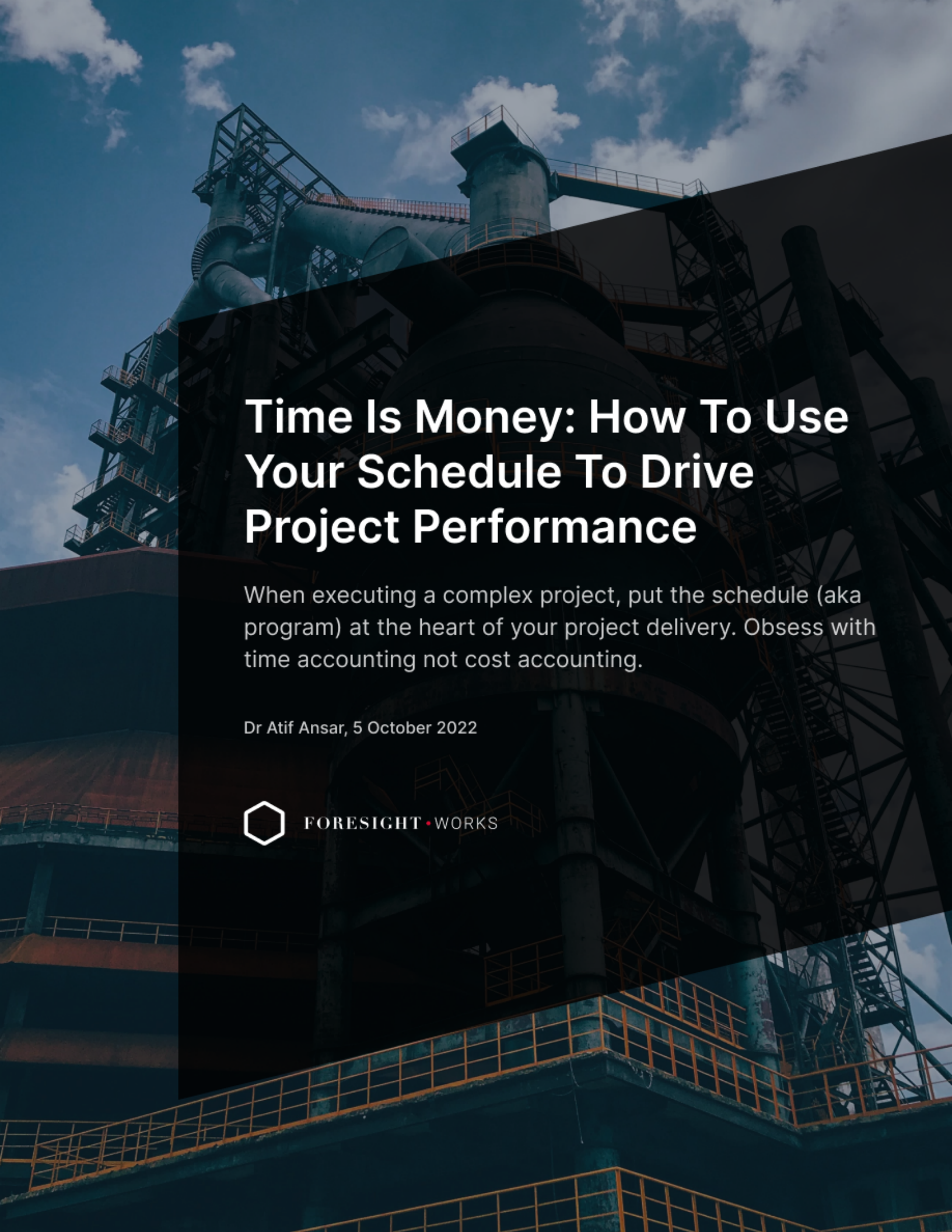

Time Is Money: How To Use Your Schedule To Drive Project Performance

When executing a complex project, put the schedule (aka program) at the heart of your project delivery. Obsess with time accounting not cost accounting.

Dr Atif Ansar, 5 October 2022

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Introduction

In this article, I explain why you need to put the schedule (aka program) at the heart of your project delivery. My research at the University of Oxford with colleagues has shown that 9 out of 10 megaprojects suffer delays and cost overruns. A poorly managed schedule—also called a program—is often the culprit. Your schedule can either be an asset or a liability.

