

Planning and Scheduling Basics

Define a Project

- A project is a set of activities and their associated information that constitutes a plan for creating a product or service. A project has a start date and finish date, WBS, resource assignments and expenses. It can also include risks, work documents and project-specific codes and calendars.

Characteristics of a Project

- 5 Aspects of a Project
 - Schedule, Resource, Cost, Quality and Risk (HSE)
- For a Project Management Software, It covers
 - Schedule: Timeline (core)
 - Resource: Man, Material, Plant
 - Cost: Money
 - Risk: Identify, classify and quantify
- Life Span of a Project
 - Planning: establish baseline when project starts
 - Controlling: monitoring, updating during project execution
 - Managing: changes, variations and revision
 - Closing Out: Administrative closure, documentation

Define an Activity - In SMART Way

- Specific: scope of work to be clearly defined
- Measurable: able to measure progress (%), resource (MH) and cost (\$)
- Achievable: realistic based on current productivity
- Resource Availability: make ready for man, material and plant
- Time-bound: have start and finish date

Procedures to Set up a Project

- Add a project to EPS and assign one of OBS
- Set up project calendar, resource pool, cost account, duration type, percent completion type – Project environment
- Set up project WBS
- Add a list of activities
- Determine activity's duration based on volume of work, production rate and past work experience
- Assign a WBS to activity
- Link activities
- Allocate resources to activity from resource pool
- Allocate cost to activity
- Schedule project, review and establish baseline

When a Project is on the way...

- Record progress, manhour and cost and update plan
- Analyze and report project status using earned value method
- Revise baseline when there are substantial changes and the programme can not reflect the actual construction any more
- Manage changes
- Lean construction (last planner) application

Performance Measurement with Earned Value Method : 3 Parameters

- **Planned Value PV (BCWS, Budgeted Cost of Work Schedule):** Budget x Schedule completion % (% of original duration, time elapsed)
- **Actual Cost AC (ACWP, Actual Cost of Work Performed):** Actual cost up to data date
- **Earned Value EV (BCWP, Budgeted Cost of Work Performed):** Budget x Actual completion % (PCT)

Performance Measurement with Earned Value Method : Measurement Index

- **Schedule Variance (SV): $SV=EV-PV > 0$, ahead of schedule as of status date**
- **Cost Variance (CV): $CV=EV-AC > 0$, spending less than planned as of status date**

Performance Measurement with Earned Value Method : An Example

- Suppose we plan to finish an activity by June 1 with a budget of \$10,000 (PV or BCWS). It is now June 1 (data date, or measurement date), and we have spend \$9,000 (AC or ACWP), but only 70% (PCT) of the work is complete (EV, or $BCWP = \$10,000 \times 70\% = \$7,000$). We are not only behind schedule ($SV = EV - PV = \$7,000 - \$10,000 = -\$3,000$), but over budget ($CV = EV - AC = \$7,000 - \$9,000 = -\$2,000$).

Manage Changes

- Record and control budget changes
- Record and track issues
- Define and monitor thresholds
- Manage risks: identify, categorize and prioritize
- Categorise and track activity-related work products (deliverables) and documents

