

Estimating the Cost of Repair & Refit Using *PERCEPTION*



Computerized Cost Estimating

- **Computer-based tools to quickly formulate a cost estimate**
- **Manage cost data from central database**
- **Maintain current catalog of actual costs**
- **Maintain catalog of prior estimates**



Establish Libraries of Centrally Available Cost Data

PERCEPTION - ESTI-MATE

File Edit View Global Library Return Cost Reports Database Window Help

C P G A Z U

Package Items For Reuse Package: PEP1

Package	Description	Quantity	UoM	Labor Hours	Material Cost
30	MS Bulkheads				
31	MS-B Deck w/shell				
32	MS-B Shaped Side Shell				
33	MS-C Deck w/shell				
34	MS-C Flat deck				
35	MS-C Flat Inner Bottom				
36	MS-C Shaped Outer Btm				
37	MS-C Shaped Side Shell				
38	MS-M Deck w/shell				
39	MS-M Flat deck				
40	MS-M Shaped Inner Btm				
41	MS-S Deck w/shell				
42	MS-S Flat deck				
43	MS-S Shaped Outer Btm				
44	MS-S Shaped Side Shell				
45	MS-S Skeg				
46	F/CS-FIN				
47	F/CS-Lab				
48	PEP1				
49	PEP2				
50	FG2				
51	FG3				
52	PM1				
53	PME1				
54	PME11				
55	PME12				
56	PME14				

Package Item ID	Description	Quantity	UoM	Labor Hours	Material Cost
1	Line Shaft	2.00	EA	0.00	35,000.00
2	Tail Shaft	1.00	EA	0.00	20,000.00
3	Line Shaft Bearings	4.00	EA	0.00	25,000.00
4	Stem Tube Bearing	1.00	EA	0.00	25,000.00
5	Thrust Bearing	1.00	EA	0.00	15,000.00
6	Fwd Stem Tube Seal	1.00	EA	0.00	1,000.00
7	Propeller	1.00	EA	0.00	35,000.00
8	Fairwater Cap	1.00	EA	0.00	2,500.00
9	Fab Coupling Bolts	1.00	PKG	100.00	1,000.00
10	Machine Stem Tube	1.00	PKG	400.00	0.00
11	Bore & Fit Stem Tube	1.00	PKG	750.00	0.00
12	Assemble Gear Box Intermediate Coupling	1.00	PKG	150.00	0.00
13	Install Shafts	1.00	PKG	400.00	0.00
14	Shaft Alignment	1.00	PKG	300.00	0.00
15	Assemble Propeller	1.00	PKG	500.00	0.00
16	Install Rope Guard	1.00	PKG	50.00	0.00

Ready



Benefits

- Fewer cost surprises
- Faster bid response
- Lower cost risk
- Greater profit potential
- More competitive bids



Basic Tool Set:

- Application of learning curves
- Complexity & productivity factors
- Cost escalation
- Cost risk analysis
- Cost trade-off
- Global edits and update features
- Return cost data analysis
- User documentation of cost estimate
- Tracking of estimate sources and changes



Work Breakdown Structures

The cost estimates are developed according to a Work Breakdown Structure (WBS):

- Identify work items
- Identify work process costs



Identify Work Items

Work Items may be cataloged by

- Ship System WBS (SWBS)
- Shipyard Product WBS (PWBS)
- Ship Owner's WBS
- Government Contract Line Item (CLIN)

Each structure can be customized by shipyard, by contract.



