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PROJECT MANAGEMENT SYSTEMS

Data processing management is naturally interested in better methods for managing and controlling projects. After all, new application system development and major enhancements are handled as projects. In the last two years or so, there has been an upsurge of interest in "full" project management systems (PMS)—mechanized systems that support the planning and control of projects. It was reported to us that one supplier sold five times as many PMS packages in a recent 20 months period as were sold in the previous several years that the package had been on the market. These "full" PMS have quite a bit to offer, but at the same time, a lot of the installations of them have been considered failures. Here is a discussion of some successful uses, plus an analysis of the problems they can raise.

The Royal Bank of Canada, with headquarters in Montreal, Quebec, is the largest bank in Canada. It has over $25 billion in assets and operates approximately 1,550 branches in Canada and international areas. The Royal Bank of Canada has operations in 30 countries of the world supported by seven independent processing centers, as well as coast-to-coast operations within Canada supported by six major processing centers.

The systems and processing operations division of the bank employs 3,000 people and it is this division that develops and operates the bank's information processing systems. Of these employees, some 400 are systems analysts and programmers. Consequently, the Royal Bank of Canada has a very large systems development and maintenance function.

The development of new application systems on time and on budget had been posing a problem for the bank during the 1960's. By 1971, the increasing number and needs of new systems development projects had reached the point where the people at the Royal Bank of Canada decided that they would develop a project management system to help them achieve a better performance.

The first step in the development of the department-wide project management system was the implementation of formal planning and reporting systems for both long and near-term planning.

The increasing frequency of changes in the banking industry, and the technological environment in which the systems and processing operations division operated, necessitated the development of a long range plan outlining a framework of business and systems development and operating objectives for the following five years. The existence of the plan and its regular annual updating provided early benefits by reducing or eliminating duplication of effort previously expended in many areas. In addition, it provided a mechanism whereby proposed developments could be evaluated for short and long term impact both in the department and with the user areas. The first year of the plan was developed in substantial detail and this provided the basis for the development of a detailed annual work program for the coming year. The remaining four years of the plan were developed in lesser detail.

The annual work program system using standard planning, staffing, and costing procedures took this first year of the long range plan and turned it into a practical working plan for the following 12 months. The purpose of the annual work program was to provide a uniform planning, scheduling and budgeting system for all work undertaken by the department and to provide an initial work outline for all development projects that were to be included in the plan.

The two planning systems developed were the first steps towards further developments in the departments project management system. Highlights of later developments are as follows.

Structured, phased approach to development work. Each project of sufficient magnitude to be included in the annual work program goes through a structured development cycle of eight phases. Each phase has its own development and approval requirements and detailed activities within the phase. These have been outlined in the departments standards manual to ensure a uniform and complete development cycle. The outputs from each phase are reviewed and approved by various levels within the department and in the user areas, ensuring that all people involved are kept up-to-date on the project's progress and implementation plan. For convenience a graphic check-list has been produced and widely distributed within the department showing the total project phases, their individual activities and all review points.

Central networking facility. The networking facility is used mainly for the larger projects where there are many dependencies or constraints in time or resources. A small centralized group of professional network analysts work directly with the project leaders in the development of initial plans for their projects. These plans indicate which activities must be performed in sequence and which can be performed in parallel with others. The activities and their precedence relationships are then supplied to a computer program which calculates the critical path as well as float for the activities not on the critical path. From that point on, the network is updated on a bi-weekly basis and outputs are distributed to affected areas.

Project planning and information system. This system is based on the eight standard phases. A standard form has been developed for each of the eight phases, listing the activities that can be performed during each phase. Monthly, or on an as-required basis, each project leader completes a set of these forms for the project(s) that he supervises. By putting marks in schedule blocks, he easily indicates what activities will be performed and when. He can add activities which are not on the standard list.

The co-ordination section within the department oversees the conversion of this information to machine language and the printing of Gantt (schedule) charts and tables. These charts show the schedules of the phases, and activities within phases, for each of the projects. Moreover, they show the original schedules as well as the current schedules (which the project leaders just entered). From such charts management can quickly tell if a project is running behind schedule and in which phase and activities it is beginning to slip behind schedule.

If desired, actual cost information can be provided from this system, at the lowest level of work activity.

Systems implementation control system. This is a large wall-mounted display board on which the schedule and current status of major projects are displayed and updated monthly. These projects include those for new systems, major redesign and major maintenance—anything with significant impact on the department in the areas of interfaces between systems, operating considerations and resources requirements.

Quarterly status report to management. This summary report shows work planned versus work accomplished for the past quarter.

Other aspects of the control system include departmental reports that show plans, budget, and accomplishments on a departmental (rather than a project) basis, and a monthly manpower summary system.

What have been the results of this project management system? The Royal Bank of Canada has seen considerable improvement on schedule performance. Now they are completing projects on schedule about 80% of the time. Cost control has improved, also; the great majority of projects are completed almost on budget, and it is the exceptional case that goes over budget by more than 10%.

