



Chapter 4: Project Management (Cont.)

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Project Cost Management (1)

- **7.1 Plan Cost Management**
- **7.2 Estimate Costs**
- **7.3 Determine Budget**
- **7.4 Control Costs**

Knowledge Areas	Process Groups				
	Initiating	Planning	Executing	Monitoring and controlling	Closing
Project cost management		7.1 Plan cost management 7.2 Estimate costs 7.3 Determine budget		7.4 Control costs	



Project Cost Management (2)

Types of Costs



- **Variable**
 - Changes with the amount of work (materials)
- **Fixed**
 - Doesn't change as work changes (set up)
- **Direct**
 - Directly attributable to project (team travel)
- **Indirect**
 - Incurred for the benefit of more than one project (administrative costs)



Project Cost Management (3)





Project Cost Management (4)

Estimate Costs

Inputs

- .1 Project management plan
 - Cost management plan
 - Quality management plan
 - Scope baseline
- .2 Project documents
 - Lessons learned register
 - Project schedule
 - Resources requirements
 - Risk register
- .3 Enterprise environmental factors
- .4 Organizational process assets

Tools & Techniques

- .1 Expert judgment
- .2 Analogous estimating
- .3 Parametric estimating
- .4 Bottom-up estimating
- .5 Three-point estimating
- .6 Data analysis
 - Alternatives analysis
 - Reserve analysis
 - Cost of quality
- .7 Project management information system
- .8 Decision making
 - Voting

Outputs

- .1 Cost estimates
- .2 Basis of estimates
- .3 Project documents updates
 - Assumption log
 - Lessons learned register
 - Risk register



Project Cost Management (5)

Three-Point Estimating

- Three estimates per activity
 - Pessimistic (**cP**)
 - Most likely (**cM**)
 - Optimistic (**cO**)
- Triangular Distribution
 - $(cP + cM + cO) / 3$
- Beta Distribution
 - $(cP + 4cM + cO) / 6$
 - Also called PERT (Program Evaluation and Review Technique)

PERT Formula	Standard Deviation
$\frac{(P + 4M + O)}{6}$	$\frac{P - O}{6}$



Project Cost Management (6)

Determine Budget

Inputs

- .1 Project management plan
 - Cost management plan
 - Resource management plan
 - Scope baseline
- .2 Project documents
 - Basis of estimates
 - Cost estimates
 - Project schedule
 - Risk register
- .3 Business documents
 - Business case
 - Benefits management plan
- .4 Agreements
- .5 Enterprise environmental factors
- .6 Organizational process assets

Tools & Techniques

- .1 Expert judgment
- .2 Cost aggregation
- .3 Data analysis
 - Reserve analysis
- .4 Historical information review
- .5 Funding limit reconciliation
- .6 Financing

Outputs

- .1 Cost baseline
- .2 Project funding requirements
- .3 Project documents updates
 - Cost estimates
 - Project schedule
 - Risk register



Project Cost Management (7)

Control Costs

Inputs

- .1 Project management plan
 - Cost management plan
 - Cost baseline
 - Performance measurement baseline
- .2 Project documents
 - Lessons learned register
- .3 Project funding requirements
- .4 Work performance data
- .5 Organizational process assets

Tools & Techniques

- .1 Expert judgment
- .2 Data analysis
 - Earned value analysis
 - Variance analysis
 - Trend analysis
 - Reserve analysis
- .3 To-complete performance index
- .4 Project management information system

Outputs

- .1 Work performance information
- .2 Cost forecasts
- .3 Change requests
- .4 Project management plan updates
 - Cost management plan
 - Cost baseline
 - Performance measurement baseline
- .5 Project documents updates
 - Assumption log
 - Basis of estimates
 - Cost estimates
 - Lessons learned register
 - Risk register



Project Cost Management (8)

Earned Value Management (EVM)

Earned Value:

A measure of the actual performance compared to the expected performance

- PV (Planned Value)
- AC (Actual Cost)
- EV (Earned Value)

- Schedule Variance (SV)
 - Tells us if the schedule is behind or ahead of what was planned
 - $SV = EV - PV$
- Cost Variance (CV)
 - Tells us if costs are higher or lower than budgeted
 - $CV = EV - AC$



Project Cost Management (9)

Earned Value Management (EVM) – Cont.

- PV (Planned Value)
- AC (Actual Cost)
- EV (Earned Value)

- Schedule Variance (SV): $SV = EV - PV$
- Cost Variance (CV): $CV = EV - AC$

- Schedule Performance Index (SPI)
 - Performance in meeting the schedule
 - Expressed as a ratio of earned value to planned value
 - $SPI = EV/PV$
- Cost Performance Index (CPI)
 - Performance in meeting the budget
 - Expressed as a ratio of earned value to actual cost
 - $CPI = EV/AC$



Project Cost Management (10)

Earned Value Management (EVM) – Cont.

