Project Size Estimation and Measurement Techniques

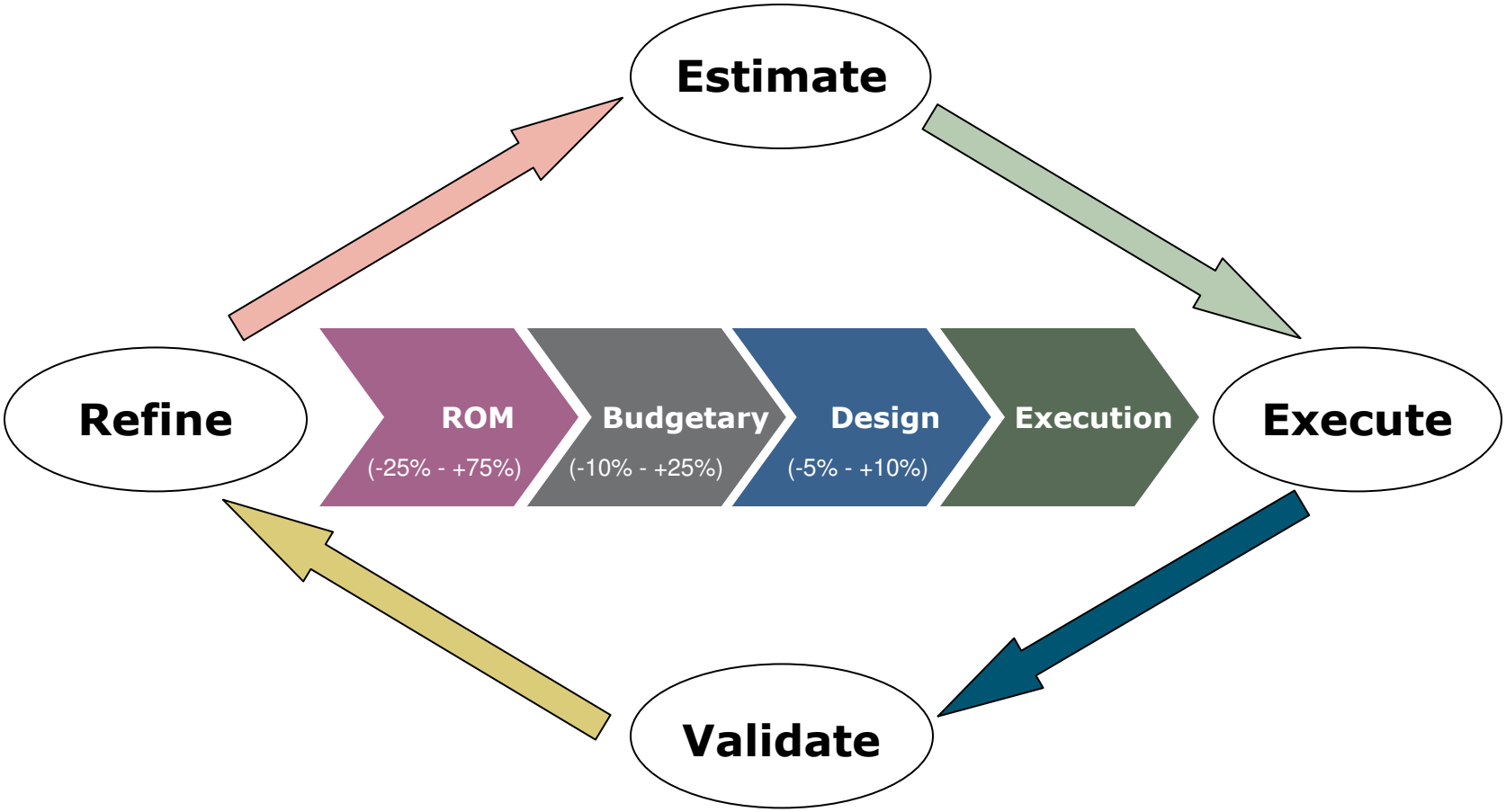
Agenda

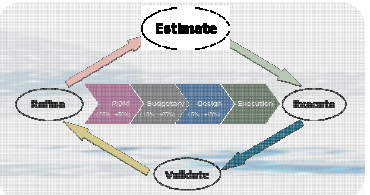
- Introduction
- The Estimate
  - Process
  - Tools
  - Models
  - Critical Success Factors
- Monitoring Progress
  - Earned Value Management (EVM)
  - Variance Analysis
- Conclusion

The Estimate

- The Estimate
  - Is NOT a one-time event
  - Provides increasing precision over time
  - IS an iterative process

