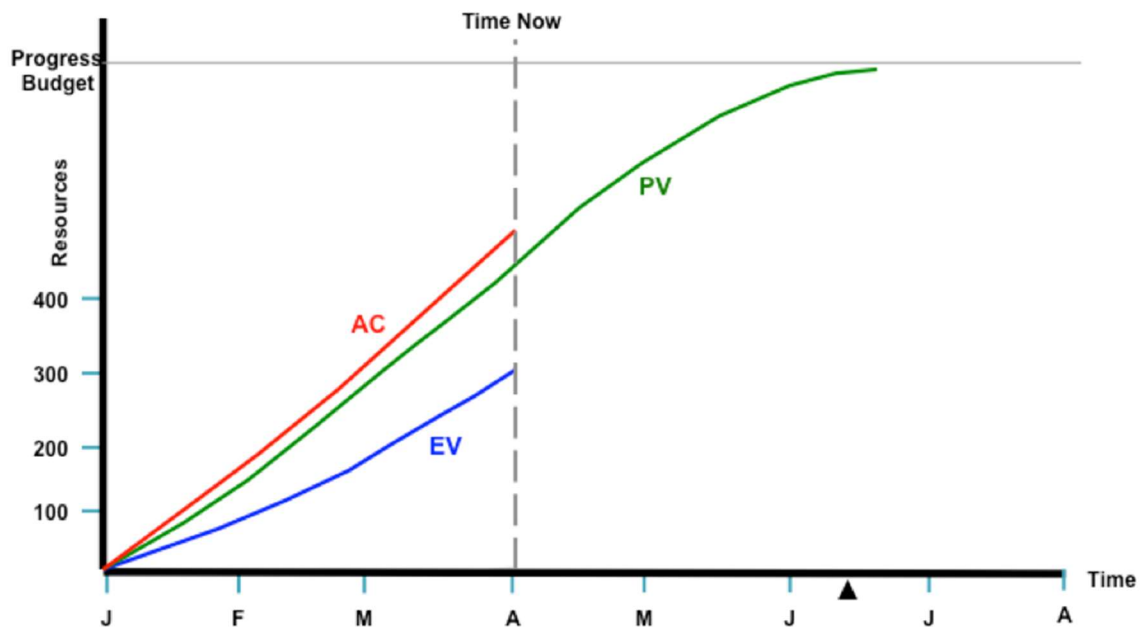# How Do Your Project S-Curves Line-up?

Example Project S-Curves. Courtesy of Project Control Academy

Multiple choice question. So your boss walks-up to you and asks how your project S-Curves are lining-up. What is your answer?

(a) Just perfectly.
(b) Actuals exceeding Planned and Earned and we are investigating.
(c) Oh Crap! (On the inside.)
(d) What are S-Curves?

It's a good chance your boss has read this article. So if you answered (c) or (d), you need to get up-to-speed real quick so read on.

S-Curves serve important roles in forecasting capital financing requirements, earned versus pay-out assessments and general project condition. This article will discuss the players for an effective forecasting model. (Graph courtesy of Project Control Academy) If you are like most of us, your S-Curves do not line-up.

The Backdrop Story

A couple of weeks ago I attended a meeting with a client that discussed methodologies for project cost forecasting. It appears that the client had a procurement package from

one of the major software providers that handled the "procurement process". However, it did not provide any enough information on cash flow forecasting needed by the financial people for planning capital cash flow. Their current process included a mass dump of data from the procurement package for purchase orders and invoices and then an Excel import for the forecasting process. Hmmm. Read on for my thoughts for an App for this.

This was not the first time I encountered this hybrid solution. This was very similar to the system used at a refinery I worked at. In that application, we would meet once a month to review previous month's numbers (from their procurement package) and then re-allocated the cash flow for future months with Excel. The person that best met their projection for the previous month got a Snickers candy bar. "Jason D." was usually the winner. ☹

These meetings were attended by the PM team including the portfolio project manager ("Mike"), the cost engineer ("Natasha"), scheduler ("Kaveh"), construction work planner ("Melissa") and, early on, the project estimator ("Rob"). This refinery had a significant construction program so knowing how much capital is needed was very important. Over-shoot the number and you pay more carrying charges (i.e. juice). Under-shoot and you pay a penalty. Albeit an Excel solution, it did work fairly well.

OK, back to the present day meeting…………

So as we talked through the forecasting process, I realized that the client was struggling with the gaps with their procurement package as a forecasting tool. Granted, this is a very intricate process and is normally not a one person job or a one software package tool either. So I decided to write this this article to go over the basics and where things are connected.

Expense or Capital?

No matter what project development methodology you use, there is a point where the money being used for development flips from expense to capital. Most multi-step processes use expense money for the initial or preliminary process design and selection steps (gates). Subsequent steps are normally capitalized which include detail engineering and execution. So first off, we need to separate expense costs from capital costs and track them separately.