Schedule slippage erodes value: not only do costs go up (paying for the standing army or extra years of inflation) but more importantly, tardy delivery delays benefits coming online. The triple whammy of schedule slippage, cost overrun, and benefit delay deteriorates the net present value of projects.

Project risk management is inherently difficult, no doubt; there are a lot of moving parts and variables—contractor or sub-contractor interfaces and handovers, supply chain disruptions, achieving design approvals or planning permissions, etc.

A good schedule thoughtfully reflects these moving parts with the description of activities and the logic among them being agreed upon among multiple parties transparently and democratically. A good schedule lives at the heart of the project delivery organization. It is recognized, debated, and dynamically adjusted with openness and realism by the whole team —up, down, and sideways. People buy into it and have a high level of confidence in its achievability.

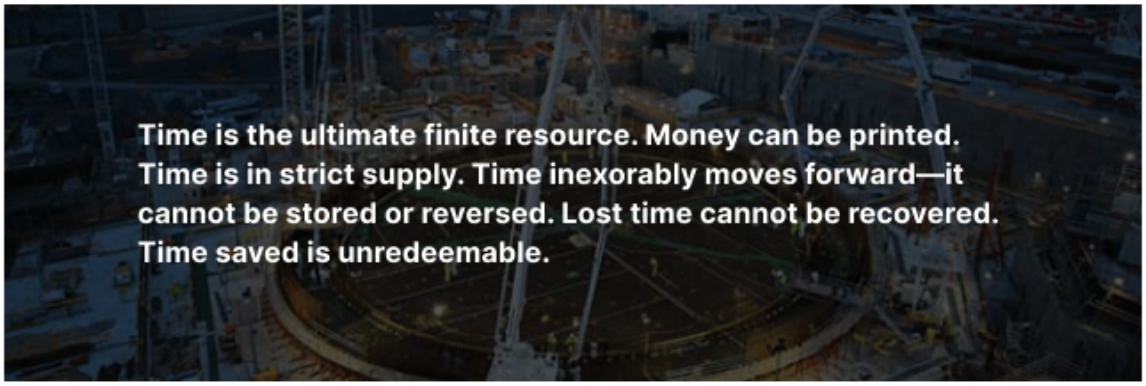
A black box schedule, removed from the action or a schedule used as window-dressing to "manage" the executive or "keep the customer happy," is a house-of-risk waiting to ignite. Scheduling is a technical discipline. It requires ambidextrous skills: subject matter knowledge of whatever is being built and knowledge of scheduling principles and hard-to-use tools such as Oracle Primavera P6 or MS-Project. None of these are good reasons to allow the schedule to become inaccessible to the wider team. Easy-to-use tools like Foresight are designed to make a technical schedule transparent to the whole delivery team.

The most effective way to overcome project risks is through a robust, collaborative schedule. I first outline the problem of time and then show how project teams can use their schedule as the central tool to get on top of risk.

The section on the problem of time will get a little technical. If you would like to read our recommendations on what you should do, jump straight to the section on Focus Time (page 6).

The Problem Of Time

The deck of time is stacked against you. It's easier to be late than early. Nassim Taleb calls these "asymmetric outcomes." For example, if you embark on a journey from New York to London, random events such as bad weather, a traffic jam on the way to the airport, or a technical fault with the plane will cause you to be delayed. Even when you experience helpful randomnesses, such as no traffic to the airport or a tailwind, your journey is unlikely to speed up. The plane will take off (or land on the other side) at its allotted time and not earlier. That's the inescapable logic of temporally sequenced events.

