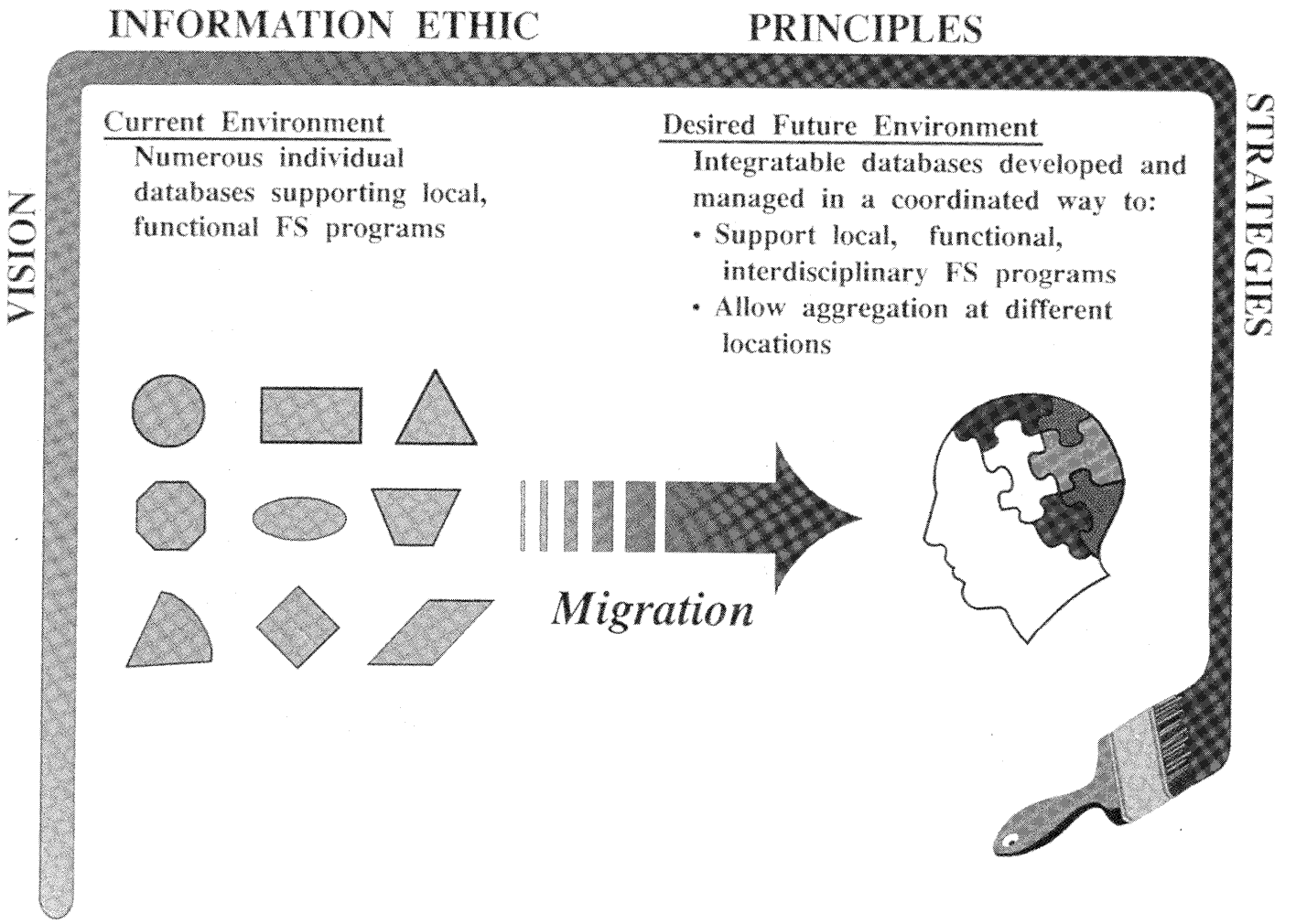
United States
Department of
Agriculture

Forest Service

Information Management: A Framework for the Future

USDA Forest Service Strategic IM Team



Preface

In June 1991, the Chief assigned a national team to develop a Forest Service strategic information management plan. This team reviewed current Forest Service information management procedures and initiatives, external information, and other companies' and agencies' experiences in information management. The team tested a draft vision and strategies against a wide cross section of Forest Service employees before presenting these recommendations to Chief and Staff, Regional Foresters, and Directors, all of whom have accepted the recommendations and have committed to support their implementation. The following report (1) summarizes this effort, (2) provides a vision and framework to move the Forest Service to an integrated information management environment with field involvement and commitment, and (3) recommends specific strategies to translate the vision and framework into needed actions.

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by

USDA Forest Service Strategic IM Team

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Information Management: A Framework for the Future

HIGHLIGHTS

To maintain our leadership in natural resource management, research, and technical assistance into the 21st century, the Forest Service needs to take advantage of expanding technology to more effectively process, display, and use our critical information resource.

Presently, the Forest Service has numerous individual data systems functionally supporting Forest Service programs. Although these systems are superior to those in many agencies, they are not adequately linked to integrate data and thereby generate the optimum information needed to support decision making, minimize duplication, and satisfy external requests.

The Forest Service can best maintain its leadership through integrated data systems developed and managed within a coordinated framework of the Forest Service programs and external information needs.

Achieving this desired state will require a clear vision, or focus on the goal, and strategic guidelines for moving toward the vision. Achieving the vision will require strong management commitment, broad understanding and field involvement in change, and a well-structured, business-process-driven, and standardized information technology and methodology. The challenges, costs, and impacts of achieving the information management vision are significant, but the benefits will include improved long-term ability to respond to issues with readily available, quality information, more informed decisions, better exchange of information with our partners and customers, less criticism of our decentralized organization, and less information and system duplication expense.

Recurring themes in this report are the need for the Forest Service to:

- recognize that sharing and managing information are critical to performing the mission and business of the organization, and
- organize information management around the way the Forest Service conducts its business, which will require integration of current functional systems.

