choose.

The first is to use existing monitors at VGA or Super VGA resolution on the imaging system. This clearly is an option, especially if the station will not require heavy imaging viewing and if the monitor can be upgraded in the future. However, expect to be able to see less than one-

half page on the screen at once. Using such a monitor to regularly view images on a permanent basis is impractical. However, our 14" monitor has been adequate on a scan station.

The second option--using a 17" color monitor at 1024 x 768 (or 1280 x 1024)--is ideal for regular although not heavy image viewing, especially when the station also runs word processing or spreadsheet applications. Users will appreciate the larger screen for word processing and spreadsheets, as well as imaging. While 19" to 21" color monitors are available, they will not run at higher resolutions with imaging applications. Also, their much higher prices, large weights and sizes, and only marginally better viewing mean that they are not practical options.⁸

We picked the NEC 17" monitor for several reasons. It is the industry standard and has been rated highly by numerous computer magazine articles. We were able to purchase it at a price comparable to, if a bit more expensive than (about \$1,300) to other 17" monitors. Finally, and most important, the NEC supports viewing at 1280 x 1024 resolution, the highest currently available for a monitor to use with imaging.

The user must be very careful in evaluating a product's stated resolution. Numerous monitors state that they support 1280 x 1024 resolution, however many only support this resolution at a refresh rate of less than 70 Hz. Such a refresh rate means that the monitor will flicker too much at this resolution to use. Note that refresh rates vary by which resolution is selected. Second, the monitor must support non-interlaced viewing at that particular resolution. The bottom line is that imaging is a demanding application for monitors and that a cheap monitor is very likely to fall short in running imaging applications even if it is more than adequate for word processing.

The third option of using a black and white dual page monitor of about 20" running at 120 dots per inch (150 dpi is also an option) and at least 1600 x 1200 resolution is the best option for workstations that will be used for viewing large volumes of images. Documents can be read on such a monitor with what approaches the ease of reading a paper document. Cornerstone and Sigma are the two leading companies that produce monitors of this type.

The drawbacks of these large monitors are their size and weight, the fact that color is a useful feature especially in Windows, and their higher cost. In considering cost, include the cost of the required video adapter that must be purchased with these monitors. (We paid about \$2,000 for the monitor and the basic adapter card.)

⁸ Cornerstone has recently come out with an expensive video adapter which makes it possible to view images at 1600 X 1200 resolution on a 19" to 21" color monitor.

2. Video Adapters

All computers include a video adapter which in very simplified terms acts as a connector between the computer and monitor. However, many of these included adapters do not support sufficient resolution and do not pass the video signal to the monitor fast enough for imaging applications. The advent of Windows has led, however, to the inclusion in many computers of video adapters that support 1024 x 768 resolution, and that display video fast enough for image applications. The Council's Gateway computers included ATI Graphics Ultra adapters which have functioned well. However, these adapters are already being replaced by a new generation of video adapters, and by a new technology called "local bus," that allows images to be presented even faster.

Purchasing a video adapter requires checking some of the same factors as with monitors. The adapter must support a particular resolution in a non-interlaced mode and with a refresh rate of at least 70 Hz. The only current adapter for color monitors that supports these conditions, and viewing at 1280 x 1024 resolution, of which we are aware is Cornerstone's Image Accel 1280.⁹ However, the cost of \$995 is high when fast adapters that support 1024 x 768 resolution come with many computers at no extra charge.

As noted above, video adapters for large black and white monitors are in a different category. These adapters are generally specific to the monitor and should be purchased with it.

C. Storage Devices

A document management imaging system must store its images on some medium. Optical disks usually are associated with the storage of images; however, hard drives and even tapes also are options.

1. Optical Drives

The Council purchased a Panasonic LF 7010 multi function optical drive. This drive holds a single disk that can be either a WORM disk or a rewritable disk. The disks hold about 1 gigabyte of data, one half on each side.

⁹ But see note 8, *supra*.

The Council chose a multi-function drive because of its flexibility. WORM disks are particularly useful if legal requirements require assurances that documents have not been altered after they have been stored on the disk. (Note, however, that a document on a WORM disk can be deleted although the disk space cannot be reused.) The Council primarily uses rewritable disks because of their greater flexibility. Documents saved by mistake can be deleted, and documents can be moved to other disks and the original disk reused.

