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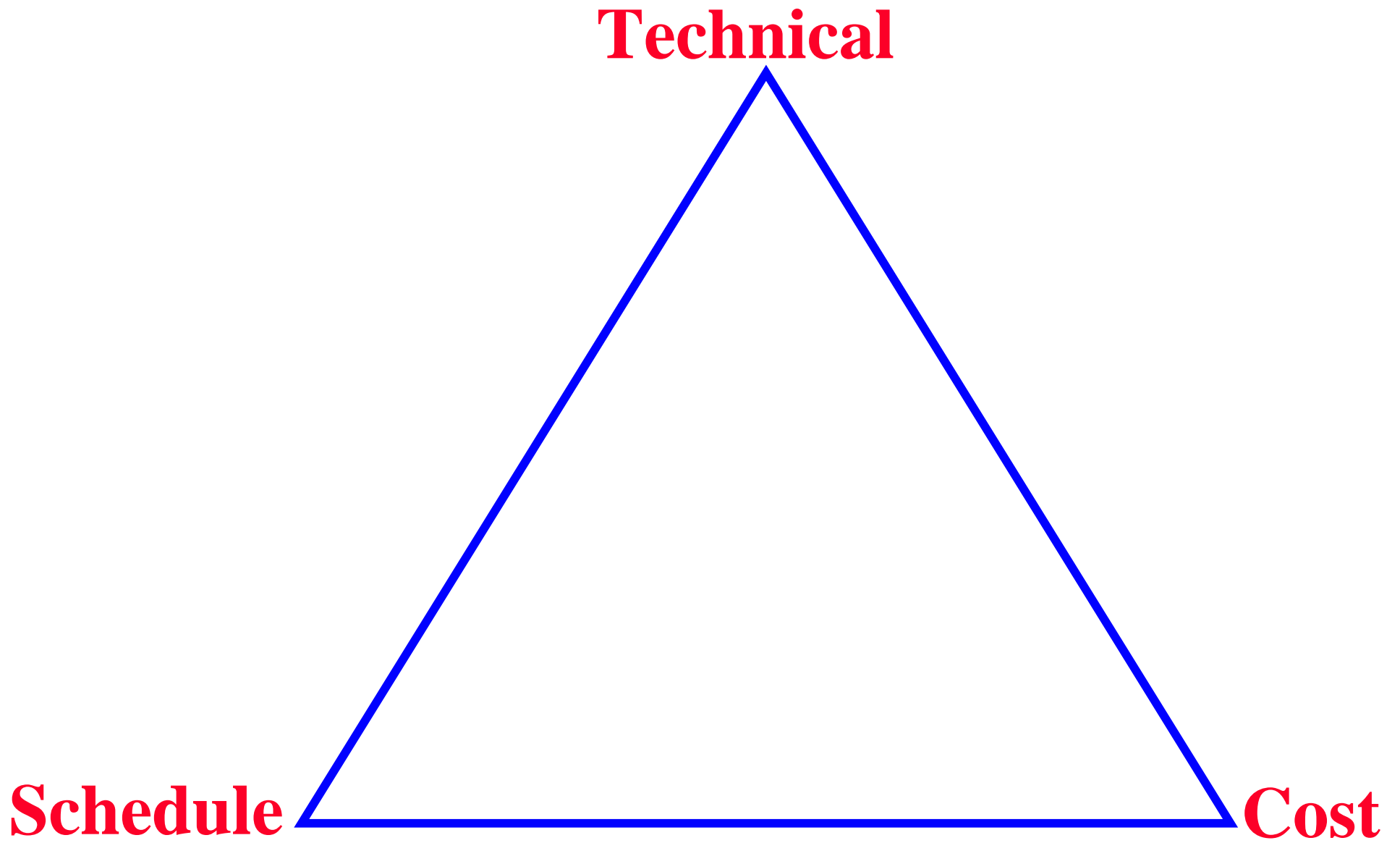
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Establishing a Performance Measurement Baseline (PMB)

**Presented by
Gary Humphreys
of
HUMPHREYS & ASSOCIATES, INC.**



PURPOSES

- **Understand how to build a compliant PMB**
- **Develop a feel for the resources and effort required**

ASSUMPTION

- **A basic understanding of:**
 - **Earned Value**
 - **Resource loaded & network schedules**
 - **Contract terms**

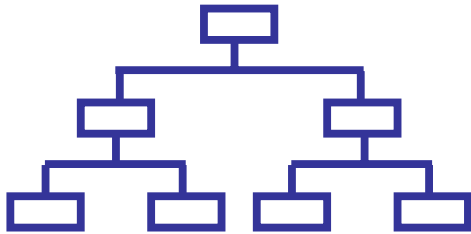
AGENDA

- **Defining & Organizing the Work**
- **Scheduling the Work**
- **Applying Resources**
- **Finalizing the Baseline**
- **Change Control**
- **Wrap-up**

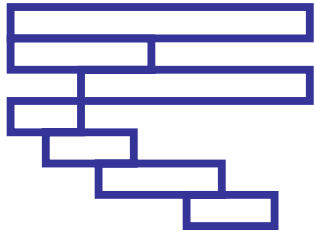
Planning & Budgeting

Establish the baseline - an iterative 3 - step process

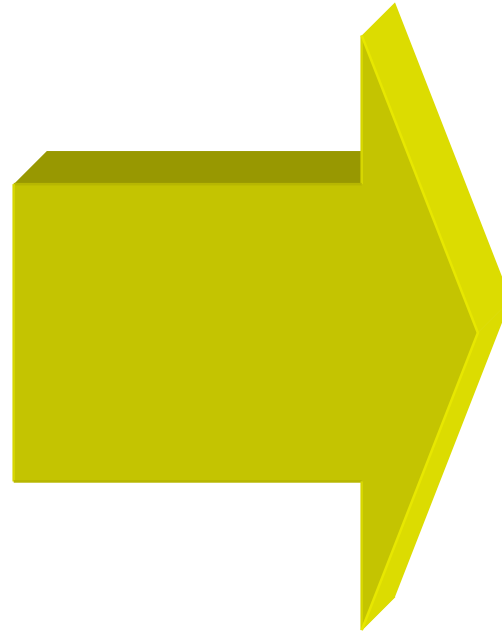
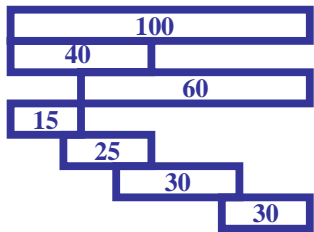
1. Define the work



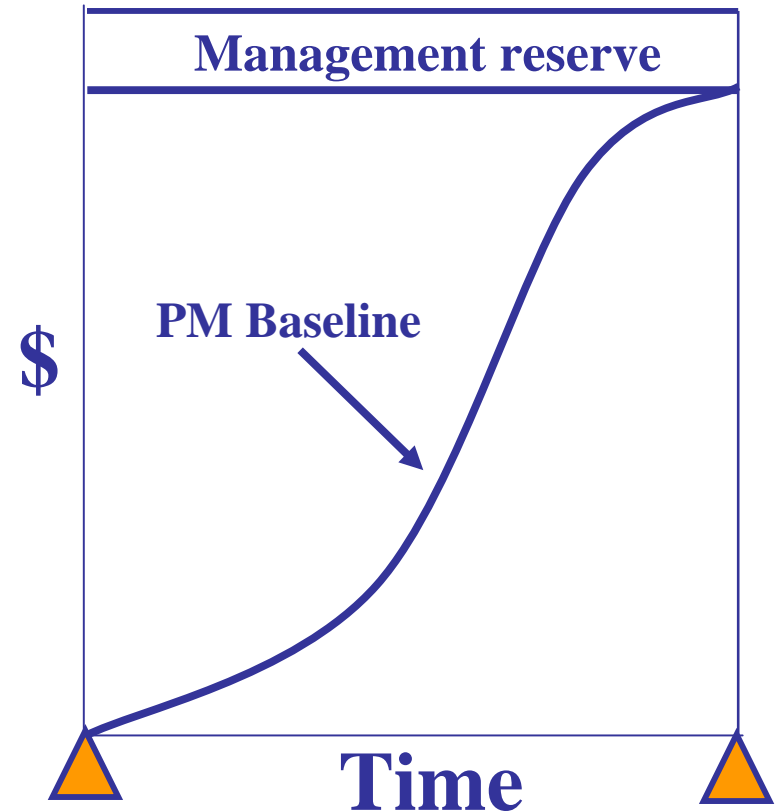
2. Schedule the work

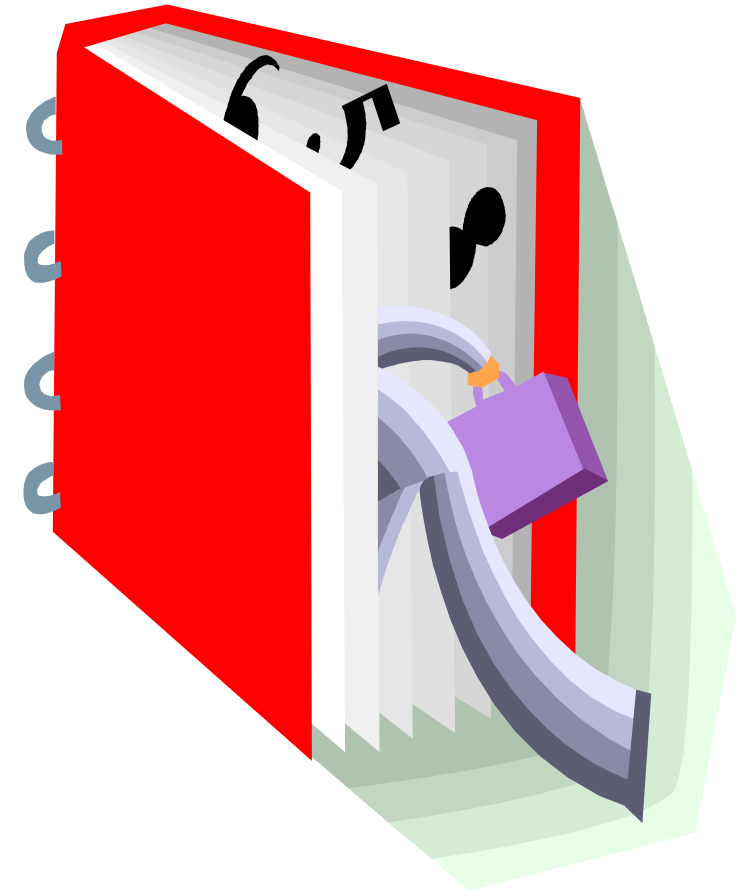


3. Allocate budgets



Contract Budget Base



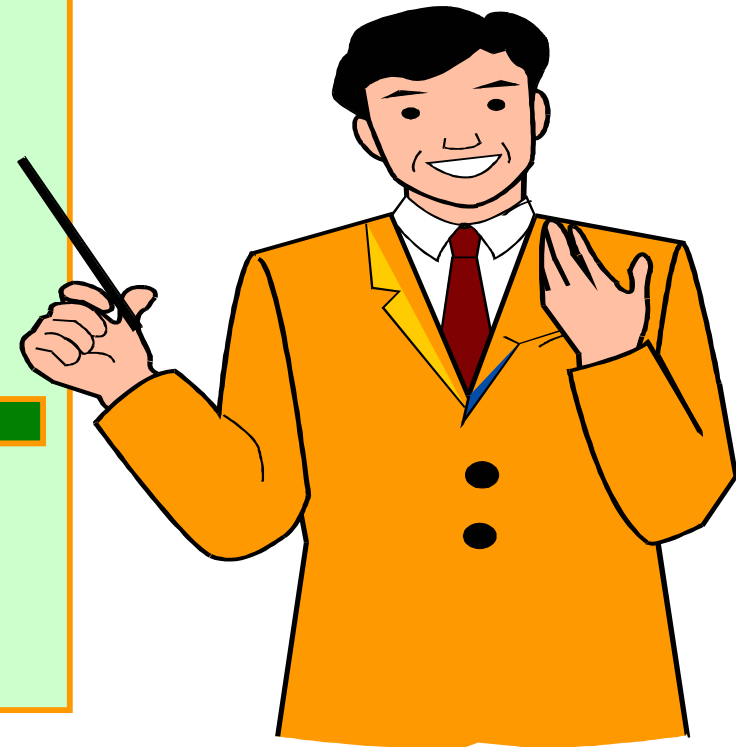
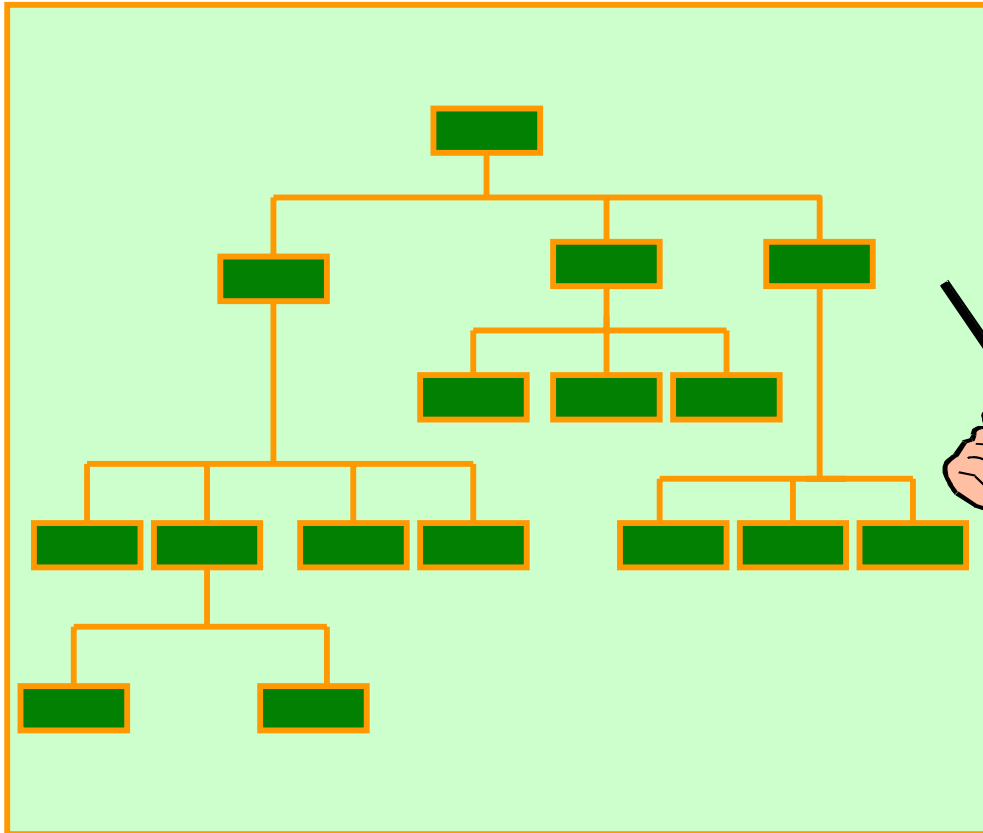