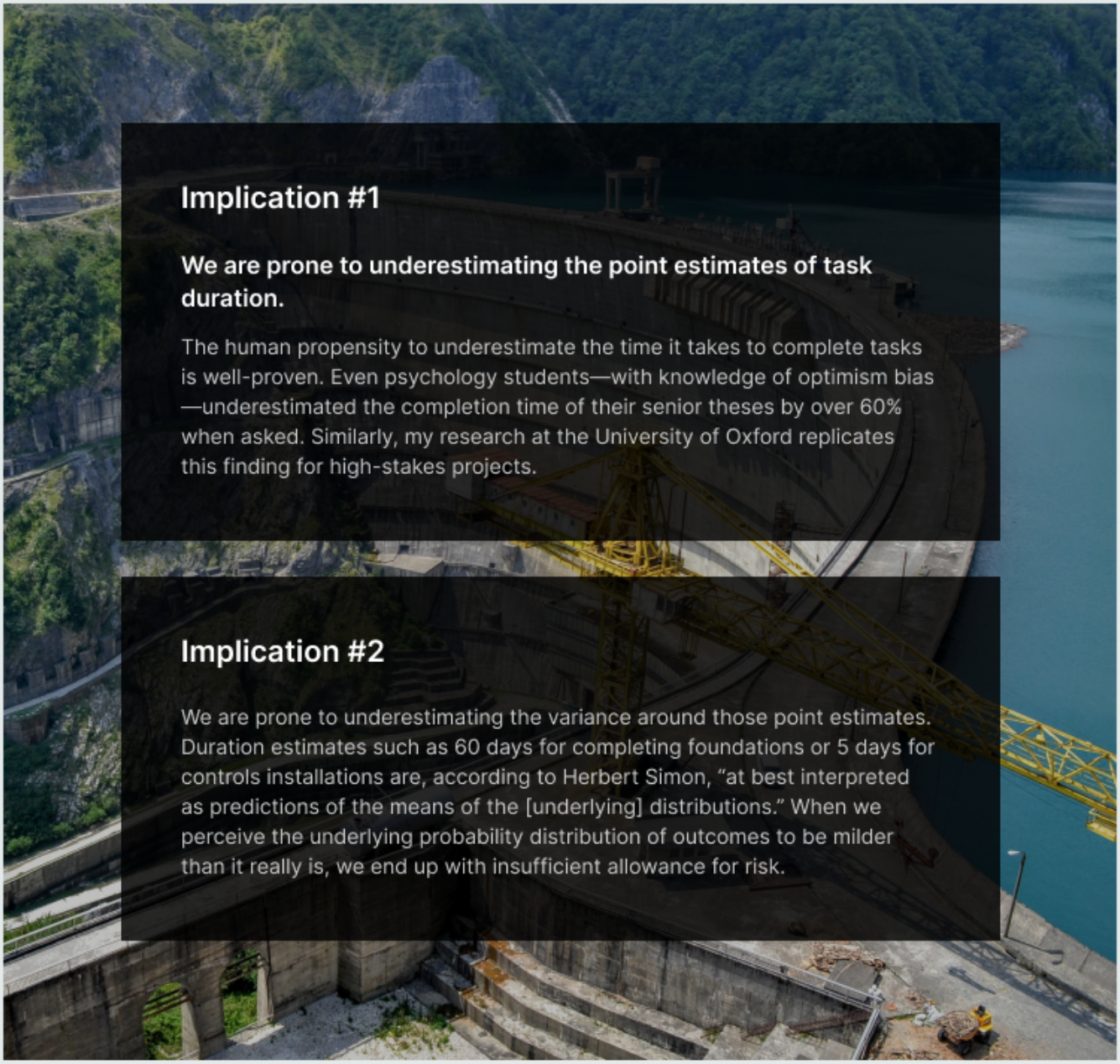


Time pressures are intense in projects. Projects are temporary organizations with a defined start and end; project delivery follows a relentless beat of activities linked up in a dependency network. Along this critical chain, statistical fluctuations accumulate delay. If you don't get planning permission in time, you cannot start construction. If the funding release is delayed, you cannot proceed to procurement. But even if you achieve a milestone early, it does not mean you'll deliver the whole project early. Those familiar with Eliyahu Goldratt's theory of constraints will immediately recognize that delays occur when statistical fluctuations meet dependent events.

Psychological Bias and Time

The problem of time is exacerbated by psychological bias. Psychologist Daniel Kahneman's Nobel-prize-winning work with Amos Tversky shows that human judgment under uncertainty is prone to systematic biases (rather than random errors). Experts and laypersons alike are too optimistic about the time it takes to complete tasks.

Optimism bias has two implications:



Implication #1

We are prone to underestimating the point estimates of task duration.

