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PROGRAM SYSTEMS STRATEGY

An Action Plan for Program Systems Management and Development

Introduction

Program systems management and development has been a shared responsibility of Information Systems Division of the Office of Information Resources Management, and of a number of Program Offices (Office of Water, Office of Enforcement and Compliance Monitoring, Office of General Counsel, Office of Air, Noise, and Radiation, Office of Pesticides and Toxic Substances, and the Office of Solid Waste and Emergency Response). Under the recently announced program systems consolidation, the responsibility now rests with the Program Systems Task Force (PSTF). This plan is an attempt to provide the framework for accomplishing what we have been called upon to do.

Need for Customer Orientation

Above all else, PSTF must remember that it is a service organization, and that program offices are its customers. Data processing support at EPA has not always had a customer orientation. In fact, some of our past actions aimed at "improving" ADP support have had opposite long range effects. Decisions that appeared cost-effective in the short term have had severely disruptive effects in the long run. Customer orientation is now mandatory. Program offices require it to accomplish their program goals; we require it to survive as a consolidated ADP office. Program managers as a group have not been strong supporters of consolidated ADP. Failing to meet their needs will bring this rather modest effort to a quick end.

A Joint Effort of Customer and ADP

Successful systems integration, data sharing, and cross media analyses will depend on the efforts of both the program and PSTF staffs. Because of this, we must understand at the outset the primary role that each party will play.

The classical roles of users as identifiers of problems/information-related needs and of ADP personnel as the developers of the solutions are still valid. PSTF must assist the program office in understanding the role of ADP in meeting program goals. Although there are exceptions, many program managers lack an understanding of what ADP can and cannot do for them. Discussions between program and technical ADP staff that purport to deal with how ADP can help too often focus on the technology of the solution, rather than on the need or the requirement. PSTF must refocus user thinking, away from technology and toward problem/need definition. This will require PSTF staff to communicate with program personnel in the language of the program. It will also require an effort on the part of PSTF staff to become familiar with what the program goals are and of what the potential ADP needs might be. And it will require that PSTF personnel build a working relationship between themselves and the the program offices they serve. Customers cannot be allowed to dictate solutions; ADP personnel must avoid "pushing" a technology where no user need exists.

Identification of ADP Needs

The next step in the program systems management and development strategy requires PSTF and the program offices to identify, describe, and prioritize the information-related needs of each program. The effort is not a data processing activity per se. Rather, it is an attempt to locate those activities to which ADP resources may have to be applied. This step, which will consider both the short and mid-term, must place emphasis on explaining how the meeting of each need relates to the accomplishment of specific program goals. With a dwindling supply of resources, we must be certain that the needs/problems to which we respond are only those whose solutions impact the achievement of major program goals.

Inventory of ADP Resources

The Agency has made a number of attempts to inventory and to describe its information resources. This is an important activity, but such efforts have not been a part of an Agency information strategy. The preliminary step to such an inventory is the identification and prioritization of information-related needs described in the previous paragraph. Having successfully completed this step, an information resource inventory begins to make sense.

Such an inventory becomes one dimension of a matrix that matches information resources with needs. The matrix will help us to see how well information resources have been applied to the attainment of program goals. The matrix may uncover several things. First, we may find needs that relate to critical program goals that are unmatched with any information resource. Second, we may see information resources which have no corresponding need. And, third, we may find resource-need pairs that match either perfectly or imperfectly. With this information, PSTF is positioned to help program personnel to develop and/or to reallocate, through PSTF, the ADP resources that may be required.

Justification for the Preliminary Work

The preliminary steps just discussed are basic to all that follows. Given the resource constraints that we now face, we must be absolutely certain that ADP is assisting the program offices in attaining the goals set for the Agency by the Administrator and the Congress. If we first identify how ADP can help, and then apply the resources we have (or can develop) where needed, the probability for success on the part of both the Agency and ADP is greatly increased.

The action plan now addresses the technical aspects of program system development and management.