Identify Work Process

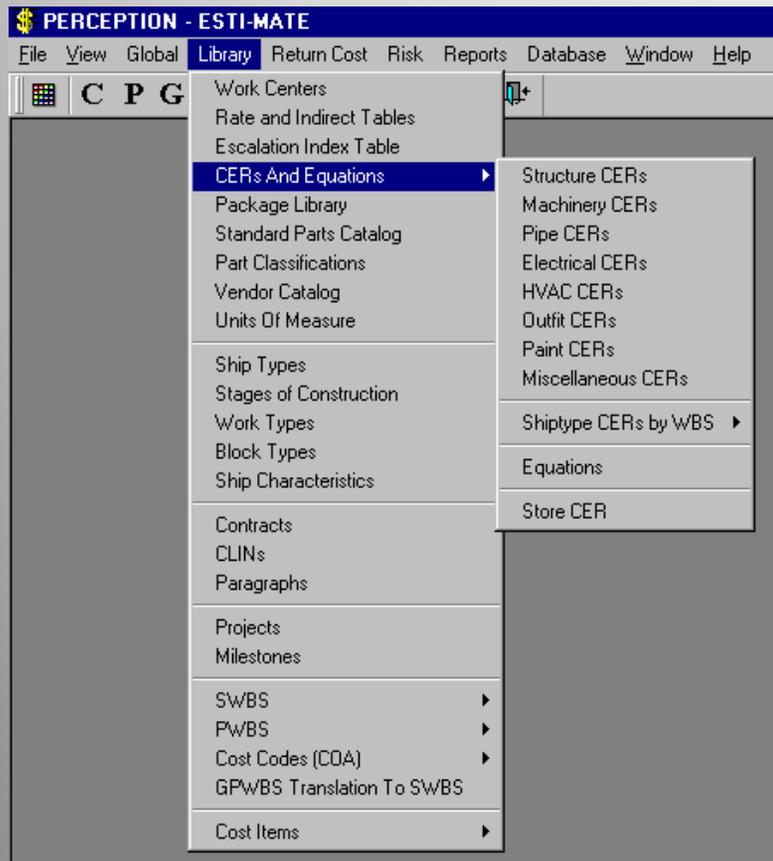
Work Process may be cataloged by

- Stage of Construction (Rip-Out, Shop Work, On-Unit, On-Block, On-Board, Test)
- Shipyard Department (COA)

Each structure can be customized by shipyard, by contract.



Cataloging Standard Costs

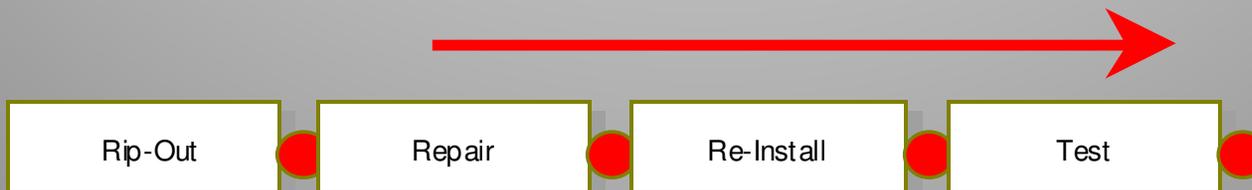


**Catalog
Standard Cost
Estimating
Relationships (CERs)
onto Computer
Database**



Cataloging Standard Costs By Sequence

- Rip-Out
- Replace
- Repair
- Install
- Test



Cataloging Standard Costs By Work Type (SWBS)

- Structural Work
- Machinery
- Piping
- HVAC
- Electrical
- Paint
- Outfit
- Shipyard Services



Variations of CERs:

Line Item CER:

Single V-butt weld size 3/16" - 5/16" (2 pass)	0.250	MH/FT
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Re-Use Package CER:

Welding Repairs:Cracks	Labor CER	Labor UoM	Material CER
Drill Out	0.500	MH/FT	\$ -
Welding Repairs:	0.250	MH/FT	\$ 1.4680
Gen Labor:	0.250	MH/FT	\$ -
Total:	1.000	MH/FT	\$ 1.4680



Cost Adjustments

$$\text{Cost} = f_{\text{adjust}} \times \text{Standard Cost}$$



Automating Cost Adjustments

- Work Productivity
- Work Site
- Work Access
- Economic Cost Escalation
- Learning Experience
- Standard Material Savings
- Material Waste Adjustments