While they continue to enhance and revise their project management system, the Royal Bank

of Canada is pleased with what it has done for them so far.

The results that the Royal Bank of Canada has obtained are the ones that many organizations seek, but the means of getting these results differ widely. The Royal Bank, with a large staff of analysts and programmers, chose to develop their system in-house. Other organizations, with much smaller staffs, have often opted to buy a proprietary PMS package. To illustrate we will briefly discuss the experience of several organizations with their use of proprietary packages.

Port of Seattle

The Port of Seattle, at Seattle, Washington, administers the port facilities for loading and unloading Pacific Ocean ships. It also administers the Sea-Tac International Airport, serving the greater Seattle area plus two pleasure craft and commercial fishing marinas and an industrial development program.

Data processing is very important to the Port of Seattle. Pacific Coast ports are competitive and Seattle must attract shippers by offering unique services. Systems and data processing helps cut shipping costs by advising when shipments can be consolidated, by efficient scheduling of operations, and so on. The Port of Seattle uses a Burroughs B4700 computer and employs a staff of 16 analysts and programmers.

In 1973, the Port of Seattle installed the PAC I project management package, supplied by International Systems, Inc., of King of Prussia, Pennsylvania. And early this year, they converted to PAC II, a new version of the package. PAC II is reasonably different from PAC I, so that this conversion required about the same amount of time as was originally needed for installing PAC I—about three months each time.

In their use of PAC, the Port of Seattle follows a relatively formal procedure. Late each year, the supervisors in the systems and data processing department make plans for the forthcoming calendar year. These plans are based on the approved budget for the department and cover desired new systems, enhancements to existing systems, an estimate of maintenance requirements, etc. *All* expected activities are included, not just projects—and this includes training, holidays, vacations, etc. Usually several iterations are needed before an acceptable plan is achieved.

Then the supervisors make up the resource allocation budget—allocating people-months of time to the projects. Departmental management reviews and approves this budget. Then the supervisors make the first pass at assigning individual people to the projects. At this point, the information is fed into PAC II. PAC II generates the schedules for the various projects, and computes manpower loading. If it is apparent that some people are overloaded at some points in time, changes are made and the schedules are regenerated. Several iterations are usually needed before an acceptable schedule is obtained. This schedule is not "set in concrete" and can be changed as unforeseen events occur. PAC II then produces a report for each staff member, telling him what management expects he will work on during the year and when.

Each week PAC II produces turnaround time sheets for the staff, showing planned work. Staff members fill in their actual times and activities, and percent-complete estimates for the activities. PAC II uses this information to produce project status and analysis reports.

PAC II thus provides a two-way communication—the plans, from management to staff, and the actuals, from staff to management. Using it the way the Port of Seattle does, it provides departmental control and communications by accounting for all staff time.

PAC has greatly improved the Port's budgetary control. For 1975, both new systems work and maintenance work were accomplished within 2% of budget. Enhancements are harder to control, and the Port is still working to improve overall schedule and control system.

Boulton & Paul Limited

Boulton & Paul Limited, with headquarters in Norwich, U.K., is a manufacturer of prefabricated building components. Annual sales are in the order of £50 million. The company has an IBM 370/145, and employs some 35 analysts and programmers.

Prior to mid-1974, Boulton & Paul had been using a PMS package that they found to be unsatisfactory for their needs. Much input data had to be supplied, it was a non-trivial task to supply it, the outputs were not fully satisfactory for their needs, and it was hard to adapt the system for their needs. So the company started looking for an-

other PMS—and selected PROJECTMANAGER, supplied by Management Systems & Programming, Ltd., of London, U.K.

PROJECTMANAGER turned out to be easy for Boulton & Paul to install. Fewer forms and less detail were required for input; those forms that were needed were adapted from the previous forms, to minimize change. The new system was in and running in a relatively few hours time, we were told, largely because all necessary data was available from the previous system.

PROJECTMANAGER is a project tracking system. Its reports show actual versus budget, for time and/or cost; at Boulton & Paul, they have chosen to control mainly on cost. The system is used to control all software development, application systems development, and all system maintenance. No standard project structure is imposed by the system; each project leader is left free to phase his projects as he desires and to provide the degree of work breakdown detail he desires. The project leader identifies the activities that will be performed on the project and the estimated person-hours for each.

The weekly time reporting takes only 15 to 20 minutes per person and is done the first thing Monday morning. The forms are checked by a department secretary in less than one hour and then sent to data entry. The output of a validation run comes back by Monday afternoon, and any detected errors are corrected. The regular reports are then produced and available either by late Monday afternoon or by the first thing Tuesday morning. Preparation of the reports only requires a few minutes of computer time.