Implementation of recommended strategies will require:

- strong commitment of Chief and Staff, Regional Foresters, and Directors,
- establishment and empowerment of a full-time Chief Information Officer (CIO) position with appropriate technical support, and
- understanding, acceptance, and support throughout the organization of an information resource ethic that has corporate as well as local or functional value.

THE FRAMEWORK

The Forest Service Information Management Framework (fig. 1) includes a vision of a desired future information environment, and the process by which we will migrate to that new environment. Inherent in the vision are fundamental principles and ethics which will provide a major improvement over our traditional ways of dealing with information. As part of the Framework,

several strategies have been described which will initiate, support, and maintain the movement to the new information environment with interdisciplinary field involvement.

Presently we have an information environment characterized by unconnected local and functional data bases individually supporting Forest Service plans and programs. This environment has served our decentralized organization and management approach, but has been a barrier to interdisciplinary program development and implementation. The inconsistently defined data, duplicated in unconnected databases and systems, has led to wasted effort in data collection and maintenance, and incompatible information that cannot be effectively brought together for quality decision making or timely, consistent response to requests for information. This has resulted insignificant criticism of Forest Service management and our decentralized organization.

This current situation brought into focus the need for change. The groundwork for change was laid when the Forest Service implemented the Data General system, introducing a Service-wide distributed electronic information system and ethic.

Newer technologies are now available for processing graphic information, more efficiently managing electronic information, and providing . greater capacity and user service.

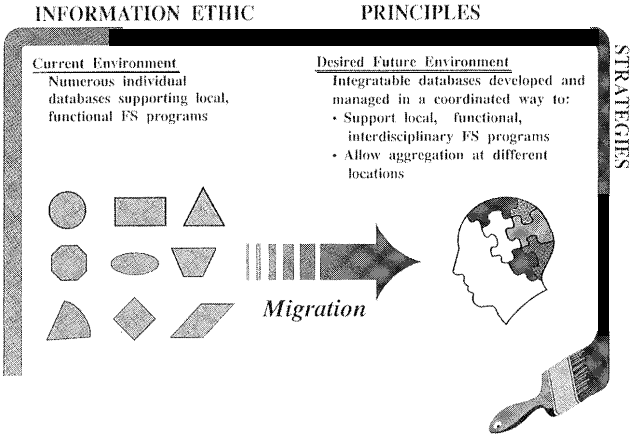

Figure 1.—The USDA Forest Service Information Management Framework.

With these opportunities, the Forest Service envisions a new information management environment where data are entered only once at the source, shared and available to all users, and systematically integrated with Forest Service plans and programs. The new environment will handle graphical as well as textual information, and support the decision-making and responsiveness missing in the current environment.

The migration from our current local information environment to a shared information environment will be a long and challenging evolution. The process will require a very structured, organized approach built upon interdisciplinary field involvement. It will take working together to standardize those widely used, commonly understood, and persistently needed data and information for the greatest Forest Service benefit rather than for individual or functional benefit. Migration to the new information environment will require leaders and program and information specialists to work together. This process is consistent with current Forest Service management philosophy.

VISION, ETHIC, AND PRINCIPLES

Vision

Our Information Management Vision pictures a desired future condition in which the Forest Service:

- Recognizes information as a resource critical to our success.
- Shares and manages information in ways that support the mission and business of the organization.
- Strives, as a commonly understood, accepted, and supported goal, to bring quality information, in the right form, to the right people at the right time to support sound and deliberate decisions and to generate ideas.

When we achieve this state:

- Employees at all levels will better understand the Information Management methodology as it relates to the business of the Forest Service, the importance and role of information as a resource in support of that business, and the need for clearly identified, essential standards for data and information elements.

- Management will be visibly involved in development and committed to implementation of national information management investments, policies, and procedures.

- The information management environment will generate quality information that can be used by all levels of the organization and by external partners in accomplishing the business of the Forest Service.

- Management will recognize the investments, and will commit the resources to implement information management decisions.

- Information policies and technologies will anticipate future needs and new developments, reflecting internal and external considerations.

Ethic

Realizing the Vision will depend on each of us recognizing and seeking to practice an ethic in which:

- We subscribe to the notion that people who develop and manage information are stewards of the information, not owners.

- We recognize we are stakeholders in the information management Vision and Principles, and strive to help the organization achieve them.

- We subscribe to the value of and need for corporate standards, but also strive for flexibility so that our individual creativity in getting our personal job done is enhanced.

- We recognize the need to synergize our local and functional information agendas with the corporate information agenda.

- We value having a consistent technology platform that is available to all employees in all offices, and strive to use the corporate technology platform whenever practical so that we do not isolate our information from others who could beneficially use it.

Principles

Embodied in the Vision and concept of information management are a number of basic principles:

- Information management is an integral part of every Forest Service program.

- Information systems are designed to help meet business needs.

- Data are captured at their source as a natural course of conducting Forest Service business.

- Data are entered once and used often.

- A shared data environment consists of integratable data bases coordinated through modern data management technology.

- Widely used, commonly understood, and persistent data, information, and processes are standardized.

- Data are consistent to the extent that implementation at each level, and across units, is compatible and mutually supportive.

. A shared-data environment ensures that information is available to employees and processes as needed.

. Data and information are shared with external cooperators and the public.

. A technology infrastructure exists to support the business of the Forest Service at all locations.

WHY CHANGE?

There are compelling reasons why the Forest Service should adopt the Information Management Framework. It will enhance our ability to:

- Respond to requests for information,
- Exchange information with users and partners,
- Exchange information internally,
- Provide Chief and Staff with useful information,

. Provide the same information for all line and staff officers, and

- Provide consistency between messages and actions at national and field offices.

It will help us:

. Reduce criticism of the Forest Service for lack of timely, consistent responses to requests,

- Reduce criticism of the Forest Service decentralized organization,
- Respond to current issues,
- Anticipate coming issues, and
- Monitor Forest Plans.