Defining and Organizing the Work

Contract Work Scope

- **Statement of Work (SOW)**
- **Schedule**
 - **Key Events**
 - **Delivery Requirements**
- **Contract Data Requirements List (CDRL)**
- **Contract Line Items**

Work Breakdown Structure



Work Breakdown Structure Guidance Documents

- **Federal Energy Regulatory Commission (FERC)
- acceptable chart of accounts**
- **National Aeronautic and Space Administration
(NASA) - NHB 9501.2B and NHB 5610.1**
- **Project Management Body of Knowledge Guide,
Project Scope Management section**

Work Breakdown Structure

It Is:

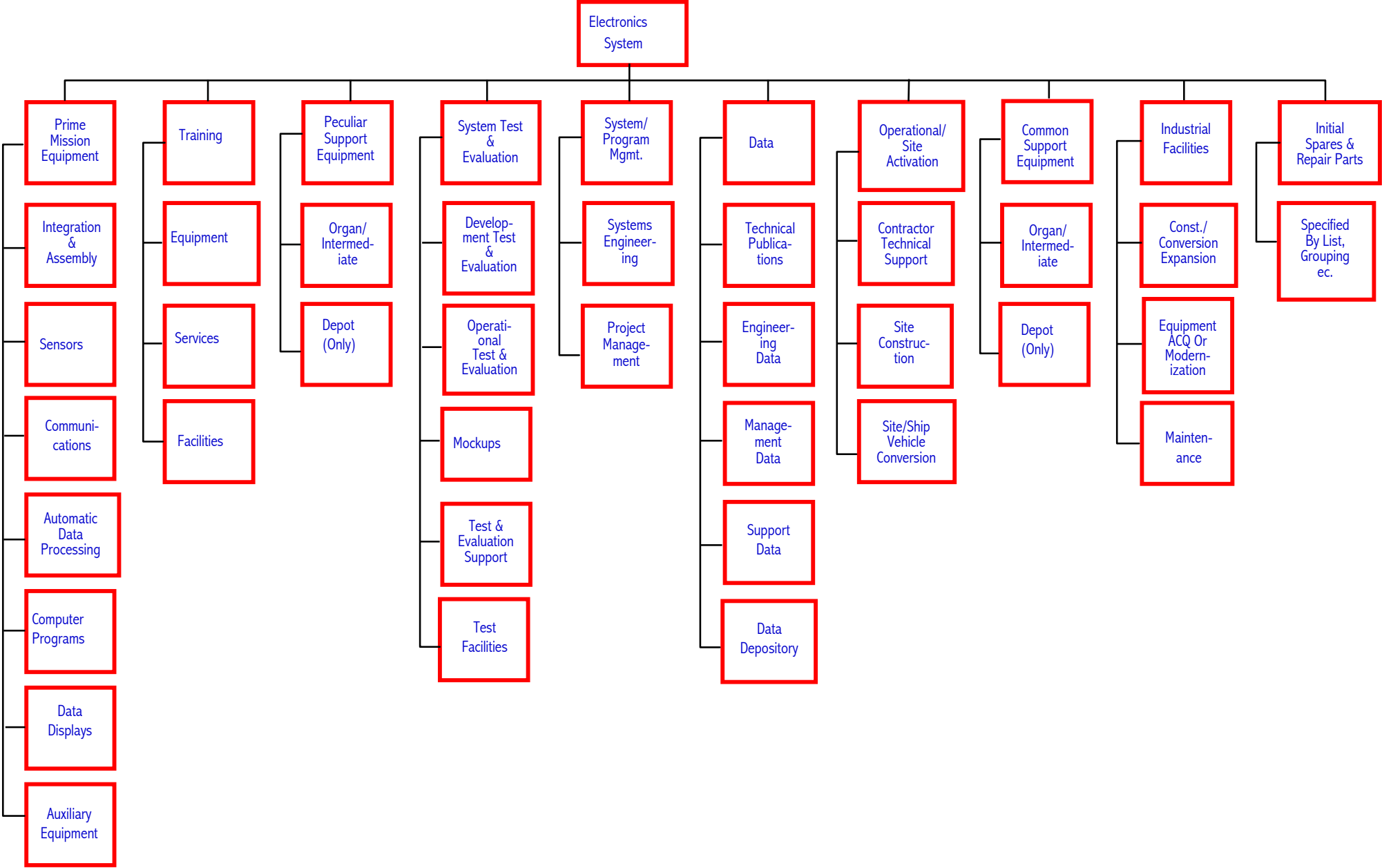
- **A product-oriented logical subdivision of hardware, software, services and facilities that make up the project.**

Work Breakdown Structure

It is not:

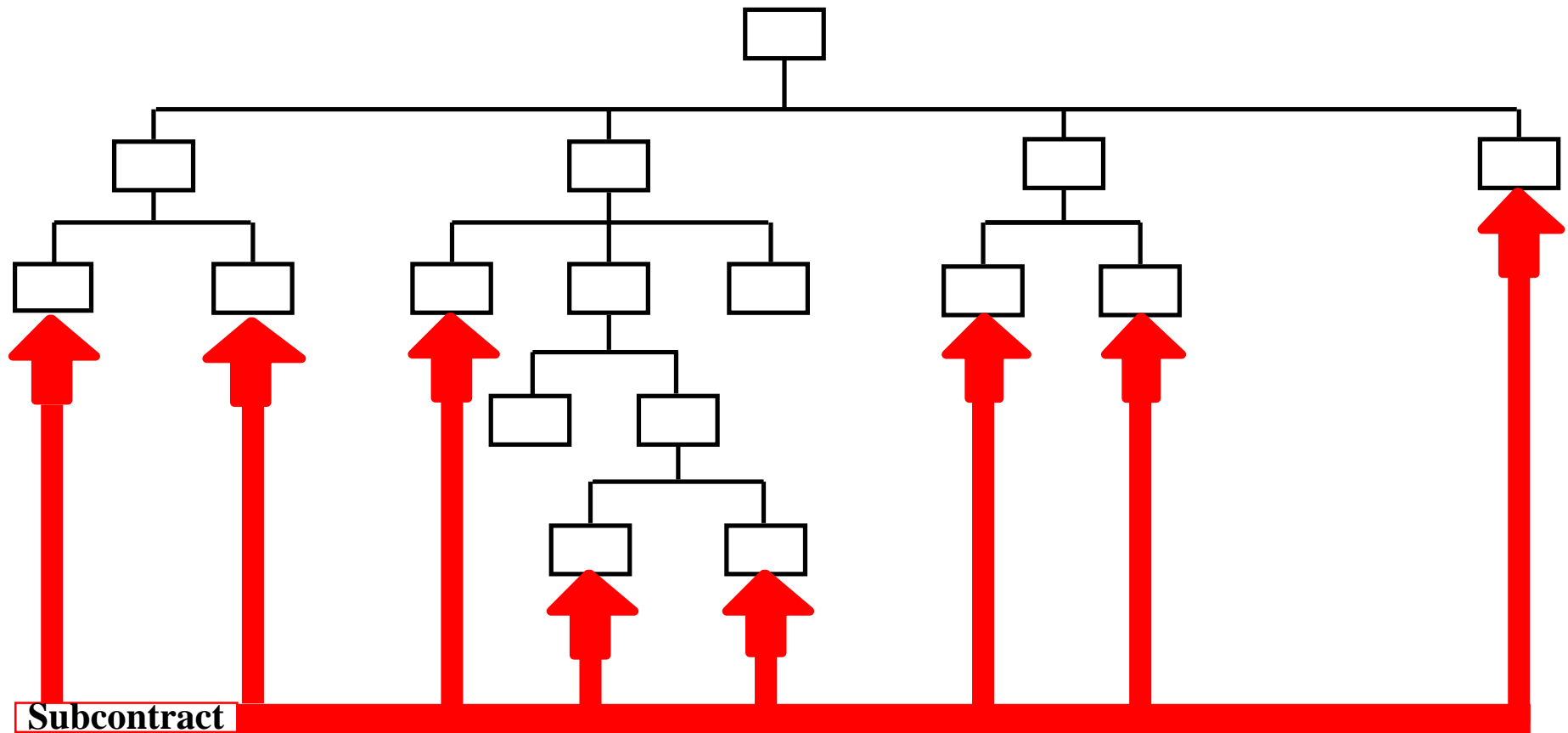
- **An organizational description of the project team that will accomplish the project**

STANDARD WORK BREAKDOWN STRUCTURE FOR ELECTRONICS SYSTEM

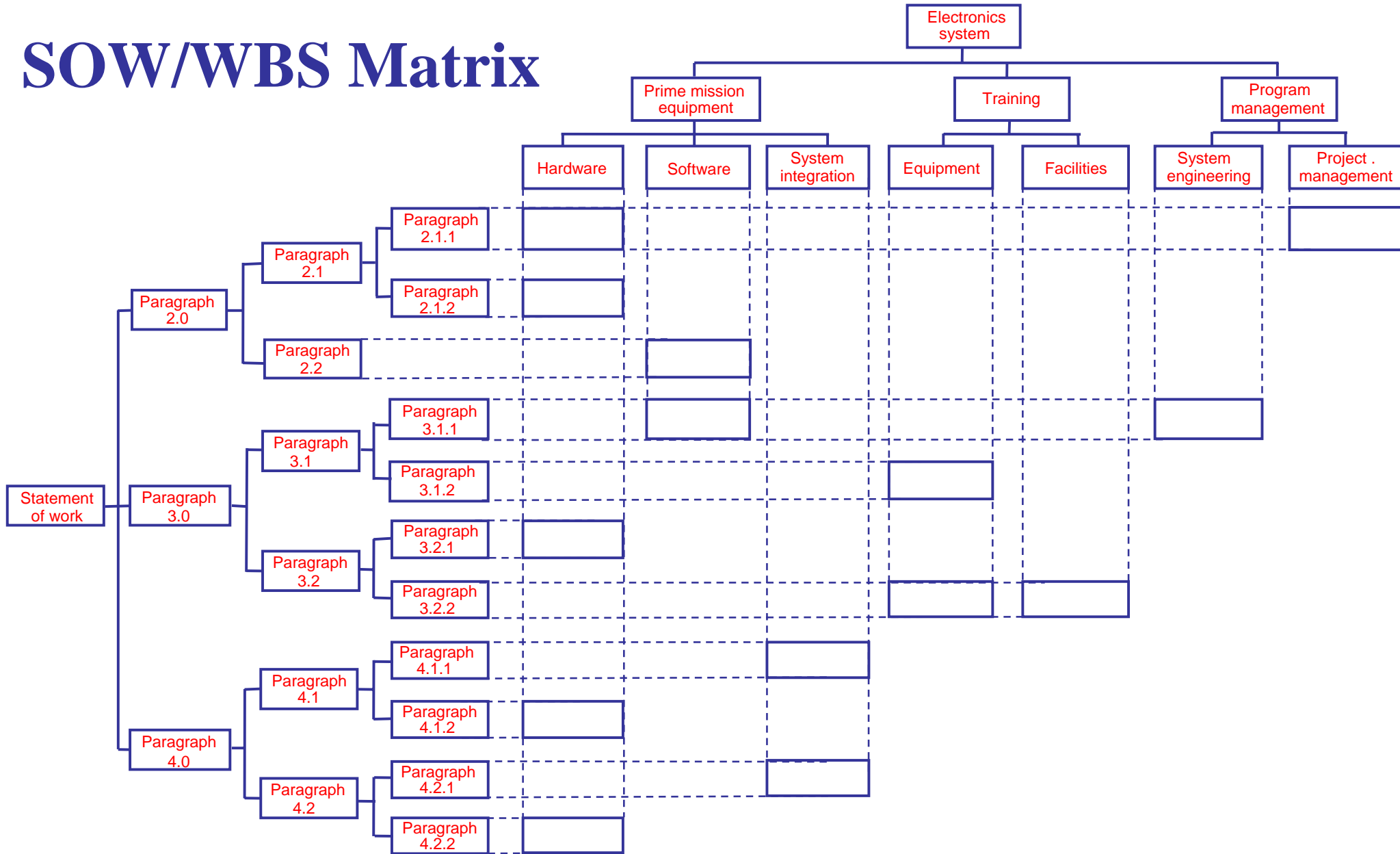


Prime Contract/Subcontract Integration

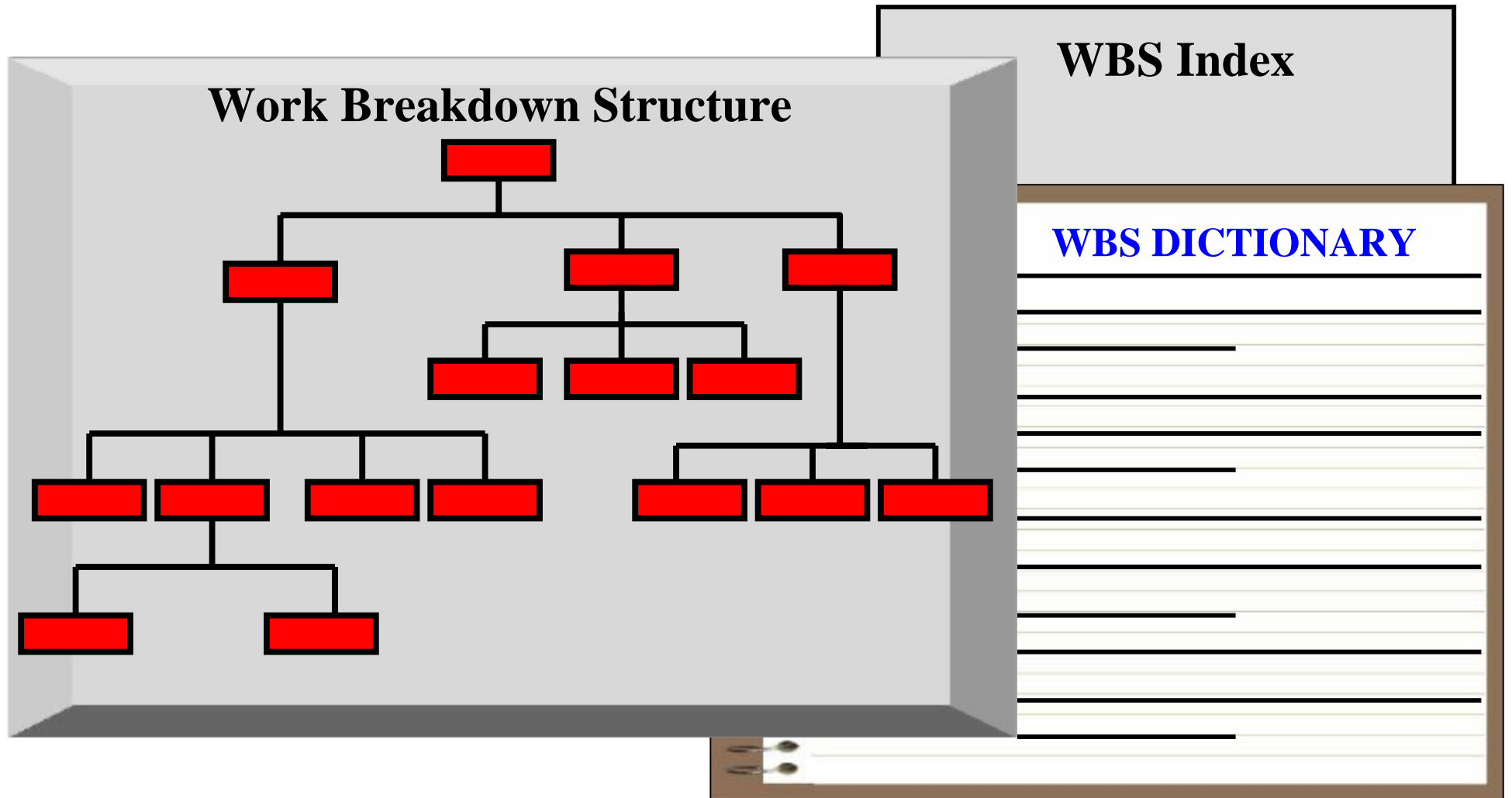
- ◆ **Subcontract effort allocated to multiple WBS elements**
(Least desirable)