Integration of Related Data Systems

During FY84, the PSTF will emphasize the integration of related systems. Classifying and integrating data systems by family will help the Agency to standardize data element names and formats and will further the sharing of similar software. More importantly, the integrating of systems that are similar will aid Agency managers and analysts in responding to evolving priorities in a cost effective manner.

For air and water quality systems (environmental data bases), the FY84 effort will consider the impact of standardizing data element names, parameter codes, look-up tables, and machine readable output report files, within and across each major system category (air systems and water systems). The first step toward this end will be taken in late 1984, when representatives of the air and water offices will meet to discuss the changes that would be required to effect standardization. The long range goal remains the full integration of air quality systems and water quality systems. While initial investigation into system integration will take place during the fiscal year, the actual work that will lead to integration may not begin before FY86. This we believe to be consistent with the Deputy Administrator's goal of avoiding program disruption where at all possible.

Facility and chemical data systems are also scheduled to be standardized and integrated. Because of the underlying similarities among the systems of the facility family, as well as among those of the chemical family, actual work should begin in FY85. We also view these families of systems to be in a somewhat more dynamic state than is the environmental family. Such characteristics make systems within the two families particularly well suited for integration in the near future.

Our efforts to integrate systems within these two families will address the more basic concerns of file organization, access methods, use of data base systems, and update and retrieval software, along with those already mentioned for environmental systems (standard data element names, parameter codes, look-up tables, and machine readable output formats). What we foresee resulting from our work is not a single facilities data system and a single chemical data system. Rather, a more likely outcome will be a confederation of related and compatible data systems within each family.

Our detailed plan for integrating enforcement tracking and compliance monitoring data systems is now under development. We expect it to be available by mid-April 1984.

Short Term Program Systems Plans

- o Chemical Systems

- ** To be provided **

- o OSWER Systems

- See the Attachment to this document.

- o Water Systems

- ** To be provided **

Uniform Application of Structured Design and Development Technologies

The Program Systems Task Force, during FY 1984, will begin an intensive effort to standardize applications software systems development, both by in-house and contractor staff. This will include; 1) wider application of structured technologies (in particular, structured programming and structured walkthroughs) and 2) use by programmers of IBM 3270 (or equivalent) terminals with SPF (System Productivity Facility). The Task Force presently has in place (or has firm plans to install) a substantial number of terminals of this type.

Structured definition, design, and development technologies are not consistently used within EPA. With the rapid increase in the price we pay for software engineers, we must require immediate use of structured techniques by all Agency and contractor personnel involved in software design and development. Individual managers must not be given the option of waiving this requirement. Obviously, the transition from the old technology to the new may initially appear to have a potential for disruption. Individual employees may fight the change. Program offices

may fear interruption in service. Although there is no guarantee that anything we do will counter these fears, our best response will be to educate both the employee and our program office client--the employee in the application and benefits of the technologies and the client in how he/she will ultimately get greater return for each dollar spent.

The second part of this strategy element is the uniform use of IBM 3270 (or equivalent) terminals with the System Productivity Facility (SPF). As noted earlier, program system offices are already beginning to acquire and to install 3270s. We may face a problem here similar to that described in the previous paragraph--a reluctance on the part of individual software designers and developers to move to something new. The use of such terminals will be enforced. Waiving the requirement will not be an option available to any PSTF manager.

SPF will make the writing of a structured program an easier task. Margin alignment, among other things, can be accomplished with little effort on the part of the programmer. This SPF feature not only increases the maintainability of the program, but also produces as a by-product source text which becomes an integral part of the software documentation.

SPF also aids the software developer in managing and controlling source libraries. All too often users have experienced problems in data systems that are directly attributable to our failing to have the proper load module online. This facility will not eliminate the problem, but can go along way toward reducing the frequency of its occurrence.

