

Continual Improvement

For Managers

Data Analysis Tools for EPC Companies

MS Excel, MS Project, Primavera, SAP & ERP



Data Analysis using MS Excel
Data Analysis using MS Project
Data Analysis using Primavera
Data Analysis using SAP & ERP

Swarup Das

LET'S KEEP LEARNING

☆ Acknowledgment 10th Aug'2020

The purpose of this book is to give guidance to the aspiring in EPC Companies, who dreams to become an experts in project management with knowledge of MS-Excel, MS Project, Primavera and SAP & ERP. Further, this book will give you a comprehensive idea about the useful report generation using charts, graphs, etc. I believe that this book will enable you use your brain up to the fullest to work smartly and achieve your goal in all endeavor. I fervently hope that this book will help the managers / Leaders to get a sound understanding of how to plan your work and achieve your goals. I'm sure that this book fundamentally will increase your capability of getting good score in your organization, entrepreneurship and interviews in a stress-free manner.

I shall be happy to entertain your asserted valued commendations regarding inaccuracies and errors, and graciously make suggestions for further improvement of the book, deemed to be a fountain of my inspirations, a new lease of hope, which will enable my quest for betterment & further development.

Please, feel free to get in touch with me through mailto: swarup_recj97@rediffmail.com, swarupdas1264@gmail.com and thru Mobile.: +91.8860451297

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☆ About the Author

I started my professional career almost two decades back as a GET (Graduate Engineer Trainee) in Civil & Structural Design & Engineering and worked for some esteem organizations, namely, Engineering and Development Consultant - New Delhi, Lahmeyer International - Gurgaon, L&T-Faridabad, ABB Limited - Faridabad, Siemens Limited - Gurgaon, Indiabulls Power Limited - Gurgaon, Skipper Electricals (I) Limited - Gurgaon, KEC International - Gurgaon and lastly as an AGM with KPTL India - Noida. Intrinsicly, I learn from diversity and create cohesion and networking among richly varying components in our business arena in hyper-connected VUCA World.

I am having PE Certificate from Institution of Engineers, India, became Member of "Institute of Engineers" India, became Member of ICE (Institution of Civil Engineers, UK) and SEFI (India), Studied Civil-Structural-Geotechnical-Earthquake Higher Engineering from IIT Delhi, Received CPD Certificate from Cambridge University (UK). I have studied "High Impact Leadership" from Cambridge University (UK). I have studied "Management Essentials" from Harvard Business School, (USA). I have studied "Psychology – An Introduction" from Oxford University, (UK). I have written and published a motivational Book "Consciencess – The Ethical Motives" and other books "Advanced Excel with VBA Macros", "Civil Structural Designer's Manual", "Learn French", "Brainstorming Management Talks", "PowerPoint Slide Design", "Primavera (PERT & CPM)", "C C++ & Python Programming:", "Data Science for beginners", "Data Analysis tools for ETC Companies", "Data Visualization (Tableau Qlikview & Power BI)". I had received attendee certificate from TUV NORD (ISO 9001:2000) in 2007.

I have visited 6 countries for official / personal tour purposes. Presently I live in Faridabad, Delhi-NCR, Haryana-121002, India.

☆ Dedication

With the loving guidance of God and his many blessings bestowed upon me, this book is affectionately dedicated to my only daughter Sanya who believed me and encouraged me to follow my dream. And also dedicated to my childhood friends, REC/NITJ/IITD friends, all my well-wishers, all my official colleagues and seniors for their support during my tenure with them.

This book is also dedicated to my late parents (Sushil Chandra Das and Madhuri Das), my Sisters and Brothers, my Nephews and Nieces, my Grandfather Kiran Chandra Das, Great Grandfather Ramgati Das and my forefather Lal Chand Das, Ram Ram Das, Sagar Das, and Tanu Lal Das.

This book is also dedicated to you, the industrious reader/user, the righteous people, with my heartiest blessing and gratitude.

This Book will enhance you :

- ✎ - to stimulate your excellent Thoughts! And revive your working skills.
- ✎ - to create Self Awareness for sustaining personal and professional growth & success.
- ✎ - to create platform for Self-empowerment for Managing & Leading in corporate world.
- ✎ - to produce better valuable outcomes more smartly, efficiently and more consistently.

I regret that some mistakes might have crept in, and I will be grateful if they are pointed out to my notice as consents. The suggestions for enriching the quality and usefulness of the book are most welcome and will be gratefully acknowledged with full fidelity.

Those who might communicate their comments and criticism to me are very welcome.

Contents

1. Data visualization in EPC Companies
2. Data Analysis using MS Excel
3. Data Analysis using MS Project (MSP)
4. Data Analysis using Primavera
5. Data Analysis using SAP & ERP

1. Data Analysis Using Excel

As data strategies become pervasive (universal) in all business and institutional sectors. Microsoft Excel is one of the top tools for data analysis and the built-in pivot tables are arguably the most popular analytic tool. Excel will become even more popular as a bridge tool for non-data scientists doing more work, more often, with data. It is a very powerful data analysis tool and almost all big and small businesses use Excel in their day to day functioning. We use Excel to do our calculations, and all math formulas are given as Excel Spreadsheets, but we do not attempt to cover Excel Macros, Visual Basic, Pivot Tables, Data filters, functions, formulas, transpose, vlookup or other intermediate-to-advanced Excel functionality. We need to explore various advanced graphing and charting techniques available in Excel. Starting with various line, bar and pie, pivot charts, scatter plots and histograms to present a set of non-structured and scattered data in a sophisticated and easy to understand manner.

Refer Book: “Advanced Excel with VBA Macros” by Swarup Das

Project Execution Plan

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
1																					
2		Project Title :	xxxxxxxxxxxxxxxx																		
3		Company Name :	xxxxxxxxxxxxxxxx																		
4		Project Lead :	xxxxxxxxxxxxxxxx																		
5		Project Start Date:	Wed, 01-Jan-2020			Highlight	01-Jan-2020														
6						Display Week	1														
7																					
8		PROJECT EXECUTION PLAN (Gantt Chart) [Henry Gantt (1861–1919)]									Jan-20	Feb-20	Mar-20								
9		SL. No.	Activities	Assign to	Start Date	End Date	Duration	Status	Progress (%)	01-Jan	07-Jan	15-Jan	21-Jan	01-Feb	07-Feb	15-Feb	21-Feb	01-Mar	07-Mar	15-Mar	21-Mar
10										1	2	3	4	5	6	7	8	9	10	11	12
11		1	Electrical Engineering		01-Jan-2020	31-Mar-2020	90 days	Completed	100												
12		2	Civil Engineering		10-Jan-2020	31-Mar-2020	81 days	Completed	100												
13		3	Fdn Bolt Procurement		01-Feb-2020	28-Feb-2020	27 days	Completed	100												
14		4	Equip Procurement		20-Feb-2020	30-May-2020	100 days	Pending	0												
15		5	Structure Procurement		20-Feb-2020	30-Mar-2020	39 days	Under Progress	\$0												
16		6	Site Mobilization		01-Feb-2020	28-Feb-2020	27 days	Completed	100												
17		7	Tower Foundation		15-Feb-2020	31-Mar-2020	45 days	Under Progress	\$0												
18		8	Transformer Foundation		01-Mar-2020	15-Apr-2020	45 days	Under Progress	\$0												
19		9	Equipment Foundation		01-Apr-2020	15-May-2020	44 days	Under Progress	\$0												
20		10	Control Building		01-Jun-2020	15-Nov-2020	167 days	Pending	0												

2. Data Analysis using MS Project (MSP)

The following are the 5 basic elements of MSP:

1. Scheduling
2. Executing
3. Monitoring
4. Rescheduling
5. Report Generation

MSP, the project management software program by Microsoft, is a very handy tool for project managers that helps them develop a schedule, assign resources to tasks, track the progress, manage the budget, and analyze workloads for an ongoing project.

Project creates budgets based on assignment work and resource rates. As resources are assigned to tasks and assignment work estimated, the program calculates the cost, equal to the work times the rate, which rolls up to the task level and then to any summary task, and finally to the project level.

A blank project file can be daunting (intimidating), especially if you're new to project management. But with a few clicks, you can tap the power of Project to convert your to-do list into a full-fledged project for you to manage and share with your team and stakeholders.

Here are a few starting points:

- Add tasks
- Outline tasks
- Link tasks
- Change your view
- Print your project

Step 1 – File → Options → General tab → Project view → Default view.
Select “Gantt with Timeline” from the dropdown box.

Step 2 – File → Options → Display tab → Show Indicators and Options Buttons For.
Check all options.

Step 3 – File → Options → Schedule tab → Schedule → Show Assignment Units.
Choose “percentage” from the dropdown box.

Step 4 – File → Options → Schedule tab → Calculation → Calculate Project after Each Edit.

Check the On button.

Step 5 – File → Options → Save tab → Save projects → Save Files In this format.
Select Project (*.mpp).

Step 6 – File → Options → Advanced tab → Edit.

Check all options.

Step 7 – File → Options → Advanced tab → Display → Show Status Bar → Show Scroll Bar.

Both options, Status Bar and Scroll Bar should be checked.

Step 8 - Resources → Level → Leveling Options → Leveling Calculations.

Set to manual.

Step 9 – Resources → Level → Leveling Options → Leveling calculations → Look for Overallocations.

Select “Day By Day” from dropdown box.

A project manager should also be able to answer other project-related questions as well. For example –

- Why this project needs to be run by the organization?
- What’s the best way to communicate project details to the stakeholders?
- What is the risk management plan?
- How the vendors are going to be managed?
- How the project is tracked and monitored?
- How the quality is measured and qualified?

MS Project can help you –

- Visualize your project plan in standard defined formats.
- Schedule tasks and resources consistently and effectively.
- Track information about the work, duration, and resource requirements for your project.
- Generate reports to share in progress meetings.

Create a New Plan

When working with MS Project you either specify a start date or a finish date. Because once you enter one of the two, and other project tasks, constraints and dependencies, MS Project will calculate the other date. It is always a good practice to use a start date even if you know the deadline for the project.

Set Up Resources

In project management terminology, resources are required to carry out the project tasks. They can be people, equipment, facilities, funding, or anything (except labor) required for the completion of a project task. Optimum Resource Scheduling is the key to successful project management.

Resource Types

- **Work resources** – People and equipment to complete the tasks.
- **Cost resources** – Financial cost associated with a task. Travel expenses, food expenses, etc.
- **Material resources** – Consumables used as project proceeds. For example, paint being used while painting a wall.

Note: Be aware of the crucial difference between People and Equipment resources. People resources will have limited work hours, say 6, 8 or 12 hours. Equipment resources have different working capacities of 2, 8 or 24 hours and could have maintenance breaks as well. Also note, that it is possible multiple people resources might be using one equipment resource, or one equipment might be accomplishing multiple tasks.

Steps involved

Click View tab → Resource Views group → Click Resource Sheet.
Click the cell directly below the Resource Name heading column.
Enter Resources as an individual person, job function or group.

Assign Resources to Task

Once the task and resource list are complete, resources need to be assigned to tasks in order to work on them. With MS Project you can track task progress, resource and tasks costs.

Steps involved

Click View Tab → Gantt Chart View → Resource Name column.

Click the box below the Resource Name column for the task you need the resource to be assigned.

From the dropdown, choose the resource name.

Plan Duration, Cost & Time

After assigning resources to tasks you can view the cost, duration and work required for the plan to complete.

Check Plan's Duration

In Gantt Chart View → View Tab → Split View group → Timeline checkbox.

You will be able to see the plan's start and finish dates.

In the Gantt Chart view, you can also look at the project summary task, to note the duration, start and finish dates of the plan.

Check Plan's Cost

Click View tab → Data group → Tables → Cost.

Cost for each task gets rolled up into summary tasks, and then ultimately to project summary task.

Check Plan's Work

Click Report Tab → View Reports group → click Resources → click Resource overview

In Resource status table which appears at the bottom, you will get a summary of resource's earliest start dates and latest finish dates as well as remaining work.

Check Project Statistics

Click Project Tab → Properties group → Project Information → in the new dialog box click Statistics...

Track Progress

Once your project plan is ready in MS Project, it becomes essential for a project manager to measure the actuals (in terms of work completed, resources used and costs incurred) and to revise and change information about tasks and resources due to any changes to the plans. A Project Manager should not assume that everything is progressing according to plan and should always keep track of each task. Resistance to formal tracking of project management data is normal. You can overcome resistance to tracking by explaining your expectations, explaining the benefits of tracking, and training people to track the task themselves.

Save a Baseline

To evaluate project performance you need to create a baseline against which you will compare the progress. One needs to save the baseline, once a plan is fully developed. Of course, due to rolling wave planning or progressive elaboration needed to manage projects one can always add new tasks, resources, constraints and costs to the plan.

Also note, it makes sense to save the baseline before entering any actual values such as percentage of task completion.

Advanced Scheduling

There are four types of task dependencies.

- **Finish to Start (FS)** – Finish the first floor before starting to build the second floor. Most used.
- **Finish to Finish (FF)** – Cooking all the dishes for dinner to finish on time.
- **Start to Start (SS)** – When doing a survey, we would seek survey responses but will also start tabulating the responses. One does not have to finish collecting survey responses before starting the tabulation.
- **Start to Finish (SF)** – Exam preparation will end when exam begins. Least used.

Adjust Task Link Relationship

Click Task Tab → double-click the required task under Task Name column → Task Information dialog box opens → Predecessors Tab.

Click the box under the Type column and choose the relationship according to your requirement.

Status Reporting

After creating a project plan and baselines, the project begins. At this stage, the project manager would be focusing on collecting, monitoring, analyzing project performance, and updating project status by communicating with the stakeholders.

When there is a difference between what is planned and the actual project performance, it is called a Variance. Variance is mostly measured in terms of Time and Cost.

Task Slippage

There are several ways to view task with variance.

Method 1: Graphical View by Tracking Gantt

Click View tab → Task Views group → Gantt Chart dropdown → Tracking Gantt.
By comparing the currently scheduled Gantt bars with baseline Gantt bars, you can see what tasks started later than planned or took longer to complete.

Method 2: Graphical View by Detail Gantt

Method 3: Variance Table

Click View tab → Data group → Tables → Variance.

Method 4: Filters

Click View tab → Data group → Filters → More

Filters → choose filter as Late tasks, Slipping task, etc.

Task Costs

To examine cost in a project life cycle, you should be aware of these terms and what they mean in MS Project 2013 –

- Baseline costs – All planned costs as saved in baseline plan.
- Actual costs – Costs that have been incurred for tasks, resources, or assignments.
- Remaining costs – Difference between baseline/current costs and actual costs.
- Current costs – When plans are changed due to assigning or removing resources, or adding or subtracting tasks, MS Project 2013 will recalculate all costs. This will appear under the fields labeled Cost or Total Cost. If you have started to track actual cost, it will include actual cost+ remaining cost (uncompleted task) per task.
- Variance – Difference between Baseline Cost and the Total Cost (current or scheduled cost).

Click View Tab → Data group → Tables → Cost.

You will be able to view all relevant information. You can also use filters to see tasks that have run over budget.

Click View tab → Data group → Filters → More Filters → Cost Overbudget → Apply.

Resource Cost

For some organizations, resources costs are primary costs, and sometimes the only cost, so these need to be closely watched.

Click View tab → Resource Views group → Resource Sheet.

Click View tab → Data group → Tables → Cost.

We can sort the Cost column to see which resources are the most and least costly. Click the AutoFilter arrow in Cost column heading, when the drop-down menu appears, click on Sort Largest to Smallest.

You can use the AutoFilter feature for each of the columns, By sorting Variance column, you will be able to see the variance pattern.

Project Report

Project comes with a set of predefined reports and dashboards. You'll find all of these on the Report tab. You can create and customize graphical reports for your project as well.

Dashboard Reports

Click Report → View Reports group → Dashboards.

Resource Reports

Click Report → View Reports group → Resources.

Cost Reports

Click Report → View Reports group → Costs.

Progress Reports

Click Report → View Reports group → In Progress.

Custom Reports

Click Report → View Reports group → New Report.

There are four options.