SOW/WBS Matrix



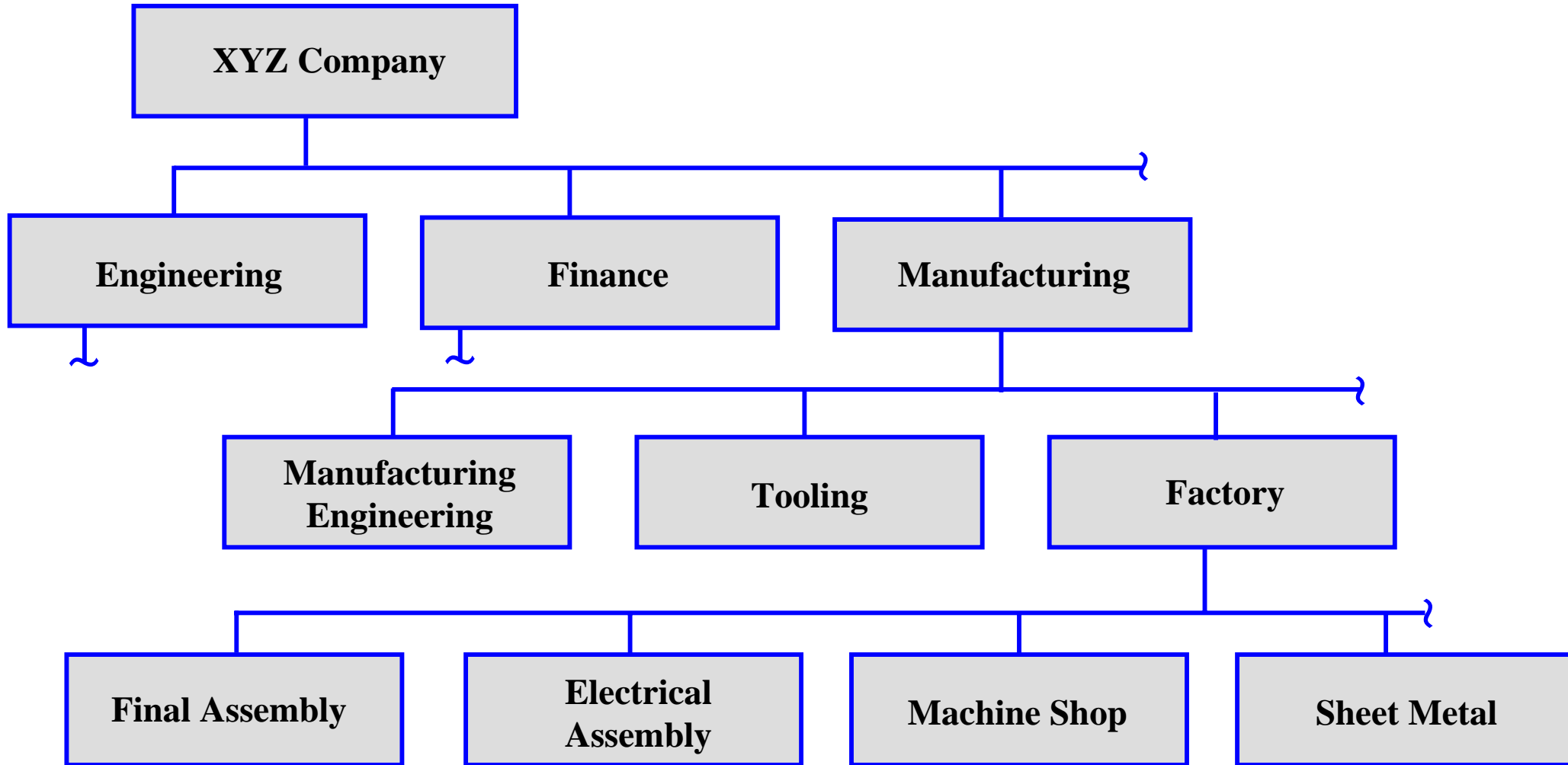
Work Definition



WBS Dictionary

Project Title: Sample Project	Date:	Contract Number:	
WBS Element Title: System Test and Evaluation		WBS Element: 1.3	
WBS Parent Title: Sample Project		WBS Parent: 1.0	
SOW Reference:		Paragraph Number: 3.2.1	
<p>Element Description: The use of prototype, production, or specifically fabricated hardware/ software to obtain or validate engineering data on the performance of the system during the development phase of the program.</p> <p>Element Includes: Detailed planning, conduct, support, data reduction and reports from such testing, and all hardware/software items which are consumed or planned to be consumed in the conduct of such testing. All effort associated with the design and production of models, specimens, fixtures, and instrumentation in support of the system level test program.</p> <p>NOTE: Test articles which are complete units (i.e., functionally configured as required by specifications) are excluded from this work breakdown structure element.</p> <p>Excludes: All formal and informal testing up through the subsystem level which can be associated with the hardware/software element.</p> <p>Acceptance testing.</p> <p>NOTE: These excluded efforts are to be included with the appropriate hardware or software elements.</p>			
Revision Number:	Date:	Authorization:	

Responsibility Assignment



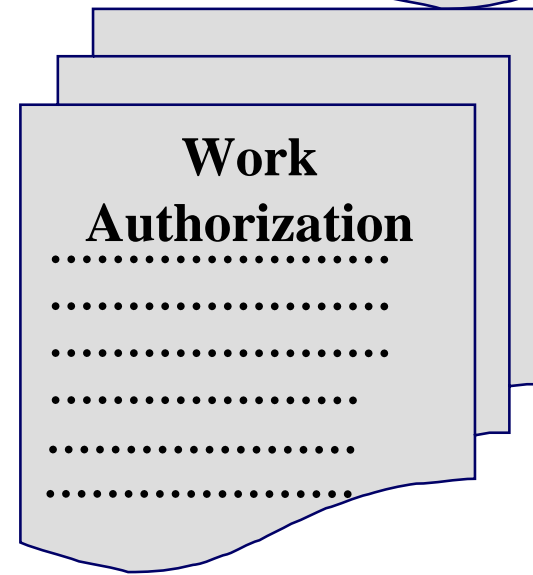
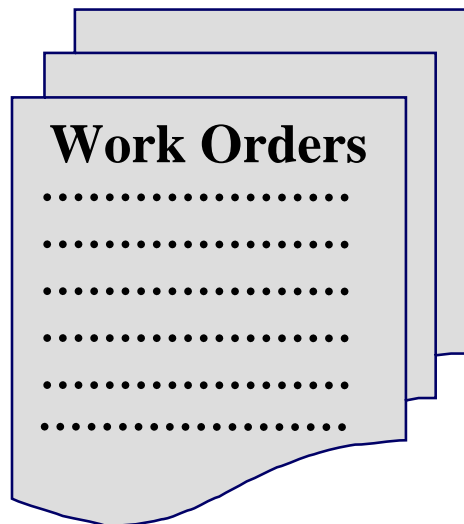
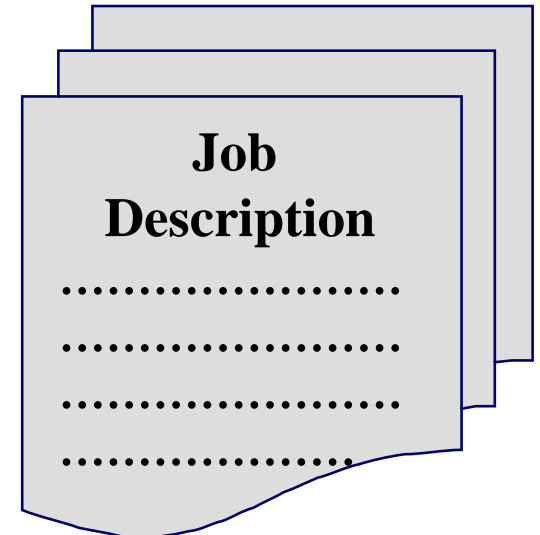
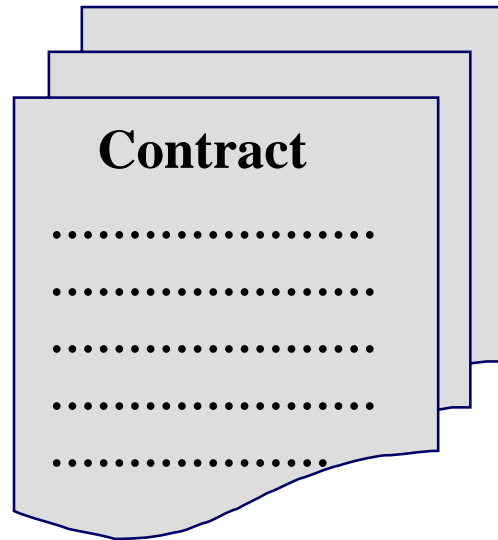
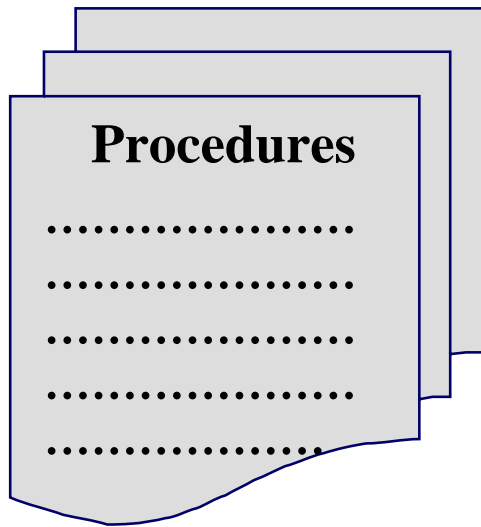
Responsibility must be assigned to an individual to perform all defined work

Organization Structure Considerations

- **Workload**
- **Expertise**
- **Availability of contractors**
- **Scope of work**
- **Economic environment**

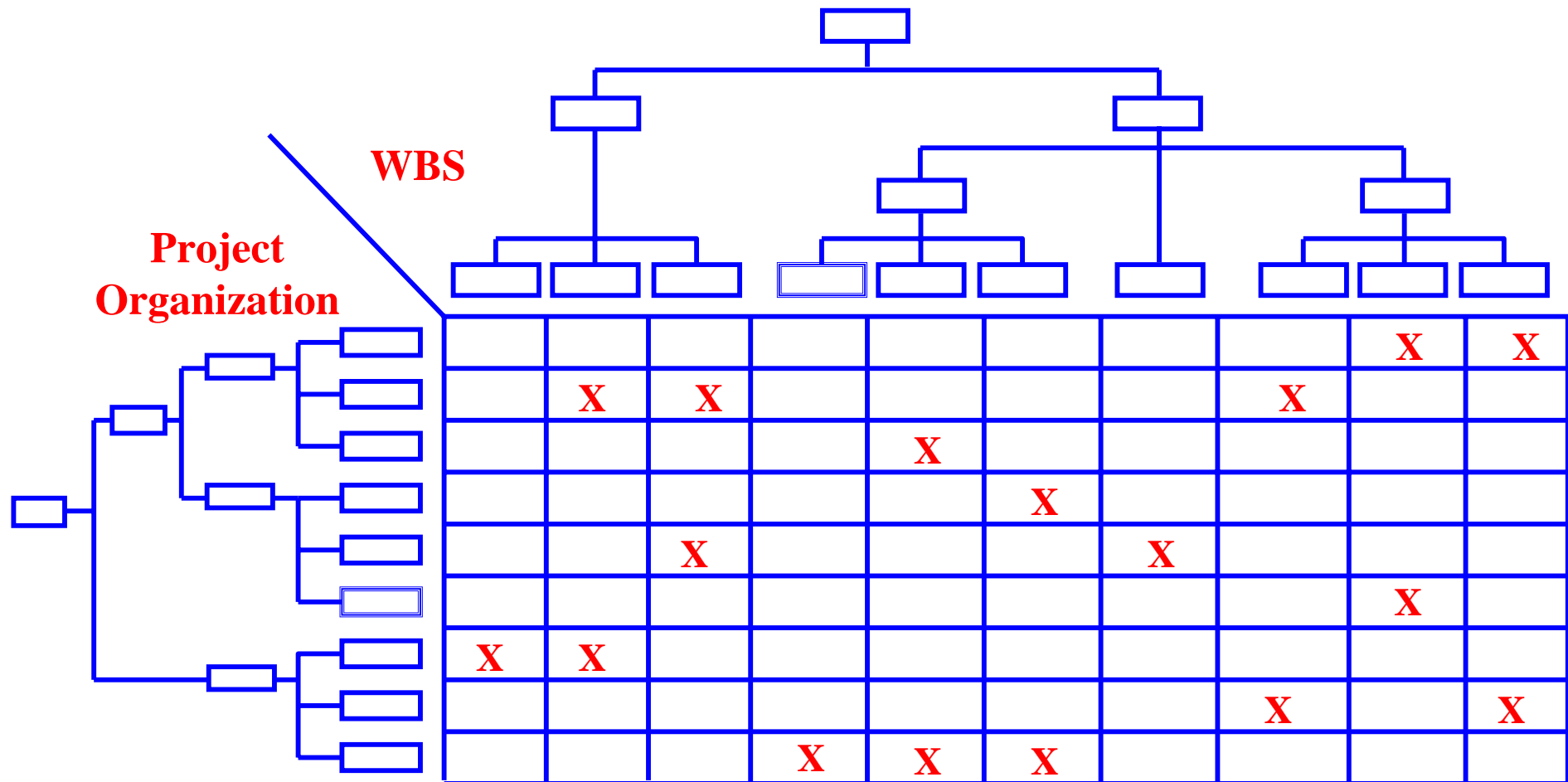
**Responsibility Must
Be Clearly Defined**