PROJECTMANAGER can provide a variety of optional reports on project progress and project cost. As mentioned, Boulton & Paul have chosen to control mainly on cost, so their reports show weekly actual hours and costs, plus cumulative hours and costs, for the total project and for each sub-project. One copy of the report is divided among the project leaders and the other goes to the accounting department.

Boulton & Paul likes the optional nature of PROJECTMANAGER. The system can be used at almost any level of detail—from just project names down through a hierarchy of tasks and activities—allowing the user to select the level most appropriate to the project. The user can select which reports and which level of detail are desired.

So, ease of use coupled with a desired minimum level of control are the features that Boulton & Paul likes best about PROJECTMANAGER.

Garrett AiResearch

AiResearch Manufacturing Company of California is a division of the Garrett Corporation, which in turn is a subsidiary of The Signal Companies. AiResearch is located in Los Angeles and is a manufacturer of aircraft, missile, and electronic components and systems. Garrett's annual sales are just under $500 million and the corporation has about 12,000 employees. AiResearch currently uses an IBM 370/158 and employs some 32 analysts and programmers.

In early 1974, data processing management at AiResearch decided to get a project management system. After looking at several packages, they selected PROCON 3, which is supplied by Nichols & Company of Los Angeles.

Management was then faced with a challenging question: should we put all projects under the control of PROCON 3 or just the large projects? At any one time, AiResearch has in the order of 170 to 180 outstanding user requests in work or waiting to be worked on. While they considered PROCON 3 to be most suitable for large projects, they decided to put all projects under the control of the system to get a complete coverage of analyst and programmer time.

AiResearch uses a standard structure for projects, with pre-defined activities. For a project of any magnitude, the project leader (usually a supervisor) performs a work breakdown, identifying the activities to be performed in each phase. "Time standards" are used to give a first approximation of manpower needs. Then analysts and programmers are selected for the project and the project leader discusses these time estimates with the people, revising them as needed to get agreement. The project leader also defines the sequence in which the activities will be performed.

Then using PROCON 3 in its simulation mode, a first version of a project schedule is computed. PROCON 3 takes into account all work assignments for the people on the project. Overloads and unused hours are flagged. The schedule is revised to balance the load and run again. Several iterations may be needed to obtain a satisfactory schedule.

PROCON 3 then produces an employee status re-

port, showing each staff member what he or she is scheduled to work on. On Friday of each week, the employee uses this PROCON-produced turnaround document to record what was actually worked on, for how much time, and the time remaining to complete each task. These turnaround documents are initially screened by a group secretary on Friday. They then go to the general supervisor who checks the time estimates for work yet to do, the coding, etc., after which the forms are sent to data entry. The reports are produced over the weekend and available for use Monday morning.

PROCON 3 can produce 13 optional reports, and AiResearch finds that they use all of them, at one time or another. The employee status reports go to the employees, telling them how they did compared with the plan as well as the plan for the upcoming week. Project analysis reports go to the supervisors and show actual project progress compared with plan. The general supervisor gets a weekly graphical progress report on large projects. And PROCON 3 collects and summarizes labor cost data for feeding into the department's regular billing system.

No comparative figures on performance were available but the general supervisor of systems and programming said that he could see a big improvement in how the department has been meeting its time and cost budgets.

MCA Inc.

MCA Inc., with headquarters in Universal City, California, is a major producer of motion pictures, television series and films, and other leisure time products. Annual sales are over $800 million. The company has nine subsidiary organizations, the largest of which is Universal Studios, and has five data processing centers in the U.S. and Western Europe for serving these subsidiaries. At the Universal City headquarters, the company has an IBM 370/158 and employs some 38 analysts and programmers.

Early in 1973, data processing management considered the need for a PMS package. After investigating several on the market, they chose the PC/70 package, supplied by Atlantic Software Inc. of Philadelphia, Penna. Initially they obtained just the basic package, which does project tracking of actual times and costs versus budgets. In early 1976, they upgraded the package by adding the extended planning capabilities.

MCA has developed a structured development cycle, a list of activities for each phase, and time standard algorithms for the activities. When a new project is started, the project manager develops a work breakdown, using the activity list for each phase. The manager has the option to use precedence relationships for the activities. Time estimates are developed for each activity based on the experience of the assigned person, application knowledge, and the relative complexity of the activity.

This information is then entered into PC/70. PC/70 then produces a completion date without scheduling an overload. If a firm completion date is imposed on the project, PC/70 starts tracking at that completion date and works backwards. It shows the schedule needed for each activity if the target date is to be met, and the overtime requirements for completion on schedule. It thus provides project managers with the visibility for restructuring schedules and assignments.

For a medium size project, eight phases are used in the development cycle. A very small project is treated as just one phase, and on a large project, some of the eight basic phases are sub-divided.

