

# PMBOK Guide 5<sup>th</sup> Edition and MS Project 2010: A Practical Step-by-Step Approach

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## 1. Abstract

Project Management Body of Knowledge (PMBOK) Guide, from PMI, comes with its 5<sup>th</sup> Edition in year 2013. MS Project 2010 (MSP) is the latest version available as a General Release, from Microsoft. A number of concepts in MS Project 2010 and the 5<sup>th</sup> edition of PMBOK Guide go hand in hand. While PMBOK addresses the theoretical aspects; MSP seeks to implement them in a practical manner. However, there are some differences between the terms and terminologies, but the core concepts in both, remain the same. This paper focuses on – how best a PMP or a professional with sound understanding on PMBOK Guide – can use and apply MSP, by harnessing the similarities of principles and practices between MSP and PMBOK Guide.

## 2. Introduction

The major comparisons between PMBOK and MSP are outlined with primary focus on the Time Management. There are various major constraints defined in PMBOK guide, [v.i.z.] scope, quality, budget, schedule, resources and risk. It must be noted that the traditional triple constraints defined in earlier PMBOK Guide has been done away with since the 4<sup>th</sup> Edition.

To have a complete understanding, certain Input, Tools and Techniques and Outputs (ITTO) of other Knowledge Areas (KA), such as Scope Management KA, Human Resource Management KA and Integration Management KA from PMBOK guide, have been used. In some places of the document, PMP and PMBOK Guide have been used interchangeably.

## 3. PMBOK Guide 5<sup>th</sup> Edition

Every Knowledge Area in PMBOK Guide comes with various Process Areas (PA) or processes. In the 5<sup>th</sup> Edition of PMBOK Guide, the “Plan Schedule Management” PA has been introduced into the Time Management KA.

It will be pertinent note on other PA along with the important ITTO for in this paper to understand the comparison and convergence between MSP and PMBOK Guide. Following are the six PA, defined in Time Management KA, along with some of the major ITTO.

### 3.1. Plan Schedule Management:

Input	Output
Project Management Plan	Schedule Management Plan
Project Charter	

### 3.2. Define Activities:

Input	Output
Schedule Management Plan	Activity List
Scope Baseline	Activity Attributes
	Milestone List

Decomposition and Rolling Wave Planning are the two major ITTO in this PA, where we can take the help of MSP.

### 3.3. Sequence Activities:

Input	Output
Schedule Management Plan	Project Schedule Network Diagrams
Project Scope Statement	
Activity List	
Activity Attributes	
Milestone List	

Precedence Diagramming Method, Dependency Determination, Leads and Lags are the major ITTO where MS Project can be used to create the final Network diagram.

### 3.4 Estimate Activity Resources:

Input	Output
Schedule Management Plan	Activity Resource Requirements
Activity List	Resource Breakdown Structure
Activity Attributes	
Resource Calendars	

Other major inputs are Risk Register and Activity Cost Estimates, which will not be focused as we are talking of primarily Time Management.

### 3.5. Estimate Activity Durations:

Input	Output
Schedule Management Plan	Activity Duration Estimates
Project Scope Statement	
Activity List	

Activity Attributes	
Activity Resource Requirements	
Resource Breakdown Structure	
Resource Calendars	

Parametric Estimating is an ITTO which can take the help of Effort Driven scheduling of MS Project to create the final estimate and schedule.

### 3.6. Develop Schedule:

Input	Output
Schedule Management Plan	Schedule Baseline
Project Schedule NW Diagram	Project Schedule
Activity Lists	Schedule Data
Activity Attribute	Project Calendars
Activity Resource Requirements	Project Management Plan Updates
Resource Calendars	
Activity Duration Estimates	
Project Scope Statement	
Resource Breakdown Structure	
Project Staff Assignment	

Other major inputs are Risk Register, which is again beyond the scope of this paper. However, we will check upon the various important tools and techniques in Develop Schedule, which are – Schedule Network Analysis, Critical Path Method, Resource Optimization Techniques, Leads and Lags, Modeling Techniques, Schedule Compression and of course the Schedule Tool, which is MSP.

### 3.7. Control Schedule:

Input	Output
Project Management Plan	Work Performance Information
Project Schedule	Schedule Forecasts
Work Performance Data	Project Management Plan Updates
Project Calendars	
Schedule Data	

We will check upon the various important tools and techniques in Control Schedule, which are – Resource Optimization Techniques, Leads and Lags, Modeling Techniques, Schedule Compression and of course Project Management Software along with Schedule Tool, which is MS Project.

## 4. A Step by Step Practical Approach to PMBOK

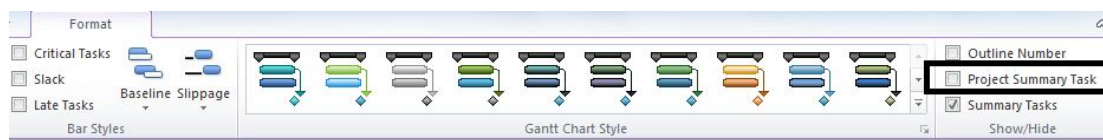
### 4.1. PMBOK and MSP: The Convergence

It must be noted that by differences, it means that certain terms and terminologies are different, but conceptually MSP and PMBOK Guide follow the same course.