Responsibility Assignment



Responsibility Assignment Matrix

And Control Account Establishment



Typical Responsibility Matrix - Functional Alignment

Work Breakdown Structure Elements Organizational Elements			Mor-Ded Motor Scooter											
			1.0 Vehicle				* 2.0 System Test & Eval.		3.0 * Data	4.0 * Depot Test Set	5.0 * Initial Spares And Repairs	6.0 * System/ Project Mgmt.		
			1.1 Power * Source & Trans		1.2 * Frame Assy.	1.3 * Sus- pension	1.4 * Integ. Assy.	2.1 Dev Tests				2.2 T&E Suppt.	6.1 Sys Eng	6.2 Pro Mgt.
			1.1.1 Engine	1.1.2 Power Trans										
President	Procure- ment Director *	Purchasing	X	X	X	X		X		X				
		Subcontracts	X			X								
	Eng. Director *	Design Group	Electronics Design	X				X		X				
			Power Design Branch	X				X		X				
			Mech. Design Branch	X	X	X	X							
		Test & Evaluation						X	X	X				
		Engineer Design Group	Drafting Branch							X				
			Computer Services							X				
	Model Shop								X					
	Manufact- uring Director *	Production Control Group										X		
		Manufacturing Engr. Group										X		
		Tooling		X										
		Shops		X	X	X	X							
		Assembly						X				X		
	Director Quality Assurance *	Quality Assurance Dept.	RAM Group					X					X	
Quality Engr. Group												X		
Quality Control Department						X				X				
Prog. Mgt. Dept. *	Mor-Ded Project Manager								X			X		

* Customer Reporting Level

Potential Work Team Alignment

Work Breakdown Structure Elements		Mor-Ded Motor Scooter													
		1.0 Vehicle				* 2.0 System Test & Eval.		3.0 *	4.0 *	5.0 *	6.0 *				
		1.1 Power * Source & Trans		1.2 * Frame Assy.	1.3 * Suspension	1.4 * Integ. Assy.	2.1 Dev Tests	2.2 T&E Suppt.	Data	Depot Test Set	Initial Spares And Repairs	System/ Project Mgmt.			
		1.1.1 Engine	1.1.2 Power Trans												
President	Procurement Director *	Purchasing		X	X	X	X		X		X				
		Subcontracts		X			X				9				
	Eng. Director *	Design Group	Electronics Design		X					X		X			
			Power Design Branch		X					X		X			
			Mech. Design Branch		X	X	X	X			7				
		Test & Evaluation							X	X	X				
		Engineer Design Group	Drafting Branch		1	2	3	4			X		10		
			Computer Services							6		X 8			
	Model Shop								X						
	Manufacturing Director *	Production Control Group											X		
		Manufacturing Engr. Group											X		
		Tooling		X											
		Shops		X	X	X	X								
		Assembly							X				X		
	Director Quality Assurance *	Quality Assurance Dept.	RAM Group							5				X	
Quality Engr. Group												X			
Quality Control Department							X				X		11		
Prog. Mgt. Dept. *	Mor-Ded Project Manager										X			X	

* Customer Reporting Level

Potential Work Team Alignment - 2

<div style="display: flex; justify-content: space-between;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">Organizational Elements</div> <div style="text-align: right;">Work Breakdown Structure Elements</div> </div>		Mor-Ded Motor Scooter											
		1.0 Vehicle				* 2.0 System Test & Eval.		3.0 * Data	4.0 * Depot Test Set	5.0 * Initial Spares And Repairs	6.0 * System/Project Mgmt.		
		1.1 Power * Source & Trans		1.2 * Frame Assy.	1.3 * Suspension	1.4 * Integ. Assy.	2.1 Dev Tests	2.2 T&E Suppt.				6.1 Sys Eng	6.2 Proj Mgt
		1.1.1 Engine	1.1.2 Power Trans										
President	Procurement Director *	Purchasing		X	X	X	X		X		X		
		Subcontracts		X						8			
	Eng. Director *	Design Group	Electronics Design		X				X		X		
			Power Design Branch		X				X	6	X		
			Mech. Design Branch		X	X	X	X					
		Test & Evaluation		1	2	3	4	X	X	X	7	9	
		Engineer Design Group	Drafting Branch								X		
	Computer Services								X				
	Model Shop								X				
	Manufacturing Director *	Production Control Group										X	
		Manufacturing Engr. Group										X	
		Tooling		X									
		Shops		X	X	X	X						
		Assembly						X				X	
	Director Quality Assurance *	Quality Assurance Dept.	RAM Group						X		11	X	
Quality Engr. Group										X			
Quality Control Department						10				X			
Prog. Mgt. Dept. *	Mor-Ded Project Manager								X	12	X		

* Customer Reporting Level

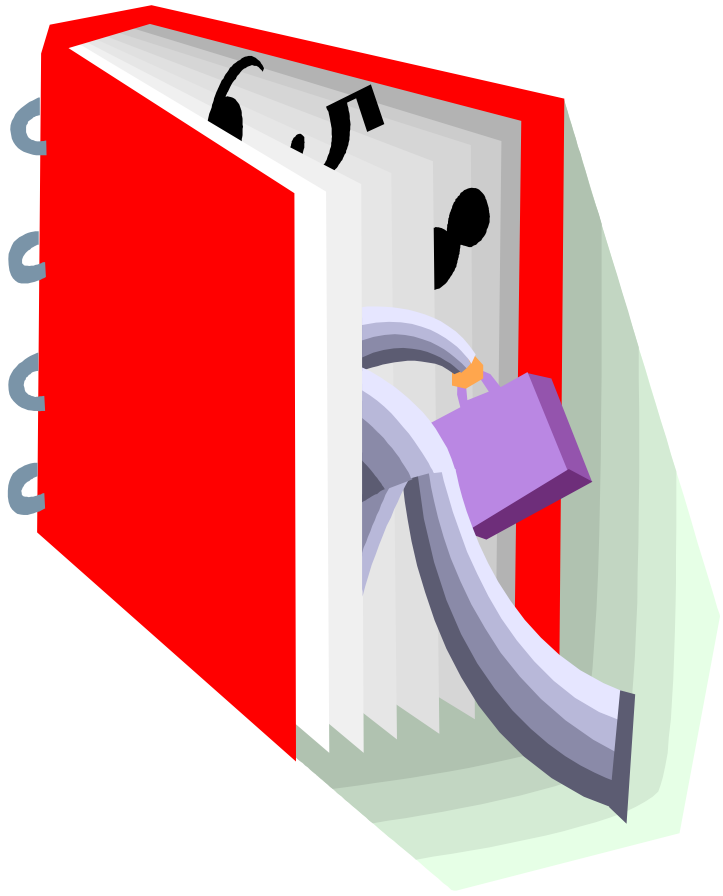
Potential Work Team Alignment - 3

Work Breakdown Structure Elements		Mor-Ded Motor Scooter												
		1.0 Vehicle				* 2.0 System Test & Eval.		3.0 * Data	4.0 * Depot Test Set	5.0 * Initial Spares And Repairs	6.0 * System/Project Mgmt.			
		1.1 Power * Source & Trans		1.2 * Frame Assy.	1.3 * Suspension	1.4 * Integ. Assy.	2.1 Dev Tests	2.2 T&E Suppt.						
Organizational Elements		1.1.1 Engine	1.1.2 Power Trans											
President	Procurement Director *	Purchasing		1 X	X	X	X		X		21 X	X 23		
		Subcontracts		X	4	7	10		17					
	Eng. Director *	Design Group	Electronics Design		X				X		X	22		
			Power Design Branch		X				X		X			
			Mech. Design Branch		X	X	X	11	15		X			
		Test & Evaluation		2	5	8			X	X	X	19		
		Engineer Design Group	Drafting Branch							18	X			
	Computer Services								X					
	Model Shop							X						
	Manufacturing Director *	Production Control Group										X		
		Manufacturing Engr. Group										X		
		Tooling		3 X		9	12						X	24
		Shops		X	6	X	X	13					X	
		Assembly						X					X	
	Director Quality Assurance *	Quality Assurance Dept.	RAM Group						X	16			X 26	
Quality Engr. Group											X			
Quality Control Department						X	14			20	X 25			
Prog. Mgt. Dept. *	Mor-Ded Project Manager									X		X 27		

* Customer Reporting Level

Pure Integrated Product Team (IPT) Organization

Work Breakdown Structure			1.0 Total Program							
			1.1			1.2			1.3	
			1.1.1	1.1.2	1.1.3	1.2.1	1.2.2	1.2.3	1.3.1	1.3.2
Organizations										
Top Level Organization	Summary IPT 1.1	IPT A	X							
		IPT B		X						
		IPT C			X					
	Summary IPT 1.2	IPT D				X				
		IPT E					X			
		IPT F						X		
	Summary IPT 1.3	IPT G							X	
		IPT H								X



Scheduling the Work

Establish Key Events

- **Key events**
 - The drivers that are critical to meeting the objective,
 - PDR, CDR, full scale mock-ups, subassembly completed, testing completed, deliveries, etc...

What Is A Baseline?

A SCHEDULE BASELINE is the approved plan (resource-leveled) for accomplishing the project objectives, plus any approved changes to that plan.

Scheduling Guidelines

Require:

- **A formal scheduling system**
- **Schedules hierarchy**
 - **Master, intermediate, detail**
- **Identification of key milestones**

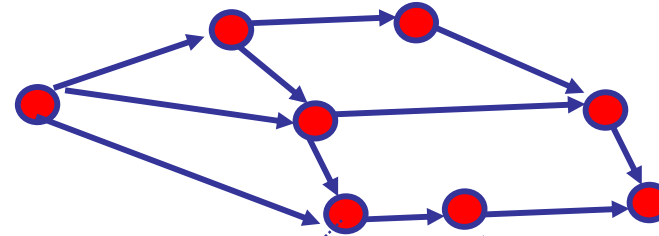
Scheduling Guidelines

- **Use of meaningful indicators for measuring schedule performance**
- **Identification of work progress and accomplishment**
- **Forecasted completion dates for scheduled work**
- **Changes visibility**

Schedule Integration “Schedules *Must* Tier”

Total Program Level

- Customer
- Senior management
- Program Office



Contract/
program
schedule

Intermediate Level

- Customer
- Program Office
- Functional management
- Control Account Managers

Item	1	2	3	4	5	6	7	
Control Account 14	△	—————		△				
Control Account 15			△	—————		△		
Control Account 16		△	—————		△			
Control Account 17				△	—————		△	
Control Account 18			△	—————				△