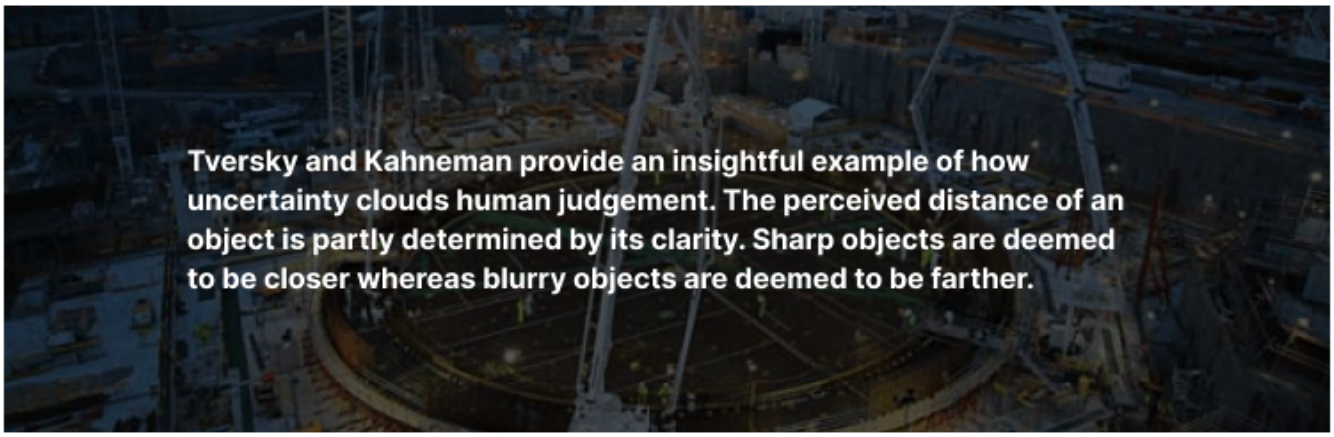
The human propensity to underestimate the time it takes to complete tasks is well-proven. Even psychology students—with knowledge of optimism bias—underestimated the completion time of their senior theses by over 60% when asked. Similarly, my research at the University of Oxford replicates this finding for high-stakes projects.

Implication #2

We are prone to underestimating the variance around those point estimates. Duration estimates such as 60 days for completing foundations or 5 days for controls installations are, according to Herbert Simon, "at best interpreted as predictions of the means of the [underlying] distributions." When we perceive the underlying probability distribution of outcomes to be milder than it really is, we end up with insufficient allowance for risk.

Psychological Bias and Time (cont.)

The fog of time, i.e., long-term forecasts necessary for megaprojects that have long implementation periods, muddles human foresight and we misjudge the true nature of uncertainty. The distributions of risk end up being wider than we perceive.



This heuristic is useful in the daily course of life for its parsimony. For instance, drivers routinely use it to judge how far another car may be on the road to avoid a collision. Reliance on this heuristic, however, also leads to systematic errors. If there is fog on the road, the contours of all cars are blurred. Drivers are then prone to overestimate the distance between themselves and other cars (i.e., they perceive other cars to be farther away than they really are by underestimating the effects of fog). A higher incidence of accidents in foggy weather is hence a likely outcome.

The passage of time is analogous to fog in this example. Just as poorer visibility exacerbates errors in judgment of distance on the road because people underestimate the effects of fog, longer time horizons lead to a greater magnitude of forecasting errors because managers underestimate randomness.

Good schedules, as we will see in the next section, take the challenge of psychological bias (low-balled point estimates and variances) seriously. Effective teams help overcome such biases; dysfunctional teams reinforce them.

Accounting for Time in Organizations

The problem of time is also exacerbated in organizations because they account for time poorly. All large companies have a Chief Financial Officer (CFO). None a Chief Time Officer. Organizations are typically excellent at accounting for money. Double-entry accounting has been the norm for at least 500 years. Owing to fiduciary responsibility, every dollar spent is accounted for and recorded in various advanced ERP systems. The records are then audited, analyzed, and independently verified by a range of internal and external parties, resulting in a clear picture of outlays. Organizations loathe wasting money. Yet, they waste time all the time.

Wasting time has financial consequences. In projects, delays are a major cost driver, yet rarely do we see the same rigor, control, and independent oversight applied to time. Increasing the rigor of controls on schedule is critical to successful megaprojects.

The value of spending time wisely is underpinned by our analysis of project contingency requirements which suggests that the schedule is worth twice that of cost. **In other words, 5% schedule contingency is the equivalent of 10% cost contingency.** It follows, therefore, that if the same effort applied to controlling cost were applied to controlling the schedule, it would have twice the impact.