At MCA, data processing management's main concern is keeping costs within budget while meeting project schedules. This factor influences their use of PC/70—what reports they want and when they want them. For instance, PC/70 produces two turnaround documents, a planning document and a time reporting document. Using the planning document, a project manager can easily revise schedules, reassign resources, alter priorities, etc., thus allowing weekly project status reports to show the most current status of project schedules.

The big benefit realized from PC/70 by MCA's data processing management is project visibility. The PC/70 methodology assists division management in their decision making process—that is, scheduling projects so as to anticipate timely completions as well as to achieve cost benefits for the company. It was this factor which influenced MCA's decision to select PC/70.

Types of project management systems

Clayton Harrell Jr., a project management consultant for the Xerox Corporation, presented a 1½

hour session at the 1974 ACM National Conference on project management systems. He reported on a study he had made in which he had looked at over 50 commercial PMS packages plus some others that had been developed in-house by companies. He saw these systems as falling into four general categories.

Manual structured systems. These are the systems that impose a standard structure on all projects, generally involving from 8 to 12 phases. Each phase has its defined work products and defined documentation. Management checkpoints are specified at which project progress is reviewed, revised estimates on remaining costs and expected benefits are presented, and where the decision is made on whether to proceed or not. Approval to proceed only applies until the next checkpoint. This process has been given the name "creeping commitment."

We have discussed such systems in our May 1973 report (the Touche Ross & Co. methodology) and in our December 1974 report (the PRIDE system). In general, these methods involve no computer assistance, although PRIDE now offers a mechanized data and system dictionary function. Control is obtained by carefully controlling the current phase for each project and by the possibility that a project may be terminated if costs start getting out of control or if expected benefits are disappearing.

Project tracking systems. These systems provide no particular facilities for project planning. Instead, they accept whatever list of activities for a project is developed and whatever time and cost budgets are assigned to those activities, and then track actual times and costs against these budgets. The reports show actual schedule realization and cost accumulation.

Earlier in this report, we discussed the PROJECTMANAGER and the basic PC/70 packages, which fit into this category.

Project networking systems. These systems develop a critical path network for a project, determine which activities fall on the critical path, and what the "float" or "slack" is for the other activities. PERT and CPM are well-known examples of two networking disciplines. Networking has been used effectively on large construction and defense projects. Networking is best suited for planning and controlling schedules and is not particularly convenient for controlling costs.

We discussed some approaches to networking in our August 1964 report. From conversations on this subject in the intervening years, it appears that the methodology is still basically the same, with some improvements made in the mechanization methods.

Full project management systems. These are the systems, says Harrell, that perform most of the functions of the other three types—work breakdown, time estimating, scheduling, manpower loading, project tracking, and providing a wide variety of reports.

Since we have emphasized these full PMS in the case examples above, and since we will be discussing some of the problems associated with them, it would be well to list the *potential* capabilities of a full PMS. Recognize, however, that not all of the supposedly full PMS packages on the market offer this full range of capabilities.

ASPECTS OF PROJECT MANAGEMENT

Planning function
- a) Work breakdown structure
- b) Checklist of potential activities
- c) Networking capability, considering all projects
- d) Manpower loading capability, considering all projects
- e) Resource scheduling, considering all projects
- f) "What-if" analysis capability

Work definition function
- a) Standard project structure, with phases, activities, and checkpoints
- b) Precedence (network) relationships among the activities
- c) Performance time standards or standard algorithms for activities
- d) Standard procedures on how to perform the activities
- e) Documentation standards for most activities

Dictionary function
- a) Data definition dictionary function
- b) System definition dictionary function

Tracking function
- a) Data collection and validation function (usually by means of turnaround documents) for collecting (1) work time and work progress data and (2) planning change data such as schedule revisions and resource allocation changes.

Reporting function
- a) Project reports for (1) management, covering status of all projects, (2) project leaders, covering details on status of their projects, (3) employees, telling actual versus plan for last week and plan for forthcoming week, and (4) accounting, showing labor costs on projects.
- b) Departmental reports for department management, showing time distribution for all staff members over all activities (including vacations, sickness, etc.)

One company pointed out to us that the most useful part of their PMS system is the "what if" capability. When a project starts getting into trouble or a major management redirection affects a plan, the PMS should be capable of helping project management analyze alternative courses of action. "Replanning is the name of the game, after a project has been launched," was the view of one specialist at this company.

There are other significant aspects of project management that may not be included in any PMS package—or, at least, not to the extent that a new user might assume.

Project selection function. This is the process of selecting the most effective set of projects, as far as the overall value to the organization is concerned. We discussed this subject in our May 1975 report. All PMS packages that we have observed pick up project management after the project selection has been made.

Evaluating quality of work. The PMS packages that we have seen simply report what work has been done, with no indication of its quality. No attempt is made to measure how well an activity has been performed.

Expected problem areas. As work on a project progresses, the project leader and/or staff members may see some challenging problems ahead for which they need management's help. For instance, some key people in other departments may not be cooperating, or may be away for extended periods, and management's help is needed before things get out of hand. A way is needed for informing management about expected upcoming problems.

