**Analogous and Parametric Estimating Template**

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**Slide 1 – (Title slide)**

The **objective** is to add to Microsoft Project **custom views** that support estimating. These features and associated techniques provide a major increase in the value of Microsoft Project.

The addition of **good estimates** enables good forecasts of the product **delivery** date. It is a projection **at the time** of the forecast. The date **can change** as productivity, impediments, issues, and change orders reveal themselves. However, date forecasting helps making **decisions** and prompts early schedule **recoveries**.

**Slide 2 - What you will see…**

Here’s what we’ll cover. I’m going to show a template for New Product Development projects. I’ve added 3 custom views to this template. I precede names of views with a number to keep them in logical rather than alphabetic sequence.

The view “04 - Estimating template initial data” sets up template estimating data based on a past, medium sized project. Then, a copy of the template makes a schedule for a specific future project.

In view “05 – Estimating the specific project” provides median and conservative estimates for the future project.

View “06 – Estimating data improvement” returns us to the template data.

After estimating, I’ll show how to enter justifiable shock absorbers and how to update correctly. At the end, I’ll show how to use File; Organizer to copy the associated artifacts – groups, fields, filters, tables, and views - to your schedule templates or project schedules. There are additional views in the template for status reporting.

**Slide 3 – Approach…**

The estimating views enable both analogous, or top down, and parametric, or bottom up, estimating. Reconciling these estimates can align expectations of your executives and team. My source material is a tool developed by PricewaterhouseCoopers while they had a software development contract business. Among literature are two Harvard Business Review articles that promote basing estimates on history and resolving top down and bottom up estimates.

**Slide 4 – Parametric Estimating – Example**

Here’s a peek at how Parametric Estimating works. The data in the template are not real data. They show how the formulas work, by examples.

To provide full control over tasks, at the bottom is the “Task Usage” view, with extra columns added.

Across the top of the view are column names. I precede their names with identifiers. “N13” means it is column Number13. “T15” means it is column Text15. These identifiers make it easier to interpret formulas entered inside the column headers.

For the task to produce the Acceptance Test Plan, column “N13 Work per item” shows 1.5 workhours which comes from the view “04 Estimating template initial data” view. It is multiplied by the 15 in column, “N14 Items in Project” to produce the estimate of 22.5 workhours in the “N3 Median Scaled” column.

After estimating all tasks, for purposes of executing the project, that whole column, “N3 Median Scaled” is copied and pasted into the Work column, thus affecting all Start and Finish dates in the schedule.

For a conservative estimate, the “Acceptance Test Plan” task is multiplied by 1.25, the “N18 High / Median” ratio. The result is used in setting the Project Estimating Uncertainty Buffer which is placed just ahead of the task to deliver the product to the customer.

At the end, the Summary Hi/Med column provides the uncertainty ratio resulting from all its detail tasks. The summery ratio is used in the Analogous Estimating schedule.

**Slide 5 – Analogous Estimating – Example**

Here’s a peek at how the Analogous Estimating works. It’s the same split view and column names although the columns are used differently.

The tasks are the summary tasks taken from the Parametric Estimating schedule. The schedule is baselined, indicating dates for the past, median sized project.

On line 62, the Developing summary task effort is 814 workhours. Let’s say, by analogy, the future project’s summary is expected to be 50% greater; thus, the multiplier is 1.5. For purposes of initial discussion with executives and customers, the high estimate becomes 1258 workhours. After baselining with high estimates, the column “N11 Work High” is copy pasted into the Work column. Thus, the Gantt Chart bars for the later tasks shift relative to their conservative dark baseline bars.

The Analogous Estimating schedule is useful for negotiating scope, resources, and thus the product delivery date.

The Parametric Estimating schedule is useful for executing the project.

**Slide 6 – Estimating Durations**

What’s wrong with estimating Durations if there are no project priorities?

A 20 hour task, performed 4 hours/day will take 1 work-week.

If 2 tasks need to move ahead, each will take 2 work-weeks.

If 3 tasks need to move ahead concurrently, each will take 3 work-weeks duration.