Given the slippery nature of time, it is crucially important to be vigilant about your schedule. Any delay in the program builds risks elsewhere. Projects in a hurry become unsafe places to work. The cost of delay recovery measures is often prohibitive (e.g., mobilizing overtime resources) without yielding desired productivity gains. I now turn to best practices in how to put your program at the heart of project delivery.

Focus Time

Overcoming the problem of time and our overly optimistic perception of it requires diligent focus on the schedule of projects. When executing a complex project, put the schedule (aka program) at the heart of your project delivery. Obsess with time accounting not cost accounting, as time is the single most robust metric to drive project delivery excellence. Here are a few steps you can take to elevate your game.

1 Start Strong and Get Buy-In

A robust, comprehensive, baseline program is paramount. Small errors in the beginning become large errors in the end. Work intensively upfront in creating a baseline schedule and securing stakeholder buy-in of that baseline. A good baseline program lays out a clear and agreed-upon work breakdown structure and presents a cohesive sequence of all intended work. Most baselines omit big chunks of effort. For example, London's £20B Crossrail project's early schedule omitted systems integration, assurance documentation, and allowance for rework from its baseline, causing a 3+ year program elongation.

A good baseline also allows you to zoom in and out of detail easily. For example, you could zoom out to a simple plan-on-a-page, such as on a time-location chart, to highlight the primary interfaces and handovers from civil works to fit-out or to systems integration. Or you could zoom in to view contractor and subcontractor level programs and inspect the sequence of milestones and activities. This level of detail is too rarely achieved in practice.

For example, a mega-rail project in Asia spent 4 years of a 12-year project producing an integrated master program. Even then, the contractor-level programs did not link up with each other, creating access issues and subsequent extension of time claims. Similarly, a big data center builder's baseline schedule had egregious missing links—start and complete foundation milestones were not linked, for instance—creating the false forecast of a speedy delivery. Project teams can benefit from best practices such as U.S. Government Accountability Office's GAO Schedule Assessment Guide.

Just because the upfront schedule is important, doesn't mean you should stretch the process out for months. Put some urgency into it. Based on her award-winning research, the advice of Stanford University professor Kathleen Eisenhardt is to collect a lot of information with speed (information intensity X high-velocity). Roadshow the draft baseline schedule with a broad set of internal (e.g., project steering committee) and external parties (e.g., contractors). Conflict will arise. Your CEO may press you hard to compress the timeline. The contractors may push for more cushion. Work through these issues head-on and seek resolution at pace.

Resist the temptation to "fast-track" the project and start construction before a broadly agreed baseline is in place. Recently, a best-in-class owner has embarked on an experiment to achieve this goal. The owner has asked contractors to submit a schedule in the form of Primavera P6 .xer file at the time of the tender. The schedule quality and constructability will be taken into consideration when selecting a contractor. After the contract award, the owner will facilitate several live workshops with the owner's engineer and major contractors to create a collaborative, mutually agreed upon, integrated baseline. To put pace into the process, no payments will be authorized until the baseline is collectively signed off on. This experiment draws inspiration from many of the alliancing and collaborative project delivery approaches that are scaling in the industry.

2 Use Historical Data to De-Bias Psychological Risk

If you are building a megaproject, with luck it's not your first rodeo. Take advantage of your and your team's experience and transfer learning from past completed projects. Systematically analyzing past projects to improve your activity duration forecasts has a technical term; it's called Reference Class Forecasting.

Optimism bias in a program—the underestimation of duration point estimates and the risk variance around them—stems from a planner taking an "inside view" of an action. With an inside view, planners focus on the constituents of the specific planned action, rather than on the outcomes of similar actions that have already been completed. Professor Kahneman likens the inside view to a movie reel of the future we visualize in our minds predicting how an event might go. The movie reel is typically too optimistic and incomplete.

Reference Class Forecasting (RCF), also called the "outside view", de-biases the inside estimate. To take an outside view on the outcome of an action (or event) is to place it in the statistical distribution of the outcomes of comparable, already-concluded, actions (or events).

