This document is a detailed Product cum the user manual for the Microsoft Project add-in tool named PERT Plus from Proventures Consulting. This tool contains Schedule Analyzer, PERT Analysis and RACI Matrix

# PERT +

PERT Plus – Microsoft Project Proprietory Add-in software

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# 1. PERT Plus Overview

PERT Plus brings to the user of the Microsoft Project 2013/2016, the following features to enhance the quality of the schedule and features. The product is being sold and distributed with the name **PERT Plus**. The suite comes with the following components in the current release [Version 3.0]

1.  **Schedule Optimizer:** This module performs a diagnostic check on your schedule against a set of 20+ scheduling guidelines and best practices as prescribed by Project Management Institute (PMI) Practice Standard for Scheduling Edition 2 and US Defense Contract Management Agency (DCMA)

2.  **PERT Analysis and Contingency planning:** You can create a three-point estimate for each activity or selected tasks and apply BETA distribution to calculate the expected duration and see how it compares with the deterministic estimate. If the estimates need correction it can be made for selected tasks or complete range of activities. Contingency planning features helps you to calculate the activity level standard distribution and roll up to project level and build a contingency at the end of the project in the form of a buffer tasks with 1 α (One Standard deviation) for 84% confidential level or 2α (Two Standard deviations) for 97.75% Confidential level. You can also add resource and cost buffer at the same proportion to the overall project effort and / or cost. This utility can also be used to practice **Critical Chain Project Management (CCPM)**

3.  **RACI Matrix:** This feature helps the user to identify deliverables / artifacts within the project and build RACI matrix [ R- Responsible, A – Accountable, C – To be consulted, I – to be informed]. We intend to add more modules.

# 2. Installation and Licensing

## Install PERT Plus Add-in [Project 2013/2016]

**Applies To:** *Microsoft Project 2013, Microsoft Project 2016*

This topic describes how to install Schedule Optimizer Add-in Setup using Microsoft Install Shield wizard.

Use the PERT Plus Project Client Add-in to validate the integrity of the Microsoft Project schedule developed. When you install the Project Client Add-in, a new contextual tab for Microsoft Project "ADD-INS" is created on the ribbon in Project. Users can use the controls on this tab to analyze the schedule developed.

**Before you install the Office Add-ins**

The following software must be already installed on a computer before Project Add-in can be installed:

Microsoft .NET Framework 4.0
Microsoft Project 2013/2016

**Install the Office Add-ins**

Use this procedure to install the files for the Project Add-in on a client computer. If you are installing other software at the same time, you may have to wait for it to complete.

1.  Double Click PERT Plus Setup. Under Welcome Screen, Click Next.
2.  Under License Agreement. Select I accept the terms in the license agreement and Click next.
3.  If the Setup Support files have not yet been installed on this computer, the Ready to install the program page is displayed. The Setup Support files are required for installation.
4.  On the Ready to install page, click Install.
5.  After the installation is completed, click Finish to close the wizard.
6.  The first time that you open Project on a computer where the Office Add-ins component was installed, you are shown the add-in Tab with the Schedule Optimizer Features.

# Uninstall PERT Plus Add-in

You can uninstall PERT Plus from Programs and Features in the Control Panel.

1. Go to Control Panel.
   a. On the Start screen, type Control Panel, and select Control Panel in the search results (or) In Windows 7 or Vista, choose Start > Control Panel.
2. Choose Programs > Programs and Features.
3. Choose the Schedule Optimizer Add-in Software you want to uninstall and choose Uninstall.

# Activating PERT Plus

It is essential to go through the activation process before you start using the product.

### Starting Trial of PERT Plus

You can start using the trial version of Schedule Optimizer immediately after installation.

After Installing the Add-in, opening any Project (mpp) file will display the PERT Plus Activation window where you can click on **Continue Trial** to use the Trial Version, your Trial period starts from the first time you open Microsoft Project after the installation.
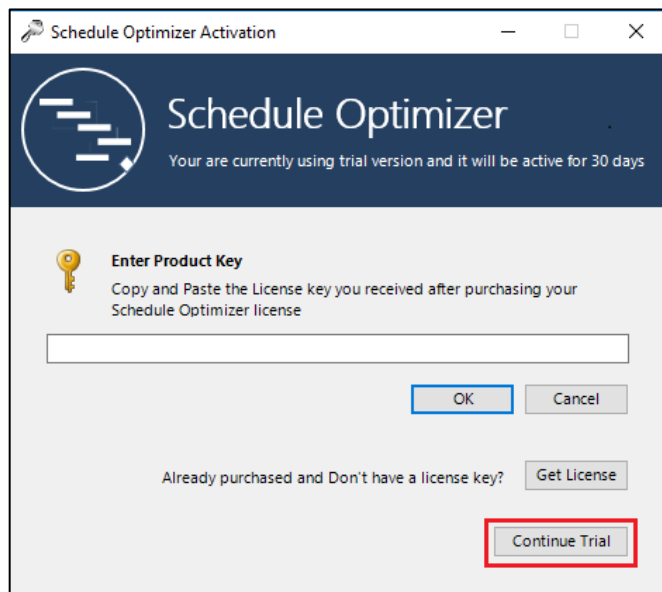


The trial version of PERT Plus is the best way to evaluate the complete features of the product. The trail version has the same content as that of the full version. You can use the trial for 30 days. After

the trial period of 30 days, the product needs to be activated, for which the license key can be received from the support team on purchase of the product

### Activating PERT Plus License

The tool displays the activation window for every 7days to remind about the Trial Period. To start using PERT Plus without the trial period limitations, you need to obtain a product license and activate it.
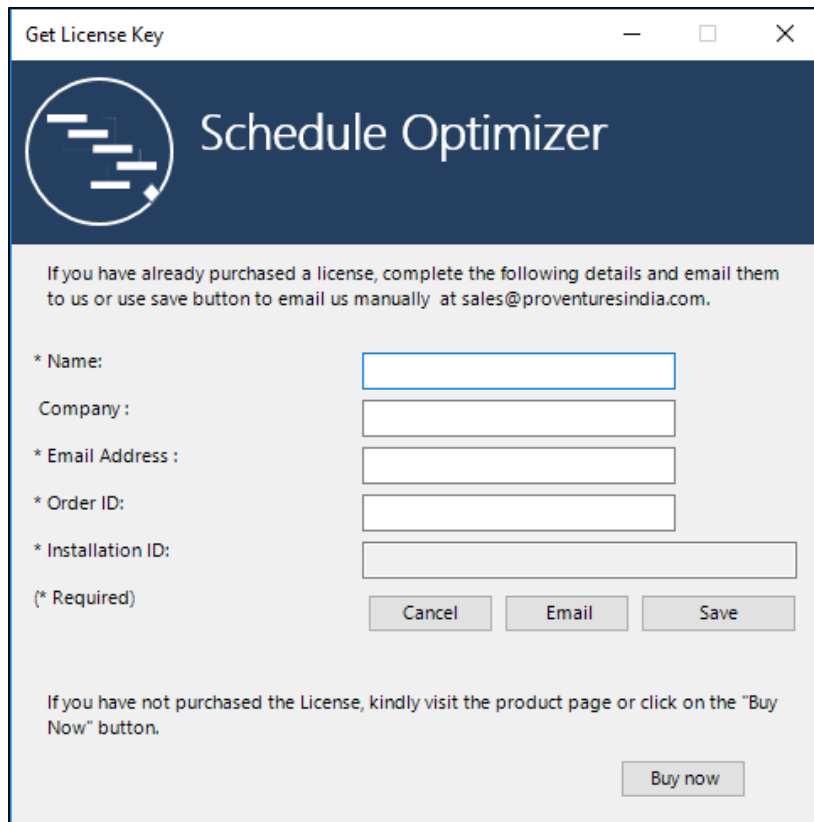
**To Activate:**

The activation window allows you to paste the license key obtained after purchasing the product, if you have not received the license key you can request the support team for the key, following the below Navigation steps to send a license activation request from the tool:

1. Open Microsoft Project.
    a. On the **Start** screen, type **Project**, and select **Project** in the search results (or) In Windows 7 or Vista, choose **Start** > **Project**.
2. Choose **Blank Project** > From Project Ribbon Click on **Add-ins** > **Activate** > **Get License** > Fill in the details

After filling the details, there are two options for sending the details:

**Option1 – when Outlook is configured:** Click **Email**. (Clicking Email button sends the email from your outlook. After Email is sent, a dialog box appears **"Mail sent successfully!!"** Click **OK** > **Cancel**.

**Option2 – when Outlook is not configured:** Click **Save**, Details are opened in a notepad, Copy and paste the details into any of your email clients and send them to sales@proventuresindia.com.  Once the Email is sent, Click on **Cancel**, to get the License Key Form.

Once you receive the License key from the Support Team, paste it into the PERT Plus Activation form and click **OK**.

Follow the Navigation steps to enter the license key into the tool:

1. Open Microsoft Project.
   a. On the **Start** screen, type **Project**, and select **Project** in the search results (or) In Windows 7 or Vista, choose **Start** > **Project**.
2. Choose **Blank Project** > From Project Ribbon Click on **Add-ins** > **Activate** > Enter License Key > OK
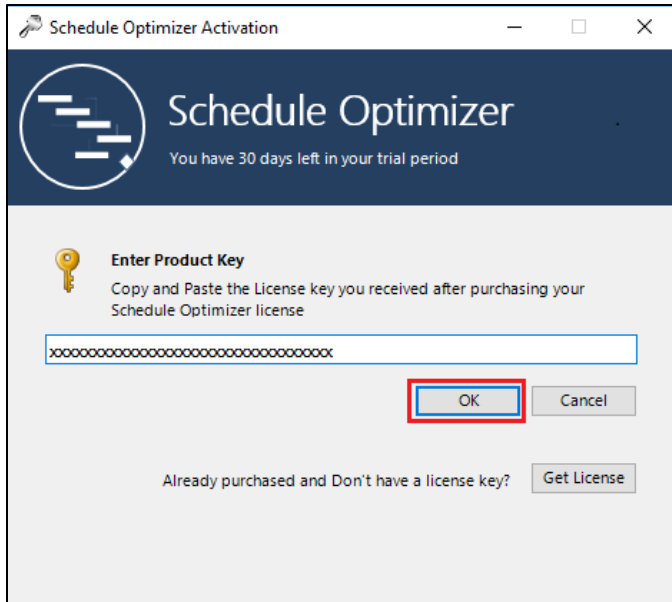
**Activation process should be complete after you enter the license key. If the license is not activated, you may have to check the product key with the support team.**

**After Activation**

You may verify the activation status, by selecting **About** icon in the MS Project **Add-ins** Ribbon.
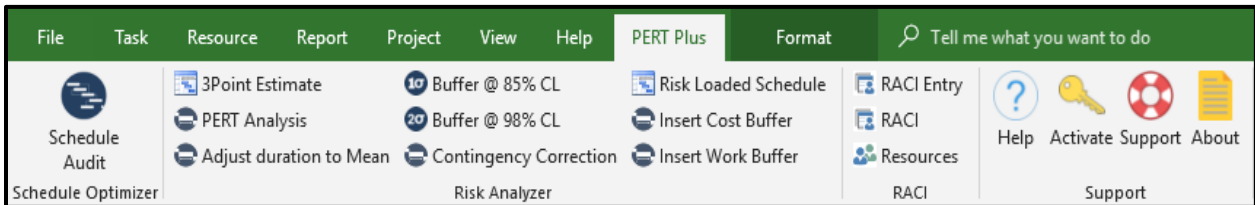


The license activation binds the product to the operating system of a given computer and since the activation is limited to your computer, you can use the same License key in case you want to reinstall the operating system. To activate the license on another computer you may have to go through the Get License Key Wizard process again.