The Procurement Plan

It is a good idea to prepare what is called a "Procurement Plan". This is a document that specifies how the project will be contracted. This includes bulk material, fabricated

material, equipment and construction labor. Many times pricing structures can be negotiated in advance. This plan should be approved by the project team, procurement, management and the financial entity early on in the project. It becomes an internal contract and is part of the overall project execution plan.

The Procurement Process

There are many procurement software packages to choose from. It basically needs to handle issuing purchase orders, change orders and track invoicing. It should have a data export function to send this information either to Excel (if you go that route) or to another software platform via web or database calls. Now in preparing purchase orders, the contract needs to establish payout amounts or percentages and dates as the contract is executed. This information will in part be generated by the project schedule. If the schedule has flaws, it will throw-off the cash flow forecast as well. (BS in BS out)

As an example, a piping fabrication package may have a payout upon shop drawing approval, upon delivery and upon successful QC check. (Yup. You need to check that the fabrication is correct.) For large projects with staggered delivery to match the execution forces, this needs to be laid out in the contract and synchronized with the project schedule. That's correct, the payouts should be by work package! The schedule is formatted by work package. And, let's not forget the project estimate, those numbers need to line-up by work package too.

Planned (Projected) Value

For a typical engineer, then procure and then construct projects, take the above example and times it by the number of work packages specified in the Procurement Plan. As can be seen, for moderate to large projects, this is a significant effort in itself. In the end you will be able to plot the various S-Curves by purchase order, work package, etc. For an Excel App, this could be very tedious code. For a Windows or Web App, this would be coded as filters. Select "All" for a complete project view or select a PO for a PO view. (I am visualize this with my VB hat on.) In either case, this becomes the "base" Projected Valve (PV) curve data points. The sum of all work packages for a given time period, based on the contracted payout date schedule and amounts (aka, schedule of payments).

Now some points to clarify here. The PV curves are based on the estimate and the schedule. Any contingencies should be included in the work packages from the start. The project total installed cost estimate should be consistent with that requested by the financial people. With this definition, change orders should not change the base PV curve. Even when the change order is justified. If the financial people approve an increase in the

project funding, then an increase in project PV amount could be added from that date on or a new PV curve can be created as change order #1, #2, etc.

Actual Costs

Now one would think tracking the actual cost (AC) would be the easiest data to acquire. You just take the contractor's invoices and assign them to their PO. But, how do you know their amounts are earned and worthy of payment? We are missing two (2) details here. The first is the invoice needs to be organized by work package. The second is that somebody needs to verify that the actual work completed for that work package matches the contractor's request for payment. If it does not, the numbers needs to be reconciled.

Earned Value

The verification of work completed is called earned value (EV). In the example above, this is normally combined with the QC check that the fabrication is correct. Do not wait until the last minute to find design or fabrication errors. Many TAR's have fell victim to last minute realizations that the design or fabrication is in error. This QC step can be performed at the fabrication facility. The completion status (or percentage) should be documented before shipment and the request for payment by the contractor is submitted. This establishes the earned value data points.

The Project Schedule

The project schedule is a living document that starts off very simple and often with Microsoft Project. As the project passes through its "Gates", the schedule takes on the responsibility to merge the procurement plan with construction activities so that the contract packages can be issued in time for everything to gel just right. In detail engineering, the schedule should be ported to P6 or NetPoint (c/o, PMA Consultants). And, in Execution, the contractor's schedules need to be incorporated as well. Do not be alarmed that the schedule may grow to thousands of activities. Heard of Pull Planning?

Another good idea is to convene what is called a "Pull Planning" session. This is where the contractors meet with the project scheduler and construction work planner and pound out specific work tasks on how each part of the project will be built. Even down to the location of tool boxes and lay-down areas. This starts at the start-up date and works backwards and looks for glitches, mis-fits, work space limitations, access to work permit people, etc.

<u>Project Execution Plan</u>

It is also a good idea to create what is normally called a Project Execution Plan. This is an internal contract document that specifies how the project will be executed. This document would be authorized by the team members, controlled and updated as the project progresses through the approval gates. If your project has private equity funding, consider this document as a requirement.

It will contain the following elements as a minimum:

- Statement of Requirements
- Business Case and Objectives
- Roles and Responsibilities
- Major Risks
- Boundaries and Constraints
- Basis of Design
- HSSE Requirements
- O&M Impacts
- Procurement Plan
- Project Basis of Estimate
- Project Schedule
- PV Cash Flow Curve
- QA/QC Plan
- Construction Execution Plan

<u>Concluding Remarks</u>

Creating and maintaining project S-Curves is not a one person job. It needs to be setup correctly from the beginning so that the data arrives in the right format. Your procurement software needs to be able to export to Excel if you choose to pursue that option for forecasting. If you choose to develop a Windows App for this, then your procurement software needs to allow database calls to acquire the data. In either approach, Excel or a Windows App have charting functions to create the curves.

HCI Systems currently has a base platform and is soliciting partners for the development of a Project Cash Flow / Forecasting module. Partners in this development will receive a license free version of the base platform and a significant rate reduction in co-development fees. When complete, the partner(s) will receive a licensed free version of the Cash Flow / Forecasting module.

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