#### 4.1.1. Project (PMBOK) Vs Project Summary Task (MSP):

A “Project” is at the highest level when a WBS is created in the “Create WBS” Process (PA) of “Scope Management” KA as per PMBOK guide. A project can be further broken down into phases or deliverables. A project is considered to be at Level-0 in the WBS.

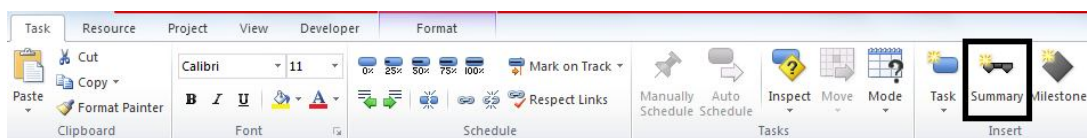
Similarly in MSP, a Project is known as “Project Summary Task” and it can be viewed by selecting the “Show Project Summary Task” option in the Show/Hide group of Format tab.



#### 4.1.2 Work Package (PMBOK) Vs Summary Task (MSP):

A “Work Package” is created in the “Create WBS” process of “Scope Management” KA. As per PMBOK, a work package can be assigned to multiple people and can be broken down to “Activity” level. A “Work Package” in PMBOK corresponds to “Summary Task” in MSP. A Summary Task can also be broken down to individual task levels.

**Note:** The duration, start date and end date of a Project Summary Task or a Summary Task can now be edited with the concept of Top-Down Summary Tasks and Placeholder Tasks in MSP. The Top-Down summary tasks can be inserted into the Gantt Chart from “Insert” group under “Task” tab as shown below in MSP.



Also, as with previous editions of MSP, bottom up calculation is also available.

#### 4.1.3 Activity (PMBOK) Vs Task (MSP):

Activities are created in “Define Activities” PA under “Time Management” KA. An “Activity” is the smallest unit which can be assigned to person. Generally, one person is assigned to an activity, though more people can also be assigned.

Similarly a “Task” in MSP is a unit of work, which is normally assigned to an individual and it is the smallest unit for which time, cost and scope can be definitively determined. Activities are rolled up to form the Work Package and similarly Tasks are rolled up to form the Summary Task.

#### 4.1.4 Activity Attributes (PMBOK) Vs Task Attributes (MSP):

Activity Attributes are created in “Define Activities” PA under “Time Management” KA. The attributes can be the successor or predecessor tasks, the links associated, the resources assigned, duration of the activity and so on.

In MS Project, similarly there are various tasks attributes for a Task which can be found or populated in the Task Information Dialog box.

#### 4.1.5 Rolling Wave Planning (PMBOK) Vs Placeholder Tasks (MSP):

In MSP, there has been concept of placeholder task which need not have a fixed start and end date. A tentative date or simply a string value can be given for the task. This concept starts with Auto and Manual scheduling, introduced in MSP 2010.

Auto and manual scheduling can be set in “Tasks” group under “Task” tab. This adds tremendous flexibility to planning including the “Rolling Wave Planning” as defined PMBOK guide.

	Task Mode	Task Name	Duration	Start	Finish	Predecessors
1	Placeholder	Placeholder Task 1	Unknown	TBD	TBD	
2	Placeholder	Placeholder Task 2	Unknown	TBD	TBD	
3	Task	Task 1	2 days	Mon 1/7/13	Tue 1/8/13	
4	Task	Task 2	2 days	Mon 1/7/13	Tue 1/8/13	

#### 4.1.6 Activity List (PMBOK) Vs Task List (MSP):

A collection of activity is called Activity List and it is created in “Define Activities” PA of “Time Management” KA. In MSP, a collection of Tasks is called “Task List”.

#### 4.1.7 Activity Duration (PMBOK) Vs Duration (MSP):

Activity Duration is estimated in “Define Activity Durations” PA of “Time Management” KA as defined in PMBOK.

In MSP, duration is calculated as Duration = Finish Date – Start Date + 1. In PMBOK though the concept of duration same, it comes with as variants, such as:

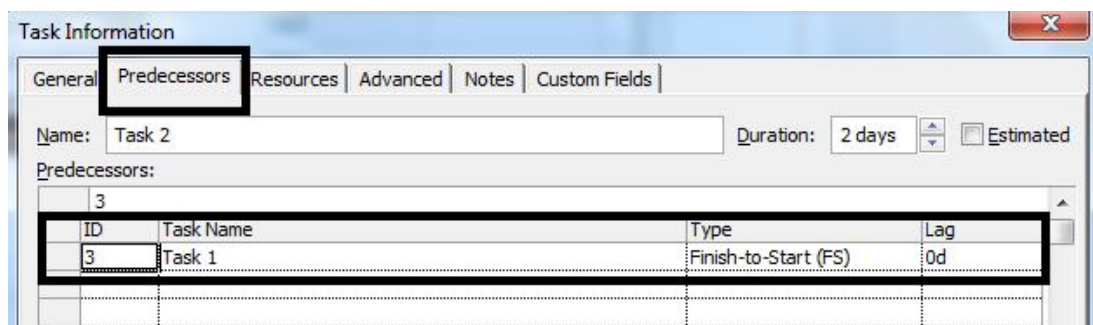
Duration = Early Finish – Early Start + 1 OR  
 Duration = Late Finish – Late Start + 1

**Note:** In MSP, the duration is dependent on the work and unit and is driven by the formula, which is Duration = Work / Unit.

