

# Project Management Professional



## PMP PREPARATION COURSE

6<sup>TH</sup> EDITION

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# Chapter 7

## Project Cost Management

PMBOK-6<sup>th</sup> Page 231 to 270

# Lecture 04 : Project Cost Management

## Contents



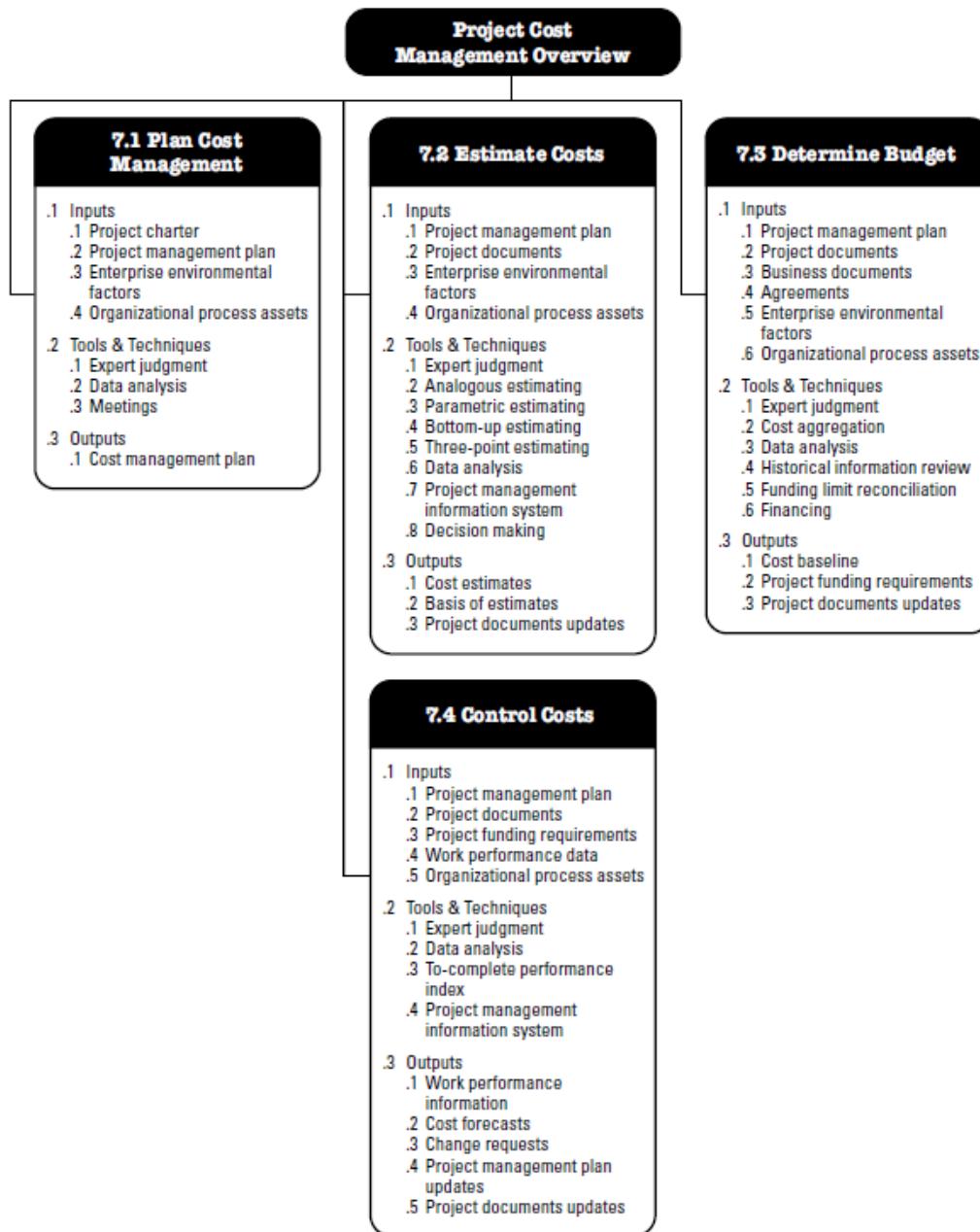
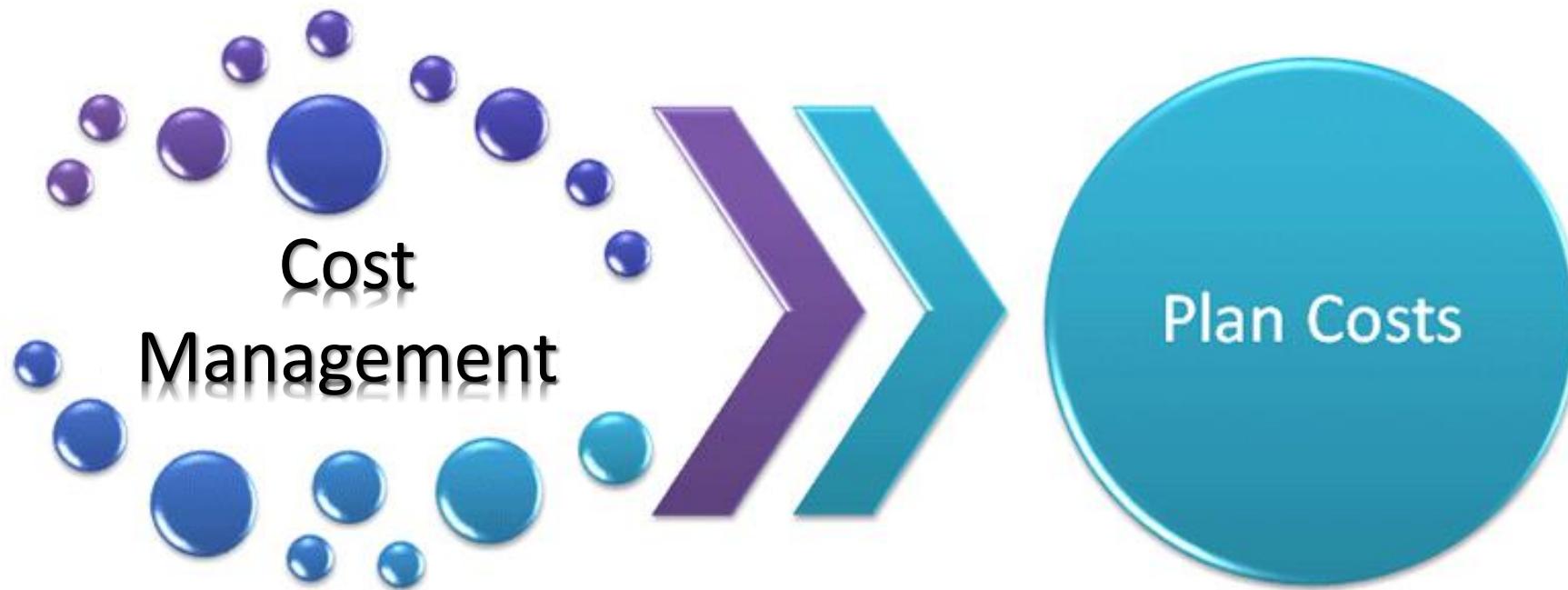


Figure 7-1. Project Cost Management Overview

# Lecture 04 : Project Cost Management

## 1.Plan Cost Management (Planning)



# Lecture 04 : Project Cost Management

## 1.Plan Cost Management (Planning)

### ➤ Plan Cost Management is the process of:

- Defining **how** the project costs will be estimated, budgeted, managed, Monitored, and controlled.
- عملية تحديد كيفية تقدير تكاليف المشروع، ووضع ميزانيتها وإدارتها ومراقبتها والتحكم بها.

### ❖ The key benefit of this process:

- ✓ provides guidance and direction on **how** the project costs will be managed throughout the project.
- ✓ توفر الإرشاد والتوجيه بشأن كيفية إدارة تكاليف المشروع على مدار المشروع.



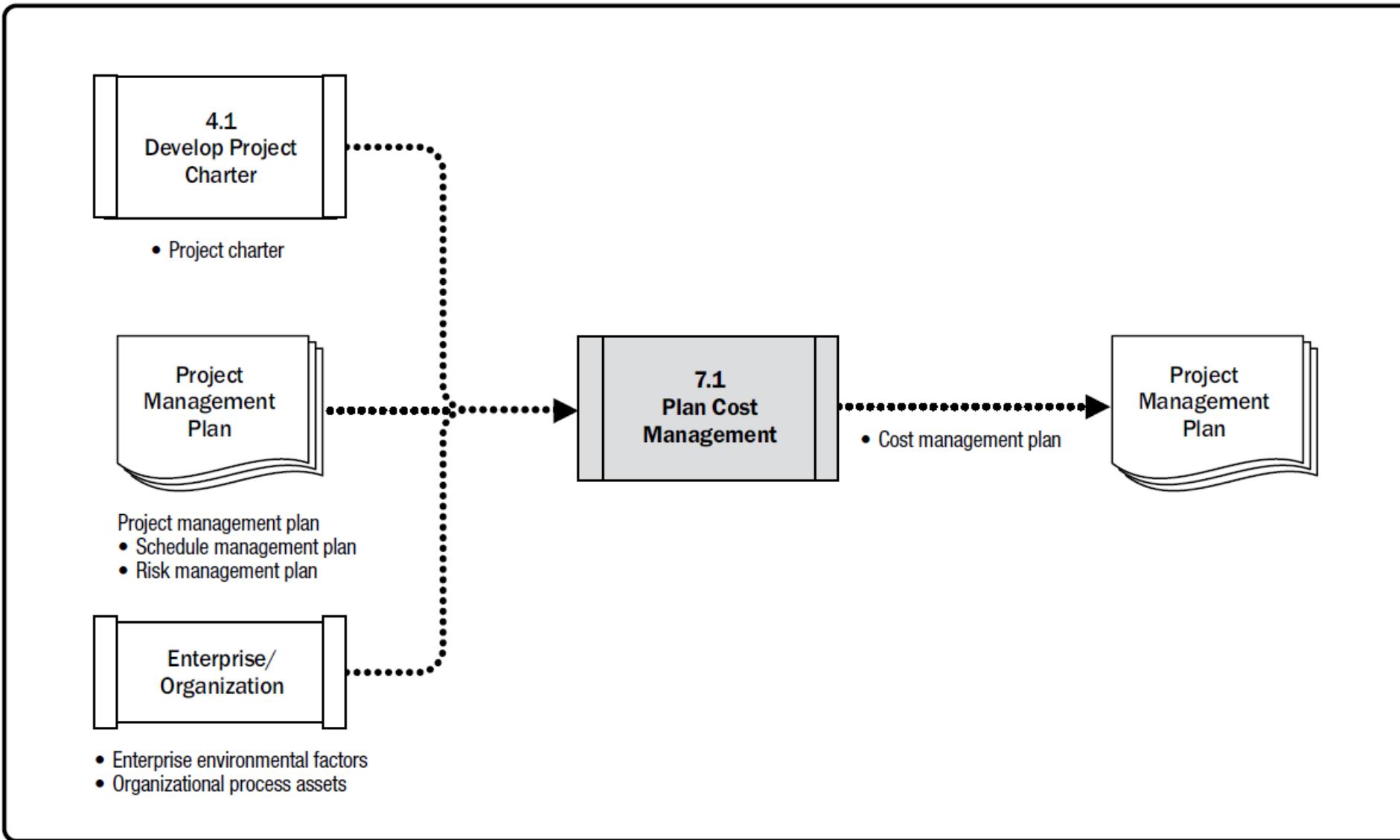
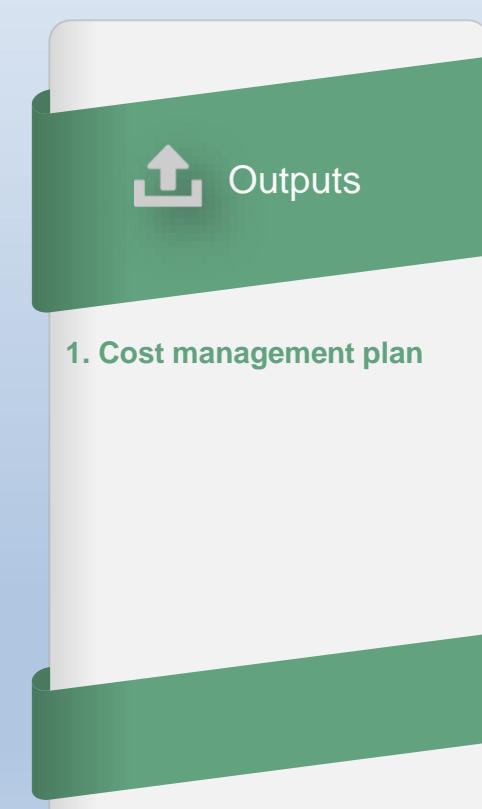
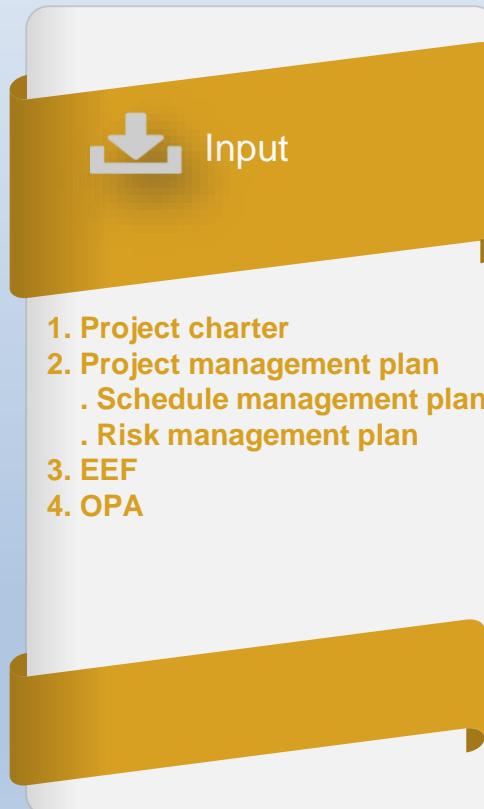