Major event
or functional
organization
milestone
schedule

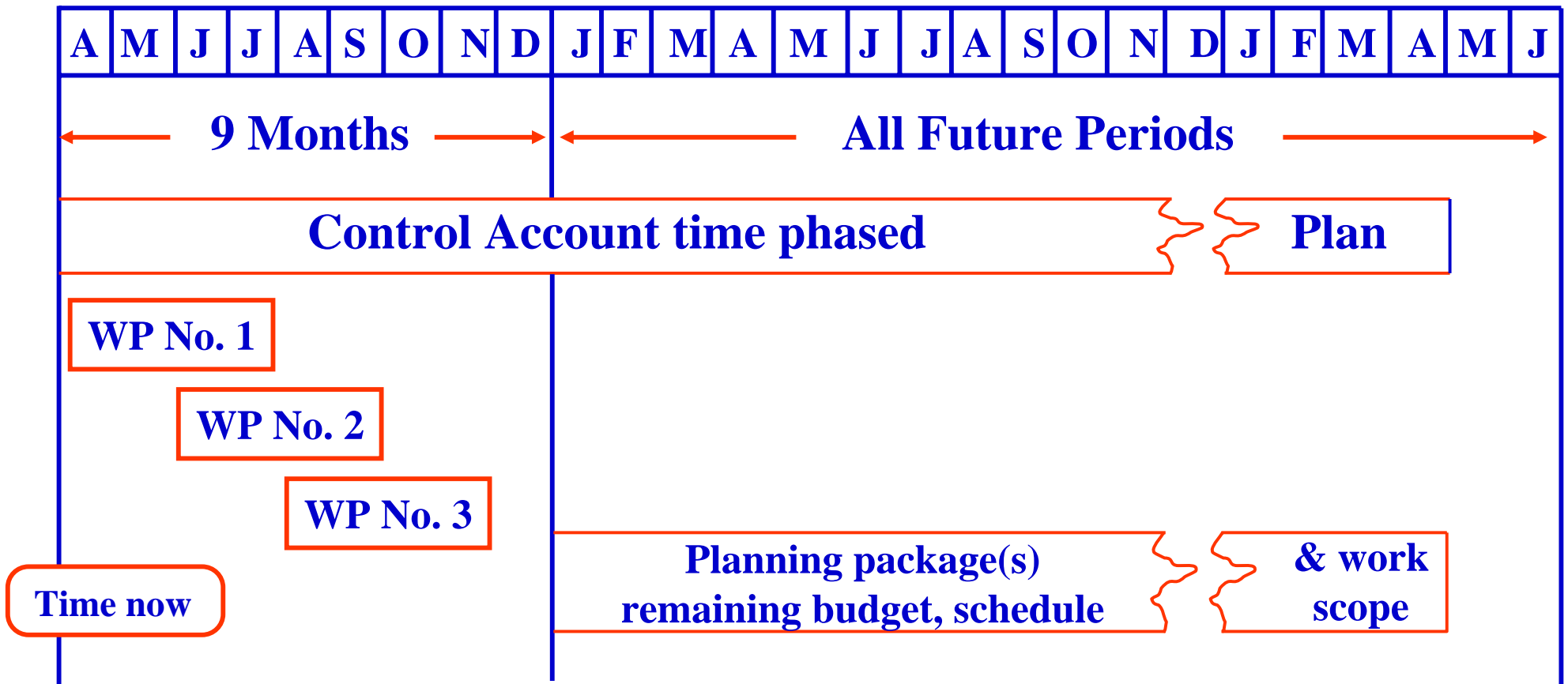
Detail Program Level

- Program Office
- Functional management
- Control account Managers

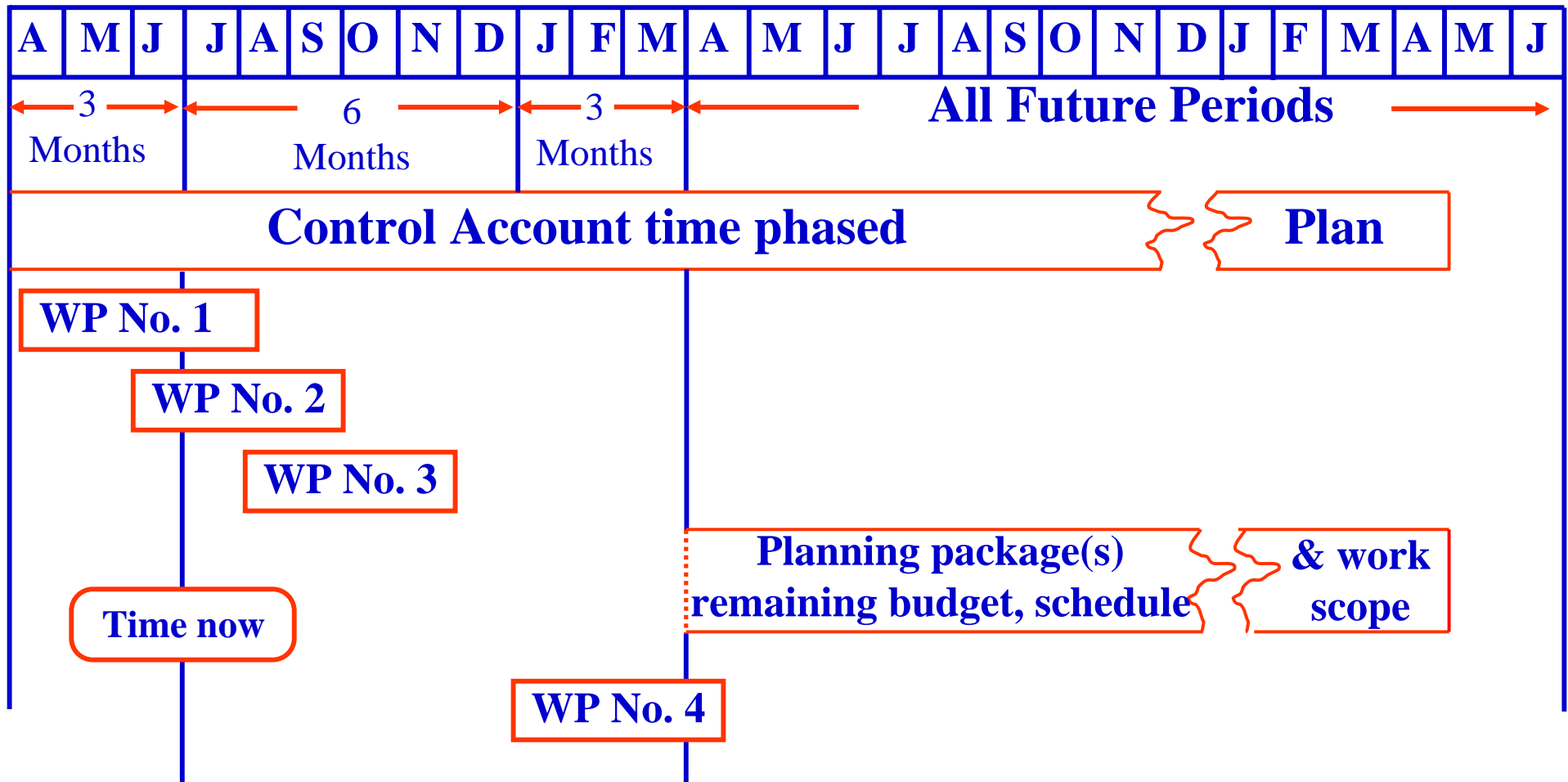
Control Account 16	△	Start	—————	Stop	△			
WP No. 1	△	—————		△				
WP No. 2		△	—————		△			
WP No. 3			△	—————		△		
WP No. 4				△	—————		△	
WP No. 5			△	—————				△

Control
Account and
work package
schedules

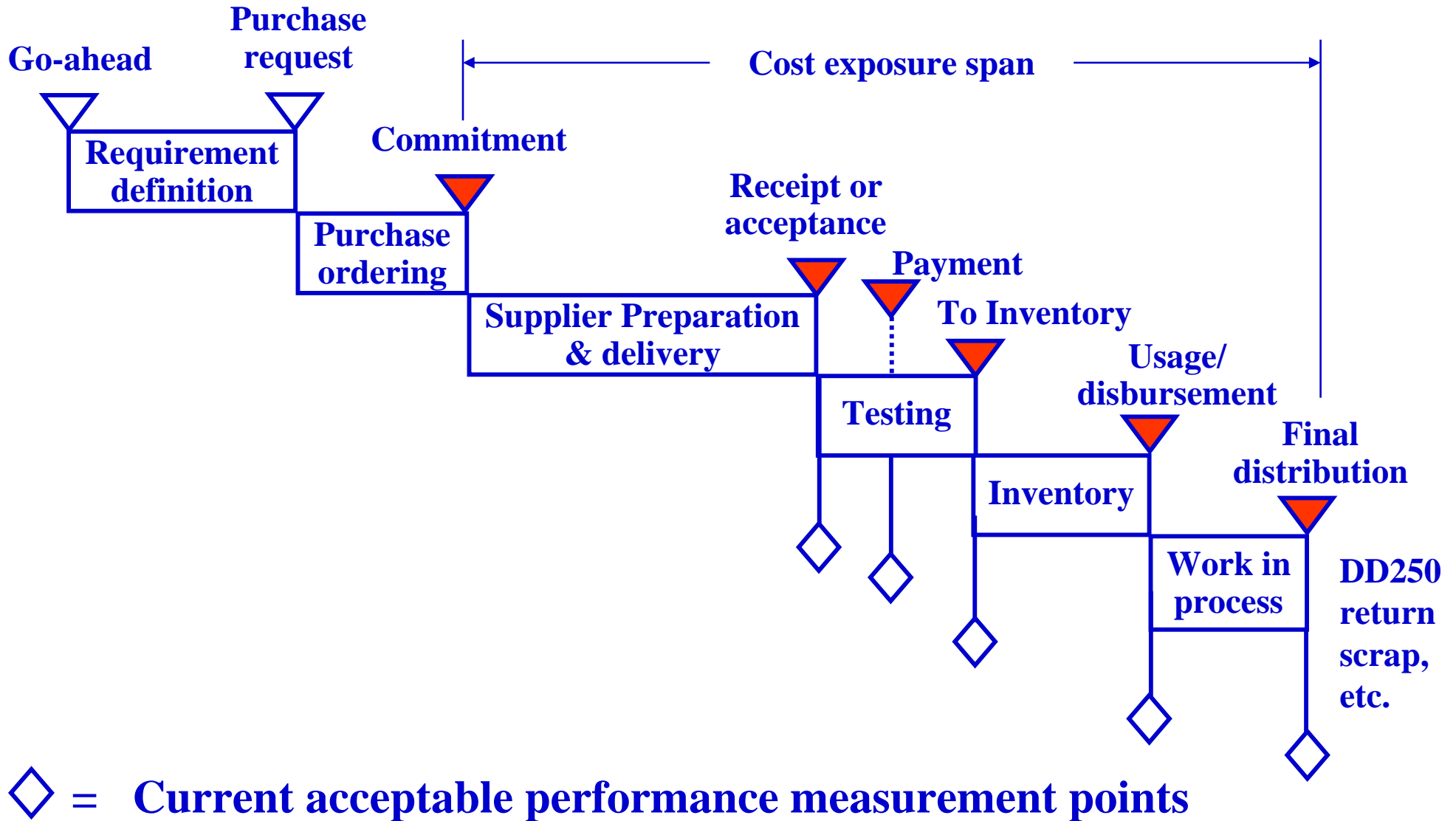
Rolling Wave Planning



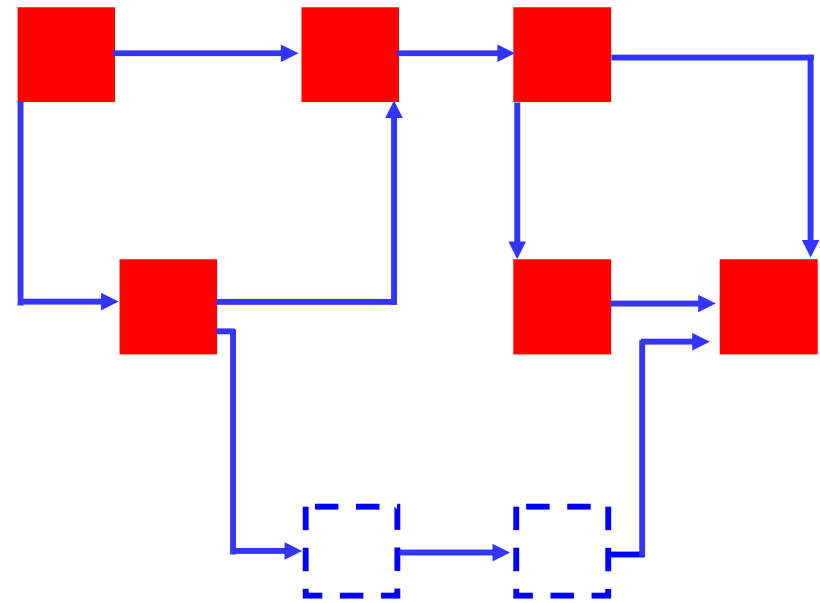
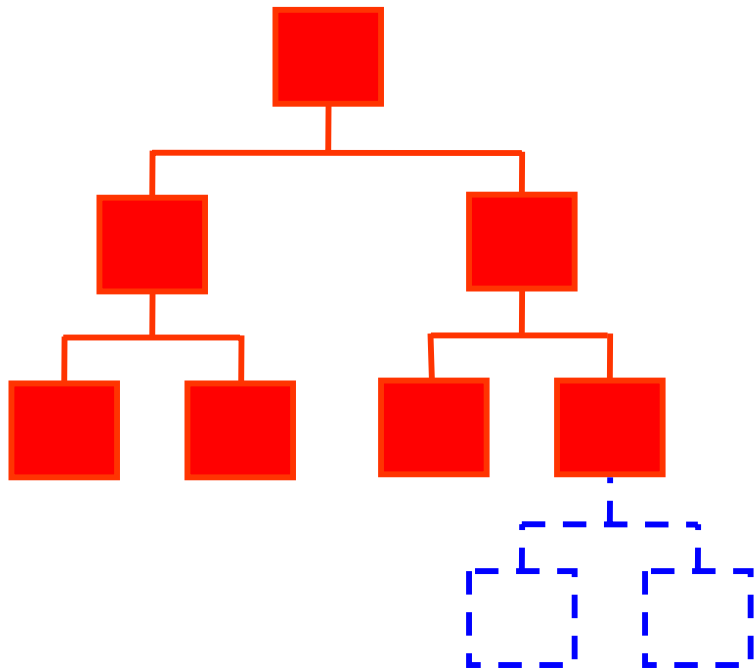
Rolling Wave Planning