- PV (Planned Value)
- AC (Actual Cost)
- EV (Earned Value)

- Schedule Variance (SV): $SV = EV - PV$
- Cost Variance (CV): $CV = EV - AC$

- Schedule Performance Index (SPI): $SPI = EV/PV$
- Cost Performance Index (CPI): $CPI = EV/AC$

- Budget At Completion (BAC)
 - Total amount planned to be spent to complete the project
- Estimate At Completion (EAC)
 - Estimated total cost of the project at completion, based on the performance to date
 - Many ways to calculate EAC depending on information
 - EAC
 - $AC + (BAC - EV)$
 - BAC / CPI



Project Cost Management (11)

Earned Value Management (EVM) – Cont.

- PV (Planned Value)
- AC (Actual Cost)
- EV (Earned Value)

- Schedule Variance (SV): $SV = EV - PV$
- Cost Variance (CV): $CV = EV - AC$

- Schedule Performance Index (SPI): $SPI = EV/PV$
- Cost Performance Index (CPI): $CPI = EV/AC$

- Budget At Completion (BAC)
- Estimate At Completion (EAC): $AC + (BAC - EV)$ and BAC / CPI

- Estimate To Complete (ETC)
 - The estimated amount needed to complete the project given the current level of performance
 - $ETC = EAC - AC$
- Variance At Completion (VAC)
 - The total variance between the budget we planned for the total project and the estimated total cost (EAC)
 - $VAC = BAC - EAC$



Project Cost Management (12)

Earned Value Management (EVM) – Cont.

- Schedule Variance (SV): $SV = EV - PV$
- Cost Variance (CV): $CV = EV - AC$

- Schedule Performance Index (SPI): $SPI = EV/PV$
- Cost Performance Index (CPI): $CPI = EV/AC$

- Budget At Completion (BAC)
- Estimate At Completion (EAC): $AC + (BAC - EV)$ and BAC / CPI

- Estimate To Complete (ETC): $ETC = EAC - AC$
- Variance At Completion (VAC): $VAC = BAC - EAC$

- PV (Planned Value)
- AC (Actual Cost)
- EV (Earned Value)

- Calculated projection of cost performance (CPI) that must be achieved on the remaining work to meet the budget or new EAC
- TCPI formula: work remaining / funds remaining
- TCPI required to hit the current budget = $(BAC - EV) / (BAC - AC)$
- TCPI required to hit the EAC = $(BAC - EV) / (EAC - AC)$



Project Cost Management (13)

Earned Value Management (EVM) – Cont.

- PV (Planned Value)
- AC (Actual Cost)
- EV (Earned Value)

- Schedule Variance (SV): $SV = EV - PV$
- Cost Variance (CV): $CV = EV - AC$

- Schedule Performance Index (SPI): $SPI = EV/PV$
- Cost Performance Index (CPI): $CPI = EV/AC$

- Budget At Completion (BAC)
- Estimate At Completion (EAC): $AC + (BAC - EV)$ and BAC / CPI

- Estimate To Complete (ETC): $ETC = EAC - AC$
- Variance At Completion (VAC): $VAC = BAC - EAC$

- TCPI formula: work remaining / funds remaining
- $TCPI = (BAC - EV) / (BAC - AC)$
- $TCPI = (BAC - EV) / (EAC - AC)$



Project Cost Management (14)

Earned Value Management (EVM) – Cont.

- You have to paint a four-wall room. Each wall takes one day to be painted and is budgeted for \$1,000/ wall. Walls have to be painted one after the other. Today is the end of day three. Using the chart below, calculate all EV formulas and interpret the answers.

Task	D1	D2	D3	D4	Current status
Wall 1	S-----F				Complete, spent \$1,000
Wall 2		S-----PF	-----F		Complete, spent \$1,200
Wall 3			PS-S-PF		Half done, spent \$600
Wall 4				PS----PF	Not yet started



Project Cost Management (15)

Earned Value Management (EVM) – Cont.

	Calculation	Answer	Interpretation
PV	$1,000 + 1,000 + 1,000$	3,000	We should have done \$3,000 worth of work
EV	$1,000 + 1,000 + 500$	2,500	We have actually completed \$2,500 worth of work
AC	$1,000 + 1,200 + 600$	2,800	We spent \$2,800
BAC	$1,000 + 1,000 + 1,000 + 1,000$	4,000	Budget is \$4,000
CV	$2,500 - 2,800$ EV - AC	-300	Over budget by \$300



Project Cost Management (16)

Earned Value Management (EVM) – Cont.