Lean Construction Concept

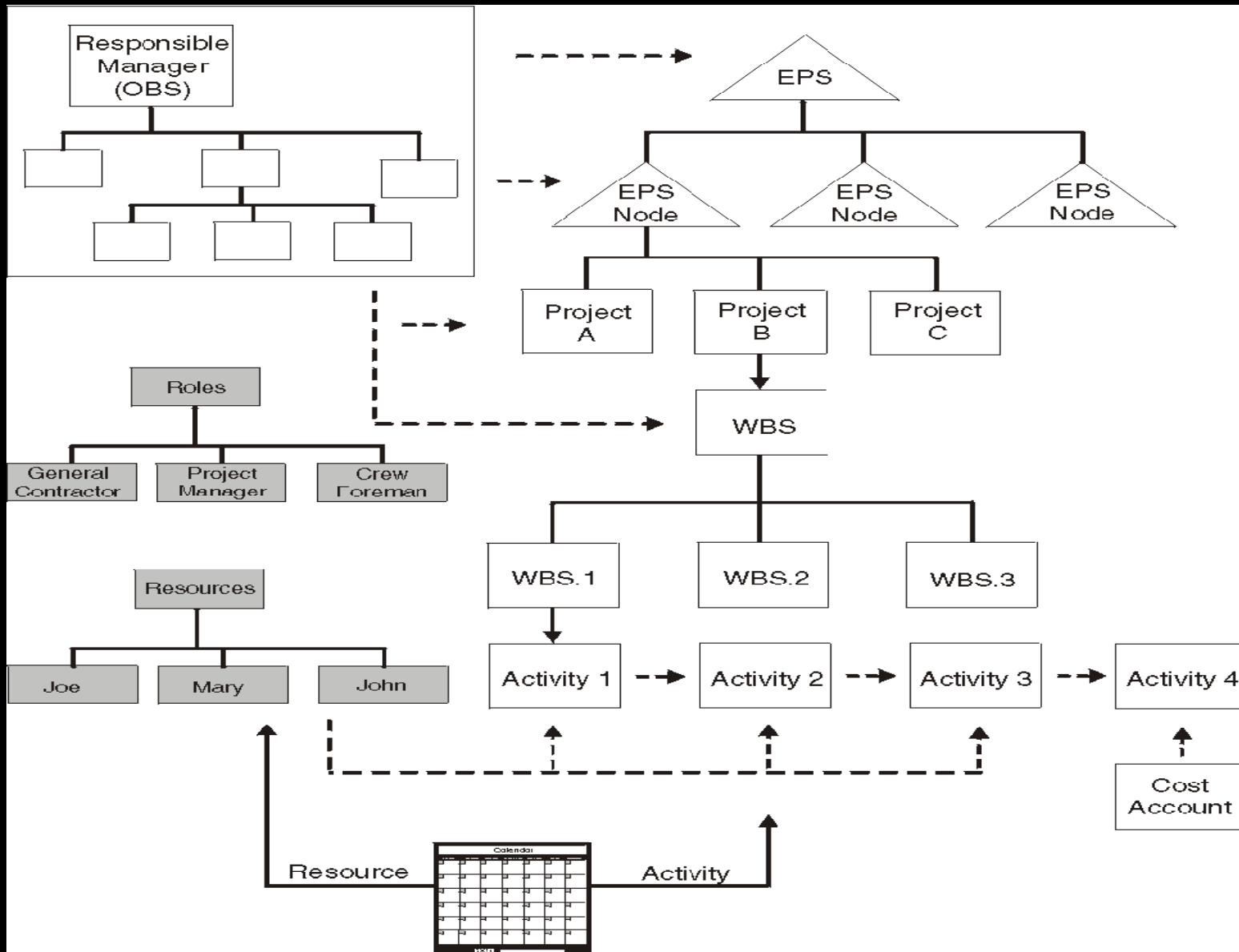
- It is weekly execution plan
- Executed under trade-based production unit
- What Jobs to Execute?
 - Constraints removed, resource sufficient, material on hand, prerequisite work completed, working area available
- Production rate achievable
- Who is the last planner?
 - Design team leader; Production unit head; Area superintendent; Crew foreman
- Job Assignment
 - No overloading. Prefer slightly under-loading to ensure smooth work flow from production unit to production unit.
- What if the plan fail?
 - Find out root reasons. Go alternative work from the backlog (backlog: incomplete make-ready works from previous period)

Master Schedule, 6 weeks Lookahead and Last Planner

	Master Schedule	Lookahead Schedule	Last Planner's Weekly Work Plan
Purpose	Baseline	CPM sequence, match labor & resource	Execution of ready activities
Detail Level	Level 2	Level 3	Level 4
Time Frame	Entire project	6 Weeks	Weekly
Data Date	-	W1 past. Plan for W2 to W6	W1 past. Plan for W2 and W3
Certainty	Low	Middle	High
Constraints	Existing	Inherited from master schedule	Removed

About Primavera Project Management P6

P6 Module Overview



P6 Project Management Module: Features

- Centralised database for all project data (data resides on server)
- Layout presentation and grouping based on Work Breakdown Structure (WBS)
- Hierarchical structure on EPS, OBS, projects, activities, resources and costs with codes and values