It will position us with the information management technology that:

- Supports our plans, programs and precess,
- Supports functional needs, and
- Facilitates integration of functions where desirable.

It will achieve numerous internal efficiencies and cost savings, including:

- Shared data,
- Data entered only once at the source,
- Less duplication, and
- Less time aggregating and reconciling inconsistently defined data.

STRATEGIES

The Chief Information Officer (CIO) is a full-time SES position responsible for leading and facilitating Forest Service movement into an integrated data and information environment. The CIO supervises functions currently performed by InS and CS&T, and reports through the Deputy Chief for Administration.

Discussion:

To improve information quality for management and decision making, we need to change the leadership structure we have provided for information management. Establishing a full-time CIO will provide a visible, executive-level focus

on the development and maintenance of an integrated information environment that has not been previously evident.

This position will provide a single, focused direction and coordinated leadership for the functions presently charged with information management in the Forest Service. This will provide more balanced information policy while still maintaining decentralized decision making. The CIO will orchestrate the information management decision-making process that will move the Forest Service from its current situation to the desired information environment. The value of a focused, executive-level information manager is demonstrated in successful examples of integrated information programs.

Establishing an executive-level CIO position in the Administration Deputy area is consistent with the Chief's decision to designate the Deputy Chief for Administration as the agency comptroller. Designating the CIO as a full-time SES position will give the Chief several alternatives for filling the position.

Next Steps:

Chief and Staff will:

1. Determine organizational structure.

2. Obtain any needed SES position authority.

3. Fill the CIO position.

Strategy 2: An Information Management Advisory Group

The CIO has the support and assistance of an Information Management Advisory Group, appointed by Chief and Staff, for advice on how to involve the rest of the Forest Service, and to structure interdisciplinary ad hoc teams to carry out needed work.

Discussion:

The new Information Management Framework (fig. 1) requires a new way of dealing with information. What is required is no less than a change in the Forest Service culture, from the present way of developing, maintaining, and owning information systems in isolation to an environment of sharing cooperation, and collaboration across all functional and organizational levels. All of this must be carried out in an open, participatory process. To be successful, the CIO will have to involve all functional areas and organizationl levels, and enlist their support and cooperation. While much will depend on the personal leadership qualities of the CIO, functional and field involvement, acceptance, and support will be facilitated by an Information Management Advisory Group.

This Advisory Group will help the CIO implement the recommended strategies in this report (see Strategy 4). It will serve as a sounding board for the development of implementation plans, the development and adoption of new policies, and, perhaps most importantly, the structuring of additional ad hoc teams to address specific implementation plans. These ad hoc teams will be the action teams necessary to implement the recommendations of this report, as opposed to the long-term, advisory nature of the Group. The Advisory Group will also insure that decisions are raised to the appropriate level of the organization, and that the information management agenda is visible throughout the organization.

Task forces and teams are commonly used within the Forest Service to achieve consensus on issues and to facilitate the implementation of decisions. The purpose and value of this Group is similar-to provide abroad point of view to the CIO to insure that proposed decisions and activities meet the Forest Service's needs, and to enlist across-the-board support. To that end, it should be structured to incorporate both field and WO personnel, and, within these two groups, represent both technical (systems) and operational areas. Diversity of viewpoints is an essential asset.

Next Steps:

1. The Deputy Chief for Administration will solicit participation in the Advisory Group from field units and WO staff.

2. After the CIO is selected, the CIO and Deputy Chief for Administration will propose Advisory Group membership to Chief and Staff.

3. Chief and Staff will appoint members of the Information Management Advisory Group.

Strategy 3: A Standard Methodology

The Forest Service uses a single, structured, business-driven, standard methodology for integrating our information, such as one of the information engineering methods already being applied in several Forest Service pilot projects. The Deputy Chief for Administration will determine the standard methodology by March 1,1992, after considering lessons and results from pilot projects.

Discussion:

To achieve a truly effective Forest Service information environment, the many individual efforts currently taking place must be brought together. The Vision and Principles of the Framework are vital, but not sufficient to bring systems and data bases into the shared information environment. A single, common methodology will provide the processes and tools that will help bring this about. As discovered by other organizations, these processes and tools facilitate communication of ideas and coordination of development across the functional and organizational boundaries of the agency. These processes bring the program people and information people together to model the business of an organization. The products of this activity thus exhibit the level of consistency and uniformity needed to achieve integration of our information and business processes.

A number of cooperative pilot efforts, such as the District Production Database Project, the Integrated Personnel System Project, and the Resource Management Information Project, have tested various methods and tools. This testing provides the basis for the agency to select one such method as the Forest Service standard.

The pilot efforts have used various methodologies, and this has limited the compatibility of their results. This experience, and that of other organizations successful in this area, lead to the conclusion that it is better to adopt a single methodology and get on with implementation than to make an extended effort testing different methodologies. While this decision would logically fall to the CI0, making the decision concurrently with filling the CIO position will expedite overall implementation. Thus the Deputy Chief for Administration, through whom the CIO will report, will make the decision by March 1,1992, after soliciting appropriate advice.

Next Steps:

The Deputy Chief for Administration will:

1. Solicit input from pilot projects and others concerning alternative methodologies.

2. Select a single, structured, business-driven standard methodology, and communicate the selection to all employees.

Application development managers and technical staff will:

1. Learn (e.g., via training) the standard methodology selected.

2. Determine what, if any, changes to make in their activities.

3. Reassess and coalesce ongoing pilot project efforts.

4. Use the new methodology in new projects and migrating existing ones.

Strategy 4: Involving Interdisciplinary Teams

The CIO, with the help of the Information Management Advisory Group, develops and communicates an implementation plan for involving interdisciplinary ad hoc teams to move the agency to the desired Information Management environment. The plan addresses outputs such as:

- Models of Forest Service programs, functions, processes, and data
- Shared data bases
- Procedure to integrate data
- Procedure to maintain data bases
- Migration paths for local or functional efforts
- Criteria for determining migration priorities
- Procedures for setting standards

Discussion:

This strategy will involve different organizational perspectives in developing a plan. The plan will be instrumental in ensuring that the adopted methodology serves the business of the Forest Service while defining products which will map the way to the new information environment. Since plan implementation will be a long-term, dynamic process, ongoing communication will be crucial in keeping the organization informed. The CIO and Advisory Group will assess and assign implementation project priorities, with conflict resolution by Chief and Staff.