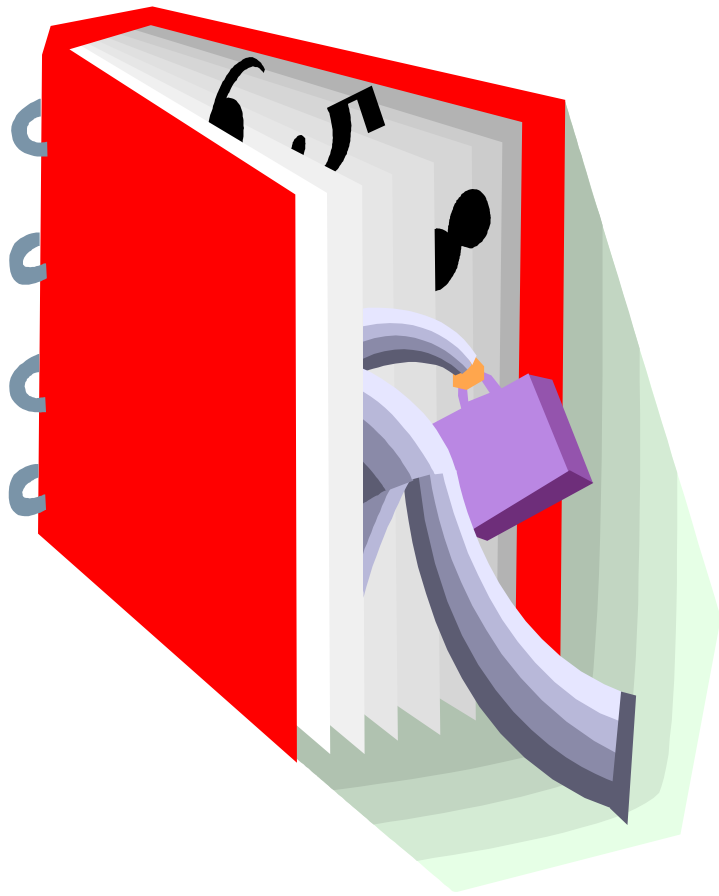


Scheduling Material



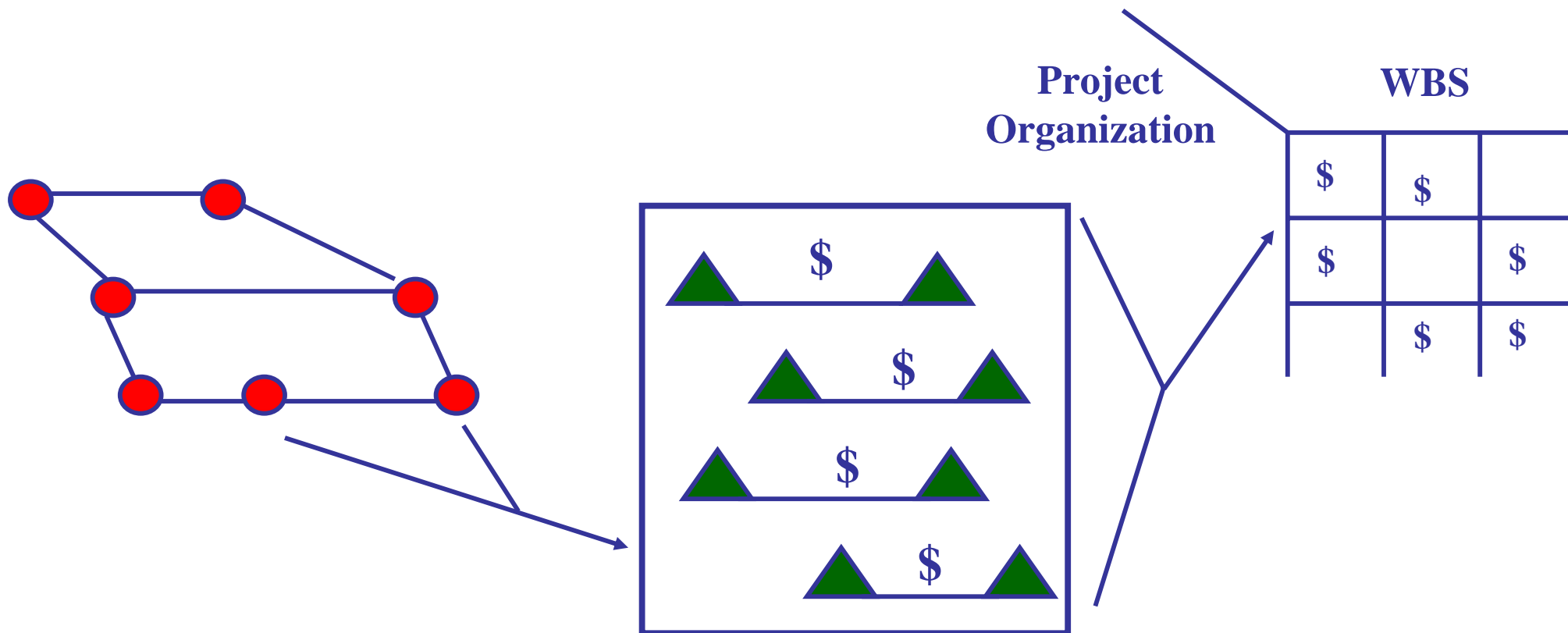
WBS And Scheduling Development *Are Iterative*



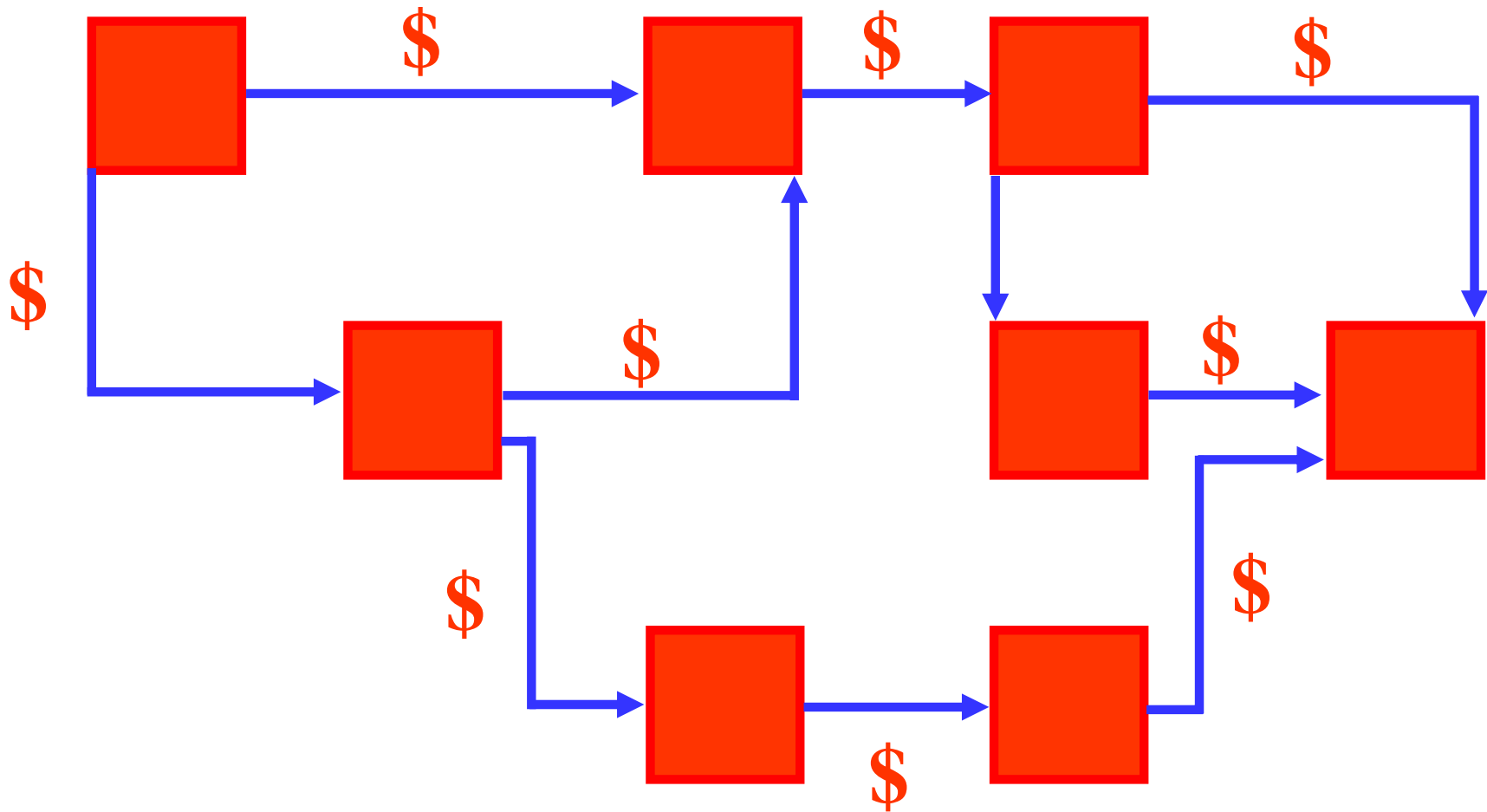


Applying Resources

Scheduling, Estimating And Performance Budgeting



Estimating Is Tied To Scheduling



Resources

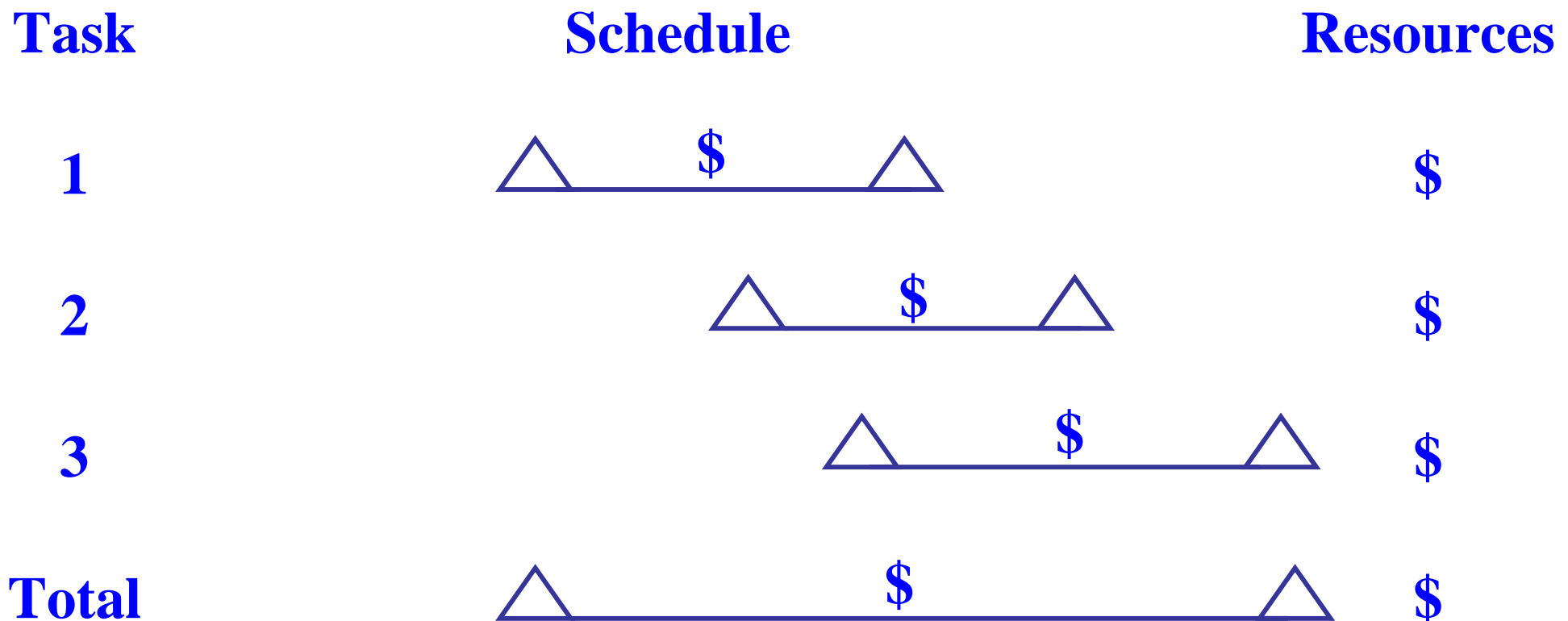
Unless resources are applied to the schedule, there is no way to determine if the schedule is achievable or efficient.

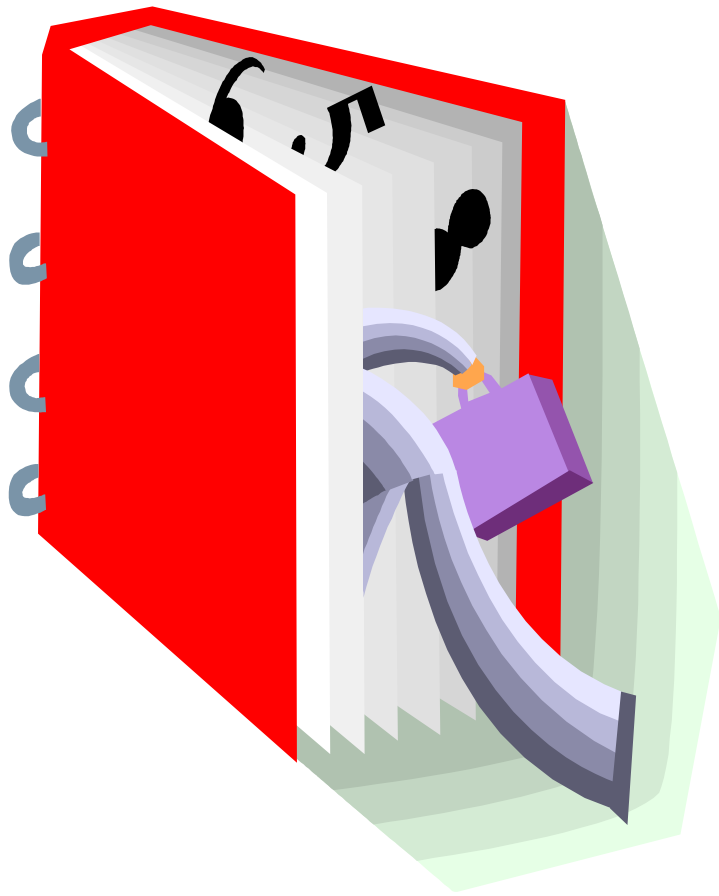
The Major Resource Questions

- **Is the project achievable within the time and resource constraints?**
- **Is the project being planned to use resources efficiently?**

By Providing A Time-Phased Budget for Each Control Account

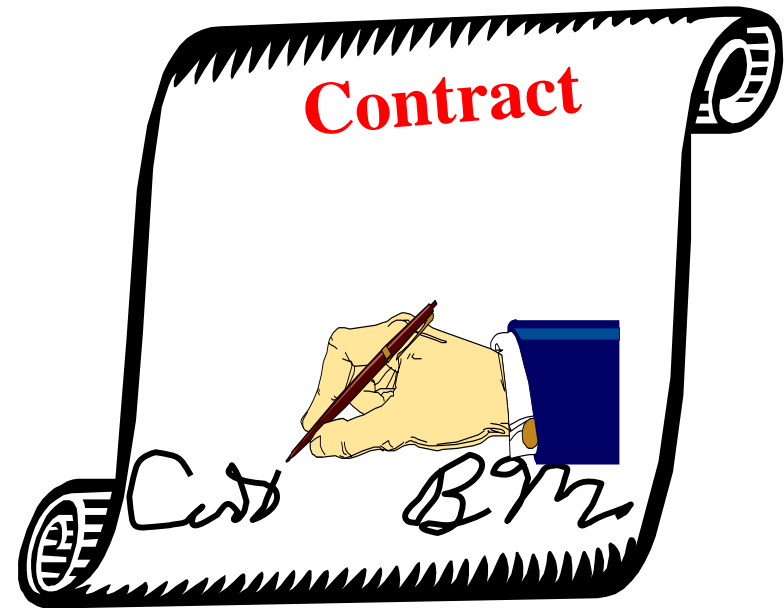
Control Account





Finalizing the Baseline

Detailed Planning Becomes Budget When Formally Authorized



Work Authorization And Release

- **WBS orientation**
- **Traceability/hierarchy**
- **Responsibility assignment**
- **Scope of work**
- **Schedule**
- **Budget**
- **Charge number**