Two capacities of disks are available for use: a 5-1/4 inch disk with a capacity of about 1 gigabyte and a 5-1/4 inch disk with a capacity of about 600 megabytes.¹⁰ The advantage of the second, smaller capacity drive is that its access times may be virtually the same as hard drives.¹¹ The larger capacity drives have much slower access times. However, optical drive technology is advancing at a very fast rate. Significantly faster and higher capacity optical drives will be available in the next couple of years. The Council anticipates replacing its optical drive in the not-so-distant future.

The final choice is whether to purchase an optical drive holding one disk or to purchase a jukebox, a drive holding many disks. A jukebox allows the user access to multiple disks--and even a relatively small user will have multiple disks--without having to walk to the server and insert a different disk. It is a significant convenience, and jukeboxes holding about 10 disks are available for about \$10,000. The Council will eventually purchase a jukebox, but decided to put this purchase off to save money initially and because optical disk technology is progressing so rapidly.¹²

¹⁰ Smaller optical drives holding about 128 MB are also available, but are not large enough for most imaging applications. Large capacity optical drives holding much larger disks also are available but are probably too expensive for the small user.

¹¹ This is only true with some manufacturer's models. Hewlett Packard's product is one example of a fast drive.

¹² Note that a double capacity disk with a capacity of 1.3 gigabytes was introduced at the 1993 AIIM show.

2. Hard Drives

The prices of large hard drives make them a faster and cheaper alternative for at least relatively small numbers of frequently used images. The major disadvantage is that hard drives are more subject to data loss. Further, storing larger number of images on hard disk is uneconomical, particularly since a separate backup system will be necessary to safeguard the data stored on the hard disk.

The Council ordered its server computer with a second hard drive with a capacity of about 1 gigabyte. This drive is now used to store current selection document images. More importantly, it gives the Council the flexibility it needs to create backup copies of optical disks and to generally manage very large image files. Finally, the hard drive is used by the imaging software to store the database that keeps track of all document images and their identifying characteristics.

3. Tape Backup Devices

Tape drives are often used for backup. We have read about one law office that used a large tape backup drive to store images. It had a very slow access time even compared to optical drives, but it also cost significantly less than an optical drive.

In fact, one company uses an 8mm 1/2 inch tape drive to store U.S. patent information. The company has stored 580 gigabytes of data so far. The patent information is available by fax.

D. Scanners

The great majority, if not all, of the software imaging vendors to whom the Council talked used a Fujitsu 309X scanner to demonstrate their systems. These scanners, costing about \$5,000, appeared to be the consistent industry standard for medium speed (about twenty pages per minute) scanning. They are supported by virtually all imaging software, include a fifty-page automatic document feeder, scan at a rate fast enough for most small users, and support an adequate range of resolutions (200-400 dpi).¹³

The Council purchased a Fujitsu 3093 scanner that will scan a maximum paper size of 11 x 14 inches. The 3096 will scan paper sized up to 11 x 17.

¹³ The November 1992 issue of *Imaging Magazine* includes a review of twenty scanners with a scan rate of at least twenty pages per minute.

Scanners generally require an adapter card to connect with the computer. An advantage of the Fujitsu scanners is that the general imaging cards discussed below all support these scanners.

E. Printers

Most imaging systems do not require a separate printer. The Council uses a HP Laser Jet IIID on its network to print word processing documents as well as images from Imara. However, imaging does introduce complications into network printing simply because imaging files are so large that they are extremely slow to print. We found that using a Postscript cartridge on our network printer was impractical because it slowed down the printer even more. The issue of print speed is discussed further when special imaging adapter cards are covered below.

Some users will find it desirable to purchase a printer specifically for the imaging system, especially if they plan to print an especially high volume of image documents. Some systems even require a separate printer. The Council in fact purchased a separate printer for one of its secretaries, partially to ease the load on the network printer, although the extra printer had more to do with convenience than with factors relating to imaging.

F. Imaging Cards

Most document imaging systems either require or at least allow the use of special imaging adapter cards to assist the imaging software. These cards can have different functions. First, they can assist the computer in handling imaging by compressing and decompressing images, either when scanning or retrieving. Second, they are necessary to connect such scanners as the Fujitsu scanners to the computer. Third, they permit faster printing by allowing a special video cable hookup between the computer and the printer. However, this last feature does not currently work for network printing. Cards are available that accomplish any or all of these functions. These adapter cards are developing and changing rapidly.

An imaging card must be selected that is compatible with the imaging software, the scanner and the printer. The Council purchased a Kofax 9200 imaging card for about \$2,500 with the necessary cables. We ordered the minimum amount of memory since Imara does not use the card to process images, but only as an interface with the Fujitsu scanner and printer. Xionics is probably the second most prominent imaging card producer after Kofax. An excellent article reviewing imaging cards appeared beginning on page 50 of the October, 1992 issue of *IMAGING MAGAZINE*.

