Accounting and Budgeting Requirements for Advance Construction Programs

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The process of formulating and carrying out a highway construction program (construction budgeting) has received increased attention from State highway departments during the past four years. Such a trend is to be expected with the expansion of the highway modernization program and with the growing importance of advance planning. Some of the larger projects and various types of special projects may require five or six years or longer from the route planning stage to the final completion date. Careful planning is required to allow adequate time for the preconstruction activities (such as location, field survey, field design, working drawings and specifications and right-of-way acquisition) and to coordinate the many projects in process. It is being realized in some highway departments that the lack of a long-term construction budget makes it virtually impossible to secure an effective and adequate current operating budget.

Assuming, that the need for thorough planning, both technical and financial, is recognized, such planning must be accompanied by an administrative ability to implement the plan properly. A good plan, of course, is worth little unless it can be placed in operation. And it does not go into operation automatically.

Late in 1959 Kentucky Department of Highway officials tentatively decided to do two things: (a) to develop a reasonably firm, long-rang highway construction program and (b) to execute and control the program primarily through the use of electronic data processing equipment.

Most State highway departments acquired electronic computing equipment in the 1956-58 period. This equipment has been used mostly for engineering computations and routine accounting functions. At least two States have mechanized cash forecasting through the use of their electronic computer. However, a brief search indicated that no State highway department had developed anything resembling complete machine control of its construction program.

Budget administration in the Kentucky Department of Highways has been weak for many reasons. The managerial devices for budget control in such large, relatively uncoordinated organizations are rather cumbersome and complex, and before 1958 the department never had anything approaching a comprehensive construction budget. With the formulation of the construction program, involving thoughtful planning, some means of implementing and controlling the program was necessary. The development of management tools for this purpose was essential. The use of machine apparatus as one important control device appeared feasible and desirable. The fact that the computer was not being fully utilized was an added inducement.

Each official of an operating division concerned with construction-oriented activity needs to be aware of progress within his division and of forthcoming assignments. The large number of projects at various stages and the several phases required for a proposed project to become a finished highway give rise to a serious problem of control and reporting, as well as to other ensuing issues of a management character. The practice of occasionally taking inventory is not adequate, and, in the long run, it is expensive. The status of each project in terms of both money spent and technical progress achieved should be continuously known so that it can be compared with the budget. Only in this manner can effective control be realized. Executives responsible for the program should have timely and adequate information constantly available. Data gathering should not consume their time. C.R. Lockyer envisaged that the data processing center could provide the vast bulk of required information either by regular reports or "on inquiry." Savings in clerical and managerial manpower could be ac-

complished thereby and data superior to those obtained manually or from small machines could be produced.

The highway construction program that is now being formulated will probably extend through 1964 or 1965. The program requires a listing on the basis of urgency and of cost of all Federal-aid projects, by system, to be undertaken during the 4- or 5-year period. It includes a time schedule by phase of activity for each project. Projects included in the program will be justified on the basis of financial, administrative, economic, social, political and, of course, engineering considerations. It is contemplated that the whole program will be thoroughly reviewed at least annually, necessary revisions made, and the program extended for another year. Of course, some replanning may be necessary more often to correct for inaccurate estimates of revenues, construction costs, and technical progress. It is assumed that the program will be adopted, either officially or unofficially, by the major State policy makers. It is hoped that the construction program will be published and distributed widely. If the experience of the few States which have published their long-term construction budget can be used as a guide, publication tends to stabilize the program and contributes to fuller public understanding and support.

The proposal to produce machine control for construction budgeting was accepted in September 1959, and a committee of management personnel was appointed to assure suitable administrative arrangements and to guide the general development of the plan. The department decided to limit initially the program to Federal-aid projects which, of course, constitute the vast bulk of the construction program. The present plan is based on the assumption that all construction will eventually be programed and machine-controlled. In developing the plan, emphasis was placed on an analysis of the preconstruction activities, as relatively little modification of departmental administrative procedure would be required from the construction contract award stage onward.

The first major task was the preparation of a description and flow chart of all relevant procedures currently used for the preconstruction phase for Federal-aid projects. This task involved an analysis of work flow through the divisions of planning, design, right-of-way, accounts and administrative services (accounting and budgeting) and a staff attached to the chief engineer's office which serves as liaison between the department and the Bureau of Public Roads district office. This analysis pointed up various administrative and procedural changes required. It also uncovered shortcomings which would hinder the smooth development of a construction budget and a machine control scheme. Many of these drawbacks when clearly identified have been corrected with little difficulty. A list of some of the things which needed to be developed for proper administration might be helpful.