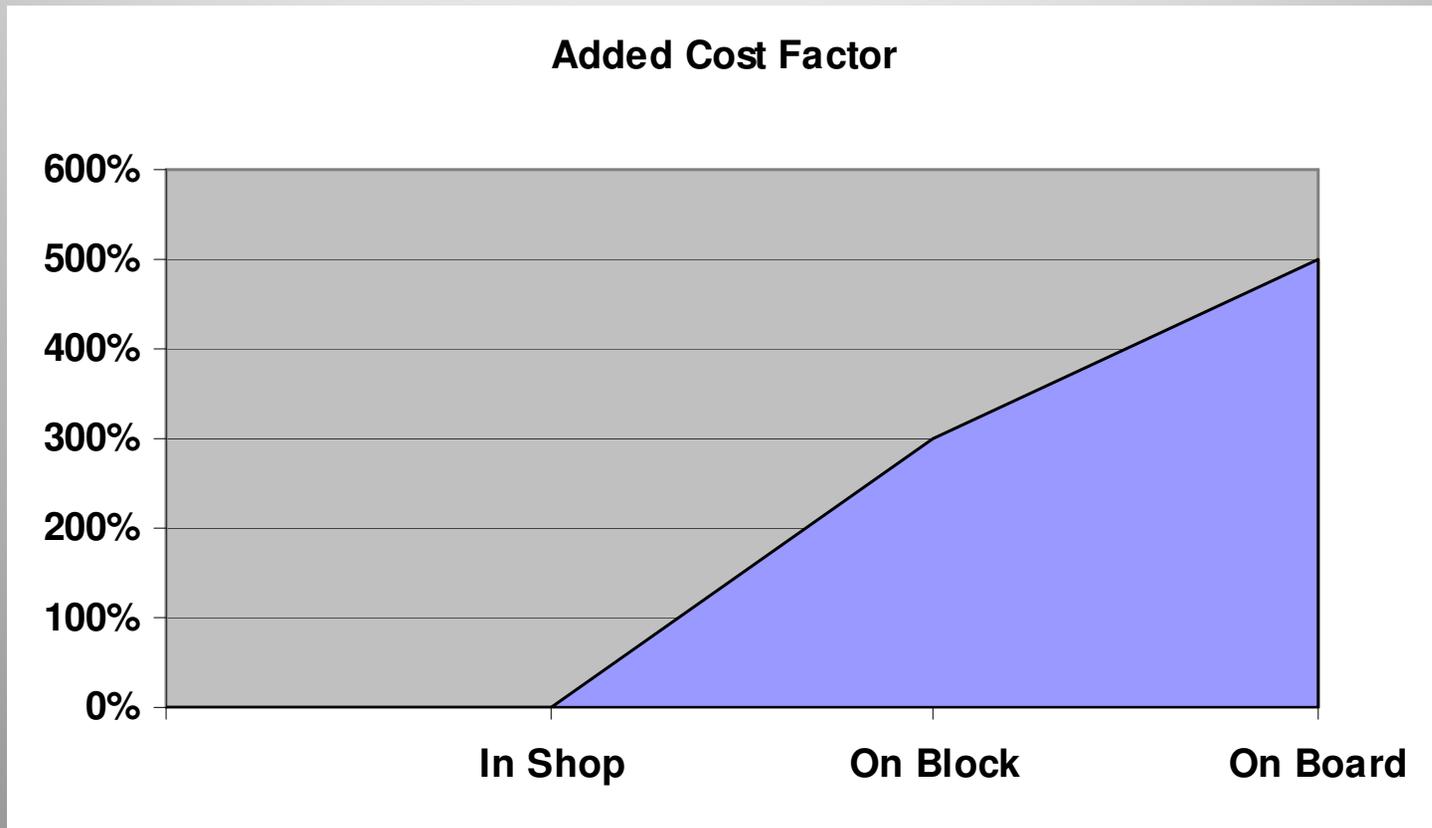


Impact of Work Productivity

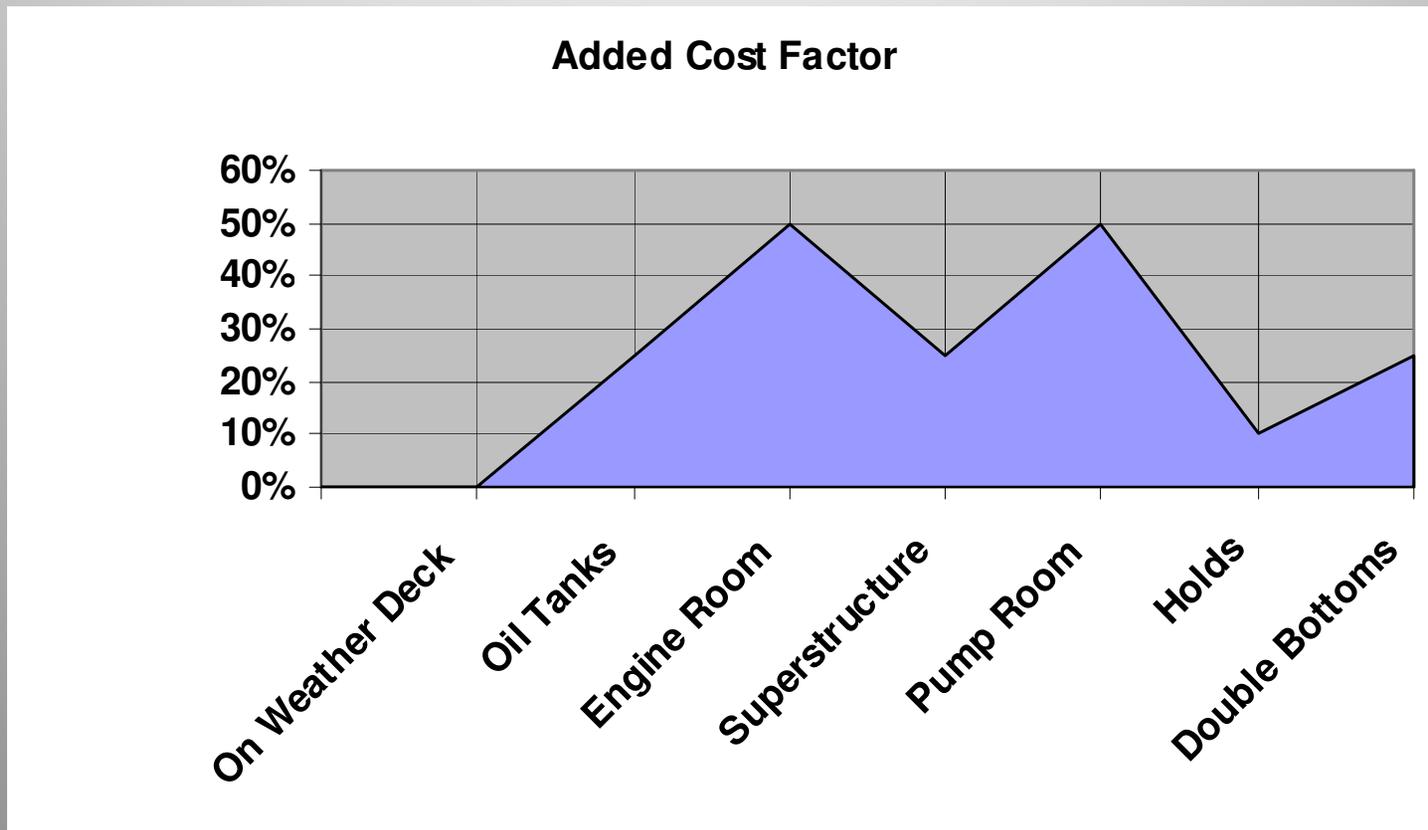
- Alternate Methods: Expensive staging versus mobile lift
- Automation: Manual versus automated welding
- Alternate Resources: In-House versus Sub-Contract
- Worker Skill Level



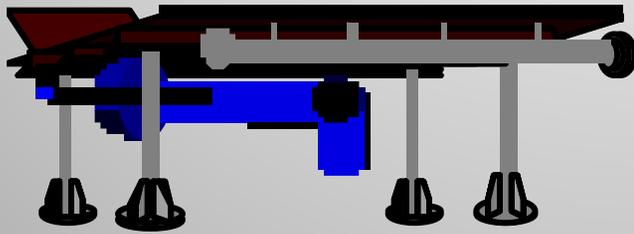
Impact of Work Site



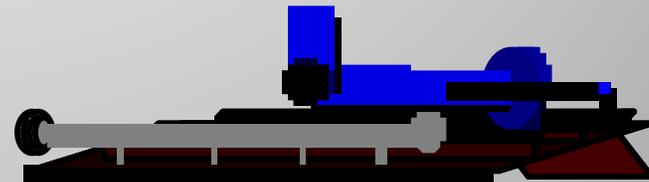
Impact of Work Access:



Impact of Work Access:



Over-Head

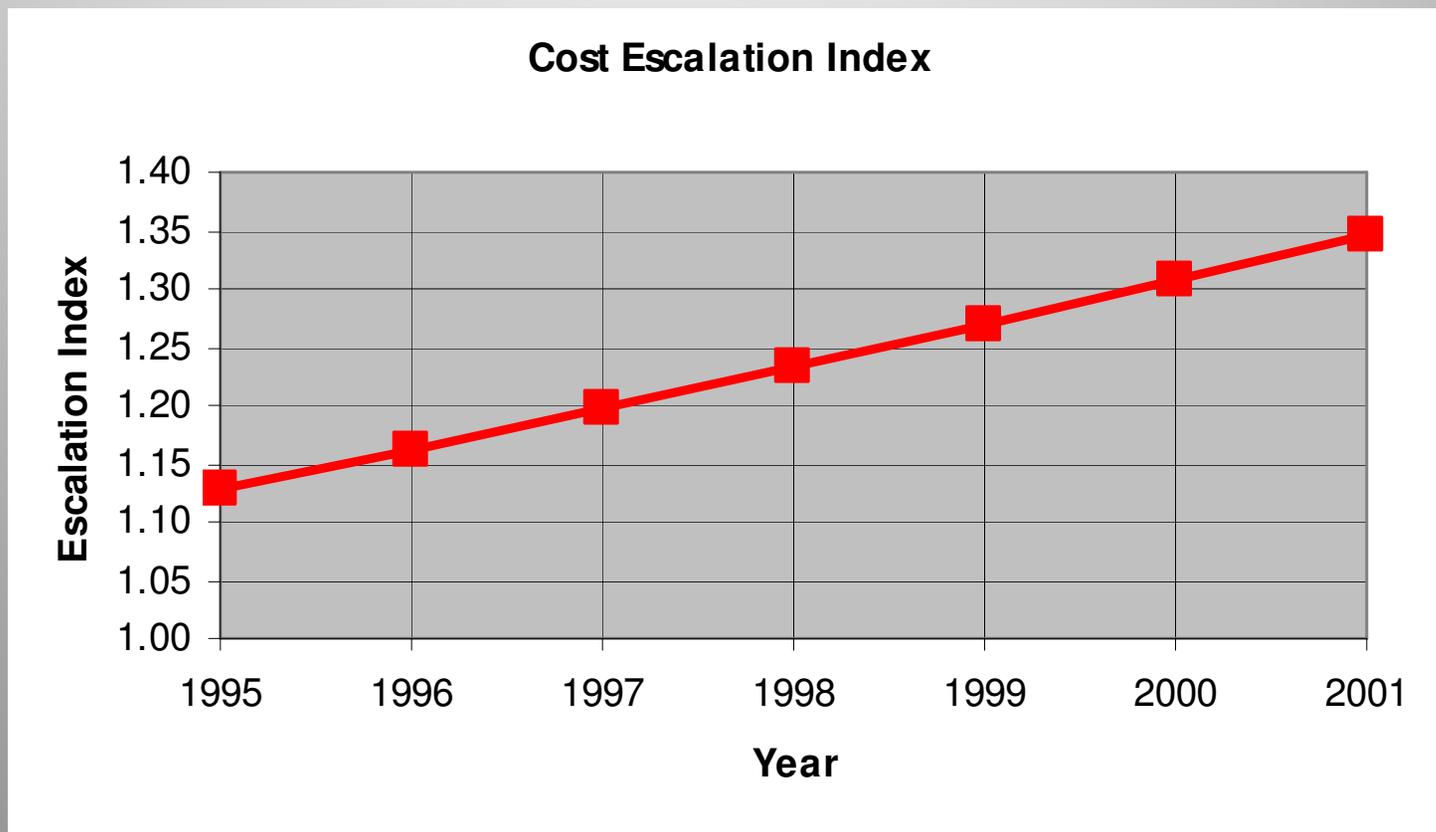


Down-Hand

More Difficult = More Expensive