Figure 7-3. Plan Cost Management: Data Flow Diagram

# Project Cost Management

## ( 1 ) Plan Cost Management



# 1. Plan Cost Management (Planning)

## Inputs

### 1- Project charter

- ✓ The project charter defines the **project approval requirements**, provides the preapproved financial resources that will influence the management of the project Costs.

### 2- Project management plan

- ✓ **Schedule management plan**. establishes the criteria and the activities for developing, monitoring, and controlling the schedule.  
The schedule management plan provides processes and controls that will impact cost estimation and management.
- ✓ **Risk management plan**. provides the approach for identifying, analyzing, and monitoring risks. The risk management plan provides processes and controls that will impact cost estimation and management.

### 3- Enterprise environmental factors

- ✓ Organizational culture and structure
- ✓ Market conditions
- ✓ Currency exchange rates

### 4- Organizational process assets

- ✓ Existing formal and informal cost estimating and budgeting-related policies, procedures, and guidelines.
- ✓ Historical information and lessons learned repository

# **1. Plan Cost Management (Planning)**

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## **1- EXPERT JUDGMENT**

Expertise should be considered from individuals or groups with **specialized knowledge or training** in the following topics:

- Previous similar projects
- Information in the industry, discipline, and application area
- Cost estimating and budgeting
- Earned value management.

## **2- DATA ANALYSIS**

### Alternatives analysis

Can include reviewing strategic funding options such as: self-funding, funding with equity, or funding with debt. It can also include consideration of ways to acquire project resources such as making, purchasing, renting, or leasing.

## **3- MEETINGS**

Project teams may hold planning meetings to develop the Cost management plan. Attendees may include the project manager, the project sponsor, selected project team members, selected stakeholders, anyone with responsibility for Project Cost.

# 1. Plan Cost Management (Planning)

## Outputs

### □ Cost management plan

هي إحدى مكونات خطة إدارة المشروع

- It's a component of the project management plan.
- Describes **how** the project costs will be planned, structured, and controlled. توضح كيفية التخطيط لتكليف المشروع وتنسيقها وضبطها.
- Cost management plan can establish the following: يمكن ان تحدد خطة إدارة التكاليف ما يلي:
  - 1- Units of measure (such as staff hours, staff days, or weeks for time measures; meters, liters, tons, kilometers, or cubic yards for quantity measures; or lump sum)
  - 2- Level of Precision (rounding up or down, ex: US\$995.59 to US\$1,000) مستوى الضبط
  - 3- Level of Accuracy The acceptable range (ex: ± 10%) مستوى الدقة. يتم تحديد النطاق المقبول
  - 4- Control thresholds (agreed-upon amount of variation to be allowed before some action needs to be taken)
  - 5- Organizational procedures links. روابط الإجراءات التنظيمية
  - 6- Rules of performance measurement قواعد قياس الأداء
  - 7- Reporting formats أشكال الإبلاغ

## COST MANAGEMENT PLAN

Project Title: \_\_\_\_\_ Date Prepared: \_\_\_\_\_

Units of Measure:	Level of Precision:	Level of Accuracy:

Control Thresholds:

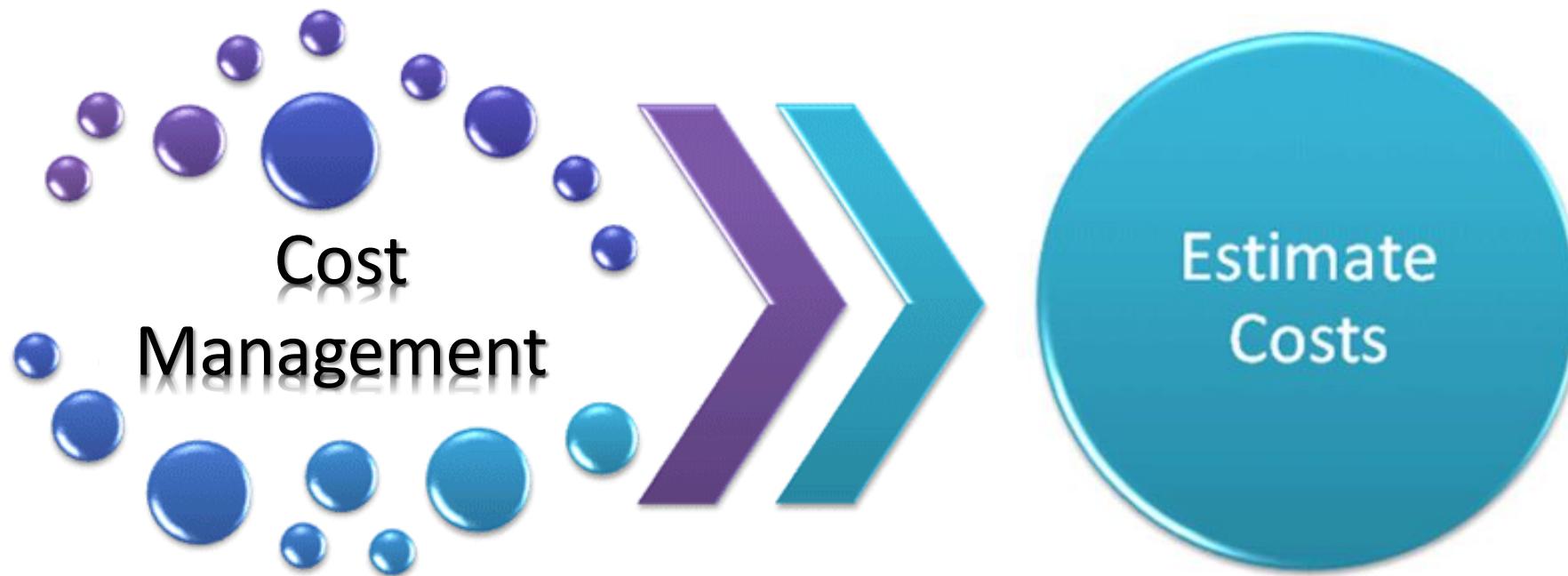
Rules of Performance Measurement:

Cost Reporting and Format:

Additional Details:

# Lecture 04 : Project Cost Management

## 2. Estimate Costs (Planning)



# Lecture 04 : Project Cost Management

## 2. Estimate Costs (Planning)

### ➤ Estimate Costs is the process of :

- Developing an approximation of the cost of resources needed to complete project work.
- هي عملية وضع تقدير تقريري لتكلفة الموارد المالية اللازمة لإكمال عمل المشروع.

### ❖ The key benefit of this process:

- ✓ Determines the monetary resources required for the project.
- ✓ تحدد مقدار الموارد المالية اللازمة للمشروع.



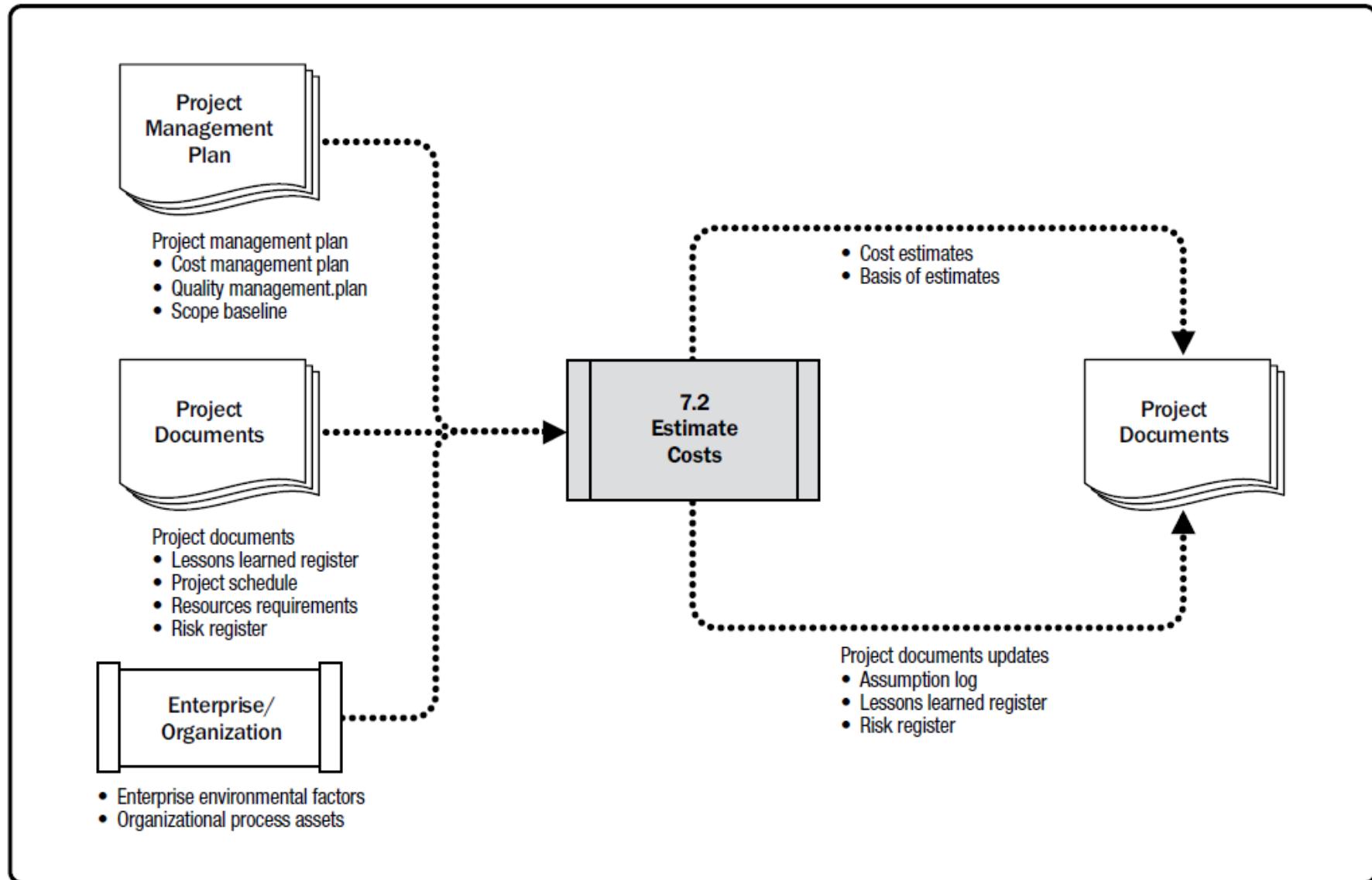


Figure 7-5. Estimate Costs: Data Flow Diagram

# Project Cost Management

## ( 2 ) Estimate Costs



### Input

- .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

# Lecture 04 : Project Cost Management

## 2. Estimate Costs (Planning)

### Inputs

#### 1- Cost management plan

- ✓ The cost management plan describes estimating methods that can be used and the level of precision and accuracy required for the cost estimate

#### 2- Quality management plan

- ✓ The quality management plan describes the activities and resources necessary for the project management team to achieve the quality objectives set for the project.