- **Blank** – Creates a blank canvas. Use the Report Tools - Design tab to add charts, tables, text, and images.
- **Chart** – Creates a chart comparing Actual Work, Remaining Work, and Work by default. Use the Field List pane to pick different fields to compare. The look of the chart can be changed by clicking on Chart Tools tabs, Design, and Layout tabs.
- **Table** – Creates a table. Use the Field List pane to choose what fields to display in the table (Name, Start, Finish, and % Complete appear by default). Outline level box lets you select how many levels in the project outline the table should show. The look of the table can be changed by clicking on Table Tools tabs, Design, and Layout tabs.
- **Comparison** – Creates two charts side-by-side. Charts will have the same data at first. You can click one of the charts and pick the data you want in the Field List pane to begin differentiating them.

MSP Practical using Software

Creating a Blank Project & Project Information

MS project includes the list of options mentioned below in the Project Information. When you open the MS Project, from the available templates, you need to click on the Blank Project as shown below.

The project sets the start date of the plan to the current date. This date is indicated by the green thin vertical line in the chart part of the Gantt Chart View.

Step 1: Start Date

- ❖ Click on Project Tab>> Properties Group>> Project Information.
- ❖ A Dialog Box will appear on your screen. In the box for Start date, enter the start date. For example- start date is 11/5/20 . You can click the down arrow and choose the date from the calendar.
- ❖ Tap on Ok to confirm.

Step 2: Set up Calendar

- ❖ Click Project Tab>> Properties Group>> Project Information.
- ❖ Click on the arrow present on current date drop-down box. Here, you will see the list with three base calendars.
- ❖ **24 hour**- Calendar having 24 hour working time.
- ❖ **Standard** - Regular working hours from Monday to Friday with 1-hour break. (8 AM to 5 PM).
- ❖ **Night shift** - It includes the timing from 11 PM to 8 AM. Night shift includes the nights from Monday to Friday.

As mentioned in picture above, you have to choose the Standard Calendar as a Calendar of your project. Tap on 'Ok' or 'Cancel' for closing the dialog box. Now, you have to add the exceptions.

Step 3 - Adding the Exceptions to Calendar

Exceptions are used for modifying the Project Calendar to have a non-working day or non-standard workday. A user can also fix unique work hours for an individual resource.

Example of creating a non-working day for any office celebrations or holiday:

Click Project tab>> Properties Group>> Change Working Time.

The Change Working Time Dialog box will get displayed on your screen. Under the Exception Tab, click 'Name Field', enter the event as ' Company Anniversary'. Enter '11/22/15' in the Start field and then enter the same in the finish field. This day will be scheduled as the project's non-working day as shown below in the picture.

Step 4 - Setup Resource Calendar

You can modify the Standard Base Calendar, in the same manner, you can also modify the working and non-working time of every resource. A user can make the modifications in the resource calendar to accommodate vacation time, flex time, training time, etc.

Resource Calendar can be set only for work resources not cost or material resources.

Step 5 - Change the working time for resource

- ❖ Click on the Project Tab and then go to Properties Group>> Change working time. The 'Change Working Time Dialog Box' will display on the screen.
- ❖ Click down arrow for 'For Calendar' drop down box.
- ❖ Choose the resource for whom you want to modify the work schedule.
- ❖ Click 'Works Week' tab.
- ❖ Double-click the [default] cell present just below the Column heading.
- ❖ Under the 'Selected day(s)', select any day for changing the work schedule.
- ❖ Click on Set day(s) to these particular work times as shown in the image below.

Step 6 - Create Non-Working days

- ❖ Click on the Project Tab and then go to Properties Group>> Change working time. The 'Change Working Time Dialog Box' will display on the screen.
- ❖ Click down arrow for 'For Calendar' drop down box.
- ❖ Choose the resource for whom you want to modify the work schedule.
- ❖ Click 'Work Weeks' tab.
- ❖ Double click the default cell present below the 'Name Column Heading'.
- ❖ Under the Selected day, select the day for which you want to change the work schedule.
- ❖ Click on any day. Use the radio button 'Set days to non-working time'.
- ❖ Tap on the OK button and close the dialog box.

Change Default Time Dimensions : Click on the Project Tab>> Properties Group>> Change working time>> options.

Create Milestone: Milestones are particular points in the timeline of the project. Milestones are used as main progress point for managing the project success and expectations of stakeholders. These are basically used for budget, input, and reviews.

As per the Mathematics, Milestone is a task of 0 duration. A user can insert a milestone in two different ways:

Method 1 - Insert Milestone

- ❖ Click task name to insert Milestone.
- ❖ Click Task Tab>>Insert Group>> Milestone.

Method 2 - Convert a Task to Milestone

- ❖ Click on a specific task or enter the new task under Task Name Heading.
- ❖ Under the heading Duration, type '0' days.

Method 3 - Convert a Task to Milestone

- ❖ Double-click on a specific Task name.
- ❖ Task Information dialog box will appear on your screen.
- ❖ Click on the Advanced tab and choose "Mark Task as Milestone" as mentioned in the picture below.

Create a Summary Task

A user can roll up the different tasks in the project schedule into a Summary Task. This will help the users to manage the plan in a better way as a user can organize the plan into phases.

For example- if a user wants to group Task 4 and Task 5 into the summary Task, a user can follow the given steps:

- ❖ Select the name of both tasks.
- ❖ Click the Task tab and then click on Group Insert.
- ❖ Click summary.
- ❖ MS project will create the New Summary task. Name it as Task 1.

Link Tasks

Once you have made the task list for accomplishing targeted goals, you are supposed to link task with task relationships known as dependencies. For example - After completion of task 1, task 2 will start, these dependencies are referred to Links.

There are 4 types of task dependencies as mentioned below:

- ❖ Finish to Start (FS)
- ❖ Finish to Finish (FF)
- ❖ Start To Start (SS)
- ❖ Start to Finish (SF)

Methods to link tasks

Method 1

Select the tasks that you want to link. For example Task 1 and Task 2. Here is the process to link tasks

- ❖ Click on the task tab.
- ❖ Schedule group.
- ❖ Link the tasks selected.
- ❖ Task 1, as well as Task 2, is linked to the FS-Finish to Start.

Important - The Start Date of Task 2 will be a day come after the finish date of Task 1.

Method 2

You need to Double Click on the targeted successor task for linking.

For example - If you have clicked the Task 4.

- ❖ The task information dialog box display on your screen.
- ❖ Click on the 'Predecessors' tab
- ❖ Now, you have to click on the empty cells in the table which are displayed below 'Task Name Column.
- ❖ A drop-down menu will appear where all the tasks defined in the project are mentioned.
- ❖ Choose Predecessor task and tap on OK.

Method 3

Here, you need to choose the task group and link them to Finish to Start relationship.

Choose multiple tasks >>Task tab >>Schedule group>> Link the Selected Tasks.

Respect Links

If you are working in a Manual Schedule Mode then, if you make any changes in the Predecessor task, the changes won't get reflected in the start date of Task 4. For example - If the task 4 start on same that which is next day to the Task 3 finish date. Then, the Task 3 duration will be changed from 5 to 7 days.

Task 4 start date will not be updated automatically.

If a user wants to change the default Scheduling Mode for all new Project Plans then:

Go to the 'File' tab.

- ❖ Click 'Options' and after that select 'Scheduled' Tab.
- ❖ Select 'All New Project' from the scheduling option.
- ❖ From the Drop down menu, choose 'Auto Scheduled' under the New Task creates as shown below.

MS Project - Settings

Every user has different Settings for their MS Project. To make sure that you get the expected outcomes without any hassle, you need to perform the following settings in your MS Project.

Important- All these are the Default Settings that comes with MS Project installation.

Step 1: Go to File>> Options. Click on the General Tab, select the Project view >> Default View.

From the Drop down menu, choose 'Gantt With Timeline' option like mentioned below.

Step 2: Go to 'Files'>>'Options'>>'Display Tab'>>' Show Indicators and Option Button for'.

Check all the available options as shown in given screen.

Step 3: Go to 'File'>>'Optios'>>' Scheduled tab'>>' Schedule'>>' Show Assignment Units'.

From the drop-down menu, select the 'Percentage' option as given below in the picture.

Step 4: Go to 'Files'>>'Options'>>' Schedule tab'>>'Calculation'>>'Calculate Project after each Edit'.

Check 'ON' button.

Step 5: Go to 'Files'>>'Options'>>' Save Tab'>>' Save Projects'>>' Save Files In this format'.

Choose ' Project (*.mpp)'.

Step 6: Go to 'File'>>'Options'>>'Advanced Tab'>>'Edit'.

Check All Options.

Step 7: Go to 'File'>> 'Options'>> 'Advanced tab'>> 'Display'>> 'Show Status Bar'>> 'Show Scroll Bar'.

Check the option 'Scroll Bar' and 'Status Bar' as shown in the picture.

Step 8: Go to 'Resources'>> 'Level'>> 'Leveling Options'>> 'Leveling Calculations'.

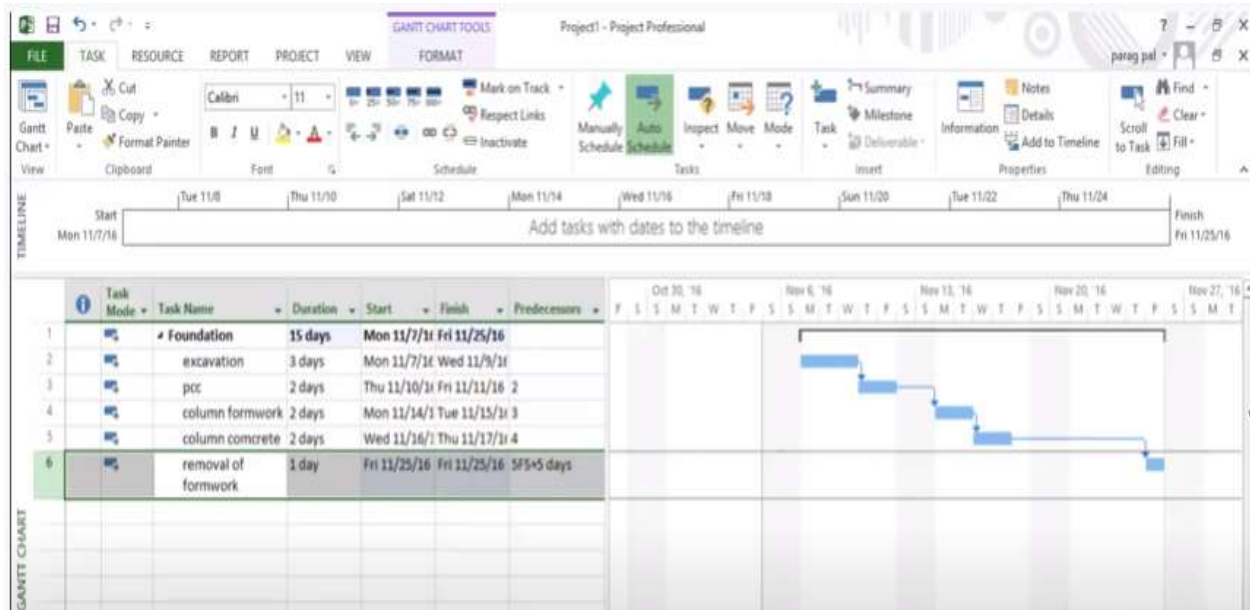
Set it to the manual and you will see the following screen.

Step 9: Go to 'Resources'>> 'Level'>> 'Leveling Options'>> 'Leveling Calculations'>> 'Look for the Over allocations'.

Microsoft Project Working Path: Open a blank Project -> File -> Info -> Project information -> Project Properties (Summary -> Fill up -> Ok) -> Organizer -> Calendars -> Go to the 'Project' by clicking on Back-Arrow -> Project [Change Working Time -> Create New Calendar -> Name(PGCIL Calendar) -> Checked 'Create New Base Calendar' -> Ok -> Details (Give input for Working, Non-working and Holidays -> give time for everyday (from -> to) -> Ok. Exception -> List out the holidays] -> Task Name [Foundation as event with 0day Duration (Excavation 3 days -> PCC 2day -> Formwork Fdn 4day -> Fdn & Col Reinf. 5days -> Foundation -> Concreting Fdn 2day -> Formwork Column 3day -> Concreting Column 4day -> Removal of Formwork 7days) -> Fill the Duration for each task] -> Task Mode [Auto Schedule => File -> Option -> Schedule -> New Tasks Created (Auto Scheduled)] -> Link [Double click on PCC -> Predecessor (ID =2, Because PCC starts after excavation which has task sequence 2 (Task sequence 1 is for Foundation Task Name with zero day duration) -> Similarly for Formwork Fdn ID = 3 that is Task no. of PCC -> Similarly the other activity's ID need to be filled with predecessor ID Number].

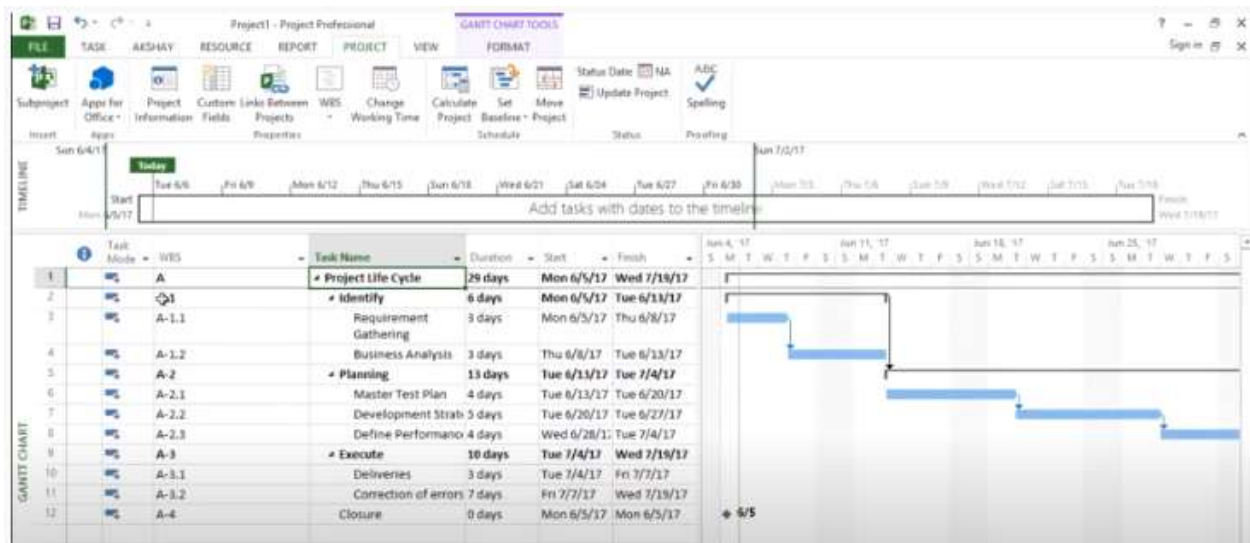
Work Breakdown Structure (WBS) in MSP:

A Work Breakdown Structure (WBS), in project management and system engineering, is a deliverable-oriented decomposition of project into smaller components. A WBS is a key project deliverable that organizes the team's work into manageable sections.



WBS Naming Convention:

Path: Project -> WBS -> Define Code [(Level – Sequence – Length – Separator) -> Sequence (Uppercase Letter orders) -> Length (1) -> Separator (- hyphen) -> Ok] -> Select Task Name (Right click -> Insert Column) -> Select or type WBS (See the WBS Numbering. Similarly, Sequence (Lowercase Letter orders) -> Length (1) -> Separator (. dot) -> Ok] -> See the WBS Numbering.