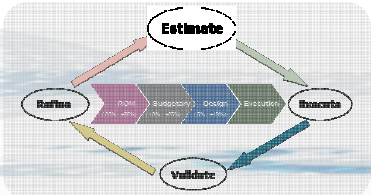
Estimating Process





Estimating Process

- Develop a WBS
- Estimate the effort
- Validate the estimate



Estimating Process
Develop the WBS

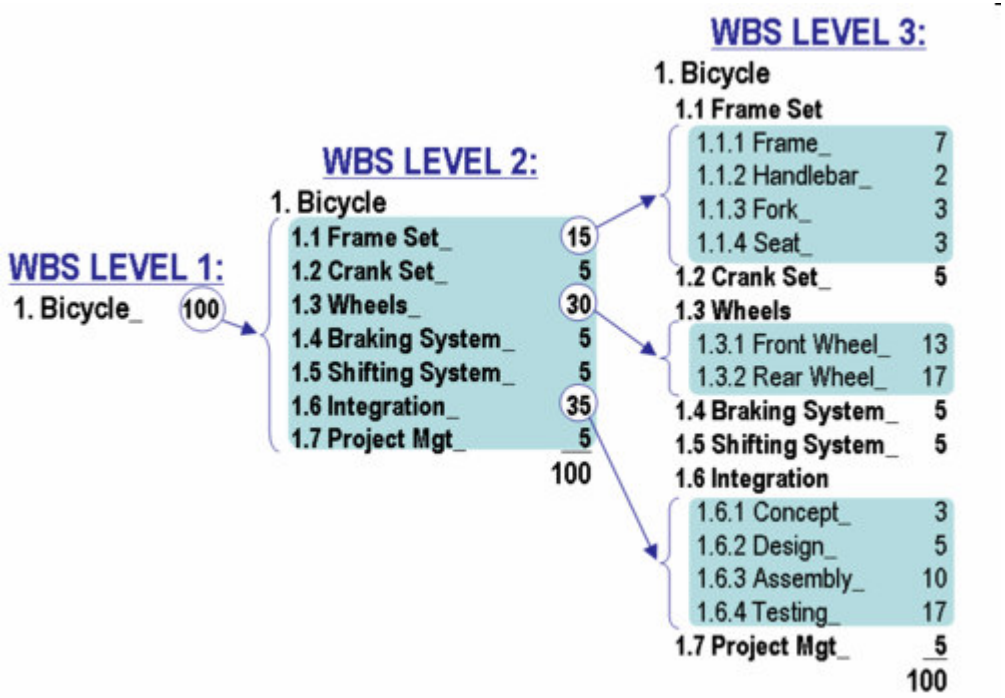
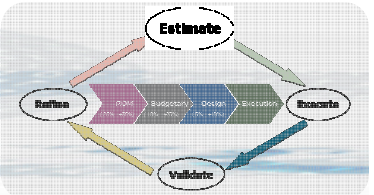
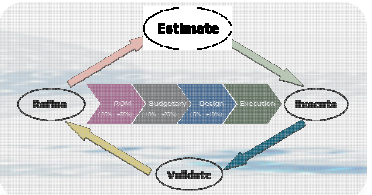


Figure 1: WBS Construction Technique. This exemplary WBS is from PMI's *Practice Standard for Work Breakdown Structures (2nd Edition)*. This image illustrates an objective method of employing the 100% Rule during WBS construction.



Estimating Process
Estimate The Effort

- Estimate the effort
  - Top Down
  - Bottom Up
  - Expert Opinion
  - Tools
  - Models
- Document the BOE