1. A firm, priority-based road-building program which would prevent such occurrences as the division of design beginning work on a project before the division of planning had received official approval from the Bureau of Public Roads, substantial delays due to the necessity of making last minute route studies and user benefit analyses, and non-Federal-aid projects being pressured for Federal participation;
2. Adequate coordination between the budget and schedules staff, which issues billings to the Federal government, and the divisions of design and of right-of-way to assure prompt reimbursement;
3. A standard for processing repayment checks from consultants and utility and railroad companies which were overpaid;
4. More careful encumbering and attention to details to preclude the delay of right-of-way vouchers for payment;
5. Accounting records of Federal aid at the various stages prior to contract encumbrance in order not to have to rely on Bureau of Public Roads district office records, which for highway department purposes are usually not up to date; and
6. A revision in the right-of-way division encumbering procedure to avert the unnecessary tying-up of thousands of dollars.

Thus, the analysis necessary for the inception of the machine control program contributed to more efficient and economical operation in several directions.

After the survey of present procedures dealing with departmental construction activities, an over-all flow chart was prepared. This chart provides the basis for establishing the work flow under a construction budget.

Next, the reporting stages required to obtain construction budget control were determined and a summary flow chart prepared showing the suggested method of obtaining such control. Then the following steps were taken:

1. The necessary procedural changes to receive the information required for the reports were made;
2. The card layout and key punch instructions were prepared and the machine program written; and
3. Instructions were written for data required for the projected program.

The data processing staff is now in a position to conduct a "trial run" using the Interstate construction program which has been prepared by the division of planning and the chief engineer's office. Shortly thereafter, the actual operation of the new system should begin. (As might be expected, one of the most important tasks of the persons formulating the machine control program has been that of "selling" the program to the entire highway department. The importance of task will scarcely diminish when the program is in operation.)

The plan calls for a construction program expediter in the office of the chief engineer who would be responsible for the execution of the program. Since this person would play a key role if the department is to achieve the planned program, he should be in a high-level position. Projects will be dealt with from the initial planning stage to final billing to the Bureau of Public Roads. The program expediter will for each project in the construction program assign and schedule the several phases to the various operating divisions. He must carefully scrutinize progress on the program and keep top management informed. It is apparent that the planned schedule cannot be maintained in all cases and that some cost and revenue estimates will be off considerably. Minimum revisions are a necessary part of the process. The program expediter will doubtless be an engineer as only an engineer is likely to be acquainted with the multitude of factors, knowledge of which is necessary for appropriate scheduling of the projects. The engineer, however, will probably need considerable collaboration with and continuing explanation from the financial experts if he is to do his job well.

Other probable duties of the expediter as recommended by E. B. Bond are:

1. Scheduling new projects into the projected highway construction program;
2. Authorizing and notifying, except for routine phases, each division when to begin its function;
3. Ascertaining from reports received from the data processing center the status of each project's position in the projected schedule and taking action accordingly;
4. Serving as the liaison between the department and the Bureau of Public Roads district office;
5. After receiving reports from the data processing center, explaining, both in writing and orally if necessary, the significance of the reports to the appropriate persons; and
6. The interpretation and explanation of the distinctly budgetary reports will continue to be made by the budget staff in the division of accounts and administrative services.

After the construction budget receives official approval, the data processing staff will record the engineering and financial estimates. This record will be maintained and compared with what actually occurs until the planned highways have been constructed. The projects will be in various stages, some will be initially inactive, some will be in the location process, some in engineering design, some in the right-of-way acquisition phase, and some will be under construction contract. As each progresses, the technical progress and the costs incurred will be posted to the project record. This information will be closely linked and appropriate reports will be prepared periodically (weekly or monthly). Undoubtedly special reports will be useful also.

These reports could indicate the status of each project for a designated system or

for all systems, the status of all projects in a particular phase (design, for example) or for all projects which have fallen behind, or on almost any other basis. The reports also could, simultaneously or separately, show every imaginable type of cost information, for example, total amount spent to date or the amount spent on each phase. Futhermore, they could avert, for instance, encumbering more than the project agreement amount or obligating for a designated system more than is reimbursable by the Federal government. The information, of course, could be used as a partial guide to future budgets. Once sufficient data have been accumulated, more accurate estimates of costs and of completion dates should be possible. Several of the engineering and accounting reports which are now prepared manually will be unnecessary duplication.

There will no doubt be problems of obtaining adequate reporting from the central office divisions and the field. For example, technical progress is ordinarily reported on the basis of the estimated percentage of work completed only. A better basis, perhaps, would be the percentage and also the estimated completion date with an appropriate explanation if it appeared that the scheduled completion date could not be met. Ninety-nine percent of the right-of-way work on a particular project may be completed in six months, yet the final 1 percent may require a year. To report that 99 percent had been completed without comment would obviously be misleading. A particular design job may be 75 percent complete one moment and 10 percent complete the next. This would probably indicate a fresh start had been made on the design. The estimated completion date would be more meaningful here also.

