

# COST ESTIMATORS/ANALYSTS— THE NECESSARY PROFESSIONALS

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# PROFESSIONAL COSTER UNIQUE SKILLS

- Earned Value Management System (EVMS)
- Real Growth (Trend) Analysis
- Cost Effectiveness Analysis (Output Quality/Quantity versus Cost)
- Translation of Resources to Cost
- Development of Estimates at Completion
- Conduct Problem Analyses Translated to Cost and/or Output

# EVMS

- Define Work Breakdown Structure
- Define Methods of Accumulating Earned Value
- Assess Problems for Root Cause(s)
- Assess Proposed Problem Solutions
- Track Success of Problem Solutions
- Determine Schedule and EAC Impacts of Problems

# EVMS APPLICATIONS

- Why Not Apply EVMS to All DOD Depots?
- Why Not Apply Earned Value to All American Item Manufacturing?
  - Auto Industry
  - Steel Industry
- Why Not Determine Ways to Apply EVMS to Service Industries
  - Federal Government (Government Performance Results Act of 1993)

# EVMS Example

- Normal Cost Variance Analysis
  - Budget for Month = \$100,000
  - Actual Cost for Month = \$90,000
  - Cost Variance = \$10,000 Under run to Budget
- Add Earned Value to Equation
  - Planned Output for Month = 1,000 units
  - Actual Output for Month = 800 units
  - Revised Cost Variance = \$10,000 **Overrun** to Budget (\$80,000 Planned Cost for 800 units)

# REAL GROWTH ANALYSIS

- Essential Cost Analyst Skill—Translate Multi-year Costs to a Single, Common Year
- Assess Real Growth Trends
  - Tie to Program Output
  - Tie to Resources
  - Tie to Policy Changes
  - Tie to External Influences
- Define Opportunities to Change Trends

# Revenue Trends in FY08 (\$B)

<b>FISCAL YEAR</b>	<b>INCOME TAXES</b>	<b>IND BUS TAXES</b>	<b>SOC INS TAXES</b>	<b>TOTAL TAXES</b>
1930	25.5	18.5	0.0	44.0
1940	26.1	33.1	22.1	81.3
1950	194.4	66.0	32.2	292.6
1960	431.1	108.2	101.7	641.0
1970	553.1	113.1	199.1	865.3
1980	705.1	115.7	360.4	1,181.2
1990	836.7	136.8	567.3	1,540.8
2000	1,469.7	195.1	791.9	2,456.7
2008	1,450.1	173.4	900.4	2,523.9

# Social Security Payment Per Person (FY08\$)

<u>FISCAL YR</u>	<u>No. of Payees</u>	<u>Annual Pmt</u>
1940	0.1M	\$3,024
1950	3.0M	\$2,493
1960	14.3M	\$4,853
1970	26.2M	\$5,677
1980	35.6M	\$7,497
1990	39.8M	\$9,086
2000	45.4M	\$10,438
2006	48.4M	\$11,801



# Entitlement Programs—Program Content Growth (FY08-\$B)

<u>Program Content Item</u>	<u>FY 1940</u>	<u>FY 1960</u>	<u>FY 1980</u>	<u>FY 2008</u>
Public Assistance	5.8	23.0	44.3	182.2
Social Security	1.6	81.4	274.9	617.5
Medical Care	1.2	7.6	130.2	711.3
Unemployment	6.2	19.2	38.6	42.9
Federal Retirement	4.8	25.9	79.2	154.0
Housing Assistance	0.0	1.0	12.4	39.5
Food/Nutrition Assistance	0.0	1.6	31.8	59.8
Other	<u>1.0</u>	<u>7.7</u>	<u>24.9</u>	<u>37.3</u>
<b>TOTAL</b>	<b>20.6</b>	<b>167.4</b>	<b>636.3</b>	<b>1,844.5</b>

## COST EFFECTIVENESS ANALYSIS

- Essential Skill—Relate Output Quality/Quantity to Resources or Cost
- Identify Relationship(s) to Measure
  - Output Quality/Quantity Data Base
  - Resource/Cost Data Base
  - Determine Relationship Measure
- Usually a Comparative Assessment Among Units/Organizations

# HS Graduate Cost Comparison (2007)

<u>County</u>	<u>Cost Per Pupil</u>	<u>Graduation Per Cent</u>	<u>Cost Per Graduate</u>
Bibb	\$7,040	58.8%	\$11,973
Houston	\$8,052	78.2%	\$10,335
Jones	\$6,821	68.9%	\$9,900
Monroe	\$8,034	70.7%	\$11,364
Peach	\$7,150	69.2%	\$10,332