# 3. Module 1 - Schedule Optimizer

Proventures Project PERT Plus is a COM Add-in to Microsoft Project 2013/2016. After the Installation process, Add-in can be accessed in the Microsoft Project Ribbon, PERT Plus Tab.
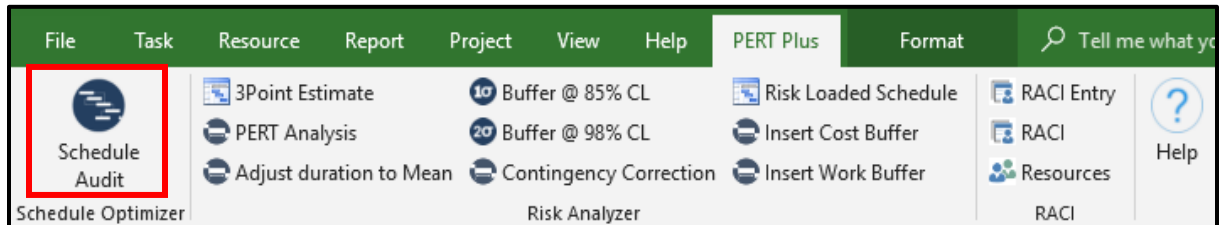


PERT Plus COM Add-in analyses the schedule for Non-Compliance against the Best Practices identified by Proventures from PMI's Practice Standard for Scheduling to improve the quality of schedule.

Few of the best practices validated in the Project Schedule Optimizer Add-in are as follows:

- Tasks with Out-of-Sequence (OOS) Errors
- Tasks with missing Baseline info
- Tasks using Task Calendars
- Lowest level WBS/Outline used
- Summary Tasks with only one detail task
- Tasks with Soft Constraints
- Tasks with Hard Constraints
- Tasks with Deadlines
- Tasks without Predecessors
- Tasks without Successors (loose ends)
- Summary Tasks with Dependencies
- Tasks with Positive Lags (+)
- Tasks with Negative Lags (-)
- Tasks with Negative Total Slack
- Tasks with Concurrency Failures
- Tasks with Concurrency Warnings
- Percentage of All Detail Tasks/Milestones fully Networked
- Percentage of Remaining Tasks fully Networked

## 3.1 Project Information:

Schedule Optimizer analyses the project data in the current MPP plan and displays a high-level project information as shown below.
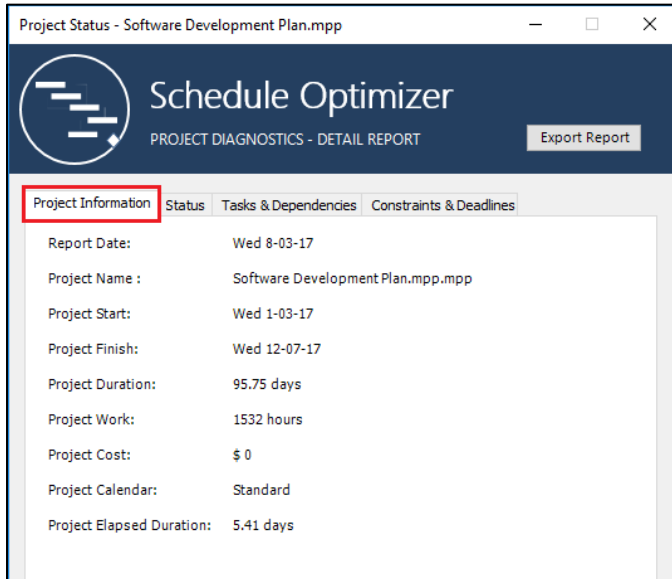


| Project Information TAB | |
|---|---|
| Report Date | Today's Date |
| Project Name | Project Name |
| Project Start | Project Start date |
| Project Finish | Project End date |
| Project Duration | Duration of Project (Days) |
| Project Work | Total Project Work (Hours) |
| Project Cost | Total Project Cost |
| Project Calendar | Project Calendar |
| Project Elapsed Duration | Duration between Project Status and Project Start. It follows the Project calendar |

## 3.2 Status
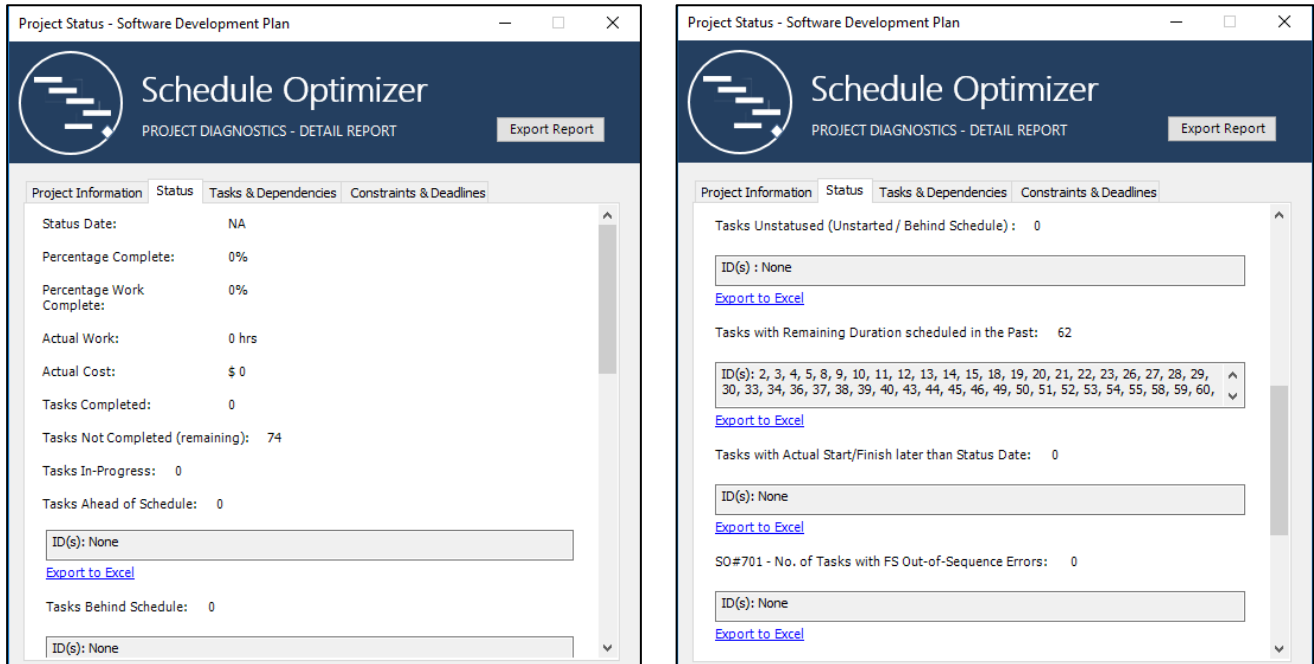
Schedule Optimizer analyses the project data in the current MPP plan and displays Status related Information as shown below.



| Project Status Tab | |
| --- | --- |
| Status Date: | Status date |
| Project Elapsed Duration | This gives you duration between Project Status and Project Start. It follows the Project calendar |
| % Complete | Percentage Complete |
| % Work Complete | Percentage Work Complete |
| Actual Work | Actual Work |
| Actual Cost | Actual Cost |
| Tasks Completed | Number of tasks completed |
| Tasks Not Completed | Number of tasks not Started and In Progress |
| Tasks in Progress | Number of tasks Started but not completed yet. |

Regardless of the physical level and depth of the overall schedule, it is recommended that the following schedule level definitions be used:

1. Level 1—Executive Summary. This is a summary level schedule, usually only one page that will include the major contractual milestones and summary level activities.

2. Level 2—Management Summary. This is a more extensive summary level schedule, usually four to five pages that will include the Level 1 and report on similar activities by area or capital equipment.

3. Level 3—Publication Schedule. This will be the level of detail used to support the monthly report. It will include all major milestones, major elements of engineering, procurement, construction, and start-up.

4. Level 4—Execution Planning. This supports the construction and commissioning teams in their overall planning of the project. All activities of over a week's duration should normally be shown. The 3-week look-**ahead schedule** is produced from Level 4 and above.

5. Level 5—Detailed Planning. This level of detail will support the short-term planning for the field, normally for those activities of less than 1-week duration. Workarounds and critical areas can be exploded here

## 3.2.1 Tasks Ahead of Schedule:

This feature compares the Current Task **Finish Date** with the Task **Baseline Finish** Date and if the **Current Finish** date is earlier than the task's **Baseline Finish** date, that task will be displayed as an Ahead of Schedule task.

Assumptions: It will not display the Summary Tasks and Recurring tasks.



## 3.2.2 Tasks behind Schedule:

This validation will check as to whether the **Project Status Date** has been set or not. Then it will calculate the difference between the Task **Baseline Start Date** and the **Project Status Date** and compares the difference with the Task's **Actual Duration**. If the Tasks **Actual Duration** is less than the difference value, then that task will be displayed as Behind Scheduled task.

Assumptions: Add-in will not display the summary Tasks and Recurring tasks.



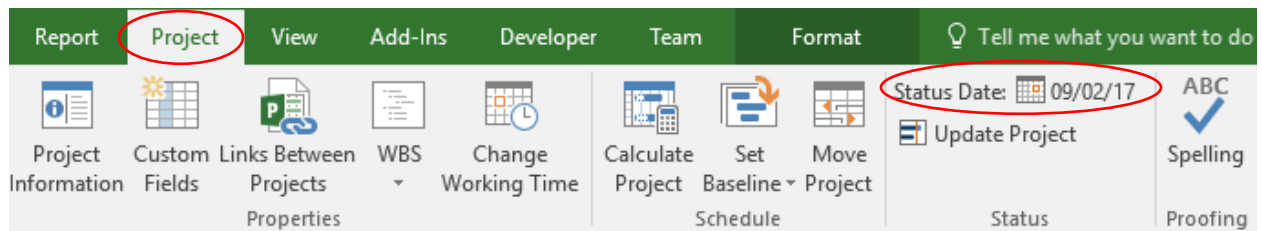## 3.2.3 Tasks with Actual Start/Finish later than Status Date:

This validation, will first check as to whether the **Project Status Date** has been set in the current MPP plan. It will then check for the below given two conditions for all the tasks in the MPP plan.

Whether -Task **Actual Start Date** is greater than **Project Status Date**

Or

Whether- Task **Actual Finish Date** is greater than **Project Status Date**

If any one of the above conditions is true, then that task will be displayed in the '**Tasks with Actual Start/Finish** later than **Project Status Date** session.