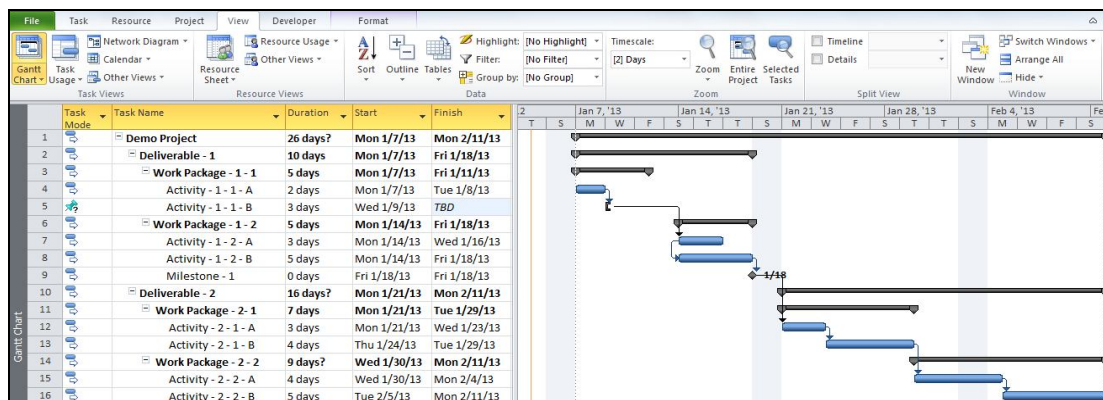
#### 4.1.8 Sequencing (PMBOK) Vs Linking (MSP)

Sequencing is an operation which is defined as “Sequence Activities” PA in the “Time Management” KA in the PMBOK. Here, the activities are sequenced in the order in which they will be executed by the team members of a project. While sequencing the activities, dependencies between the activities are defined.

Dependencies can in the form of mandatory or discretionary or external dependencies. Similarly in “Task Linking” of MSP, a sequencing of tasks and linking with other tasks is done with one type of aforementioned dependency. After linking is performed on each task, a “Predecessor Task” field will be available for each “Successor Task”. In MSP, for a Task, information is filled in the Task Information dialog box.



Above all, by applying the aforementioned concepts, a PMP or management professional can create a Gantt Chart via MSP 2010. A sample project will look like as below:



From the above Gantt Chart, it can be referenced that:

- Work Packages in PMBOK are similar to Summary Tasks in MSP, e.g., Work Package 1-1; Activities are similar to Tasks.
- The Milestones are of 0 duration and they are represented as filled up diamonds, e.g., Milestone – 1.
- The dependencies are formed between the Activities or Tasks (Finish to Start or Start to Start) with linked arrow marks in the Chart portion of the Gantt Chart.
- Tasks which are Manually scheduled will not have a Gantt chart display depending on the unfilled data. Above, Activity-1-1-B is manually scheduled.

#### **4.1.9 Resource Breakdown Structure – RBS (PMBOK) Vs Resources (MSP):**

RBS is an output from “Estimate Activity Resources” PA of “Time Management” KA of PMBOK. It structures the resources based on Category and Type.

In similar lines, resources defined in MSP are of 3 types: [namely] work, material, and cost resources.

**Work** → People/Human Resources and Equipment Resources. It is defined as “Work Resources”, as these resources actually do the work.

**Material** → This resource will be consumed, like DVD for final software that will be burned. This does not perform any work on its own, but they are used for your project.

**Cost** → There is another type of resource which is known as “Cost Resource” and it is newly introduced in MS Project 2010. It is a type of expense in the project, e.g., travel of a staff to his new office location or an onsite coordinator who will have to travel to the client location. This does not perform any work. The sole purpose of it is to assign the cost to a task.

#### **4.1.10 Activity Resources (PMBOK) Vs Work Resources (MSP)**

Activity Resource requirement is an output from “Estimate Activity Resources” PA of “Time Management” KA. Resources as defined by PMBOK guide can be Human resources or Equipment Resources. Activities will be performed by work resources and aided by other resources material. In MSP, Activity Resources are mapped to Work Resources, which are of 2 types, i.e., People (or Human) Resources and Equipment Resources.

Cost Resource is though a slightly difference concept in MS Project, still to be applied in MS Project, an Activity or Task has to be created for final calculation of cost.

After identifying resources along with their types in MSP, a PMP or management professional can create a Resource Sheet, which will look like as shown below. This will be part of Resource Sheet View in MSP.