In these 3 cases, the work estimate is the same 20 workhours.

Thus, Work is stable, Durations depend on concurrent activities.

Since Microsoft Project opens showing the Duration column and so many users are self-educated, typically they estimate Durations and update by entering %-complete.

They are unable to level a schedule’s workload, improve their estimating data, or see when to recover their schedule.

**Slide 7 – Precision: Refined Work Definition**

Work can be decomposed into Level of Effort and Net Work.

Level of Effort is work not allocated to a particular task, e.g. time in meetings, doing status reports, doing interviews, etc. In meetings, numerous tasks and projects may be discussed, and no objects resulting from a task are produced.

Net Work is time producing task objects. It provides estimating precision.

Gross work is the **sum** of the two. It is the basis of project labor costs.

**Slide 8 – How do you get started?**

For a type of project, find a usable schedule template or make your own. Size it to represent a past, medium sized project so that it can be scaled for larger or smaller projects.

Include usual waiting times in predecessor lags since no work is performed on the task while waiting.

For unusual delays, insert an extra detail task so that it can be Inactivated before completing the template.

**Slide 9 – Past Project Interviews**

Meet with the resources who worked on that past project.

Ask for the workhours just used to produce each task’s output, excluding meetings, interviewing, status reporting, supervising, peer reviewing, etc.

Exclude risks because they will be covered by a Risk Reserve.

Ask how many persons produced each task’s output.

Ask on how many days during each task’s duration that work was performed.

Ask for each resource, the average workhours that were applied to tasks on days when work was performed.

Ask about the pace: low, medium, or high productivity.

Ask how many items the task involved. How many needs, modules, customers, pages, etc.

Calculate the workhours performed on the task. Adjust the estimate so that the task result would have the intended quality.

Ask for the uncertainty in estimating each task. Ask for the estimate that would be sufficient in 80% of the cases. To get the median value, ask for the estimate in cases where there would be equal likelihood of the Actual Work being above or below the estimate. Calculate a ratio: High estimate divided by median estimate.

Ask about risks for potential delays and their likelihoods for future projects.

Use Save-as to save the schedule, and on the line below File Name, select Microsoft Project Template.

A popup appears asking if you want to delete data. Just click OK to complete the save. The file will have an extension of .mpt.

**Slide 10 – Forecast the future project**

Make a copy of the template and save the copy as a project using the name of a specific project. The file will have an extension of .mpp.

Enter data in the unshaded columns; the columns shaded green have formulas in their headers.

For a specific project larger than the template, the column, “N14 Items in Project” values would mostly be larger than Items in column, “N16 Items in Template”; less in a project smaller than the template.

Review the High / Median ratios for consistency so the more uncertain tasks have higher ratios.

Toward the end of the schedule, just before the task for product delivery to the customer, enter 3 milestones.

Name them from the top milestone to the last: Deadline, Risk Reserve, and Estimating Uncertainty Buffer. Link them by predecessors. For each in “Work Number” enter 0 and in “Items in Template” enter 1.

Double click the task named Deadline; in Advanced tab; Deadline, enter the Finish date of the predecessor.

On the Risk Reserve predecessor add a lag corresponding to the largest risk of delay that would not terminate the project. Better is to set the lag to the sum of potential risk delays, times their likelihoods after mitigations.

Calculate the “Estimating Uncertainty Buffer” as follows: in the “Work” column paste the High Estimates column and get the Deadline date. Then in the Work column, paste the Median Estimates column and get the Deadline date. Size the Buffer as half the difference between these dates. Type that date in the Buffer’s Start column and add it to the task’s name. That date is the product delivery commitment date. It will be reset only if unknown risks, issues, or change orders occur.

**Slide 11 – Update Correctly**

Update the schedule using view, ”10 Tracking Gantt 2”. It has the needed columns sequenced appropriately. Update each task entering Actual Start, Actual Work, and a fresh estimate of Remaining Work.

Updating by entering %-complete is not appropriate because it’s formula is

100 \* Actual Duration divided by Duration.

