Rolling Wave Planning

Paul K Taylor

An approach to schedule development which can be applied when in the early stages of a project or study to control optimism bias on overall durations

CURRENT PERCEPTIONS OF LATE DELIVERY AND COST OVER RUNS

The problem with many large projects is the high level of complexity and the fact that effectively predicting time and cost on these projects over the longer term is can be difficult. This is usually due to lack of known scope and has resulted in the opinion that many, that infrastructure projects are delivered late and over budget.

This is causes that support this perception:

- Under estimation of project scope which then causes underestimation of costs combined with underestimating timescales.
- Inappropriate use and too much reliance on risk in trying to determine the unknown unknowns (Estimating Uncertainty), instead of the known unknowns (Discrete Risk), which gives an unrealistic sense of confidence.
- Management assuming large amounts of detailed activities is the underpinning, instead of clear scope definition and the use of historic performance analysis.
- Durations are pressurised due to ineffective use of previous achievements as a benchmark and the overarching to business demand is resulting in optimism bias
- A management assumption that schedule delivery can be improved without dramatically altering business processes.
- Lack of standard methodology and governance as to what engineering is applied to each Project Phase, and working more on a one off project methodology.

PRE DEFINING A ROLLING WAVE APPROACH

Bringing in Techniques such as rolling wave planning in conjunction with the USE OF estimating funnel techniques and future cost control will allow the company to improve its accuracy range on delivery timescales to be more in line with other industries.

The Rolling Wave process is a move away from relying heavily on highly detailed schedules in future phases, to only developing the detailed schedule phases when true underpinning is available

It is important that the schedule before baselining or modelling is reviewed and effectively challenged to ensure that it is achievable based on the information available. The planning and scheduling using a rolling wave basis, accommodates lack of knowledge in futures Phases by adopting norms and stops the company applying unrealistic durations which cannot be underpinned.

The rolling wave approach involves more checks against new regression norms for work phases that are being developed and more rigorous reviewing of resource profiles, including labour from the supply chain.

It is important that we the approach reflects how the business operates in the phase durations. For example, timescales around gateways should be based on historic norms, including the prolongation that occurs through slow release of funds and approvals. These can be challenged and reduced but only when the procedures and protocols are changed

APM BODY OF KNOWLEDGE REFERENCE

On larger projects and all programmes, it is unreasonable to develop detailed schedules for the entire life cycle. The later Phases of work will be subject to change, as a result of altered requirements and performance in the earlier Phases.

It is common to apply the principle of ‘rolling wave planning’ where earlier Phases and tranches are planned in more detail than the later ones.

PHASE KNOWLEDGE

Current Phase	Horizon One Info	Horizon Two Info	Horizon Three Info	Horizon Three Info	Horizon Three Info
Needs Study	Needs Study	Optioneering	Outline Design	Detail Design	Construction
Optioneering	Optioneering	Outline Design	Detail Design	Construction	Commissioning
Outline Design	Outline Design	Detail Design	Construction	Commissioning	
Detail Design	Detail Design	Construction	Commissioning		
Construction	Construction	Commissioning			
Commissioning	Commissioning				

By using a rolling wave there is an admission that the depth of knowledge around future work is not fully understood or defined and there is a large element of uncertainty. It is important to note, when determining the project's future phase durations, it is critical to the success of the rolling wave process that fixed rules are applied.

Horizon One Approach

This applies to the current phase or a phase about to start and the work can be Horizon One with fully developed durations and deliverables, in some cases it can cover the next phase beyond as well. Subject to the project size Horizon one also has a fully detailed risk approach.

Horizon Two Approach

This applies to the next phase where we have a reasonable understanding of what is required. The schedule activities are developed up from phase templates in design, and in construction there is enough knowledge to develop the WBS and further activities covering area construction and system installation. Regression curves should not be used in Horizon Two phases.

Horizon Three Approach

Work in the Horizon Three Phases, which is a minimum of two phases after the current phase, is lacking in detail. In these future design phases the phase templates can be applied, but in construction only high level schedules can be developed based on available knowledge. Durations for each of the phases will be developed from regression curves and are based on the estimate values including uncertainty range at the phase gate.

DURATION DEVELOPMENT IN EACH PHASE

CURRENT PHASE	FUTURE PHASES				
Needs Study	Horizon One	Horizon Two	Horizon Three	Horizon Three	Horizon Three
	Needs Study	Optioneering	Outline Design	Detail Design	Construction
	Fully Developed Durations and Deliverables	Phase Template and Developed durations	Phase Template and Regression Curve Norms	Phase Template and Regression Curve Norms	Regression Curve Norms
Optioneering	Horizon One	Horizon Two	Horizon Three	Horizon Three	Horizon Three
	Optioneering	Outline Design	Detail Design	Construction	Commissioning
	Fully Developed Durations and Deliverables	Phase Template and Developed durations	Phase Template and Regression Curve Norms	Phase Template and Regression Curve Norms	Regression Curve Norms
Outline Design	Horizon One	Horizon Two	Horizon Three	Horizon Three	
	Outline Design	Detail Design	Construction	Commissioning	
	Fully Developed Durations and Deliverables	Phase Template and Developed durations	Phase Template and Regression Curve Norms	Phase Template and Regression Curve Norms	
	Fully Developed Durations and Deliverables	Phase Template and Developed durations	Phase Template and Regression Curve Norms	Phase Template and Regression Curve Norms	
Detail Design	Horizon One	Horizon Two	Horizon Two		
	Detail Design	Construction	Commissioning		
	Fully Developed Durations and deliverables	Fully Developed Durations	Phase Template and Developed durations		
Construction	Horizon One	Horizon One			
	Construction	Commissioning			
	Fully Developed Durations and deliverables	Fully Developed Durations and deliverables			
Commissioning	Horizon One				
	Commissioning				
	Fully Developed Durations and deliverables				

HISTORICAL ALGORITHMS FOR FUTURE WAVES

For effective rolling wave scheduling on a large programme of work undertake, it is imperative that there is a basis of scheduling for future phases where the workflow and deliverable scope can be poorly defined.