	Resource Name	Type	Material	Initials	Group	Max.	Std. Rate	Ovt. Rate	Cost/Use	Accrue At	Base Calendar
1	Satya Dash	Work		S	MGMT	100%	\$140.00/hr	\$140.00/hr	\$0.00	Prorated	Standard
2	Juliano Sanchez	Work		J	PRD	100%	\$120.00/hr	\$140.00/hr	\$0.00	Prorated	Standard
3	Vimala R	Work		V	PRD	100%	\$120.00/hr	\$140.00/hr	\$0.00	Prorated	Standard
4	Ravi M	Work		R	DEV	100%	\$120.00/hr	\$140.00/hr	\$0.00	Prorated	Standard
5	John Scholman	Work		J	DEV	100%	\$120.00/hr	\$140.00/hr	\$0.00	Prorated	Standard
6	Michael A	Work		M	DEV	100%	\$120.00/hr	\$140.00/hr	\$0.00	Prorated	Standard
7	Partha G	Work		P	TEST	100%	\$100.00/hr	\$120.00/hr	\$0.00	Prorated	Standard
8	Deepa P	Work		D	TEST	100%	\$100.00/hr	\$120.00/hr	\$0.00	Prorated	Standard
9	Travel	Cost		T						Prorated	
10	DVD	Material		D			\$0.00		\$0.00	Prorated	
11	Software License	Material		S			\$0.00		\$0.00	Prorated	

As it can be seen from the Resource Sheet view:

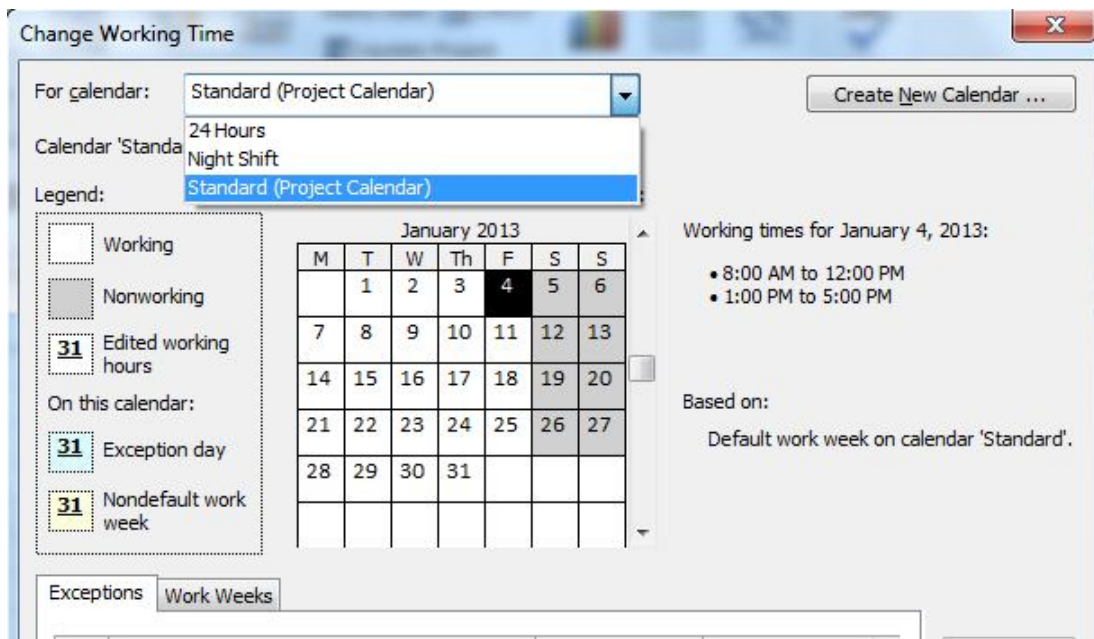
- Only Human Resources and Equipment Resources (=Work) have rates and max units.
- Material resources have a rate and they can be consumed
- Cost resources do not have a rate – as they will have only cost when they are associated with a task.
- Work, Material and Cos Resources have been grouped along the departmental lines

#### 4.1.11 Project Calendar (PMBOK) Vs Base Calendar (MSP)

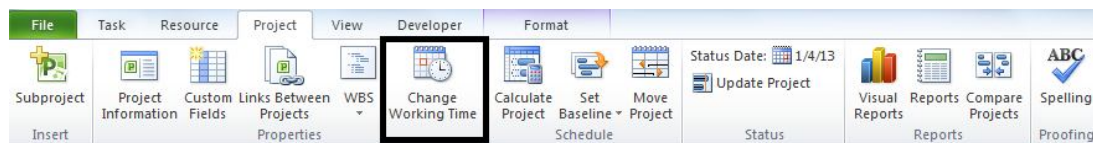
Project Calendar is initially created in the “Develop Schedule” PA of “Time Management” KA. As defined in PMBOK, Project Calendar is then fed into “Control Schedule” PA for monitoring and controlling of the project schedule. Project Calendar contain all information at the project level – such a various holidays, organization specific non-working date or any other exception cases. It is one of the Project Documents in PMBOK Guide.

In similar lines, for MSP, there is a concept of Base Calendar. A Base Calendar can be of 3 types, which are Standard Calendar, 24 Hour Calendar and Night Shift Calendar. The default applied one to MS Project is the Standard Calendar. In this calendar all holidays, project specific non-working days and any other project specific information is noted.