#### 3- Scope baseline

- ✓ Project scope statement: Reflects funding constraints by period for the expenditure of project funds or other financial assumptions and constraints
- ✓ Work breakdown structure: provides the relationships among all the project deliverables and their various components.
- ✓ WBS dictionary: description of the work in each WBS component required to produce each deliverable.

# Lecture 04 : Project Cost Management

## 2. Estimate Costs (Planning)

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### Analogous Estimating

التقدير التناضري

- Uses values of a previous project that are **similar** to the current project.

يستخدم تقدير التكلفة التناضري قيم لمشروع سابق مشابهة للمشروع الحالي.

Analogous  
Estimating



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### Parametric Estimating

التقدير باستخدام المعاملات

- Uses a statistical relationship between relevant historical data and **other variables** (e.g., square footage in construction).

يعتمد على العلاقة الإحصائية بين البيانات السابقة والمتغيرات الأخرى

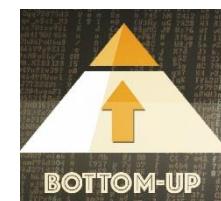
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### Bottom-up estimating

التقدير من أسفل الى أعلى

- The **cost of individual work packages or activities** is **estimated** to the greatest level of specified detail. The detailed cost is then summarized or “rolled up” to higher levels.

يتم تقدير تكلفة حزم العمل أو الأنشطة الفردية بأعلى مستوى من التفاصيل المحددة. ثم يتم تلخيص التكلفة المفصلة أو تقريرها إلى مستويات أعلى لأغراض رفع التقارير.



# Lecture 04 : Project Cost Management

## 2. Estimate Costs (Planning)

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### Three-Point Estimating

التقدير ثلاثي النقاط

- ✓ The accuracy of single-point duration estimates may be improved by considering estimation uncertainty and risk.

M : Most likely (based on realistic effort assessment for the required work)

O : Optimistic (best-case scenario for the activity)

P : Pessimistic (worst-case scenario for the activity.)

➤ Two commonly used formulas are triangular and beta distributions :

❖ Triangular distribution.  $E = (O + M + P) / 3$

❖ Beta distribution.  $E = (O + 4M + P) / 6$



# Lecture 04 : Project Cost Management

## 2. Estimate Costs (Planning)

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### Data analysis

#### ✓ Alternatives analysis

- Used to evaluate identified options in order to select which options or approaches to use to execute and perform the work of the project.

An example would be:

Evaluating the cost, schedule, resource, and quality impacts of **buying** versus **making** a deliverable.

#### ✓ Reserve analysis.

- Cost estimates may include **contingency reserves** to account for **cost uncertainty**.
- Contingency reserves are the budget **within the cost baseline** that is allocated for **identified risks**.
- Contingency reserves are often viewed as the part of the budget intended to **address the known unknowns** that can affect a project. For example, **rework for some project deliverables could be anticipated**, while the **amount of this rework is unknown**.

#### ✓ Cost of quality

# Lecture 04 : Project Cost Management

## 2. Estimate Costs (Planning)

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### PROJECT MANAGEMENT INFORMATION SYSTEM (PMIS)

- Can include spreadsheets, simulation software, and statistical analysis tools to assist with cost estimating.

يمكن أن يتضمن نظام معلومات إدارة المشروع جداول بيانات وبرمجيات محاكاة وأدوات التحليل الإحصائي للمساعدة في تقدير التكلفة.

### DECISION MAKING

- The decision-making techniques that can be used in the Estimate Costs process include voting
- Voting is an assessment process having multiple alternatives with an expected outcome in the form of future actions. These techniques are useful for engaging team members to improve estimate accuracy and commitment to the emerging estimates.

# Lecture 04 : Project Cost Management

## 2. Estimate Costs (Planning)

### Analogous Estimation

- It is the **fastest** technique to estimate cost but **less accurate**.
- This technique can be used with **limited information** available about the project.

### Parametric Estimation

- This technique uses the **statistical relationship** between **historical data** and **variables**; e.g. cost of painting of wall per square foot.
- It is **more accurate** than the analogous estimation.

### Three-point Estimation

- This technique uses three estimates to calculate the **average estimate**. The three estimates are the **most likely** cost, the **pessimistic** cost and the **optimistic** cost.
- It reduces the biases, risks, and **uncertainties** from the estimation.
- It is **more accurate** than the Analogous and Parametric estimating techniques.

### Bottom-up Estimation

- This technique is the **most accurate** technique of all the techniques discussed above.
- This technique can only be used when **every detail about the project is available**.
- This is **very time-consuming** and **costly technique**, but gives reliable and **most accurate** result.

# Lecture 04 : Project Cost Management

## 2. Estimate Costs (Planning)

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### COST ESTIMATES

تقديرات التكلفة

Costs are estimated for all resources that are applied to the cost estimate includes :

- Direct Cost (Labor, materials, equipment and services.) التكاليف المباشرة
- Inflation allowance, exchange rates مخصص التضخم وأسعار صرف العملة
- Cost contingency reserve
- Indirect costs التكاليف غير المباشرة



# Lecture 04 : Project Cost Management

## 2. Estimate Costs (Planning)

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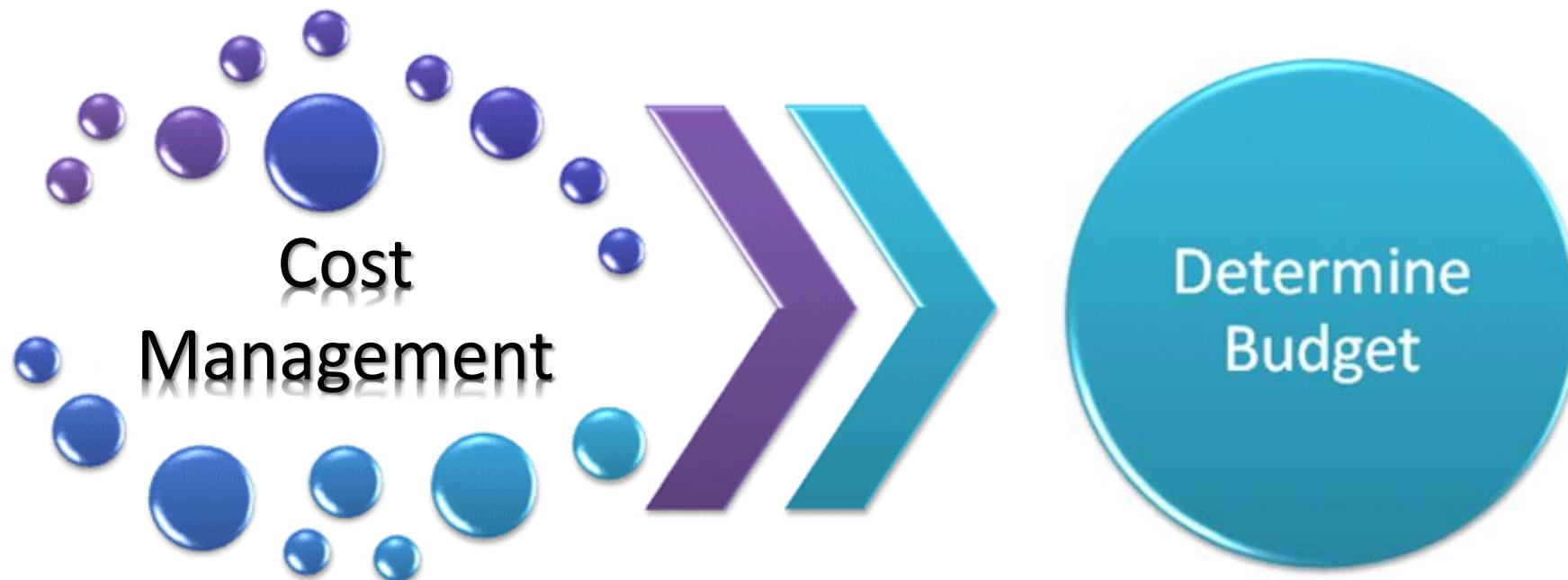
### BASIS OF ESTIMATES

تقديرات التكلفة

- Documentation of the basis of the estimate (i.e., how it was developed),
- Documentation of all assumptions made,
- Documentation of any known constraints,
- Documentation of identified risks included when estimating costs,
- Indication of the range of possible estimates (e.g., US\$10,000 ( $\pm 10\%$ ) to indicate that the item is expected to cost between a range of values), and