## 3.2.4 No of Tasks with Out-of-Sequence (OOS) Errors (SO#701):

**Out of Sequence (OOS) Logic:**

OOS logic arises when a project is already in progress. An activity may be reported as started before its predecessor is reported as finished, causing OOS logic. For example, if Activity A has a finish-to-start (FS) relationship with Activity B, but Activity B has been updated with an actual start date before Activity A has been updated with an actual finish date, the result is OOS logic. OOS logic should be corrected (e.g., by further decomposition of Activity A) or removed in order to preserve the integrity of the risk analysis. Schedule analysis will properly identify how best to resolve OOS logic problems; however, **do not rely** solely on the scheduling tool to correct the problem, because only the team can best determine the OOS logic resolution. In some cases, it may be that the defined relationship created during the planning stage was not correct and hence should be corrected for this project and for future reference

First it will check for Baseline Start and Baseline Finish dates of both Predecessor and successor tasks. And, it will also, check for relationship between the Predecessor and the successor.

1. Finish – to – Start
2. Start-to-Start (SS)
3. Finish-to-Finish (FF)
4. Start-to-Finish (SF)

## 1. Finish-to-Start (FS):

Specific for two activities where, the successor activity cannot be started until the predecessor activity is completed.

All activities, except the first and last activity, shall have at least one "?S" predecessor relationship and one "F?" successor relationship, where "?" can be either an S or F, regardless of any other relationships that may be present (where S stands for start and F stands for finish) and this is typically, the most commonly used relationship.

In this relationship, the following conditions will be checked:

❖ **Predecessor has No Actual Finish, but Successor has Actual Start**

| Task Name | Actual Start | Actual Finish | % Complete | Predecessors | Duration | Feb '17 | | | | | Ma |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 22 | 29 | 05 | 12 | 19 | 26 |
| ⊿ FS_OOS_Erros | Mon 30/01/17 | NA | 58% | | 24 days | | | | | | |
| Predecessor | Mon 30/01/17 | NA | 75% | | 16 days | | | | | | |
| Successor | Tue 31/01/17 | NA | 25% | 1 | 8 days | | | | | | |

❖ **Predecessor has Actual Finish but Successor's Actual Start is earlier than Predecessor's Finish + lag**

| ID | Task Name | Actual Start | Actual Finish | % Complete | Predecessors | Duration | Feb '17 | | | | Mar '17 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 29 | 05 | 12 | 19 | 26 | 05 |
| 0 | ⊿ FS_OOS_Erros | Mon 30/01/17 | NA | 54% | | 24 days | | | | | | |
| 1 | Predecessor | Mon 30/01/17 | Fri 03/02/17 | 100% | | 5 days | | | | | | |
| 2 | Successor | Tue 31/01/17 | NA | 25% | 1 | 8 days | | | | | | |

## 2. Start-to-Start (SS):

Specific for two activities where, the successor activity cannot be started until the predecessor activity is started.

All activities, except the first and last activities, shall have at least one "?S" predecessor relationship and one "F?" successor relationship, where "?"can be either an S or F, regardless of any other relationships that may be present (where S stands for start and F stands for finish).

In this relationship, the following conditions will be checked:

❖ **If Predecessor has No Actual Start but Successor has Actual Start**

| ID | Task Name | Predecessors | Actual Start | Actual Finish | Finish | Predecessors | % Complete | Qtr 1, 2017 Jan | Feb |
|----|-----------|--------------|--------------|---------------|--------|--------------|-----------|-----------------|-----|
| 0 | ◢ SS_OOS_Erros | | Mon 30/01/17 | NA | Mon 20/02/17 | | 33% | | |
| 1 | Predecessor | | NA | NA | Mon 20/02/17 | | 0% | | |
| 2 | Successor | 1SS | Mon 30/01/17 | Fri 17/02/17 | Fri 17/02/17 | 1SS | 100% | | |

❖ **If Predecessor has Actual Start and Successor Has Start earlier than Predecessor Start + lag**

| ID | Task Name | Predecessors | Actual Start | Actual Finish | Finish | % Complete | Predecessors | Duration | Qtr 1, 2017 Jan | Feb |
|----|-----------|--------------|--------------|---------------|--------|-----------|--------------|----------|-----------------|-----|
| 0 | ◢ SS_OOS_Erros | | Fri 27/01/17 | NA | Mon 20/02/17 | 0% | | 17 days? | | |
| 1 | Task 1 | | Mon 30/01/17 | NA | Mon 20/02/17 | 0% | | 16 days | | |
| 2 | Predecessor | 1SS | Mon 30/01/17 | NA | Wed 08/02/17 | 0% | 1SS | 8 days | | |
| 3 | Successor | 2SS | Fri 27/01/17 | NA | Mon 30/01/17 | 0% | 2SS | 1 day? | | |

3. **Finish-to-Finish (FF):**
Specific for two activities where, the successor activity cannot be completed until the predecessor activity is completed.
All activities, except the first and last activities, shall have at least one "?S" predecessor relationship and one "F?" successor relationship, where "?" can be either an S or F, regardless of any other relationships that may be present (where S stands for start and F stands for finish).

In this relationship, the following conditions will be checked:

❖ **If Predecessor has No Actual Finish but Successor has Actual Finish**
❖ **If Predecessor has Actual Finish and Successor's Finish is earlier than Predecessor Finish + lag**

| ID | Task Name | Predecessors | Actual Start | Actual Finish | Finish | % Complete | Predecessors | Duration | Qtr 1, 2017 Jan | Feb |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | ▲ FF_OOS_Erros | | Mon 30/01/17 | NA | Mon 20/02/17 | 50% | | 16 days | | |
| 1 | Predecessor | | Mon 30/01/17 | NA | Mon 20/02/17 | 25% | | 16 days | | |
| 2 | Successor | 1FF+2 days | Wed 08/02/17 | Fri 17/02/17 | Fri 17/02/17 | 100% | 1FF+2 days | 8 days | | |

4. **Start-to-Finish (SF):**

Specific for two activities where the successor activity cannot be finished until the predecessor activity is started.

All activities, except the first and last activity, shall have at least one "? S" predecessor Relationship and one "F?" successor relationship, where "?" can be either an S or F, regardless of any other relationships that may be present (where S stands for start and F stands for finish)

In this relationship, the following conditions will be checked:

   ❖ **If Predecessor has No Actual Start and Successor has Actual Finish**

| ID | Task Name | Predecessors | Actual Start | Actual Finish | % Complete | Predecessors | Qtr 1, 2017 Jan | Feb |
|---|---|---|---|---|---|---|---|---|
| 0 | ▲ SF_OOS_Erros | | Mon 30/01/17 | NA | 20% | | | |
| 1 | Predecessor | | NA | NA | 0% | | | |
| 2 | Successor | 1SF | Tue 14/02/17 | Fri 17/02/17 | 100% | 1SF | | |

   ❖ **If predecessor has Actual Start and Successor's Finish is later than Successor Finish + lag**

| ID | Task Name | Predecessors | Actual Start | Actual Finish | Finish | % Complete | Predecessors | Qtr 1, 2017 Jan | Feb |
|---|---|---|---|---|---|---|---|---|---|
| 0 | ▲ SF_OOS_Erros | | Mon 30/01/17 | NA | Mon 20/02/17 | 50% | | | |
| 1 | Predecessor | | Mon 30/01/17 | NA | Mon 20/02/17 | 25% | | | |
| 2 | Successor | 1SF+2 days | Wed 08/02/17 | Fri 17/02/17 | Fri 17/02/17 | 100% | 1SF+2 days | | |

## 3.3 Tasks & Dependencies

Schedule Optimizer analyses the project data in the current MPP plan and displays Tasks and Dependencies related Information as shown below

### 3.3.1 Total Number of Tasks (SO#702)

This gives the total number of Tasks (activities) in the project. (Summary Tasks, Milestones and Recurring tasks.)

### 3.3.2 Total Number of Summary Tasks (SO#703)

Summary tasks are those that have subordinate tasks below them (i.e. a Parent/Child relationship) where the Summary field equals "Yes".

This will count and display the number of summary tasks in the current plan. A summary task is made up of subtasks, and it shows their combined information.



### 3.3.3 Detailed Tasks (SO#704)

This will give you the number of detailed tasks in the project. A detailed task should follow the bellow rules:

1. Summary equals "No";
2. Milestone equals "No"
3. Recurring equals "No"

## 3.3.4 Recurring Tasks (SO#705)

If you have a task that will happen every couple of days or every month — any regular schedule, — Project can help you create it as a recurring task, and therefore you will have to set it up only once.

Examples would be the hour-long staff meeting every Monday or the weekly or monthly report that's due at the end of each month.

This will give the number of tasks that are considered "**Recurring**".  (Recurring field equals "Yes".)

| ID | Task Name | Recurring | Work | Actual Work | Duration |
|---|---|---|---|---|---|
| 0 | ▲ Recurring Tasks | No | 0 hrs | 0 hrs | 1 day |
| 1 | ▲ Weekly Recurring Task | Yes | 0 hrs | 0 hrs | 1 day |
| 2 | Weekly Recurring Task 1 | Yes | 0 hrs | 0 hrs | 1 day |
| 3 | ▲ Weekly Recurring Task 2 | Yes | 0 hrs | 0 hrs | 1 day |
| 4 | Weekly Recurring Task 2 1 | Yes | 0 hrs | 0 hrs | 1 day |

## 3.3.5 External Tasks (SO#706)

The External Task indicates whether the task is linked from another project or whether it has originated from the current project.

If the task is linked from another project, that is, if it is a predecessor or successor from another project, the value is Yes. If the task was created in this project, the value is No. This gives you the total number of external tasks in the project plan.

## 3.3.6 No. of Tasks with missing Baseline info: (SO#707)

A baseline is a group of nearly 20 primary reference points (in five categories: start dates, finish dates, durations, work, and cost estimates) that you can set to record the original project plan when the plan is completed and refined. As the project progresses, you can set additional baselines (to a total of 11 for each project) to help measure changes in the plan.

This metric is particularly useful when the project is underway and new tasks are added.  It will help identify where new tasks have not been added to the baseline.

This will check for the following conditions and give you the number of tasks.

Assumptions:

- Task should be baseline (**Baseline Start** & **Baseline finish** Not Equal to **NA**)
- If Task is not a Milestone, then **Baseline Duration** should not be ZERO (0)

- When no **Resource** is on a task then **Work** is Zero

| ID | Task Name | Milestone | Baseline Duration | Duration | Work | Resource Names | Baseline Start | Baseline Finish | % Complete | February 2017 28 | 31 | 03 | 06 |
|----|-----------|-----------|-------------------|----------|------|----------------|----------------|-----------------|------------|------|----|----|----|
| 0 | ⊿ Missing Baseline Info | No | 5 days | 6 days? | 0 hrs | | Mon 30/01/17 | Fri 03/02/17 | 0% | | | | |
| 1 | Not Milestone But Baseline Duraion is Zero | No | 0 days | 5 days | 0 hrs | | Mon 30/01/17 | Fri 03/02/17 | 0% | | | | |
| 2 | Resource Assigned But Work is zero | Yes | 5 days | 0 days | 0 hrs | Resource 1 | Mon 30/01/17 | Mon 30/01/17 | 0% | | | 03/02 | |
| 3 | Task Not baselined | No | 5 days | 1 day? | 0 hrs | | NA | NA | 0% | | | | |

## 3.3.7 No. of Tasks using Task Calendars: (SO#708)

This defines the working period for the task. The **Task calendar** overrides the **Project calendar** for those tasks to which it is applied.