Level Resources

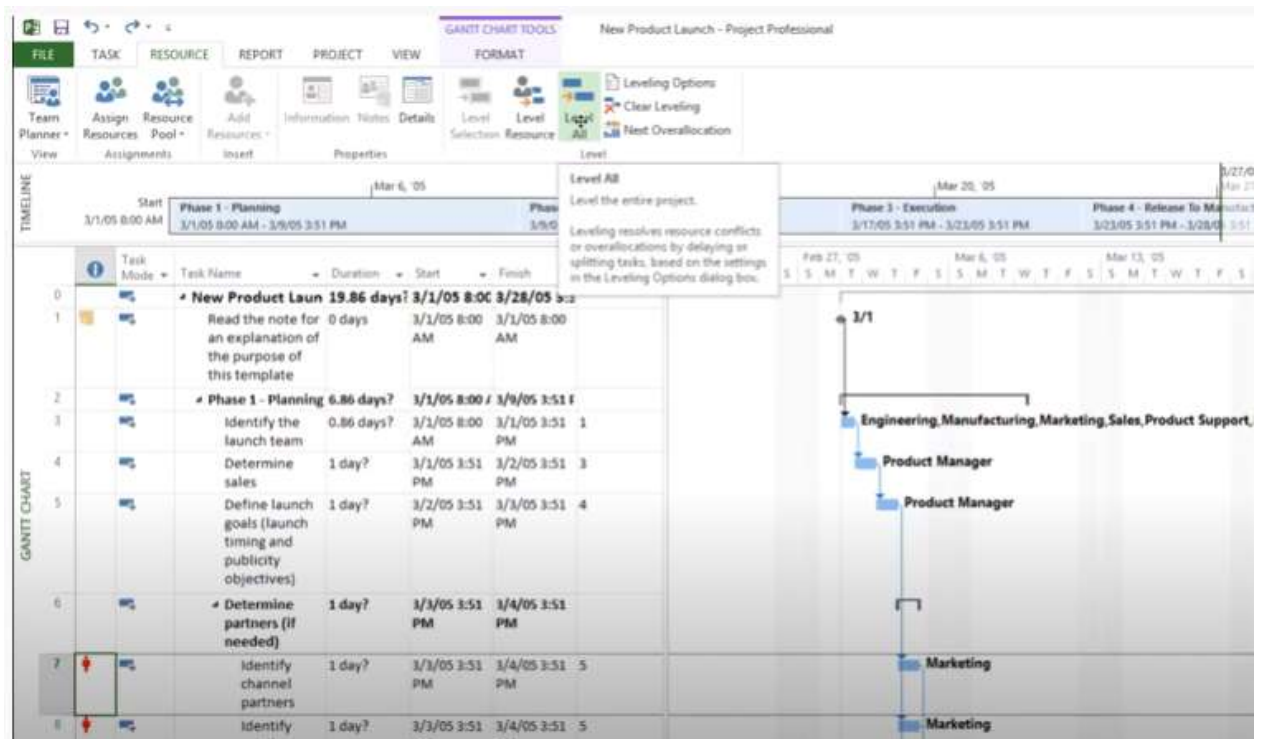
MSP Path => Go to Menubar -> RESOURCE Tab -> Level Resources -> Select the over allocated resource (Level Now).

Other way: Go to Menubar -> RESOURCE Tab -> Level All.

Levelling Option: Go to Menubar -> RESOURCE Tab -> Levelling Option (Levelling Calculation -> Checked Automatic and see the dropdown, say, select 'day by day') -> Levelling range for new days product launch (level for entire project or within some time duration, From To) -> Resolving overallocation (Checked options suitably).

Clear Levelling: Go to Menubar -> RESOURCE Tab -> Clear Levelling (Checked 'Entire project' or 'selected task')

Next Overallocation: Go to Menubar -> RESOURCE Tab -> Next Overallocation (The over allocation Red sign selection moves to the next overallocation).



Resource Analysis:

One of the most important aspects of your role is to monitor the assignments for each of your resources so that you can effectively balance their workloads. Some resources might be overallocated, and others might be underallocated. You can review how efficiently your resources are being used in your project, and whether

you need to make any adjustments, by viewing their workloads and availability in Microsoft Project.

MSP Path: Task menu -> Gantt Chart dropdown menu -> 'Resource Sheet' [the red colored resources are overallocated -> Right click on the column (Insert a new column and give a column name say, 'Peak') -> Change the max value same as peak value.

Grouping: View -> Group by (Milestone or Critical, No Group, etc.) -> Format Tab (Critical Tasks) -> Group by (New Group – give a name as 'Resource Group by Deptt.' -> Field name 'Resource Group' -> Apply) -> View (Resource Sheet & Resource Usage).

3. Data Analysis using Primavera

Management Techniques in Construction – PERT & CPM

To comprehend the scheduling of any project execution plan, let us understand first the basic concept of the following:

- Project Management
- Phases of Project Management
- Guidelines for Network Construction
- Critical Path

Project Management:

- A project consists of individual activities, which are to be executed in a certain order before the entire task is completed.
- The activities are interrelated in a logical sequence that is known as precedence relationship.
- Project is represented in the form of a network for the purpose of analytical treatment to get solutions for scheduling and controlling its activities.

Project Life Cycle



Techniques in Project Management (for scheduling of project activities):

- I) **CPM** – Critical Path Method: In this method, the activity's timings are deterministic in nature. CPM is deterministic, i.e, with fixed activity time. CPM is usually used in repetitive type of project management.
- II) **PERT** – Project Evaluation and Review Technique: In this method, the activity's timings are probabilistic in nature, i.e, activity duration is not certain. PERT technique is usually used in a new project for project management.

In PERT, Activity duration follows “Beta” distribution. And Each activity will have three different time estimates. These are:

- Optimistic Time (t_o) – *Favorable condition*
- Most likely time (t_m) – *Average condition*
- Pessimistic time (t_p) – *Adverse condition*

To note that, $t_p > t_m > t_o$

Phases of Project Management:

1) Planning

- Dividing the project into distinct activities
- Estimating time requirement for each activity
- Establishing precedence relationships among the activities
- Construction of the arrow diagram (Network)

2) Scheduling

- Determines the start and end time of each and every activity

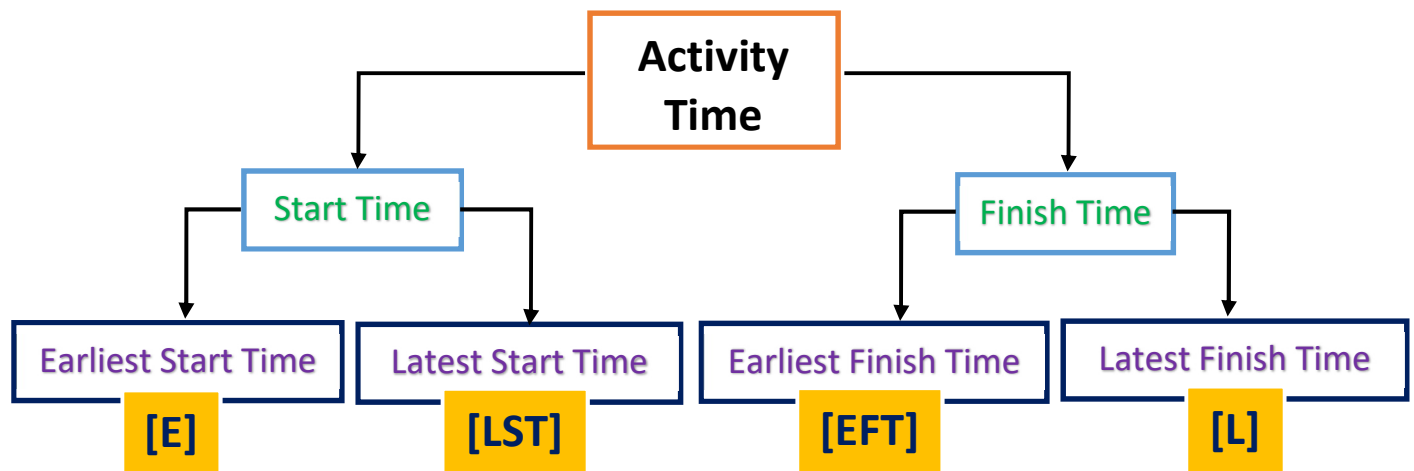
3) Controlling

- Using the arrow diagram and time chart for continuous monitoring and project reporting

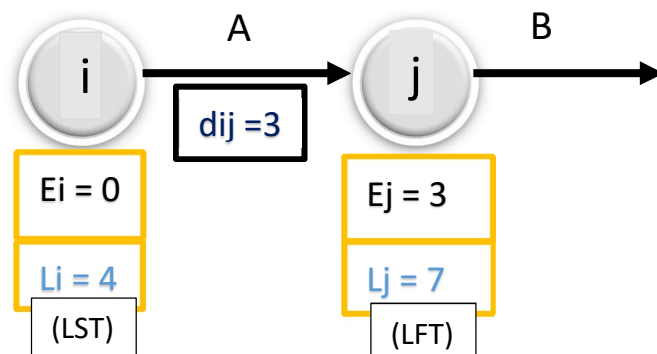
Guidelines for Network Construction

1. The starting event and ending event of an activity are called tail event and head event, respectively.
2. The network should have a unique starting node (Tail Event).
3. The network should have a unique completion node (Head Event).
4. No activity should be represented by more than one arc in the network.

5. No two activities should have the same starting node (Starting Event) and the same ending node (Ending Event).
6. Dummy activity is an imaginary activity indicating precedence relationship only. Duration of a dummy activity is zero. It is required when Start node and End node are same for two activities. It does not consume any resource or time. This is used to satisfy the predecessor relation only. We can use any nos. of dummy activity as required to satisfy the relation.
7. There should not be any closed looping and dandling (open ended node) in the network. Dangling should be connected (ended) to next or end event (node).
8. Fulkerson's Rule is used for numbering of nodes(events). Say, i as start node(Tail Event) and j as end node (Head Event), as per Fulkerson's rule $j > i$.



Let us see Activity Time by an example: Time provided for a work = 7 days, but actual time required (d_{ij}) to complete the work is say, 3 days [Relax = $(7-3) = 4$ days].



Example -1 (CPM): Consider the details of a project as shown in the table below

Activity	Predecessor	Duration (Months), (Dij)
A	-	2
B	-	5
C	-	4
D	B	5
E	A	7
F	A	3
G	B	3
H	C,D	6
I	C,D	2
J	E	5
K	F,G,H	4
L	F,G,H	3
M	I	12
N	J,K	8

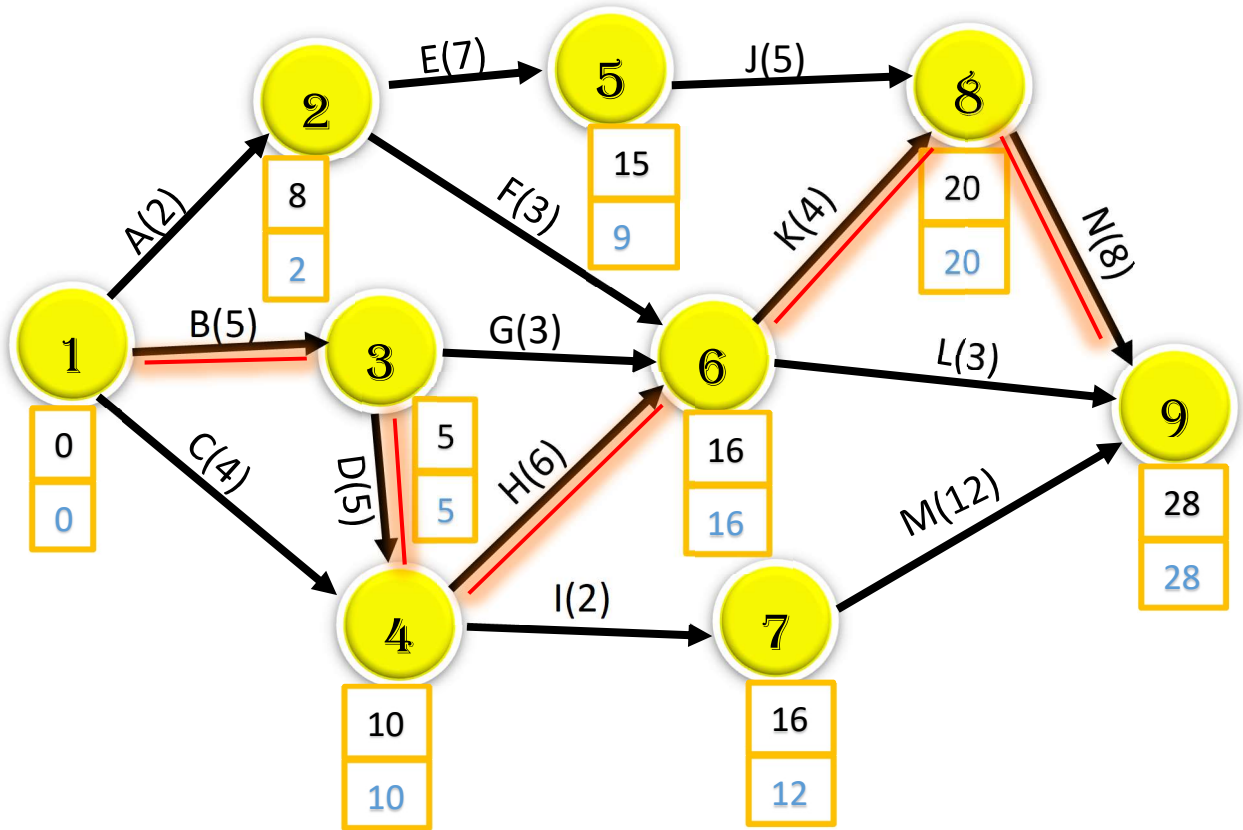
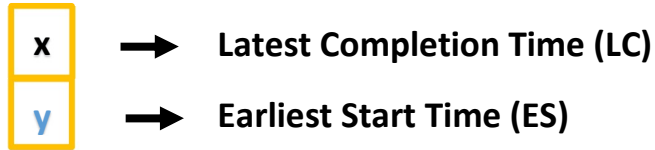
Questions:

- Construct the CPM Network
- Determine the critical path and project completion time
- Compute total floats and free floats for non-critical activities
- What is the Slack Time at each event (node)?

Critical Path – The CPM Network

Condition of Critical Path:

- $ES_i = LC_i$
- $ES_j = IC_j$
- $ES_j - ES_i = LC_j - LC_i = D_{ij}$



Critical Path:

Critical Path of a project network is the longest path in the network. This can be identified by simply listing out all the possible paths from the start node (event) of the project to the end node (event) of the project and then selecting the path with the maximum sum of activity times on that path.

Two phases:

- i) Determine Earliest Start times (ES) of all the nodes (events). This is called Forward Pass.
- ii) Determine Latest Completion times (LC) of various nodes (events). This is called Backward Pass

Determination of Earliest Start Time => Forward Pass => $ES_j = \max_i (ES_i + D_{ij})$

For Node 1 $ES_1 = 0$ (Always zero)

For Node 2 $ES_2 = 0 + 2 = 2$

For Node 3 $ES_3 = 0 + 5 = 5$

For Node 4 $ES_4 = 5 + 5 = 10$

For Node 5 $ES_5 = 2 + 7 = 9$

For Node 6 $ES_6 = 10 + 6 = 16$

For Node 7 $ES_7 = 10 + 2 = 12$

For Node 8 $ES_8 = 16 + 4 = 20$

For Node 9 $ES_9 = 20 + 8 = 28$

Determination of Latest Completion Time => Backward Pass => $LC_i = \min_j (LC_j - D_{ij})$

For Node 9 $LC_9 = 28$ (Always Max. ES)

For Node 8 $LC_8 = 28 - 8 = 20$

For Node 7 $LC_7 = 28 - 12 = 16$

For Node 6 $LC_6 = 20 - 4 = 16$

For Node 5 $LC_5 = 20 - 5 = 15$

For Node 4 $LC_4 = 16 - 6 = 10$

For Node 3 $LC_3 = 10 - 5 = 5$

For Node 2 $LC_2 = 15 - 7 = 8$

For Node 1 $LC_1 = 5 - 5 = 0$

Critical Path => The Largest Path in the Network. Here node (event) 1-3-4-6-8-9 is the critical path, i.e, Total Time required to complete the project, i.e project completion time along with Critical Path = Duration for activity B + D + H + K + N = $5 + 5 + 6 + 4 + 8 = 28$ months (t_{cp}).