# Lecture 04 : Project Cost Management

## 3. Determine Budget (Planning)



# Lecture 04 : Project Cost Management

## 3. Determine Budget (Planning)

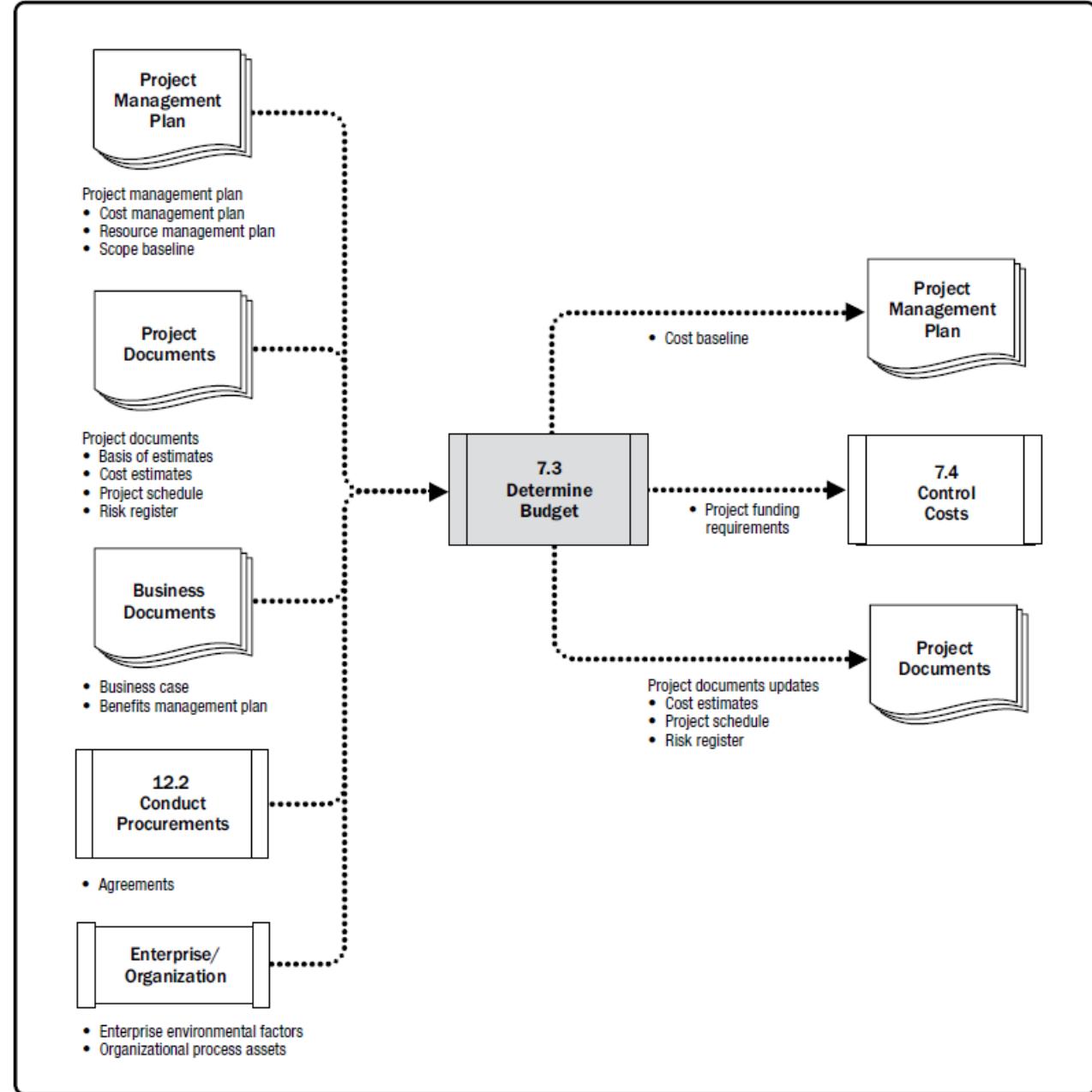
### ➤ Determine Budget is the process of :

- Aggregating the estimated costs of individual activities or work packages to establish an authorized cost baseline.
- هي عملية حساب إجمالي التكاليف التقديرية للأنشطة الفردية أو حزم العمل لإنشاء مرجع معتمد للتكاليف.

### ❖ The key benefit of this process:

- ✓ Determines the cost baseline against which project performance can be monitored and controlled.
- ✓ تحدد الخط المرجعي للتكلفة التي يمكن في ضوئها متابعة أداء المشروع والتحكم فيه





# Project Cost Management

## ( 3 ) Determine Budget



### Input

1. Project management plan
2. Project documents
3. Business documents
4. Agreements
5. Enterprise environmental factors
6. Organizational process assets



### Tools & Techniques

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



### Outputs

1. Cost baseline
2. Project funding requirements
3. Project document updates

# Lecture 04 : Project Cost Management

## 3.Determine Budget (Planning)

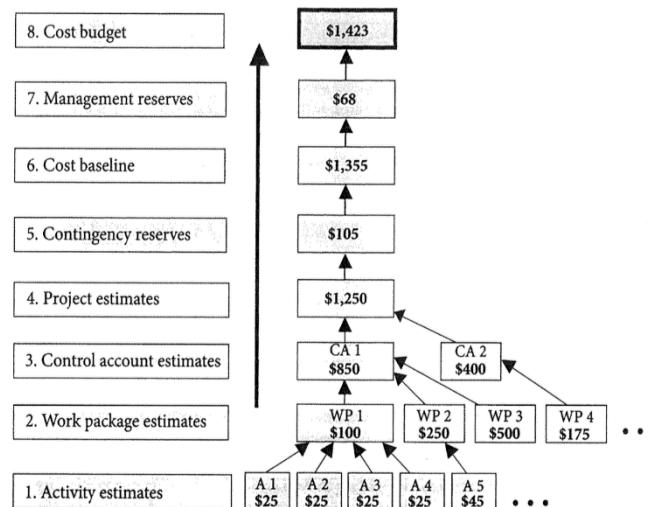
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### COST AGGREGATION

تجميع التكاليف

- ✓ Cost estimates are aggregated by **work packages** in accordance with the WBS.
- ✓ The work package cost estimates are then aggregated for the **higher component levels** of the WBS (such as control accounts) and, ultimately, for the **entire project**.

تجميع التكاليف من مستوى الأنشطة الى حزم العمل ثم الى حسابات التحكم ثم الى المشروع بالكامل.



# Lecture 04 : Project Cost Management

## 3.Determine Budget (Planning)

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### Data Analysis

تحليل البيانات

#### Reserve Analysis :

- Contingency Reserve.
- Management Reserve :
  - For unforeseen work that is within scope of the project.
  - Address the unknown unknowns that can affect a project.
  - Is not included in the cost baseline but is part of the overall project budget.

Important

- When an amount of management reserves is used to fund unforeseen work, the amount of management reserve used is added to the cost baseline, thus requiring an **approved change** to the cost baseline.  
في حال استخدام مقدار من الاحتياطات الإدارية في تمويل أعمال مفاجئة، يتم إضافة مقدار الاحتياطي الإداري المستخدم إلى الخط المرجعي للتكلفة ومن ثم يلزم إجراء تغيير معتمد على الخط المرجعي للتكلفة.



# Lecture 04 : Project Cost Management

## 3.Determine Budget (Planning)

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### Funding Limit Reconciliation

تجمیع التکالیف

Very Important

- ✓ The expenditure of funds should be reconciled with any funding limits on the commitment of funds for the project.

يجب تسوية إنفاق التمويلات مع أي قيود تمويل على التزامات التمويل الخاصة بالمشروع.

- ✓ A variance between the **funding limits** and the **planned expenditures** will sometimes necessitate the **rescheduling** of work to **level** out the rate of expenditures.

أحياناً **التباین** بين حدود التمويل والمصروفات المخططة يحتم إجراء إعادة جدولة للأعمال لتسوية معدل الإنفاق.

**Q-** a project manager in construction project, if the Project Sponsor tells you that the project will be terminated because of Stumbled in the credit limit of the bank. What could have done by the project manager to prevent this type of situation?

- A. Funding Limit Reconciliation
- B. Reserve Analysis
- C. Critical path method
- D. Critical chain method



# Lecture 04 : Project Cost Management

## 3.Determine Budget (Planning)

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### Financing

التمويل

- ✓ Financing entails acquiring funding for projects.
- ✓ It is common for **long-term** infrastructure and industrial to seek **external sources of funds**. If a project is funded externally, the funding entity may have certain requirements that are required to be met.

من الشائع أن تسعى مشاريع البنية التحتية **طويلة الأجل** والمشاريع الصناعية ومشاريع الخدمات العامة للحصول على **مصادر خارجية للتمويل**. وإذا مُول المشروع **تمويلًا خارجيًّا**, فمن الممكن أن يكون للكيان الممُول بعض **الاشتراطات التي يلزم استيفاؤها**.

# Lecture 04 : Project Cost Management

## 3. Determine Budget (Planning)

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### Cost Baseline

الخط المرجعي للتكلفة

- ✓ Is the approved version of the time-phased project budget.

نسخة معتمدة من موازنة المشروع المقسمة على مراحل زمنية.

- ✓ Excluding any management reserves.

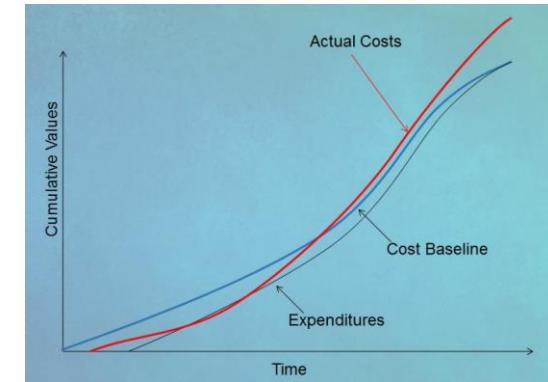
لا تشمل الاحتياطات الإدارية.

- ✓ Can only be changed through formal change control procedures.

لا يمكن تغييرها إلا من خلال الإجراءات الرسمية للتحكم في التغيير.

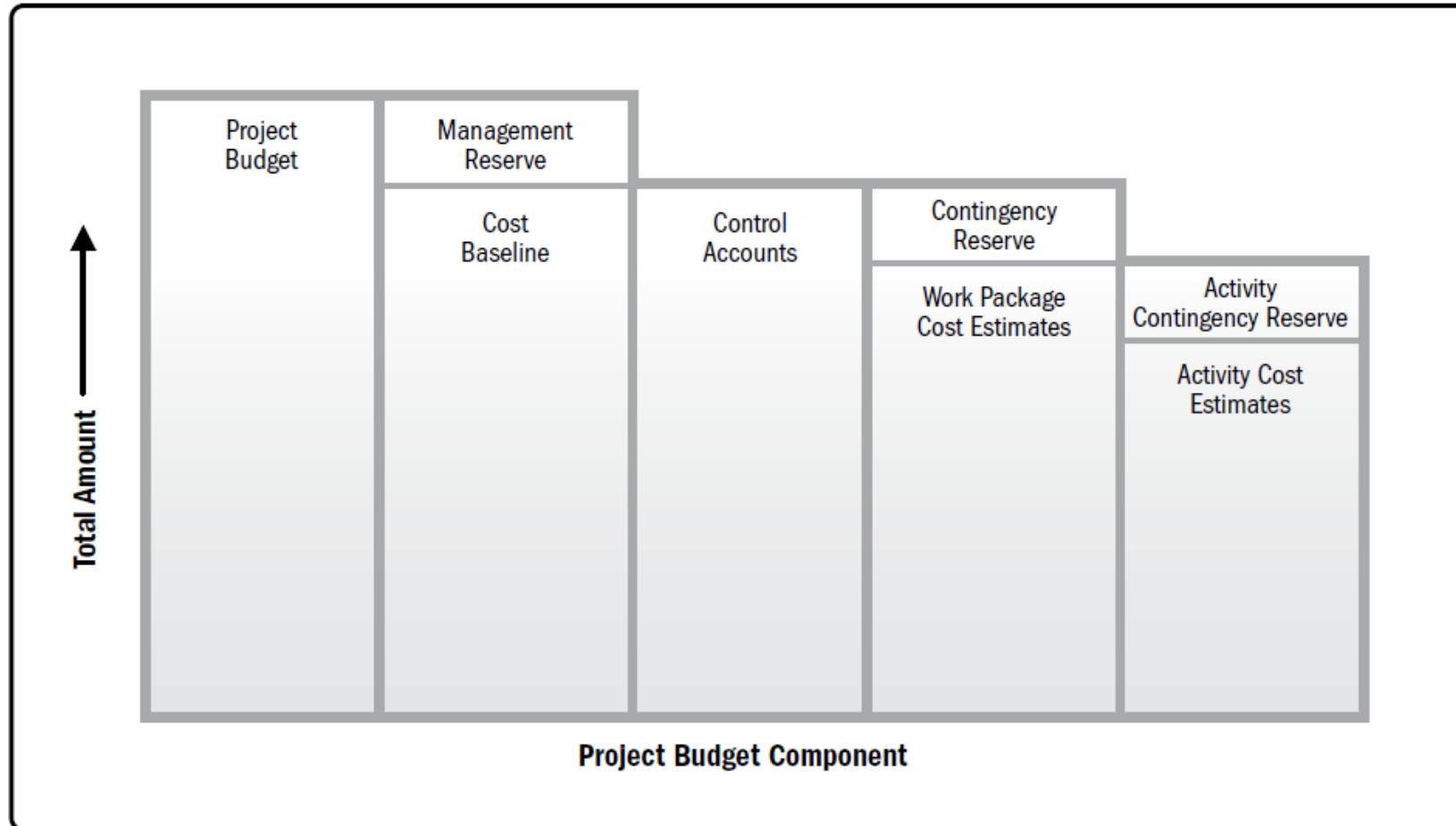
- ✓ It is used as a basis for comparison to actual results.

