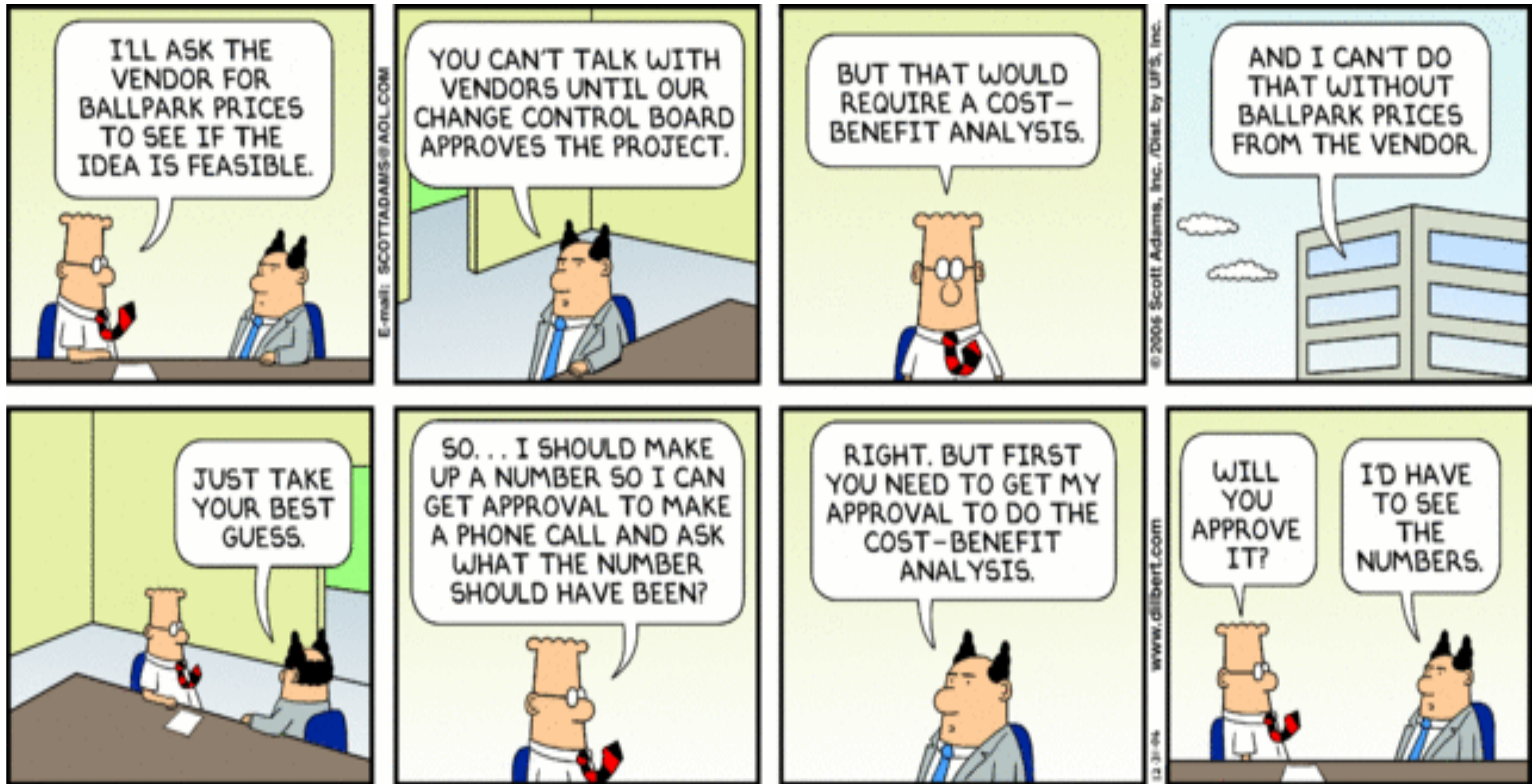


# Project Cost Management (Cost Management Knowledge Area)

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May 23, 31, 2012 MUSE INTERNATIONAL





