ADP training systems—Organization-wide training for increased productivity

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ABSTRACT

In most organizations with medium to large computer centers, management attention is primarily focused on technological gains as the major method for improving data processing services and utilization. However, computer system productivity can also be increased through effective organization-wide training.

To improve on training currently available to most organizations—OJT, standard courses provided by the hardware manufacturer or independent suppliers, and self-study packages—a systems approach to training is suggested, named the ADP Training System (ATS). This approach employs proven systems methodology to plan, develop, and implement fully documented ADP training to improve job performance of all personnel who manage, operate, or use the computer center facilities and services. An ATS is tailored to meet specific needs of the organization.

ATS planning includes determination of organization needs, available resources, and program constraints. It documents objectives, scope, costs and master schedules.

ATS development includes course definitions, development schedules, and course materials development. It provides implementation schedules, instructor's guides, student materials, and support materials.

ATS implementation includes administration, execution of courses, evaluation and redirection.

After a discussion of ATS concepts, a case history of an ATS program which involved the authors is presented.

It is concluded that an ADP Training System provides management the planning and control capability to implement organization-wide training for new systems and technology on a cost-justifiable basis.

INTRODUCTION

As the use of automated data processing for commercial applications has become more and more widespread, it has become increasingly worthwhile to examine those factors that influence the cost/effectiveness of ADP systems. This paper addresses one such area: organization-wide training for increased productivity. It advocates the application of total system concepts to the development and implementation of training programs and presents an example of the use of those concepts in an actual situation.

In most organizations with medium to large scale computer centers, personnel costs exceed the costs for computing equipment and software; nevertheless, management attention continues to be focused on technological gains as the primary method for improving data processing services and utilization. Granting that processing costs can be substantially reduced with improved hardware technology, it is also true that the over-all effectiveness of complex data processing systems can be improved through effective organization-wide training.

However, in many, if not most, organizations, computer center hardware and software have surpassed the capabilities of existing programs to train personnel to manage, operate and use this technology. In many organizations ADP training is only available on an ad hoc basis, often unplanned, and provided as on-the-job training, instruction at a computer manufacturer's or independent supplier's education center, and self-study of textual or audiovisual packages. In short in many organizations, ADP training tends to be episodic, fragmented and directed toward the satisfaction of unanticipated needs.

After extensive experience as vendors of training services to many organizations such as those noted above, the authors have developed and implemented a systems approach to training that they call ADP Training Systems. The ADP Training Systems method employs proven planning, systems and training methodologies to produce a fully documented ADP training program that is directed toward improvement of on-the-job performance of all personnel who manage, operate or use the products of an organization's automated data processing system. Each ADP Training System is developed for a specific organization and has as its major objective satisfaction of that orga-
nization's training needs in a coherent, timely and economic manner.

An ADP Training System is an organization-wide program for the training or re-training of personnel to meet new or changing job requirements that are occasioned by changes in the scope or level of automated data processing technology available to the organization. It is concerned with a broad range of personnel, including: top executives; middle management; project administrators and supervisors; users; systems analysts; applications and systems programmers; and operations personnel. It is characterized by an orderly, planned process of installing an effective operational training capability to support all of the training needs of the organization in an economic, efficient manner.

The scope, complexity and depth of penetration of a specific ADP Training System is dependent on the size, complexity and needs of the specific organization for which it is intended. In any case, to some extent it always includes three functions:

1. Planning;
2. Development;
3. Implementation.

Planning—This function includes determination of: the organization's training needs; the resources available to support a training program; and the considerations and constraints that must be taken into account in developing and implementing the ADP Training System. The function's outputs are a set of planning documents that define: the objectives of the ATS; its scope and content; its probable cost for development and operations; and the estimated timeframe for development and operation of the ATS.

Development—This function includes: definition of the individual training courses required; setting development schedules; selection or development of course materials. The function's outputs are: a program implementation schedule; instructor's guides; student materials; class schedules, class announcements and other ancillary materials.

