V. Information Systems and Services User Services

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The other sessions in this symposium were associated with the user community through a so-called user discipline (e.g., agriculture, geology, land use). The information systems and services session and the user services session were also related to the user community but in a different fashion; its association was more directly with the technology itself.

Prepared papers were presented in both sessions; an "interactive session," in which members of the audience could interact directly with a panel of experts, was held in the user services session. Papers presented can be categorized topically as follows.

1. Data availability and distribution
2. Descriptions of complete processing systems
3. Developments regarding subsystems
4. Applications related to the technology
5. Research for future technology
6. Education and training opportunities and materials

Modern remote-sensing technology has been under intensive development by NASA for about the last decade. Now, two important questions, which were amplified during this symposium, must be considered. Is there really a technology ready for the user? If so, to what extent has this technology already begun to permeate the user community?

Of the papers presented, fully one-third were descriptions of complete, ready to use data processing systems that are offered by various organizations. Figures V-1 and V-2 are examples of those discussed. These and similar systems provide concrete evidence that hardware specially designed for remote-sensing technology and for the user community is now available off the shelf, which was not true at previous symposia. These systems represent recognition by private enterprise of the existence of a user community and a market and of the actual and potential use of such technology. This trend is a major indicator of the answer to the question about readiness of remote-sensing technology.

A second observation can be noted from the applications papers presented during this session. For example, a speaker (I-6, vol. I-B) from the U.S. Forest Service described a straightforward and routine application of remote-sensing technology using Landsat data as a part of the agency's daily efforts. There have been many spectacular events in this field in the past; however, there are now evidences that remote-sensing techniques are being used in many more routine kinds of applications. These nonspectacular applications are important because they indicate a maturing of the technology.

Further conclusions about remote-sensing technology and its relationship to the user community may be drawn from information about data availability and from descriptions of data uses. There were two presentations on data availability (I-21, vol. I-B, and U-2, vol. II). Some statistics regarding requests to the Earth Resources Observation Systems (EROS) Data Center were given that lead to some perceptions about trends in data use.

The number of requests received at the EROS Data Center for remote-sensing data is shown in table V-I by fiscal year (FY). Notice the very large increase in requests for Landsat imagery, 94 percent, from fiscal year 1973 to 1974, and another increase in fiscal year 1975.

In his remarks during the opening session of the symposium, William Stoney emphasized the very rapid adaptation of the user community to digital data. The expanded use of Landsat computer-compatible tape (CCT) units shown in table V-I clearly illustrates this fact.

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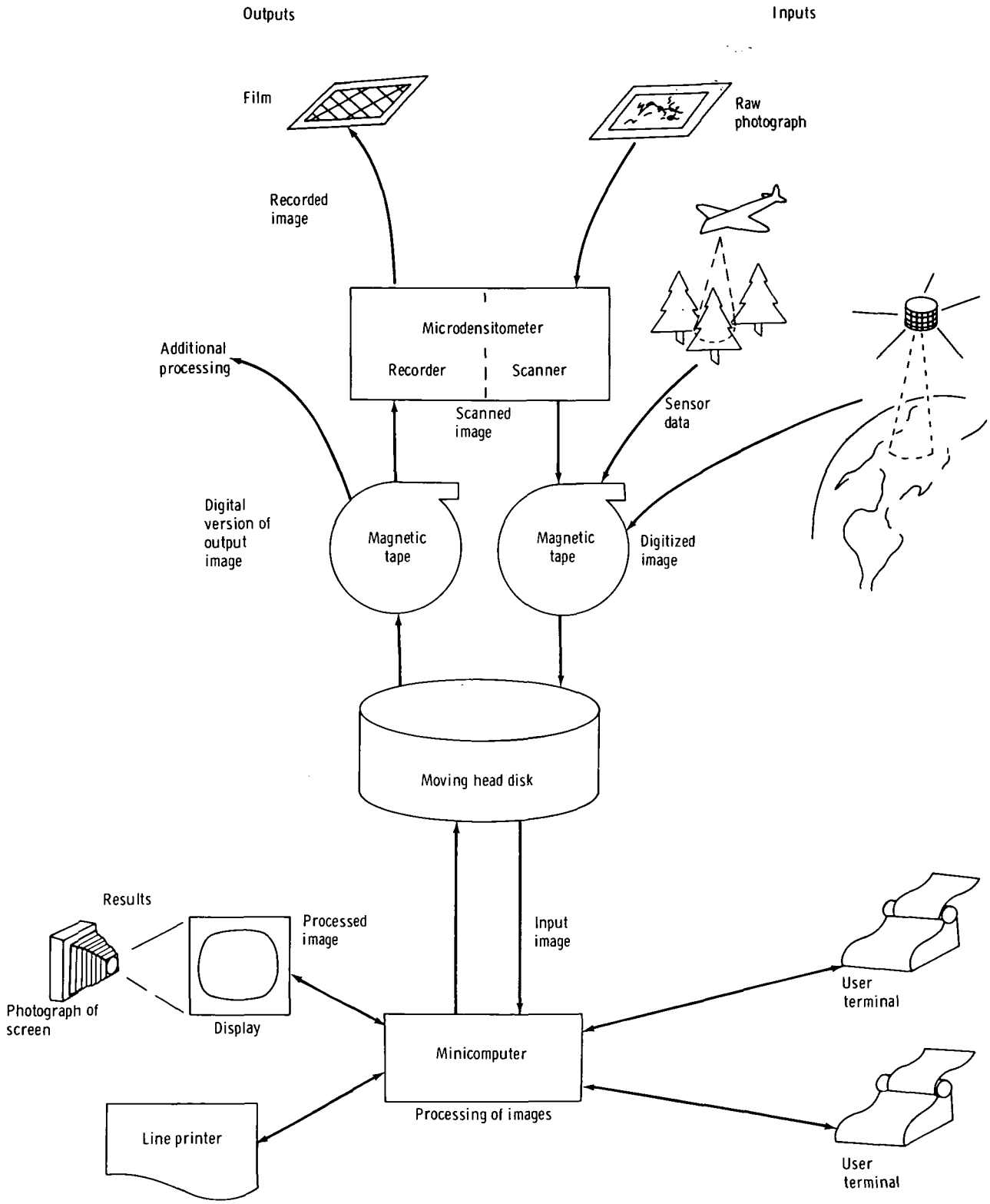