## Project Cost Management For Healthcare IT



# Project Cost Management

## Healthcare Project Management



### Learning Objectives:

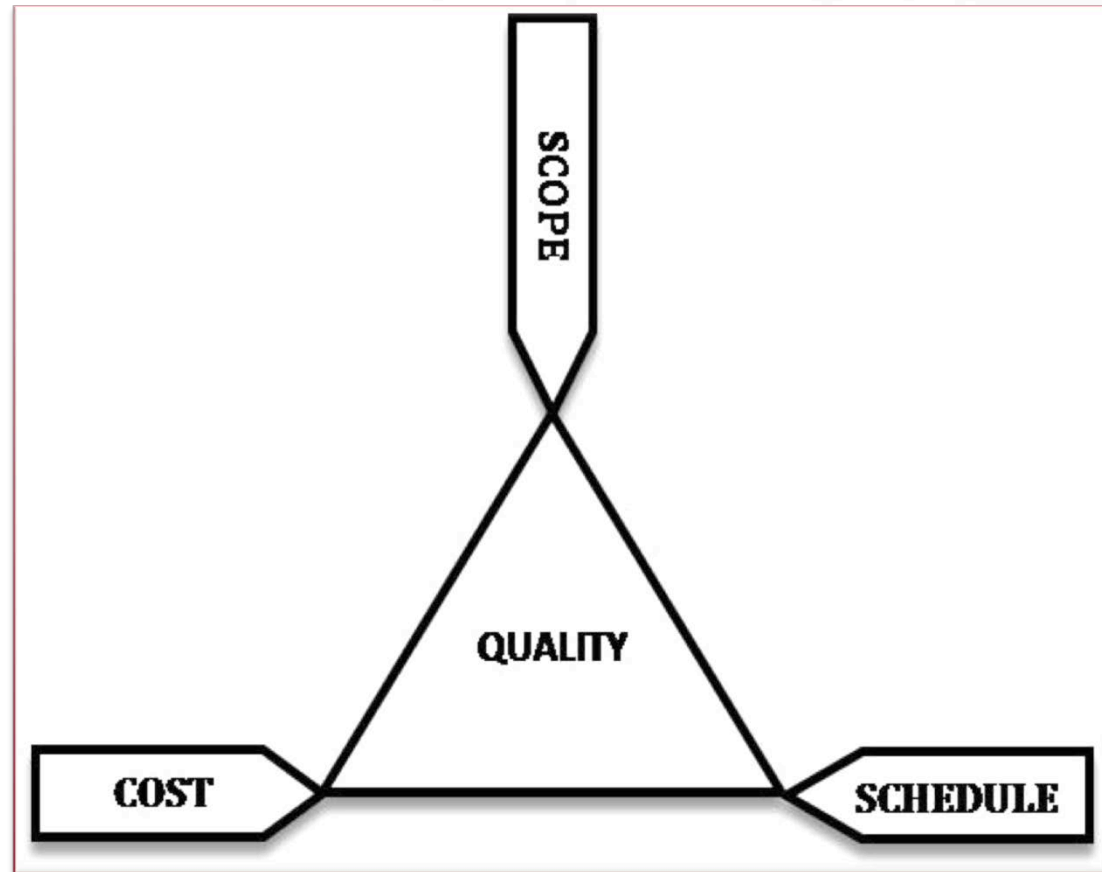
- Learn and understand the Essence of Cost Management for Healthcare IT Project Managers is **“to be in CONTROL of the PROJECT COSTS and NOT let the COSTS CONTROL YOU”**  
(sound familiar to the Time management seminar?)
- Review PMBOK body of knowledge regarding the management of COSTS...which is primarily about “estimating, budgeting and controlling costs so that the project can be completed within the approved budget”.

# Project Cost Management

## Healthcare Project Management



### Review: Cost Management – a Triple Constraint





# Project Cost Management

## Healthcare Project Management



### Learning Objectives Continued:

We will be reviewing key processes in the process groups including **Planning and Monitoring/Controlling in the COST Management Knowledge Area.**

The **THREE** processes of **Project Cost Management** are preceded by a planning effort by the Project Management team, done as a part of the develop Project Management plan process – which produces the **cost management plan.**



# Project Cost Management

## Healthcare Project Management



### Learning Objectives Continued:

**The Cost Management plan** (from your project plan –integration Knowledge Area) **sets the format for planning, structuring, estimating, budgeting and controlling project costs. The cost management plan can establish:**

- Level of accuracy
- Units of measure
- Organizational procedures links (acct. codes)
- Control thresholds
- Rules of performance measurement
- Reporting formats
- Process descriptions

“PMBOK” is a registered mark of Project Management Institute, Inc.

