Project management through the Accomplishment Value Procedure (AVP)

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INTRODUCTION

This paper describes a technique called the Accomplishment Value Procedure, AVP, which accurately measures the status of and provides visibility to an information systems development project. It builds upon the foundation of two of R. I. Benjamin’s axioms:

Axiom #10—“The great leap forward is best accomplished in short, comfortable hops; if there is a ‘Golden Rule’ in information systems development, this is it.”

Axiom #14—“If you can’t plan it, you can’t do it.”

to which I add my own corollary:

“If you don’t schedule it, it won’t get done.”

A persistent problem of project management has been to relate resources budgeted with work accomplished after the project begins. AVP bridges that gap. As a tool of project management, AVP:

1. Provides the means to schedule, monitor and control a project after it has passed the planning phase.
2. Enforces a discipline for resource estimating and time scheduling that focuses on the completion of tasks.
3. Provides a method to handle changes to schedules and to resources which can be documented and displayed simply and clearly.
4. Provides a method for summarizing overall status of projects by management responsibility.

AVP does all this by focusing on the gathering of data that is plotted on a Project Visibility Chart for an individual project and a Summary Visibility Chart for a group of projects.

In doing so, AVP communicates with all levels of an organization in a consistent manner:

1. Top management sees a snapshot of the overall status of development projects.
2. Middle management sees a snapshot of individual projects.
3. Project leaders can monitor performance and compare it to schedules and estimates which point to areas of potential problems that might require management analysis.
4. Project team members can see the status of the projects they are working on.

The remainder of this paper deals with (1) a discussion of Background: AVP in the Perspective of Project Management, (2) a description of the Accomplishment Value Procedure, (3) a description of an Example of the AVP Process, (4) a description of How AVP Handles Changes in schedules and estimates, (5) a description of the AVP Summary Process and (6) a Summary section that includes conclusions and observations regarding the applicability of AVP.

BACKGROUND—AVP IN THE PERSPECTIVE OF PROJECT MANAGEMENT

Project management usually means different things to each of us. A major reason is that a project is a unique effort marshalling resources to solve a unique problem. The uniqueness has attracted special management techniques which, according to Murdick and Ross include “outstanding characteristics,” such as:

1. Work breakdown structuring which is a method that decomposes the project end result, level-by-level, all the way down to something called the work package, the lowest identifiable element of work to be done.
2. Network definition which describes task relationships in a project and which is usually associated with PERT/CPM activities.
3. The integration of performance/cost/time for project planning and control.

You can locate AVP in the perspective of project management by relating the outstanding characteristics to the three basic managerial functions required as defined by Paulson as follows:

- Planning—“. . . the various tasks . . . must be performed to complete the project . . . involves approxi-
TABLE I.—Project Management Matrix

<table>
<thead>
<tr>
<th>Outstanding Characteristics</th>
<th>Work Breakdown Structuring</th>
<th>Integration of Performance/ Cost/Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning</td>
<td></td>
<td>AVP</td>
</tr>
<tr>
<td>Scheduling</td>
<td></td>
<td>AVP</td>
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<tr>
<td>Control</td>
<td></td>
<td>AVP</td>
</tr>
</tbody>
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mate requirements for material, equipment and manpower.

- **Scheduling**—"... the feasible start and completion dates for each activity..."
- **Control**—"... monitoring actual performance and comparing it to that which was anticipated from the schedule. The essence of control lies in recognizing differences when they occur, determining reasons for them, and promptly evaluating effects on the schedule."

In terms of the three "outstanding characteristics," AVP assumes that (1) formal, or informal work breakdown structuring exists with or without a standard work breakdown structure being built, and (2) that the relationships and dependencies among tasks are understood with or without a network being drafted. It is the third characteristic dealing with performance, cost, and time to which AVP applies—\( \text{with one distinction. The distinction is that AVP takes place after planning is completed.} \)

The matrix in Table 1 shows where AVP fits in the relationships between Outstanding Characteristics and Managerial Functions of Project Management. AVP addresses itself to the articulation of accomplishment (performance) and manpower (cost) related to (integrated with) time. By displaying accomplishment and manpower at points in time, AVP provides a visibility that communicates the schedule and supports control.

The quantification of the value of accomplishing each task is crucial to AVP. As each task is completed, the project is credited with the value of the task. There is no credit for a partial completion; thus the notion of "percentage complete" is avoided. The expression of percentage complete has traditionally been difficult in its execution, arbitrary in its determination and misleading in its interpretation. How often has one heard the response that a project is "x percent complete?" In fact, projects have been known to be "90 percent" complete for months.

THE ACCOMPLISHMENT VALUE PROCEDURE

The mechanics of the procedure result in the creation and update of the Project Visibility Chart. The vehicle for this
procedure is the Estimating and Scheduling Form. The form integrates the key steps of the procedure and flows through to provide the data for the Project Visibility Chart. The form is a composite of five parts, referred to as Parts A through E. Figure 1 shows all parts in the relative positions of the flow of data and information, i.e., from A to B to E and from A to C to D.