This feature will give you the number of tasks when the **Task Calendar** field does not equal the default **Project Calendar** assigned to the project under the Project, Project Information menu. **Task calendars** are used when a specific task must be scheduled to a different calendar of working days than the default **Project Calendar**.

Internally this feature will check for the bellow condition:

**Task Calendar is not NONE**

| ID | Task Name | Task Calendar | Start | Finish | Duration | Feb '17 29 | 05 | 12 | 19 |
|----|-----------|---------------|-------|--------|----------|------|----|----|----|
| 0 | ⊿ **Tasks using task calenders** | **None** | **Mon 30/01/17** | **Fri 24/02/17** | **20 days** | | | | |
| 1 | Task Using Project calendar 1 | None | Mon 30/01/17 | Fri 03/02/17 | 5 days | | | | |
| 2 | Task Using Project calendar 2 | None | Mon 06/02/17 | Fri 10/02/17 | 5 days | | | | |
| 3 | Task Using Project calendar 3 | None | Mon 13/02/17 | Fri 17/02/17 | 5 days | | | | |
| 4 | Task Using Task Calandar | Task Calander | Mon 20/02/17 | Fri 24/02/17 | 5 days | | | | |

## 3.3.8 Lowest level WBS/Outline used: (SO#709)

This feature will show the lowest level of the outline structure in the project. In other words, this will tell you, how many levels deep (indentation) is the project. This will display "Highest number in the **Outline Level**" field.

| Task Name | Duration | Start | Finish | Outline Level | b '17 05 | 12 | 19 | 26 | Mar '17 05 |
|-----------|----------|-------|--------|---------------|------|----|----|----|------|
| ⊿ **Software Development** | **3.5 days** | **Fri 10/02/17** | **Wed 15/02/17** | **0** | | | | | |
| ⊿ **Scope** | **3.5 days** | **Fri 10/02/17** | **Wed 15/02/17** | **1** | | | | | |
| Determine project scope | 4 hrs | Fri 10/02/17 | Fri 10/02/17 | 2 | | Management | | | |
| Secure project sponsorship | 1 day | Fri 10/02/17 | Mon 13/02/17 | 2 | | Management | | | |
| Define preliminary resources | 1 day | Mon 13/02/17 | Tue 14/02/17 | 2 | | Project Manager | | | |
| Secure core resources | 1 day | Tue 14/02/17 | Wed 15/02/17 | 2 | | Project Manager | | | |
| Scope complete | 0 days | Wed 15/02/17 | Wed 15/02/17 | 2 | | 15/02 | | | |

### 3.3.9 No. of Summary Tasks with only one detailed task: (SO#710)

This will give you the number of **Summary Tasks** for one detailed task/**Milestone** that rolls up to it. Summaries are intended to combine multiple tasks into one meaningful **Summary Task** that represents the details below it. A summary of one task is redundant and, therefore unnecessary. Either add more detailed tasks to it or combine the one detailed into another summary.

| ID | Task Name | Duration | Start | Finish | |
|---|---|---|---|---|---|
| 0 | ⊿ Summay Task with only one Detail Task | 15 days | Mon 30/01/17 | Fri 17/02/17 | |
| 1 | ⊿ Sumary Task 1 | 10 days | Mon 30/01/17 | Fri 10/02/17 | |
| 2 | Sub Task 1 | 5 days | Mon 30/01/17 | Fri 03/02/17 | |
| 3 | Sub Task 2 | 5 days | Mon 06/02/17 | Fri 10/02/17 | |
| 4 | ⊿ Summary Task 2 | 5 days | Mon 13/02/17 | Fri 17/02/17 | |
| 5 | Detail Task 1 | 5 days | Mon 13/02/17 | Fri 17/02/17 | |

### 3.3.10 No. of Detailed Tasks without Predecessors: (SO#714)

This will give you the number detailed tasks and **milestones** without even one **predecessor**.

| Task Name | Duration | Start | Finish | Predecessors | Resource Names | |
|---|---|---|---|---|---|---|
| ⊿ Task with out Predecessor | 2 days | Fri 10/02/17 | Mon 13/02/17 | | | |
| ⊿ Scope | 2 days | Fri 10/02/17 | Mon 13/02/17 | | | |
| Determine project scope | 4 hrs | Fri 10/02/17 | Fri 10/02/17 | | Management | |
| Secure project sponsorship | 1 day | Fri 10/02/17 | Mon 13/02/17 | 2 | Management | |
| Define preliminary resources | 1 day | Fri 10/02/17 | Fri 10/02/17 | | Project Manager | |
| Secure core resources | 1 day | Mon 13/02/17 | Mon 13/02/17 | 4 | Project Manager | |
| Scope complete | 0 days | Mon 13/02/17 | Mon 13/02/17 | 5 | | |

### 3.3.11 No. of Detailed Tasks without Successors (loose ends): (SO#715)

Tasks with no successors are called "loose ends". A loose end task is essentially saying that if this task is delayed or never completed it will not impact the project. If it truly will not impact anything, then the question is- whether the task should even be done at all. There has to be some reason for the task planned. If you can't find anything to tie it to, tie it to the project end task or delete the task

Gives you the number of detailed **tasks** and **milestones** without at least one **successor**.

| Task Name | Duration | Start | Finish | Successors | Resource Names | b '17 ... Mar '17 |
|---|---|---|---|---|---|---|
| ⊿ Task with out Successors | 2 days | Fri 10/02/17 | Mon 13/02/17 | | | |
| ⊿ Scope | 2 days | Fri 10/02/17 | Mon 13/02/17 | | | |
| Determine project scope | 4 hrs | Fri 10/02/17 | Fri 10/02/17 | 3 | Management | Management |
| Secure project sponsorship | 1 day | Fri 10/02/17 | Mon 13/02/17 | | Management | Management |
| Define preliminary resources | 1 day | Fri 10/02/17 | Fri 10/02/17 | 5 | Project Manager | Project Manager |
| Secure core resources | 1 day | Mon 13/02/17 | Mon 13/02/17 | 6 | Project Manager | Project Manager |
| Scope complete | 0 days | Mon 13/02/17 | Mon 13/02/17 | | | 13/02 |

## 3.3.12 No. of Summary Tasks with Dependencies: (SO#716)

As a general rule, you want to enter the dependencies at the detailed level so that the **critical path** will identify the real "drivers" in the schedule. Entering dependencies at the summary level can obscure the real culprits that are pacing the project/program.

A value of zero (0) is preferred. Otherwise minimize the use of dependencies on summary tasks.

This will give you the number of summary tasks (Summary field equals "Yes") that have at least one predecessor or successor.



| ID | Task Name | Predecessors | Successors | Start | Finish | Feb |
|---|---|---|---|---|---|---|
| 0 | ⊿ Summary Task Without Dependency | | | Mon 30/01/17 | Fri 03/03/17 | |
| 1 | Individual Task | | 2 | Mon 30/01/17 | Fri 03/02/17 | |
| 2 | ⊿ Summary Task with Dependency | 1 | 5 | Mon 06/02/17 | Fri 17/02/17 | |
| 3 | Sub Task 1 | | 4 | Mon 06/02/17 | Fri 10/02/17 | |
| 4 | Sub Task 2 | 3 | | Mon 13/02/17 | Fri 17/02/17 | |
| 5 | ⊿ Summary Task without Dependency | 2 | | Mon 20/02/17 | Fri 03/03/17 | |
| 6 | Sub Task 1 | | 7 | Mon 20/02/17 | Fri 24/02/17 | |
| 7 | Sub Task 2 | 6 | | Mon 27/02/17 | Fri 03/03/17 | |

## 3.3.13 No. of Tasks with Positive Lag (+): (SO#717)

This is the modification of a logical relationship which allows an acceleration of the successor activity. For example, in a finish-to-start dependency with a ten-day lead, the successor activity can start ten days before the predecessor activity finishes. A negative lead is equivalent to a positive lag

The use of lags should be minimized--generally limited to situations where the lag represents a delay between two tasks.

This will give you the number of tasks with positive lags in the dependencies.

| Task Name | Predecessors | Start | Finish | Duration |
|---|---|---|---|---|
| ▲ **Tasks with +ve and -velags** | | **Fri 03/02/17** | **Thu 23/03/17** | **35 days** |
| Task 1 | | Fri 03/02/17 | Thu 09/02/17 | 5 days |
| Positive Lag | 1FS+5 days | Fri 17/02/17 | Thu 23/02/17 | 5 days |
| Posotive Lag | 2FS+10 days | Fri 10/03/17 | Thu 16/03/17 | 5 days |
| Task 4 | 3 | Fri 17/03/17 | Thu 23/03/17 | 5 days |

## 3.3.14 No. of Tasks with Negative Lag (-): (SO#718)

The use of negative (-) lags should be avoided with few exceptions.

This will show the number of tasks with **Negative lag** in the dependencies.

| Task Name | Predecessors | Start | Finish | Duration |
|---|---|---|---|---|
| ▲ **Tasks with +ve and -velags** | | **Fri 03/02/17** | **Thu 09/03/17** | **25 days** |
| Task 1 | | Fri 03/02/17 | Thu 09/02/17 | 5 days |
| Negative Lag | 1FS-5 days | Fri 03/02/17 | Thu 09/02/17 | 5 days |
| Task 3 | 2FS+10 days | Fri 24/02/17 | Thu 02/03/17 | 5 days |
| Task 4 | 3 | Fri 03/03/17 | Thu 09/03/17 | 5 days |

## 3.3.15 No. of Tasks with Negative Total Slack: (SO#719)

**Float:** Float is also called slack

**Free Float (FF):**

No of days that a schedule activity can be delayed without delaying the CPM (Critical Path Method), early start of the immediate schedule activities.

**Total Float (TF):**

No of days that a schedule activity may be delayed from its CPM early start date or CPM early finish date without delaying the project end date or violating a schedule constraint. This is calculated using the critical path method thereby, determining the difference between the CPM early finish dates and CPM late finish dates.

Negative Total Slack/Float reflects a constraint somewhere that's causing the task's Early dates to be later than the task's Late dates.  This situation must be resolved to a zero or positive number.