# Project Cost Management

## Healthcare Project Management



### Learning Objectives Continued:

**Level of accuracy-** activity estimates will adhere to rounding of data , and may include an amount for contingencies

**Units of measure-** the unit used in measurement, such as hours, days, weeks, defined for project resources

**Organizational procedures links-** control account codes linked to your organizations accounting system (for project budgeting)

**Control thresholds-** variance thresholds for costs

**Rules of performance measurement** - earned value rules-establishes the earned value measurements to be employed

## Project Management Process Groups

Knowledge Areas	Initiating	Planning	Executing	Monitoring & Controlling	Closing
Integration	1-Develop Project Chart	2-Develop Project Management Plan	3-Direct and Manage Project Execution	4-Monitor and Control Project Work 5-Perform Integrated change control	6-Close Project or Phase
Scope		1-Collect Requirements 2-Define Scope 3-Create WBS		5-Verify Scope 6-Control Scope	
Time		1-Define activities 2-Sequence Activities 3-Estimate activity resources 4-Estimate activity durations 5-Develop Schedule		6-Control Schedule	
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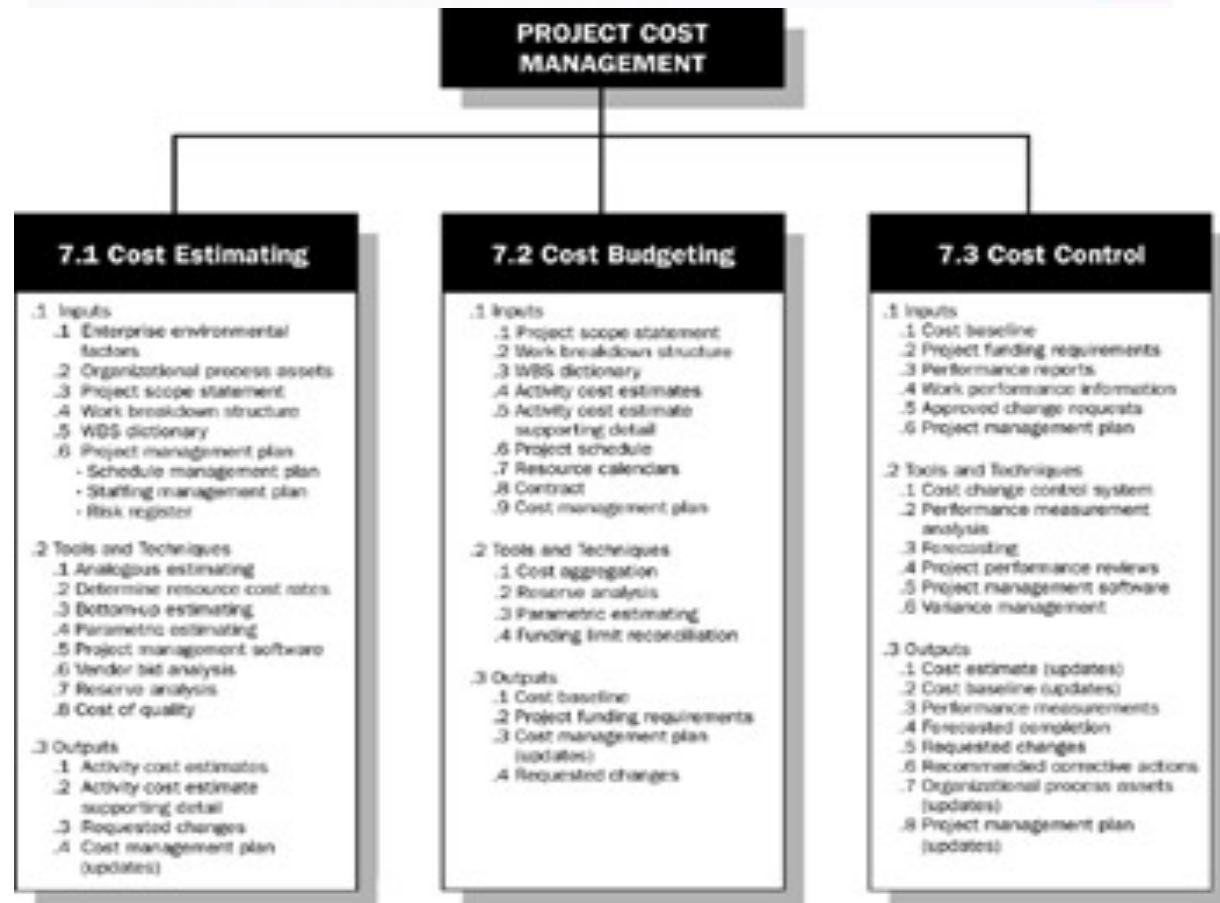




