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Why do most Capital Projects end up being schedule-driven in execution?

Most capital projects end up being schedule-driven as they are decided and awarded at the last possible moment. Various reasons are often mentioned such as delays in decision-making, willingness to keep options open as much as possible, student's syndrome or other reasons. This phenomenon is actually a natural consequence of the necessary trade-off between project framing and project definition. In this White Paper we investigate the reasons for this situation and what can be done to avoid this trap.

The origin of execution schedule-drive: the paradox of project definition

Conventional wisdom and best practice for Capital Projects calls for the best possible definition level at Final Investment Decision stage and stability of the project scope during execution. This well-defined project is the result of an often long and comprehensive definition phase. At the same time, the objectives and the opportunity to which the project responds, being often a market-related opportunity or the need expressed by a client, are basically a bet on the future – and for large capital projects, on a future 3 to 5 years ahead. It makes sense to wait for the latest possible moment to have the maximum possible information on what can be expected in the future, and keep options open as long as possible.

This paradox between the need of a best-in-class definition and the intrinsic uncertainty of the bet taken when investing for a capital project results in the execution of most capital projects being de facto schedule-driven. This leads to technical or contractual strategy constraints leaving less flexibility or options, while increasing substantially the probability of disappointment due to delays compared to expectations.

Some other aspects also contribute to this situation:

- an effect of the NPV (net present value) calculation which is done when developing the business plan. The longer the project the later the revenue stream and the lower NPV,
- the planning fallacy that tends to create convictions that shorter schedules are possible (refer to our White Paper [2016-08 'What the Psychological Factors At Work in Scheduling Are, and How They Affect Schedule Optimism'](#))
- Another situation that reinforces the schedule drive of some projects is when the Owner has entered into contracts with clients for the delivery of products of the project to justify the investment and enable the investment decision. The Owner is then locked in an obligation to deliver the product to its clients with a significant risk of having to buy the product (if available) at the market spot price if ever the project is delayed causing severe losses to the Owner if the

spot price is higher than the agreed sales price for the product.

Two traps of precipitations: the lack of definition and non-realistic schedules

Sometimes, the solution chosen to the paradox when a market opportunity is identified is to shorten the definition phase so as to try to benefit from this opportunity as early as possible. This is obviously not recommended as this approach is generally correlated with substantial overruns in cost and schedule, and/or issues about plant operability.

Another effect which is sometimes observed is the voluntary and unrealistic shortening of the schedule by a contributor to the project in response to pressure exercised from above. This shows in unrealistically shorter activities,

even sometimes in simply severing some linked in the schedule to artificially bring forward the project end-date or shortening the commissioning and start-up phases. It is essential that irrespective of the context, the proposed schedule be aligned with relevant industry benchmarks, and if it is shorter, that the reasons for that result are properly understood.

The need to optimise the benefit of late decision against the additional costs

A cost and benefit analysis could be performed to decide to what extent the decision to start the project should be delayed, compared to the benefits of delaying it. This appears to be rarely performed as such.

On one side, this analysis requires a quantification of the cost impact of the project's schedule drive, and of the additional costs resulting from a lengthening of the definition phase.

On the other side, the analysis requires a valuation of the benefits of delaying the decision or of shortening the execution time from the market perspective.

Additional costs related to a schedule-drive and late decision

A schedule-driven execution will result in additional costs. This may be compounded by the effect of a definition phase which may have been longer than strictly needed waiting for the investment decision to be made. A prolonged definition phase may result in demobilisation and loss of a substantial part of the project team or,

conversely, in additional cost if not demobilised and excessive engineering detail at this stage, which is not ideal. The total additional cost related to the schedule-drive, plus the additional cost related to the late decision can then be considered as the “cost of opportunity” – delaying the decision to reduce the market risk leads to a higher project execution cost.

This amount of additional cost due to the schedule constraint can be estimated quite easily by an experienced estimator and from data provided by suppliers and contractors. One specific aspect is the risk associated with the need to order long lead items in advance of the Final Investment Decision if it is delayed while the start-up date is maintained and the cancellation conditions for such long lead items should the project not be sanctioned.

The cost-benefit analysis of shortening the execution phase of the project is often not performed with sufficient care

Benefits related to a shorter schedule

Benefits related to a shorter schedule from investment decision to full production include:

- Lower financing costs linked to shorter repayment schedules and possibly better credit conditions,
- Earlier production sale cash flow, resulting in a better return on investment overall,
- Better knowledge of the anticipated market conditions

The first two aspects can be easily computed in monetary terms using financial modelling and accounting for available financing terms.

For the last aspect, the best solution is of course to sign long term supply agreements with clients; while this removes the potential benefit of spot price sales and possible associated speculation, it removes much risk in the economic equation. This solution is generally sought when it is possible (example: gas production projects and other specific products that do not have an established fluid global market).

If that solution is not available, in the context of large complex industrial projects and therefore long projects (3 to 5 years) between the Final Investment Decision and actual production, anticipation of the market conditions in a few years' time has only limited validity. Long term trend analysis, typical cycle behaviour of commodity prices, macro-economic cycle anticipations can be used as well as more specific market analysis. Generally, the investment will be designed for production over decades, therefore anticipation of longer-term market conditions will be even

more of a gamble – or has to be based on a long-term medium price range. Therefore, the gain from a shorter execution schedule is often quite illusory from the perspective of decision quality except if there is a definite, substantiated opportunity.

Strategies to overcome the time-to-market paradox

If practical, strategies that involve a flexible investment schedule that can adapt to actual market conditions may be more suitable. They are too rarely considered in industrial projects.

The typical example is to invest for a minimum basis that can be expanded quickly for additional production if the market price of the output becomes high. This minimum basis can for example be investing in long-lead items and the foundation for the facility, or the realisation and operation of a first production module that can then be duplicated when needed with the benefit of a learning curve to reduce time and cost. Modular designs should be favoured in that respect. The rate of making new production capacity available can then be adapted to actual market conditions, and modules can be shut down at will if not profitable.

Summary

The fact that industrial projects are often schedule-driven in execution is due to the expectation of Owners to wait as long as possible to improve their knowledge of market conditions when production will start. If there is no possibility to have long term supply agreements signed, this expected improved knowledge is often illusory. Owners should also be wary of unrealistic expectations in terms of project schedule caused by a pressure for shortening the project lead time. The cost-benefit analysis of shortening the execution phase of the project is often not performed with sufficient care, and we observe that sometimes schedule constraints could actually be relaxed to improve the return on investment, or that alternative approaches could be considered to make the design more modular and adaptable to future market conditions.

In any case Owners should be conscious of this issue and manage it properly so as not to cause project teams to manage unrealistic expectations from the start of project execution.



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