Implementation will depend upon individuals throughout the agency. They represent the collective resources needed to achieve the new information environment. Additionally, as the Forest Service finds its traditional organizational boundaries including more external groups, individuals must be utilized who can address this perspective as well. Chief and Staff approve the implementation plan.

Next Steps:

The CIO and Information Management Advisory Group will:

1. Develop the implementation plan and identify interdisciplinary teams needed to implement the selected methodology.

2. Develop a Process to maintain communications with all employees about implementation progress.

Strategy 5: Involving Managers and Technical Staff

Managers and technical staff who are sponsors and stewards of all application and data modeling efforts participate in implementing the Information Management Framework, and migrate their systems into the new environment, consistent with the migration priorities they helped develop.

Discussion:

This strategy focuses on the sponsors and stewards of existing applications and their com-

mitment to the Service-wide information management Vision, Principles, and Strategies. These people, who have the skills and funds to do the actual work, will be the ones who move specific applications to the shared information environment. Their attitude, participation, and long-term support are essential to successful implementation. For example, F&AM recently supported P&CR's effort to develop an Integrated Personnel System, recognizing that this effort would support future development of an F&AM Redcard application, which in turn will support other Forest Service certification processes, such as silviculture, engineering construction, and blasting.

Application sponsors and stewards will participate in prioritizing projects. They recognize that not all systems can be enhanced at once, but that we need to move forward to achieve the benefits of shared information. Further investments in applications which do not fit the new information environment should be minimized.

Next Steps:

Sponsors and stewards of existing efforts will:

1. Participate on the Information Management Advisory Group and interdisciplinary ad hoc teams.

2. Begin to identify their priorities for integrated development or migration.

3. Formulate a plan for their contributions to the corporate effort, including identifying resources and partners for integration efforts.

4. Inform their staffs about the Information Management Framework.

5. Demonstrate a commitment to make ongoing contributions of resources to achieve long-term direct benefits.

Strategy 6: Technology Acquisitions Support the Framework

The CIO ensures that all information technology acquisitions, such as Project 615, support the Information Management Framework.

Discussion:

Acquisitions of new information technologies are an integral, enabling part of the desired Forest Service information management environment. For example, the planned Project 615 acquisition includes telecommunications, hardware, and software to expand capacity and provide graphic capability (such as GIS). Information technology acquisitions to date have placed the Forest Service in an excellent position to proceed with the new Framework by providing a level of systems and telecommunications integration capability unavailable to most other complex organizations. These evoking technologies must continuously be incorporated into Forest Service information management.

Information technology, within the Framework will focus on enabling the internal and external sharing of expertise, work, decision-making responsibility, and accountability. Networking capability is essential for sharing by complex organizations with diversified external partners and audiences. Project 615 provides an opportunity to demonstrate how information technology will facilitate sharing within the Forest Service Information Management Framework.

Establishment of the Chief Information Officer (CIO), and supporting mechanisms, provides the vehicle for early and continuing assurance that Project 615 and other future information technology acquisitions are conducted as enabling parts of the Framework. A primary responsibility of the CIO is to assure that all information technology acquisitions support the new Information Management Framework, and that this support is communicated.

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Next Steps:

The CIO and Advisory Group will:

1. Develop plans and procedures, using the interdisciplinary team approach, to assure that all new information technologies support the Information Management Framework.

2. Publish a document for all Forest Service employees to explain how Project 615 will facilitate sharing within the Information Management Framework.

Strategy 7: Information and Training Plans

The CIO ensures that a communications and training plan is developed that contains the following components:

- Orientation for all Forest Service employees to the Information Management Framework

- Technical and user training needed to implement the Information Management Framework

- Ongoing communication to all employees, including progress reports and success stories, to reinforce the Information Management Framework.

Discussion:

Acceptance of the Information Management Framework signals to the organization that it is time to change the way we do business. This means that, to the maximum extent possible, data will be generated as a natural outcome of Forest Service business processes and operations. Additionally, the organization must commit to function in a shared data environment that makes information available to employees and processes as needed.

To facilitate this cultural/behavioral change, we will develop and deliver a three-tiered training and education plan. First, concepts contained in the Information Management Framework must be clearly communicated to all employees and strongly endorsed by line and staff managers at all levels of the organization. This awareness is critical to achieving organizational understanding, support, and involvement, and will be a key to successful implementation.

Second, we will need to develop new applications or migrate existing applications into the new information environment using technical skills that may not currently exist insufficient numbers within the organization. This need for new skills does not translate to a need for new people, however. Rather, a training program must be developed to provide these new skills within the existing workforce.

Finally, implementation of the Information Management Framework will be a dynamic process requiring a continuing effort to reinforce our Vision, Ethic, and Principles. Sharing progress and successes will be a key component of the education process, as well as a way to demonstrate that adherence to the Information Management Framework is encouraged and rewarded.

Next Steps:

The Chief will distribute the Information Management Task Force Report throughout the organization.

The CIO will:

1. Develop an orientation/education module to disseminate to all Forest Service employees, to increase their awareness of the Information Management Vision, Ethic, Principles, and Strategies.

2. Identify skills needed Forest Service-wide to implement the Information Management Framework.

3. Assess skills within the organization.

4. Design or obtain from external sources any needed training programs.

SUPPORTING DISCUSSIONS

What is Information Management?

Information Management is a structured process to bring quality information in the right form to the right people at the right time to support sound and deliberate decisions, and to generate ideas.