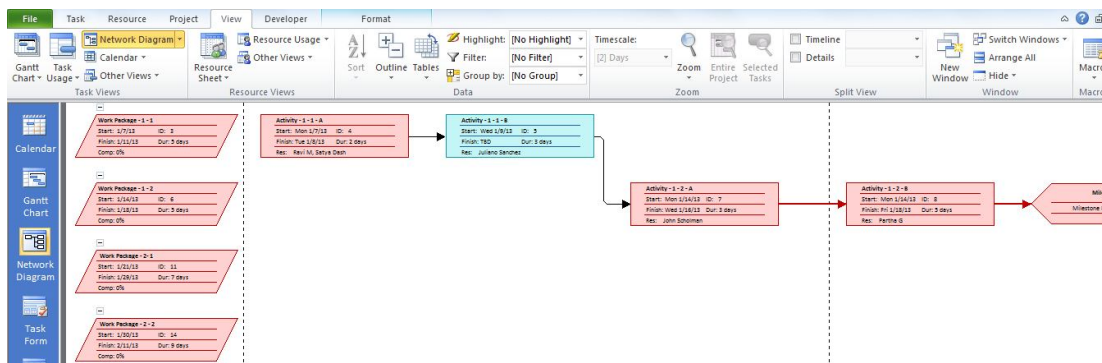
The standard calendar can be invoked in MS Project with the help of “Change Working Time” under “Properties” group of “Project” tab.



#### 4.1.12 Project Schedule Network Diagram (PMBOK) Vs Network Diagram (MSP)

Project Schedule Network Diagram is created in “Sequence Activities” PA of “Time Management” KA. The Activities are sequences with their dependencies and finally the network diagram is created. This is then fed into “Develop Schedule” PA to create the final Project Schedule.

In MSP, it is known as simply Network Diagram. It is one of the many views defined in MSP, where the default view is the Gantt Chart View. After assigning resources to the project created before in the section of “Sequencing Vs Linking”, the Network Diagram View will be as below.



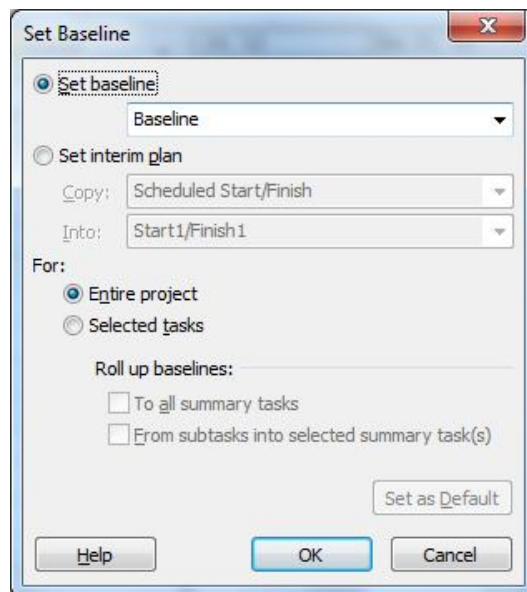
In MSP, the view can be switched to “Network Diagram” view with the help of View Bar or from the drop down menu. This can be further analyzed to check on the schedule.

#### 4.1.13 Schedule Baseline (PMBOK) Vs Baseline (MSP)

“Schedule Baseline” is created in the “Develop Schedule” PA of “Time Management KA” as defined in PMBOK Guide. As the name suggests, base-lining is done when enough planning for the schedule has been done and the manager of the project has been given the go ahead from the concerned stakeholders or sponsor(s). At this stage, the actual percentage of completion or the current status of the project is not entered.

Similarly, the Baseline concept in MSP applies to all the above rules mentioned. In MS Project, after performing a baseline, there will not be any visible reflection of it in the Gantt Chart. Only when start tracking (after assigning the actual finish percentage) is performed, then the tasks which are completed will be shown via a tick mark. However, to see the baselined data, one can switch to the Tracking Gantt View.

Baselining in MSP can be done with “Set Baseline” functionality under “Schedule” group of “Project” Tab.