Total Float (TF):

It is the amount of time that the completion time of an activity can be delayed without affecting the project completion time. Therefore, the formula for Total Float calculation for each activity is:

$$TF_{ij} = LC_j - E_{si} - D_{ij}$$

Free Float (FF):

It is the amount of time that the activity completion time can be delayed without affecting the earliest start time of immediate successor activities in the network. Therefore, the formula for Free Float calculation for each activity is:

$$FF_{ij} = E_{sj} - E_{si} - D_{ij}$$

Summary of Total Floats and Free Floats			
Activity (i,j)	Duration (D _{ij})	Total Float (TF _{ij})	Free Float (FF _{ij})
A 1,2	2	8 - 0 - 2 = 6	2 - 0 - 2 = 0
B 1,3	5	5 - 0 - 5 = 0	5 - 0 - 5 = 0
C 1,4	4	10 - 0 - 4 = 6	10 - 0 - 4 = 6
D 3,4	5	10 - 5 - 5 = 0	10 - 5 - 5 = 0
E 2,5	7	15 - 2 - 7 = 6	9 - 2 - 7 = 0
F 2,6	3	16 - 2 - 3 = 11	16 - 2 - 3 = 11
G 3,6	3	16 - 5 - 3 = 8	16 - 5 - 3 = 8
H 4,6	6	16 - 10 - 6 = 0	16 - 10 - 6 = 0
I 4,7	2	16 - 10 - 2 = 4	12 - 10 - 2 = 0
J 5,8	5	20 - 9 - 5 = 6	20 - 9 - 5 = 6
K 6,8	4	20 - 16 - 4 = 0	20 - 16 - 4 = 0
L 6,9	3	28 - 16 - 3 = 9	28 - 16 - 3 = 9
M 7,9	12	28 - 12 - 12 = 4	28 - 12 - 12 = 4
N 8,9	8	28 - 20 - 8 = 0	28 - 20 - 8 = 0

Any critical activity will have zero total float and zero free float, based on this property can determine critical activities. Therefore, B, D, H, K and N are critical activities.

Hence, 1 - 3 - 4 - 6 - 8 - 9, i.e, B - D - H - K - N = 5 + 5 + 6 + 4 + 8 = 28 months.

Slack Time at each Event (Node):

Formula for determine “Slack Time” = LC – ES, i.e, Latest Completion time minus Earliest Start time. Note that, “Slack Time” for **Events** on Critical Path is zero (0).

Event (Node) or Operation	Slack Time = (LC – ES)
1	0 – 0 = 0
2	8 – 2 = 6
3	5 – 5 = 0
4	10 – 10 = 0
5	15 – 9 = 6
6	16 – 16 = 0
7	16 – 12 = 4
8	20 – 20 = 0
9	28 – 28 = 0

CPM (Floats):

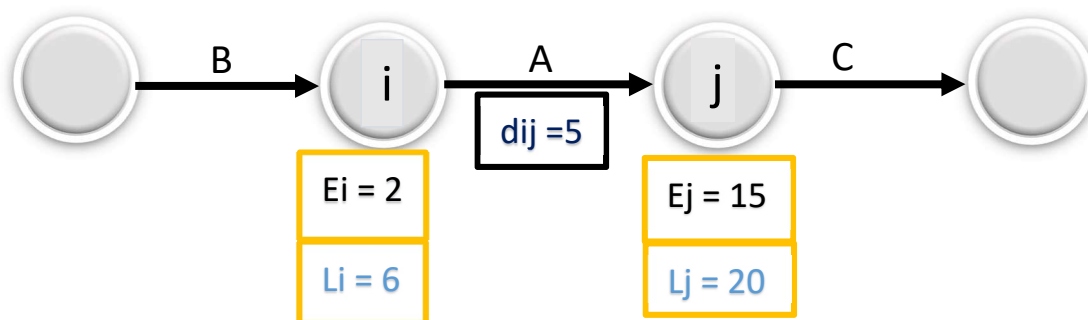
Float is defined as the Relax or Delay provided to any activity.

Relax or Float = Time provided – Duration of any activity (d_{ij})

Types of Float:

- i) Total Float (TF)
- ii) Free Float (FF)
- iii) Independent Float (IF)

Let us understand the various types of floats in details with an example:



Total Float (TF): The maximum Relax or Delay provided to any activity without affecting project duration.

$E_i = 2 \Rightarrow$ Earliest Start Time (EST) of activity A

$L_j = 20 \Rightarrow$ Latest Finish Time (LFT) of activity A

Therefore, **(TF)_A** = [Time provided – Duration] $\Rightarrow [(L_j - E_i) - d_{ij}] = [(20 - 2) - 5] = \mathbf{13 \text{ days}}$

Free Float (FF): Relax or Delay provided to any activity without affecting EST of successor.

$E_i = 2 \Rightarrow$ Earliest Start Time (EST) of activity A

$E_j = 15 \Rightarrow$ Earliest Start Time (EST) of successor activity C

Therefore, **(FF)_A** = [Time provided – Duration] $\Rightarrow [(E_j - E_i) - d_{ij}] = [(15 - 2) - 5] = \mathbf{8 \text{ days}}$

Independent Float (IF): Relax or Delay provided to any activity without affecting EST of successor as well as LFT of predecessor.

$E_j = 15 \Rightarrow$ Earliest Start Time (EST) of successor activity C

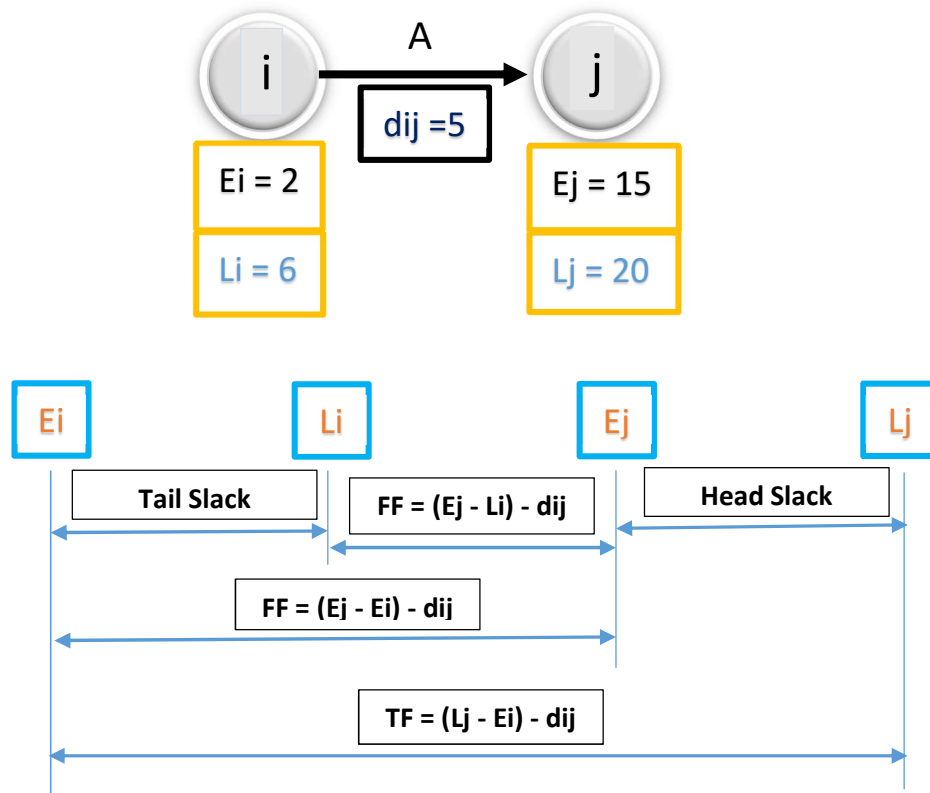
$L_i = 6 \Rightarrow$ Latest Finish Time (LFT) of predecessor activity B

Therefore, **(IF)_A** = [Time provided – Duration] $\Rightarrow (E_j - L_i) - d_{ij} = (15 - 6) - 5 = \mathbf{4 \text{ days}}$

Note:

- i) $TF > FF > IF$
- ii) $TF = FF = IF = 0$ in Critical Path
- iii) Tail Event Slack at node i = $S_i = L_i - E_i$
- iv) Head Event Slack at node j = $S_j = L_j - E_j$

To understand the Floats from a diagram point of view:



Example -2 (PERT): Consider the following table summarizing the details of a project

Activity	Predecessor	Duration (Weeks)			Mean Duration, Dij (Expected Duration)	Variance
		t_o	t_{ml}	t_p	$t_e = (t_o + 4t_{ml} + t_p) / 6$	$V = \sigma^2 = [t_p - t_o] / 6]^2$
A	-	5	6	7	6	0.11
B	-	1	3	5	3	0.44
C	-	1	4	7	4	1.00
D	A	1	2	3	2	0.11
E	B	1	2	9	3	1.78
F	C	1	5	9	5	1.78
G	C	2	2	8	3	1.00
H	E,F	4	4	10	5	1.00
I	D	2	5	8	5	1.00
J	H,G	2	2	8	3	1.00

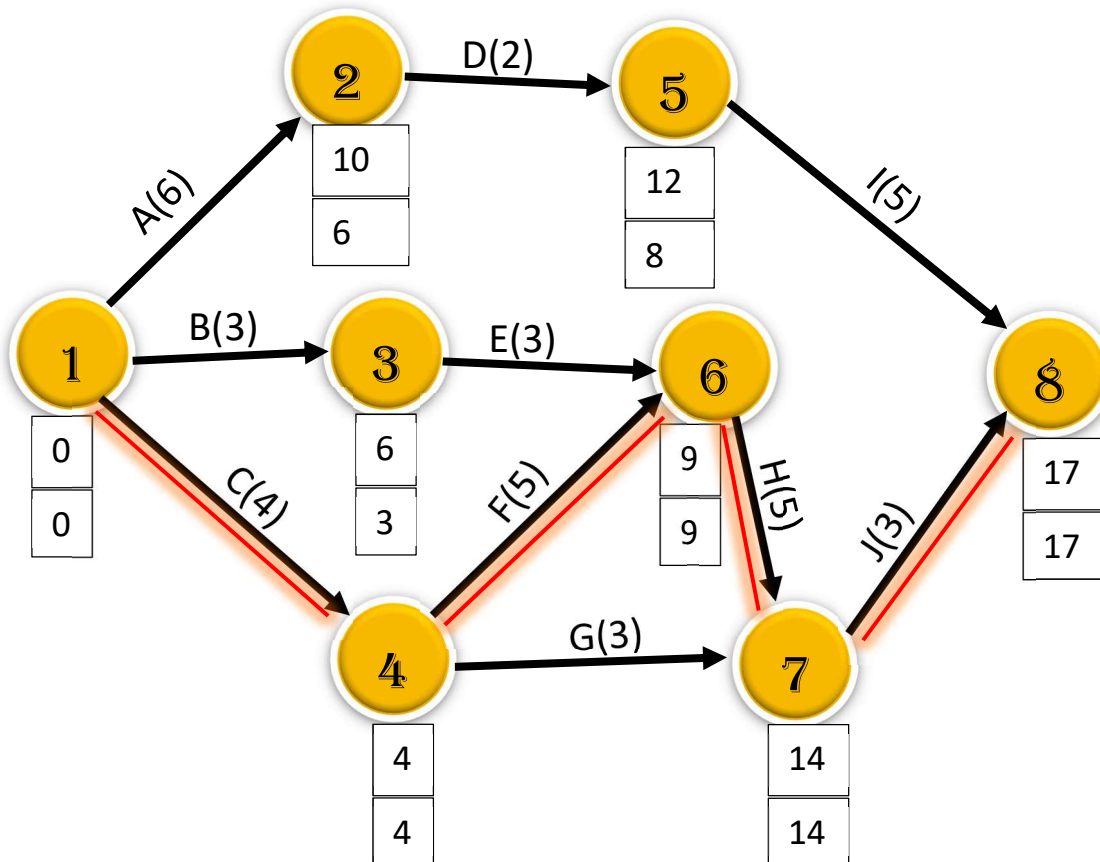
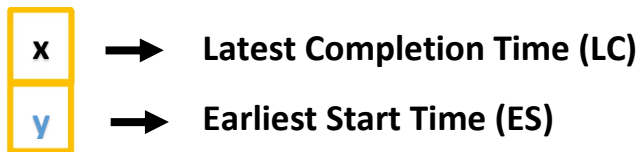
Questions:

- Construct the project network
- Find the expected duration and variance of each activity
- Find the critical path and expected project completion time
- What is the probability of completing the project on or before 22 weeks?

Critical Path – The PERT Network

Condition of Critical Path:

- $ES_i = LC_i$
- $ES_j = IC_j$
- $ES_j - ES_i = LC_j - LC_i = D_{ij}$



Earliest Start Time => Forward Pass => $ES_j = \max_i (ES_i + D_{ij})$

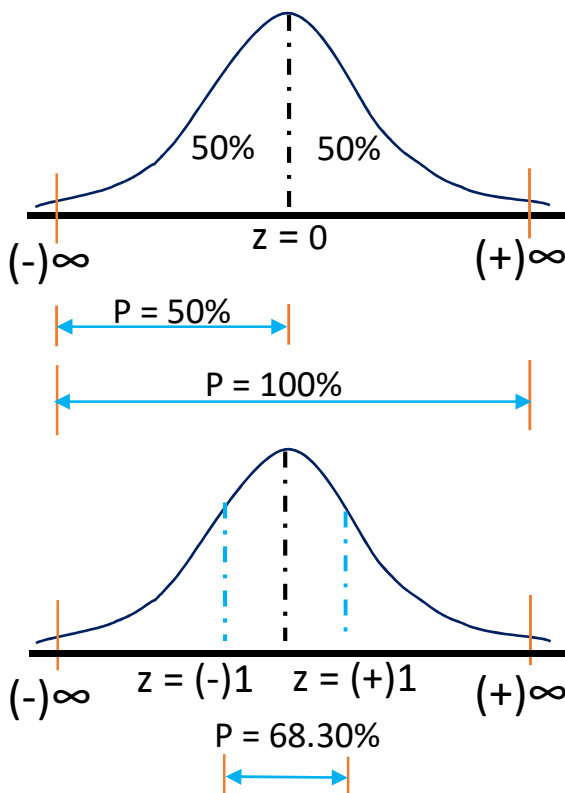
Latest Completion Time => Backward Pass => $LC_i = \min_j (LC_j - D_{ij})$

Critical Path => The Largest Path in the Network, Here node (event) 1-4-6-7-8 is the critical path, i.e, Total Time required to complete the project, i.e project completion time along with Critical Path = Duration for activity C + F + H + J = 4 + 5 + 5 + 3 = 17 weeks (t_{cp}).

Therefore, Standard Deviation, $\sigma = \text{Sqrt}(\sum \text{Variance of Critical Path}) = \text{Sqrt}(\text{Variance of C+F+H+J}) = \text{Sqrt}[(1.00+1.78+1.00+1.00) = 4.78] = 2.19$

Hence, Probability = $P(t \leq 22) = P[z \leq (t - t_{cp}) / \sigma] = P[z \leq (22 - 17) / 2.19] = P[z \leq 2.28] = 0.9887$. Now, refer standard deviation Chart w.r.t 2.28, i.e, 2.2 and 0.08, the value we get = 0.9887. This value is obtained from standard normal distribution table. Therefore, the probability of completing the project on or before 22 weeks is 0.9887, i.e, 98.87%

PERT (Probability):



In PERT, Project Duration follows "Normal Distribution".

μ => Mean Completion Time.

σ => Standard Deviation.

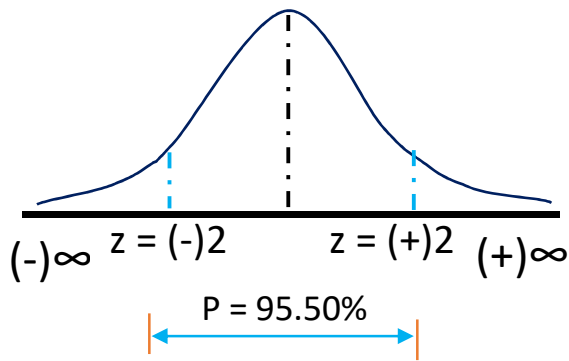
X => Maximum Time Require to complete the project.