Information is data that has been processed and interpreted. This is a much more complex concept than is often simplistically diagramed as a broad based pyramid of ground level data feeding up through the organization to a focused, key bit of data at the top (fig. 2). The mix of data and information at the top differs significantly from that at the bottom; external information exchanged grows in significance; a majority of data evolves to information, which may in turn become data for a subsequent generation of information.

We commonly recognize natural (water, range, timber, etc.) and capital (campgrounds, offices, roads, etc.) resources. However, like cultural and human resources, we frequently do not focus on information as a resource, and consequently do not manage it as a resource.

There are two components to information management (fig. 3): the overall Information Management Framework, or approach to planning, developing, or acquiring information systems, followed by implementation plans for each specific information technology (such as GIS, integrated data bases, or telecommunications). The concept of an integrated information system is important to both levels.

Our current information environment consists of hundreds of development efforts (applications systems development, data bases, standards, etc.) that, because of their functional development, are not well linked. The result is an information environment characterized by

. redundant data,

- inconsistent, incompatible information,
- inaccurate information,
- duplication with high retrieval and analysis costs,
- systems that are unable to share data electronically, and

. "islands" of information in unconnected data bases and systems.

Consequently, Forest Service information is frequently seen as not effectively organized. We frequently ask field units for information they don't have or that is kept indifferent formats at different locations. In addition to the significant work impact, this method of collecting data includes a high risk of inaccuracy, affecting both decisions made and our credibility with those to whom information is provided. In turn, this is

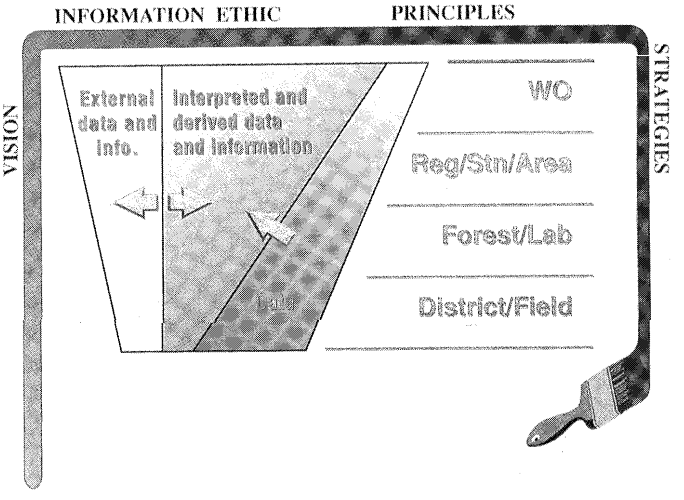

Figure 2.—information Is data that has been processed and interpreted.

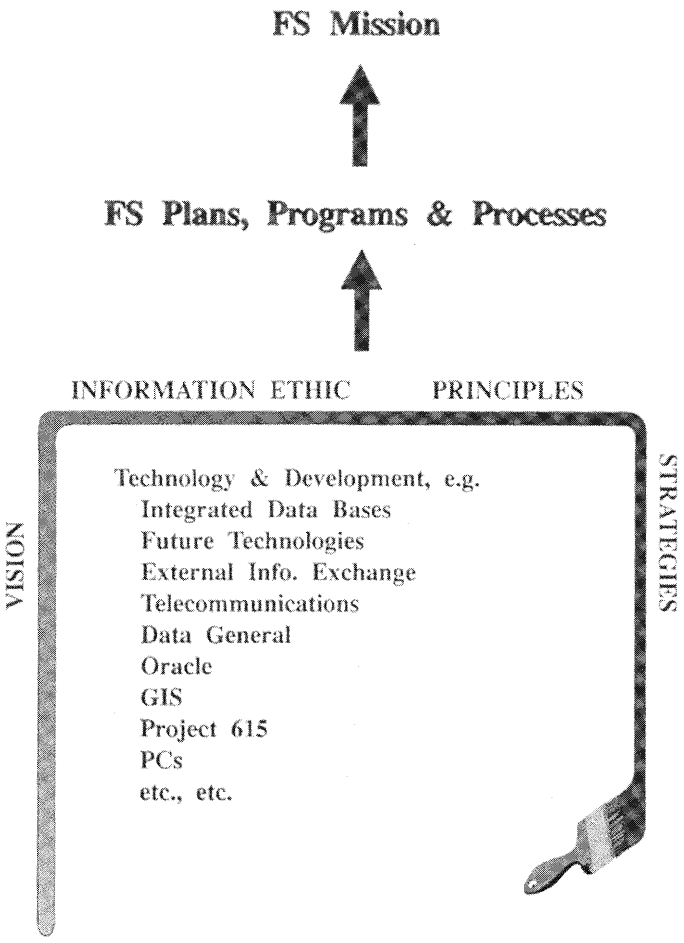

Figure 3.—Information Management components.

sometimes perceived as a major flaw of a decentralized organization.

Information management provides a structure and process through which separate data bases and information systems can be integrated so that information is only entered and maintained at one point, but is shared and available to all users for numerous purposes (fig. 4). This requires agreement on shared data definitions by all users (see also section on Standardization).

A critical concept here is shared data: data shared between data bases, not a single, organization-wide data base. There is flexibility in the individual systems to keep information beyond that which is shared.

Achieving this integrated, shared information requires an organized, structured methodology, also referred to as information engineering or information architecture. Various methodologies range from totally unique structures developed by an organization, to adaptation of broad systems-industry outlines (such as Zachman's Matrix), to adoption of a specific commercial process (such as the CASE*Method). Clearly, a single method must be selected and standardized across the organization.

Information systems could be integrated to a limited extent on a system-by-system basis, identifying other users and sharing information for each functional project. However, total Forest Service efforts can best be supported if the information models have been integrated with models of the various Forest Service programs, processes, and functions.