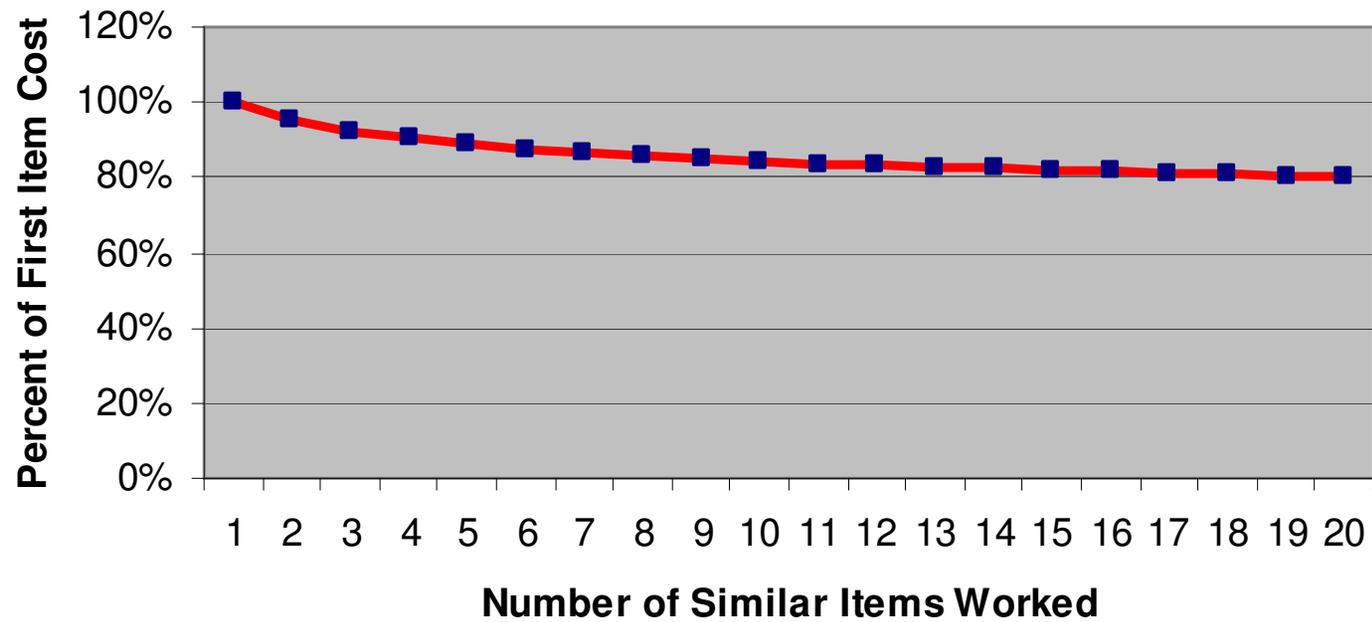


Impact of Cost Escalation:



Impact of Learning:

Cost Reductions From Repeatability



Impact of Standard Materials:

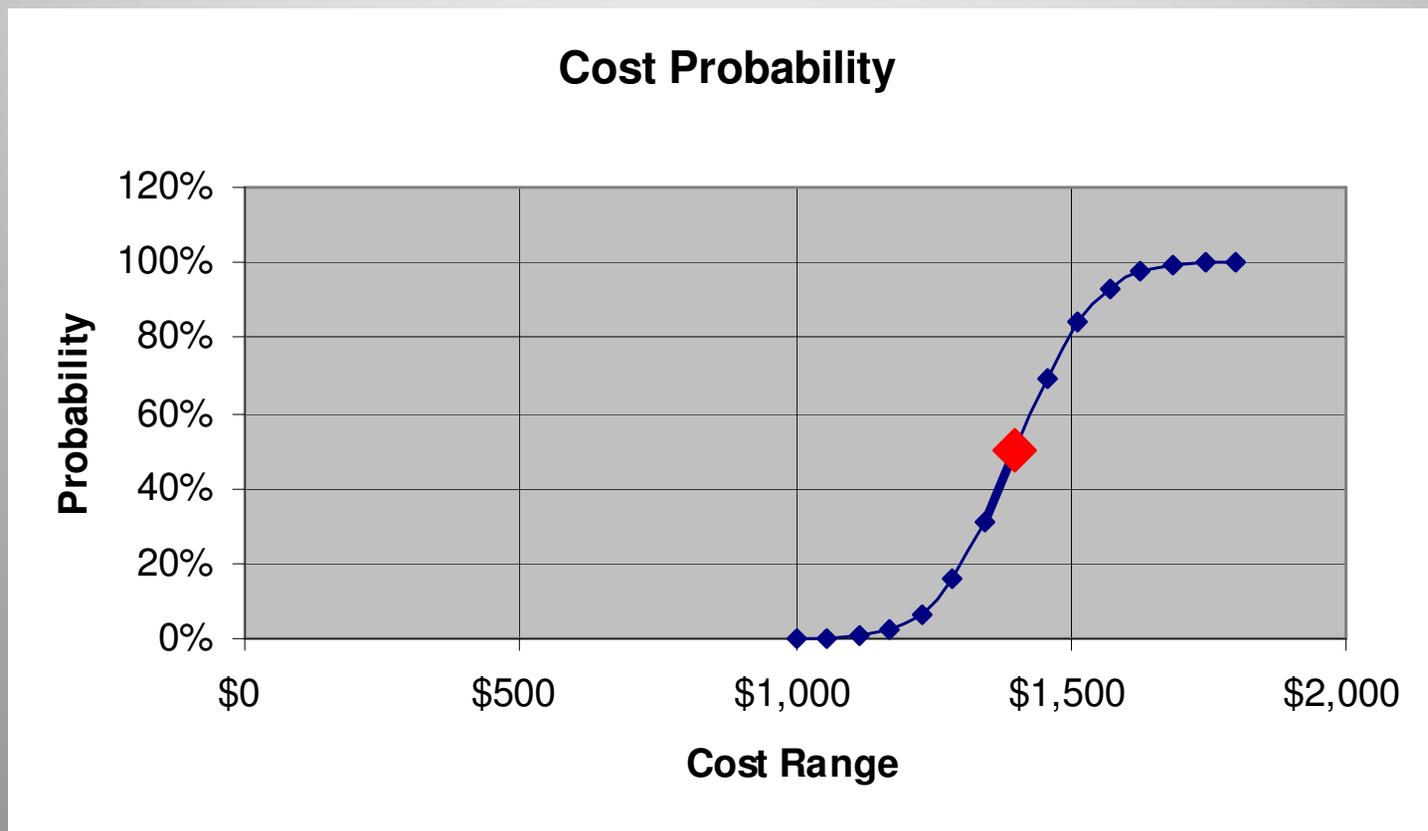
- ❑ Standard material items typically less expensive than non-standard items.
- ❑ Standard material deliveries less expensive than high-priority rush orders