Implementation—This function includes: administration and execution of individual courses; evaluation of students, instruction, and overall system operation; modification or re-direction of the system as needed.

PLANNING FOR AN ADP TRAINING SYSTEM

In order to do a creditable job of planning for an ADP Training System, it is necessary that the planner have a reasonable understanding of the goals, activities and organization of the company or agency for which the ATS is intended. The normal investigative and analytical techniques used in any system study are applicable to this problem. Once the organization itself is understood, the ATS planner can move toward definition and documentation of the organization's training needs and objectives.

The fundamental goal of training in any organization is, or should be, to improve performance on the job. Specific, more detailed, objectives flow from this goal. Any departure from this goal will necessarily result in a decrease in the cost/effectiveness of the system. Courses of an academic nature, while useful in the long range, do not necessarily support the organization's operational objectives and are, therefore, difficult to justify. It is more cost/effective to encourage individuals with academic interests to pursue course work at a local college or university.

Training, within the operational organization, for both technical and non-technical personnel should be oriented to specific job functions and particular ADP applications. With this strategy, both management and employees can better understand the value of ADP training; management can more easily evaluate the financial investment in terms of increased personnel productivity and the ability of personnel to handle increased responsibilities; employees can more readily accept the training as a vehicle for improved performance on the job, self-development, career enlargement, and professional growth.

In addition to satisfying the basic goal of improved job performance, an ADP Training System should be tailored to meet the special needs of the organization, including: selection of topics to relate the instruction directly to the installed or anticipated computer configuration; development of computer-oriented student problems; off-hour or part-day scheduling of classes to accommodate the regular workload of the students; and, when appropriate, the development of case studies based on actual experiences at the installation.

Planning for an ATS should also include consideration of factors that influence training costs. In the authors' experience, appreciable cost savings can be effected through implementation of training programs on-site which allows use of installation-owned classrooms and equipment for instructional purposes and eliminates student travel expense and idle time. For an on-site course, $50 per student for each instructional day appears to be an achievable goal for groups of 12 or more. This number should be contrasted with $75 to $150 a day per student at typical classes held by manufacturers and producers of commercial seminars.

Some other considerations that bear on the development of a plan for satisfying the training requirements of an organization faced with technological change, relate to the training curriculum. First, training must be implemented for all personnel categories involved with the computing center or using its products. Such training may range from a two-hour seminar for top executives to a six month case study in systems analysis and design. Training should not be limited to tech-

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Six classroom hours
nical professionals, i.e., analysts and programmers, but should be extended to technician-level personnel, i.e., coding clerks, computer operators, tape librarians and so on, and to users, managers and executives. In addition, each training course should be related to a specific personnel category. Courses should be organized as a progressive sequence of formal classroom instruction, interleaved with practical OJT assignments as appropriate. Refresher and review courses of short duration should be planned to provide technical updates, answer questions regarding current operations and future plans, and to minimize the normal tendency of individuals to drift away from established systems and procedures.

The outputs of this developmental phase consist of a set of planning documents, including:

1. A statement of the objectives of the ADP Training System;
2. A description of the course content of the ADP Training System;
3. A summary estimate of the resources required for the ATS including a cost estimate for each major class of resource;
4. A proposed schedule for the ATS;
5. An outline and summary for each course including planned OJT segments. The documentation for each course should include:
   - The behavioral objectives of the course.
   - A profile of the typical target participant including: prerequisite training and experience; current work assignment; and proposed work or job functions to be assigned at the completion of the course.
   - A topic outline of the course content.
   - A description of the proposed instructional methodologies for the course.
   - A description of student materials.
   - A proposed schedule for the course.
   - An estimate of the resources required for the course including a cost estimate for each major class of resources;
6. A plan and schedule for development and implementation of the ADP Training System.

The completed ATS planning package is presented to management for review and concurrence. Any needed revisions to the plan should be made before proceeding to the next developmental phase.