# F-X Operating Cost by Base-FY08

<u>System</u>	<u>Total Operating Cost</u>	<u>Qty of Flt Hours</u>	<u>Unit CL\$ Per Hr</u>
F-X Operating Cost at Base A	\$4,500,000	9,000	\$500
F-X Operating Cost at Base B	\$4,800,000	10,000	\$480
F-X Operating Cost at Base C	\$4,165,000	8,500	\$490
F-X Operating Cost at Base D	\$5,040,000	12,000	\$420
F-X Operating Cost at Base E	\$4,845,000	9,500	\$510

# TRANSLATE RESOURCES TO COST

- Essential Skill—Assign Cost to Resource Quantities
- Determine Correct Unit Cost Rates
  - Labor Rates by Function
  - Overhead Rates by Function
  - Unit Material Prices
  - Inflation Rates
  - Other Rates or Factors
- Enables Cost Assessment/Comparisons of Various Organizations and Different Output Quantities
  - Permits Unit Cost Curve Development
  - Permits Organizational Cost Comparisons

# REGRESSIVE SOCIAL SECURITY-2009

<u>Annual Salary Income</u>	<u>Social Security Tax Paid</u>	<u>Effective Tax Rate</u>
\$50,000	\$6,200	12.4%
\$100,000	\$12,400	12.4%
\$250,000	\$13,243	5.3%
\$500,000	\$13,243	2.65%

# PUBLIC ED. COST PER STUDENT

<u>Item</u>	<u>1980</u>	<u>1990</u>	<u>2000</u>	<u>2005</u>
Total Cost in Current \$	\$96,105M	\$209,698M	\$374,782M	\$495,518M
Student Qty	40.878M	41.217M	47.203M	49.114M
Cur \$ Cost Per Student	\$2,351	\$5,088	\$7,940	\$10,089
GDP Deflator	2.042	1.386	1.138	1.000
CY07 \$ Cost Per Student	\$4,801	\$7,052	\$9,036	\$10,089

TYPICAL PRICING SHEET					
9 March 2009					
	LABOR	LAB	DIRECT	O/H	INDIRECT
FUNCTION	HOURS	RATE	DOLLARS	RATE	DOLLARS
Fabrication Labor	2,000.0	\$13.35	\$ 26,700	200.00%	\$53,400
Assembly Labor	10,000.0	\$17.05	\$ 170,500	200.00%	\$341,000
Qual Ctrl Labor	1,200.0	\$15.70	\$ 18,840	200.00%	\$37,680
Mfg Ctrl Labor	1,000.0	\$26.20	\$ 26,200	200.00%	\$52,400
Mfg Support Labor	4,000.0	\$23.68	\$ 94,720	200.00%	\$189,440
Logistics Labor	800.0	\$29.17	\$ 23,336	100.00%	\$23,336
Engineering Labor	800.0	\$37.54	\$ 30,032	100.00%	\$30,032
Prgm Admin Labor	3,000.0	\$41.45	\$ 124,350	150.00%	\$186,525
Labor Subtotals	22,800.0		\$ 514,678		\$ 913,813
Material			\$1,500,000	5.00%	\$75,000
Travel			\$40,000		
Outside Contractors			\$250,000		
Premium Pay			\$6,000		
Subtotal Other			\$296,000		
Cost Accumulation			\$3,299,491	15.00%	\$494,924
<b>Total Cost</b>			\$3,794,415		
<b>Total Price</b>		15.00%	<b>\$4,363,577</b>		



# DEVELOP ESTIMATE AT COMPLETION

- Essential Skill--Project Current Program Content & Cost to Future Completion By Analysis or Statistics
- Conduct Analysis of Existing Conditions
  - Assess Program Content Complete
  - Assign Costs of Content to Date
  - Determine and Assess Content/Cost Problems
  - Project Content Completion Date & Dollar Cost of Work Remaining
- Determine If Sufficient Budget Exists to Complete Program Content

# EAC USING EVMS

- EVMS a “Natural” for Developing EAC
  - BCWP Provides \$ Value of Work Complete
  - ACWP Provides Cost of Work Completed
  - Schedule Variance Provides Work Accomplished Compared to Plan (BCWS)
  - Cost Variance Shows Actual Costs Incurred vs. the Costs Associated with the Planned Content
  - Variance Analysis Narrative Discusses Impacts and Projections of Variances for Total Contract Effort

# EAC DEVELOPMENT METHODOLOGY

- Assess Resource Needs for Work Content Remaining by WBS Element
- Tie \$ to Resource Needs to Get Cost of Work Remaining
- Add Cost of Work Remaining to Cumulative ACWP for Each WBS Element
- Several Statistical Derivations of EAC Available