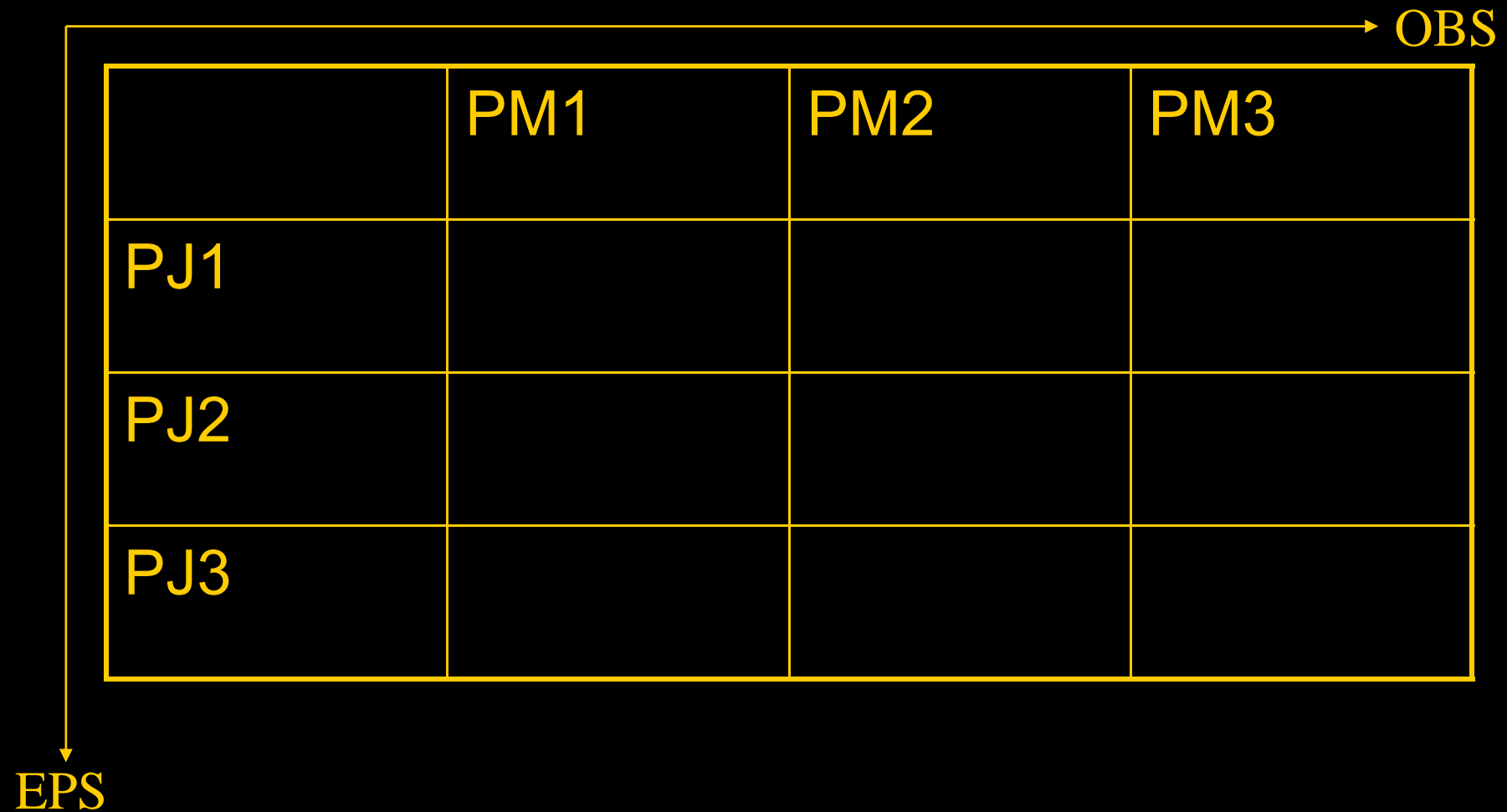
Before Add a Project, Establish the Environment

- Enterprise Project Structure (EPS)
- Organisation Breakdown Structure (OBS)
- Global Calendars
- Resource pool
- Budget structure
- Coding structure like project code and activity code (for filtering, grouping and data analysis)

EPS and OBS

- Enterprise Project Structure (EPS)
 - Company-wide hierarchical project breakdown Structure
- Organisation Breakdown Structure (OBS)
 - Company-wide hierarchical responsible managers for the projects

EPS and OBS: Work Side by Side



EPS and OBS: An Example

The diagram illustrates the relationship between EPS (Enterprise Project System) and OBS (Organizational Breakdown Structure). A vertical arrow on the left points downwards from the top of the grid to the label 'EPS'. A horizontal arrow at the top points to the right from the right side of the grid to the label 'OBS'.

	Process	Civil	Piping	Equipment	Instrument	Electrical	Construction
Project A							
Project B							
Project C							
Project D							

OBS Example

Organizational Breakdown Structure

Display: All OBS Elements

OBS Name: JGC Singapore Pte. Ltd.

- Engineering Dept
 - Process
 - Civil
 - Piping
 - Equipment
 - Instrument
 - Electrical
- Procurement Dept
- Construction Dept
- Project Dept
 - Refinery Project
 - Petrochemical Project
 - Chemicals Project
 - Pharmaceutical Project
 - Mizokami
 - S. Ishikawa
 - Amos Tang

Close

Add

Del. / Merge

Cut

Copy

Paste

Help

General Users Responsibility

OBS Name: JGC Singapore Pte. Ltd.