G. Fax Cards

Many imaging systems are compatible with fax cards that allow images to be faxed out of and into the imaging system. The Council purchased a Gammalink Gammafax CP card for approximately \$800. This network fax card was the only one compatible with Imara when we purchased it. Several imaging systems are compatible with single-user fax cards that are substantially less expensive.

H. Database

Some imaging software systems such as Keyfile employ a proprietary database. Others such as Navigator 2000 come with a runtime version of an independent database. Neither type of imaging software requires the user to make a choice.

Some imaging software, however, is compatible with several different database products. The Council had a choice between Oracle, Microsoft's SQL Server and IBM's Database Manager. We chose SQL Server (about \$2,000 for a 10-user version) primarily to maintain consistency in our network. We use Microsoft's Windows on workstations and Microsoft's Lan Manger as network software. Further, we expect Imara, Lan Manager and SQL Server to migrate from OS-2 to Windows NT in the near future.

One advantage of an open database, and of having a full license for the database rather than only a runtime version, is that the database can be accessed and manipulated independently of the imaging software. We intend to use a Windows database called Approach 2.0 (purchased for about \$100) to access tables set up by Imara. We believe this will allow us substantially more flexibility in manipulating tables containing image reference information, as well as tables containing summary information about judges and judicial applicants.

I. Network Software

Network software, like the other items discussed in this section, should be purchased after ensuring that the network software is compatible with the imaging software. Alternately, if the user already has a network installed, make sure the imaging software is compatible with it. Fortunately, most imaging software is compatible with the major type of networks so this is not a particular problem. However, some imaging products, for example Laser Fiche, are optimized for a particular network vendor, in this case Novell.

The Council chose to purchase Microsoft's Lan Manager network software. First, unlike Novell it runs on a server using OS-2 version 1.3. Since the Imara server also runs on OS-2 version 1.3, we are able to use one computer as the network and image server. This slows performance, but for a small network, performance remains acceptable and a substantial amount of money is saved.

Second, we saw an advantage in using one vendor's products for our workstation operating system (Windows), our server operating system (OS-2 v. 1.3), our database (SQL Server) and our network software (Lan Manager). This consistency is particularly important in an area as complex and as fast-moving as imaging.

The Council did consider a peer-to-peer network system such as Lantastic. We remain unsure, however, how well such a system would handle the large size of imaging files. We suspect, however, that at least on a small network (five users??), a peer-to-peer system would work just fine. Its advantages would be a simpler network system and one that is in many ways more flexible.

J. Network Hardware

1. Adapter Cards

The first choice in deciding upon network hardware is to decide whether to use a token ring or ethernet network system. Token ring is marginally faster, but was not for our purposes was not fast enough to justify the significantly greater expense.

There are dozens of ethernet network adapters available. We have no special knowledge of the relative merits of the cards. We chose 3 Com 16TP cards primarily on the basis of price. (We paid about \$150 per card.) We do believe that it would be worthwhile to use an EISA network card in the server and plan to do so in the future.

2. Wiring

There are several types of wiring which can be installed to enable a network. Again, while we have no particular expertise in this area, we were able to use existing twisted pair wiring already installed in our building. Only the wall jacks needed to be updated.

3. Hubs

An ethernet network set up in a star configuration needs to have a hub or repeater to connect the wiring that goes to each computer. This component can be in the form of a separate box with widely varying capabilities and prices. We used a hub that is contained in an adapter card that goes in a computer. The Intel NEH9125 twelve-port hub EISA card which we purchased (\$688) has network administrative capabilities for Novell networks. These capabilities cannot be utilized by Lan Manager, but with the small size of our network, we did not need them. The advantage of a hub card is that you get more for your money because the manufacturer does not include a box or a power supply. The disadvantage is that it takes a slot in a computer, though the computer does not have to be the server.

K. Optical Character Recognition Software

While an occasional imaging product such as File Magic has OCR software included in its software, most products only include compatibility with a commercial OCR product. The user's choice will be constrained by the product chosen by the imaging vendor. We have not purchased OCR software yet, but expect to after Imara adds support for this capability.

V. Conclusion

This report has attempted to present the Council's experience with document management imaging software in some detail, and with imaging peripherals such as scanners and optical drives at least very briefly. We hope that our experiences can be of use to others. However, readers should keep in mind the limitations of this report described above. Readers are encouraged to talk to us about their plans. We are happy to share our experiences.