It’s an output that measures the passage of time, not the progress toward the task’s objective. %-complete can be typed into the Physical-%-Complete column. To the right of the Physical-%-Complete column is a column of traffic lights, warning if Physical-%-Complete is considerably less than the calculated %-complete. Next to the right is a column, “T18 Cause”. It contains dropdown entries for several possible reasons for troubles. The more frequent causes may be brought to the attention of executives.

Initial updating enables adjustments to downstream task estimates. After the first task by each resource, if the task’s Peak units differ substantially from Assignment Units, discuss with the resource adjusting their Assignment Units for all their remaining tasks using the view, “07 Resource Usage – Assignment Units”.

After the first task for each parameter, if total Actual Work differs substantially from the estimated Work Number, consider adjusting the “N14 Items in Project” for all that factor’s remaining tasks.

After each updating session, check the days remaining in the Estimating Uncertainty Buffer. If penetrated 1/3, plan schedule recovery. If penetrated 2/3, implement the recovery plan.

**Slide 12 – Improve Estimating Data**

Now we come to the huge step forward in the value of Microsoft Project.

As each task is finished, the cycle can be closed between updating and the continuous improvement of estimating data for all the template’s future project schedules.

If the execution of the just finished task was common, that is, not a special case, then switch to the view, “06 Estimating data improvement”. If the Actual Work differs from the “N3 Median Scaled” estimate, enter in the column, “F17 Use” a “Yes”. In the column “N10 Yes: Observations + 1”, increment the number so that the “T20 New Work Number” will be adjusted less and less as would be the case if additional observations were averaged into an accumulating set of data.

Copy the new work number and paste it into the template’s view, “04 Template Initial Data” for the task’s “T21 Work Number” column. In the “05 Estimating the specific project”, consider adjusting the “N18 High / Median” ratio for that task.

That’s it. They updating and estimating cycle is now a closed loop.

**Slide 13 – Tricks necessary in Microsoft Project**

There are two tricks used in setting up the template.

The first problem is that an update to Actual Work modifies the Work data. But, to improve estimating data the starting value of Work needs to be retained until it is improved. The trick is to copy the Work column into a Text column, “T21 Work Number”.

The second problem is that the Work data ends in “… hrs” which a formula can’t handle. The trick is to replace the “ hrs” with nothing, making it useful as a numeric value.

**Slide 14 – How to Make an Analogous Schedule – 1 of 2**

To make an Analogous Schedule, use the view, “02 Gantt Chart 2”. If not using the Project Summary Task on row 0, set Outline to Level 1, which will show just the high level summary tasks. Then the analogous schedule can be inserted on lines below the lines of the parametric schedule.

If using the Project Summary Task on row 0, set Outline to Level 2. However the analogous schedule then needs to be in a separate file.

Copy the columns for Task Names, Work, and Duration. Paste them where the analogous schedule is to appear. Above these tasks, enter a summary task.

Change the detail tasks to Fixed Work.

One task at a time, in Resource Name, enter “Resource”. If the Duration changes, replace it. Microsoft Project calculates the Assignment Units.

Then change all tasks back to Fixed Units, Effort Driven: No.

Slide 15 - **How to Make an Analogous Schedule – 2 of 2**

Link the analogous detail tasks with predecessors to match their Finish dates with those of the parametric schedule’s summary tasks.

In the view, “04 Template Initial Data”, copy the column Work and paste into column, “T21 Work Number”. Replace “ hrs” with nothing so that the data can be used in a formula.

In column “N16 Items in Template” enter “1” and drag to all tasks.

Set Baseline.

To scale the Analogous schedule use multipliers in the column “N14 Items in Project”.

**Slide 16 – How do I Scale the Analogous Schedule?**

In the view, “05 Estimating the Specific Project” in the column, “14N Items in Project” enter scaling multipliers on each task.

Then copy the column, “N11 Work High”, and paste it in to the Work column.

The analogous schedule can be used in negotiating the product delivery date and labor cost, according to adjustments to scope and resources.