Training in use of PMS. This is a deceptive item because all PMS suppliers would claim that they *do* provide training in the use of PMS. But full PMS packages involve the detailed planning of work to be done at all levels, including the individual team member level—and many organizations are not accustomed to this amount of planning. Instead, they tend to want to get started on detailed work as soon as possible. So training is needed in how to perform the planning function. The supplier of the PERT 6 package, for instance, provides a three day course for project managers using a computer-based simulated project. This course provides the equivalent of six months experience with the system, it is claimed.

Which approach to PMS for you?

Some interesting points were made to us during our study.

Point 1. If the suppliers of full PMS were surveyed and were candid in their comments, they would report that over one-half of the full PMS installations have been failures—the customer ends up not using the package. An additional number are making only limited use of a full PMS, perhaps by a few project leaders who like to use the systems.

Point 2. A full PMS is no panacea. It will not bring order out of chaos. It cannot be used as a solution for other ills, such as poor system design procedures or poor programming practices. But it can help make a fairly smooth running operation run even more smoothly.

Point 3. If an organization does not have a project management system at present, then it would be wise not to try to install a full PMS at the outset. Instead, start with a manual structured system or a project tracking system.

Point 4. Installing a PMS is like installing any other management procedure. It needs commitment, encouragement, and endorsement by management—rather than an edict. Management sets the tone and must support the system by actually *using* the reports that the system produces.

These points indicate that troubles can occur when installing a PMS. To gain further insight into this subject, we talked to Glenn Craig of Glenn Craig & Affiliates, Los Angeles, California. Craig formerly was involved with the development and marketing of a popular PMS package. He helped install the package at over a dozen organizations and has talked to many other organizations about their use of PMS.

He outlined for us what he felt were the top problem areas when installing a full PMS. These fall into three main categories:

- Insufficient support
- Costs out of proportion
- Lack of realistic understanding

We will discuss the types of problems that he has seen arise in each of these categories. At the same time, he emphasized to us that there *are* many successful installations of these packages. The purpose of this discussion, then, is not to warn against the use of full PMS but rather to point out problems that can arise so that steps can be taken to avoid them.

Insufficient support

Lack of management involvement

Who will benefit fromt he installation of a PMS? Not the analysts and programmers, says Craig; for them the disadvantages outweigh the advantages. If management uses the system's reports, the chance of the analysts and programmers being overloaded is reduced. But at the same time, the system can be a source of embarrassment to them by pointing up performance deficiencies. Even worse, those "deficiencies" may be due solely to a planned schedule that has been developed by someone else and that does not take into account the quality of the work. So don't expect the analysts and programmers to want to see the system be successful, says Craig.

Also, the project leaders will not have any great motivation for supporting the new system. The main benefit they will get from the system is insight into the impact of schedule slippages on project status and on employee load. But the mechanics of supporting the system can easily take 10% of a project leader's time—for reviewing time sheets, correcting errors, reading reports, resolving employee overload conditions, talking to others about the conditions flagged by the system, and so on.

So the only people with a real incentive for making the system work are the managers—primarily the department head and the head(s) of systems and programming. The system can give them visibility of who is doing what and where each project stands. In addition, the system involves little personal effort on their parts. It is up to them to *make* the system work.

If data processing management is not willing to make this type of commitment, says Craig, then there is a real risk of failure.

Lack of a PMS staff

A full PMS really requires the services of a project control administrator and a project control clerk, says Craig. In general, these are not full-time jobs. For instance, with a staff of 25 analysts and programmers, each of these two people might spend in the order of 20% to 25% of his or her time on project control.

Ideally, the administrator is a former project manager. He or she becomes the in-house expert on using the package and how to plan projects. The job includes training people in the use of the package as well as auditing its use for compliance and quality. The administrator should report to the manager of systems and programming.

The clerk often is a capable secretary who collects the weekly input documents, screens them, corrects validation run errors, and distributes the output. The job also involves maintaining the package's dictionary—people's names, job classifications, time standards, lists of activities, and so on.

Equally important, these people must see to it that *all* updating information is entered *every* week. If weeks go by without some input, the reports will become more and more in error and the system will fall into disuse.

Inadequate vendor support

The onus here is not so much on the vendor of the PMS as it is on the user. Typically, when a PMS package is sold, the vendor agrees to provide perhaps one to three days of on-site training in the use of the package. This training might be in the form of one-day sessions at two or three points in time. Or it might be in the form of a two-day training session for project leaders, in which they try to apply the package to their current projects.

This amount of vendor support probably is not adequate, says Craig, although it is about the maximum that the vendor can include with the price of the package because of competitive pricing.