This validation gives the Tasks having Negative Total Slack Value.

| Task Name | Predecessors | Start | Finish | Total Slack | Predecessors | 17 | 12 Feb '17 | 26 Feb '17 |
|---|---|---|---|---|---|---|---|---|
| ⊿ Tasks with - ve Lag & + ve Lag | | Fri 03/02/17 | Fri 10/03/17 | -1 day | | | | |
| ⊿ Phase 1 | | Fri 03/02/17 | Thu 16/02/17 | -1 day | | | | |
| Negative Slack | | Fri 03/02/17 | Thu 09/02/17 | -1 day | | | | |
| Negative Slack | 2 | Fri 10/02/17 | Thu 16/02/17 | -1 day | 2 | | | |
| Positve Slack Task | 2 | Fri 10/02/17 | Thu 16/02/17 | 6 days | 2 | | | |
| ⊿ Phase 2 | | Fri 10/02/17 | Mon 27/02/17 | 1 day | | | | |
| Negative Slack | 3FS+2 days | Tue 21/02/17 | Mon 27/02/17 | -1 day | 3FS+2 days | | | |
| Positve Slack Task | 4 | Fri 17/02/17 | Thu 23/02/17 | 6 days | 4 | | | |
| Positve Slack Task | 2 | Fri 10/02/17 | Thu 16/02/17 | 1 day | 2 | | | |
| ⊿ Phase 3 | | Fri 17/02/17 | Fri 10/03/17 | 0 days | | | | |
| Positve Slack Task | 8 | Fri 17/02/17 | Thu 23/02/17 | 1 day | 8 | | | |
| Negative Slack | 10,6 | Tue 28/02/17 | Mon 06/03/17 | -1 day | 10,6 | | | |
| Negative Slack | 7,11 | Mon 06/03/17 | Fri 10/03/17 | -1 day | 7,11 | | | |

## 3.3.16 No. of Tasks with Concurrency Failures: (SO#720)

Concurrency Failures are generally caused by excessive negative lag in a **Finish-to-Start, Start-to-Start** or **Finish-to-Finish** dependency. This situation is generally illogical. Consider reducing or eliminating the negative lag or changing the dependency. This condition can also occur when Finish-to-Finish dependencies are used, and the start of the successor is forced to be earlier than the start of the predecessor because of the length of the successor's duration. These situations aren't always wrong but should be checked for validity.

This validation gives the number of tasks where the Successor's start date is earlier than the Predecessor's start date (except for **Start-to-Finish** dependencies).

| ID | Task Name | Duration | Predecessors | Start | Finish | Feb '17 | | | | Mar '17 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 29 | 05 | 12 | 19 | 26 | 05 |
| 0 | ⊿ Concurrency Failures | 25 days | | Mon 30/01/17 | Fri 03/03/17 | | | | | | |
| 1 | Kick Off | 20 days | | Mon 30/01/17 | Fri 24/02/17 | | | | | | |
| 2 | Predecessor | 5 days | 1 | Mon 27/02/17 | Fri 03/03/17 | | | | | | |
| 3 | Successor | 5 days | 2FS-20 days | Mon 06/02/17 | Fri 10/02/17 | | | | | | |

## 3.3.17 No. of Tasks with Concurrency Warnings: (SO#721)

This is generally caused by excessive negative lag in a Finish-to-Start, Start-to-Start or Finish-to-Finish dependency. While this is not as serious as a Concurrency Failure, it suggests too much "concurrency" between the two tasks for the dependency that has been chosen. For example, the logic between two tasks may not be really **Finish-to-Start** if negative lag is used that it causes the two tasks to be scheduled simultaneously or with a high degree of parallel activity. This relationship would be suspect.

Displays the number of tasks where the Successor's start date overlaps the predecessor by greater than 50% but less than 100% of the Predecessor's duration.

| ID | Task Name | Duration | Predecessors | Start | Finish | Feb '17 / Mar '17 |
|---|---|---|---|---|---|---|
| 0 | ⊿ Concurrency Failures | 25 days | | Mon 30/01/17 | Fri 03/03/17 | |
| 1 | Kick Off | 20 days | | Mon 30/01/17 | Fri 24/02/17 | |
| 2 | Predecessor | 5 days | 1 | Mon 27/02/17 | Fri 03/03/17 | |
| 3 | Successor | 5 days | 2FS-20 days | Mon 06/02/17 | Fri 10/02/17 | |

# 3.3.18 Percentage of All Detailed Tasks/Milestones fully Networked: (SO#722)

Theoretically, a project should be 100% networked.  That is, all tasks and milestones are accounted for in the network by being schedule based on predecessor/successor logic and not hard coded dates (constraints).  We could think of exceptions that will keep the metric from being 100%.

Displays, as a percentage, the ratio of detailed tasks and milestones that have at least one predecessor AND successor to the total number of detailed tasks and milestones.

(COUNT
(Task must have both Predecessor and successor AND Task is NOT a Recurring Task AND Task is NOT a Summary Task)
/
## COUNT
(Task NOT a Recurring Task AND Task NOT a Summary Task)) *100

| ID | Task Name | Predecessors | Successors | February 2017 |
|---|---|---|---|---|
| 0 | ⊿ % of All Detail Tasks/Milestones fully Networked | | | |
| 1 | ⊿ **Summary Task 1** | | | |
| 2 | Task 1 | | 3 | |
| 3 | Task 2 | 2 | 4 | |
| 4 | Task 3 | 3 | 5 | |
| 5 | Task 4 | 4 | | |
| 6 | ⊿ **Summary Task 2** | | | |
| 7 | Task 5 | | | |
| 8 | Task 6 | | | |
| 9 | ⊿ **Recurring Task** | | | |
| 10 | Recurring Task 1 | | | |

## 3.3.19 Percentage of Remaining Tasks Fully Networked: (SO#723)

This will give you, as a percentage, the ratio of the remaining (not completed) milestones that have at least one predecessor AND successor to the total number of detailed tasks and milestones remaining (not completed).  This provides a statistical measure of the "robustness" of the network relative to the remaining tasks to be completed.  Tasks that are completed are no longer driven by dependencies and so whether completed tasks have dependencies or not are of no consequence at this point.  For projects that are in progress, this item measures the level of being "networked" for only the remaining tasks.
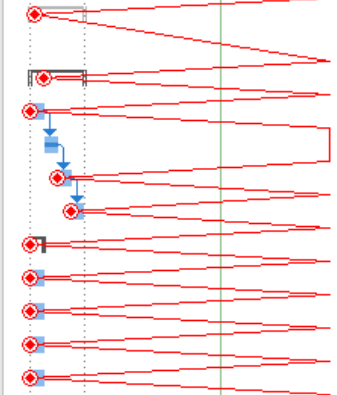
Internally calculates based on the bellow formula:

(COUNT
(Task must have both Predecessor and successor AND Task is NOT a Recurring Task AND Task is NOT a Summary Task AND Task Remaining Duration > 0)
/
COUNT (Task NOT a Recurring Task AND Task NOT a Summary Task AND Task Remaining Duration)) *100

| ID | Task Name | Predecessors | Successors | February 2017 28 31 03 06 09 12 15 18 |
|---|---|---|---|---|
| 0 | ⊿ **% of Remaining Detail Tasks/Milestones fully Networked** | | | |
| 1 | ⊿ **Summary Task 1** | | | |
| 2 | Task 1 | | 3 | |
| 3 | Task 2 | 2 | 4 | |
| 4 | Task 3 | 3 | 5 | |
| 5 | Task 4 | 4 | | |
| 6 | ⊿ **Summary Task 2** | | | |
| 7 | Task 5 | | | |
| 8 | Task 6 | | | |
| 9 | ⊿ **Recurring Task** | | | |
| 10 | Recurring Task 1 | | | |

## 3.4 Constraints & Deadlines

Schedule Optimizer analyses the project data in the current MPP plan and displays related to Constraints and Deadlines as shown below.
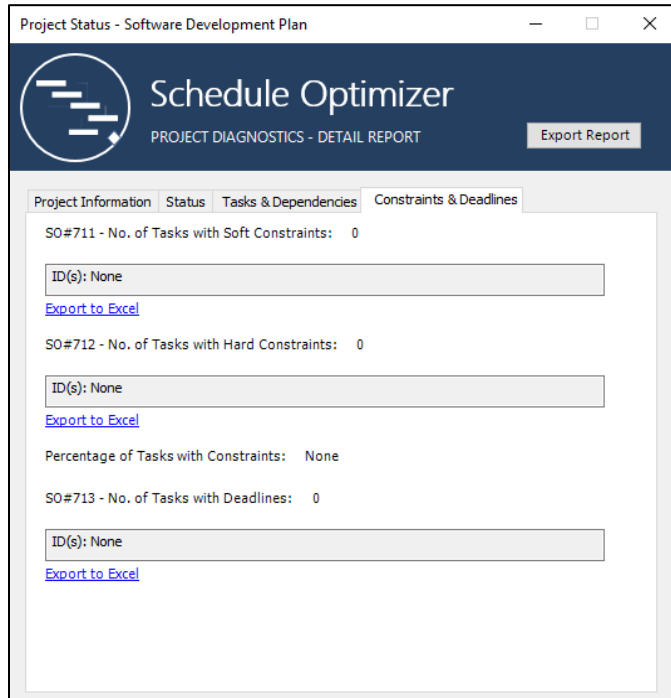
## 3.4.1 No. of Tasks with Soft Constraints: (SO#711)

Constraints restrict a project's natural flow, disregard the effects of risk, and limits the usefulness of the schedule risk analysis. Date constraints should be avoided wherever possible and used only when compatible with a project's expected course of development. For example, one use of a date constraint might be to establish a not-earlier-than or a not-later-than date for tasks for which there is no effective predecessor or successor in the schedule.
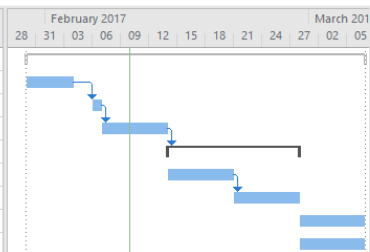
An illustrative example may be delivery of a piece of equipment by a vendor where it is not practical or desirable to include the vendor's task in the schedule model. Even in this example, care should be taken so as not to inject a break in the critical path. Constraints can be flexible (e.g., as soon as possible), moderately flexible (e.g., finish no earlier than) or inflexible (e.g., must start on). Moderately flexible constraints are called **Soft constraints** and inflexible constraints are called **Hard constraints**. Since constraints limit scheduling flexibility, they should be used only when schedule logic cannot correctly address the situation. When a date constraint becomes necessary, flexible constraints are preferred over inflexible constraints

Soft constraints have the little calendar icon with the blue square in the Indicators field. This will help you to minimize the use of soft constraints as much as possible.