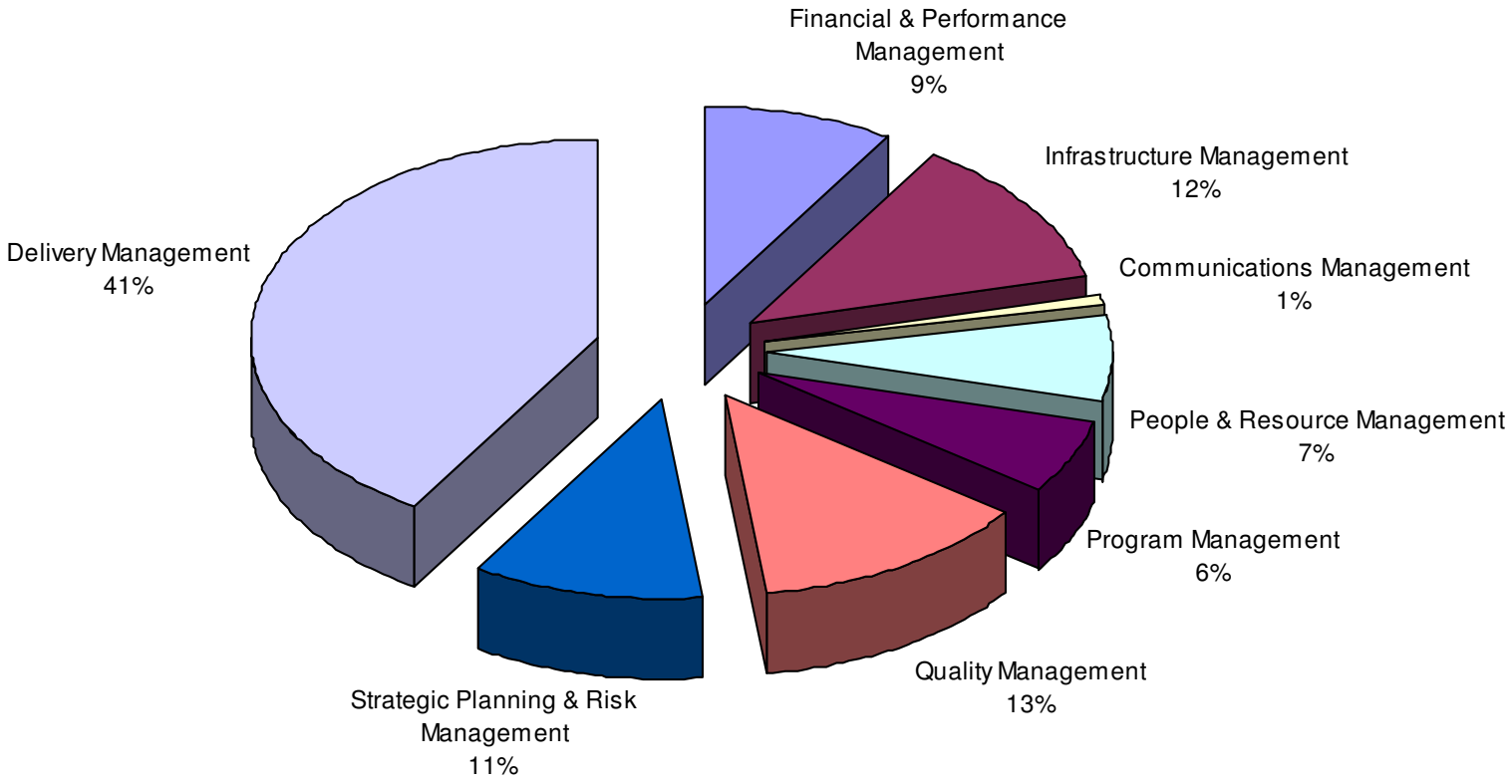


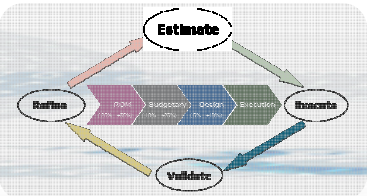
Estimating Process
Estimate The Effort

- Top down estimates
  - Generally used for ROM and budgetary estimates
  - Often used in conjunction with other techniques (e.g. expert opinion)
  - Can be completed very quickly
  - Less accurate than bottom-up estimates

Estimating Process
Estimate The Effort

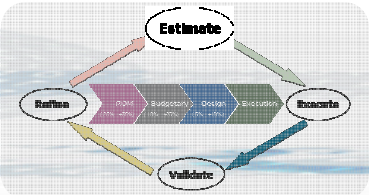
PMO Work Distribution Model





Estimating Process
Estimate The Effort

- Bottom-up Estimates
  - Typically used for Design estimates
  - Require a significant amount of time and effort to do properly
  - Most effective when participants have formal training
  - Can be validated using top-down estimates and estimating models



Estimating Process
Estimate The Effort

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Change Control Boards		
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PSC (Program/Project Steering Committee)	25 hrs/project X 10 projects X 2 resources = 500 hrs + 30 hrs to record meeting minutes & post to QP = total 530 hrs	530
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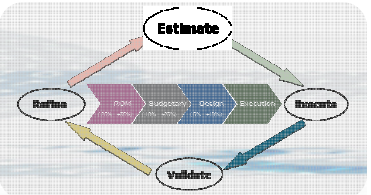

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Estimate The Effort

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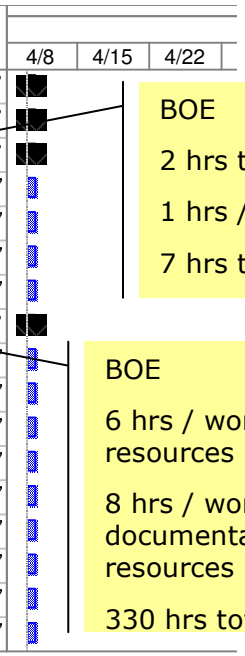

BOE

2 hrs to develop schedule format

1 hrs / workshop * 5 workshops

7 hrs total

BOE

6 hrs / workshop * 5 workshops * 7 resources = 210 hrs

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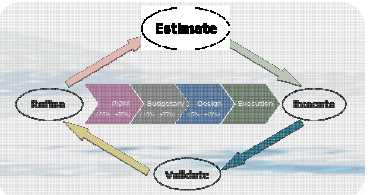
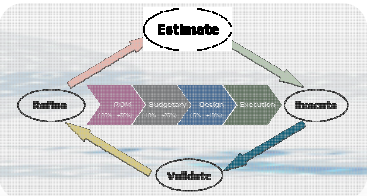
330 hrs total