# Project Cost Management

## Healthcare Project Management

### Cost Management Overview



# Project Cost Management

## Healthcare Project Management

### **Learning Objectives Continued:**

Discuss and Understand the **PRIMARY OUTPUTS** of the 3 Cost Processes

**I. Estimate Costs Process** - Activity Cost Estimates

**II. Determine Budget Process** - Cost Performance Baseline and Project Funding Requirements

**III. Control Costs Process** - Work Performance Measures and Budget Forecasts

# Project Cost Management

## Healthcare Project Management

### **Learning Objectives Continued:**

#### **Learn to use the 13 key formulas for Cost Management:**

- Earned Value
- Budgeted at Completion
- Planned Value
- Actual Cost
- Schedule Variance
- Cost Variance
- Cost Performance Index
- Cumulative CPI
- Schedule Performance Index
- Estimate at Completion
- Estimate to Completion
- Variance at Completion
- To-Complete Performance Index

# Project Cost Management

## Healthcare Project Management

### **Learning Objectives continued:**

- Learn important concepts like **Life-Cycle costing**, where you look at the “total cost” of ownership from purchase through operations to disposal of a product.
- Discuss the significance of **Value engineering**, the practice of getting more out of the project in every possible way.
- In general, Value engineering “squeezes more benefit and value from each project aspect.”

# Project Cost Management

## Healthcare Project Management

### Learning Objectives continued:

- **Project Cost Management** is primarily concerned with the cost of the resources needed to complete the projects activities.
- However, Project Cost Management will also consider the effect of project decisions on the recurring cost of using, maintaining and supporting the product, service or result of the project.



(EXAMPLE of CUSTOM DEVELOPMENT)- a decision to add cost to the project and develop a custom application, may add future costs of maintaining and supporting the custom software application.



# Project Cost Management

## Healthcare Project Management

### Learning Objectives continued:

➤ **We will talk about Direct Costs vs. Indirect Costs**, an assumption regarding your projects indirect costs should be included in your SCOPE STATEMENT

**Direct Costs** are for those activities and specific projects, such as salaries for project staff, materials or software for a particular project

**Indirect Costs** are not directly accountable to a cost object such as a particular project, function, or product (THEY CAN BENEFIT MORE THAN ONE PROJECT and CANNOT BE TIED DIRECTLY TO A SPECIFIC PROJECT) – such as security costs, administration, personnel costs

# Project Cost Management

## Healthcare Project Management

### Learning Objectives continued:

➤ And Other types of cost:

**Fixed Costs** - costs that stay the same throughout the life of the project and are unaffected by changes in activity level (examples: such as a piece of hardware like a server, insurance costs, rent of a room)

**Variable Costs-** costs that differ on a project and vary with the level of activity, (examples such as hourly labor, supplies, fuel costs)

**Sunk Costs-** expenditures that cannot be recovered and are common to all options and can be ignored (like spilled milk, they are unrecoverable, and are treated as though they are irrelevant)

**Opportunity Costs-** what else could have been done with these resources, the trade-off

## Project Management Process Groups

### Knowledge Areas

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# Project Cost Management

## Healthcare Project Management

- I. **ESTIMATE COSTS (*Planning process group/ Cost Management Knowledge area*):** the process of developing an approximation of the monetary resources needed to complete project activities.