يستخدم كأساس للمقارنة بالنتائج الفعلية



# Lecture 04 : Project Cost Management

## 3.Determine Budget (Planning)



# Lecture 04 : Project Cost Management

## 3.Determine Budget (Planning)

### o Project Funding Requirements

متطلبات تمويل المشروع

- Total funding requirements and periodic funding requirements (e.g., quarterly, annually) are derived from the cost baseline.
- The cost baseline will include projected expenditures plus anticipated liabilities.
- Funding often occurs in incremental amounts, and may not be evenly distributed, which appear as steps.
- The total funds required are those included in the cost baseline plus management reserves.

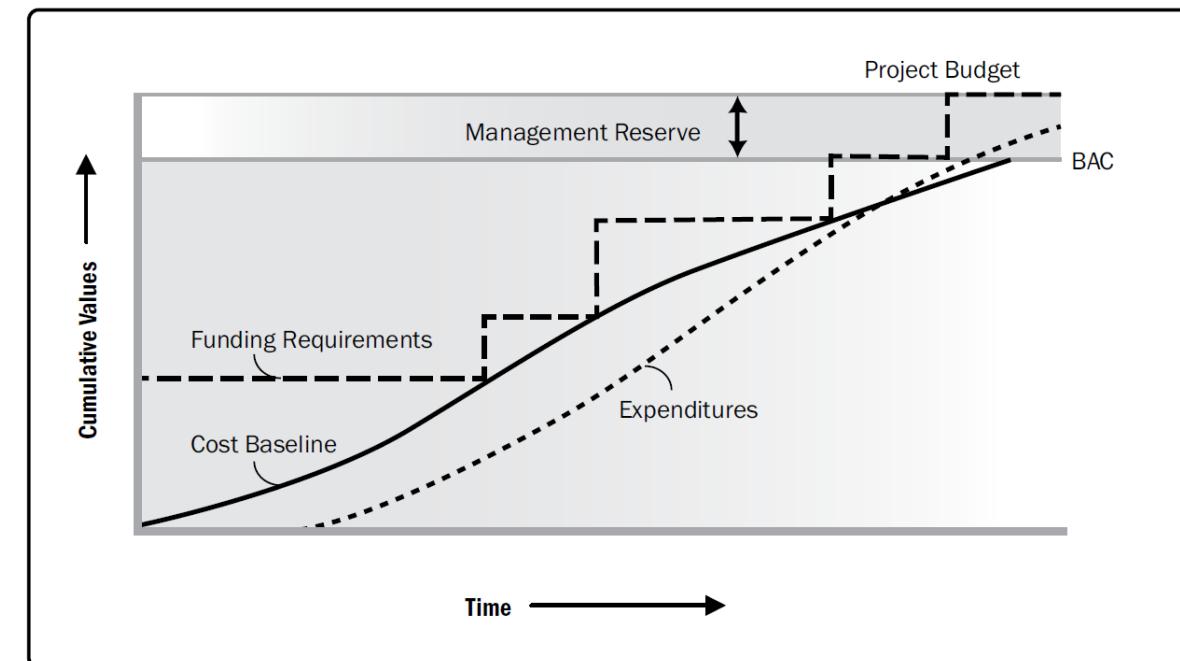
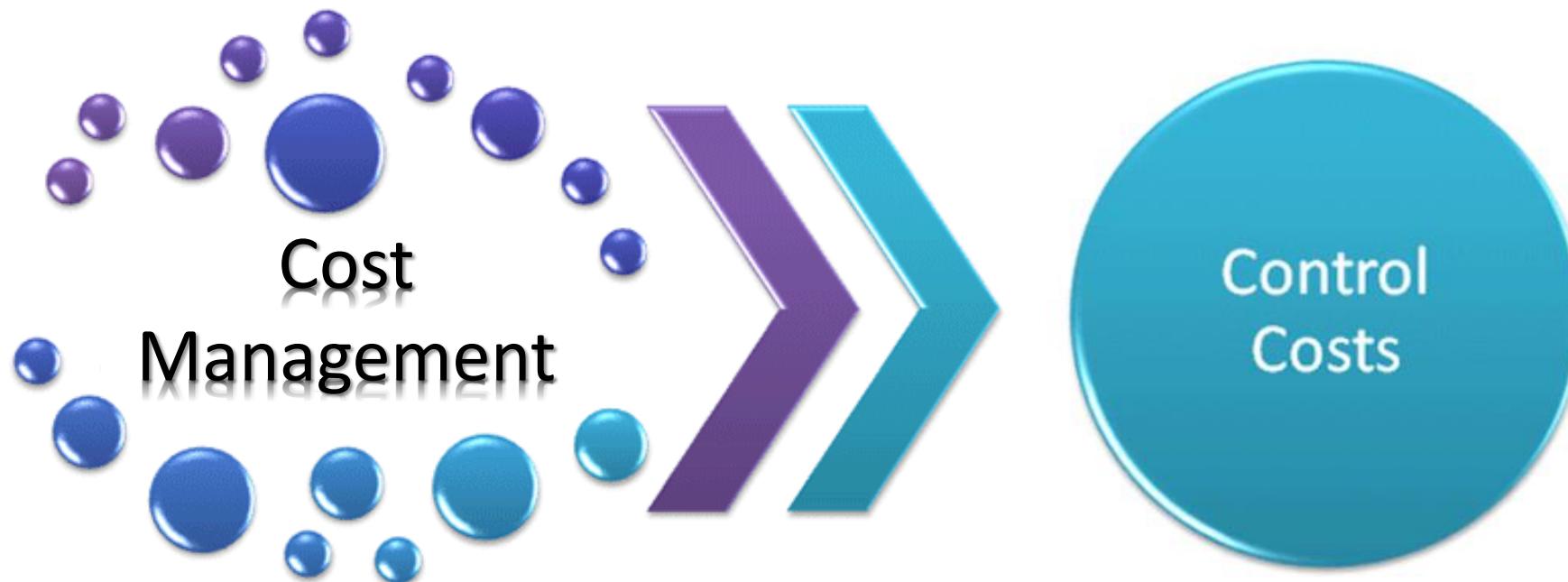


Figure 7-9. Cost Baseline, Expenditures, and Funding Requirements

# Lecture 04 : Project Cost Management

## 4. Control Costs (M/C)



# Lecture 04 : Project Cost Management

## 4. Control Costs (M/C)

### ➤ Control Costs is the process of :

- Monitoring the status of the project to update the project costs and managing changes to the cost baseline.
- هي عملية مراقبة حالة المشروع من أجل تحديث تكاليف المشروع وإدارة التغييرات التي تطأ على الخط المرجعي للتكلفة.

### ❖ The key benefit of this process:

- ✓ The cost baseline is maintained throughout the project.
- ✓ الحفاظ على الخط المرجعي للتكلفة على مدار المشروع.

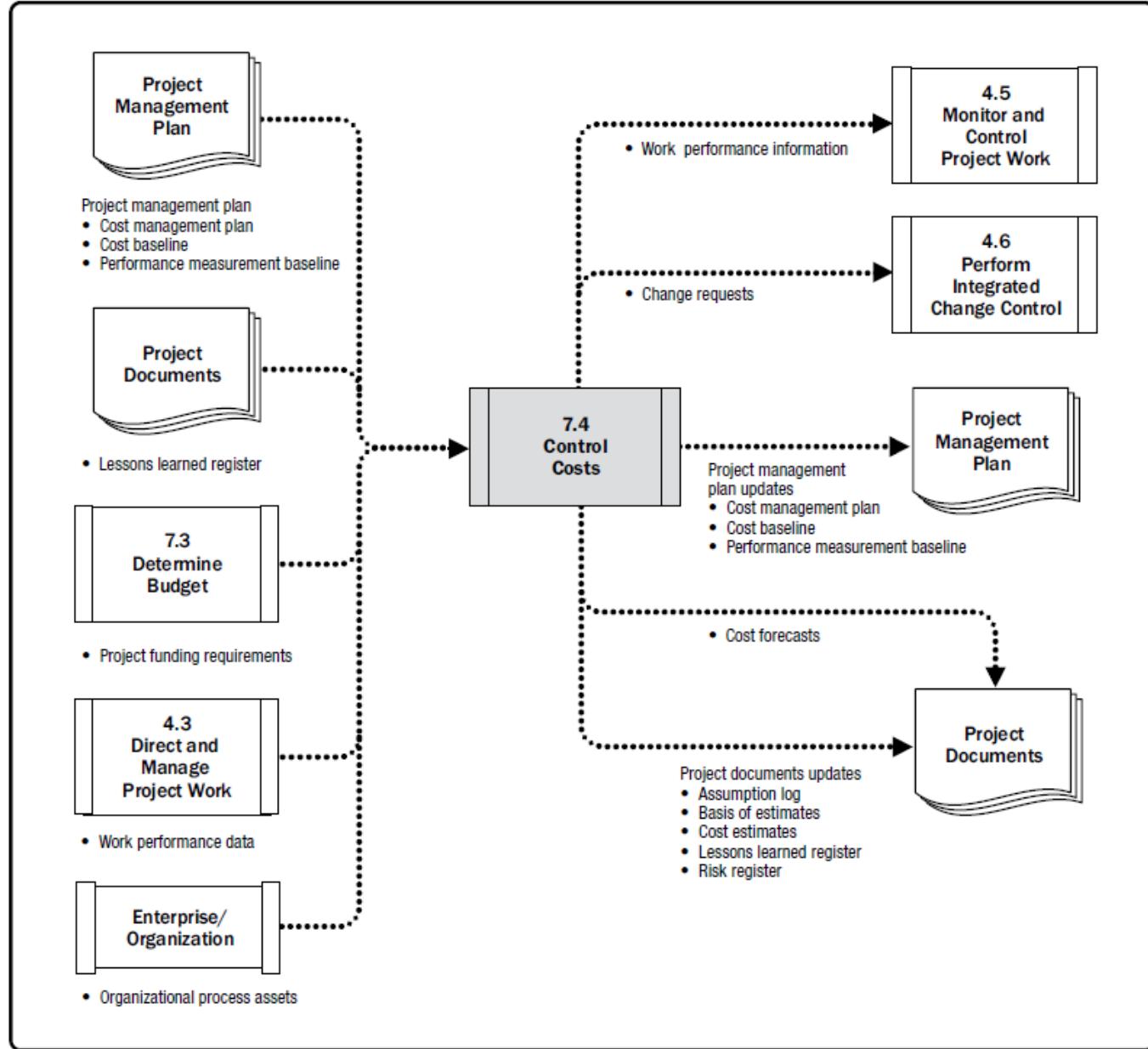


Figure 7-11. Control Costs: Data Flow Diagram

# Project Cost Management

## ( 4 ) Control Costs



# Lecture 04 : Project Cost Management

## 4. Control Costs (M/C)

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### Data Analysis

#### Earned Value analysis:

1- Planned Value (PV)      قيمة الأعمال المخطط تنفيذها عند نقطة زمنية محددة

- It is the authorized budget planned for the work to be accomplished for an activity.