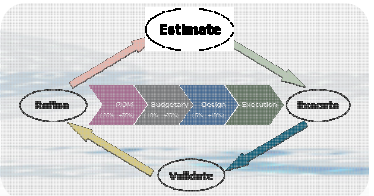
Estimating Process
Estimate The Effort

- Expert Opinion
  - Typically used for ROM and Budgetary estimates
  - Often used in conjunction with Delphi techniques
  - Spend extra effort documenting the BOE



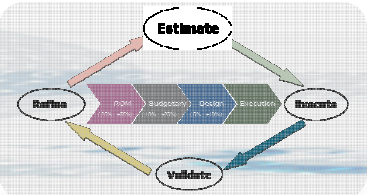
Estimating Process Tools

- There are dozens of tools available
  - COCOMO & COCOMO II
  - SEER-SEM
  - GEMS
  - QSM
- A tool is not a silver bullet
- The tool is only as good as the process surrounding it



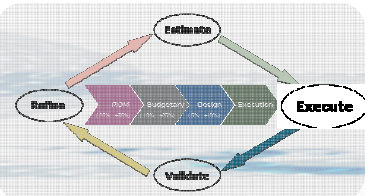
Estimating Process Models

- Estimating Models
  - Work Distribution Model (WDM)
  - SLOC Model
  - Use Case Point
  - Function Points
- Models are useful for validating estimates
- Generally used for top-down estimating



Estimating Process Critical Success Factors

- Train estimators
- Validate estimates with known models
  - WDM
  - RUP “whale hump”
- Document BOE
- Employ an iterative process



Monitoring Progress - EVM

- BCWS, BCWP, ACWS, ACWP
- SPI
- CPI
- Binary EV vs Incremental EV
- EV Tutorial
  - http://www.oakinc.com/pdf/EVTutorial.pdf

Monitoring Progress - EVM

	A	B	C	D	E	F	G	H	I	J	K
1	**Cost Performance Index**				start	today	planned end	forecast			
2	Actual Cost to date	578,504		Baseline	0	534,407	565,443				
3	Earned Value to date	378,000		Actuals To Date	0	578,504					
4	CPI	65.3%		Projected Cost & Schedule	0	578,504	670,400	865,373			
5	Baseline EAC	565,443			11/8/2003	3/5/2005	6/4/2005	1/27/2006			
6	Forcasted cost	670,400									
7	**Schedule Performance Index**										
8	Earned Value	378,000									
9	Planned Value to date	534,407									
10	SPI	70.7%									
11											
12	Planned Duration (Baseline) Wks	82									
13	Forecasted EAC	865,373									
14	Forecasted Duration Wks	116									
15											
16											
17											
18											
19											
20											
21											
22											
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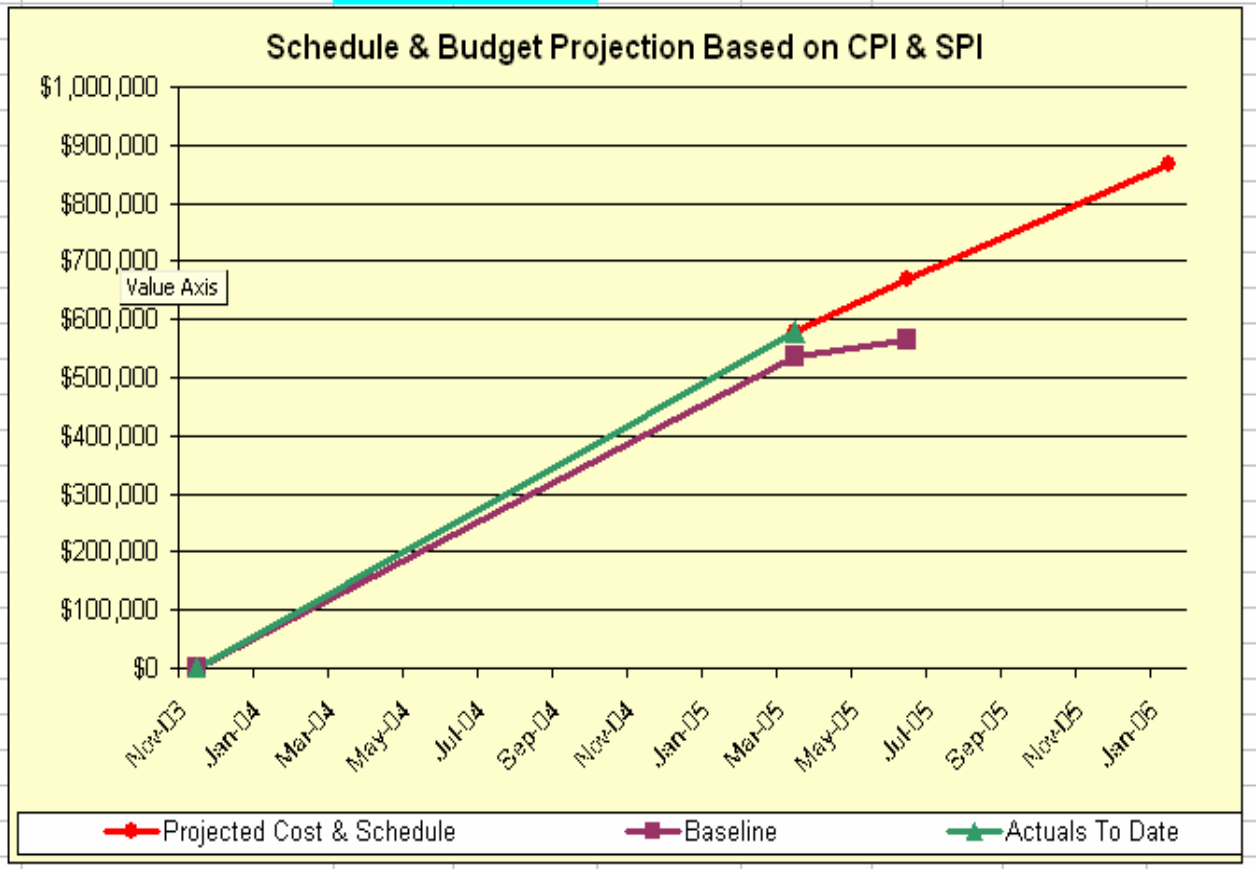
24											
25											
26											
27											
28	Directly from the project plan										
29	Requires PM to determine										
30											