Conditions for Soft Constraints are:
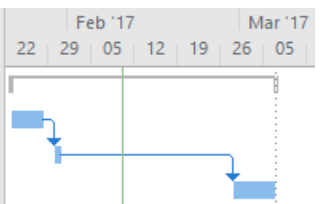
In Forward scheduling, it displays the number of tasks with **Start-No-Earlier-Than** or **Finish-No-Earlier-Than** Constraint Types.

| | ID | Task Name | Constraint Type | Recurring | Remaining Duration |
|---|---|---|---|---|---|
| | 0 | ◢ No. of Tasks with Soft Constraints | As Soon As Possible | No | 26 days? |
| | 1 | Task with Start-No-Earlier-Than Constraint | Start No Earlier Than | No | 5 days |
| | 2 | Task with Finish-No-Earlier-Than Constraint | Finish No Earlier Than | No | 1 day? |
| | 3 | Task with out Constraint | As Soon As Possible | No | 5 days |
| | 4 | ◢ Summary Task | Start No Earlier Than | No | 10 days |
| | 5 | Task 1 | As Soon As Possible | No | 5 days |
| | 6 | Task 2 | As Soon As Possible | No | 5 days |
| | 7 | ◢ Recurring Task | As Soon As Possible | Yes | 5 days |
| | 8 | Recurring Task 1 | Start No Earlier Than | Yes | 5 days |

In Backward scheduling, it displays the number of tasks with **Start-No-Later-Than** or **Finish-No-Later-Than** Constraint Types. "

| | ID | Task Name | Constraint Type | Recurring |
|---|---|---|---|---|
| | 0 | ◢ No. of Tasks with Soft Constraints | As Late As Possible | No |
| | 1 | Task with Start No Later Than Constraint | Start No Later Than | No |
| | 2 | Task with Finish No Later Than Constraint | Finish No Later Than | No |
| | 3 | Task with No Constraint | As Late As Possible | No |

## 3.4.2 No. of Tasks with Hard Constraints: (SO#712)

**Hard constraints** have the little **Calendar** icon with the red square in the Indicators field.  Minimize the use of hard constraints as much as possible

In Forward scheduling, it displays the number of tasks with **Must-Start-On, Must-Finish-On, Start-No-Later-Than** or **Finish-No-Later-Than** Constraint Types.

| ℹ | Task Mode ▾ | ID ▾ | Task Name ▾ | Constraint Type ▾ | 22 | 25 | 28 | 31 | 03 | 06 |
|---|---|---|---|---|---|---|---|---|---|---|
| | 🔁 | 0 | ◢ No. of Tasks with Hard Constraints | As Soon As Possible | | | | | | |
| 🗓 | 🔁 | 1 | Task with Must Start On Constraint | Must Start On | | | | | | |
| 🗓 | 🔁 | 2 | Task with Must Finish On Constraint | Must Finish On | | | | | | |
| 🗓 | 🔁 | 3 | Task with Start No Later Than Constraint | Start No Later Than | | | | | | |
| 🗓 | 🔁 | 4 | Task with Finish No Later Than Constraint | Finish No Later Than | | | | | | |
| | 🔁 | 5 | Task with No Constraint | As Soon As Possible | | | | | | |

In Backward scheduling, it displays the number of tasks with **Must-Start-On, Must-Finish-On, Start-No-Earlier-Than** or **Finish-No-Earlier-Than** Constraint Types."

| ℹ | Task Mode ▾ | ID ▾ | Task Name ▾ | Constraint Type ▾ | Constraint Date ▾ | Remaining Duration ▾ |
|---|---|---|---|---|---|---|
| | 🔁 | 0 | ◢ No. of Tasks with Hard Constraints | As Late As Possible | NA | 9 days |
| 🗓 | 🔁 | 1 | Task with Must Start On Constraint | Must Start On | Mon 06/02/17 | 5 days |
| 🗓 | 🔁 | 2 | Task with Must Finish On Constraint | Must Finish On | Mon 06/02/17 | 5 days |
| 🗓 | 🔁 | 3 | Task with Start No Later Than Constraint | Start No Earlier Than | Mon 06/02/17 | 5 days |

## 3.4.3 No. of Tasks with Deadlines: (SO#713)

A **deadline** is a target date indicating when you want a task to be completed. If the deadline date passes and the task is not completed, Project displays an indicator.

Deadlines can be thought of as target dates that you're aiming for and will give you a visual indicator on the screen of where the deadline is but will not restrict the scheduling of the task

This feature will give you the number of tasks with **Deadline** date field not equal to "**NA**".
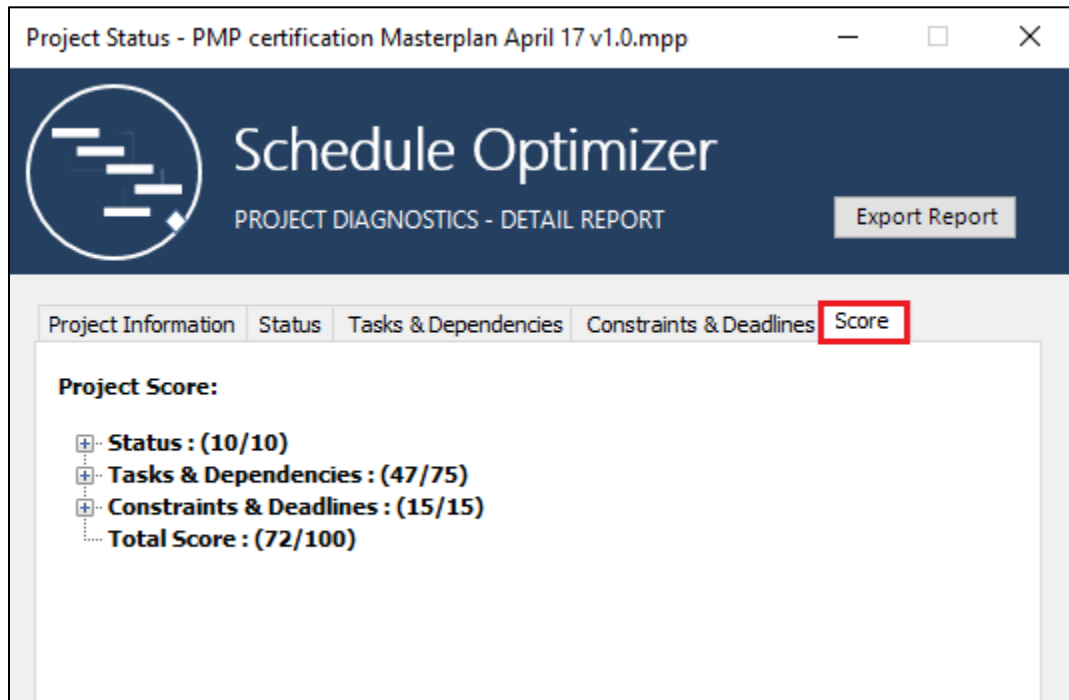


Open-Ended Activities

An open-ended activity is an activity lacking either a predecessor or a successor or both. Open-ended activities can obscure the logical relationships between project activities, create a false appearance of float in a project, and reduce the apparent impact of risk during a schedule analysis. The only open-ended activity in a project should be the start and finish milestones at the beginning and end of the project. Unless linked to other projects, a project's start and finish milestones will always contain open end.

## 3.5 Score

Schedule Optimizer analyses the project data in the current MPP plan and displays the total score of the Project plan as per the below Scoring Criteria

## Scoring Criteria

| Score Sections | Scoring Criteria | Score | Negative Score Criteria |
|---|---|---|---|
| **Status** | | | |
| Track No of Tasks with Out-of-Sequence (OOS) Errors: | No OOS Errors | 10 | |
| **Tasks & Dependencies** | | | |
| Summary Tasks | No task should be at outline level 1 | 5 | More than 2 % of tasks having outline number as 1 will reduce the score at the rate of 1 per 2%. First 2 %: 5, 2-4 :4, 4-6: 3 etc. |
| Recurring Tasks: | Existence of recurring tasks | 5 | No negative scoring |
| No. of Tasks with missing Baseline info: | All tasks are baselined | 10 | In case of tasks with no baseline, Score will reduce by 1 for every 5% of tasks |
| No. of Tasks using Task Calendars: | Task calendar used in project plan | 2 | More than 5 % of tasks use task calendar, score is reduced by 1% for every 5% of tasks |
| Lowest level WBS/Outline Level used: | Outline Level is more than 1 | 3 | No negative scoring |
| No. of Summary Tasks with only one detail task: | No Summary Tasks with one child task | 5 | Reduce the score by 1 for every 5% tasks |
| No. of Detail Tasks without Predecessors | Except first task of the project, all other tasks has predecessor | 5 | For every 2% of tasks score is reduced by 1 |
| No. of Detail Tasks without Successors (loose ends): | Except last task of the project, all other tasks has predecessor | 5 | For every 2% of tasks score is reduced by 2 |
| No. of Summary Tasks with Dependencies: | No Summary tasks with Dependencies | 5 | For every 1% of summary tasks score is reduced by 1 |
| No. of Tasks with Pos Lags (+): | Lags used in the project plan | 5 | No negative scoring |
| No. of Tasks with Neg Lags (-): | Leads used in the project plan | 5 | No negative scoring |
| No. of Tasks with Negative Total Slack: | No negative total slack in the project plan | 5 | For any negative slack found score is reduced by 1 for every 5% of tasks |

| | | | |
|---|---|---|---|
| No. of Tasks with Concurrency Failures: | No concurrency errors found in the project plan | 5 | For any concurrency errors found reduce the score by 1 for every 5% of tasks |
| No. of Tasks with Concurrency Warnings: | No concurrency warnings found in the project plan | 5 | For any concurrency warnings found reduce the score by 1 for every 5% of the tasks |
| Percentage of All Detail Tasks/Milestones fully Networked: | Milestones used in project plan | 5 | More than 5% tasks are milestones score will be reduced by 1 for every 5% milestones |
| **Constraints & Deadlines** | | | |
| No. of Tasks with Soft Constraints: (Except Recurring Tasks) | 5% of the tasks can have Soft Constraints | 5 | More than 5% of tasks have soft constraints reduce the score by 1 (5-10% four, 10-15% three, 15-20% two, 20-25% one, more than 25% zero) |
| No. of Tasks with Hard Constraints: | No Hard constraints in the project plan | 5 | More than 5% of tasks have hard constraints reduce by 1 (5-10% four, 10-15% three, 15-20% two, 20-25% one, more than 25% zero) |
| No. of Tasks with Deadlines: | Deadlines present on the critical path | 5 | No negative scoring |

# 4. Module 2 - PERT Analyzer

## 4.1 Introduction: PERT Analysis and Contingency Planning

Schedule model analysis utilizes various tools and techniques throughout the project life cycle to optimize schedule from various perspectives such as Critical Path, Critical Chain, Uncertainties/Risks, Resources constraints and various types of dependencies before creating the baseline schedule model.

Risk analysis is done in the following two stages:

- Qualitative Risk Analysis and
- Quantitative Risk Analysis

Qualitative risk analysis prioritizes the risks based on Probability, Impact and Risk exposure. Based on the prioritized risks response strategies are drawn and an action plan is developed and documented in a risk register. These actions are implemented by reworking on the schedule and building reserves in terms of schedule duration, cost budget and work (effort).

This module focusses on the following key features:

- Establish Three Point Estimates (Optimistic, Most likely and Pessimistic) at each activity level
- Calculating the mean duration for each activity using Beta distribution
- Option to revise the base estimate with the calculated mean
- Calculating the Standard deviation for the project and
- Arriving at Buffer for two levels of confidence (84% and 98%)
- Insert a new **Non-effort buffer task** and applying the contingency to the is task
- Insert a deadline at the finish date of this buffer task
- Adjust buffer while monitoring the schedule performance

**Benefits:**

These features help the project managers to leverage the uncertainties and build a proactive schedule with internal and external targets separated by project buffer. With an effective risk response strategy put in place along with an effective contingency strategy you can demonstrate a minimum of 15 to 20% improvement compared to traditional scheduling methods.

This module helps the project managers to practice Critical Chain scheduling method in conjunction with existing standard CPM and Resource levelling features of Microsoft Project

## Probabilistic Distribution of Activity Durations

If Activity durations involve a great deal of uncertainty, a commonly used estimating technique is the three-point estimate. These three points correspond to activity duration defined as **Optimistic, Most likely, and Pessimistic** durations. Additionally, the risk register may also be used to support estimating the uncertainty in activity durations. In order to quantify uncertainty about the overall project duration, starting from the three-point estimate of every activity, PERT (which uses an approximation of beta distribution) can be utilized. The activity optimistic duration and activity pessimistic duration represent the probable durations, but not the entire domain of values. The three-point estimates of duration should be made by those performing the activities or by someone with experience performing similar activities. The most common approach for creating the probabilistic distribution is to estimate the most likely value as accurately as possible and then to skew the distribution toward maximum or minimum values. The degree to which the distribution is skewed is suggested by the shape of a curve fitting the three estimated durations (such as beta, uniform, or triangular). The distribution relating the three duration estimates (or cost estimates) should be selected to best fit the supporting data for similar activities.