هي الموازنة المعتمدة المخططة للأعمال المطلوب تنفيذها لنشاط أو مكون بهيكل تجزئة العمل.

2- Earned value (EV)      القيمة المكتسبة من تنفيذ اعمال فعلية عند نقطة زمنية محددة

- It is the budget associated with the authorized work that has been completed.

هي الموازنة المقرنة بالأعمال **المعتمدة** التي تم استكمالها.

3- Actual Cost (AC)      التكاليف الفعلية للأعمال التي تم تنفيذها

- Is the realized cost incurred for the work performed on an activity during a specific time period

هي **التكلفة الواقعية المتکبدة** للأعمال المنفذة في النشاط خلال فترة زمنية معينة.

# Lecture 04 : Project Cost Management

## 4. Control Costs (M/C)

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### Data Analysis

#### Variance analysis: تحليل التباين.

1- Schedule variance (SV) هو مقياس لأداء الجدول الزمني معبراً عنه بالفرق بين القيمة المكتسبة والقيمة المخططة.

$$( SV = EV - PV )$$

2- Cost variance (CV) هو قياس أداء التكلفة للمشروع ويتم التعديل عنه بالفرق بين القيمة المكتسبة والتكلفة الفعلية.

$$( CV = EV - AC )$$

3- Schedule Performance index (SPI)

هو مقياس لكفاءة الجدول الزمني

$$( SPI = EV / PV )$$

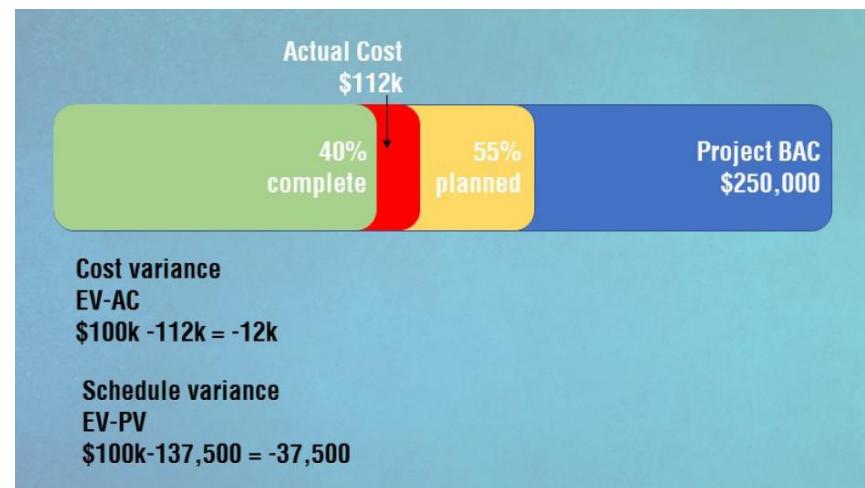
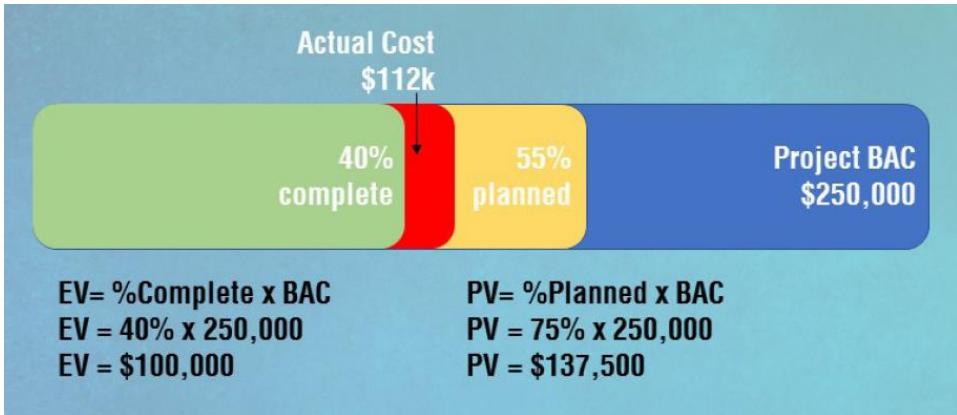
4- Cost Performance index (CPI)

مقياس كفاءة تكلفة الموارد بالموازنة

$$( CPI = EV / AC )$$

# Lecture 04 : Project Cost Management

## 4. Control Costs (M/C)



# Lecture 04 : Project Cost Management

## 4. Control Costs (M/C)

Example :

	Cost/Unit	Quantity
Budget	1000	180
Actual	1200	160

$$PV = 1000 \times 180 = 180,000.00$$

$$EV = 1000 \times 160 = 160,000.00$$

$$AC = 1200 \times 160 = 192,000.00$$

Variance :

$$SV = EV - PV = 160'000 - 180'000 = -20'000 \quad (\text{Behind Schedule})$$

$$CV = EV - AC = 160'000 - 192'000 = -32'000 \quad (\text{Over Budget})$$

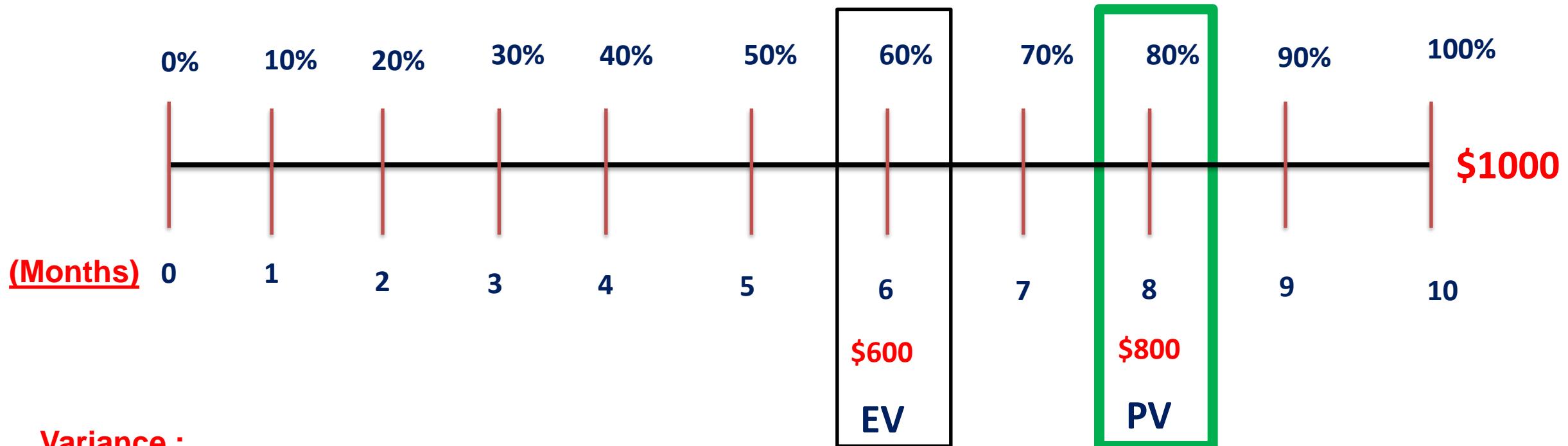
Performance Index

$$SPI = EV / PV = 160'000 / 180'000 = 0.88 \quad (\text{Behind Schedule})$$

$$CVI = EV / AC = 160'000 / 192'000 = 0.833 \quad (\text{Over Budget})$$

# Lecture 04 : Project Cost Management

## 4. Control Costs (M/C)



### Variance :

$$SV = EV - PV = 600 - 800 = -200 \quad (\text{Behind Schedule})$$

$$CV = EV - AC = 600 - 900 = -300 \quad (\text{Over Budget})$$

AC=\$900

### Performance Index

$$SPI = EV / PV = 600 / 800 = 0.75 \quad (\text{Behind Schedule})$$

$$CVI = EV / AC = 600 / 900 = 0.66 \quad (\text{Over Budget})$$

# Lecture 04 : Project Cost Management

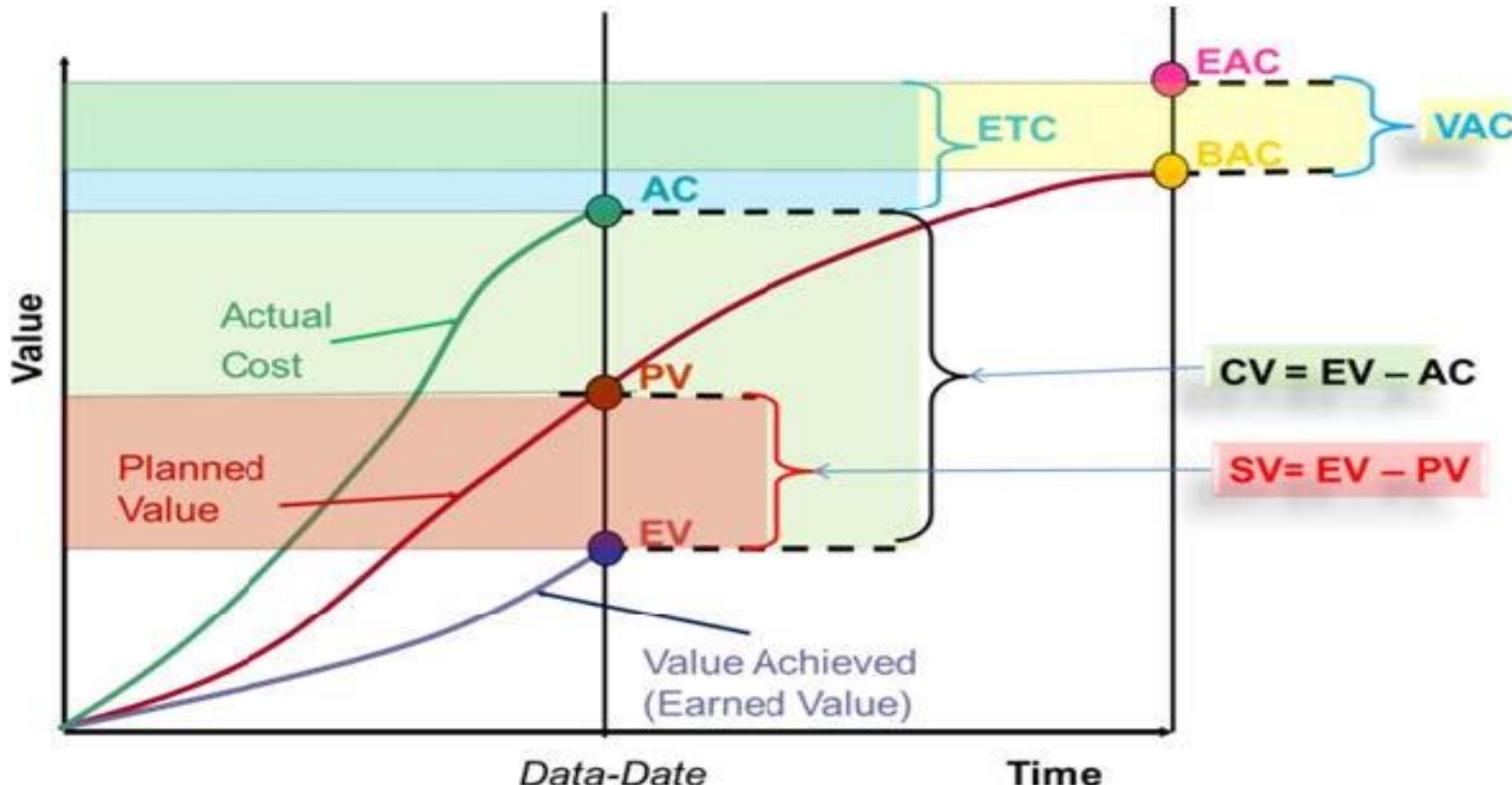
## 4. Control Costs (M/C)

TT

Data Analysis

Variance analysis:

تحليل التباين.