If an organization is going to spend, say, $15,000 for a full PMS system, it would be wise to budget another $5,000 for consulting services from the vendor, Craig feels. The vendor's staff generally has had experiences with installing and using PMS packages in a number of organizations. Use these people to train the project leaders in how to plan projects—work breakdown, time estimating, resource allocation, network analysis, and so on. Then have them audit the use of the package, fairly frequently during the first weeks and then gradually tapering off.

It is up to data processing management to *make* the new system work. The vendor can play a key role at the outset, to make sure that the system gets off to a good start. From that point on, it will be up to data processing management and the project control administrator to make sure that the system continues to work.

Costs out of proportion

Shop is too small

Craig's rule of thumb is that no more than 5% of the annual salaries of analysts and programmers should be spent on the purchase of a full PMS package. This rule of thumb is based on witnessing the efforts of a good number of organizations of varying sizes to install such systems.

This "rule" means that it will take a shop of at least 20 analysts and programmers to justify a full PMS, with some confidence that the costs will not be considered excessive. (We will have more to say about the *full* costs below.) It might be possible to get sufficient value for the costs involved in a shop of, say, 15 analysts and programmers. But such a size is at best marginal, he feels.

Below 15 analysts and programmers, the shop might better consider a manual structured system or a relatively simple project tracking system. And, of course, the smaller the size of the shop, the more visibility of project progress the manager has without the aid of a project management system.

Lack of awareness of "hidden" costs

Most attention is given to the purchase cost of the full PMS package, Craig feels—and this is really only the tip of the iceberg. To illustrate, he said, "Let's assume a shop of 25 analysts and programmers, with 7 project leaders, and—to simplify things—an average cost of $20 per hour for these people for salaries, fringe benefits, and overhead. Let's get an estimate of the initial installation costs and then of the annual operating costs."

APPROXIMATE COSTS OF PMS

Installation costs	
1. Purchase of the PMS package	$15,000
2. Time spent on selecting the package, 20 man-days	3,000
3. Training:	
7 project leaders @ 3 days	3,000
25 analysts and programmers @ 1 day	4,000
managers' time	1,000
4. Converting on-going projects to system	
7 project leaders @ 5 days	5,000
managers' time	1,000
Estimated total installation costs	$32,000
Operating costs per year	
1. Analyst and programmer time @ 30 min. per week	12,000
2. Project leader time @ 4 hours per week	28,000
3. Machine time @ $500 per month	6,000
4. Project administrator @ 10 hours per week	10,000
5. Project clerk @ 8 hours per week	3,000
Estimated annual operating costs	$59,000
Conversion plus 1 year operating	$91,000

For the first year, the costs of the PMS are about equal to the costs of 2½ analysts or programmers—about 10% of the staff. So management has to decide whether the value expected from the PMS is worth this much to them.

Note that these costs are just a first approximation and can vary with the circumstances of any particular organization. But they do give some idea of what it might cost to install and operate a *full* PMS.

Lack of realistic understanding

Unaccustomed to planning

There is little correlation, Craig says, between the size of the data processing staff and the experience with planning projects. Moreover, a wide variation exists in how organizations approach the planning and conduct of data processing projects.

It is not unusual to find a data processing shop that considers planning efforts to be largely a waste of time. This attitude might occur where the development staff is under severe pressure to meet schedules. The top management of the organization might demand relatively firm costs and schedules for development projects and major enhancements before approving the projects—and the data processing management might accede to these demands. If times and/or costs have been underestimated (which seems to be "standard" in the field), then the staff soon realizes that there is trouble ahead. In such a situation, the normal tendency is get into computer programming just as rapidly as possible. The whole attitude is, "Let's go!"

If anything like this attitude prevails in a shop, then the installation of a full PMS will involve upheaval—emotional and otherwise. In such a situation, it would be much wiser to install a manual structured system or a project tracking system at first and then gradually work toward the planning of projects.

The point that Craig makes here is that if the shop is not already accustomed to planning projects in some detail, then the people do not really appreciate what planning involves. Management looks for the benefits of planned projects without understanding what the price is for obtaining the planning. This lack of understanding raises the specter of failure, he says.

Other necessary procedures missing

At one of the most successful installations of a PMS that Craig has seen, the data processing executive himself made a thorough study. He conducted a prototype project, just as if a full PMS were installed. He and one or two of his key people prepared all of the input, had sample reports prepared, and gained an insight into how the overall system would work.

What this prototyping brought home to this executive, said Craig, was the need for other supporting procedures. These were:

SUPPORTING PROCEDURES FOR PMS

1. A project initiation and funding procedure that clearly specifies what is to be done and provides the funding for doing it.
2. A planning checklist, identifying the activities that might have to be done on a project. The actual activities to be performed are, in general, selected from this list. A large project might have some 200 activities to be performed, and a medium size project might have 50 items on its list.
3. A procedure for estimating the man-hours required for each activity; ideally this procedure should include consideration of the experience of each staff member and his or her knowledge of the application, as well as the inherent size and complexity of the activity.
4. A schedule preparation procedure, for identifying the sequence in which the activities should be performed.
5. Activity performance standards that tell what to do for each activity, how to do it, what documentation should be prepared, and what the tangible results of the activity should be.
6. Quality review points, and the procedures to be followed at those review points, throughout the life cycle of the project.