Proventures PERT Analyzer is a COM Add-in to Microsoft Project 2013/2016 which simulates the PERT Analyzer. After the Installation process, Add-in can be accessed through the Microsoft Project PERT Plus Ribbon. PERT Analyzer Module performs the PERT Analysis considering Durations of the activities with the Optimistic, Most likely and Pessimistic Durations using Mean Formula

$$\text{Mean}=(O+4ML+P)/6.$$

Add in also calculates

- **Standard Deviation=(P-O)/6**,
- **Activity Variance= SD*SD** and
- **Critical Path Variance=Variance of Critical Activities**
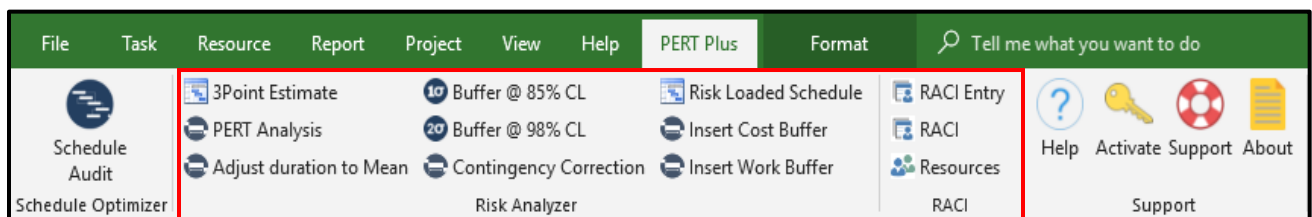


In addition, PERT Analysis also performs the following functionalities

- 3Point Estimate
- PERT Analysis
- Adjust Duration to Mean
- Buffer @85% CL
- Buffer @98% CL

- Contingency Correction
- Risk Loaded Schedule
- Insert Cost Buffer
- Insert Work Buffer
- RACI Entry, RACI, Resources

## 4.2 Estimation through Three Point Estimate

Upon Clicking on the **3Point Estimate** feature on the Risk Analysis Add in, Tool creates a View called "PERT" and Table called "PERT Table" along with the fields **Optimistic**, **Most Likely**, **Pessimistic**, **Mean**, **Standard Deviation**, **Variance** (Activity Variance) and **Critical Path Variance**.
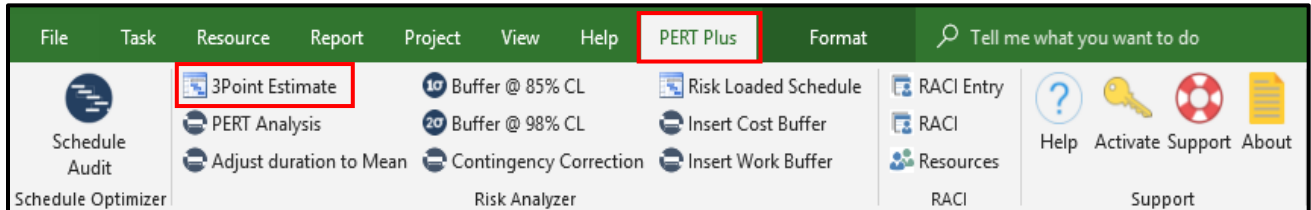


Below are the Formulae's used in the Fields created for 3Point Estimates.

| Formulae | |
|---|---|
| **Mean** | (O+4ML+P)/6 |
| **Standard Deviation** | (P-O)/6 |
| **Activity Variance (Variance)** | SD*SD |

### Normal Schedule with Deterministic Duration



### 3Point Estimate

## 4.3 PERT Analysis



PERT Analysis helps to calculate Optimistic, Most Likely and Pessimistic values based on the deterministic duration and common multiplication factor set by the user.



Upon populating the Optimistic, Most Likely and Pessimistic values, the **Mean**, **Standard Deviation**, **Variance** (Activity Variance) and **Critical Path Variance** Fields are auto populated.

# 4.3.1 Adjust Duration to Mean



**Adjust Duration to Mean** feature enables the user to copy the new Mean value to the Duration field for the selected tasks. (**Mean** is auto populated by the Tool after performing PERT Analysis).



After adjusting the Mean to the Duration, Duration can be rounded of at the activity level for the required tasks.

## 4.3.2 Buffer @ 85% CL





**Buffer @ 85% Confidence Level** feature enables the user to insert the buffer of 1sigma which gives 85% confidence level into the project schedule.

Based on the activity level standard deviation, system will calculate the project level standard deviation for the critical path activities. Assuming the activity duration variability follows standard distribution, the system calculates a buffer of 1 sigma to give 85% confidence level, and the user wants an increased confidence level they can go for 2 sigma that gives 98% confidence level

The buffer will be inserted into the schedule as the last activity on the critical path with a deadline on the Finish Date. This value also can be changed as per user requirement.



| | | Task Mode | Name | Duration | Optimistic | Most Likely | Pessimistic | Mean |
|---|---|---|---|---|---|---|---|---|
| 0 | | | ◢ System Implementation v2 | 83.11 days | 60 days | 78.75 days | 101.25 days | 79.38 days |
| 1 | | | Project Initiation | 5 days | 4 days | 5.25 days | 6.75 days | 5.29 days |
| 2 | | | Requirements Analysis | 16 days | 12 days | 15.75 days | 20.25 days | 15.88 days |
| 3 | | | System Aqusition | 16 days | 12 days | 15.75 days | 20.25 days | 15.88 days |
| 4 | | | Software Customization | 21 days | 16 days | 21 days | 27 days | 21.17 days |
| 5 | | | Software Testing | 16 days | 12 days | 15.75 days | 20.25 days | 15.88 days |
| 6 | | | Implementation at client site | 32 days | 24 days | 31.5 days | 40.5 days | 31.75 days |
| 7 | | | Go live, Transition and closure | 3 days | 2.4 days | 3.15 days | 4.05 days | 3.18 days |
| 8 | | | Project Buffer 85% CL | 4.11 days? | 0 days | 0 days | 0 days | 0 days |
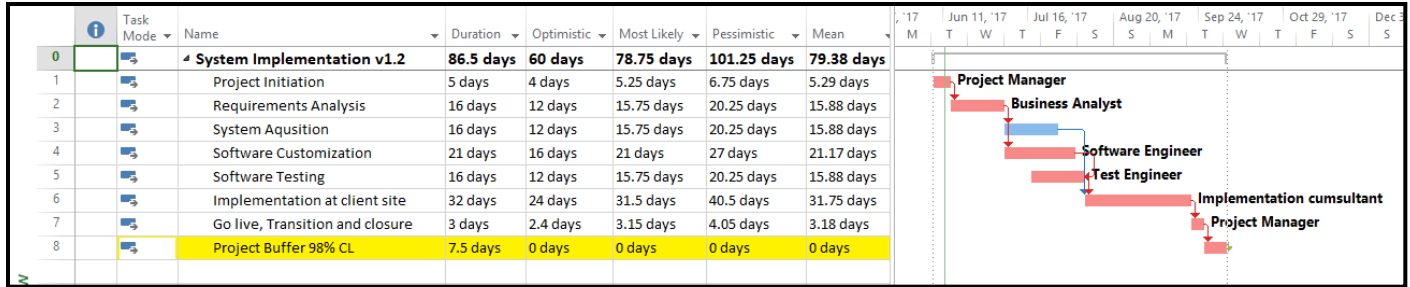
A Deadline will be added to the contingency task on the finish date. This is used to calculate the negative float in case of schedule delays.

## 4.3.3 Risk Loaded Schedule
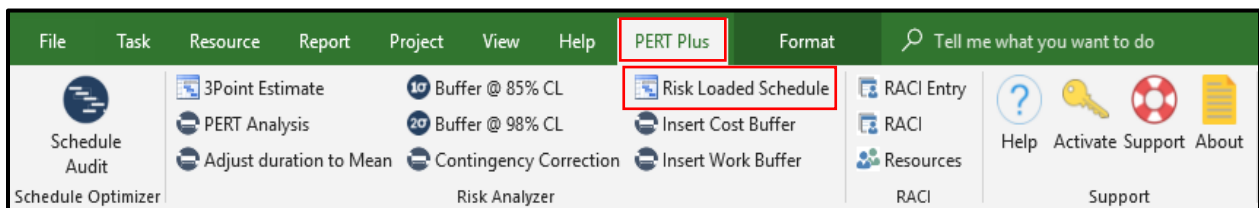


While protecting the schedule against delays, it is also important to protect cost and effort overrun. PERT Analyzer protects these parameters by building buffers in the same ratio used for schedule buffer.

Risk Loaded Schedule Navigates to a view called "Risk Loaded Schedule" tagged to a table called "RL Schedule" bringing the Duration, Cost and Work Fields together.
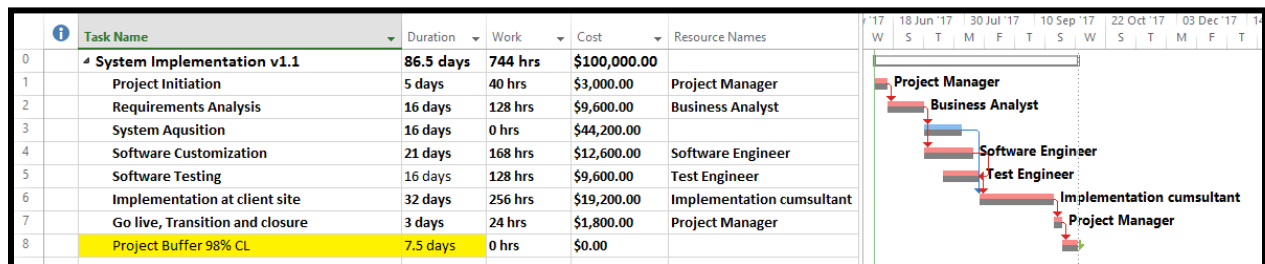
## 4.3.4 Insert Cost Buffer and Insert Work Buffer
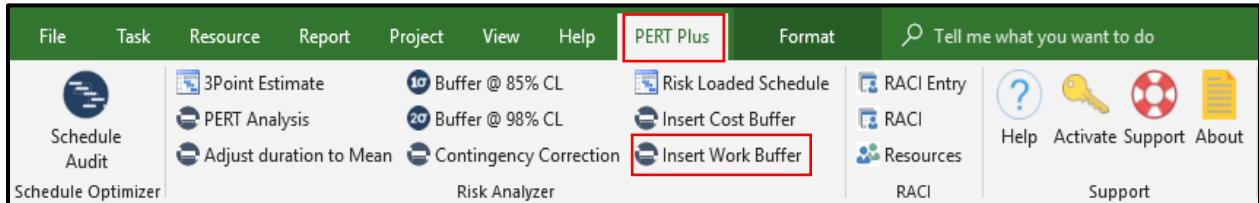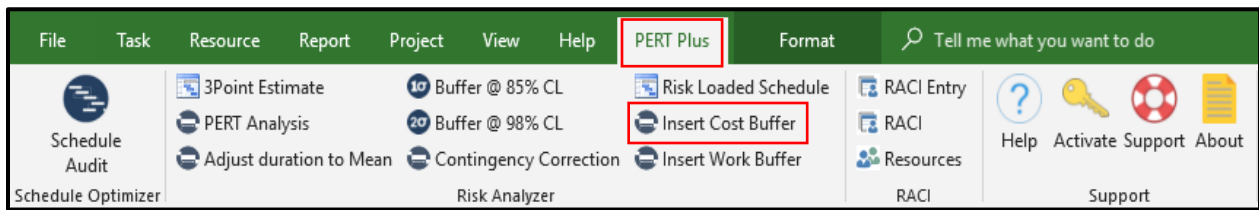




While protecting schedule buffer PERT Analyzer protects work and cost parameters by building buffers in the same ratio used for schedule buffer.