OBS Description

EPS Example

Enterprise Project Structure (EPS)

Display: EPS

EPS ID	EPS Name
JGC	JGC Singapore Pte. Ltd.
Tenders	Tender Projects
wWyeth	wWyeth Singapore S-40
Ongoing	Ongoing Projects
PRJ2	Project 2
CON2	Construction
PRJ3	Project 3
CON3	Construction
Templates	Template Projects
Archive	Archive
TEMP	Backup and Temporary

Close

Add

Delete

Cut

Copy

Paste

Help

EPS ID: JGC EPS Name: JGC Singapore Pte. Ltd.

Responsible Manager: JGC Singapore Pte. Ltd.

EPS -> Projects Example

Primavera : Template (Template Project)

File Edit View Project Enterprise Tools Admin Help

Projects

Layout: Projects

Project ID	Project Name	Responsible Manager	Total Activities	Risk Level	Strategic Priority	CI
▶ JGC	JGC Singapore Pte. Ltd.	JGC Singapore ...	22249	5 - Very High	500	
▶ Tenders	Tender Projects	JGC Singapore P...	247	3 - Medium	500	
▶ Wyeth	Wyeth Singapore S-40	JGC Singapore Pte. Ltd.	247	3 - Medium	500	
T-0178-01	Wyeth Nutritionals Singapore WNS S-40 (EPC)	Pharmaceutical Project	128	3 - Medium	500	W
T-0178-02	Wyeth Nutritionals Singapore WNS S-40 (Engineering)	Pharmaceutical Project	119	3 - Medium	500	W
▶ Ongoing	Ongoing Projects	JGC Singapore P...	0	3 - Medium	500	
▶ PRJ2	Project 2	JGC Singapore Pte. Ltd.	0	3 - Medium	500	
▶ CON2	Construction	JGC Singapore Pte. Ltd.	0	3 - Medium	500	
▶ PRJ3	Project 3	JGC Singapore Pte. Ltd.	0	3 - Medium	500	
▶ CON3	Construction	JGC Singapore Pte. Ltd.	0	3 - Medium	500	
▶ Templates	Template Projects	JGC Singapore P...	57	3 - Medium	500	
Template	Template Project	JGC Singapore Pte. Ltd.	57	3 - Medium	500	
▶ Archive	Archive	JGC Singapore P...	20912	3 - Medium	500	
▶ SI Group	SI Group Asia AP Project	JGC Singapore Pte. Ltd.	6659	3 - Medium	500	
▶ GLAXO WELLCOME MGSK PROJECT		JGC Singapore Pte. Ltd.	1218	3 - Medium	500	
▶ SRC Clean Fuels PJ	SRC CLEAN FULES PROJECT	JGC Singapore Pte. Ltd.	1357	3 - Medium	500	
▶ Wyeth Nutritionals	Wyeth S40 Project	JGC Singapore Pte. Ltd.	160	3 - Medium	500	
▶ Complete Project	Project Completed	JGC Singapore Pte. Ltd.	11518	3 - Medium	500	
▶ TEMP	Backup and Temporary	JGC Singapore P...	1033	3 - Medium	500	

Portfolio: All Projects User: Johnny Data Date: 01-Jan-07 Access Mode: Shared Baseline: Current Project

Work Breakdown Structure (WBS)

- Deliverable-oriented hierarchy
- Continuation from EPS, with project the highest level, followed by strings of deliverables and decomposing to the bottom level of work package
- Company-wide standard WBS template Vs. customised project-specific WBS
- Play an essential role in P6. It can be assigned OBS, resource, budget and tracked by earned value for the progress

WBS Example

Primavera : Template (Template Project)

File Edit View Project Enterprise Tools Admin Help

Work Breakdown Structure

Layout: WBS

WBS Code	WBS Name	Total Activities	Est Weight	January 2007				February	
				01	08	15	22	29	05
Template	Template Project	57	1.0						
Template.Milestones	Project Milestones	8	1.0						
Template.12	Basic Engineering	8	1.0						
Template.13	Detail Engineering	10	1.0			21-Jan-07			
Template.14	Procurement Services	6	1.0						
Template.21	Manufacturing	6	1.0						
Template.31	Construction	17	1.0						
Template.17	Commissioning and Operation	2	1.0						

General | Notebook | Planning Resources | Budget Log | Spending Plan | Budget Summary | WBS Milestones | WPs & Docs | Earned Value

General

WBS Code: Template WBS Name: Template Project

Status: Active Responsible Manager: JGC Singapore Pte. Ltd.