Z => Standard Normal Deviate = $(x - \mu) / \sigma$

Z => Standard Normal Deviate = $(x - \mu) / \sigma$

For $z = -1$, Probability (P) = $50\% - (68.3/2)\% = 15.85\%$

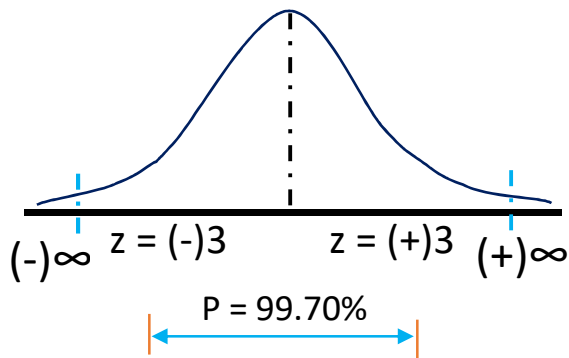
For $z = +1$, Probability (P) = $50\% + (68.3/2)\% = 84.15\%$



$Z \Rightarrow$ Standard Normal Deviate = $(x - \mu) / \sigma$

For $z = -2$, Probability (P) = $50\% - (95.5/2)\% = 2.25\%$

For $z = +2$, Probability (P) = $50\% + (95.5/2)\% = 97.75\%$



$Z \Rightarrow$ Standard Normal Deviate = $(x - \mu) / \sigma$

For $z = -3$, Probability (P) = $50\% - (99.7/2)\% = 0.15\%$

For $z = +3$, Probability (P) = $50\% + (99.7/2)\% = 99.85\%$

E.g: For a construction project, the mean and standard deviation of completion time $m = 200$ days and $s = 6.1$ respectively. Assume normal distribution and use the value of standard normal deviate $z = 1.64$ For the 95% confidence level, the maximum time required for the completion of the project (x) would be...

We know that the Standard Normal deviate, $z = (x - \mu) / \sigma \Rightarrow z * \sigma + \mu = x \Rightarrow 1.64 * 6.1 + 200 = x \Rightarrow x = 210$ days.

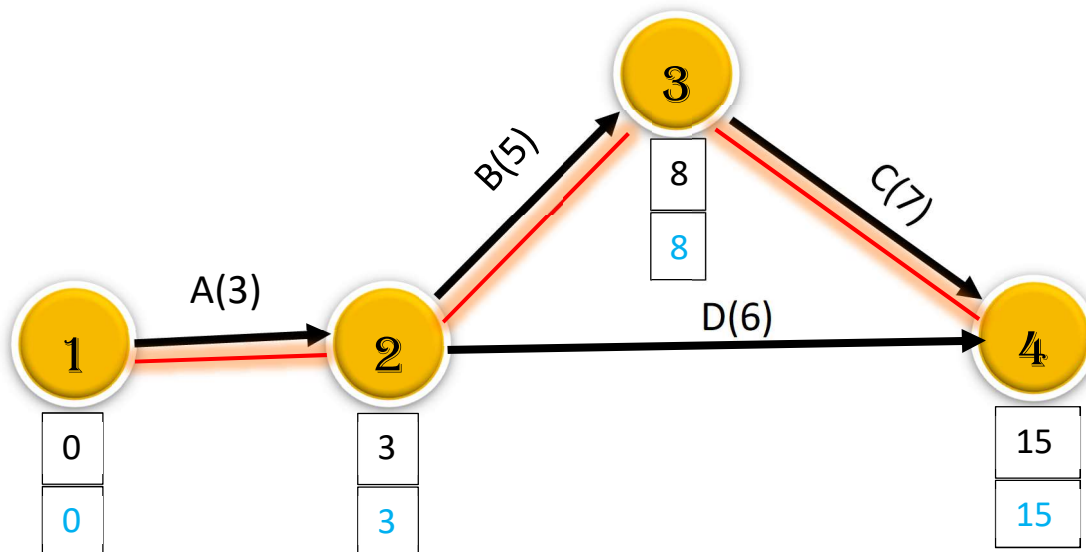
Z-table: A “z-table” also called the standard normal table, is a mathematical table that allows us to know the percentage of values below (to the left) a z-score in a standard normal distribution (SND).

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
0.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
0.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998

Crashing of Project Network (Cost and Time Analysis):

Crashing is defined as the process to reduce the project duration. By doing this the project cost may decrease or increase.

- x** → Latest Completion Time (LC)
- y** → Earliest Start Time (ES)



Time:

Normal Time (T_N) => Actual time required without any deduction of project duration.

Crash Time (T_C) => Reduced time for crashing the project duration by increasing resources, where $T_N > T_C$

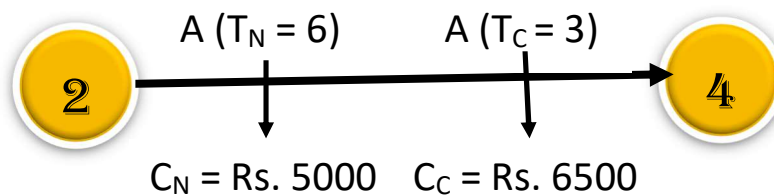
Cost:

Normal Cost (C_N) => Independent of project duration, e.g, material cost.

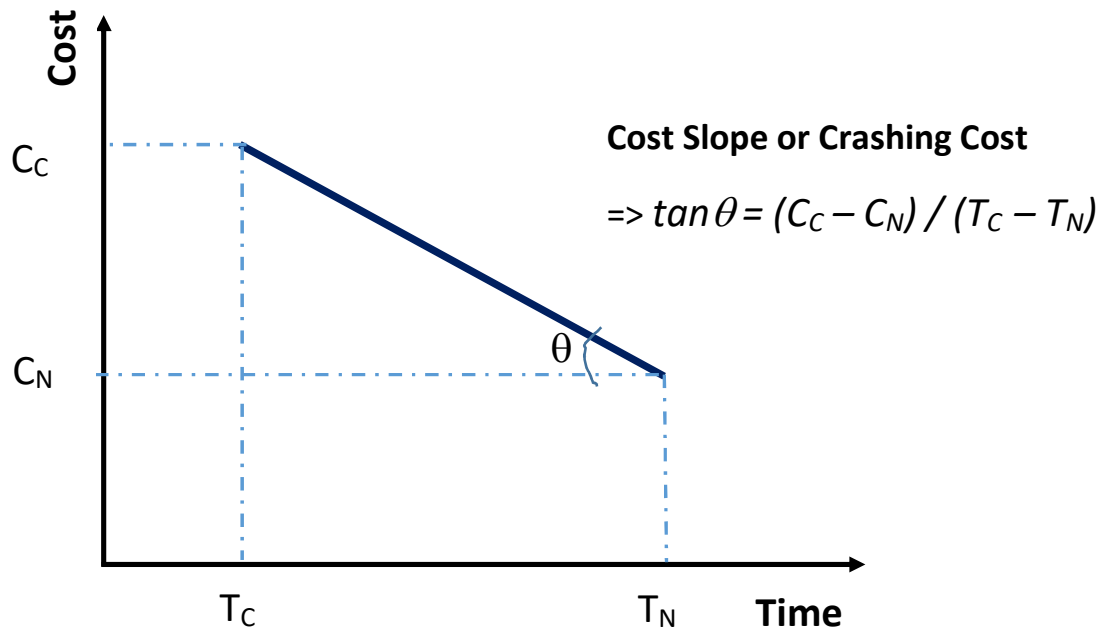
Crash Cost (C_C) => Extra money for extra resources for decreasing the project duration. Depends on project duration (pd).

Overhead Cost (C_O) => Cost associated with project duration, e.g, labor cost (say, Rs. 500/day). Depends on project duration (pd).

Cost Slope or Crashing Cost:



Cost Slope or Crashing Cost = $[(C_C - C_N) / (T_N - T_C)] = (6500 - 5000) / (6 \text{ days} - 3\text{days})$
 = Rs. 500 / day.



Now, Total Cost of the Project:

= [Normal Cost (C_N) + Crash Cost (C_C) + Overhead Cost (C_0)]

= [Given + (n Nos. of day * C_C per day) + (pd x C_0 per day)]

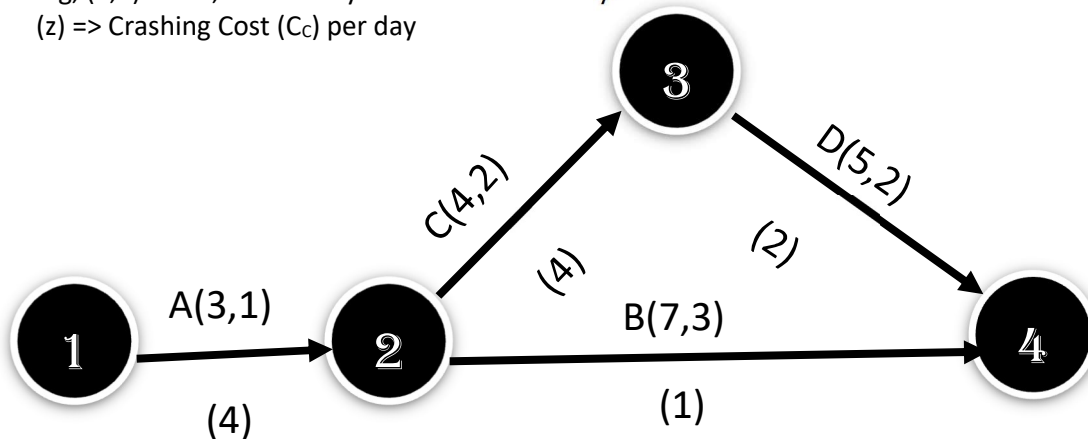
Let us understand the “Total Cost” of a Project by an example:

Note:

(x,y) => (T_N, T_C) = (Normal Time, Crashing Time)

e.g, (3,1) => i.e, the activity can be done in 1 day.

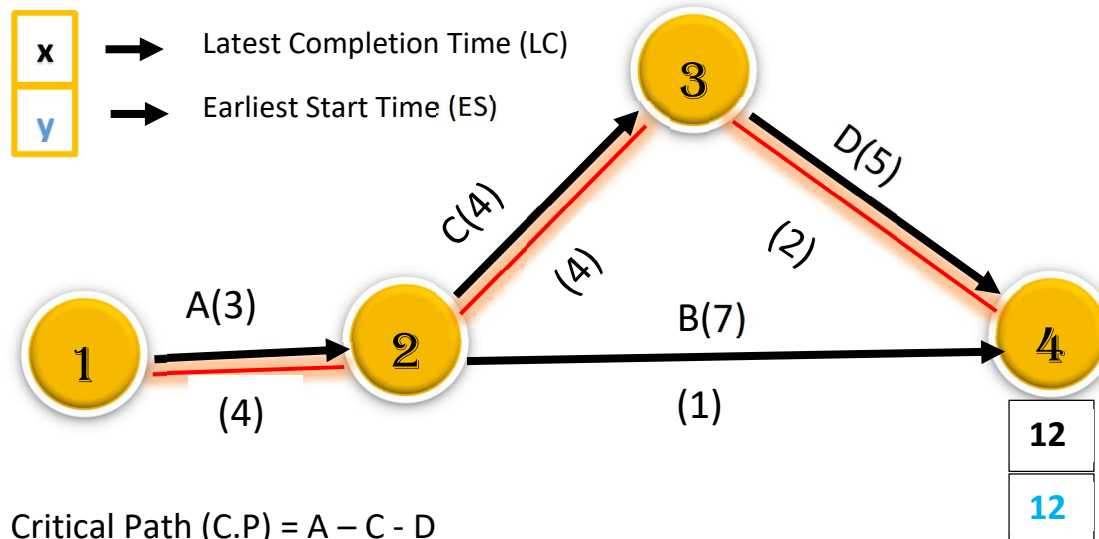
(z) => Crashing Cost (C_C) per day



If Overhead Cost (C_o) is Rs. 4.5 / day and Normal Cost (C_N) is Rs. 100.

Find the Total Cost if this project is done in 6 days.

Solution:



Critical Path (C.P) = A – C - D

Project Duration (p.d) = 12 Days.

Now, Total Cost of the Project:

$$= [\text{Normal Cost } (C_N) + \text{Crash Cost } (C_C) + \text{Overhead Cost } (C_o)]$$

$$= [\text{Given} + (\text{n Nos. of day} * C_C \text{ per day}) + (\text{pd} * C_o \text{ per day})]$$

$$= 100 + 0 + (12 * 4.5)$$

$$= 154 \text{ Rs. (if the project is being completed as per normal duration, i.e, in 12 day).}$$

Now, by Crashing in Critical Path, the project is to be completed by 6 days. Here, this is to be noted that maximum crashing shall be done in activity where crashing cost is minimum (here Activity D, $C_C = \text{Rs. } 2$) and also to note that here we can crash maximum 2 days (because the non critical path may be critical).

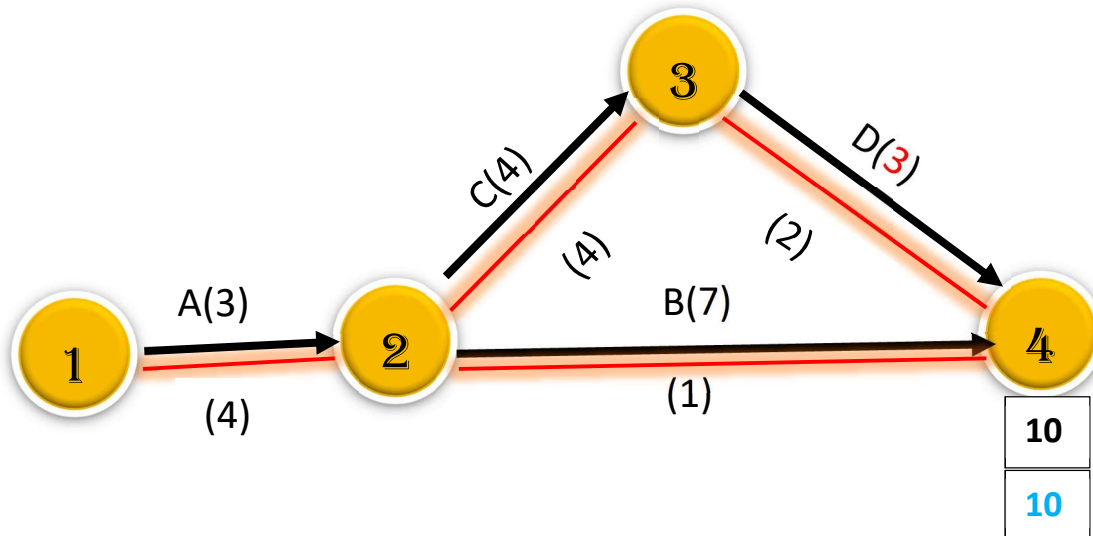
Therefore, New project duration (p.d-New $\mathbf{1}$) = $12 - 2 = 10$ days

And, New Total Cost = Previous Total Cost + Crash Cost – Overhead Cost

$$= 154 + (2 \text{ days} * 2 \text{ Rs.}) - (2 \text{ days} * 4.5 \text{ Rs})$$

= 149 Rs.

Now, Critical Path => A – C – D & A –B, both are critical path(s).



Now, Find out the further crashing options.

Try to crash equal nos. of days from each activity in parallel path. But in series, you can crash any activity in any order.

- By Crashing of Activity A, Crashing Cost = Rs. 4 per day
- By crashing of Activity (B+C), Crashing Cost = Rs. (1+4) = Rs. 5 per day
- By crashing of Activity (B+D), Crashing Cost = Rs. (1+2) = Rs. 3 per day

Let us do the crashing of the activity whose crashing cost per day is minimum, Here, we can make crashing of B & D. So crash B+D by 1 day.

Therefore, New project duration (p.d-New²) = 10 -1 = 9 days

(Here, crashing in parallel, i.e, the deduction is 1 day in both the activity in parallel)

And, New Total Cost = Previous Total Cost + Crash Cost of (B+D) – Overhead Cost

$$= 149 + (1 \text{ day} * \text{Rs. } 1 + 1 \text{ day} * \text{Rs. } 2) - (1 \text{ day} * 4.5 \text{ Rs})$$

$$= 147.5 \text{ Rs.}$$

Again, Find out the further crashing options.