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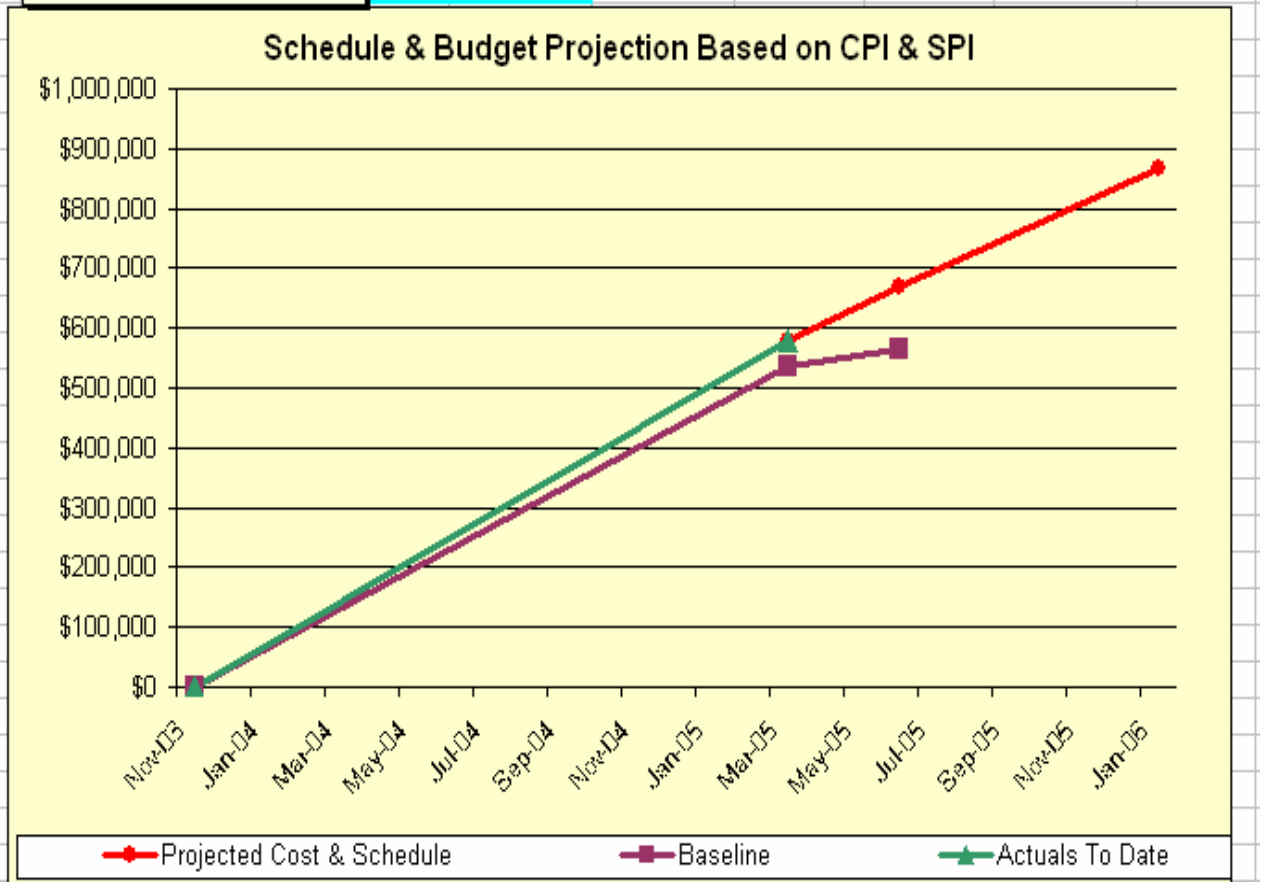
Value of approved deliverables (include only deliverables 100% complete, no credit for work in process)