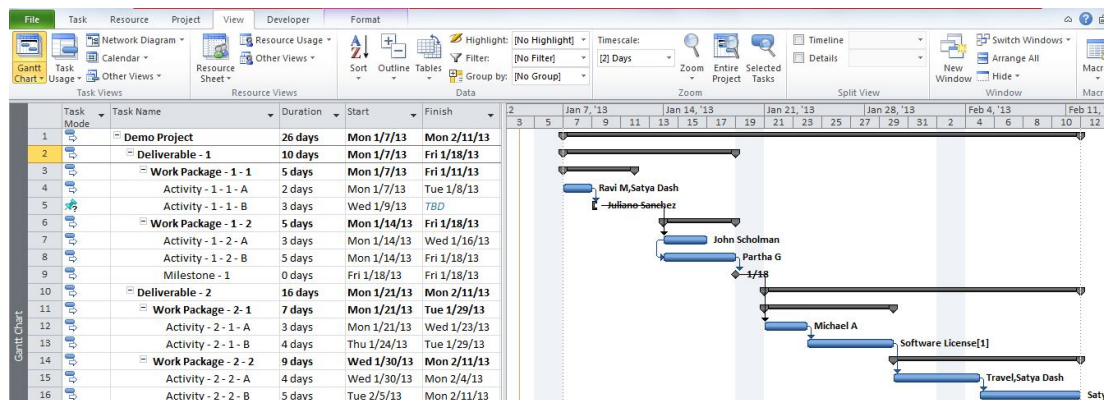


#### 4.1.14 Schedule Management Plan (PMBOK) Vs Microsoft Project Plan (MSP)

In PMBOK Guide, the Project Management Plan consists of many subsidiary plans such as Scope Management Plan, Schedule Management Plan, Quality Management Plan, Risk Management Plan and so on. All the plans are consolidated together and is called the Project Management Plan. There are additional project documents defined such as Risk Register, Stakeholder Registers.

It must be noted that in MSP, there is no such segregation based on various plans. Scope, Time, Cost, Quality etc. are integrated into one plan and it is called the Microsoft Project Plan (in dot MPP format). It is a single file with information on scope, cost, time, quality and integration related information with change requests.

The plan is viewed in the default Gantt Chart view. By using the same Demo project as in “Linking and Sequencing Section” and assigning various resources to the Tasks, in MSP, the Gantt Chart will look as below. The name of the resources along with the completion value of the tasks or activities, are shown on the Bars for the Gantt chart.

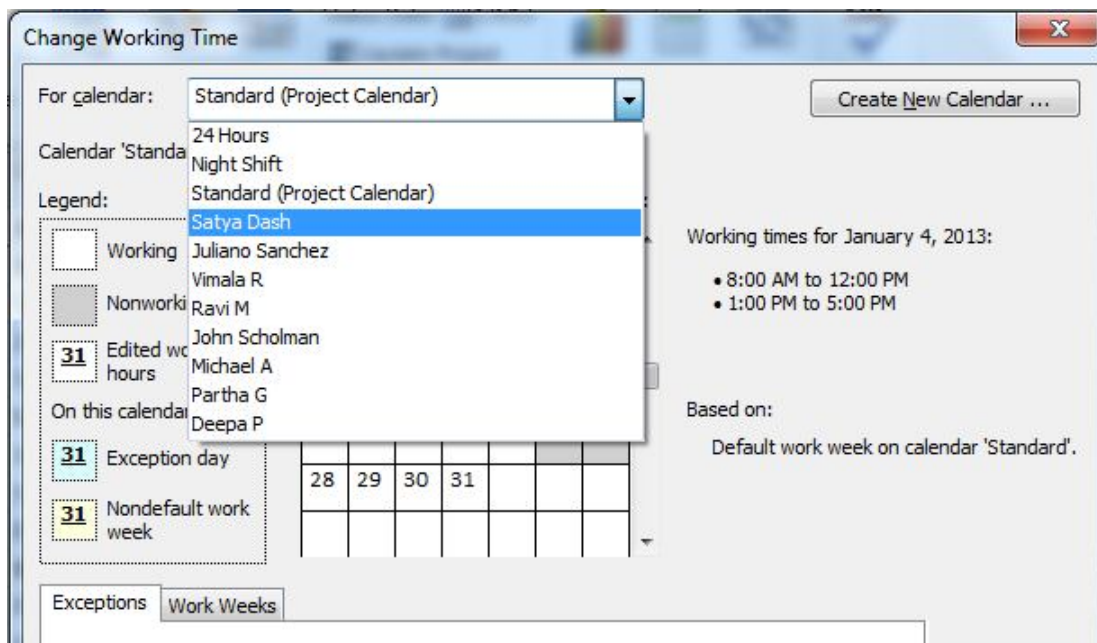


## 4.2. PMBOK and MSP: The Convergence

### 4.2.1 Resource Calendar (PMBOK/MSP)

Resource Calendars are created in the “Acquire Project Team” PA of “Human Resource Management” KA in PMBOK guide. Resource Calendar applies Human Resources.

In similar lines, for MSP, every work resource will have a Resource Calendar associated with it. However, Material and Cost Resources will not have any calendar associated. In MSP, all resource calendars will be derived from the project specific standard calendar and can have specific information to that resource. Resource Calendars are auto available after populating the Resource Sheet and they can be modified.



#### 4.2.2 Milestone/Milestone List (PMBOK/MSP)

Milestone List is created in “Define Activities” PA of “Time Management” KA. Milestone list is a set of milestones. The meaning of word Milestone is same for both PMBOK and MSP. It is an activity which of “zero duration”. It is a time in the project where a significant event happened (say Phase – 1 is complete) and it is normally imposed from outside.

It has to be noted here for practical reasons, the milestone value in MS Project can be set to no more than zero days, e.g., getting approval for a project document across time zones will require more than 1 day.

#### 4.2.3 Dependencies (PMBOK/MSP)

As per PMBOK, there are 3 kinds of dependencies: [namely] mandatory dependency (or hard logic), discretionary dependency (soft logic), and external dependency. The most common mandatory dependency is Finish-to-Start (F-2-S) dependency. The other 3 are: [namely] S-2-S (Start-to-Start), S-2-F (Start-to-Finish), and F-2-F (Finish-to-Finish).