Accurate reporting is necessary if the machine apparatus is to be of maximum utility. Instilling this idea in the thinking of highway personnel is likely to be more difficult in the field than at the central office. As in many highway departments, there is considerable resistance to change. This is a problem that cannot be solved swiftly. However, over time it should be correctable by training programs, by top management insistence on careful reporting on a timely basis, and perhaps by granting the administrative areas more authority and responsibility. Some of the carelessness undoubtedly can be accounted for by the individual's lack of pride in his job and a feeling that what he does is of no consequence in the over-all highway department operation.

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Discussion

Hart. — Has Kentucky put this data processing in operation as far as their total program is concerned? Or has any department put it into operation?

Holshouser. — No, it is not in operation. The department now is in a position to undertake a trial run, so it should not be too long before it is in operation.

Granum. — How do you visualize this to be integrated, particularly on the fiscal side, with the regular accounting system; that is, the documents that produce the pay checks, etc.? Is this to be a self-contained separate reporting system, or is it to be tied in with the more routine and regular accounting operation?

Holshouser. — No. I think this will be an independent system. Some of the other things have already been mechanized and have been in operation for some time.

I do not know exactly what the situation will be. I think some experimentation is going to be necessary before we reach a final conclusion.

Babcock. — We are involved in this same thing. Have you worked up your machine programs on this?

Holshouser. — Yes.

Babcock. — And what do you envision? A print-out sheet on each program, that will give the status of the problem, with where it is in design, where it is in location, etc. on one such sheet?

Holshouser. — Yes. I believe this is the idea, one print-out sheet.

Walker. — I would be interested in getting any material you have on simplifying that. For one thing a manual reporting system takes a lot of time.

There are two things that we are up against. One is timeliness. By that I mean relying on the divisional reports to get current up to date information on every process, all phases. And the other is manual labor. In fact, that is what I was going to present in my paper. And we certainly have not developed it to the point we want, by any means.

Donnell. — How much of a time lag do you feel you want to have between machine input and what you are going to be able to furnish the administrator?

How up to date is your data going to be? For instance, you are reporting on a right-of-way project. You are going to report that 70 percent has been acquired. How up to date is that report when the chief engineer gets it? Is it two weeks old, or is it a week old?

Holshouser. — It will depend on how often these reports are published. I think this will be one of the advantages of the system. That is, you will be able to get the data currently. By mechanizing it, the process should be speeded up considerably, and there should not be much of a time lag.

Donnell. — We are also trying to set this up. You have a field division man who is going to have to make a report to the headquarters office, and before that can be punched and put on cards, there has to be a time lag. How often are you going to have him report? Weekly, or bimonthly?

Holshouser. — Probably weekly, possibly monthly.

Walker. — When we get down to 90 days before a letting, we supply management with a right-of-way situation weekly. We get them up-to-date weekly; prior to that — monthly.

Donnell. — On a sliding scale, the closer it is to the letting of the contract?

Walker. — Yes. And we get information from the field almost daily by teletype.

Kimley. — Taking our case in point, to program for two years, we have 60 to 70 projects going through the commission all the time. Just about what size or what capacity machine would be required in terms of the IBM to put all these cost analyses and the positioning of the particular projects within the departments, and the various sub-departments?

Holshouser. — The Kentucky projects will be done on the 650.

Bidell. — Is this type of reporting also going to include all the jobs that are up to date or on schedule, or is it just going to show those that are behind, or ahead, whatever the case may be?

From the point of view of management, after they have seen and approved the initial set-up, are they really interested in seeing those jobs which are on time?

Holshouser. — Well, of course, it will be much more important to get a list of those jobs that are behind schedule. As to those that are on schedule, it would be important to get them to prevent potential trouble, which might be detected in the reports.

Donnell. — Where are you going to pick up this project, if for example, you have a 5-year construction program? Are you going to pick up all the jobs in the first year construction program, or the first two years, or are you going to pick it up when it starts into location?

Holshouser. — The entire program will be recorded once it receives official approval. And some of the projects will be initially inactive. There may not be any work done on them at all for two or three years, but the whole program will be recorded initially.

Hart. — I presume that you would only put in your system the expected cash payments of right-of-way. Would you also do that for construction operations, rather than when you have an obligation to contract? When you have a contract, is this situation finished as soon as it is let to contract, or will it continue cash payments until the final close-out of the project?

Holshouser. — No, it will continue throughout until final billing to the Bureau of Public Roads.

McCaa. — How many IBM cards are necessary? With the data you have listed here, I can visualize that one project might require 12 to 20 IBM cards. Then in your print-out, data can be in various parts of those cards. In the manual for punching all of this information, how many cards do you anticipate?

Holshouser. — I do not have any idea how many there will be.

McCaa. — Do you carry all your financial data and various types of funds? That would consume a lot of space.

Holshouser. — It consumes a lot of space. No question about it.