Forecasting Cost to Complete on Major Projects

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Abstract

This paper demonstrates the importance of regularly and accurately calculating forecasted cost-to-complete for major construction projects. The objective is to assist project controls professionals in achieving better cost control and oversight of their projects; and to deliver accurate projections of cash flow to all project stakeholders. Calculating forecast-to-complete is a critical aspect of project controls. It demands a careful process of budgeting, data gathering, progress measurements, change order management, time-phasing and detailed forecasting, to achieve a reliable result. This presentation will dive into the processes and methods required to be able to deliver consistent, accurate results for predicting remaining project costs over a timeline, and early identification of critical issues. What’s equally significant to this method, is that it is practical and achievable; and the result of working with many project controls professionals in a variety of industries over the past 10 years. This method stands out from previous methods in that it strategically leverages both distributed and automated techniques for capturing and processing key data for feeding the forecasting and project controls engine.

Introduction

Major construction projects withstand a level of complexity like no other; and more than ever, organizations are searching for ways to increase efficiencies, reduce costs, increase productivity, collaboration and automation on their construction projects. To achieve this, the project team needs to apply a significant level of rigour in the planning and management of projects; and deliver key metrics and projections to all project stakeholders throughout its execution. When, for example, it’s 9-months into a 2-year Facility construction project, and you’re asked by your CFO to provide a month-over-month projection of costs to complete, you’re not going to simply subtract cost-to-date from the original budget. You’re fully aware (as is she), that it’s far more complex than that. First of all, nothing ever goes exactly to plan. Things change, budgets can be wrong, subcontractors aren’t as speedy as initially hoped, material prices get inflated, fabrication delays, incorrect drawings, mistakes, etc., all factor into the forecast. Calculating a month-over-month forecast requires that you’ve not only done sufficient upfront project planning, but you’re also performing ongoing monitoring, measurement and management of the project in order to produce an accurate report. This includes having a time-phased budget, iterative progress measurements, detailed forecasts by activity, actual costs to date, and all your change orders consistently captured. If you’ve done a decent job of all that, you’ll then need good reporting to grab all the relevant information and pump out that nicely formatted timeline forecast for the CFO.

Why Forecasting is Important on Major Projects

Knowing where a project is at on any given day is a critical project controls function for major projects. However, knowing where it’s going is arguably even more important. Any project stakeholder with a
It Starts with Good Planning

To properly prepare for effective forecasting during project execution, the project planning stage is vital. The nominal extra effort that goes into planning will make things run smoothly and streamlined while the project is underway.

Planning for Forecasting

There are of course many essential elements that go into a good project plan, however for the purposes of this paper, we’ll zero-in on a few of those key elements required to achieve good forecasting ability down the road during project execution. It’s at the planning stage that the project needs to be set up so that it can be first measured, then forecasted. We therefore need the structure in place to streamline the process of iteratively measuring current progress & performance, so that the remainder can be forecasted from there.

This includes the following:

1. **A well-designed work breakdown structure and cost breakdown structure.** The WBS needs to be defined down to the activity level where activities are designed to be measurable in terms of budget, cost and progress. This ideally includes attaching an objective production quantity to the activity: for example, “155 Units Installed.”

2. **A Time-Phased Budget.** The project budget needs to be merged with the schedule – along with any time-phased overrides – so that critical metrics like Planned-Value and SPI can be calculated, and so that timeline curves can be used to visualise the project spend forecast.

3. **A budget derived from resource-level estimating.** To perform detailed forecasting, a detailed budget is required. This identifies the labour & equipment hours, material quantities, etc. that go into the budget. When performing a forecast, the team can then compare budgeted against burned-to-date and enter the forecasted remaining amounts.

4. **Well-defined progressing methods.** Each project activity that will be budgeted and tracked should have a defined method for how it will be progressed. This could be based on, for example: Rules of Credit, Weighted Steps, Production Quantities, Budget, Schedule, etc.

Set it up so that it’s Easy to Measure

You need to know where you’re at before you can predict where you’re going. Measuring project progress therefore, is the starting-point for forecasting. Key to successful progress measurements is that they need to be straightforward, and not introduce a lot of extra work. To accomplish that, you’ll shift the bulk of effort to the upstream planning stage so that the practice of capturing and measuring during execution become simplified; and carried out with minimal effort.

Automated and Distributed Progress Measurements

Accurately measuring project progress is arguably the most challenging component of project planning and execution. Again, a little extra upfront planning can really simplify the measurement process. It’s
key that capturing progress is both *distributed* and *automated* wherever possible. This is vital for two reasons:

1. It shares the effort and responsibility to the wider project team, and natural execution of the project. This reduces the reliance on a small group of individuals. By distributing and automating, it ensures that progress measurements will not be overlooked and will actually get done.
2. Automated and distributed measurements are more objective and reduce the risk of personal bias

**Determine What You’ll Forecast**
A progress measurement is clearly a valuable snapshot in time. However, it only provides indicators of past performance. These indicators can of course then be used to predict future outcomes if productivity (CPI) continues on as it was. But what if past performance is a misleading indicator of where the project is going? For example, maybe you just came out of a cold winter that slowed things down, and now you need to predict the future based on a more optimistic productivity factor. Or, at a more detailed level, maybe you’ve become aware that the amount of steel beams required was likely vastly underestimated. You’ll need a mechanism to *forecast* what you, as a project controller, predict is going to be necessary to successfully complete the activity. This can be as simple as overriding the estimate-to-complete (ETC) on activities; or overriding the cost-performance-index (CPI) on activities; or inputting resource-level quantity forecasts of remaining work, materials, equipment, hours, etc. Forecasts should also be time-phased in terms of when they are anticipated to be burned.