Anticipated Dates

Anticipated Start:

Anticipated Finish:

Portfolio: All Projects User: Johnny Data Date: 01-Jan-07 Access Mode: Shared Baseline: Current Project

WBS Example

Primavera : Template (Template Project)

File Edit View Project Enterprise Tools Admin Help

Work Breakdown Structure

Layout: WBS

WBS Code	WBS Name	Total Activities	Est Weight	January 2007				February		
				01	08	15	22	29	05	
Template	Template Project	57	1.0	[Gantt bar]						
Template.Milestones	Project Milestones	8	1.0	[Gantt bar]						
Template.12	Basic Engineering	8	1.0	[Gantt bar]						
Template.13	Detail Engineering	10	1.0	[Gantt bar]						
Template.13.1	Civil General	1	1.0	21-Jan-07 [Gantt bar]						
Template.13.2	Concrete Structure	2	1.0	21-Jan-07 [Gantt bar]						
Template.13.3	Steel Structure	2	1.0	10-Feb-07 [Gantt bar]						
Template.13.4	Building	1	1.0	[Gantt bar]						
Template.13.5	Equipment	1	1.0	21-Jan-07 [Gantt bar]						
Template.13.6	Piping	1	1.0	21-Jan-07 [Gantt bar]						
Template.13.7	Instrumentation	1	1.0	21-Jan-07 [Gantt bar]						
Template.13.8	Electrical	1	1.0	21-Jan-07 [Gantt bar]						
Template.13.9	Insulation	0	1.0	[Gantt bar]						
Template.13.A	Painting	0	1.0	[Gantt bar]						
Template.13.B	Fire Proof and Surface Protection	0	1.0	[Gantt bar]						
Template.13.C	Catalyst, Chemical and Utilities	0	1.0	[Gantt bar]						
Template.13.Z	Others	0	1.0	[Gantt bar]						
Template.14	Procurement Services	6	1.0	[Gantt bar]						
Template.21	Manufacturing	6	1.0	[Gantt bar]						

General | Notebook | Planning Resources | Budget Log | Spending Plan | Budget Summary | WBS Milestones | WPs & Docs | Earned Value

General

WBS Code: 13 WBS Name: Detail Engineering

Status: Active Responsible Manager: JGC Singapore Pte. Ltd.

Anticipated Dates

Anticipated Start: []

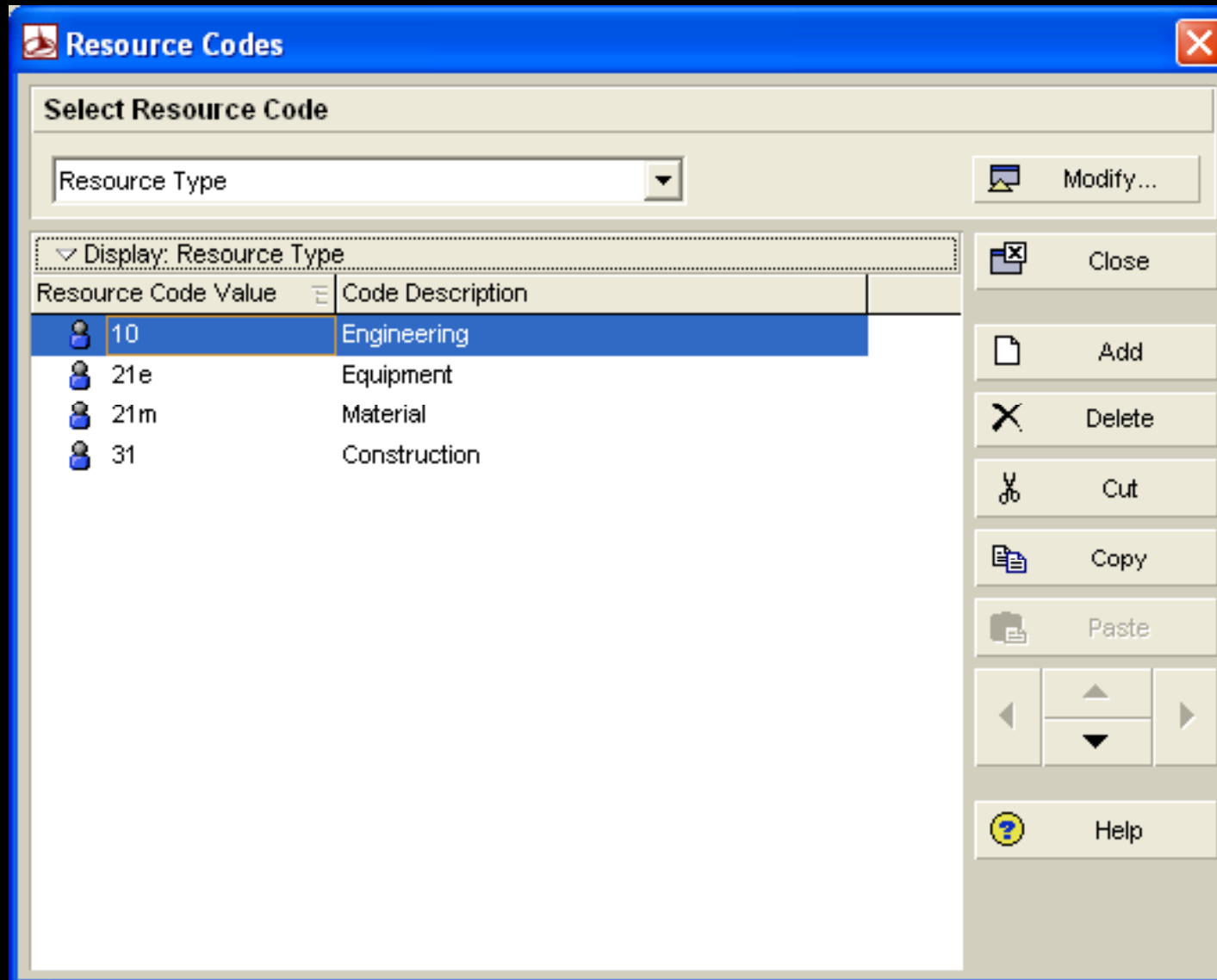
Anticipated Finish: []