Cost Risk Analysis

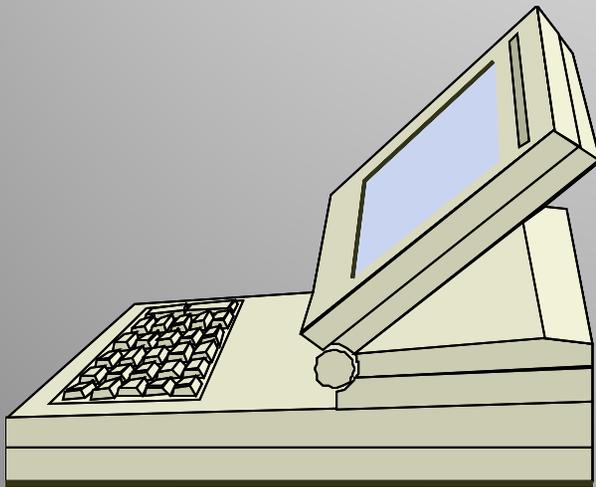


Cost Risk Analysis

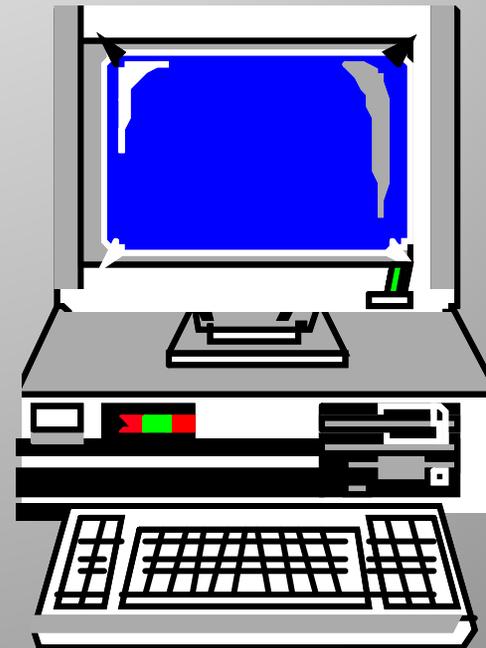


Hardware Options

Single User Laptop

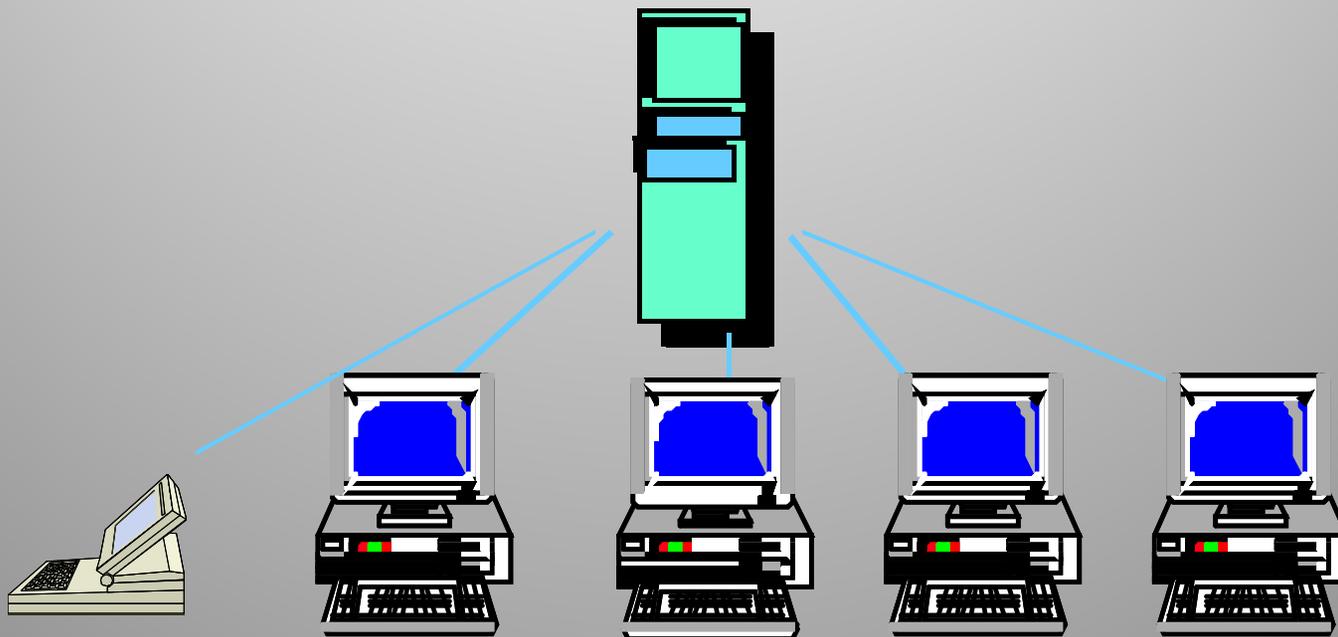


Single User Desktop



Hardware Options

Multi-User Network



Many Report Formats

- **Detail Cost Item Reports**
- **WBS Summary Reports**
- **Major Equipment Lists**
- **Detail Bills of Material**



Cost Detail Information

- Labor Hours
- Labor Costs
- Material costs
- Total Direct Costs
- Taxes & Duties
- Indirect Costs
- Profit
- Total Cost



Other Capabilities:

- Import/Export: Spreadsheets & Databases
- Data Analysis Module: statistical analysis of cost information to develop CERs
- Return Cost Module: link to shipyard production management systems
- Link to CAD systems: automated cost estimating from design process
- Link to CAD systems: automated down-loading of bills of material



Over 35 Years Serving the Shipbuilding & Repair Industry