The prototyping of the use of a PMS pointed out to this executive just what types of supporting procedures were needed in order to provide him *with the type of control he sought.* Some of the procedures were already in use at his organization but some were not. He decided to delay the purchase of a PMS until he had these missing procedures in operation.

The key words in the above paragraph, in our opinion, are: "with the type of control he sought." This executive had a pretty good idea of what he wanted from a PMS. As he went through the prototype exercise, his ideas were firmed up. He thus gained an understanding of the supporting procedures that would be needed to give him what he wanted.

Different data processing executives will want different things from a PMS. A prototype exercise can be very helpful for identifying just what supporting procedures will be needed before a PMS can give the executive what he is seeking.

Purchaser unaware of package shortcomings

While the major PMS packages on the market appear similar, in fact they have significant differences. Just because one package has a feature that data processing management particularly desires does not mean any other package will have it.

The thing to do, we were told, is to disregard the sales talk about the packages. Instead, once the search has narrowed to two or three packages, insist on some demonstration tests. First, borrow a user's manual for each package. If you do not plan to budget about $5,000 for vendor support after the sale, then do not let the vendors help you with the test; just use the user's manuals because that is all you will have to work with anyway. Then the data processing manager and the manager of systems and programming should prepare the plans for two or three projects and develop dummy data for those plans. (If the manager of systems and programming participates very reluctantly, this might be a signal that the whole idea should be dropped, or another approach taken.) Then ask the vendors to run the reports on each of the systems being compared. This comparison will give a good idea of how the packages *really* operate, as opposed to the sales claims for them.

But do not stop there, says Craig. It would be a good idea to visit some user locations for each of the packages under consideration. Ask to see the reports and find out who is actually using them. Talk to those people and find out what they like and do not like about the system.

It is possible that some important shortcoming will come to light after you start using the package. What are these possible shortcomings? Perhaps the data validation function in the package is

not adequate, letting erroneous data slip through. Perhaps the package is unusually sensitive to data errors, causing production blow-ups. Perhaps the resource allocation and levelling function does not operate the way the salesman indicated it did, and moreover, it operates in a way that management does not like.

Incorrect assumptions about what PMS will do

The previous point dealt with the functions that the package might perform but in a manner different from what the purchaser believed. The point being made here is that data processing management might have unrealistic assumptions about what *any* PMS can do.

The most common incorrect assumption, says Craig, seems to be that the PMS reports will give a complete picture of project status. That just is not true. There are two important types of information that are missing from PMS reports: *quality of work done* and *expected problems.*

"Quality of work done" information can be obtained at the project checkpoints, by conducting technical reviews of the work. We do not believe this to be either easy or infallible. But system and program designs might be reviewed from the standpoints of ease of conversion, ease of future maintenance, ease of future enhancements, use of computer resources, and so on.

"Expected problems" information can be obtained from a hierarchy of manual reports, says Craig. Each week, each analyst and programmer, in addition to reporting time, might prepare a brief manual report for the project leader that says: here is what I worked on this week, here is what I plan to work on next week, and here are some expected problems where I think I need your assistance. Twice a month, the project leaders might summarize these for submission to the manager of systems and programming—who, in turn, might submit a narrative report to the data processing executive once a month. Problems such as poor machine turnaround or lack of cooperation from some user department people would thus be reported up the line until they reached the point where corrective action could be taken.

So a PMS does *not* give a complete picture of project status. It needs to be supplemented with manually prepared reports.

Unrealistic implementation approach

A number of mistakes can be made in connection with installing a PMS, many of which are due to a lack of understanding on the part of management.

One of the most serious mistakes is for the data processing executive to give the responsibility for installing the system to a junior staff member. Really, the data processing executive is the one to have the responsibility—or, at the very least, the manager of systems and programming.

Another mistake is to allow insufficient time for the staff to learn the system and to bring their projects up on it. As the people at one installation said to us, it took six months of experience with the system before they began relying much on the reports—and a year later, they were still learning how to use the system more effectively.

Another mistake is for the top data processing executive to show little or no interest in the system and to depend on word-of-mouth for project status information. As Craig pointed out, a PMS is mainly for the benefit of data processing management. If the top managers show little interest, the effort stands a good chance of failing.

An area of controversy is whether or not the department should try to convert all projects to the system essentially simultaneously. Some installations have done it successfully. But it is probably safer to adopt a phased approach.

So the problems of installing a PMS are further examples of how the lack of realistic understanding about the subject can increase the risk of failure.