In series, you can crash any activity in any order.

- i) By Crashing of Activity A, Crashing Cost = Rs. 4 per day
- ii) By crashing of Activity (B+C), Crashing Cost = Rs. (1+4) = Rs. 5 per day

Do the crashing of the activity whose crashing cost per day is minimum, Here, we can make crashing of A. So crash A by **2** day.

Therefore, New project duration (p.d-New**3**) = 9 - **2** = 7 days

$$\begin{aligned}\text{And, New Total Cost} &= \text{Previous Total Cost} + \text{Crash Cost of A} - \text{Overhead Cost} \\ &= 147.5 + (2 \text{ days} * \text{Rs. } 4) - (2 \text{ days} * 4.5 \text{ Rs}) \\ &= 146.5 \text{ Rs.}\end{aligned}$$

Now, the only crashing option left, that is B+C.

- i) By crashing of Activity (B+C), Crashing Cost = Rs. (1+4) = Rs. 5 per day

Do the crashing of the activity whose crashing cost per day is minimum, Here, we can make crashing of A. So crash B+C by **1** day.

Therefore, New project duration (p.d-New**4**) = 7 - **1** = 6 days (Which is required)

$$\begin{aligned}\text{And, **New Total Cost**} &= \text{Previous Total Cost} + \text{Crash Cost of A} - \text{Overhead Cost} \\ &= 146.5 + (1 \text{ day} * \text{Rs. } 1 + 1 \text{ day} * \text{Rs. } 4) - (1 \text{ days} * 4.5 \text{ Rs}) \\ &= \mathbf{147 \text{ Rs. (if the project is to be completed by 6 days)}}\end{aligned}$$

CPM Scheduling in Primavera:

Primavera Path: To open the scheduling of project you may Press F9 or got to menubar and click on Schedule tab (Icon) -> a small task window name "Schedule" will pop-up. Click on 'Schedule' button. Go to "Layout: Classic Schedule Layout" -> Layout -> Open -> Select 'CP Schedule Analysis' (CP => Critical Path) -> Open -> Look at the 'Early Start'; 'Early Finish'; 'Late Start'; and 'Late Finish' and 'Total Float'

columns.

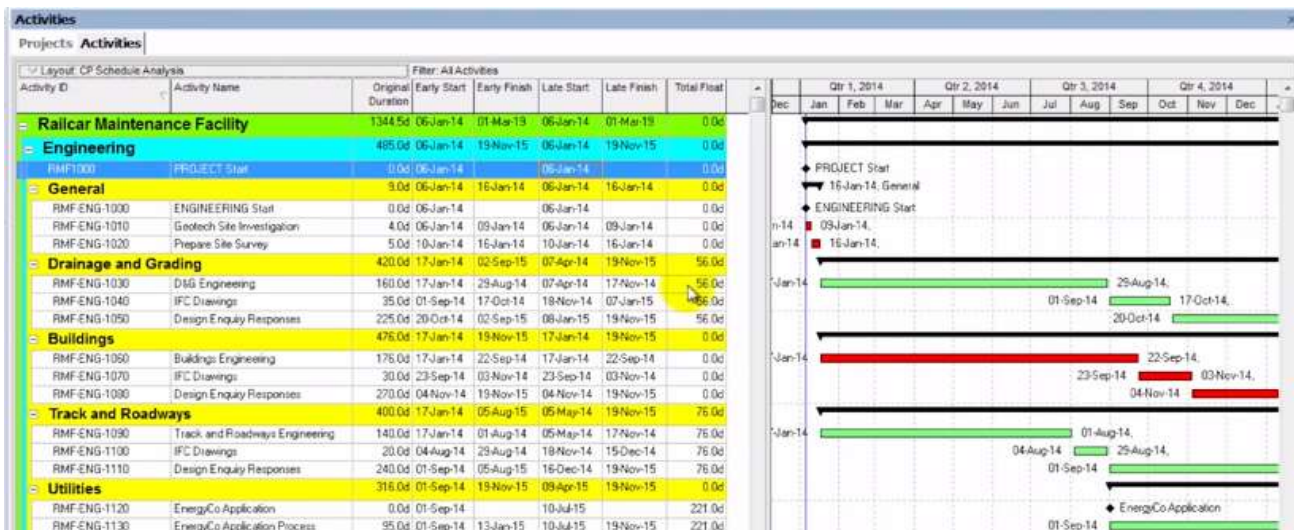
->

Activities

Projects **Activities**

Layout: CP Schedule Analysis Filter: All Activities

Activity ID	Activity Name	Original Duration	Early Start	Early Finish	Late Start	Late Finish	Total Float
Railcar Maintenance Facility							
Engineering							
RMF1000	PROJECT Start	0.0d	06-Jan-14	19-Nov-15	06-Jan-14	19-Nov-15	0.0d
General							
RMF-ENG-1000	ENGINEERING Start	0.0d	06-Jan-14	06-Jan-14	06-Jan-14	16-Jan-14	0.0d
RMF-ENG-1010	Geotech Site Investigation	4.0d	06-Jan-14	09-Jan-14	06-Jan-14	09-Jan-14	0.0d
RMF-ENG-1020	Prepare Site Survey	5.0d	10-Jan-14	16-Jan-14	10-Jan-14	16-Jan-14	0.0d
Drainage and Grading							
RMF-ENG-1030	D&G Engineering	160.0d	17-Jan-14	29-Aug-14	07-Apr-14	17-Nov-14	56.0d
RMF-ENG-1040	IFC Drawings	35.0d	01-Sep-14	17-Oct-14	18-Nov-14	07-Jan-15	56.0d
RMF-ENG-1050	Design Enquiry Responses	225.0d	20-Oct-14	02-Sep-15	08-Jan-15	19-Nov-15	56.0d
Buildings							
RMF-ENG-1060	Buildings Engineering	176.0d	17-Jan-14	22-Sep-14	17-Jan-14	22-Sep-14	0.0d
RMF-ENG-1070	IFC Drawings	30.0d	23-Sep-14	03-Nov-14	23-Sep-14	03-Nov-14	0.0d
RMF-ENG-1080	Design Enquiry Responses	270.0d	04-Nov-14	19-Nov-15	04-Nov-14	19-Nov-15	0.0d
Track and Roadways							
RMF-ENG-1090	Track and Roadways Engineering	140.0d	17-Jan-14	01-Aug-14	05-May-14	17-Nov-14	76.0d
RMF-ENG-1100	IFC Drawings	20.0d	04-Aug-14	29-Aug-14	18-Nov-14	15-Dec-14	76.0d
RMF-ENG-1110	Design Enquiry Responses	240.0d	01-Sep-14	05-Aug-15	16-Dec-14	19-Nov-15	76.0d
Utilities							
RMF-ENG-1120	EnergyCo Application	0.0d	01-Sep-14	10-Jul-15	10-Jul-15	19-Nov-15	221.0d
RMF-ENG-1130	EnergyCo Application Process	95.0d	01-Sep-14	13-Jan-15	10-Jul-15	19-Nov-15	221.0d
RMF-ENG-1140	PowerCo Application	0.0d	04-Nov-14	11-Jun-15	11-Jun-15	19-Nov-15	155.0d
RMF-ENG-1150	PowerCo Application Process	115.0d	04-Nov-14	15-Apr-15	11-Jun-15	19-Nov-15	155.0d



Work Flow Diagram in Construction Industry

Site Mobilization → Excavation → Construction (Predecessor and successor)

We need to identify which are the activities can start in parallel without any predecessor.

ES (Early Start) => EF (Early Finish)

LS (Late Start) => LF (Late Finish)

D (Duration)

F (Float) – Float for an activity is the amount that its duration can slip without causing the project to be delayed.

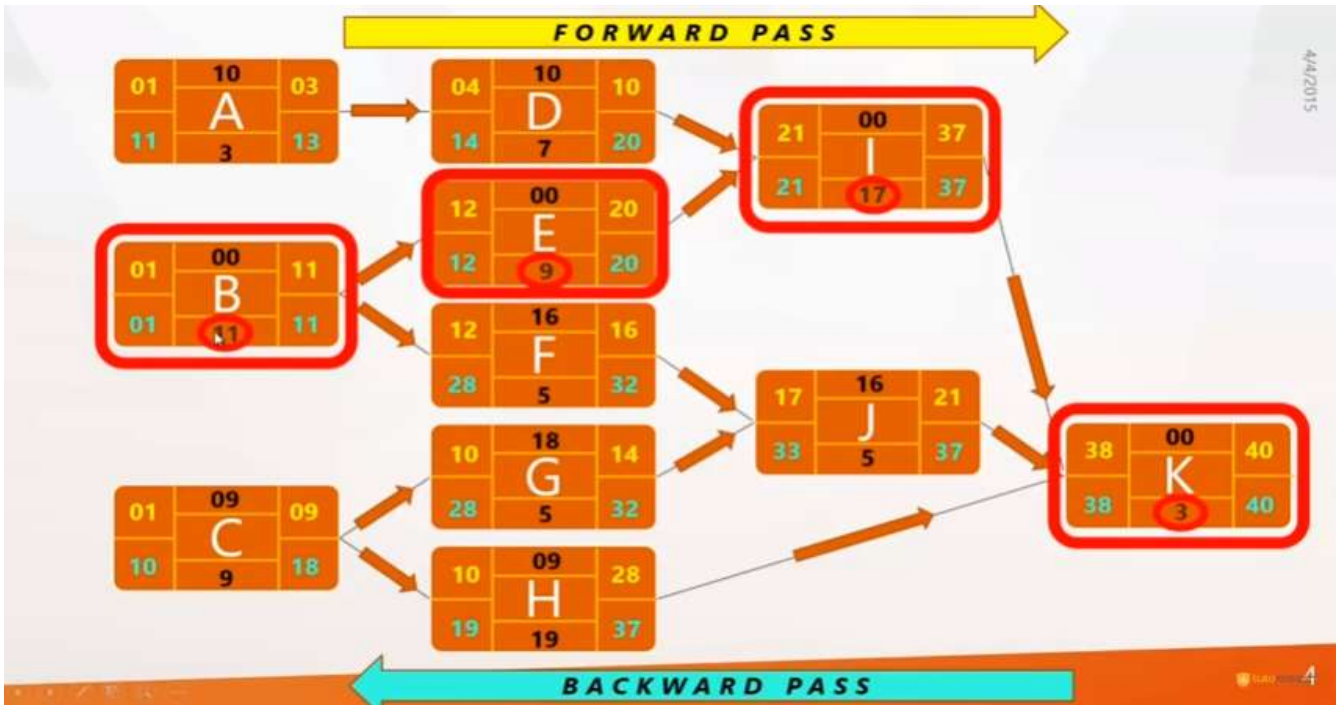
The slide illustrates project management concepts. At the top, a process flow diagram shows three stages: 'Site mobilization' (green arrow), 'Excavation' (blue arrow), and 'Construction' (purple arrow). Below this is a table of activities with their durations and predecessors. To the right of the table is a diagram for activity A showing its float (F) and duration (D) relative to its early start (ES), early finish (EF), late start (LS), and late finish (LF). At the bottom right is a glossary defining these terms.

ACTIVITIES	DURATION	PREDECESSOR
A	3	-
B	11	-
C	9	-
D	7	A
E	9	B
F	5	B
G	5	C
H	19	C
I	17	D,E
J	5	F,G
K	3	I,J

ES	F	EF
	A	
LS	D	LF

ES	Early start	It is the earliest time that an activity can start
EF	Early finish	It is the earliest time that an activity can finish
LS	Late start	It is the late time that an activity can start
LF	Late finish	It is the late time that an activity can finish
D	Duration	Duration of activities
F	Float	The float for an activity is the amount that its duration can slip without causing the project to be delayed

Forward Pass ⇔ Backward Pass & Float



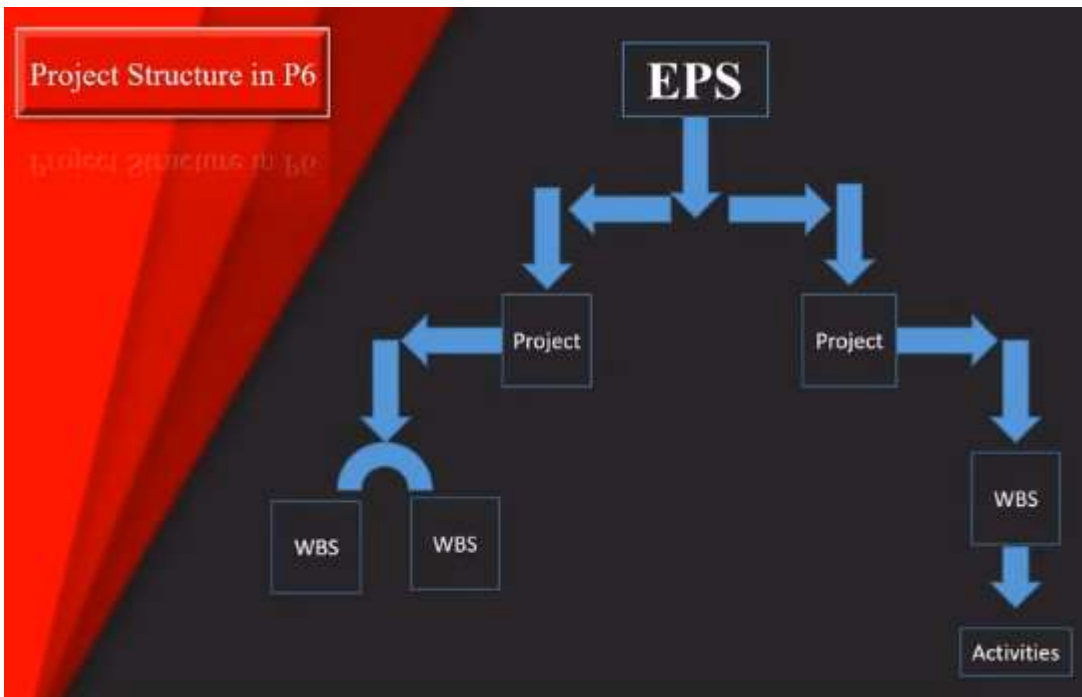
Project Management and Primavera

Project Management life cycle includes 5 phases:

- Initiating Process => Feasibility Study; Identify the Stakeholders; Scope; Schedule; Budget; Quality; Setting up Project office; Appoint the project team and Mobilization; Approval for the next phase.
- Planning Process => Scope planning; Activity sequencing with duration; Resource planning & Organizational planning; Procurement planning, Quality planning; Costing.
- Executing Process => Team; Contract; Scope verification; Information distribution; Quality assurance; Actual execution.
- Controlling & Monitoring Process => Schedule control; Scope change control; Cost control; Risk Response control; Quality Control.
- Closing Process => Project closure report that includes Project Overview, Result & Outcome, Project Cost, Project Performance Analysis, Challenges faced and Risk, Lessons Learned, Return of Experience.

What is Primavera?

Primavera is a project management tool used of planning, tracking, scheduling, organizing, securing, managing the resources and tracking project progress, etc. that are needed to complete the project on-time and within budget. Primavera software is used of managing the organization's programs and projects effectively irrespective of the complexity of the projects and can manage multiple projects in a single file. This tool provide the real time visibility of the status of the project(s) and further report to top management for better understanding of the project execution and better decision making. We can manage resources using the primavera P6 tool.



Scheduling Terminology:

Critical Path => is the longest path of the project. Any delay to an activity on this path will have an effect on the overall project finish date.

Total Float => is the amount of time that an activity can be delayed without impacting the succeeding activity.

Lag => is a way to delay or accelerate an activity's start or finish date. If activity is delaying, the lag is called negative (-ive) lag and when the activity is accelerating, the lag is called positive (+ive) lag.

Relationship types => Finish to Start(FS); Finish to Finish (FF); Start to Start (SS); Start to Finish (SF).

Predecessor and Successor => describing the order of activity in sequence.

4. Data Analysis using SAP & ERP

What is an ERP?

- E stands for Enterprise
- R Stands for Resources
- P Stands for Planning

Enterprise resource planning (ERP) is defined as the ability to deliver an integrated suite of business applications. ERP tools share a common process and data model, covering broad and deep operational end-to-end processes, such as those found in finance, HR, distribution, manufacturing, service and the supply chain.