# Lecture 04 : Project Cost Management

## 4. Control Costs (M/C)

SV > 0	Ahead of Schedule
SV = 0	On Schedule
SV < 0	Behind Schedule

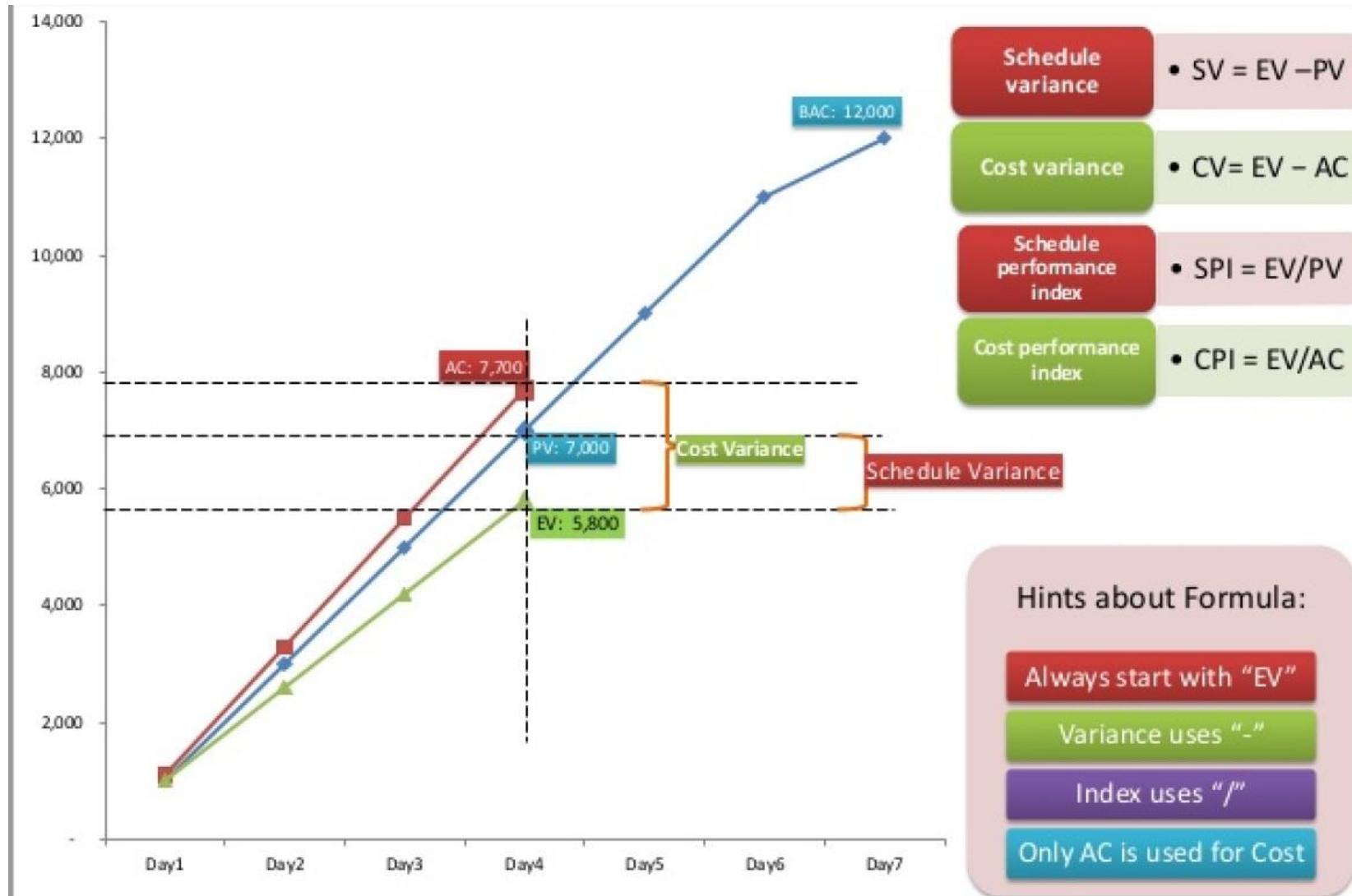
CV > 0	Under Budget
CV = 0	On Budget
CV < 0	Over Budget

SPI > 1	Ahead of Schedule
SPI = 1	On Schedule
SPI < 1	Behind Schedule

CPI > 1	Under Budget
CPI = 1	On Budget
CPI < 1	Over Budget

# Lecture 04 : Project Cost Management

## 4. Control Costs (M/C)



# Lecture 04 : Project Cost Management

## 4. Control Costs (M/C)

TT

### Data Analysis

Trend analysis: تحليل الاتجاه.

Forecasting التوقع

- Estimate at Completion (EAC) = Actual costs + Estimate to Complete (ETC)

القيمة المتوقعة في نهاية المشروع = القيمة الفعلية حتى الآن + المتوقع لانهاء المشروع

**Only three of the more common methods are described as follows:**

**1- If future work will be accomplished at the planned rate, use:**

$$EAC = AC + BAC - EV$$

التكاليف الفعلية + المتبقى في الميزانية

**2- If the CPI is expected to be the same for the remainder of the project**

$$EAC = BAC/CPI$$

ويفترض أن يتم تنفيذ أعمال التقدير حتى الاكتمال وفق مؤشر أداء التكلفة التراكمي نفسه الذي واجهه المشروع حتى اليوم

**3- If both the CPI and SPI influence the remaining work**

$$EAC = AC + [(BAC - EV) / (CPI \times SPI)]$$

# Lecture 04 : Project Cost Management

## 4. Control Costs (M/C)



### Bridge construction Project:

Duration : 12 months, Cost of the Project: 10,000,000

Current status at end of month 6:

Work completed: only 55% of complete project

Actual cost: 5,000,000

#### EAC based on Budgeted Rate:

- $EAC = AC + (BAC - EV)$
- $BAC = 10,000,000$
- $AC = 5,000,000$
- $EV = 55\% \times 10,000,000 = 5,500,000$
- $EAC = 5,000,000 + (10,000,000 - 5,500,000)$
- $EAC = 5,000,000 + 4,500,000$
- **EAC = 9,500,000**

#### EAC based on Current Progress (Based on CPI):

- $EAC = BAC / CPI$
- $BAC = 10,000,000$
- $AC = 5,000,000$
- $EV = 55\% \times 10,000,000$
- $EV = 5,500,000$
- $CPI = EV / AC$
- $CPI = 5,500,000 / 5,000,000 = 1.1$
- $EAC = 10,000,000 / 1.1$
- **EAC = 9,090,909**

#### EAC based on Current Progress (Based on CPI & SPI):

- $EAC = AC + [(BAC - EV) / (CPI \times SPI)]$
- $PV = 50\% \text{ of } 10,000,000 = 5,000,000$   
*(six months completed)*
- EV & CPI calculation is same.
- $SPI = EV / PV$
- $SPI = 5,500,000 / 5,000,000 = 1.1$
- $EAC = 5,000,000 + [(10,000,000 - 5,500,000) / (1.1 \times 1.1)]$
- $EAC = 5,000,000 + (4,500,000 / 1.21)$
- $EAC = 5,000,000 + 3,719,008.26$
- **EAC = 8,719,008.26**

# Lecture 04 : Project Cost Management

## 4. Control Costs (M/C)

TT

### To-complete performance index (TCPI)

مؤشر الأداء للقيمة المطلوبة لإكمال المشروع

- is a measure of the cost performance that is required to be achieved with the remaining resources in order to meet a specified management goal.

هو قياس أداء التكلفة المطلوب تحقيقه باستخدام الموارد المتبقية لتحقيق هدف إداري معين

- Expressed as the ratio of the :

نسبة الاعمال المتبقية إلى التمويل المتبقى

Formula:

$$\frac{\text{Work Remaining (BAC-EV)}}{\text{Funds Remaining (BAC-AC) or (EAC-AC)}} = \text{TCPI}$$

- The equation for the TCPI based on the BAC:

**(BAC – EV) / (BAC – AC).**

**(BAC – EV) / (EAC – AC).** If BAC is no longer Valid

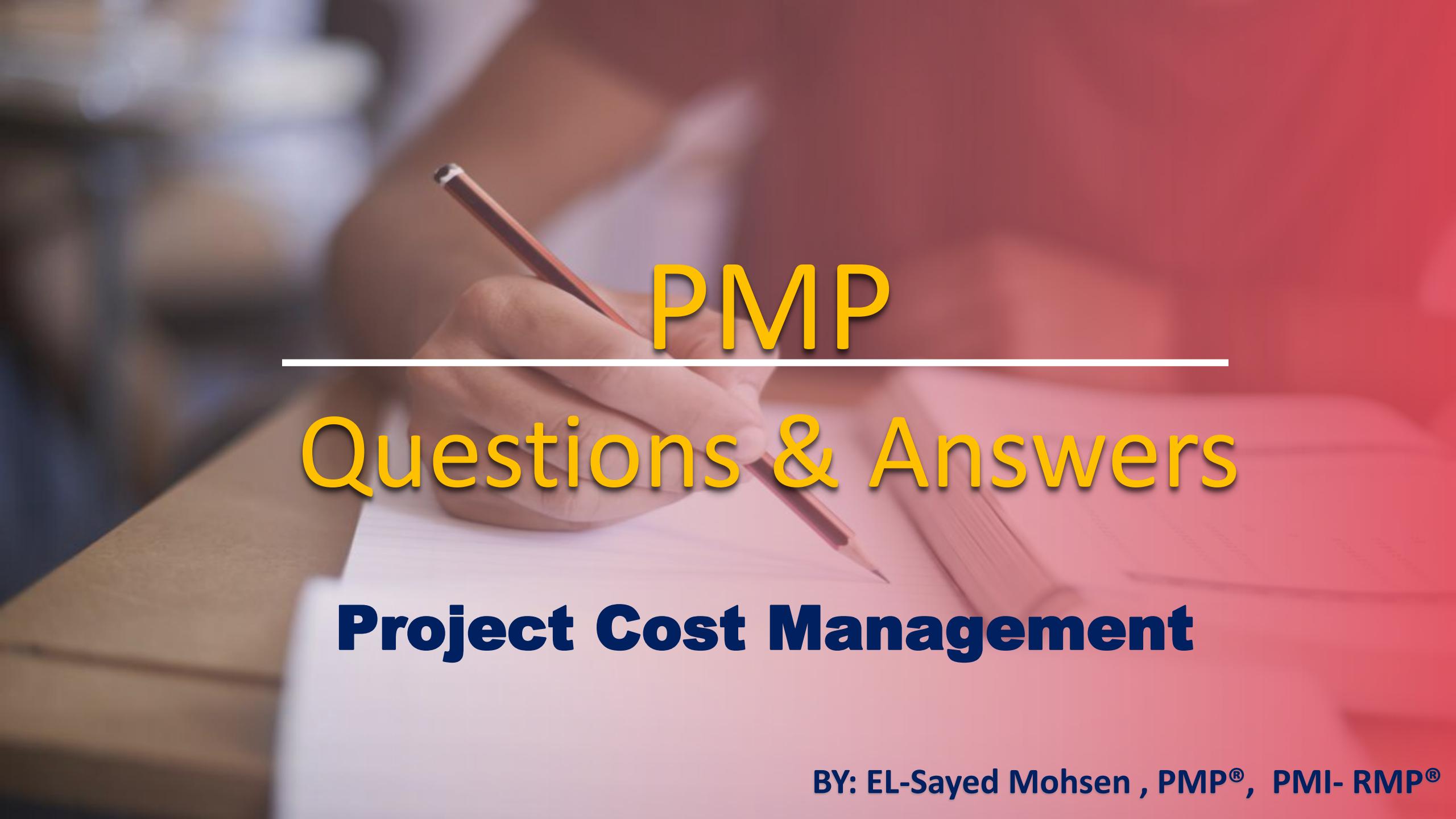


If **TCPI > 1** Harder to complete

If **TCPI < 1** Easier to complete

### To-Complete Performance Index

- Can you meet the BAC?
- Can you meet the EAC?
- $\text{TCPI}=(\text{BAC}-\text{EV})/(\text{BAC}-\text{AC})$
- $\text{TCPI}=(\text{BAC}-\text{EV})/(\text{EAC}-\text{AC})$

A close-up photograph of a person's hand holding a pencil, poised to write on a white notebook. The background is blurred, showing a wooden desk and some papers.