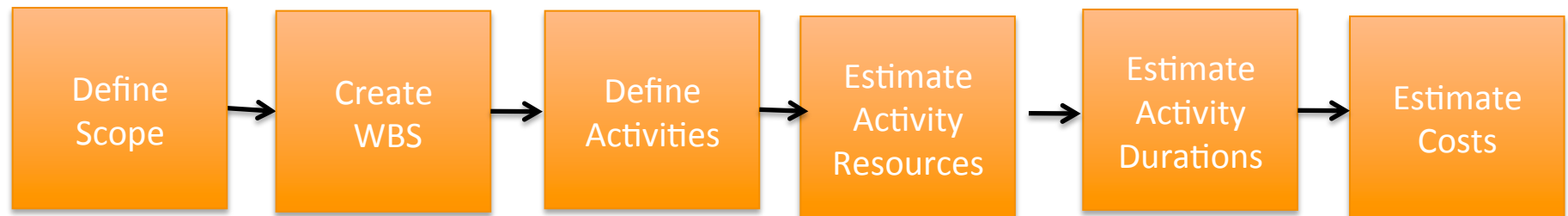
**Cost estimates are a prediction based on information known at a given point in time.**

**Cost estimates are refined during the course of the project as additional detail becomes available.**

# Project Cost Management

## Healthcare Project Management

**ESTIMATE COSTS – certain processes must occur BEFORE you can estimate costs like estimating activity resources and your projects activity durations!**





# Estimate Costs Process

Planning process group/Cost Knowledge Area

- Scope Baseline
- Project Schedule
- Human Resource Plan
- Risk Register
- Enterprise Environmental Factors
- Organizational Process Assets

Inputs

Tools and Techniques

1. Expert Judgment
2. Analogous estimating
3. Parametric Estimating
4. Bottom-Up Estimating
5. Three-Point Estimating
6. Reserve Analysis
7. Cost of Quality
8. Project Management Estimating Software
9. Vendor bid Analysis

Outputs

- Activity COST estimates
- Basis of Estimates
- Project Document Updates

## (6) Inputs for Estimate Costs Process Healthcare Project Management

1. **Scope Baseline** is made of the approved scope statement (**often includes assumption about direct and or not including indirect costs**), the WBS and the WBS dictionary. Assumptions and constraints can dramatically impact your costs estimates!
2. **Project Schedule** – the project schedule contains all the activities, also certain types of labor or resources may be more expensive at some times than other times during the year. The project schedule will help the team anticipate the impact
3. **Human Resource Plan** – project staffing attributes, personnel rates, staffing from a specific vendor costs vary, is necessary for developing project cost estimates.

## (6) Inputs for Estimate Costs Process Healthcare Project Management

3. **Risk Register**- should be reviewed to consider risk mitigation costs. Which can be either viewed as threats or opportunities for the project and can have an impact on activity and overall project costs.
4. **Enterprise Environmental Factors (EEF)** **market conditions** can influence costs, as to what is available in your region, or global supply area, and resource cost rates are sometimes published commercial information for healthcare resources.
5. **Organizational Process Assets** - can influence estimating costs such as hospital cost estimating policies, previous templates used at your facility, historical information, lessons learned.

## (9) Tools and Techniques for Estimating Costs



1. **Expert Judgment**- experts who are guided by historical information, provide valuable insight about the environment and possibly prior similar projects
2. **Analogous Estimating** – analogous cost estimating uses values of parameters such as scope, cost, budget and duration or measures of scale such as size, weight complexity from previous, similar projects, as basis for estimating the same measure or parameter for your current project (accuracy depends on how similar projects were)
3. **Parametric Estimating** – uses statistical relationships between historical data and other variables to CALCULATE an estimate for activity parameters, such as cost, budget and duration. (can produce higher levels of accuracy, based on the sophistication – need more historical data)

## (9) Tools and Techniques for Estimating Costs



**4. Bottom-Up Estimating** – is a method for estimating a component of work. The cost of individual work packages or activities is estimated, and then “rolled up” to higher levels for reporting and tracking.