Integrating external information exchange will be a major challenge from several aspects. External partners typically have their own corporate data definitions, quite probably different from that most comfortable to the Forest Service. We will need to balance Forest Service convenience against the greater good of sharing with others. External information exchange is typically more complex and less tangible than our more basic resource data (data used by State and Private Forestry and International Forestry, for example, as opposed to National Forest Systems data.)

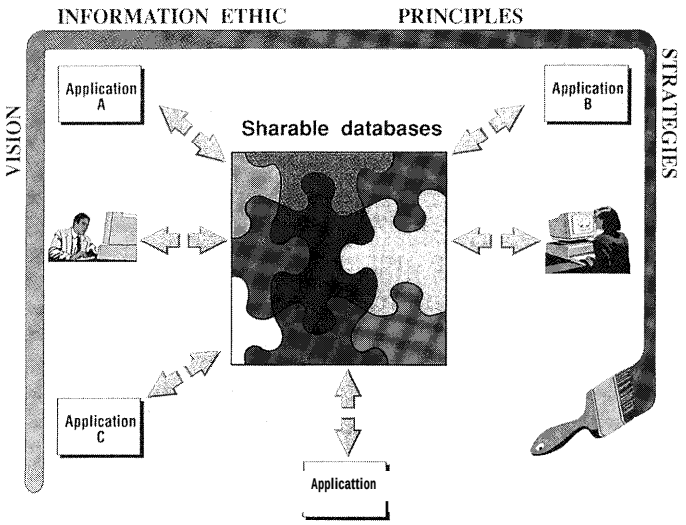

Figure 4.—Information management provides a system and structure to Integrate separate databases and Information systems.

Much external need for information is upward reporting, and this often takes a specialized format difficult to anticipate when identifying data standards.

External access to the Forest Service integrated information system will be a controversial issue. We have many partners and users of Forest Service information, and we can build these relationships as well as our own efficiency by providing external access. Conversely, there is a significant concern that data could be taken and used out of context.

Modeling

For information to best support the mission and business of the organization, information management must be driven by Forest Service business strategies and the agency's desired future condition. The Forest Service has a strategic plan, the RPA Program, which articulates desired future conditions, agency roles, and strategies to guide the movement of the organization to its desired state.

In addition to RPA, there are strategic plans for many organizational units, programs, and functions within the organization. These individual strategic plans can be viewed as "tiering" to the RPA Program to provide more specific guidance to appropriate organizational units, programs, or functions. Supplementing these strategic plans are the Land Management Plans of individual National Forests and the 5-Year Plans of Research Work Units, for example, which help define the business of the organization. These plans outline, for each respective unit, a course of action designed to move that unit to its desired future condition in support of the overall Forest Service Mission.

However, we presently pursue these business plans in a functional, programmatic, rather than integrated, manner. This is driven by tradition, functional budgets, and functional organization. Our current information systems also reflect this functional approach.

To most effectively integrate our information systems to support the business plans, we will concurrently need to build an integrated model of the business of the Forest Service. An integrated information model could be developed solely for the purpose of integrating information, or we can also look beyond information management to additional, broader benefits of an integrated framework.

Despite our functional programs and organization, the Forest Service strives for an interdisciplinary, integrated approach to projects. Institutionalizing an integrated information model within a standard information management methodology provides the ideal framework for the interdisciplinary approach.

Imagine a Wildlife Biologist, Hydrologist, Forester and Engineer coming to the interdisciplinary table to plan a project, each with a functional data base. Much time will be spent clarifying data requirements and definitions relative to the project at hand. In contrast, imagine these same specialists coming to the table with shared, integrated information already available. They could immediately begin addressing the project issues because they already have common agreement on the data.

The Forest Service standard methodology would be used to begin modeling major processes that support our mission. Modeling would proceed to the next level of broad, high-level processes that support the first level, and soon down the corporate structure to the numerous specific "doing" jobs of the Forest Service.

Information needs and common information users would be identified as the basis for standardizing information and integrating information systems that then support the integrated Forest Service programs, processes, and plans. This process may even change where and by whom different information is maintained.

Standardization

Does integrated information management mean a single data management system with all data standardized? No! Only specific data or information that is commonly understood and widely used over time will be standardized and shared. (Sharing between data bases is accomplished through a relational data base manager, such as ORACLE.) 'Widely used means that a particular piece of information is used in many data systems, possibly across functions, locations, and organizational levels, or with partners and customers. Standardized and shared information must be persistent because of the impracticality of frequently changing definitions, and the need to maintain consistency in use and reporting. The more basic the data (inventory, personnel records, business processes) the larger the proportion of standardized and shared information. Conversely, the more specialized, interpretive, or external the information system, the less the proportion of standardized, shared information.

Beyond the standardized, shared information, each data system would continue to have traditional flexibility for other data needs.

Standardizing and sharing information will constitute a cultural change, however, from our traditional approach of individually defining owning and managing information. In the integrated information environment, we will become custodians of information, rather than controllers er owners. For some, this maybe perceived as a loss of power.

Identifying data to be shared and standardizing that data will be neither a top-down or bottom-up effort, but a Forest Service effort, visible to all. We will have to work with other users and the collectors of the shared data to agree on the best Forest Service definition. We will have to build quality control into the applications, and learn to trust the quality of shared data.

Benefits and Costs

The desired information management environment will provide the following benefits over current processes:

- **Field people will have opportunity to be** involved in, and informed about, information technology plans, acquisitions, and development.

- Shared data in an integrated information environment will provide the efficiencies of entering data only once close to the source, and being available for all users. Further efficiencies will be gained in not having to resolve similar but inconsistently defined data for aggregation and further use.

- . The concept of shared information recognizes the need for, and provides the flexibility for, additional specialized information and innovation.

- The Information Management Framework includes a process for prioritizing the migration of existing functional data systems to an integrated environment to minimize impact on programs and other system developments.

- The integrated, shared information environment will improve the consistency, quality, and timeliness of response to external requests for information. In turn, this will present the Forest Service as a well-managed organization with centralized information availability, while preserving the benefit and spirit of a decentralized organization.