Portfolio: All Projects User: Johnny Data Date: 01-Jan-07 Access Mode: Shared Baseline: Current Project

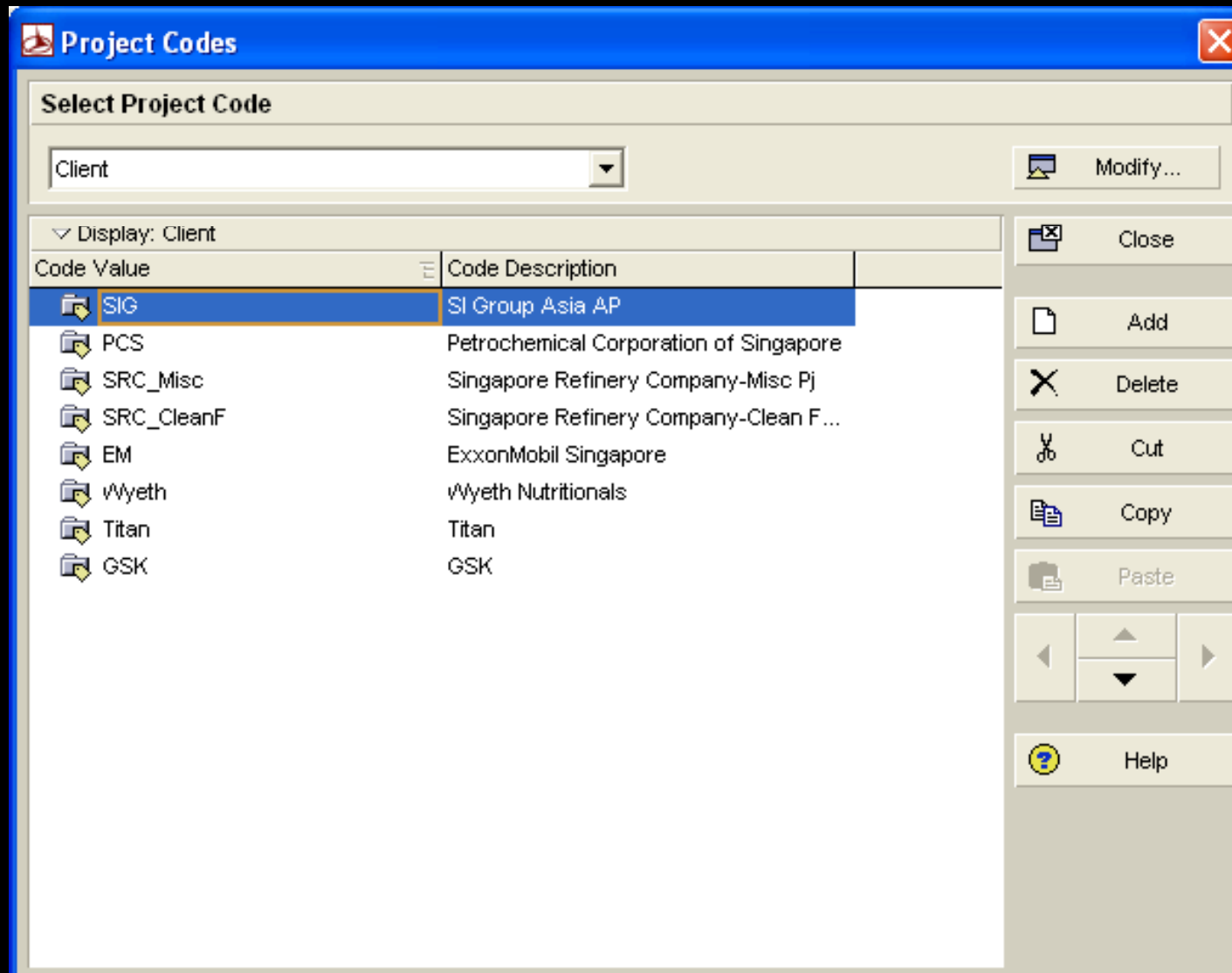
Calendars

- Global
- Project specific
- WBS specific
- Resource specific

Coding Structure: Resource Code



Coding Structure: Project Code



Resource and Role

- Resource includes
 - People
 - Material
 - Plant
- Role
 - Required personnel skill and proficiency level -> Job title and function
- Resource calendar
- Resource limit (availability) (MH / day)
- Resource cost (\$ / MH)

Resource and Role

	Role 1 (Job Title)	Role 2 (Job Title)	Role 3 (Job Title)
Resource 1 (Personnel)			
Resource 2 (Personnel)			
Resource 3 (Personnel)			

Resource Example

Primavera : Template (Template Project)

File Edit View Project Enterprise Tools Admin Help

Resources

Display: All Resources

Resource ID	Resource Name	Resource Type	Unit of Measure	Primary Role	Default Units / Time
MBP2 - Root	Resources for project MBP2	Labor			0/d
SUBCON Root	SUBCON Resources	Labor			9/d
ENGINEERING	Engineering	Labor			8/d
EQUIPMENT	Equipment and Material	Nonlabor			8/d
MATERIAL	Material	Nonlabor			8/d
CONSTRUCTION	Construction Work	Nonlabor			8/d

Primavera : Template (Template Project)

File Edit View Project Enterprise Tools Admin Help

Resources

Display: All Resources

Resource ID	Resource Name	Resource Type	Unit of Measure	Primary Role	Default Units / Time
MBP2 - Root	Resources for project MBP2	Labor			0/d
SUBCON Root	SUBCON Resources	Labor			9/d