DEVELOPING AN ADP TRAINING SYSTEM

Upon acceptance by management of the ATS plan, the ADP Training System package may be developed and documented. The major outputs from this activity are:

1. The ADP Training System Catalog;
2. Course announcements;
3. Structured training course packages.

The ADP Training System Catalog is an edited version of the approved ATS plan. It is in a form suitable for distribution to prospective students. Publication and distribution should be in accordance with normal policies of the organization. Course announcements are extracted from the catalog as needed.

The structured training course package consists of two major components: the instructor's guide with its supporting materials and the appropriate student materials. The basic instructor's guide is composed of:

1. A narrative exposition of behavioral objectives, content and instructional methodologies;
2. A course schedule;
3. A listing of student materials;
4. A set of lesson plans which set forth a detailed description of: instructor activities and instructional aids; the instructional content of the unit; lesson objectives; and student activities.

Appropriate student materials are developed or selected and procured, and are coordinated with the instructor's guide.

IMPLEMENTING AN ADP TRAINING SYSTEM

Implementation of an ADP Training System consists of system administration and course presentation. The system administrator need not be an educator or teacher, but he should have a firm grasp of the objectives of training and of good administrative practice. His functions are to: select or approve instructors; announce courses in a timely fashion; administer the student selection process; assure the availability of needed facilities, materials and equipment; evaluate overall system operation; and prepare appropriate management reports.

Instructors should be selected from professionals in the data processing field who have achieved a reasonable balance among technical experience, instructional experience and communication skills. Experience has shown that instruction in technical subjects requires an unusually high degree of instructional talent which includes not only a good background in the subject matter, but also a high level of empathy with the students.

It is important that the ADP Training System and its constituent courses be properly announced and supported to insure that all prospective students and their supervisors are aware of the available training opportunities and can have the time necessary to plan for their attendance. Elements of the announcement strategy include: letters from the chief executive re-
questing support of the training function by line management; the early distribution of the ADP Training System Catalog; briefing sessions for prospective students to explain the program or courses and to answer their questions; course announcements through bulletins or other communication media in the organization.

Each prospective student for each course should be screened to assure that he satisfies course prerequisites and that his post-training assignment will be appropriate. In addition, the system administrator should assure that each student's current work schedule has been adjusted to allow class attendance.

Effective training requires that students receive all documentation appropriate to the subject matter. For example, students training in hardware/software technology should receive personal copies of appropriate technical manuals; students in introductory courses should receive text books written at levels commensurate with their capabilities, e.g., executives should receive texts written at a general level. Other student materials such as charts, diagrams, templates and the like should be distributed as needed.

Audiovisual materials can be valuable instructional aids. Such aids reinforce textual and oral presentations and provide an enlivening change of pace. However, such materials must be integrated with other course activity: each audiovisual segment should be both introduced, and followed up by the instructor. The system administrator's responsibility in regard to audiovisual support is to assure that both materials and any required equipment are available when and where needed.

It is important that administration of the ATS be handled just as any other project; therefore, the training administrator should prepare periodic management reports regarding overall performance and adherence to budget.

In the authors' experience, classroom operation is most successful when well structured and tightly disciplined. In this approach, daily quizzes based on outside reading assignments and the previous day's class work provide a sharp focus on the instructional content of the course. Each class session starts with a quiz which is then corrected immediately in a process that provides the framework for discussion and clarification of the previous session and reading assignment. The extensive testing is used primarily to reinforce learning and to provide the students immediate goals for learning. It is only secondarily used for evaluating student progress.

As appropriate, many instructional methodologies are used, including: oral presentations by the instructor; audiovisual materials; laboratory exercises and workshops; and outside reading or project assignments. The particular methodologies used in a specific course are dependent on course content, course scope, and the type and level of persons being trained.