Communication Between All Involved Parties

Failing to communicate in an adequate way has often been cited as the cause of a diverse range of problems. While we do not attribute all of our problems to this failure, we do acknowledge that we can do better in our exchange of information. Our communication failures include the lack of any dialogue between the parties and the absence, in some cases, where there is dialogue, of any meaningful exchange of information. Formalizing

communication between PSTF and the program offices is a partial remedy. Under a consolidated ADP office, PSTF is in effect a contractor and the program office is the customer. Formal communication between the two parties is a natural outgrowth of the arrangement. This is seen in all arm's length relationships, where written communication documents the interchange of ideas, the issuance of orders, and the response to such orders. American Management System's final report on CADP specifies the type of formal communication that we envision. We strongly support the designating of individual points of contact through which all major communication is funneled, not only in PSTF and the program offices, but also in all involved regions, states, and contractor offices. Each point of contact is then responsible for disseminating the information exchanged to all interested parties. Points of contact for each project will also be designated. Having formal points of contact at the program and project levels does not bar communication at any level. Indeed, it requires it. Informal communication lays the groundwork for our formal, written exchanges. Both are indispensable. Our emphasis now on formal communication stems from our past failure to use it to the extent we should have.

Periodic PSTF-user/client meetings are also desirable. Such gatherings may take the form of past STORET user meetings or involve smaller groups over shorter periods of time. Regardless of the shape, meetings of this type provide managers and technicians on both sides of the fence, opportunities to learn from the experiences of others, to air complaints, and to suggest solutions. Customer orientation, the first principle of the strategy, requires that the customer be heard. Forums of this type provide the opportunity.

Earlier, this paper spoke of a need for program personnel and ADP staff to communicate in a language that both understand. Jargon, which clouds our exchanges, is not the sole property of ADP personnel. Program offices have their acronyms, too, which they freely use. While our goal is to communicate in English, we recognize that jargon can facilitate the exchange of ideas. There is an obligation, therefore, on the part of both Program and

ADP staff, to learn each other's language, and a particular responsibility on the part of ADP personnel to become familiar with the programs and with the goals of the offices they serve.

Standardization

Many of the benefits associated with consolidated ADP result directly from the standardization that consolidation encourages. PSTF will require standardization in a number of areas. Some of these are presented below:

- o Data element names, parameter codes, look-up table values, and machine readable output report files within system families. (This was addressed in the section on system integration.)
- o File structure, access methods, update and retrieval software, and data base management systems, where appropriate. (Also addressed earlier as a longer term goal.)
- o Communication. (See the section above on communication.)
- o System and program documentation. Documentation for systems of medium to large size will include the problem specification, logical and physical design specification, the programming specification, the users guide (which includes a glossary of terms and a data element dictionary), and a systems maintenance guide. Each of these will be a deliverable item for all work performed by a contractor and will be fully in accord with all EPA standards and FIPS Publications 38 and 64.

Much of the technical documentation that is required will be a by-product of the software system design and development methodology. The System Productivity Facility (SPF) will aid the programmer in developing software text that reflects the logic of the solution (e.g., subordinated program blocks

will be indented under the higher level blocks to which they belong). Structured programming, top down design and development, HIPO, pseudo-code, and structured flowcharts each contribute documents or are themselves documents that become part of the technical system documentation.

User-oriented documentation will be written in the language of the customer, not in the jargon of ADP. Documentation of this type is intended to help the customer to use the systems we provide. While description of the internal workings of the systems and programs are important, they do not belong in user manuals, procedures, and guides that we give to users. Such material is the property of technical documentation for systems and computer programs.

The level of detail and formality and the number of unique documents required will depend on the size of the system developed. Obviously, smaller systems require less documentation than the larger ones. But, in every case, regardless of system size, we must ensure that the written record communicates what we did, why we did it, how we did it, and how what we produced is used. The sophistication of the documentation can vary, but not its purpose.

- o Software Sharing and Dissemination. PSTF will develop standard procedures for making software available to other ADP groups and to interested users. Although the procedures are not yet fully developed, it is clear at this time that two things must be done early in the process. First, a catalog of existing software must be prepared that provides the program name, the language, the hardware environment, and an abstract. This step can be part of the information resource inventory described earlier in this paper. Second, a formal mechanism will be established for software exchange. This central exchange authority will keep the software

inventory up-to-date, circulate the inventory to interested parties, receive requests, send out requested programs, and maintain a list of those who provide and receive the software.

o Testing

PSTF will require that program module and system tests be developed before solution implementation (programming) begins. Test specifications will be jointly developed by the client and PSTF staff as early in the design phase as possible.