CONCWKR	Concrete Worker	Labor			9/d
CIVWKR	Civil Worker & Concrete	Labor			9/d
ELEC WKR	Electrical Worker	Labor			9/d
Temp. Worker	Temp. Facility Worker	Labor			9/d
INSTTECH	Instrument Technician	Labor			9/d
INST WKR	Instrument Worker	Labor			9/d
MANUFACT	Manufacture (Equipment/Mats)	Labor			8/d
MECH FTR	Mech Work	Labor			9/d
PAINTER	Painter	Labor			9/d
PIPEFTR	Pipe Work	Labor			9/d
SCAFFDER	Scaffold Erector	Labor			9/d
SWorker	Structural Work	Labor			8/d
Building Worker	Building Worker	Labor			8/d
ENGINEERING	Engineering	Labor			8/d
Process	Process Engineer	Labor		Process En...	8/d
Civil	Civil Engineer	Labor		Civil Engin...	8/d
Piping	Piping Engineer	Labor		Piping Engi...	8/d
Mech	Mechanical Engineer	Labor		Mechanica...	8/d
Instru.	Instrument Engineer	Labor		Instrument ...	8/d
Electr.	Electrical Engineer	Labor		Electrical E...	8/d
EQUIPMENT	Equipment and Material	Nonlabor			8/d
MATERIAL	Material	Nonlabor			8/d

Role Example

The screenshot shows a software application window titled "Roles". The main area displays a hierarchical tree of roles. The "EM" (Engineering Manager) role is selected and expanded, showing its sub-roles: EM.PS ENGR (Process Engineer), EM.CIV ENGR (Civil Engineer), EM.PIP ENGR (Piping Engineer), EM.MECH ENGR (Mechanical Engineer), EM.INST ENGR (Instrument Engineer), and EM.ELEC ENGR (Electrical Engineer). Other main categories include Proc (Procurement Manager), CM (Construction Manager), and PM (Project Manager), each with their respective sub-roles.