# EAC EXAMPLE—RAW DATA

- WBS Activity—Recurring Overhaul of Item
- Cumulative Data (10 Items on Contract) in \$
  - BCWS = \$6,000,000, BCWP = \$5,400,000, ACWP = \$5,800,000
- Content Data—Labor Standards
  - BCWS = 30,000, BCWP = 25,000, Per Cent Complete = 50% (25,000/50,000 Labor Stds)
- Total Output = 10 Units (50,000 Labor Stds)

# EAC EXAMPLE--ANALYSIS

- Content Complete = 50%
  - Actual Cost per Std Hour = \$232.00
- Estimate to Complete (ETC)
  - 23,000 Standard Hours Remain
  - Remaining Work \$ = Std. Hr. Cost X No. Std. Hrs. = \$5,336,000
- $EAC = ACWP + ETC = \$11,336,000$
- EAC Represents Cost Increase of \$1,336,000

# EAC EXAMPLE--STATISTICAL

- Work Complete EAC--Cumulative ACWP  
Divided by Cumulative BCWP X BAC
  - $\$5,800,000 / \$5,400,000 \times \$10,000,000 = 1.074 \times \$10,000,000 = \$10,740,000$
- Work Complete, Schedule Accelerate EAC--  
(Cum ACWP Divided by Cum BCWP) X (Cum BCWS Divided by Cum BCWP) X BAC
  - $1.074 \times 1.111 \times \$10,000,000 = \$11,932,140$

# NOTES ON EAC ANALYSIS

- Note Significant Differences Between Statistically Derived EACs
  - Numerous Formulae for Statistical EACs
  - Statistics Ignore Causal ID and Solution
  - Statistics Incorporate Data Anomalies
- Note Advantages of Analytical EACs
  - Assess True Program Status
  - Incorporate and Project Problem Solutions
  - Adjust EAC as Get Well Plans
- Encourage Use of Analytical EAC Methods

# PROBLEM ANALYSES

- Essential Skill—Use Disciplined Approach to Analyze Problem and Propose Implementable Solutions
- Use Problem Analysis Model
  - Identify Problem
  - Determine Root Cause(s)
  - Assess Resource and Output Impacts
  - Develop Alternative Solutions
  - Recommend Most Effective Solution
- Success Measured by Implementation (Or Not)



# PROBLEM—U. S. HOUSING MESS

- Problem Statement—Housing Default Rate Extremely High Against Historical Standards
- Root Causes
  - “Under Water” Home Values
  - “Over Their Head” Monthly Homeowner Payments
- Impacts
  - Collapse of U. S. Housing Market Sales
  - Collapse of Financial System in U. S.
  - A Nasty Economic Recession in U. S.

# U. S. HOUSING MESS-SLIDE 2

- Possible Solutions
  - 1. Devalue Homes to Fair Market Value
  - 2. Forgive Loans to “Over Their Heads”
  - 3. Foreclose Loans of “Over Their Heads”
  - 4. Refinance Loans of “Over Their Heads”
- Recommended Solutions
  - Numbers 1 and 4 Above with Restrictions on Number 4
    - Ensure Homeowner Will Live in Home for at Least 5 Years
    - Loan Monthly Payment Cannot Exceed 30% of Take Home Pay
    - Homeowners Must Have Stable Income History or Future

# PERSPECTIVES

- Cost Analysts Have Unique Qualifications to Participate in Important Decision-making
- Cost Analysts Provide a “Sterility” to Decision Processes Necessary for Unbiased Outcomes
- Cost Analysts, More Than Any Other Discipline Accurately Interrelate Resources, Costs, and Outputs
- Cost Analysts Promote Disciplined Problem Assessment and Solutions

# VISION OF ADDED AREAS OF INFLUENCE

- Public Policy
  - Education (Efficiency, Greater Output Qty & Qual)
  - Health Care (Efficiency, Output Qty & Qual, Total Cost Reduction)
- EVMS Implementation
  - All Product Mfg Industry in U. S., Both Public and Private

# VISION OF ADDED AREAS OF INFLUENCE

- Service Industries
  - Quantitative Measures of Merit
  - Definition of Output Quantities
  - Appropriate Levels of Investment
- Higher Education Goals
  - Establish Academic Program for Cost Analysis/Estimating at Masters & Doctorates
  - Acceptance As a True Business Discipline

# VISION OF ADDED AREAS OF INFLUENCE

- Suggested SCEA Initiatives
  - Establish and Enforce Code of Conduct
  - Expand Library of Topics to Include Areas of Vision
  - Encourage Members to Publish & Recognize Those Who Do
  - Target Non-DOD Organizations for Topical Review
    - Academic Focus
    - Publishing Focus
    - Study Focus