**5. Three-Point Estimating**- this method uses three estimates to define a range for an activities cost.

- **Most Likely** – based on realistic effort assessment and predicted expense
- **Optimistic**- based on best case scenario
- **Pessimistic**- worst case scenario

**Expected =  $\frac{\text{Optimistic} + 4(\text{Most Likely}) + \text{Pessimistic}}{6}$**



## (9) Tools and Techniques for Estimating Costs

6. **Reserve Analysis**- includes a contingency reserve to buffer for uncertainty and project slippage. This reserve may be developed by various methods and will be used, reduced or eliminated as more precise project information becomes available.
7. **Cost of Quality (COQ)**- looks at all costs that will be realized in order to “achieve quality.” Also used in the Quality Planning process, costs of items not conforming to quality standards are costs of poor quality.
8. **Project Management Estimating Software** – your PMIS may help you to perform calculations and organize and store your data/info.
9. **Vendor Bid Analysis** – bids from vendors should be analysis, this is an analysis of what the project should cost based on bids from qualified vendors. Additional cost estimating work may be required by the project team to examine the price of individual deliverables, and total project costs.



## (3) Outputs for Estimating Costs

- 1. Activity Cost Estimates** – this is a quantitative assessment of the probably costs required to complete the project work. Activity costs can be presented in summary form or detail format. (includes: labor, materials, equipment, services, facilities, and allows for inflation, and indirect costs if they are included)
- 2. Basis of Estimates**- are the supporting details of the cost estimate, which should include: documentation of how the basis estimate was developed, documentation of how assumptions were made, documentation of known constraints, possible range of the estimates (+ - 15%), confidence levels.
- 3. Project Document Updates** – as activity cost estimates are created, the cost management plan (developed in Integration Mgmt.) detailing how project costs are managed will likely be updated.

## Project Management Process Groups

### Knowledge Areas

- Integration
- Scope
- Time
- Cost
- Quality
- Human Resources
- Communication
- Risk
- Procurement

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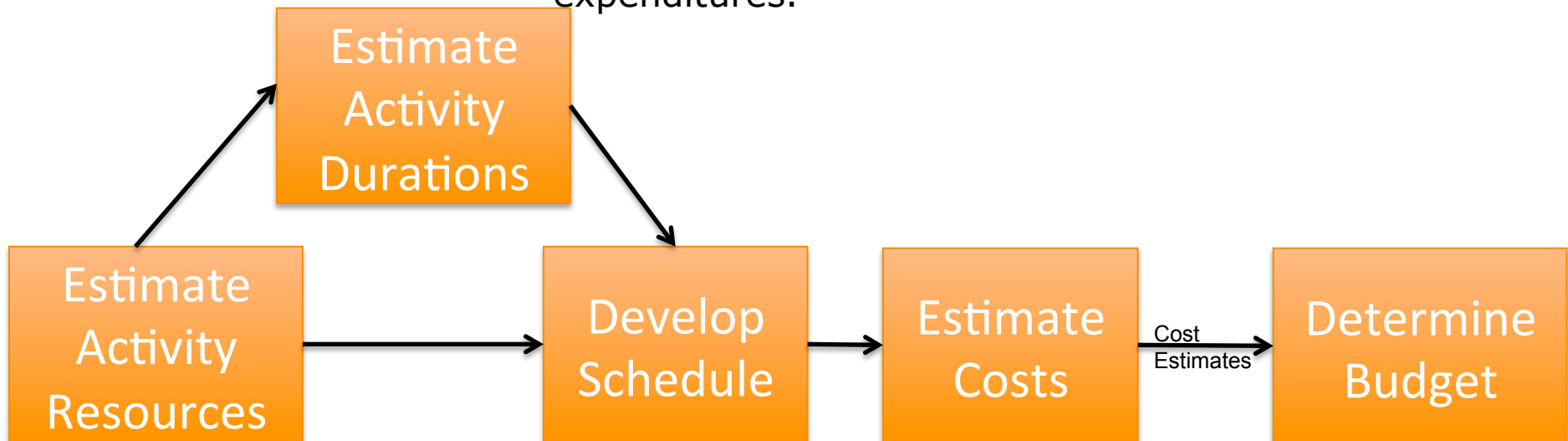


# Determine Budget Process

Planning Process Group/  
Cost Management Knowledge Area

**II. Determine Budget-** aggregates the estimated costs of individual activities or “work packages” to establish an authorized COST BASELINE. This baseline includes all authorized budgets, but excludes management reserves.