Optimism bias has two implications:

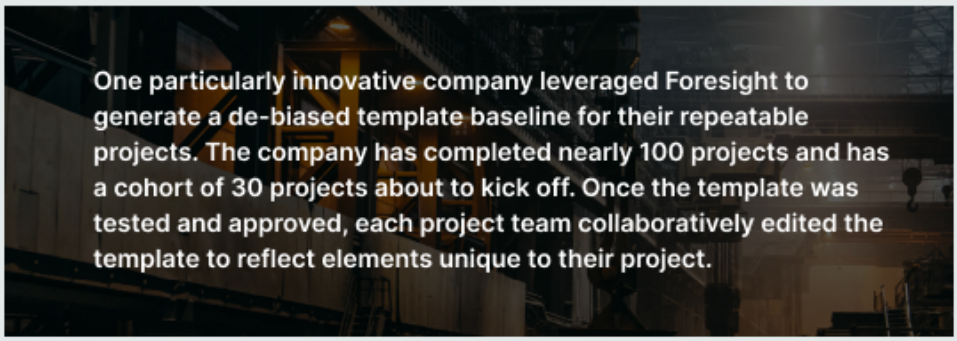
1. It is time-consuming to extract, analyze, and communicate these findings, resulting in large consulting bills;

2. Tools such as Power BI are only as good as their human handlers. These tools are not purpose-built to perform these calculations, so they require advanced configuration and administration to be used effectively. In the hands of a good consultant, a project team may get useful, albeit expensive, service. Getting consistent service across the entire portfolio proves challenging and non-scalable.

Applying the outside view to complex projects involves four steps: (i) identify a reference class of past comparable projects; (ii) establish an empirical distribution for the selected reference class of the parameter that is being forecasted (for example, activity duration); (iii) compare the specific case with the reference class distribution; (iv) fit AI/ML models to the reference data to predict future outcomes.

With de-biased forecasts and a better handle on empirical distributions, project teams can make data-driven, rather than optimistic, judgments. The same RCF analyses power a probabilistic schedule (instead of the conventional deterministic schedule). A probabilistic schedule enables teams to run what-if scenarios and find risk-adjusted paths to completion.

With Foresight's AI algorithms, such as natural language processing (NLP), you can cluster like-for-like activities with a click of a few buttons across multiple past projects by uploading baseline and as-built Primavera P6 .xer or MS-Project .mpp files of your projects. Right now, leading teams are using Foresight's powerful algorithms and their own as-built past data to improve activity duration forecasts and sequencing across chains of activities.



One particularly innovative company leveraged Foresight to generate a de-biased template baseline for their repeatable projects. The company has completed nearly 100 projects and has a cohort of 30 projects about to kick off. Once the template was tested and approved, each project team collaboratively edited the template to reflect elements unique to their project.

The impact has been staggering. The company has saved over 12,000 skilled-staff hours in the effort put into baselining the 30 new projects. Moreover, the elapsed time for generating a robust baseline has fallen from six months to six days. Most importantly, their baseline program quality score has increased from an average of 52 to 75 using this approach. 80% of each team now report a high level of confidence in the constructability of their baseline and its forecast finish date.

3 Diligent Time Accounting

Once you have a collaboratively approved and de-biased baseline, you are ready to build. Diligent tracking against the plan is essential. In terms of accounting for time, high-performance teams update their schedule with actuals on a weekly or bi-weekly cadence. Such teams use Primavera P6 or MS-Project as a system of record and Foresight as a system of intelligence to have near-continuous visibility of progress and risk.

During crucial periods such as peak site production or the program's last mile, a daily update is not uncommon among the best-in-class. In more complex projects, a monthly update is OK (not amazing). Program reporting cycles with a lag greater than a month or a lack of independent assurance on the progress percentage is a major red flag. High-performance teams also maintain a high level of program integrity. The decision to add or delete activities or change activity sequencing from one version update to the next is not made lightly or opaquely.

Low-performance teams, on the other hand, have an unstable program with no independent program audit or assurance. Each version update contains major changes (added or deleted activities, logic changes, new constraints), practically a re-baseline. These changes are made unannounced. An unstable, opaque program smacks of incompetence at best or the malice of strategic misrepresentation—a vain attempt to hide delays or create claim opportunities. Such practices—candidly, shenanigans—tolerated in scheduling would never be allowed in accounting for money in any solvent organization.

When projects fail, they die a death by thousand cuts. Variances between planned vs. actual start and finish dates are a red flag irrespective of float. Even seemingly tolerable statistical fluctuation is an early warning of a higher-amplitude risk tsunami building up. Stick to the program. Revisions to the program are OK but if they are numerous, re-baseline the program openly and stick to the re-baseline.