**Next, There Needs to be a Good Process in Place**
As a project team, you’ll need to define an iterative, repeatable process for how and when these measurements and forecasts are going to take place. This is similar to how your finance department works in continuous reporting *periods*. Let’s say, for example, you set up your period cut-off (or period close) to be monthly. In this case, you’d set up your ‘progressing period’ to be fixed on a certain day each month where you’d submit the progress measurement and forecast. This would then lock-down that period; after which you’d open the next period, and on and on. The resulting data from the measurement periods can then be charted on a timeline to visualise key project trends.

To ensure a distribution of effort, the process also includes the regular capture of progress, cost, hours, etc., from the wider team. For example, it’s common for your jobsite personnel (or subcontractors) to capture daily production quantities of physical work completed. This data should be natural inputs to the current period’s progress measurement.

**Project Execution: Tracking, Measuring, Forecasting and Reporting**
With good planning in place, project execution becomes streamlined, productive and much more accurate.

**Tracking**
Project tracking should be a rigorous process of capturing every detail of a project underway. Every hour burned, every item installed, every activity completed, materials delivered, etc. should be tracked and routed as cost and progress on the project. For example:
• Daily costs, hours and progress are captured by your field personnel
• Subcontractors are submitting progress claims, or hours or invoices – which recognize cost and progress
• Suppliers are delivering materials, etc. which incurs cost

Measuring
Measuring a project’s progress should be a continuous, daily capture that’s mostly automated and distributed. In other words, don’t wait until the end of the reporting period, and pull an all-nighter to cram in all the cost and progress entries. That is a recipe for failure. At the time of submitting a progress measurement, all the data should be already captured and ready for review and analysis. Your job as a project controller is to oversee that the information is complete and accurate and make adjustments as necessary. You should, in fact, be doing this on a daily basis; not just at the end of the reporting period.

Forecasting
Project Forecasting is a methodical and process-driven science. While it’s largely manual and subjective, it must be undertaken using strict and auditable methods to ensure it’s defensible and objective. Remember, not all activities need to be forecasted in each reporting period. Only those activities that are not playing-out as initially planned need to be addressed. A forecast can be considered a precursor to a Potential Change Order. Unlike a change order however, a forecast is a well-informed prediction of trends that are arising that need to be identified and captured prior to a change order. Any predicted trends that turn out to be true, can then be converted into a change order and become part of the project budget & schedule. The forecast should be submitted as a package along with the progress measurement for approval.

Reporting
The project forecast data should be included in the standard project status reporting package delivered to all project stakeholders. Reports can be tabular in nature, showing baseline, current and forecast budget & schedule. It’s highly recommended to also produce timeline reports showing comparative curves of budget, actual and forecast.

Conclusion
The importance of diligently measuring and forecasting major construction projects can’t be stressed enough. The mere act of forecasting on an iterative, incremental basis will not only deliver confident numbers to project stakeholders; it will also serve to uncover insidious issues that could compromise the successful execution of the project. A key takeaway is to emphasise that the methods described in this document can be done without adding extra effort or resources. It will however, necessitate a shift in where the effort is focused. In other words, by shifting to doing more upfront planning and ongoing measurements – and by taking advantage of some key automation techniques – project managers can significantly improve their downstream productivity and execution performance. The ultimate benefit of doing this of course, is that they’ll be able to produce far superior project analysis reporting and controls.
**Author Profile**

Chris Ronak is the CEO of Jetsoft Group, makers of 4castplus Project Cost Management Solutions. With a background in technology, finance and project controls, Chris has over 25 years of experience delivering critical systems for practical, game-changing applications. Over the past 10 years, Chris has worked with project controls and cost engineering professionals to streamline and improve their ability to deliver successful projects. Chris has a unique insight into the key role project controls plays in major and mega projects. He recognizes the practical application of project controls methods that balance the right amount of rigour and effort to suit the size and complexity of the project.

**Acronyms**

- **CPI**: Cost Performance Index. This is a ratio comparing approved budget for work completed, with what was actually spent for that work completed. It’s most often used as a productivity indicator showing how well the project is performing to date against the plan. CPI is calculated as Earned Value / Actual Cost.

- **Planned Value (PV)**: Planned Value is the approved value, in terms of budget, of the work that is to be completed at a given point in time. It is the amount of budget that should have been burned at a specific status date. PV is calculated as, (Planned % Complete) / Budget at Complete.

- **SPI**: Schedule Performance Index. This is an indicator for how efficiently the project is progressing compared to the planned project schedule. SPI is calculated as, Earned Value / Planned Value.

- **ETC**: Estimate to Complete. This defines the remaining budget required to complete the project or activity. ETC is calculated as, (Budget at Complete – Earned Value) / CPI.

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