Work Authorizations

Engineering

Engineering order
Test order
Work order

Manufacturing

Fabrication order
Assembly order
Shop order
Manufacturing order

Purchasing

Purchase requisition
Purchase order

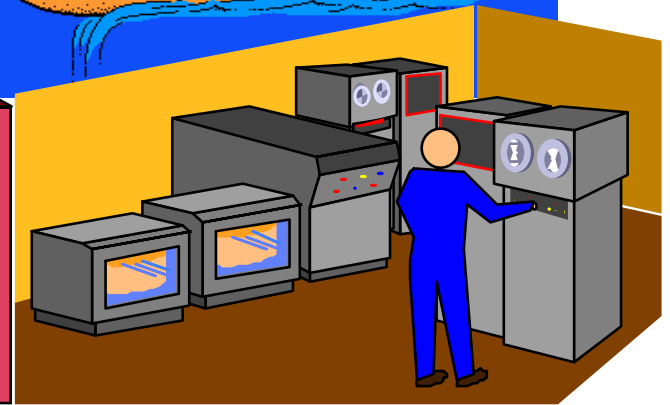
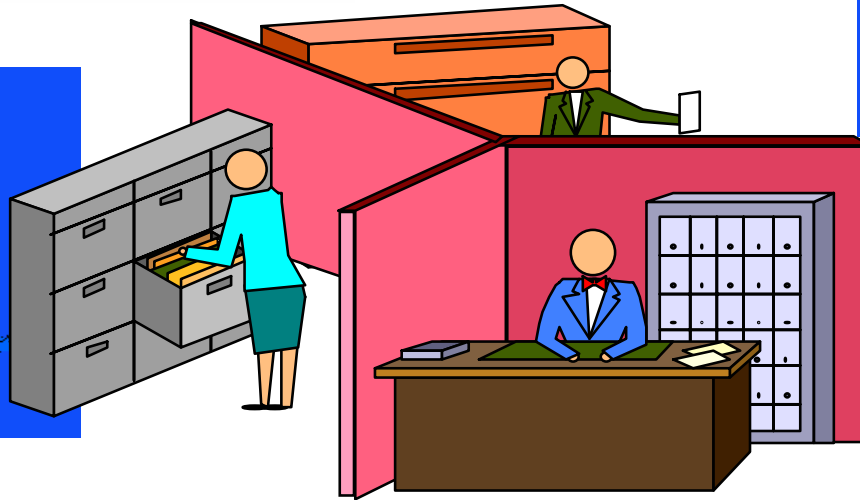
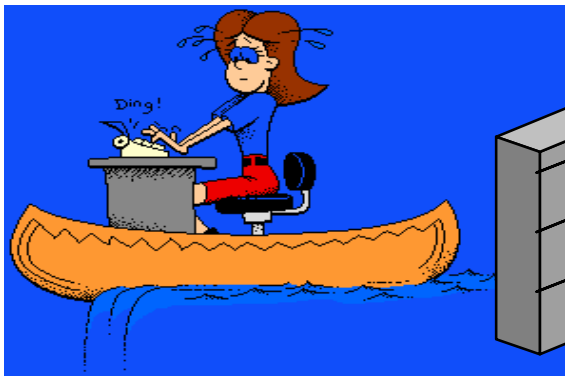
Inventory

Withdrawal slip
Material transfer

**We Now Have a Performance
Measurement Baseline!**

But Are We Done???

Integrated Baseline Review (IBR)



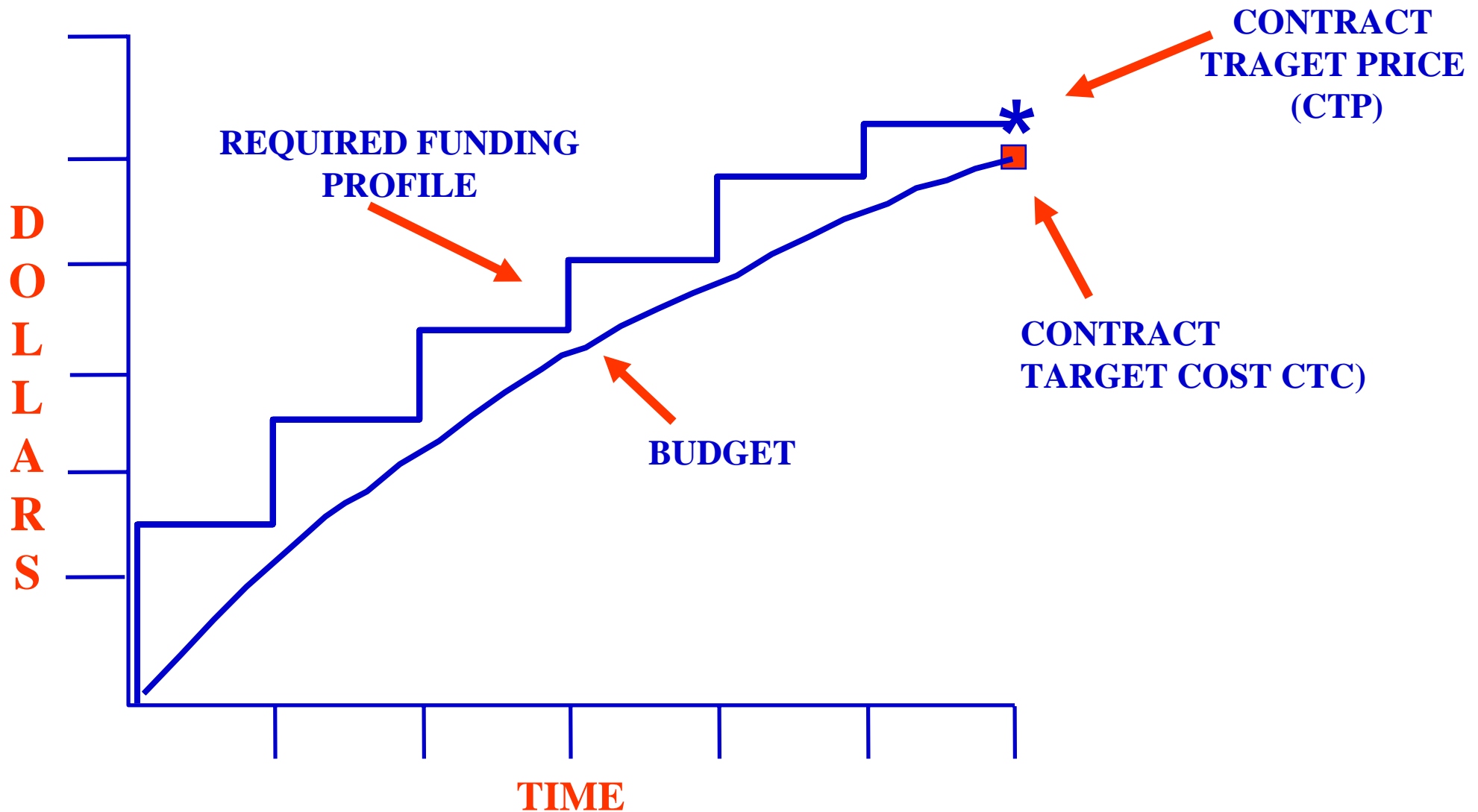
What Is An IBR ?

A review conducted by the customer program manager and technical staff following contract award to verify the technical content of the performance measurement baseline.

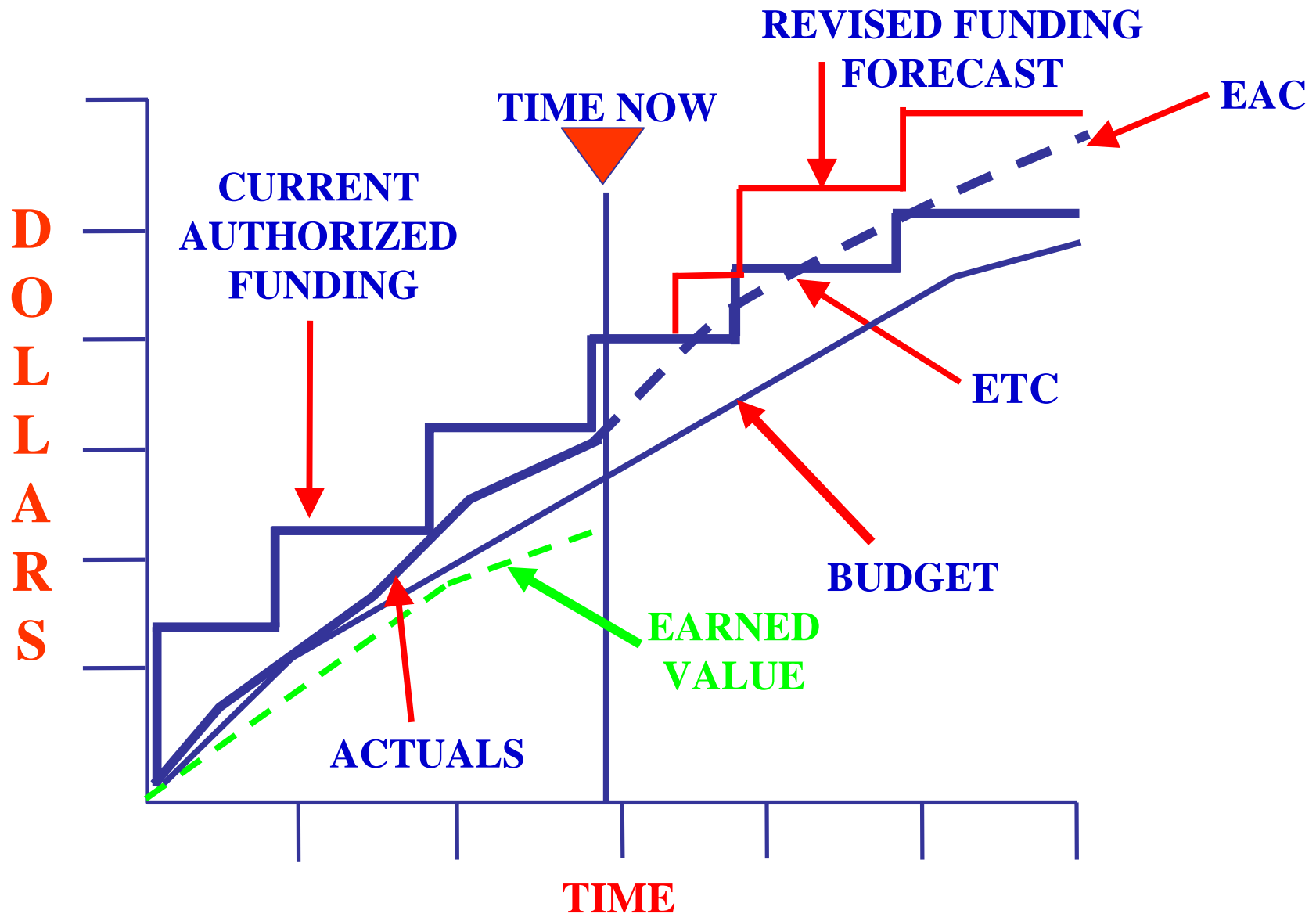
What Are The Objectives Of An IBR ?

- **To ensure the timely establishment of the technical, schedule, and cost baselines**
- **To determine the credibility, sufficiency, and adequacy of these baselines and...**
- **To ensure these baselines are integrated with each other**