Role ID	Role Name
EM	Engineering Manager
EM.PS ENGR	Process Engineer
EM.CIV ENGR	Civil Engineer
EM.PIP ENGR	Piping Engineer
EM.MECH ENGR	Mechanical Engineer
EM.INST ENGR	Instrument Engineer
EM.ELEC ENGR	Electrical Engineer
Proc	Procurement Manager
Proc.Buyer	Procurement Buyer
Proc.Expeditor	Procurement Expeditor
CM	Construction Manager
CM.SM	Safety Manager
CM.SE	Safety Engineer
CM.INSP	Inspector
PM	Project Manager
PM.PJE	Project Engineer
PM.SCH	Project Scheduler

Below the tree is a table with columns: General, Resources, Prices, and Limits. The "Resources" column is active, showing fields for "Effective Date" and "Max Units / Time".

General	Resources	Prices	Limits
	Effective Date		
	Max Units / Time		

At the bottom of the table are "Add" and "Delete" buttons.

On the right side of the window is a toolbar with buttons: Close, Add, Del. / Merge, Cut, Copy, Paste, and Help.

Budget and Cost

- Top-down approach: for upper management
- Bottom-up approach: for accurate estimate
- Budget (total) and spending plan (monthly distribution)
- Resource dictionary and cost account
- Budgeted cost=Budgeted unit (man-hour) x Price per unit (\$/MH) for each activity
- Roll up to Project, EPS or WBS level

Cost Account Example

The screenshot shows a software window titled "Cost Accounts". The main area displays a tree view of cost accounts under the heading "Display: All Cost Accounts". The tree is organized into three main categories: 10 (Engineering Cost), 21 (Procurement Cost), and 31 (Construction Cost). Each category contains several sub-accounts with specific names like "Project Managemnt Cost", "Basic Engineering", "Civil and Structure", "Equipment", "Piping", "Instrumentation", and "Electrical".

Cost Account ID	Cost Account Name
10	Engineering Cost
10.11	Project Managemnt Cost
10.2	Basic Engineering
10.1	Civil and Structure
10.5	Equipment
10.6	Piping
10.7	Instrumentation
10.8	Electrical
21	Procurement Cost
21.5	Equipment
21.6	Piping
21.7	Instrumentation
21.8	Electrical
31	Construction Cost
31.0	Temporary Facilities
31.1	Civil and Structure
31.5	Equipment
31.6	Piping
31.7	Instrumentation
31.8	Electrical

Below the tree view, there is a detailed view of the selected "Engineering Cost" account (ID: 10). It includes input fields for "Cost Account ID" (containing "10") and "Cost Account Name" (containing "Engineering Cost"). Below these is a "Cost Account Description" field with a rich text editor toolbar.

On the right side of the window, there is a vertical toolbar with the following buttons: Close, Add, Del. / Merge, Cut, Copy, Paste, navigation arrows, and Help.

Summary

	Global	EPS Node	Project-specific	Resource-specific	Remarks
WBS			✓		Level 1 is project. Level 2 and down are deliverables. The lowest level is the work package (or activity)
Resource	✓				
Cost	✓				
Calendar	✓	✓	✓	✓	
Layout	✓	✓	✓		

Global (Enterprise, root node of EPS) -> EPS -> Project -> WBS -> Work Package or Activities

P3 Vs. P6

P3 Vs. P6

	P3	P6	Remarks
Scope	Project based project management	Enterprise-wide project management	
Project Structure	Single	Multiple (EPS), Global (Enterprise)	Hierarchical Enterprise Project Structure (EPS)
Work Responsibility	Project manager	Project managers for multi-projects. OBS.	Hierarchical Organisation Breakdown Structure (OBS)
WBS	Optional	Have more weight than P3	Level 1: project; Level 2 and down: deliverables (measurable products and services); Lowest Level: Work package
User	Usually single user	Multiple users	
Database	PC based 16-bit Btrieve database	Server based Oracle or MS SQL server	For standalone, use MS SQL Server Desktop Engine (MSDE)
File Structure	Multiple files	Single file (.xer)	
Architecture	PC based. Programme and data residing on PC	Database on server; Programme on station	
Activity Code	Main features	Have less weight than P3	Part of category, grouping and filtering function replaced by EPS
Driven Predecessor	with * before an predecessor	Solid relationship line	