Software design and development personnel in PSTF will employ four levels of testing: unit testing, where each module is separately tested, system testing, where the system is tested, acceptance testing, and installation testing. Because top down design and development will be used, system testing begins with the development of the first module.

PSTF will use the testing procedures outlined in Managing a Program Project, by Philip W. Metzger. This formal procedure requires early planning, user participation, and third party involvement. We believe test execution by persons not involved in the actual program coding to be essential.

o User Training

Training programs will aid our clients in using the automated tools we provide. Such training will include lecture, workshops, and "hands-on" terminal sessions. All training activity will emphasize the practical over the theoretical, and will give examples that the user can employ with little modification.

Career Development

Retaining high calibre ADP staff is difficult under

the best of conditions. Unfortunately, conditions at EPA have not always been ideal. PSTF intends to create a climate that offers qualified technical personnel the opportunity to attain career goals. Throughout the Government, technically qualified personnel have had to move to a management position to reach grade levels above GS-13. Although this situation is not presently within our control, we must work to get career paths for our technical personnel that lead to GS-13 and GS-14 levels, without such personnel having to accept management responsibilities.

PSTF will also encourage technical personnel to attend short and long term training sessions, conferences, expositions, etc., to become familiar with state-of-the-art technology. Periodic, informal briefings will be conducted by individual PSTF employees for fellow staff members and interested users. These sessions will allow individuals to share with others the indepth understanding that they possess in their area of specialization.

Our goal is three fold. First, we want to offer the employee an employment benefit that is legitimately his/hers: the opportunity to acquire the expertise necessary for career advancement. Second, we want to attract and retain competent personnel. And third, we want to develop our most important resource, the ADP professional.

Role of Planning

Planning at EPA is often viewed as a paper exercise. The real purpose and long term benefits of planning have difficulty emerging from the mountain of forms that we prepare and circulate. PSTF will strongly support and participate in all OIRM and Agency planning processes. However, the task force urges that we re-examine both our planning goals and procedures. A reduction in paper work seems an obvious first step. Gaining the support of program managers and budgetary personnel is a second. Planning for ADP has historically met with much program office resistance. We believe that cooperation will replace opposition when the program office begins to see planning as a way to prepare for the future. This transformation in user thinking requires 1) that we streamline the process and 2) that we impart to the client an understanding of and appreciation for what we are trying to do.

We think it significant to note that ADP planning is tied, to a very large degree, to program planning. PSTF must become familiar with the tactical and strategic plans of each program office. Program offices have not historically been very successful in laying out short and long-term goals. The potential impact of this program failure on ADP planning must be recognized.

Movement to IBM Compatible CPUs

An important mid term goal of PSTF is the installation and operation of all large program systems on IBM compatible CPUs. We are convinced that such hardware offers the Agency the capabilities that it will need in the mid and late 1980s, at a price that will be hard to beat. The movement to such hardware has begun. Both the Office of Water and the Office of Pesticides and Toxic Substances have acquired IBM 4341 computers. The central computer facility at RTP has recently procured an IBM 3081. It is now time to acknowledge that for the next five to seven years, IBM (or one of several IBM plug compatible vendors) will provide the hardware environment in which our systems operate. Denying this only delays getting our systems to the operational state that we seek.

We also intend to investigate the role that the distributed IBM 4341 (or equivalent) network will play. One option under consideration involves distributing relevant portions of our large program systems to each 4341 site. We await the final recommendation of the ADP modernization study. With these in hand a rational policy can be developed.

Conclusion

Our strategy for program system development and management emphasizes providing the program offices with the ADP support they require to meet their program goals. This demands a customer orientation on the part of PSTF and an understanding of and an appreciation for the Agency's information resources management (IRM) policy. The approach laid out here is fully consistent with such policy. PSTF looks forward to its implementation within the IRM framework.