- The expanded graphical information capability, and links between graphic and textual information, will enhance integrated forest, program, and project planning and communication of these plans to our partners, users, and publics.

- The integrated, shared information environment will promote data consistency and availability for sound and deliberate decisions, and for generating ideas.

- Integrating information with Forest Service programs, processes, and plans will improve the information support for the day-today implementation of such activities. Additionally, program management and coordination will benefit from the exercise of modeling the processes and identifying shared users for structuring the information.

. Integrating information will promote and facilitate multi-functional, multi-cultural, interdisciplinary, teamwork-oriented dialog within the Forest Service.

- Developing the shared information environment will help employees at all levels to better understand the need for, and use of, information they deal with.

- Properly developed and applied standards will free development efforts and creativity for more beneficial information uses.

The costs of moving to the new information environment will primarily be offset by redirecting investment from developing, enhancing, and maintaining functional systems, to investing in a shared, integrated environment. There may be a real increase in cost to achieve the even greater benefits of graphical information capability.

There will be the appearance of additional cost to some because of the need to make a major multi-year investment before achieving the tangible benefits. These up-front investments will include management time, and staffing teams to develop information management implementation plans. Also, early progress will be slow because of learning and the lack of an existing structure. There will be the cost of communicating the Framework, and training employees in the use and application of new methods and technologies. There will be starts and stops, duplication, mistakes, and lots of learning. Progress will become more rapid and efficient as development builds on existing structure, shared users are defined, standards are agreed to, barriers are overcome, and corporate understanding grows. Equal sharing in funding early phases will, for many, be investments in future benefits.

There will be some cost in duplication of efforts as some employees hang onto traditional information systems before developing understanding and comfort with the new approach. Some minor duplication cost may result during the migration from existing systems to the integrated environment, depending on the sponsors' planning, involvement, and support.

Ongoing Information Management Developments

The Forest Service has a good track record in information management, albeit not as integrated or visible as may have been desired.

The USDA National Computer Centers at Fort Collins, CO and Kansas City, MO, the National Finance Center in New Orleans, LA, and personal computers are widely used for business functions, special applications, project work, and external networking. It would be hard to imagine functioning now without the Service-wide Data General system.

While we were contracting for the Data General, a 1984 national task force recognized additional needs, assessed emerging technologies, and laid the groundwork for Project 615. Project 615 specifically addresses a Service-wide system with graphics and relational data base management

capability, and capacity for GIS and integrated information management.

Pilot learning efforts in the use of GIS, involving a variety of hardware and software, have been underway in various Regions and Forests. A National GIS Plan was developed in 1988, and a Data Structure and Data Dictionary have been published. A 5-year effort to digitize the basic physical features for GIS (terrain, streams, ownership, transportation, etc.) will be completed as the national GIS capability becomes available.

ORACLE, a relational database management system, was procured to meet USDA standards and to begin evolution to a shared information environment. Several pilot integrated information efforts have begun using ORACLE. These include the Integrated Personnel System Project (previously known as the People Data Base), the Resources Management Information Project (RMIP), and the District Production Model. These efforts have used the CASE*Method and other methodologies, and included versions of a Forest Service information model.

Actual "road maps" for implementing these efforts are still evolving, and, within the Framework, will include field involvement.

Implementation and Commitment

Moving to a shared-data, integrated information environment will take a well thought out plan. Integration is not something that takes place across all systems atone time. Rather, it must proceed one or a few projects at a time. Maintaining interest and support will be difficult. There will be little structure or experience for early projects. Early projects will be slow, learning processes, with many iterations and false starts. But the journey will be as important as the accomplishments. Once the first several projects have been implemented, progress and efficiency will increase rapidly (fig. 5).

Selection and prioritization of projects will be keys to success on several fronts. There should be a natural sequence of projects that produce the

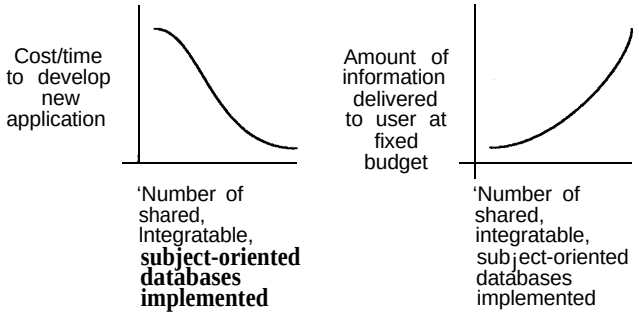

Figure 5.—The Data Synergy Effect of information management.

earliest and greatest good to the doing work of the Forest Service. Models must be realistic, visible, and accepted by most employees. Projects must remain focused so they are do-able and get done, rather than growing into dinosaurs that bog down and die. The models, selection sequence, visible accomplishment and helpfulness of results will be major determinants in organizational attitude and support.

Delivering the hardware and software to meet timely, user-friendly expectations, and providing user taining will similarly determine implementation attitudes, support, and success.

The specific implementation plan will be developed by the CIO in conjunction with the Information Management Advisory Group. This process will begin with the selection of a standard methodology (fig. 6). With this methodology, an interdisciplinary team will begin modeling the Forest Service programs, processes, and plans to create a structure of possible implementing projects. Concurrently, the CIO and Advisory Group will assess alternative annual funding and staffing level capabilities (including contracting) to achieve implementation within various time frames, and agree on an initial 3-year level to establish out-year programming. Also concurrently, applications sponsors would assess their programs and applications development priorities and provide these to the CIO, along with their interest in further involvement.