Monitoring Progress - EVM

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1	**Cost Performance Index**				start	today	planned end	forecast			
2	Actual Cost to date	578,504		Baseline	0	534,407	565,443				
3	Earned Value to date	428,000		Actuals To Date	0	578,504					
4	CPI	74.0%		Projected Cost & Schedule	0	578,504	670,400	764,278			
5	Baseline EAC	565,443			11/8/2003	3/5/2005	6/4/2005	10/24/2005			
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11											
12	Planned Duration ne) Wks	82									
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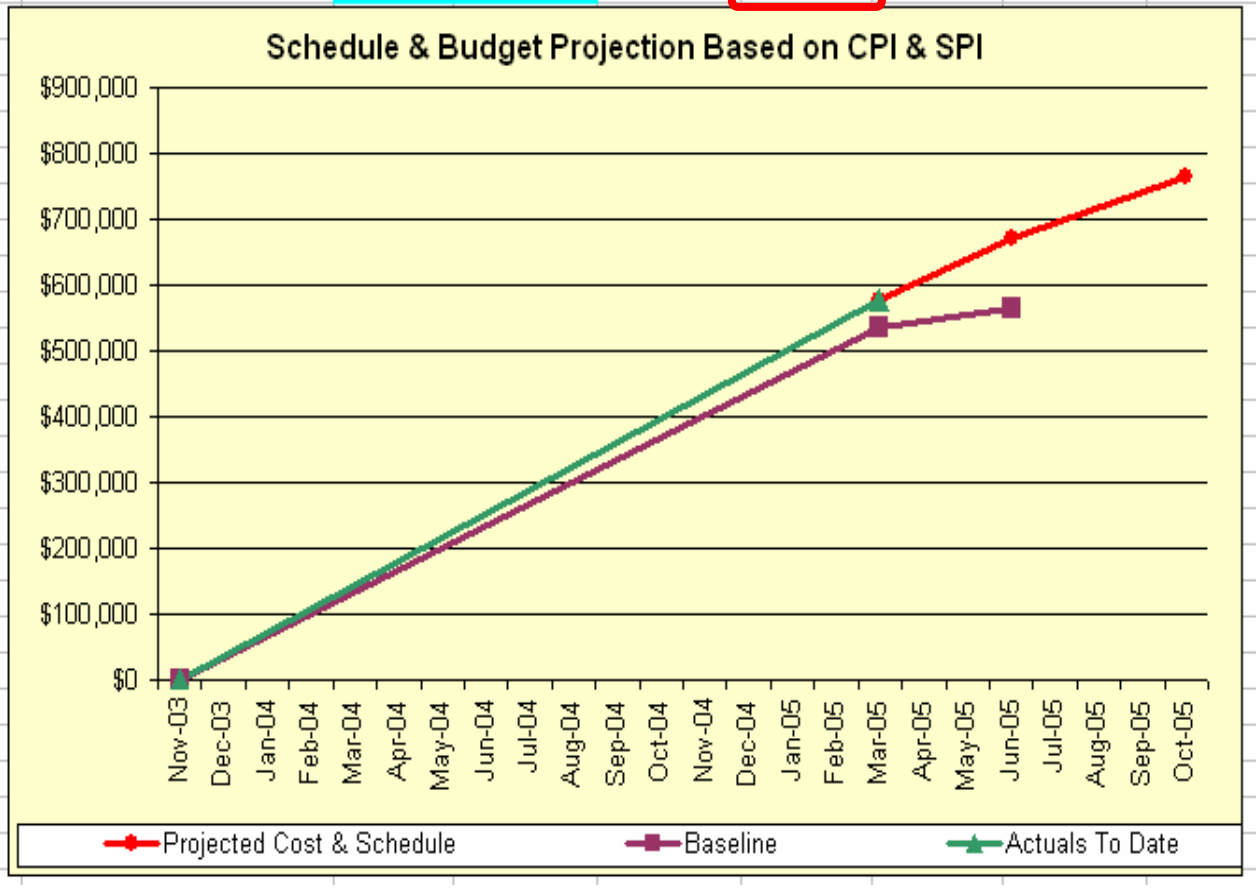
14	Forecasted D ks	102									
28	Directly from the project plan										
29	Requires PM to determine										

Completing an additional $50K worth of deliverables could bring the schedule in by 3 months