Installing a PMS

We received suggestions on installing a PMS from several sources, including Glenn Craig, from some of the installations we visited, and from some PMS vendors. Following are the steps in the process, as we see them.

Analysis of needs. Data processing management should make a careful analysis of what is desired and what the "price" would be of satisfying those desires. As we have tried to point out, not only must the package price and other conversion and operating costs be considered but also the upheaval factor associated with a new planning and control system.

The analysis should consider the four types of project management systems—manual structured

systems, project tracking systems, project networking systems, and full PMS. As we have pointed out, the manual structured systems and the project tracking systems seem to be much easier to install than full PMS—but, of course, they do less than the full PMS.

The people at McDonnell Douglas Automation Company, suppliers of the Management Scheduling and Control System, made the following points to us about selecting a system. The package should be easy to use, with simple input and control techniques. It should have thorough and well documented data validation and file maintenance functions. Reporting should be flexible, allowing the user to select reports and formats by means of parameters. The package should have a simplified computer interface. If the networking function is provided, the user should be sure that he understands the limitations of the function and the effect of those limitations on the output reports. Also, vendor support should be available in systems and programming, in case software problems arise, as well as for applications, to help the user put the system to use.

Also, under the analysis of needs, it might be very wise for the data processing executive to conduct a prototype test with the package type being considered. Such a test would help determine just what the total costs—in money and in upheaval—might be. The test would also point up the need for any supporting procedures which might not be in use at the organization.

If the results of the pilot test are successful and the decision is to go ahead with installing a system, then the test data might also be used for testing the candidate systems.

This may look like a lot of work for selecting a "relatively inexpensive" package. As we have tried to point out, it is not the cost of the package that is so important (although overall costs are not trivial) but rather the impact on the organization. A PMS would not even be considered if there were not a desire for better project control. But the risk of failure with a full PMS appears to be in the order of 50%, which is high. Further, if the effort ends in failure, the organization may be worse off than it was in the first place—loss of morale, wasted effort, other things postponed because of it, etc. As we say, it is not the package cost that is paramount. Rather, it is the effect that the effort will have on the organization. In this sense, it is worthy of the manager's time to carefully analyze the situation.

Plan the installation. Once the package has been selected, the next step is to plan how it will be installed. Avoid "system shock" (upheaval), says Craig. Work with a senior representative from the vendor to plan the initial installation carefully. Select one large project to start with, and convert it to the system with the close support of a staff person from the vendor. After it is running, phase in a small cross section of other projects, again with the help of the vendor's staff person.

Note that the amount of help from the vendor that has been suggested here is not normally included in the package price. It would help to get an estimate of such support costs from the vendors when the packages are being evaluated and to allow for those costs in the budget.

At about the same point in time that the planning for this phased approach is being done, the project control administrator should be appointed. This person should be closely involved with all of the conversions in the first phase.

Develop user manual. After the first large project and cross section of other projects have been converted to the system, then write the in-house procedure manual. All vendor manuals have to be rewritten to some extent, says Craig, to fit them to the needs of the installations. The project control administrator might develop the manual.

The manual should describe the procedures that will be used with the PMS. An example would be the procedure for estimating man-hour times for activities. The procedure should address not only how such times are computed but also the process of checking those times with the people who will actually be doing the work and the process of reconciling differences.

Vendor training sessions. With some experience in using the system and with the user manual available, the next step is to train the remaining project leaders in the use of the system. The project leaders might use their current projects as class problems during the training.

Convert remainder of projects. The conversion of the remainder of the projects to the system can now be undertaken. Again, a phased approach should be considered.

Audit the progress. During this conversion period, it would be wise to have a senior person from

the vendor visit about one day a week. This person would review the progress on using the system and should point out any practices that need changing.

This senior vendor representative should also audit the work of the project control administrator and project control clerk. They play key roles in the on-going success of the project management system. If either gets off to a bad start, or does not seem to catch on to the needs of the job, this should be detected and corrected as early as possible.

Hopefully, after a few months, the effective use of the system will be apparent and help from the vendor can taper off.

Yes, there is a fair amount of effort needed for installing a full project management system. The benefits of project management are real. But it is usually no simple matter to gain those benefits. It will take the wholehearted concern and support of data processing management.

REFERENCES

For more information on available PMS packages, see the following:

1. *Datapro 70,* Datapro Research Corporation (1805 Underwood Boulevard, Delran, New Jersey 08075); annual subscription price $250.
2. *ICP Software Directory,* International Computer Programs, Inc. (1119 Keystone Way, Carmel, Indiana 46032); annual subscription price $100.

Next month we will return to the subject of distributed systems. There is growing interest in these systems, the reasons for which include the promise of reduced operating costs and the decentralization of data processing responsibility. But distributed systems may well bring a radical change in the whole data processing environment. All aspects of the data processing function may shift in the direction of the end user. Next month we will discuss some experiences of pioneer users of distributed systems and the enhanced role of the end users.

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