AACE INTERNATIONAL RECOMMENDED PRACTICE

55R-09

ANALYZING S-CURVES

SAMPLE
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ANALYZING S-CURVES
TCM Framework: 10.1 – Project Performance Assessment

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PURPOSE

This recommended practice (RP) for analyzing S-curves is intended to serve as a guideline, not to establish a standard. As a recommended practice of AACE International, analyzing S-curves provides guidelines for stakeholders of a project to evaluate the current status and trends of a project in a simple graphical format.

S-curves are usually developed by a project scheduler or cost engineer and can be applied on a variety of project types. The product is generally used as a project management and/or total cost management (TCM) tool for graphic representation of project performance.

The RP provides descriptions of S-curves with the intent to improve understanding and communication among project participants and stakeholders when preparing and analyzing graphics based upon project schedule information. The RP describes different types of S-curves that may be generated from a schedule provided the proper information is loaded into the schedule and the status of the information is maintained throughout the duration of the project.

OVERVIEW

An S-curve is a graphic display of cumulative costs, labor hours, progress, or other quantities plotted against time. The term derives from S-like shape of the curve, flatter at the beginning and end and steeper in the middle, which is typical of most complex projects. Most projects start slowly, accelerate throughout the majority of the work and then slow down again near the end as productivity declines and work runs out.

The term S-curve can also be used to indicate an S shaped chart resulting from a cumulative likelihood distribution. In this function, an S-curve is a tool of quantitative risk analysis which project management would use to determine the possible dangers of any given course of action.

S-curves are also called, “cumulative distribution charts,” “velocity diagrams,” and “SPLOTS” (S-plots.)

RECOMMENDED PRACTICE

AACE recommends that schedulers and other project team members develop and use S-curves to plan, monitor, analyze, forecast and control project progress. Project managers should request that project controls personnel produce and use this graphical technique as a tool for briefing stakeholders on project status and trends in a quick and intuitive manner.

DEVELOPING S-CURVES

Prior to developing an S-curve, a project baseline schedule needs to be developed. The baseline schedule should employ best scheduling practices (i.e. documentation of scheduling basis, start, finish, no open ends, minimal constraints, a defined critical path, etc.). The baseline schedule should also contain cost and/or quantity data information if that type of S-curve is desired. The S-curve produced from the baseline early dates is often referred to as the “target S-curve” which reflects projected or planned progress on the project if all tasks are completed on their original early finish dates. This curve represents the “best” progress or productivity that can be expected. It is
important that the cost and/or quantity information loaded into the activities represents the appropriate time-
scaled values for those activities.

For example, if electrical service equipment will be delivered in one large shipment and then installed over a three
month time period, the large cost of the equipment will be earned when delivered, so that cost should be loaded
into the delivery activity, and the balance of the costs can be loaded into the installation activity. When loading
costs into activities, the activities should reflect a straight-line consumption of those costs (a ten day activity with a
$10,000 cost should reflect installation of $1,000 per day). This methodology of loading costs into the schedule will
result in reasonable and appropriate S-curves.

S-curves were generated traditionally within the C/SCSC (Cost/Schedule Controls Systems Criteria) process that
evolved into the present Earned Value Management System.

1. Common S-Curves:

A variety of S-curves exist, the most common being man hours versus time, and costs versus time. While the S-
curves generated using any quantities versus time that are useful for comparison, such as volume of concrete or
linear footage of pipe, the S-curves generated using cost versus time may be helpful in developing the projects
overall cash flow. The time unit used is typically monthly to coincide with normal monthly project status updates.
Weekly and even daily time units are also used. The smaller the time unit between readings, the “smoother” the S-
curve will be and easier to use for forecasting trends.

The shape of the S-curve may yield significant information about the nature of the project. Curves that start up
steeply and then flatten out may indicate front-loading, which could be projects that require little or no planning
time, repair of disaster damage, or they could indicate a schedule that has been accelerated from the beginning.
Curves that start out with a lower slope and then run steeply to completion could indicate a large planning or
design time in the beginning and a reduced construction time.

If the project is primarily labor, generally those curves are typically back-loaded, initially flat and increasingly steep
towards the end of the project. Projects where the costs are mostly installed materials and labor tend to show a
fairly linear distribution of costs over time. Mobilization costs and deposits will cause more front-loading of the
curve.

1.1. Progress S-Curves:

After creating a baseline schedule, a baseline S-curve should be generated. Baseline S-curves provide the basis on
which to compare a project’s actual status to its planned progress. There are two types of comparisons that can be
developed (for simplicity’s sake Figure 1 and 2 below reference hours but, just as easily could be replaced with
costs):
The two comparisons can be combined with a target or earned vs. actual comparison which can provide insight as to manpower and financial resources required to complete the project.

Schedules with status applied to them are called updated schedules. One can produce the same type of S-curves as produced with the baseline schedule to track actual progress and to forecast upcoming progress. S-curves produced from update schedules are typically similar but different than those produced from the baseline schedule in that they also display curves derived from earned and actual data.

The baseline schedule provides target progress, typically in costs or man hours. The update schedule may provide three basic metrics; the value of the work that was planned to be achieved at the time of the update, the actual value of the work achieved at the time of the update and the earned progress typically shows earned costs or earned man hours at the time of the update. Payrolls or other man hour reports provide actual man hours expenditures.

Updated project schedules and payrolls/timecards provide the actual data that is then compared to the baseline S-curves. This allows the progress of a project to be monitored and quickly reveals any divergence from the baseline schedule. S-curves may also be used to depict project growth, slippage, and progress.