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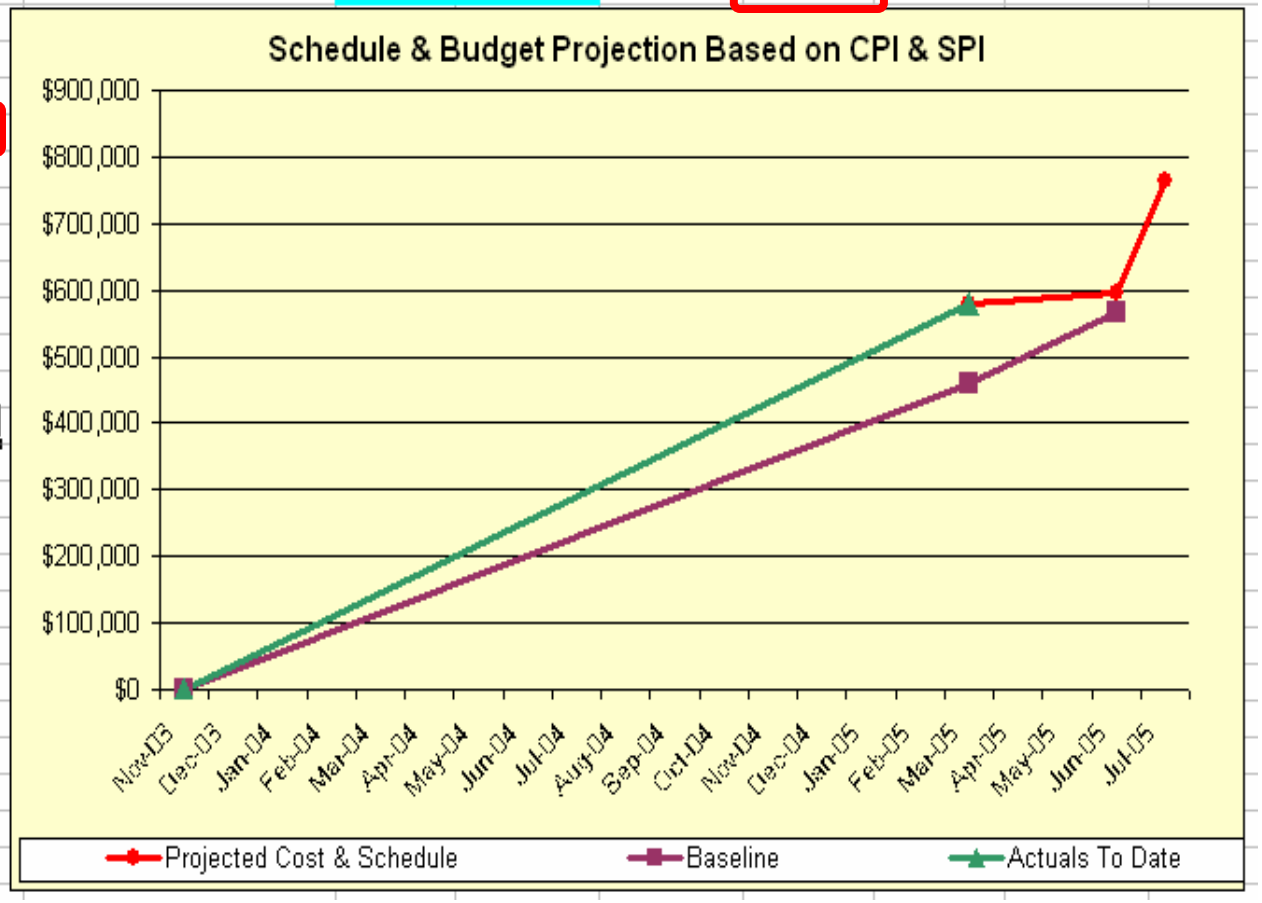
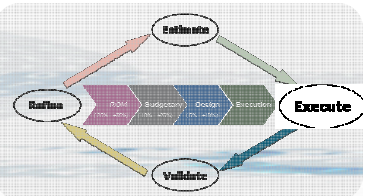


Reducing $75K worth of scope could bring the schedule in by an additional 2.5 months



Monitoring Progress – BOE Variance

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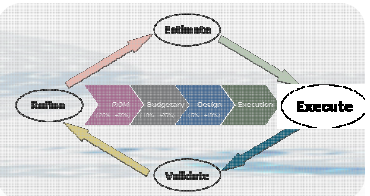

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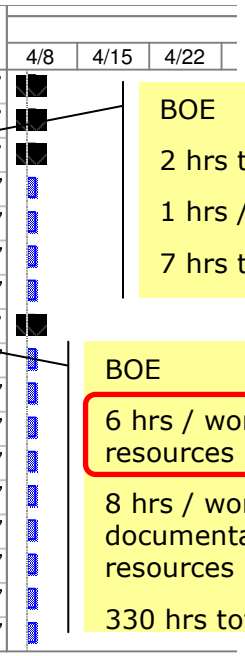

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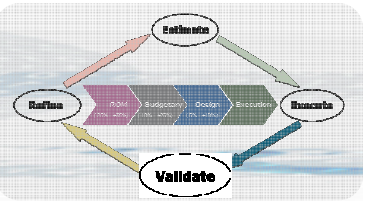
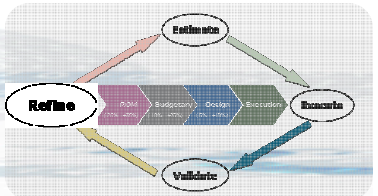