**Slide 17 How do I Scale Data Parametrically: ways 1 & 2**

In the specific, parametric schedule, scaling data copied from the template involves 4 techniques.

**Fixed:** Some tasks are the same size regardless of the specific project being larger or smaller than the template. For them, the column, “T15 Factor” can be set to “Fixed” or “Same” for instance. For them, the “N16 Items in Template” and “N14 Items in Project” are both set to “1”.

**Pages:** For tasks that produce documents, the estimate is based on the work to produce an average new page. So, the estimated number of equivalent new pages is entered in the “N14 Items in Project” and the “T21 Work Number” is adjusted to get the expected hours per page.

**Slide 18 - How do I Scale Data Parametrically: ways 3 & 4**

**Analogous:** For tasks that involve a single item, the “N16 Items in Template” is “1”, and in the specific schedule the “N14 Items in Project” is a multiplier.

**Parametric:** For tasks that involve quantities of items, those quantities are entered in the template’s “N16 Items in Template” and the scaled up or down quantities are entered in the specific schedule’s “N14 Items in Project”.

**Slide 19 – Are there other considerations?**

The “N14 Items in Project” can be biased to account for other considerations; for instance skills, knowledge, facilities, tools, methods, security, etc.

Another technique is to decompose creative tasks into discover and implementation tasks like search and recovery activities. The discovery efforts have large uncertainty; the implementation effort can have much less uncertainty.

The discovery task can be limited by budget. The high estimate can cover 80% of the total, planned search. The median estimate is half the total search effort, since it is unknown if the objective will be found in the first or second half of the search.

**Slide 20 – How to copy views to your templates?**

The features included in the template you download can be copied to other schedule templates and project schedules. Since the estimating and reporting views included use such a large number of custom fields and tables, it would be better not to copy the features to the Microsoft Project’s “Global” template.

The key is to copy the artifacts from the right tab to the left, starting with Groups and ending up with the views.

**Slide 21 – Summary of Approach**

To summarize the approach, start by making a schedule template with unit-effort estimating data from a past, medium sized project.

Exclude considerations covered by techniques other than estimating, such as risks, issues, and change requests.

Do include improvements that would affect estimating.

Make a specific project schedule by copying the schedule template.

Scale the data for equivalent new pages, items in the project, or multipliers.

Adjust “items in project” for other considerations, such as knowledge, complexity, productivity, etc.

Relate medium and high estimates using ratios so that the ratios can be compared for consistency among all tasks. In the parametric schedule, the high estimates are only used for setting the Estimating Uncertainty Buffer.

Execute projects using median estimates.

**Slide 22 – Conclusions: Connect estimating & Tracking**

Get resources to start as soon as possible the tasks on the critical path. Get them to apply the hours per day they are assigned for producing tasks deliverables.

Update with Actual Start, Actual and Remaining Work, and adjustments to resource Assignment Units. All progress is to appear in the past; all incomplete work is to appear in the future.

Upon updating the first task each factor, adjust “Items in Project” on its subsequent tasks.

Upon updating the first task with each resource, discuss adjusting their Assignment Units.

Don’t update by entering %-complete because it has no effect on a task’s finish date, leaves incomplete parts of a task in the past, or shows progress has already been made at a future time.

As tasks finish without special causes, improve estimating data in the schedule template.

**Slide 24 – What did you see**

You’ve seen parametric estimating, which enables making an analogous estimating schedule.

You know how to get work data from a past project and set up unit-effort values.

You’ve seen the addition of a project Deadline and justifiable shock absorbers for risks and estimating uncertainty. The uncertainty buffer can trigger schedule recovery on near term, large tasks using fast tracking tasks with different resources, crashing, or crunching. Crashing is adding resources to a task, or adding to the resource’s Assignment Units. Crunching is assigning resources more than 8 hours per day or 40 hours per week. According to productivity literature, Crunching is only effective for up to two weeks before productivity declines to less than the 40 hours per week level.

As a result of completing projects on-time, full scope, and adequately tested, you should expect a bonus, raise, or promotion. You’ll be asked to manage more projects, more complex projects, programs, portfolios, etc.