Part A is where you would insert descriptive data about each task (milestone) deliverable. The procedure assumes a documentation standard and just about any version would do. Further, the procedure amplifies the doctrine espoused by ADP Analyzer, which says "... documentation be completed by the end of each phase and each review period. If the documentation has not been completed, then the phase has not been completed—and the next phase cannot begin." AVP accepts any documentation standard and encourages even finer breakouts or subsets.

Part B is where you would enter the estimates of resources committed to each task/milestone/deliverable by time period (usually a month, but the procedure can handle weekly and daily). We focused on manhours because it is the key resource and it is easier to collect data regarding manpower on a timely basis.

Part C is where you enter the time span for each task/milestone/deliverable further annotated with the "value" calculated for each.

Part D is a table which is built on the accumulation of data concerning accomplishment units scheduled and actual for each time period and accumulated by the end of each time period.

Part E is a table which is built on the accumulation of data concerning manhours estimated and actual for each time period and accumulated by the end of each time period. For convenience in preparation and for easy reference and analysis, Parts D and E are physically part of the Project Visibility Chart.

In Figure 2 is an example of a Project Visibility Chart for a completed project showing in the top portion, the Cumulative Accomplishment Values, Scheduled vs. Actual and in the bottom portion, the Cumulative Manhours (resources), Estimated vs. Actual, for the history of a project. The Chart displays the status of the project expressed in Accomplishment Units as well as the expenditure of Manhours, both over the life of the project. Notice that the points plotted on each Chart are derived from the data tables, Part D and Part E, contiguous with each. The data tables are built as a result of the process previously described.

EXAMPLE OF THE AVP PROCESS

The Accomplishment Value Procedure (AVP) highlights actual completion of milestones and ignores partial comple-
Figure 3—Example of Parts A-B and A-C filled out at the beginning of the AVP process.
tion. It provides the mechanism for identifying those milestones in the development process that have specific deliverable documents which signal the completion of a milestone.

Once the milestones are identified and resource estimates are associated with each, the sequence of events can be scheduled. Next is the calculation of the "value" of each milestone. For our purposes, value is based on the establishment of an arbitrary denomination of units which reflect the relative estimated manhour resource for each milestone/deliverable.

The Accomplishment Value is the focal point for the project as it moves to completion. The Accomplishment Value is plotted monthly on the graph along with the resources. In this example, 20 manhours was selected as equal to one Accomplishment Value. Thus, if the milestone/deliverable is estimated to need 160 manhours of resources, then its Accomplishment Value is eight.

See Figure 3, Key I, which is the Estimating and Scheduling Form—Part A filled out with the Accomplishment Values for each milestone/deliverable and represents the beginning of the process.

Having completed Part A, you can proceed to Part B where the loading of the resources over the course of the project is entered. This loading then becomes the estimated manhours (resources) for the life of the project. See Figure 3, Key II, which shows the manhour loading or MONTH EST (estimate) by month for each task/milestone/deliverable and the total MONTH EST (Estimate) for each month.

For each milestone/deliverable that you have associated with a Scheduled Start and Completion date, you can enter the symbol for the start in the week in which the effort for that milestone/deliverable will begin and a \( \Box \) in the week that it is scheduled to be completed and delivered.

In the square for the ending week, you can enter the Accomplishment Value. Next, add up the Accomplishment Values for each month. See Figure 3, Key III.

The values of each milestone/deliverable are combined to roll up to the total value of the project. In the course of completing the project and as each milestone/deliverable is achieved, the value of each milestone is credited toward project completion, and a measure of project status is established. Credit is given only to those milestone/deliverables that are completed; resources expended on an incomplete deliverable are given no credit. This criteria forces attention to establishing as many milestones as is logical and manageable—a basic rule in successful project management. As a corollary, a specific deliverable could be segmented with each segment becoming a separate milestone/deliverable that would be scheduled, estimated and accomplishment valued.

Next, you build the data tables in Parts D and E that will be the plots for curves on the Project Visibility Chart. See Figure 4.

The MONTHLY SCHEDULE Accomplishment Value in Part D is simply a posting of the totals from the bottom of Part C and from which the CUMULATIVE SCHEDULE Accomplishment Value data is calculated.

The MONTHLY EST (Estimate) manhours data in Part E is simply a posting of the totals from the bottom of Part B and from which the CUMULATIVE EST (Estimate) is calculated.

The CUMULATIVE SCHEDULE Accomplishment Value and the CUMULATIVE EST (Estimate) manhours are the plots by month on the Project Visibility Chart in Figure 4.

As the project develops, Actual Data is collected for Manhours and Accomplishment Values. In our example you can see the data recorded through April, the fourth month. The Project Visibility Chart representing the status of the Sample Project through April would be as in Figure 4. An analysis of the charts and the data in the table above and below the charts (which are Parts D and E of the Estimating and Scheduling Form) shows that the Project fell behind the Scheduled Accomplishment during March but that we caught up during April. The recovery, however, seems to be costly since we have exceeded our estimated manhours.
by nearly 200 manhours. If the trend continues, the project
could get into a serious over-budget situation. This situation
would require further analysis.