Validate Estimates

- Collect actual effort that corresponds with the BOE
- Verify that actual effort is effort spent progressing the plan
  - Eliminate “hour dumping”
- Develop work distribution models
  - Technology stack
  - Platform(s)
  - Methodology
  - Project size
  - Team composition
    - Onshore
    - Offshore
    - subcontractor

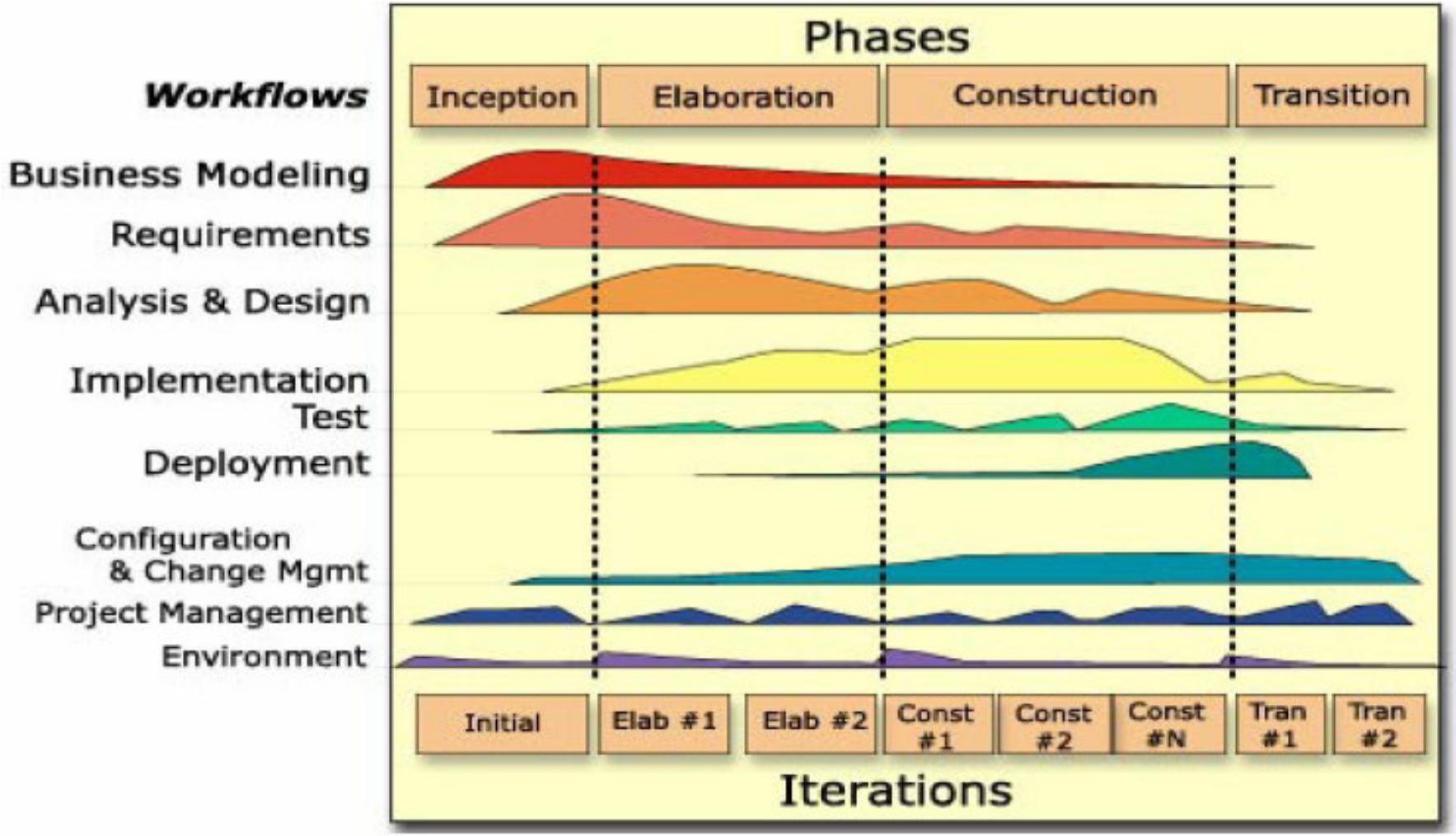


Refine Estimates

- Apply reasonable statistical principles
  - Reasonable sample size
  - Remove anomalies
  - standard deviation
- Update estimating models
  - Integrate lessons learned & best practices
  - Be aware of changing trends
    - More productive team members
    - Improved processes
    - Productivity enhancing tools
- Feed updated models, best practices, etc. back into the estimating process

Conclusion

- Utilize an iterative estimating process that includes a feedback loop
- Document BOE
- Use BOE variance analysis as an early warning system
- Use EVM to keep projects on track


Phases
Workflows
Inception
Elaboration
Construction
Transition
Business Modeling
Requirements
Analysis & Design
Implementation
Test
Deployment
Configuration
& Change Mgmt
Project Management
Environment
Initial
Elab #1
Elab #2
Const #1
Const #2
Const #N
Tran #1
Tran #2
Iterations