# **PMP**

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# **Questions & Answers**

## **Project Cost Management**

**BY: EL-Sayed Mohsen , PMP®, PMI- RMP®**



Q1) your vice president asked you what the Estimate at Completion (EAC) will be for a small project you are working on. You were given a budget of \$30,000, and to date you have spent \$20,000 but only completed \$10,000 worth of work. You are sure the future work will be accomplished at the planned rate. What is the EAC?

- A- \$10,000
- B- \$60,000
- C- \$30,000
- D- \$40,000

$$\begin{aligned} \text{EAC} &= \text{AC} + \text{BAC} - \text{EV} \\ &= 20,000 + 30,000 - 10,000 \\ &= 40,000 \end{aligned}$$

**ANSWERS**

*D*



Q2) You are working on a project to set up a call centre for your client. The duration of the project is two years. One year has passed, however, only 40% of the work has been completed against the schedule, which says that by now 50% of the work should have been completed. To date, you have spent 60% of the budget. What is the cost performance index of the project?

- A- 1.25
- B- 1.5
- C- 0.8
- D- 0.67



In the question, you have not been provided with the budget, therefore, let us assume that the project budget is “x”.

$$\begin{aligned}\text{Earned Value} &= 40\% \text{ of the budget} \\ &= 0.4x\end{aligned}$$

$$\begin{aligned}\text{Actual Cost} &= 60\% \text{ of the budget} \\ &= 0.6x\end{aligned}$$

$$\begin{aligned}\text{We know that the cost performance index} &= (\text{Earned Value}) / (\text{Actual Cost}) \\ &= 0.4x / 0.6x \\ &= 0.67\end{aligned}$$



Q3) You have received an urgent call from management and they asked you to find the cost estimate of a new project. Since time is critical and you have to provide them with the cost estimate, which technique will you use to calculate the project cost?

- A- Parametric**
- B- Analogous**
- C- Bottom up**
- D- Critical path method**





Q4) The CV= -1.1 and the SV=1.2. How is your project doing?

- A. Ahead of schedule, under budget
- B. Ahead of schedule, over budget
- C. Behind schedule, under budget
- D. Behind schedule, over budget





**Q5) in your project, SPI is 0.8, CPI 1.2. You analyzed the baseline and decided to return the schedule back to meet customer plan. You will:**

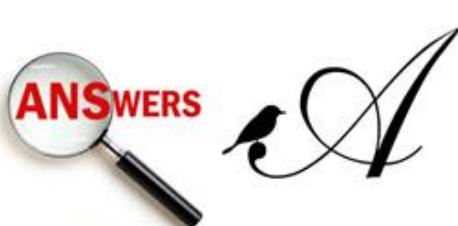
- A- Check tasks which can be removed from baseline**
- B- Check with team task can be automated and save time**
- C- Check option of crashing the project**
- D- Check with your sponsor**





**Q6) The estimating technique that uses a statistical relationship between the historical data and other variables (e.g., square footage in construction) to calculate an estimate for an activity parameters is called:**

- A- Parametric Estimating**
- B- Analogous Estimating**
- C- Vendor Bid Analysis**
- D- Bottom-up Estimating**



#### 7.2.2.3 PARAMETRIC ESTIMATING

Described in Section 6.4.2.3. Parametric estimating uses a statistical relationship between relevant historical data and other variables (e.g., square footage in construction) to calculate a cost estimate for project work. This technique can produce higher levels of accuracy depending on the sophistication and underlying data built into the model. Parametric

**PMBOK 244**



Q7) As part of earned value management (EVM), a project manager is calculating the to-complete performance index (TCPI) based on EAC. The data he has is as follows: The budget at completion for the project is \$100,000. The earned value for the project is \$25,000. The actual costs to date are \$40,000, and the estimate at completion is \$115,000. What is the TCPI that he will get?

- A- 1.1
- B- 0.9
- C- 1
- D- 0

$$\text{BAC-EV/EAC-AC}$$

$$\frac{100,000-25,000}{115,000-40,000} = 1$$



C



**Q8) For the week of July 15, you will report to management that your project has an EV of \$7700 and a PV of \$9600. What is the status of your project?**

**A- Ahead of schedule**

**B- On schedule**

**C- Not enough information provided**

**D- Behind schedule**

**EV < PV**

**SO the Project is Behind Schedule**





**Q9) You are reviewing your project where PV=5000 & AC=4000 & EV=3000. What is the project situation?**

- A- Project is going normal and it will be managed and closed normally.**
- B- Project is under budget but ahead of schedule.**
- C- Project is going slower than planned.**
- D- Project should be terminated as no solution to fix it.**



*C*

**EV < AC&PV**

**SO the Project is Behind Schedule & Over Budget  
= Project is going slower than planned**



**Q10) You are a Project manager in construction Project. If an pessimistic estimate (P) = \$12, optimistic estimate for an activity (O) = \$8, Most likely (M) = \$10. What is the Cost estimate activity by Beta?**

- A- 9.5 \$**
- B- 9 \$**
- C- 11 \$**
- D- 10 \$**

$$P+4M+O/6$$

$$\begin{aligned} &12+4*10+8/6 \\ &=10 \end{aligned}$$





**Q11) You are a project manager in Big construction project, During the implementation phase the Project Sponsor tells you that the project will be terminated because of tumble in the credit limit of the bank. What could have done by the project manager to prevent this type of situation?**

- A- Benchmarking**
- B- Cost Aggregating**
- C- Funding Limit Reconciliation**
- D- Historical information Review**



*C*



**Q12) Your project in the planing phase, the project team commence to estimating cost by using work breakdown structure. What is the tool the project team use ?**

- A- Analogous estimating**
- B- Parametric estimating**
- C- Top-down estimating**
- D- Bottom-up estimating**



**Q13) You are managing a project which has BAC 90.000 \$ and supposes to finish in 9 months. Five months have passed; however, four months of the work have been completed. To date, you have spent 60% of the budget. What are the EV, CPI, and SPI?**

- A- EV= 40,000 & CPI = 0.74 & SPI = 0.8**
- B- EV= 35,000 & CPI = 0.74 & SPI = 2**
- C- EV= 30,000 & CPI = 0.74 & SPI = 0.9**
- D- EV= 35,000 & CPI = 0.74 & SPI = 0.9**

$$\begin{aligned} \text{EV} &= 4/9 * 90,000 \\ &= 40,000 \end{aligned}$$



**ANSWERS**





Q14) Which document provides high-level cost information that is useful when planning for project cost management?

- A- Cost management plan**
- B- Cost baseline**
- C- Management reserve**
- D- Project Charter**

ANSWERS

D



Q15) A project team had planned to accomplish \$25,000 worth of work to date. It has spent \$23,000 to date, and accomplished \$20,000 worth of work. Which of the following statements is true about the project?

- A- The project is \$5,000 under budget
- B- The project is \$5,000 Over budget
- C- The project is \$3,000 Over budget
- D- The project is \$2,000 under budget

$EV = \$20,000$

$AC = \$23,000$

$$\begin{aligned} CV &= EV - AC \\ &= -3,000 \end{aligned}$$



C



Q16) You are the project manager of the HDM Project. Your project must be completed by September 11 and cannot exceed \$10,000. \$10,000 is an example of which one of the following?

**A- Constraint**

**B- Management reserve**

**C- Scheduled completion date**

**D- Assumption**

ANSWERS



**Q17) You are working on a project to construct four buildings, each building will be completed every month with a cost 100,000. During a status meeting after three months, the project manager informs the team that:**

**1st Building completed with AC = \$100,000**

**& 2nd Building completed with AC = \$120,000**

**& 3rd Building only 50% completed with AC = \$60,000.**

**What is the TCPI?**

**A-125%.**

**B-120%.**

**C-110%.**

**D- 100%.**



$BAC = 4 * 100,000 = 400,000 \text{ & } AC = 100,000 + 120,000 + 60,000 = 280,000 \text{ & } EV = 2.5/4 * 400,000 = 250,000$  So the  $TCPI = (BAC - EV) / (BAC - AC) = (400,000 - 250,000) / (400,000 - 280,000) = 1.25 = 125\%$

**Q18) Based on the following table, which of the following activities will be within the budget and behind schedule?**

- A-Activity A.**
- B-Activity B.**
- C-Activity C**
- D- Activity D.**

Activity	PV	AC	% of work completed	BAC
A	8,000	7,000	10	70,000
B	9,000	9,000	20	50,000
C	8,000	8,500	30	30,000
D	11,000	11,000	40	20,000



To solve this question, you should calculate the CV and SV for all activities:

Activity A:  $CV=EV-AC ( 7000-7000 = 0 )$  &  $SV= EV-PV ( 7000-8000 = -1000 )$  so the project is within budget and behind schedule .

Activity B:  $CV=EV-AC ( 10,000-9000 = 1000 )$  &  $SV= EV-PV ( 10,000-9000 = 1000 )$  so the project is under budget and ahead of schedule .

Activity C:  $CV=EV-AC ( 9,000 - 8500 = 500 )$  &  $SV= EV-PV ( 9,000 - 8000 = 1000 )$  so the project is under budget and ahead of schedule .

Activity D:  $CV=EV-AC ( 8,000 - 11,000 = -3000 )$  &  $SV= EV-PV ( 8,000 - 11000 = -3000 )$  so the project is over budget and behind schedule .

SO the Correct answer is Activity A

**Q19) While Estimating costs - you are expecting some rework in deliverables. However, the amount of rework is not known. This is an example of**

- A- Management reserves**
- B- Bottom-Up Estimation**
- C- Contingency Reserves**
- D- Three-Point Estimation**

ANSWERS

**Q20) The most recent analysis of the project shows a CPI value is 0.8. If we add resources for activities on the critical path, what is going to happen with CPI?**

- A- Increase**
- B- Decrease**
- C- Stay the same**
- D- The project is over budget and the project manager should terminate the project**



*B*

**Q21) You are managing a few projects and the sponsor asks you to submit CPI and TCPI numbers for them. You provided CPI = 1 for project A, CPI = 1.2 for project B, TCPI = 0.9 for project C and TCPI = 1.2 for project D. Which project do you think the sponsor might terminate based on this data?**

- A- Project A**
- B- Project C**
- C- Project D**
- D- Project B**



*C*

**Q22) You have submitted the cost baseline to the sponsor. After a review, the sponsor tells you that the amount you have estimated for a certain month is more than the funds the sponsor can disburse you for that month. What do you think the sponsor will advise you to do next?**

- A- To reschedule the work of that month**
- B- To remove some of the work scope for that month**
- C- To reduce the cost estimates of the activities for that month**
- D- To motivate the project team to do the work of that month without being fully paid for it**



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