A CASE HISTORY

This case history involves the ADP Training System that was established for a large federal agency that was upgrading its computer capability. Its second generation equipment was being replaced by a large third generation computer with advanced software support and remote terminal and RJE capability. Implementation of the new system was contracted to an industrial firm who provided on-site technical assistance, system development, computer center management and training. The implementation plan extends over a five year period.

In the early years, the training plan was to provide basic technological training and to develop an in-house training capability. It is intended that the contractor will gradually phase out as agency personnel become capable of picking up responsibility. At the end of five years, it is intended that the agency will be managing all aspects of its operational and training program.

The original plan called for training programs to be set up for approximately 100 programmers and analysts, 50 computer operators and support personnel, 350 terminal users and operators, and 150 executive and middle management personnel. The initial training period extended over approximately 18 months ending in December, 1975. The original plan called for approximately 500 days of instruction over this period. The authors' company participated in a substantial portion of the technical training of personnel.

Although the program was reasonably successful, some areas of possible improvement are documented for future reference. Such comments relate only to segments of the program that were produced by the authors.

At an early date, a master plan and schedule was produced by the prime contractor and accepted by the agency's management. This plan had a reasonable array of courses scheduled in progression from basic to more advanced training. The authors' company was engaged as a subcontractor to produce courses to meet the plan's specifications.

These courses dealt with four training areas:

1. Systems programming;
2. Programming languages;
3. Operator training;
4. Terminal user training.

The systems programming training consisted of thirty instructional days presented over a four month period. This schedule permitted students to attend class part-time and to perform their regular assignments during out of class hours. The instructional goals were met, but not without difficulty. The students' job assignments imposed a heavier and heavier burden as the application conversion program proceeded. Additionally, the four month time frame
tended to dilute the instructional impact of the course. A better result would have been attained by organizing the content of the course into two or three courses of shorter duration.

The courses in COBOL, FORTRAN and JCL were only partially successful. Although the courses were announced with appropriate prerequisites, no significant controls were exercised over attendance. As a result many students did not meet the prerequisites and had great difficulty with the course. Additionally, many students lacked any real job-connected objective to be met by this training, that is, neither current nor prospective job assignments required use of the knowledge and skills to be attained by successful completion of training. The presence of a substantial number of such individuals in these courses seriously compromised the effectiveness of the training.

The objective of the three day operator training course was to indoctrinate second generation computer operators and production control personnel with third generation ADP system concepts. The presence of production control personnel in this course presented some difficulties since, in contrast to the computer operators, they had little prior ADP training. In any case, training for computer operations personnel is a complex problem, because such personnel represent a wide range of interests, backgrounds and capabilities, and frequently lack the motivation and study skills needed for mastery of complex technical subjects.

Terminal user training, presented in a four day course, was quite successful. The course, intended to introduce administrators and professional personnel to the use of remote terminals to access an interactive programming system and an on-line data base management system, was of sufficiently short duration so that student interest was easily maintained. Since this was an introductory course, the divergent backgrounds and objectives of the students did not constitute a severe problem; however, in the future, the course outcomes could be improved by grouping individuals with similar interests into separate classes. In this way, both the instructor's presentation and the workshop sessions which are an integral and important part of this course could be more specific to each group's interests.

Many of the problems encountered in producing the courses discussed above, flowed directly from a lack of strong, sustained management interest. At the beginning of the program it was recognized that an in-house training capability was required. Four full-time agency people were initially assigned to the program; however, after a short time, management decided that those individuals were needed elsewhere and the in-house training function was abandoned.

This shortfall in management interest was strongly felt, since the training courses that made up the program were provided by four different organizations. Lacking strong program administration, each provider interpreted the plan in its own way and handled its part of the program in its own style. The overall effect was that the benefits realized from this ADP Training System were less than might have been reasonably expected.

Nonetheless, much about the ADP Training System was right: the organization's training needs and objectives were properly defined; a realistic and effective training plan was documented; a large number of good training courses were developed and implemented. The shortfalls in the student selection process and in program administration should not be allowed to obscure the very real benefits produced by this ATS.