The CIO and Advisory Group will then assess the possible projects, and prioritize a 3-year schedule approved by Chief and Staff. Projects,

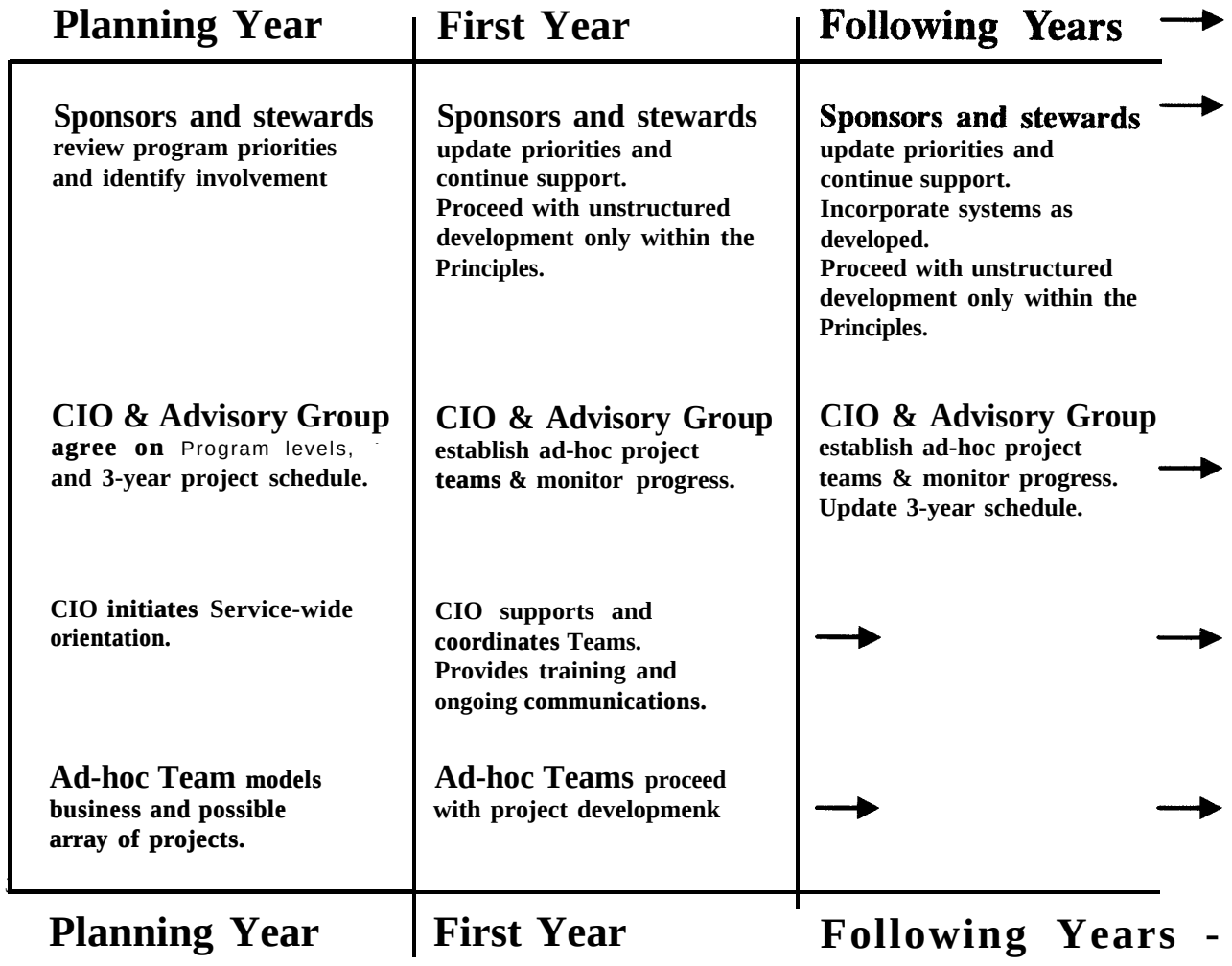

Figure 6.--Standard methodology to implement shared information.

priorities, and out-year funding would then be reviewed and updated annually. The CIO would lead and facilitate implementation of the first-year plan. With the Advisory Group, the CIO would identify and train individual interdisciplinary teams to proceed with project development, and they would monitor team progress. The CIO would coordinate development between the teams, and keep the whole agency informed of progress.

Sponsors and stewads would monitor team development, incorporating results into their programs as appropriate. They would assess any other applications needs relative to the 3-year implementation plan and schedule. Sponsors would proceed independently with applications development outside the structured implementation only after careful consideration and then within the shared information principles. For example, they would first consider use of Service-wide technologies, identify shared information users, and seek common definitions with shared users.

Annually, sponsors would update their applications development priorities, and re-affirm their support and involvement with the national efforts.

Roles and Responsibilities

All employees have a responsibility to understand the Forest Service Information Management Framework, and to track and be a part of implementation of the new information environment. Applications stewards and information specialists will work together to integrate information needs with Forest Service program needs. Particularly, each of us needs to consciously, positively practice the Information Management Ethic.

Additionally, line and staff officers must set goals for achieving the shared information management environment, including budgeting time and funds for implementation. They participate in priority setting and implementation, and support employee participation. They create and maintain a positive, supportive environment for the Principles of integrated information management, including communications and training.

The C1O represents information resources at the Forest Service decision-making level, maintaining ongoing Chief and Staff involvement and feedback in implementing the shared information environment and anticipating new technologies. The CIO has leadership responsibility for information management functions. With the assistance of the Information Management Advisory Group, the CIO proposes policy, sets priorities, plans and supports interdisciplinary involvement, and coordinates decision-making necessary to achieve the integrated information management environment. The CIO plans and coordinates information, communications, and training across the agency to keep employees current with implementation and new technologies. The CIO represents Forest Service information management with the USDA Office of Information Resource Management and other external interests

The ***Information Management Advisory Group*** provides a high-level, interdisciplinary sounding board and support group to the CIO for information management policies, standards, priorities, funding resources, and resolution of user issues. They coordinate plans for development, acquisition, and application of new technologies. They sponsor and support conceptual business and information models and methodology. They approve, adopt, and monitor implementation plans. They ensure interdisciplinary participation at field and WO levels. The Advisory Group provides the positive, enthusiastic attitude visible throughout the organization that encourages and gives credibility to the information management effort.