Clicking Insert cost buffer, adds cost buffer to the Project Buffer activity in the same ratio of duration buffer.

Clicking Insert work buffer, adds work buffer to the Project Buffer activity in the same ratio of duration buffer. Both these values can be modified to suit user requirements.

## 4.3.5 Contingency Correction
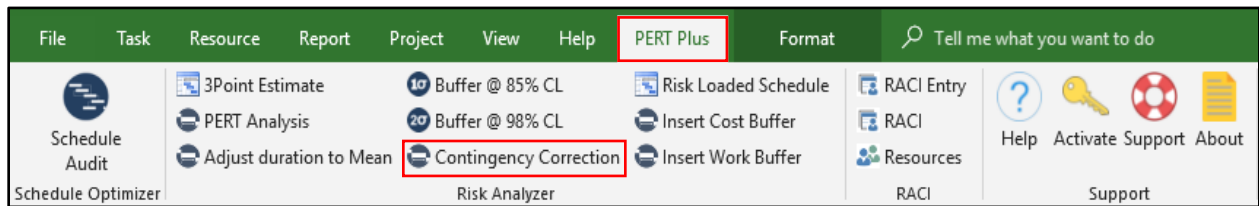


If there is any delay in the activities of the schedule, the deadline comes into conflict and a negative float is generated equal to the quantum of schedule.

Considering the Example above: the first task project initiation took 7 days instead of planned duration of 5 days. The project experienced a finish variance of 2 days. Due to the imposed deadline, a negative float of 1.76 days is generated. Since we have a buffer of 7.5 days available we can adjust this delay from the available buffer. This is achieved by the feature "contingency correction"



Clicking the contingency correction feature by selecting the buffer task, and upon confirmation the project buffer is adjusted to 5.74 from 7.5 days. Total slack is recalculated as zero.



Though we see a shift to baseline schedule, the end date committed to customer is intact and the balance buffer available is 5.74 days.

# 5. Module 3 - RACI Matrix

## 5.1 Module Overview

**Resource Management**

Plan Resource Management is the process of defining how to estimate, acquire, manage and use team and physical resources. This process also establishes the approach and level of management effort needed for managing project resources based on the type and complexity of the project. This process is performed once or at predefined points in the project.

Resource planning is used to determine and identify an approach to ensure that sufficient resources are available for the successful completion of the project. Project resources may include team members, suppliers, materials, equipment, services and facilities. Effective resource planning should consider and plan for the availability if, or competition for, scarce resources.
Below are the few Tools and Techniques of this Process:

- Expert Judgement
- Data Representation

One of the **Data Representation** techniques that can be used for this process include **Assignment Matrix.** A **RAM** shows the project resources assigned to each work package. It is used to illustrate the connections between work packages, or activities and project team members. The matrix format shows all activities associated with one person and all people associated with one activity. This also ensures that there is only one person accountable for any one task to avoid confusion about who is ultimately in charge or has authority for the work.

One example of RAM us a RACI (responsible, accountable, consult and inform) chart, as shown in below figure.

| RACI Chart | Person | | | | |
|---|---|---|---|---|---|
| **Activity** | Sam | John | Vinod | Ramya | Chirra |
| **Create Charter** | A | R | I | I | I |
| **Collect Requirements** | I | A | R | C | C |
| **Submit Change Request** | I | A | R | R | C |
| **Develop test plan** | A | C | I | I | R |

**R = Responsible | A = Accountable | C = Consult | I = Inform**

The sample **chart** shows the work to be done in the left column activities. The assigned resources can be shown as individuals or groups. A RACI chart is a useful tool to use to ensure clear assignment of roles and responsibilities when the team consists of internal and external resources.

Proventures RACI is a COM Add-in to Microsoft Project 2013/2016 which simulates the RACI Functionality. After the Installation process, Add-in can be accessed through the Microsoft Project PERT Plus Tab in the Ribbon.
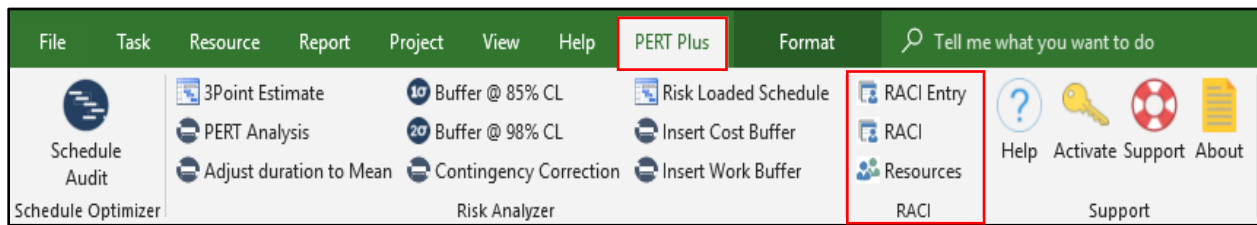
# 5.2 RACI Entry

Upon Clicking on the **RACI Entry** feature on the Add in, Tool creates a View called "RACI Entry" and a Table called "RACI Entry Table" along with the fields **Work Package**, and **Artifact**.
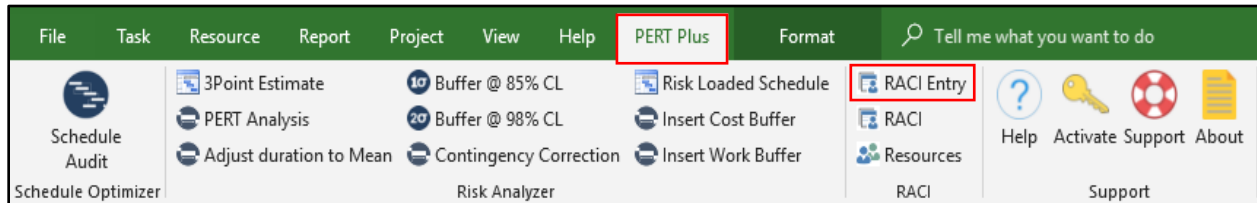


## RACI Entry View

From the Work Package Fields choose yes if the activity is a Work Package. Also define the Name of the Deliverable that will be developed for the respective work package or activity in the Artifact Field.

| | ⓘ | Name | Work Package | Artifact |
|---|---|---|---|---|
| 0 | | ⊿ **Software Development** | **No** | |
| 1 | | ⊿ Scope | Yes | **Scope Document** |
| 2 | | Determine project scope | No | |
| 3 | | Secure project sponsorship | No | |
| 4 | | Define preliminary resources | No | |
| 5 | | Secure core resources | No | |
| 6 | | Scope complete | No | |
| 7 | | ⊿ **Analysis/Software Requirements** | Yes | **Requirements Doc** |
| 8 | | Conduct needs analysis | No | |
| 9 | | Draft preliminary software specifications | No | |
| 10 | | Develop preliminary budget | No | |
| 11 | | Review software specifications/budget with team | No | |
| 12 | | Incorporate feedback on software specifications | No | |
| 13 | | Develop delivery timeline | No | |
| 14 | | Obtain approvals to proceed (concept, timeline, budge | No | |
| 15 | | Secure required resources | No | |
| 16 | | Analysis complete | No | |
| 17 | | ⊿ **Design** | Yes | **Design Document** |
| 18 | | Review preliminary software specifications | No | |
| 19 | | Develop functional specifications | No | |
| 20 | | Develop prototype based on functional specifications | No | |
| 21 | | Review functional specifications | No | |

## 5.3 Build RACI

Upon Clicking on the **RACI** feature on the Add in, Tool creates a View called "RACI View" and a Table called "RACI Table" along with the fields **Responsible, Accountable, Consult** and **Inform.**



Assign the roles **Responsible, Accountable, Consult** and **Inform** to selected tasks.

Upon clicking on the Resources icon in the RACI group, the **"Assign RACI Resources"** dialog box appears with the list of resources created in the Recourse sheet.



Loads New Resources/changes to existing resources, in to the "Assign RACI Roles" dialogue box.

Assigns the resource to the selected Role.

**Example:** Select the Role you want to assign to a resource on the Sheet, click on the

**Resources** icon in the RACI group under the PERT Plus tab in Ribbon, checkbox the Resource

you want to assign to the role and click on Assign Resources to Selected Task

# About Proventures

Proventures Education and Consulting Private Limited is a firm that offers consulting services under a single roof interconnecting specialized process consulting, competency development and technology solutions to achieve integrated and effective delivery of enterprise strategy.

## What we do?

**Consulting Services** – Process Gap Analysis Services, Maturity Modeling, Best Practice Implementation Services, Portfolio Management design and implementation Services, Enterprise Risk Management Process Design and deployment.

**PPM Implementation Services** – Enterprise Portfolio and Project Management through Oracle Primavera Suite of Products. Enterprise Portfolio and Project Management through Microsoft Project Server Suite of Products.

**Software Development Services** – Develop industry best practice aligned customized software in the domains of Business Process Management, Content Management, Document Management, Service Management etc. using commercial as well as open source platforms and standards.

*Training Services* – Pre-Approved PMI Certification workshops ranging from PMI-CAPM, PMI-PMP, PgMP, PfMP, PMI- RMP, PMI-SP, PMI-ACP, Project Estimation, Earned Value Management, Prince 2, Contract Management, Critical Chain Project Management, Microsoft Project Workshop, Primavera P6 Workshops, SharePoint Server Workshops

*PMO Services* - PMO Design and Deployment Services, PMO Trouble Shooting, PMO Reporting Services

*KPO Services* – Project Plan validation, Portfolio Reporting Services, Support and Handholding Services, Project Coordination Services.

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## Our Partnerships

As a **Silver Partner** of Microsoft on the **Project and Portfolio Management** Competency, Proventures offers a wealth of expertise in consulting and Training in the areas of Project Management and effective project Team Collaboration.

Proventures is a **Global Registered Education Provider** of PMI, USA providing highly customized and industry mature courses to the Project Management Community. This partnership helps Proventures with Portfolio, Program and Project Management standards and other related extensions/practices.

Proventures is a Strategic Partner of The Project Group who provides highly customized solutions, quick to deploy and industry certified **ERP integration products**.

Proventures is a Strategic Partner of Intaver Institute Inc. providing highly customized and industry mature Training and Consulting services aligned with Global best practices in **Project Risk Management through Risky Projects 6.0**