HOW AVP HANDLES CHANGES

The technique lends itself to a procedure for changing
schedules and estimates based on changes in project scope
or in availability of resources, etc. If for example, at the end
of April it was determined that the project's schedule could
be shortened by infusion of additional available resources,
(while it may violate Brooks' Law it is optimistically ex-
poused here for illustration purposes) then the Estimating
and Scheduling Form—Parts B, C, D, and E—should be
modified to reflect this change and to show the impact on
the bar chart schedules. The impact of the revision with the
new manpower estimate, and the Accomplishment Value
Units, for May and June is readily shown in the Project
Visibility Chart, Figure 5, which shows a new chart with the
scheduled and estimated lines shifted upward for both Ac-
complishment Values and Manhours. This representation is
significant since it provides visibility for changes in esti-
mates and schedules.

THE AVP SUMMARY PROCESS

AVP further lends itself to summarizing groups of projects
by management responsibility such as those of an individual
cost center. A collection of Project Visibility data from sev-
eral projects can be aggregated to provide visibility. By
focusing on an individual fiscal month, you can display
Scheduled and Estimated data for its development projects
at the beginning of the month. At the end of the month, you
can then aggregate the Actual data for Accomplishment and
Manhours.

On the right side of Figure 6 is a Summary Visibility Chart
completed for a development cost center for the month of
October 1978. The Bar Graphs show the Scheduled Accom-
complishment Units next to the Actual Accomplishment Units
in the top portion with the Estimated Manhours next to the
Actual Manhours in the bottom portion.

On the left hand side of Figure 6 is the AVP Log which is
the vehicle for the Summary Process. The Log provides
space for recording the Schedules and Estimates for each of
a group of projects at the beginning of a time period (usually
Fiscal Month) and for their Actual Data at the end of the
period.

While transferring Accomplishment Values from the Part
Ds you have to make certain that the Unit of Measure (U/
M) is consistent. If 20 manhours were used as the U/M for
the Summary Process, then the procedure is to divide the
U/M of each project by 20 and then to multiply the resulting
fraction by the Accomplishment Value Units associated with
the project. For example, if a project had scheduled 72 units
with a U/M of 10, then to convert—divide 72 by 20 which
results in \( \frac{1}{2} \); then multiply \( \frac{1}{2} \) by 72 which results in the
conversion of 36 Accomplishment Units. It is the latter
number that you post to the Summary AVP Log.

Six projects are posted on the Summary AVP Log with a
total Accomplishment Value of 120 (based on a unit of
measure of 20 manhours per each Accomplishment Unit)
and 2,600 manhours are estimated (and committed) to be
used in the process of doing project work. At the end of the
month, the actual data are posted totaling 100 Accomplish-
ment Value Units and 3,000 manhours respectively. It is the
data from the totals column that is used as a basis for
constructing the bar chart.

SUMMARY

This paper has introduced the Accomplishment Value Pro-
cedure (AVP) by first discussing where it fits in the back-
ground perspective of Project Management. Then, the paper...
described the steps in the AVP process which lead up to the creation of and provides the basis for updating the Project Visibility Chart. Included in the description was an illustration of how changes in resources or in time would be shown on the Project Visibility Chart. Finally, there was a description of the AVP Summary Process which provides for tracking and displaying of projects of a functional organization by aggregating their Visibility Data.

AVP is currently in place in the Customer Service Operations Development (C.S.O.D.) Department which is the internal ADP/MIS systems development and computer operations organization at the Field Service Headquarters of Digital Equipment Corporation, Maynard, Mass. C.S.O.D. provides system development and computer-based support to headquarters functions in worldwide logistics, financial control and product engineering and centralized design and development of distributed systems for decentralized implementation at 15 data centers worldwide.

The benefits of its application revolve around the simplicity of how well it can be understood by project team members and how effective it is in relating (communicating) status to users and to management.

In addition, individual project team members reach a "comfort" level with the graphical representation of the project status and spend their time with greater attention to the objectives of the project.

There are other benefits. AVP highlights the viability of resource estimates and schedules at the onset of the develop-
opment cycle and the resource consumption and accomplishment achievement during the development cycle by the smoothness or lack of smoothness of the curve on the Project Visibility Chart.

The discipline of the Accomplishment Value Procedure lends itself to contracting applications development to a vendor. By focusing on specific deliverables you could contract for progress payments synchronized with each deliverable under either a cost re-imbursable basis or a fixed-price basis.

At project completion, final payment could be held back until a reasonable warranty period has passed. Moreover, there can be variations that would provide incentives to a contractor. For example, a progress payment or a fixed-price commitment for a deliverable by a certain date would pay $X$ dollars to the vendor but delivery one month earlier would pay 120 percent of $X$ dollars where the incremental 20 percent would serve as an incentive to the contractor.

REFERENCES