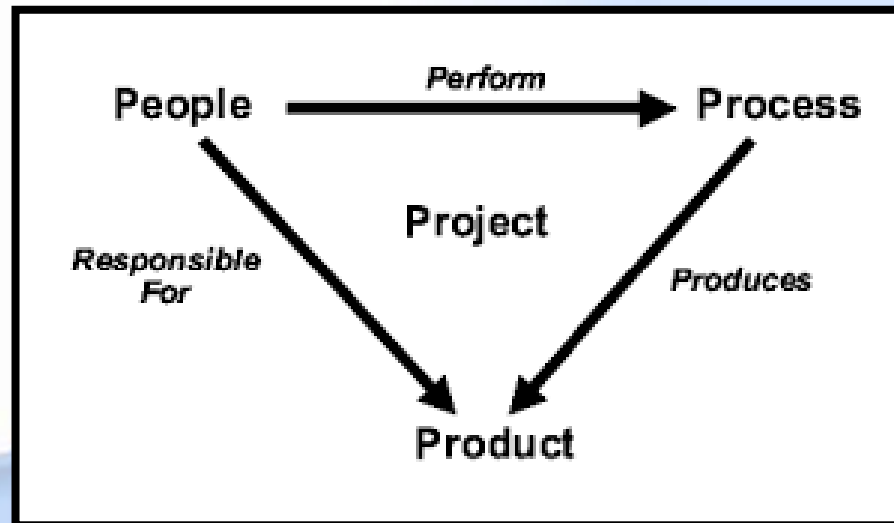
	Calculation	Answer	Interpretation
CPI	$2,500 / 2,800$ EV / AC	0.893	We are getting 89 cents out of every dollar invested
SV	$2,500 - 3,000$ EV - PV	-500	We are behind schedule
SPI	$2,500 / 3,000$ EV / PV	0.833	We are progressing at 83% of the planned rate
EAC	$4,000 / 0.893$ BAC / CPI $2,800 + (4,000 - 2,500)$ AC + (BAC - EV)	4,480 typical 4,300 atypical	Total cost will be \$4,480 typical \$4,300 atypical
ETC	$4,480 - 2,800$ $4,300 - 2,800$ EAC - AC	1,680 typical 1,500 atypical	We will need \$1,680 to finish the project (typical) or \$1,500 (atypical)
VAC	$4,000 - 4,480$ $4,000 - 4,300$ BAC - EAC	-480 typical -300 atypical	\$480 over budget when the project will be completed (typical) or \$300 over budget (atypical)



Software Project Management (1)

The Management Spectrum

Effective software project management focuses on the four Ps:
people, product, process, and project.





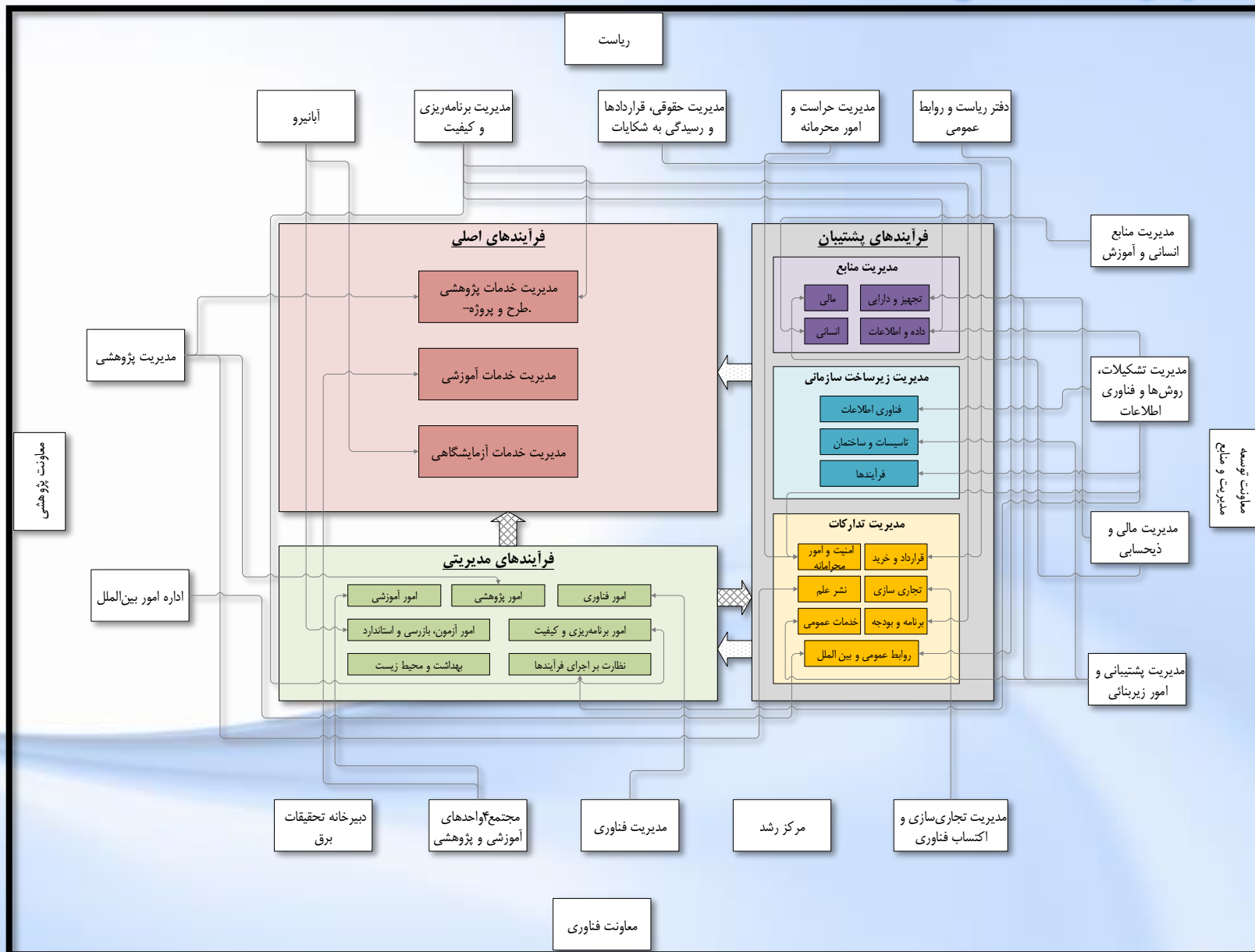
Software Project Management (2)