Figure V-1.– Input/output resources and capabilities of the interactive digital image manipulation system.

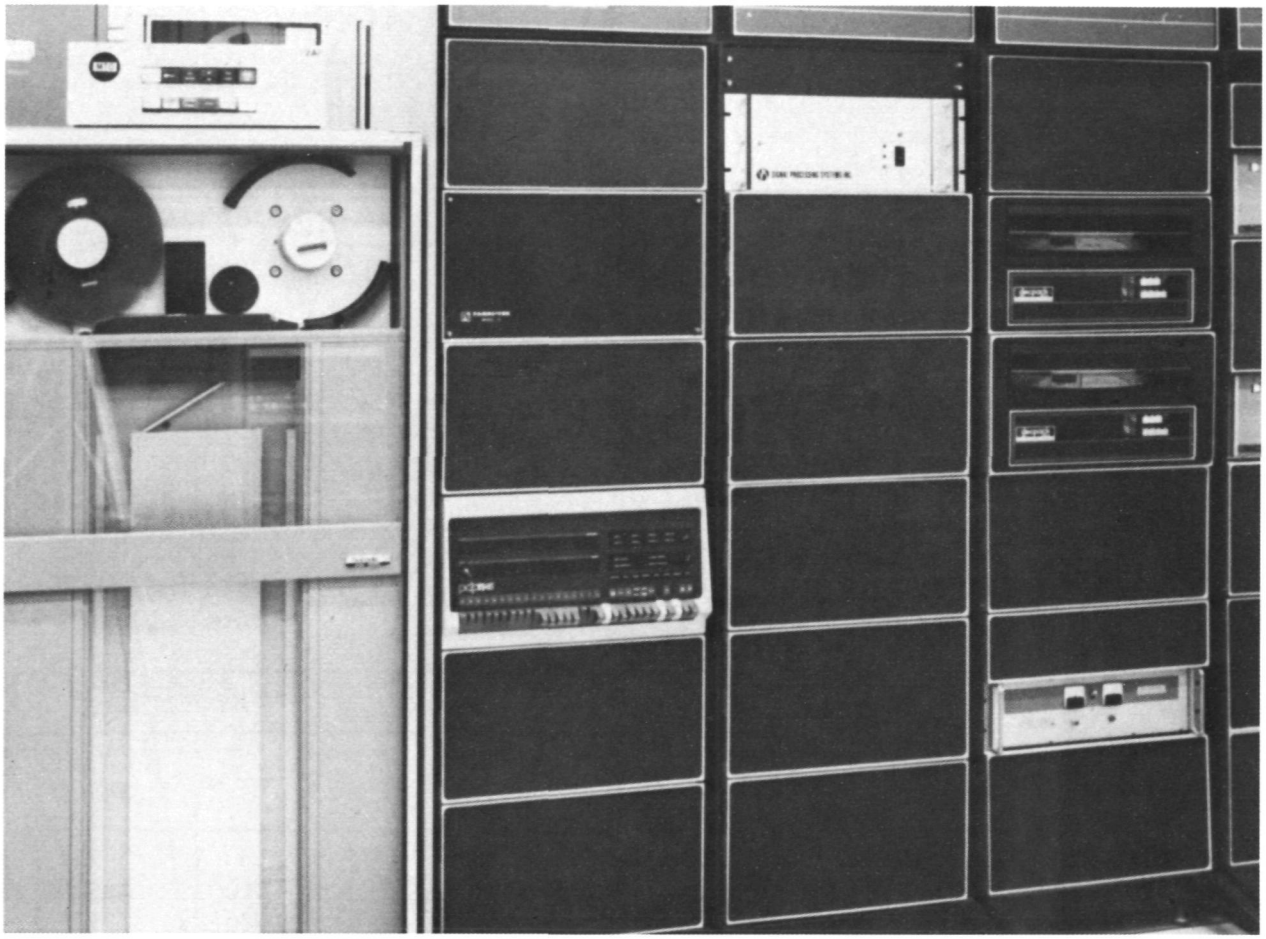

Figure V-2.– The PDP 1145 minicomputer used in the screwworm eradication data system and elsewhere.