Enterprise:

Enterprise is another word for a for-profit business or company, but it is most often associated with entrepreneurial ventures. A business enterprise is always a for-profit entity. The definition of an enterprise is simplified as a project, a willingness to take on a new project, an undertaking or business venture. An example of an enterprise is a new start-up business. An example of enterprise is someone taking initiative to start a business.

Resources:

An economic or productive factor required to accomplish an activity, or as means to undertake an enterprise and achieve desired outcome. Three most basic resources are land (Factories), labor (Man Power), and Money (capital);

other resources include material, machinery, energy, entrepreneurship, information, expertise, management, and time.

However, there are four categories of resources, or factors of production:

- Natural resources (land)
- Labor (human capital)
- Capital (machinery, factories, equipment)
- Entrepreneurship.

Further, an organization uses different resources to accomplish goals. The major resources used by organizations are often described as follow:

- (1) Human resources,
- (2) Financial resources,
- (3) Physical resources, and
- (4) Information resources.

Planning:

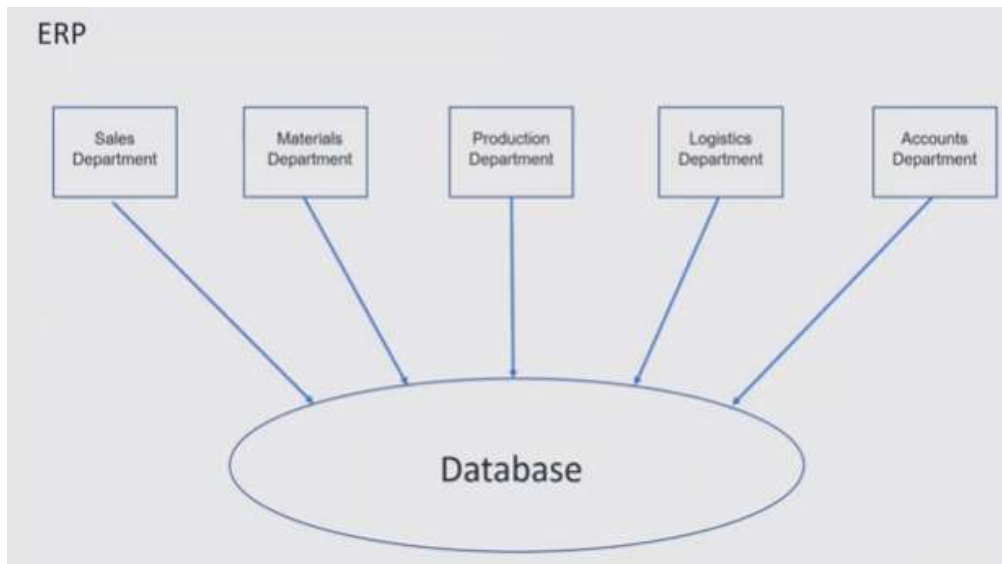
Planning is the process of thinking about the activities required to achieve a desired goal. It is the first and foremost activity to achieve desired results. It involves the creation and maintenance of a plan, such as psychological aspects that require conceptual skills. Some examples of various types of planning:

- Strategic Planning
- Project Planning
- Timeline Planning
- Production Planning
- Capacity Planning
- Demand Planning
- Material Purchase Planning
- Material Storage Planning
- Organizational Change Management planning

We make into a planning procedure and that planning procedure is called an ERP.

Let us consider a company ABC has five departments, namely:

- 1) Purchase
- 2) Production
- 3) Sales
- 4) Finance and
- 5) HR



All the business has various departments. And these departments exchange and share lot of information with each other. This process take so much of time.

ERP: Enterprise Resource Planning.

ERP is an business management software which used to integrate all the business activities in any organization.

Major reason for adopting ERP

- Integrate financial information
- Integrate customer order information
- Standardize and speed up operations processes
- Reduce inventory
- Standardize Human Resources information

Potential Benefits of ERP

Internal Benefits

- a) Integration of a single source of data.
- b) Control over various business processes.
- c) Eliminate duplication of data.
- d) Increased productivity, inventory management, promote quality.
- e) Reduced operating costs and Improved internal communication.
- f) Reduce material cost by inventory planning.

Potential Benefits of ERP

External Benefits

- a) Improved customer service and order fulfillment
- b) Improved communication with suppliers and Customers
- c) Improve customer service.
- d) Enhanced competitive position and Increased sales and profits
- e) Effective HRM(Human Resource Management).

Example of ERP

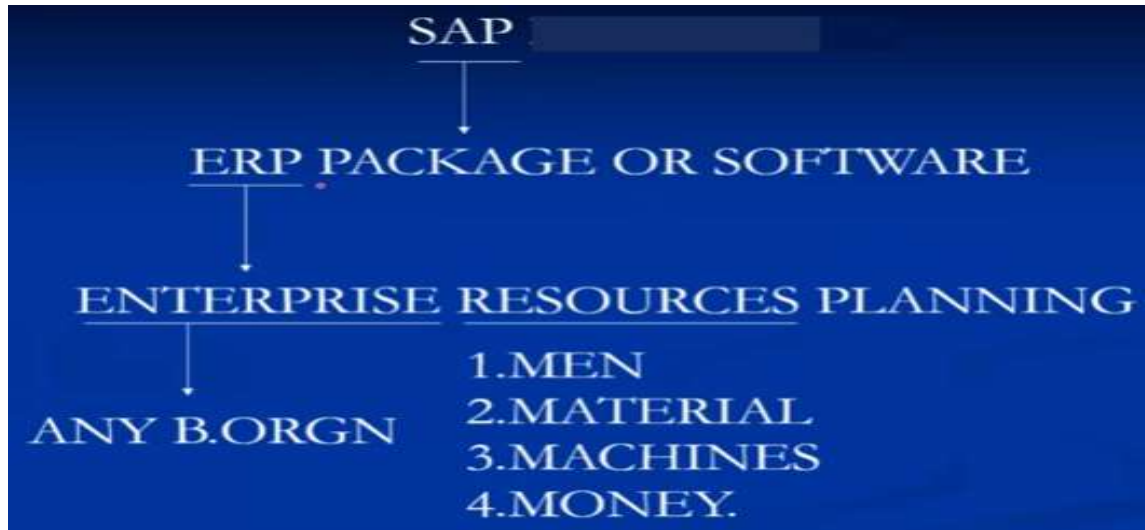
- Oracle Finance - Works for Finance only
- People Soft - Works for HR only
- Bann - Works for Purchase and Production only
- JD Edwards - Works for Sales only
- SAP - Works for all departments in integration

What is SAP?

- S stands for System
- A Stands for Applications
- P Stands for Products

SAP stands for Systems, Applications & Products in Data Processing

SAP software products provide powerful instruments for helping companies to manage their financials, logistics, human resources, and other business areas. The backbone of SAP software offering is SAP ERP system which is the most advanced Enterprise Resource Planning (ERP) system from currently available ones. SAP SE is one of the largest vendors of enterprise resource planning (ERP) software and related enterprise applications. The company's ERP system enables its customers to run their business processes, including accounting, sales, production, human resources and finance, in an integrated environment.



SAP Products

- ✓ Enterprise Resource Planning (ERP)
- ✓ Customer Relationship Management (CRM)
- ✓ Product Lifecycle Management (PLM)
- ✓ Supply Chain Management (SCM)
- ✓ Supplier Relationship Management (SRM)
- ✓ And Many More

Functional Modules

- ✓ FI (Finance)
- ✓ CO (Controlling)
- ✓ SD (Sales & Distribution)

Technical Modules

- ✓ BASIS
- ✓ ABAP
- ✓ BI/BW
- ✓ XI/PI
- ✓ HANA

SAP has Contains Vast Number of Modules

Functional Modules

- ✓ Project System (PS)
- ✓ Human Resource (HR)
- ✓ Plant Maintenance (PM)
- ✓ Production Planning (PP)
- ✓ Sales and Distribution (SD)
- ✓ Material Management (MM)
- ✓ Financial Accounting and Controlling (FICO)

Technical Modules

- ✓ Advance Business Application Program (ABAP)
- ✓ Business Application Systems Integrated Solutions (BASIS)

Ready Add-on(Plugins), Workflow

- ✓ Oil & Gas
- ✓ Construction
- ✓ Retail
- ✓ Mining
- ✓ Textile
- ✓ Chemicals
- ✓ Health Care
- ✓ Media
- ✓ Banking
- ✓ Automotive
- ✓ Consumer Products
- ✓ Industrial Machinery & Components
- ✓ Telecommunications
- ✓ Government Sector
- ✓ IT

What is ABAP? - Back end of SAP System is ABAP

- A stands for Advanced
- B Stands for Business
- A Stands for Application
- P Stands for Programming Language

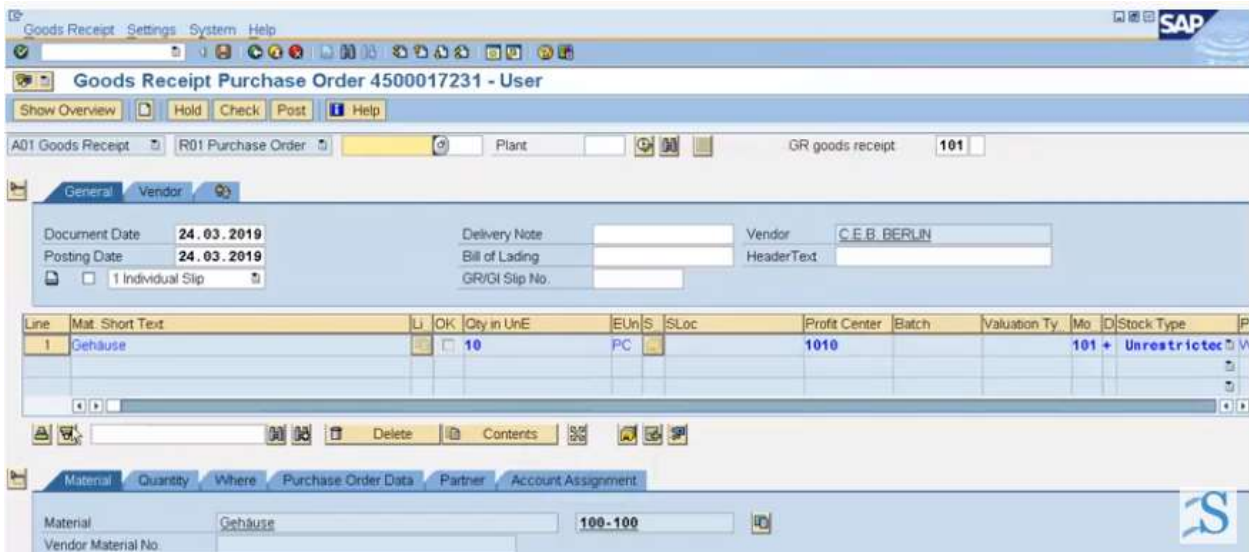
Goods Receipt (GR) and Invoice Receipt (IR) in SAP

1. PO No.
2. Vendor Name
3. Material Name

4. Quantity
5. Plant Name
6. Storage Location

Goods Receipt in SAP is a confirmation, that the material mentioned in the Purchase Order has been received at the plant, which is mentioned in the PO document while creating. MIGO Transaction in SAP is important as it generates accounting and material document. With the goods receipt (GR) you post the physical inward movement of goods from an external vendor or from production and then complete a goods movement, which leads to an increase in the warehouse stock. Reserved quantities are displayed as planned receipts in the stock overview and plant stock availability.

GR/IR is the SAP process to perform the three-way match – purchase order, material receipt, and vendor invoice. You use a clearing account to record the offset of the goods receipt (GR) and invoice receipt (IR) postings. Once fully processed, the postings in the clearing account balance. Clearing is performed at the purchase order (PO) line item level based on quantity entered. Price variance and exchange rate variance are calculated. You can write off small differences using transaction MR1.



Purchase Price Variance

This discussion assumes you are using standard price control (S) for purchased materials. The quantity and amount on the GR and IR postings are important. You must have posted GR to record purchase price variance (PPV). There is no PPV posting for just IR. There can be additional variance postings on IR after GR is posted for differences between PO price and actual price paid. When posting GR, the price variance is based on the PO price, unless IR has already been posted, then it is based on actual price paid. If IR has already been posted, the GR will be based on the IR up to the quantity of the IR, after that it will use the PO price again. After all postings to a PO line item, the net PPV posted will be the difference between the actual price paid and the standard cost of the material.

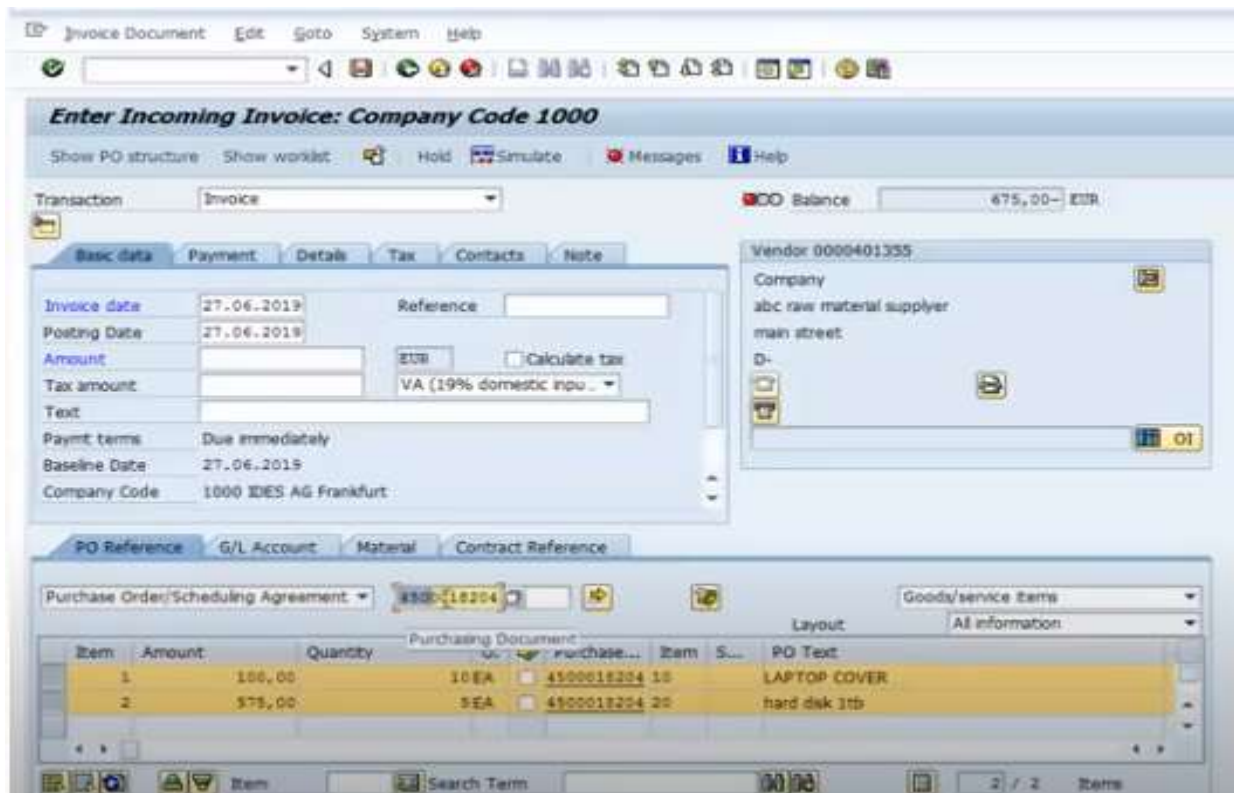
Invoice Verification in SAP (SAP PO Cycle)

- Invoice verification marks the end of procurement, after purchase order and goods receipt.
- Invoice posting updates all the related documents in financials and accounting.
- Blocked invoice that vary from actual invoice can be processed through invoice verification.