Determine budget helps to “**time phase**” the **costs** so the Hospital or Healthcare entity knows how to plan for cash flow and expenditures.



# Determine Budget Process

Planning process group/Cost Knowledge Area

- Activity Cost Estimates
- Basis for Estimates
- Scope Baseline
- Project Schedule
- Resource Calendars
- Contracts
- Organizational Project Assets

Inputs

Tools and Techniques

1. Cost Aggregation
2. Reserve Analysis
3. Expert Judgment
4. Historical Relationships
5. Funding Limit Reconciliation

Outputs

- Cost Performance Baseline
- Project Funding Requirements
- Project Document Updates

# (7) Inputs for Determine Budget Process

1. **Activity Cost Estimates** – provides cost estimates for each activity within each work package. (NOTE: OUTPUT FROM ESTIMATE COST PROCESS)
2. **Basis of Estimates** - documentation of how the basis estimate was developed, documentation of how assumptions were made, documentation of known constraints, possible range of the estimates , confidence levels. (NOTE: OUTPUT FROM ESTIMATE COST PROCESS)
3. **Scope Baseline** – contains:
  - **Scope baseline** - lists limitations by period for expenditure of project funds, funding constraints, assumptions,
  - **WBS** - provides relationships among project deliverables
  - **WBS dictionary** - provides an identification of the deliverables and a description of the work in each WBS component



## (7) Inputs for Determine Budget Process

4. **Project Schedule** – (part of the project management plan) provides planned start and finish dates for activities and milestones, work pages, planning packages and control account information. The Project schedule information can be used to aggregate costs to the calendar periods where costs will be incurred.
5. **Resource Calendars** – provide information on which resources are assigned to the project and when they are assigned and when they are available, and are used to help plan resource costs over the duration of the project.
6. **Contracts** – list costs related to contracted products, services or results that have been purchased and need to be included when determining the project budget.
7. **Organizational Process Assets** – influence determine budget process, such as existing formal budget policies, procedures, cost budgeting tools available from the hospital, reporting methods used by the facility.

## (5) Tools and Techniques for Determine Budget Process



1. **Cost Aggregation** – provides costs that are estimated at the activity level then aggregated up to the work package level for higher “control account” and entire project cost aggregation.

**NOTE:** The **Work Package Level** is where most costs will be measured, managed and controlled during your project.

2. **Reserve Analysis** – provides the contingency reserves and management reserves for determining your projects total budget.

**A. Contingency Reserves-** allowances for unplanned changes that can result from risks

**B. Management Reserves** - budgets reserves for unplanned changes to scope and cost

**NOTE:** Management reserves are **not** a part of earned value calculations or project cost baseline



## (5) Tools and Techniques for Determine Budget Process



**3. Expert Judgment** - provided by a group or person with specialized education, knowledge, skill experience, or training. Expert judgment comes from many sources:

- Other departments within your hospital
- Consultants
- Stakeholders, customers, doctors, nurses
- Professional associations, technical associations, industry groups

**4. Historical Relationships** – information provided from historical “data” (historical projects) that results in parametric or analogous estimates that involve the use of project parameters to develop mathematical models used to predict total project costs. (Project costing models are most reliable when they are scalable and parameters used are quantifiable)

## (5) Tools and Techniques for Determine Budget Process



**5. Funding Limit Reconciliation** - funds must be reconciled with any funding limits (from the Hospital Organization – perhaps fiscal year) on the commitment of funds for the project.