Because Landsat data are relatively new, one might suspect that many of the data requests represent curiosity rather than actual use. Although curiosity is undoubtedly a factor, the table also shows a significant increase in requests for aircraft data as well. Aircraft data are not new; this data source has existed for many years.

A customer profile for the EROS Data Center is shown in table V-II. Notice that the largest customer, both in number of requests and in money spent, was private industry. Industry accounts for at least one-third of the total data requested. It seems logical that private industry should occupy this position. With regard to a new technology, industry is the most mobile of the various sectors; it has more local control over its resources and therefore can move more rapidly when a new and viable technology becomes available. It usually takes longer for the governmental sector to secure the necessary approvals and appropriations to take advantage of such technology.

During the period April 1974 to March 1975, the same as that covered in table V-II, the EROS Data Center received orders for 413 000 frames of all types of data, including 167 000 frames of Landsat imagery. These figures certainly indicate more than a casual interest in this type of data by the user community.

The EROS Data Center has also classified the major uses of its products into the following general areas.

1. Mineral and fossil fuel exploration and related geologic base mapping
2. Applications research
3. Cartographic and related mapping applications
4. Water resources management and inventory
5. Timber and forest product inventories and land use mapping
6. General land use stratification
7. Agricultural land use stratification
8. Wildland inventory and monitoring
9. Miscellaneous (uncategorized)

TABLE V-I.- EROS DATA CENTER DATA DEMAND

(a) Quantity

Data type	FY 1973 no. of frames	FY 1974		FY 1975	
		No. of frames	Increase, percent	No. of frames	Increase, percent
Landsat imagery	81 071	157 178	94	185 000	18
Landsat CCT's	10	228	2200	820	260
Skylab and Apollo data	--	17 201	--	33 000	92
Aircraft data	83 942	109 490	30	193 000	76
Totals	165 023	284 097	72	411 820	45

(b) Cost

Data type	FY 1973 cost	FY 1974		FY 1975	
		Cost	Increase, percent	Cost	Increase, percent
Landsat imagery	$ 228 042	$ 528 514	132	$ 792 000	50
Landsat CCT's	1 600	36 480	2200	164 000	349
Skylab and Apollo data	--	34 421	--	124 000	250
Aircraft data	114 676	237 332	64	520 000	119
Totals	$ 374 318	$ 836 747	124	$ 1 600 000	91

It is important to emphasize the potential impact of remote-sensing technology in the preceding areas on major contemporary problems, such as the availability of energy sources and of food supplies and the utilization of land resources.

During the last several years, remote-sensing technology has been somewhat troubled by its own success. Demand for data rose more rapidly than anticipated; as a result, delays in obtaining data became excessive. This problem is being corrected, at least for data in image form, and it seems reasonable to assume that faster availability of digital magnetic tape data will also result soon. The importance of solving this problem of delay is very great.

A third perspective from which one can sense this movement to technology utilization should be noted. If a technology is to be broadly used, educational and training opportunities must be available. Through this symposium, much information about remote-sensing training programs and training materials has been assembled. One author (U-3, vol. II) found 10 books and 5 scientific journals devoted exclusively to remote sensing. He further noted at least 4 regularly scheduled symposia on the subject and 11 regularly occurring short courses presented by different organizations, including one now offering a 1-week short course each month.

The opportunities and materials offered for training in remote sensing must be regarded as unusual because of the diversity of educational materials available. They range from the usual books, ad hoc short courses, and the like to prepackaged minicourses, television and audio-tutorial tapes, and even include a computer remote terminal system. One of the most unusual programs was produced by the University of Nebraska and consists of materials for use in secondary schools. High school administrators have shown a great deal of interest, and a description of the program also stimulated much interest at the symposium session.

TABLE V-II.- EROS DATA CENTER

CUSTOMER PROFILES[a]

User	By item, percentage	By dollar value, percentage
All data		
Private industry	34	30
Foreign	12	12
Federal Government	27	24
Academic	14	16
Individuals	7	11
State and local government	1	1
Unknown	5	6
Landsat data only		
Private industry	24	24
Foreign	24	20
Federal Government	15	15
Academic	14	15
Individuals	10	13
State and local government	1	1
Unknown	12	12

[a]April 1974 to March 1975.

In summary, during the information systems and services and user services sessions, and during the other sessions as well, ample and convincing evidence was given that remote-sensing technology has moved and is moving into the user community. Therefore, it seems important, while continuing to encourage this movement, to begin in earnest the development of a second stage of remote-sensing technology. We are only at the beginning; the potential for further development is great. If the benefits beginning to accrue from past technology development are true indicators, the importance of bringing this potential to reality over the years to come is indeed great.