The Management Spectrum

- The People capability maturity model (people-CMM): “every organization needs to continually improve its ability to attract, develop, motivate, organize, and retain the workforce needed to accomplish its strategic business objectives.
- Before a project can be planned, Product objectives and scope should be established, alternative solutions should be considered, and technical and management constraints should be identified.
- A software Process provides the framework from which a comprehensive plan for software development can be established. A small number of framework activities are applicable to all software projects, regardless of their size or complexity.
- We conduct planned and controlled software Projects for one primary reason—it is the only known way to manage complexity

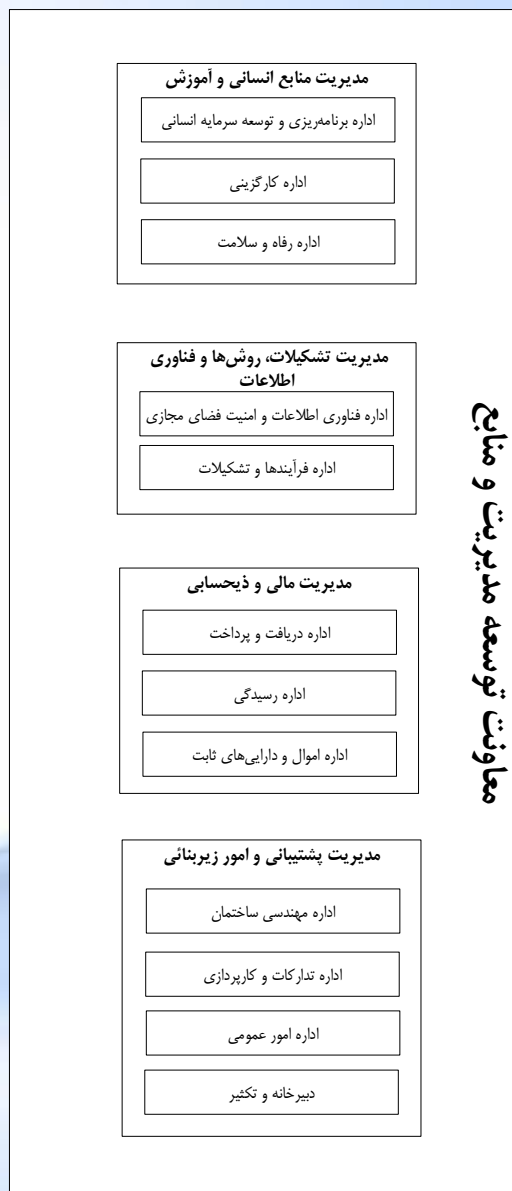


Introduction to Different Business Systems (1)





Introduction to Different Business Systems (2)





Introduction to Different Business Systems (3)

Type Of Business Software In Depth List





End of Session 5

**Any
Question?!**





**THANKS FOR
YOUR
ATTENTION**