In a rolling wave approach, use historic algorithms can be developed to provide approximate durations based on the following:

Project Type	Geographical Area	Minimum Project Value	Maximum Project Value	Most Likely Project Value	Current Phase

The future durations can be calculated using regression curves from scatter graphs of previous projects or sub projects of a similar type. Ranges can then be applied using 3σ technique (66, 95, 99 rule)

BASELINE STRATEGY USING ROLLING WAVE

In Rolling Wave as a Project moves through the gated process there is a need to carry out a re-baseline exercise which then allows the next forward Phase to be monitored and measured effectively.

This re-baseline will include all the necessary change control aspects needed on how the project reached the gate. The re-baseline will fully reflect the project outturn and any effective reasoning for either decreases or increases.

Contingency processes have to be revised for Rolling Wave especially around schedule due to lack of definition in future stages This means the current phase has a full monte-Carlo model developed, and the later phases beyond have a lighter approach due to a proportion of risk and EU included in the algorithms.

PROCESS ADJUSTMENTS TO MAINTAIN AN AUDITABLE TRAIL

To maintain a full auditable trail, as the schedule is developed overtime, simple changes to planning techniques are required. Most planning software uses the a unique activity ID as a reference point for baseline information, so providing the Activity ID is not amended we are able to have a record back to the start of the project

This results in what are high level tasks in the construction Phase in the early stages of the rolling wave when the project is in optioneering, become the overarching summaries for the detailed work when we are actually in the construction Phase

ROLLING WAVE: SUPPORTING PRE REQUISTITES

To allow the effective introduction of rolling wave approach, pre requisites on the set out of gated projects has to be developed and a concentration on aligning estimating, cost control and schedule with clearly defined interrelationships between all three are required. This ensures there is a consistent approach on the bulk of an individual company's projects.

These included:

WBS Restructure

In general companies have a large amount of inconsistency on how they develop their lower levels of project WBS.

To adopt rolling wave this has to be improved, this to ensure that projects follow consistent and measurable approach and that pre-defined flow process including specific deliverables and tasks can be applied the correct WBS phases.

The introduction of specific phase templates defines the type of high level tasks that are required to a far greater detail than other approaches.

Estimating Approach

The estimating approach within most companies should be using a CBS that aligns to the RICS recommended NMM2 "New Method Of Measurement 2" This allows for an overarching approach how to develop the cost of a project through its full life cycle, and that in the early Phases of every project the estimate definition is low and has to develop in cost ranges

Cost Capture Techniques

The approach to cost control will also need alignment to act as the bridge / interface between schedule and estimating. The cost capture points are sensible but unique positions which link the standard estimating CBS to the standard scheduling WBS.

If the WBS and CBS are developed in this way it allows for adoption a pre-defined regression curve permutations and also enables a standard approach to knowledge capture helping companies gain the consistency to be able to move to a rolling wave techniques.

PHASE EFFORT AND DEFINTION REQUIREMENTS

CURRENT PHASE		FUTURE PHASES			
Needs Study	Horizon One	Horizon Two	Horizon Three	Horizon Three	Horizon Three
	Needs Study	Optioneering	Outline Design	Detail Design	Construction
	Summaries holding costs and fully developed tasks holding resources	Summaries holding cost and resource with Phase Template tasks underneath	Summaries holding cost and resource with Phase Template tasks underneath	High Level Tasks holding cost and resources	High Level Tasks holding cost and resources
Concept	Horizon One	Horizon Two	Horizon Three	Horizon Three	Horizon Three
	Optioneering	Outline Design	Detail Design	Construction	Commissioning
	Summaries holding costs and fully developed tasks holding resources	Summaries holding cost and resource with Phase Template tasks underneath	High Level Tasks holding cost and resources	High Level Tasks holding cost and resources	High Level Tasks holding cost and resources
Prelim	Horizon One	Horizon Two	Horizon Three	Horizon Three	
	Outline Design	Detail Design	Construction	Commissioning	
	Summaries holding costs and fully developed tasks holding resources	Summaries holding cost and resource with Phase Template tasks underneath	High Level Tasks holding cost and resources	High Level Tasks holding cost and resources	
Detail Design	Horizon One	Horizon Two	Horizon Two		
	Detail Design	Construction	Commissioning		
	Summaries holding costs and fully developed tasks holding resources	Summaries holding costs and fully developed tasks holding resources	Summaries holding cost and resource with Phase Template tasks underneath		
Construction	Horizon One	Horizon One			
	Construction	Commissioning			
	Summaries holding costs and fully developed tasks holding resources	Summaries holding costs and fully developed tasks holding resources			
Commissioning	Horizon One				
	Commissioning				
	Summaries holding costs and fully developed tasks holding resources				