In MSP, dependencies are known as relationships and they will be one of the aforementioned four types. For a particular task, the relationship of it with the predecessor task can be viewed in the Task Driver pane. It can also be viewed in the Task Information dialog box. The notations in the bar area of the various views in MS project will be as below.

Dependencies	Notations
Finish-to-Start (FS)	
Finish-to-Finish (FF)	
Start-to-Start (SS)	
Start-to-Finish (SF)	

#### 4.2.4 Leads and Lags (PMBOK/MSP)

In PMBOK, a Lead is the amount of time by which the successor activity can be advanced with respect to a predecessor activity. A lag is the opposite of it.

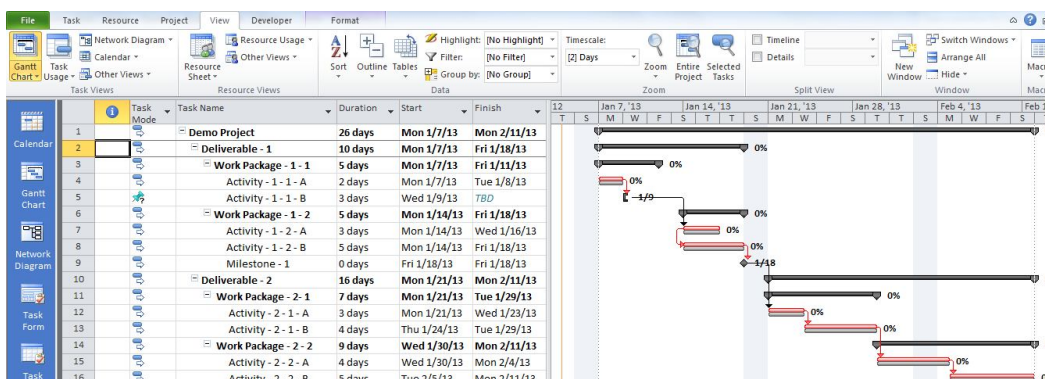
In MS Project as well, the concepts are same and it is applicable to the tasks. It is noted that lag is noted with a positive value, where as lead is noted with a negative value (in number or percentage) in MSP.

#### 4.2.5 Critical Path (PMBOK/MSP)

Critical Path method is defined as one of the Tools and Techniques in “Schedule Development” KAP of Time Management KA of PMBOK guide.

A project’s critical path is the combination of activities that, if any are delayed, will delay the project’s finish. The primary objective of it is to determine the project’s finish date and to determine the extent to which an activity can be delayed without delaying the project. The tasks or activities on a critical path have zero slack.

The concept of critical path is same in MSP. Below is snap of critical path in the Tracking Gantt view. In this case, the project has also been baselined for further tracking through “Control Schedule” PA. The baselined information is marked with another bar (gray colour) on top the default bars for the tasks.

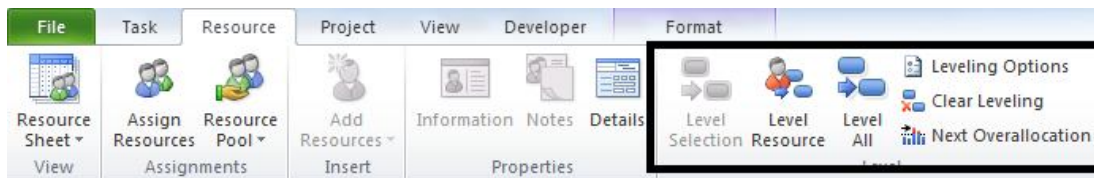


The tasks or activities marked in red are in critical path. Any delay in these activities will result in the delay of the project's finish date.

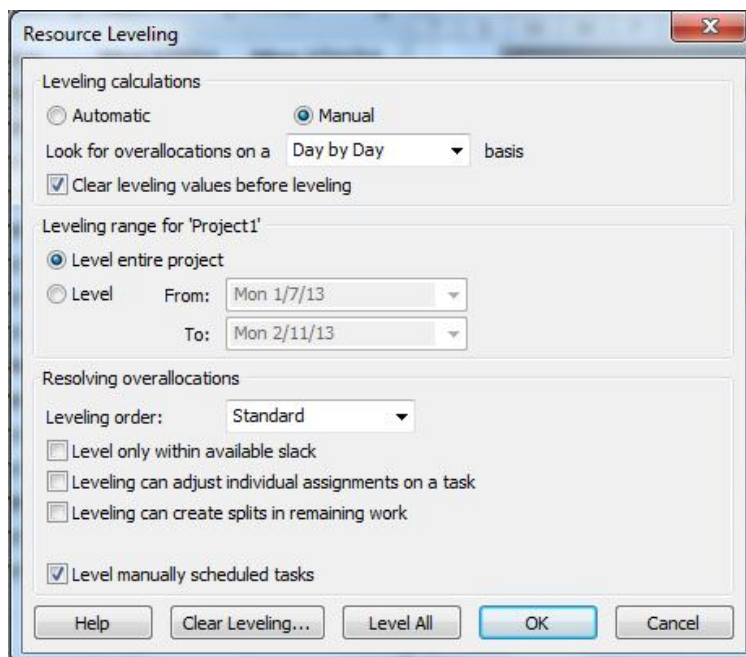
#### 4.2.6 Resource Optimization Techniques - Resource Leveling (PMBOK/MSP)

“Resource Optimization Techniques” is one of the Tools and Technique defined in “Develop Schedule” and “Control Schedule” PA of Time Management KA as defined in PMBOK guide. One of the Resource Optimization Techniques is the “Resource Leveling”.