The preferred method for verifying invoices is by email. Simply, your account manager sends an email to the accounts payable representative at your customer and gets the needed information. Since email doesn't always provide quick results, invoices can also be verified by phone. Invoice verification is about checking that you got what you paid for before progressing for payment. There are many factors that will influence the level at which an invoice is verified. These include:

- The priority the organization puts on ensuring a correctly rendered invoice (paying for what you get).
- The appetite for risk an organization has with respect to errors and mistakes not being discovered (cost leakage), as well as meeting audit requirements; and
- Lacking the tools, defined processes and adequately skilled resources to perform the verification activities in a cost and resource effective manner.

Path in SAP: SAP menu -> Logistics -> Material Management -> Logistics Invoice Verification -> Document Entry -> MIRO Enter Invoice -> Copy PO No. -> Click on MIRO Enter Invoice -> Company Code -> Paste the PO No. -> Enter Invoice Date -> Transaction (Invoice, Credit memo, Subsequent debt, Subsequent credit) -> The top portion of the window below is called Header area and the bottom portion is called application area.



P2P Process in SAP

P2P is a process of obtaining and managing the raw materials needed for manufacturing a product or providing services and making payment for these. Procure to Pay (P2P) process is also known as an External Procurement Process. SAP Procure to Pay process is required when we need to purchase materials/services from an external vendor for our company. This process includes all the business tasks starting from a purchase requisition (PR) and finishing with payment to the vendor.

Process of P2P:

- 1) Material requirement planning
- 2) Purchase Requisition (PR –Entry in ME51N) to the purchase department
- 3) Request for quotation to open market
- 4) Vendor selection on the basis of quality and past experience
- 5) Issue of Purchase Order (PO – Entry in ME21N) to the selected vendor
- 6) Goods Receipt Note (GRN – Entry in MIGO) – vendor issue goods to the factory or plant
- 7) Verification of invoice (MIRO) by finance department
- 8) Payment to vendor (Entry in F-53) – Release payment to the vendor
- 9) Vendor evaluation and reporting to the management

Path in SAP: SAP menu -> Logistics -> Material Management -> Purchasing -> Purchase Order -> Purchase Requisition -> ME51N – Create (ME52N – Change, ME53N – Display) -> Double Click on ME51N – Create (The below window will pop-up -> Fill the required data).



Menupath for RFQ (Request For Quotation): SAP menu -> Logistics -> Material Management -> Purchasing -> RFQ/Quotation -> Request for Quotation -> ME41-Create (ME42-Change; ME43-Display; ME44-Maintain Supplement; ME45-Release) -> Double Click on ME41-Create and provide the required data in the below window:

RFQ Edit Header Item Environment System Help

Create RFQ : Initial Screen

Reference to PReq Reference to Outline Agreement

RFQ Type	AN
Language Key	EN
RFQ Date	26.04.2018
Quotation Deadline	30.04.2018
RFQ	30.04.2018

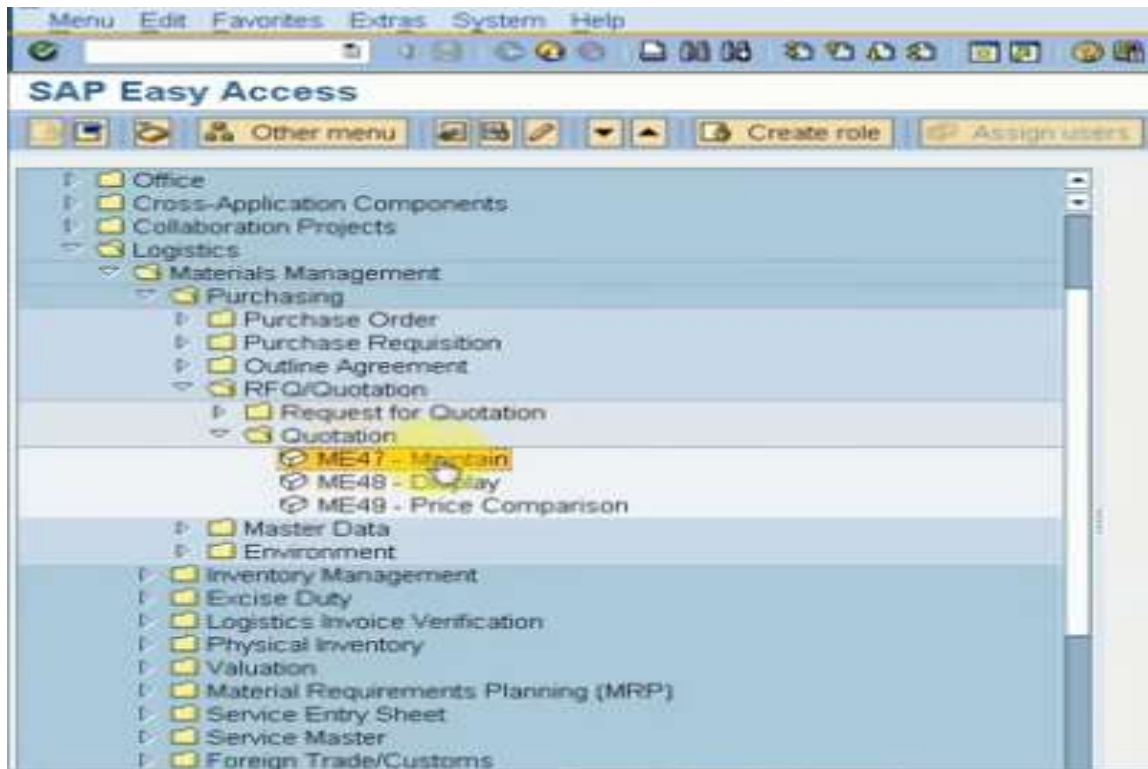
Organizational Data

Purch. Organization	1000
Purchasing Group	100

Default Data for Items

Item Category	
Delivery Date	T
Plant	1000
Storage Location	
Material Group	
Req. Tracking Number	

Follow the below window for Quotation:



Goods Receipt Note (GRN)



Sales Order MenuPath: SAP menu -> Logistics -> Sales and Distribution -> Sales -> Order (VA01 - Create; VA02 - Change; VA03 - Display). Double Click on VA01 – Create and make the necessary changes.




Entry	Result
/n	Cancels the current transaction
/nXXXX	Initiates the specified transaction directly from another transaction
/o	Displays an overview of sessions
/oXXXX	Initiates the specified transaction in a new session
/nend	Ends the logon session with a confirmation dialog box
/nex	Ends the logon session without a confirmation dialog box
/i	Deletes your current session

Create Sales Order: Initial Screen

 Create with Reference



 Sales

 Item overview

 Ordering party

Order Type

Organizational Data

Sales Organization  

Distribution Channel

Division

Sales Office

Sales Group

Author's Accomplishments

Y2001-2020: Worked for 7 Nos. of MNCs (Lahmeyer International, Siemens Limited, ABB Limited, L&T Valdel, Skipper Electrical Limited, KEC International and Kalpataru Power Transmission Limited)

Y2020: Written/Published a book "Data Science for Beginners"

Y2020: Written/Published a book "C, C++ & Python"

Y2020: Written/Published a book "Logical Reasoning & IQ Test"

Y2020: Written/Published a book "Primavera (PERT & CPM)"

Y2020: Written/Published a book "PowerPoint Slide Design"

Y2020: Written/Published a book "Brainstorming Management Talks"

Y2020: Written/Published a book "Learn French – For Beginners"

Y2020: Written/Published a Book "Civil Structural Designer's Manual for UG, PG, Phd. and Professional"

Y2020: Written/Published a book "Advanced Excel with VBA Macros – Exercises and Practices"

Y2020: Received Professional Engineer (PE) Certificate from Institution of Engineers, India, PE7002799

Y2020: Became Member of "Institute of Engineers" India, M-1677777

Y2019: Studied "Psychology" Online Certification Course from Oxford University (UK)

Y2019: Written/Published a motivational Book "Consciences – The Ethical Motives"

Y2019: Studied "Management Essentials" Online Certification Course from Harvard Business School (USA)

Y2019: Received CPD Certificate from the Cambridge University (UK)

Y2019: Studied "High Impact Leadership" Online Certification Course from University of Cambridge (UK)

Y2019: Became Member (93495049) of ICE (Institution of Civil Engineers, UK) and 2010: SEFI (India)

Y2015-2018: Visited Nigeria, Kenya, Nepal, Bhutan and Afghanistan for Official duties

Y2015: Given lecture at CBIP Gurgaon on Transmission Line - Civil aspects

Y2013: Presented Seminar on PEB at LII INDIA (Gmbh)

Y2012: Presented Seminar on Substation Projects (AIS & GIS)

Y2011 to 2013: Persuaded M.Tech/Ph.D. Civil / Structural Engineering Subjects at IIT Delhi

Y2009: Delivered lectures on AIS & GIS Civil / Structural Design in LII-GMBH (INDIA)

Y2008: Presented Seminar on "Quality and Developments" – ISO 9001-2000 at L&T Faridabad

Y2007: Became internal Auditor at ABB Faridabad (ISO 9001:2000 – QMS Requirements)

Y2007: Received certificate for attending Internal Audit Training Course – TUV NORD (ISO 9001:2000)

Y2004: Selected best performer of the year and got increment twice in a year

Y2003: Got a new job at Lahmeyer with more than 100 increment in salary

Y2001: Secured "Best Athlete"-NIT Jalandhar, Also was Captain of NITJ Football Team

Y2001: Selected for University Football Team, Organized cultural event as a Lead in Engineering College

Y2001: Selected in NDA through REJ Campus Interview, Allahabad-Army wing.

Y1995: Honoured with "Sabhyasachi Award" from Barisha High School-Class Xth, Kolkata

Y1993: Secured Certificate from "NCC"- Air wings

Y1992 & 1993: Secured Certificate: All India Talent Test Examination

Y1989: Received maximum Nos. of academic & sports award (19Nos.) in Class –V, Barisha High School, Kolkata

Nota Bene (N.B): Any suggestions for enriching the quality and usefulness of this article on "Brainstorming Management Talks" are most welcome and will be gratefully acknowledged with full fidelity. I am looking forward to receive your goodwill thoughts to mature my sense of understanding. – Swarup Das [Mail: swarup_recj97@rediffmail.com; Mob: (+)91-8860451297]

Keep Conciliating “TIME”

T stands for Trust.

I stands for Involvement.

M stands for Motivation.

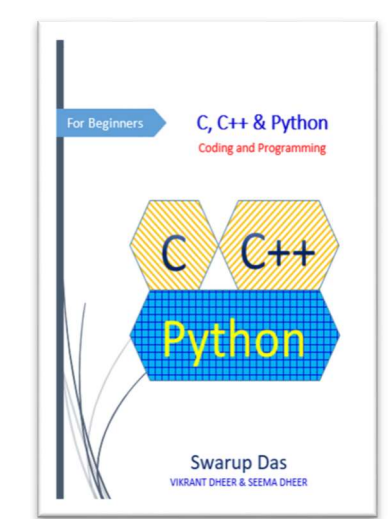
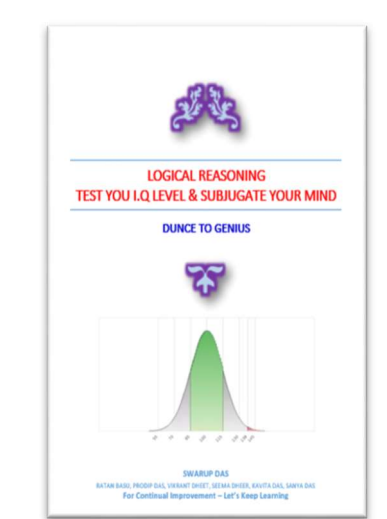
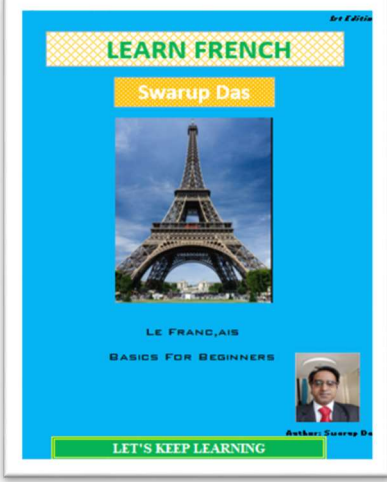
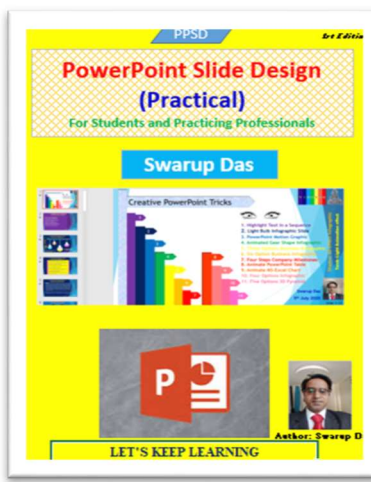
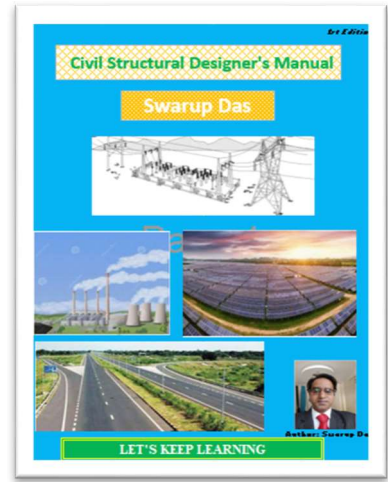
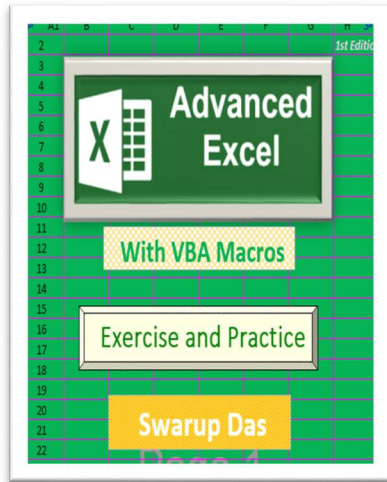
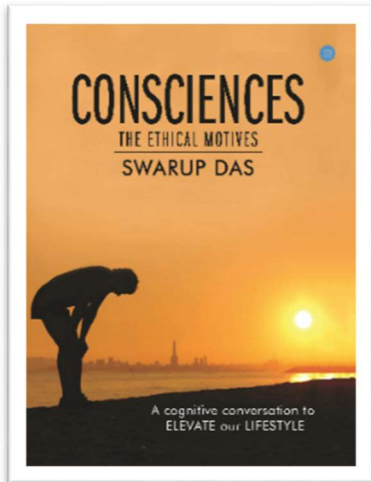
E stands for Enthusiasm/ Energy.

“THE LESS SAID THE BETTER”

“WE ARE POOR BECAUSE WE LACK ATTITUDE”

Thank You

“You need to start. Don’t wait for the things to happen. It’s better that you make it happen” - Swarup Das (+91-8860451297)



For Managers **Data Analysis tools for EPC Companies**
MS Excel, MS Project, Primavera, SAP & ERP

Data Analysis using MS Excel
Data Analysis using MS Project
Data Analysis using Primavera
Data Analysis using SAP & ERP

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For Beginners **Introduction To Data Visualization**
Tableau Qlikview & Power BI

Data Analysis using Tableau
Data Analysis using Qlikview
Data Analysis using Power BI
Data Analysis using MS Excel
Data Analysis using MS Project
Data Analysis using Primavera
Data Analysis using SAP & ERP

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Team Leader
Executive Officer & Chief Executive Officer

Qualities of a Team Leader

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Continual Improvement

For Managers

Data Analysis tools for EPC Companies

**MS Excel, MS Project, Primavera,
SAP & ERP**



The purpose of this book is to give guidance to the aspiring in EPC Companies, who dreams to become an experts in project management with knowledge of MS-Excel, MS Project, Primavera and SAP & ERP. Further, this book will give you a comprehensive idea about the useful report generation using charts, graphs, etc. I believe that this book will enable you use your brain up to the fullest to work smartly and achieve your goal in all endeavor. I fervently hope that this book will help the managers / Leaders to get a sound understanding of how to plan your work and achieve your goals. I'm sure that this book fundamentally will increase your capability of getting good score in your organization, entrepreneurship and interviews in a stress-free manner.

Swarup Das

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