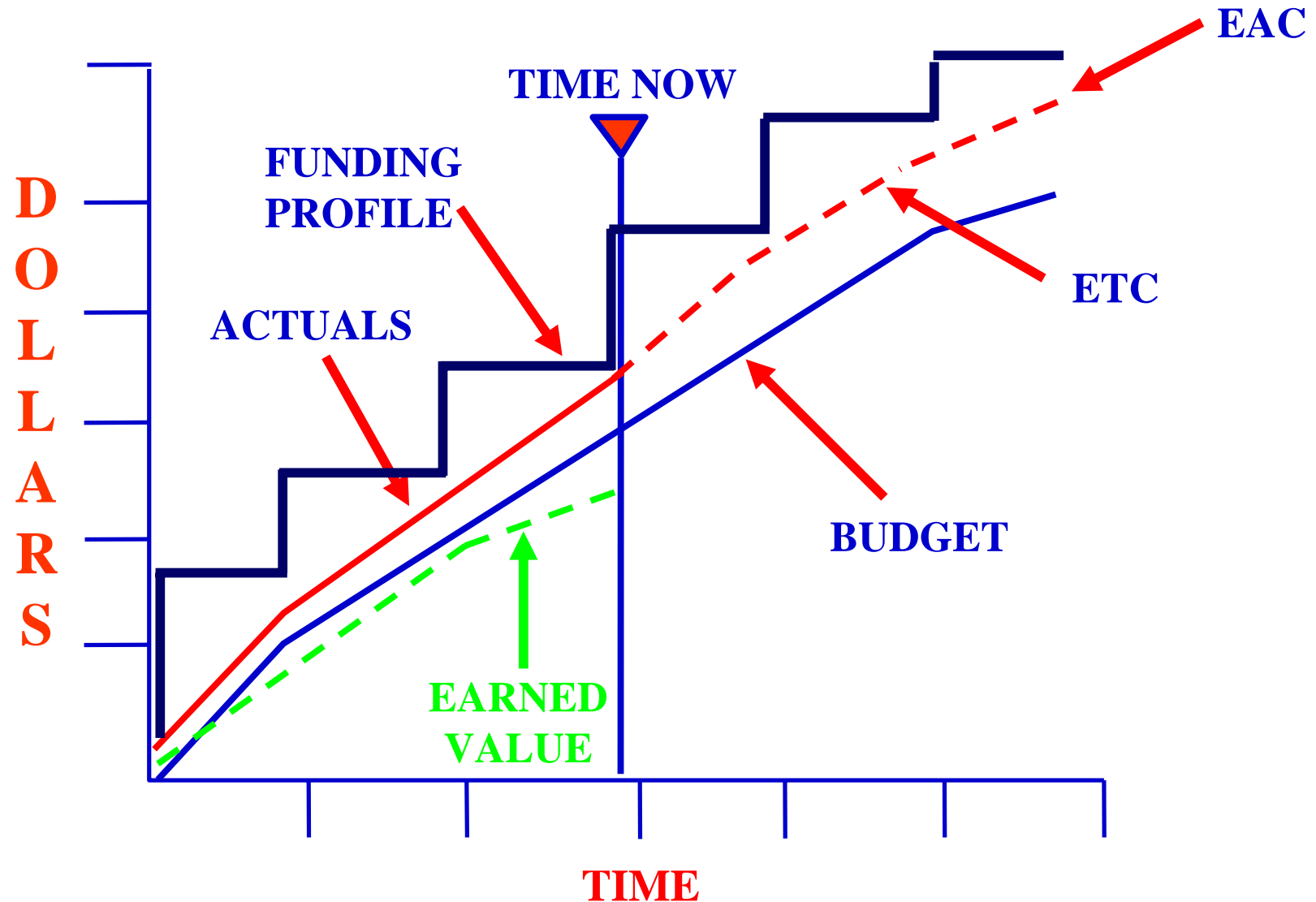
Funds vs. Budget

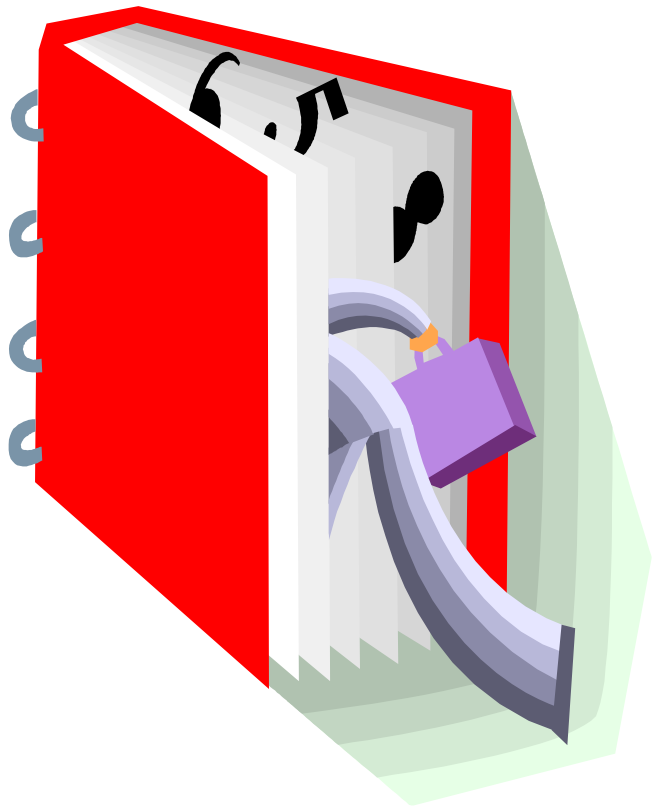


Funds vs. ACWP + ETC



Funding Profiles vs. Performance Trend Lines

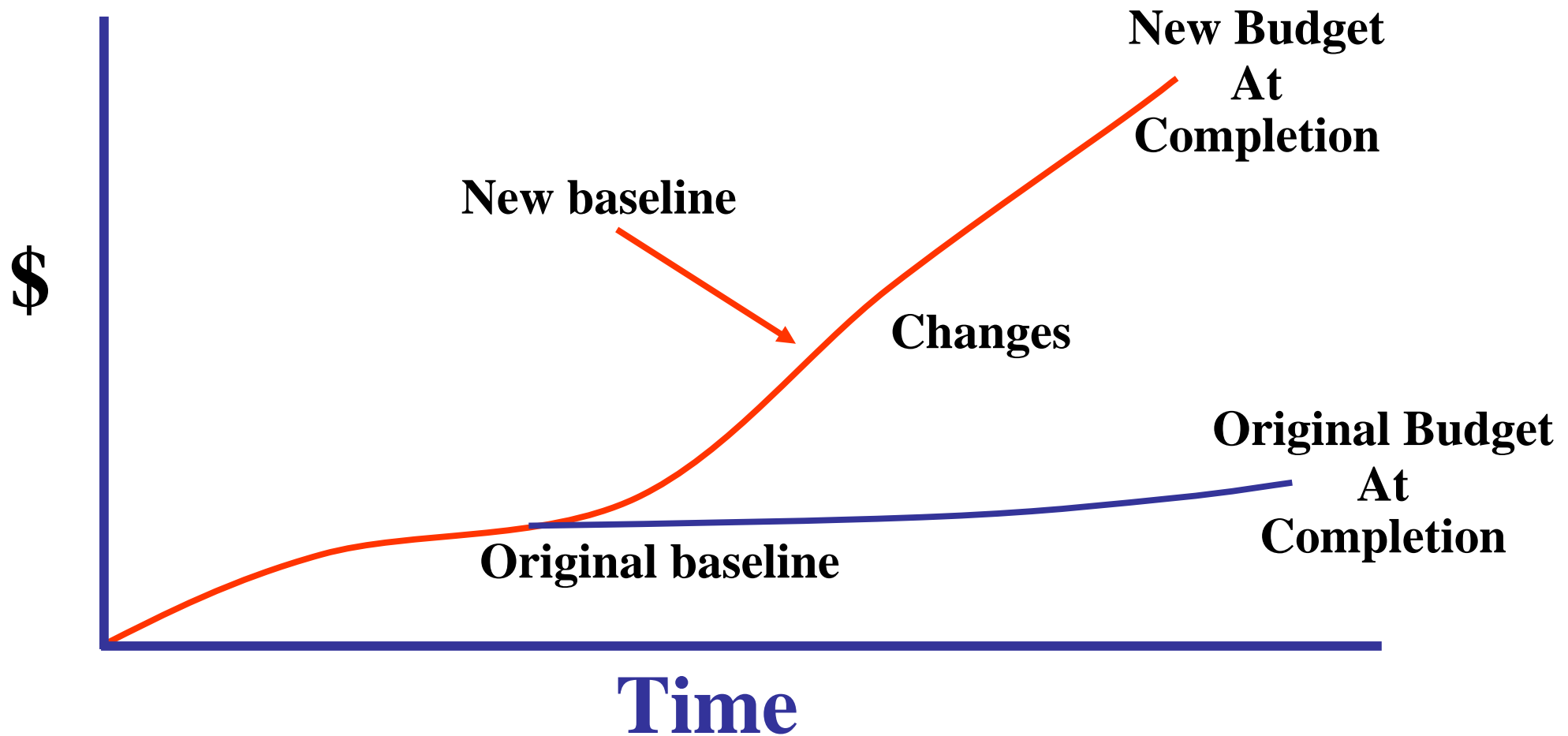




Change Control

**Before undertaking
contract expenditure
clearly define the scope
of work in the WBS
dictionary**

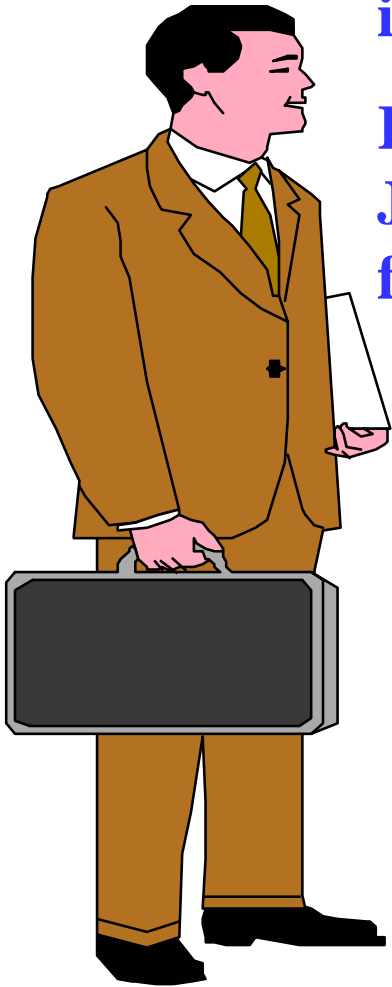
Effect Of Changes



Maintain Adequate Documentation

**Jerry kept all of that
in his head.**

**Remember
Jerry..the guy you
fired last year?**



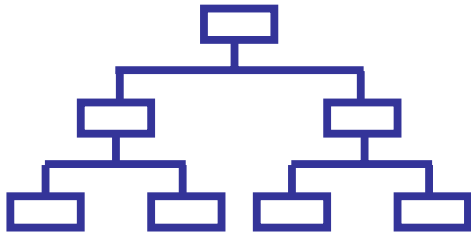
**Jim, what about the
change order?**



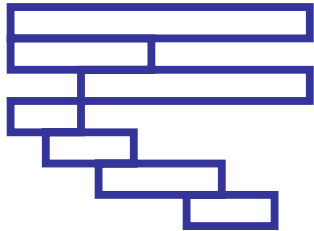
Planning & Budgeting

Establish the baseline - an iterative 3 - step process

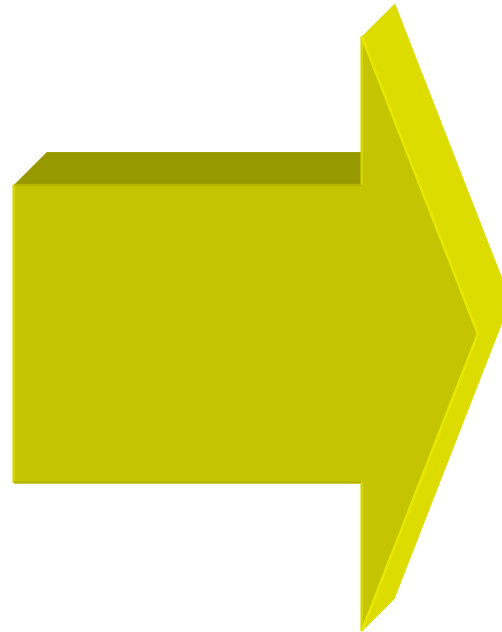
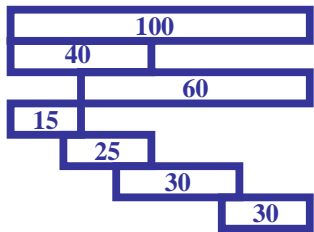
1. Define the work



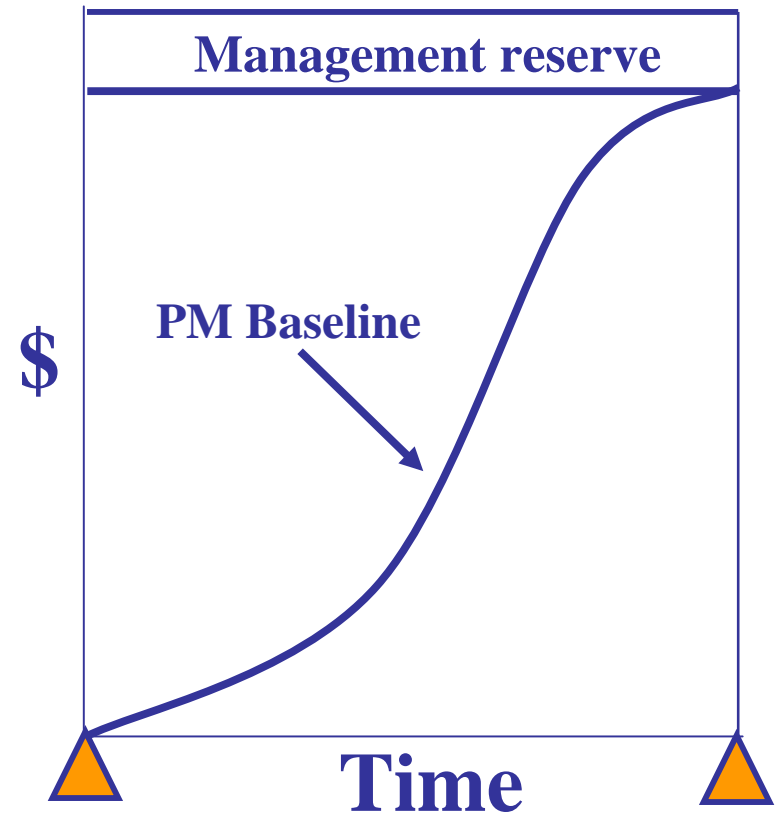
2. Schedule the work



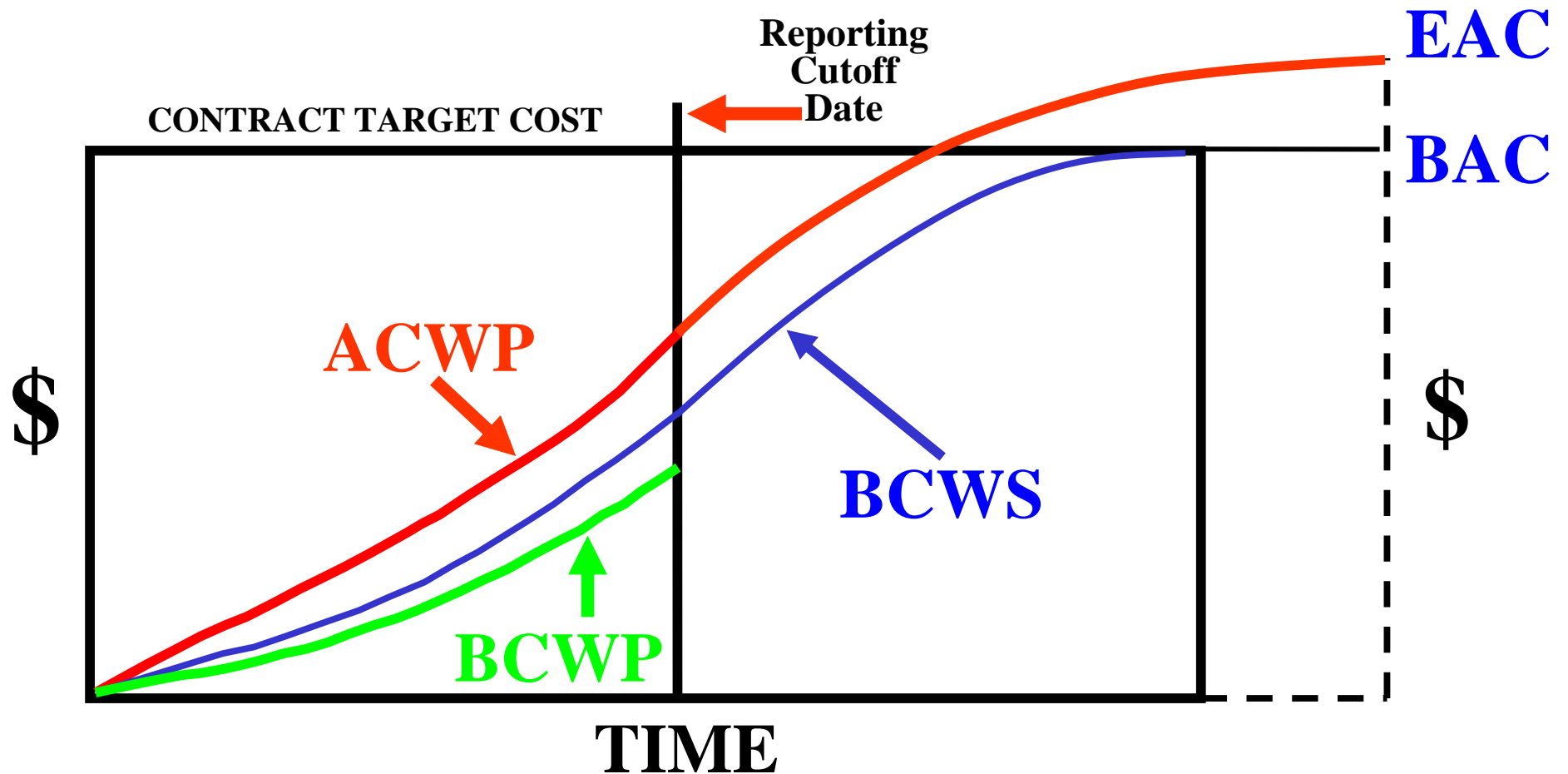
3. Allocate budgets



Contract Budget Base



The End of Instruction



Thank you for your participation