In order to level the resource, first the critical path of the project is analyzed, the ability of the organization's to supply resources is determined and over allocated or under allocated resources are properly assigned. In MSP, the concept of resource leveling is same and it can be done manually or automatically. Additional resources can be assigned to task, a task can be delayed or a resource assignment can be delayed. Various Resource Leveling options are available under “Properties” group of “Resource” Tab in MSP



Manual or Auto resource leveling option can be set with the Leveling Option dialog box in MSP. The dialog box is shown below.



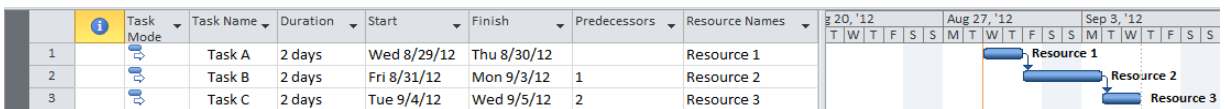
## 4.2.7 Modeling Techniques – What If Analysis (PMBOK/MSP)

Modeling technique defined in PMBOK for “Develop Schedule” and “Control Schedule” process for Time Management KA. One of the Modeling techniques is the What If Analysis. This is typically an analysis of the question with of “What if the situation represented by ‘X’ happens?” What If Analysis in MS Project can be done with the help of Compare Project functionality and also with Resource Leveling.

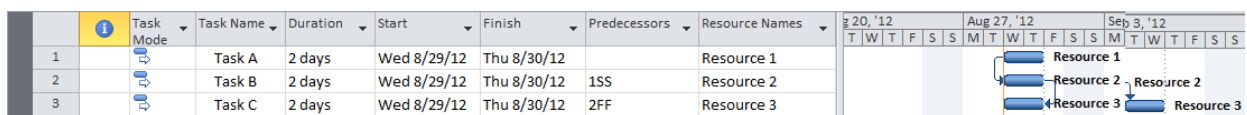
## 4.2.8 Schedule Compression (PMBOK/MSP)

Schedule compression technique is used to shorten the schedule without reducing the project scope in order to meet project constraints such as date. They are of two types, [v.i.z] Crashing and Fast Tracking.

In MSP, the concept is also similar. Fast tracking is typically done by having dependencies such as SS or FF and Crashing is done by adding more resources to the task. Let us consider 3 tasks each of duration 2 days and with various resources assigned as shown.

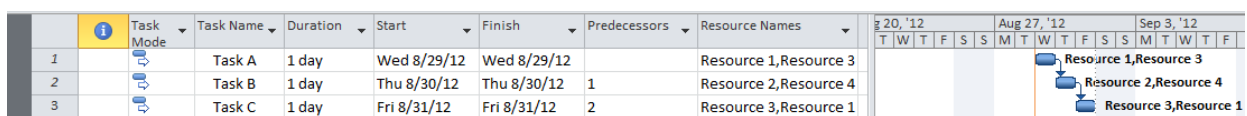


### Fast tracking:



As it can be inferred from the above diagram, fast tracking has been done by applying SS and FF dependencies. Leads and Lags can also applied along with the dependencies to compress the schedule further.

### Crashing:



In crashing, more resources are added to the tasks to compress the schedule.

## Conclusion

PMBOK is one of the most widely used reference books for PMP and many management professionals around the planet. Though it is quite theoretical in its approach, still the concepts defined in PMBOK are very scientific and real time oriented. A PMI-PMP or a project management professional while using the best principles and practices of PMBOK may find it somewhat difficult for practical application with the use of tools. MS Project 2010, from Microsoft, is one of the most popular tools used by management professionals. Though there are certain differences between terms and terminologies of PMBOK and MSP, MS Project can be used as a tool to apply the principles of PMBOK guide.

As a matter a fact, various knowledge areas defined in PMBOK Guide such as Integration Management, Scope Management, Time Management, Cost Management, and Resource Management can be practically applied with the help of MSP. To a certain extent, Quality Management and Risk Management can also take the help of MSP.

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**Satya Narayan Dash** is management professional with around 11 years of experience. He has been associated with various companies such as Motorola, Subex, Wipro, Zoho in roles of Program Manager, Project Manager, PMO & Technical Project Leader, and has coached, mentored, and consulted over a thousand of Project Management, Consulting, PMO professionals across the globe. He holds a Bachelor Degree in Electronics and Communication Engineering from National Institute of Technology, Jalandhar, India and is a certified PMP from PMI, a certified MSP from Microsoft, a certified CSM from Scrum Alliance and also a certified Java professional. His web presence is at <http://managementyogi.blogspot.com> and he can be contacted at email: [managementyogi@gmail.com](mailto:managementyogi@gmail.com).