There are three more things you can do to improve time accounting in your projects.

01

Proactively identify risk drivers

High-performance teams use multiple approaches to identify risk in a program:

a. Graph-based algorithms to identify bottlenecks in the program based on the location of activities within the precedence network (a complement to the critical path algorithm with a large family of other graph algorithms that shed light on activities with high criticality irrespective of float);

b. Simulation-based methods such as monte-carlo simulation; or

c. Reference class forecasting-based methods to identify activities most prone to delay based on past data.

What should you do once you have identified potential bottlenecks? Leading companies using Foresight apply two general mitigation strategies that work wonders. First, they assign the high-criticality activities to a named responsible owner. Individual-level ownership empowers the team members and drives accountability. Second, they stipulate the acceptance criteria for "done-done" for these high-risk activities using Foresight's collaboration features. Done is different from done-done. A contractor may be "done" once the physical work (such as installing an elevator) is completed. But the milestone of "elevator installation" is "done-done" only when the safety documentation that the elevator has been tested and complies with company and regulatory standards has been accepted. Many such acceptance criteria live outside the Primavera P6 schedule so stipulating them for the critical activities helps to de-risk misalignment of what it takes to get over key hurdles.

Track even minor slippage in the start or finish of the highest criticality items and pay close attention that predecessors of these activities are completed on time. The upcoming highest criticality items should form the agenda for weekly or monthly meetings with the contractor or participants of the project war room.

02 Prioritize

There's a lot to do in projects. Teams need a systematic method to prioritize weekly and monthly wins. High-performance teams use a prioritization framework to achieve superlative results. One such framework, which Foresight supports, is the Eisenhower Matrix.

Dwight D. Eisenhower was the 34th President of the United States. Before becoming President, he served as a general in the US Army and as the Allied Forces Supreme Commander during World War II, leading the D-Day landings.

Eisenhower had to routinely make hard decisions about which of the many tasks he should focus on each day. This led him to invent the enduring Eisenhower prioritization framework. The matrix prioritizes tasks by urgency and importance. Leading companies are using Foresight's prioritization algorithm that highlights exactly what each team member needs to be working on in the coming week, month, and quarter to enable timely delivery.

03 Resource planning

Project teams struggle to specify resources for their program. Every team aspires to do it but even among mature companies, it's rare to come across a resource-loaded program. Use the prioritization framework to identify the next three months' urgent and important activities and resource-load those. This helps create a dynamic resource look ahead

TLDR Recommendations

BIG IDEA: When executing a complex project, put the schedule (aka program) at the heart of your project delivery. Obsess with time accounting not cost accounting.

Recommendation 1

Build a robust, whole-of-project, baseline program. Use best practices (these are stringent, don't chicken out) such as U.S. Government Accountability Office's GAO Schedule Assessment Guide.

Recommendation 2

Although the upfront schedule is important, don't stretch the baselining process out for months. Put some urgency into it. Collect a lot of information with speed (information intensity X high-velocity).

Recommendation 3

Roadshow the draft baseline schedule with a broad set of internal (e.g., project steering committee) and external parties (e.g., contractors). Open the black box of your technical Primavera P6 to MS-Project schedule and achieve collective sign-off.

Recommendation 4

Conflict will arise. Your CEO may press you hard to compress the timeline. The contractors may push for more cushion. Work through these issues head-on and seek resolution at pace.

Recommendation 5

Take advantage of your and your team's experience and transfer learning from past completed projects. Systematically analyze past projects to improve your activity duration forecasts and sequencing using Reference Class Forecasting.

Recommendation 6

Update your schedule with actuals on a weekly or bi-weekly cadence.

Recommendation 7

Ensure there's independent verification, audit, and assurance of your program and its monthly updates. Don't massage the program. The truth will set you free.

Recommendation 8

Stick to the program. Interrogate large changes in the structure of the schedule from one update to the next. Revisions to the program are OK but if they are numerous, re-baseline the program openly and stick to the re-baseline.

Recommendation 9

Proactively identify risk drivers. Complement the critical path with multiple sophisticated approaches. Apply two general mitigation strategies that work wonders: First, assign the high-criticality activities to a named responsible owner. Second, stipulate the acceptance criteria for "done-done" for these high-risk activities.

Recommendation 10

Use the Eisenhower Matrix to prioritize Urgent X Important activities. Resource load these with three months look ahead.