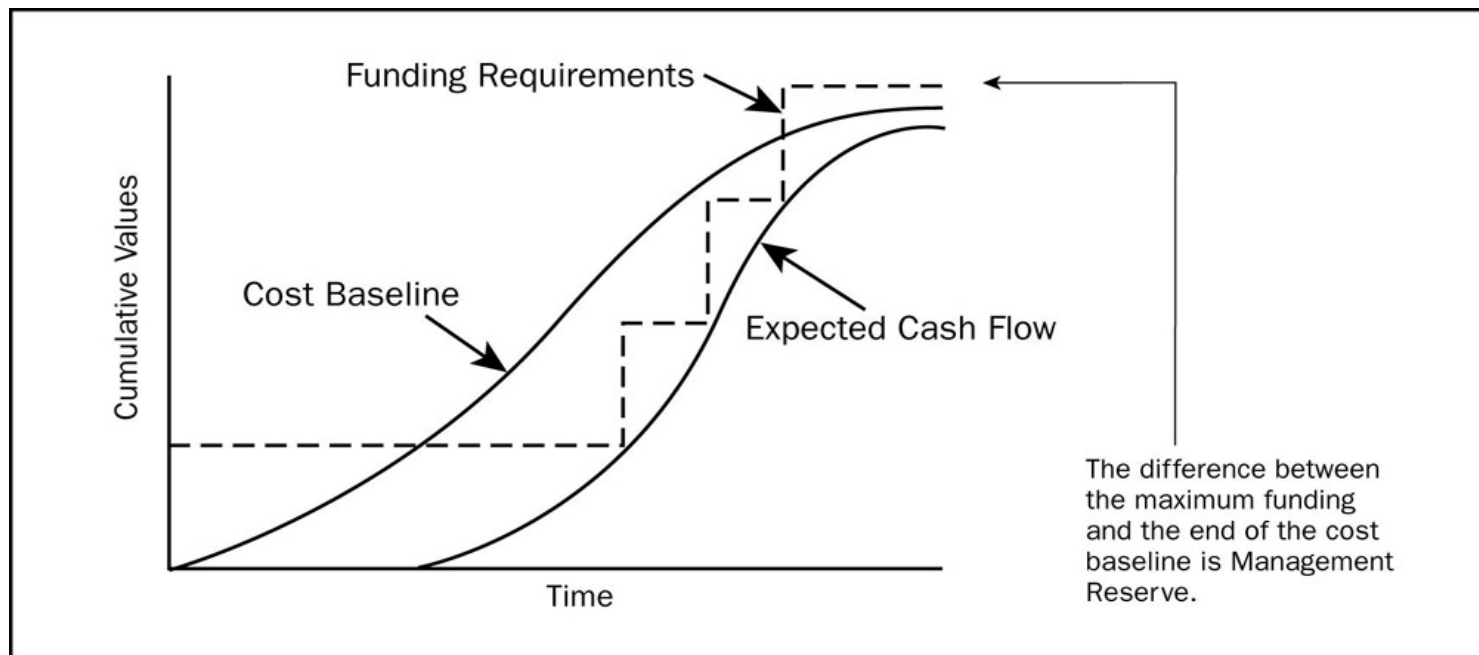
Therefore, you may have to reschedule some work or materials to be delivered when FISCAL year organizational funding becomes available for your project. The organization may be providing an additional \$500,000 for your project that began in January 2011, after their fiscal year begins in July 2012. So you may have to delay or reschedule some of the work until you receive the additional funding.

# (3) OUTPUTS

## Determine Budget Process

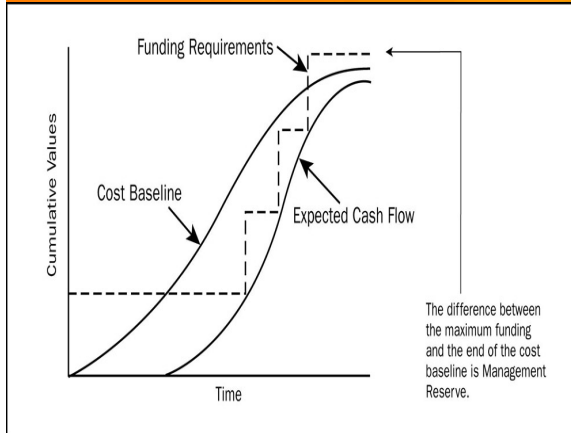
- 1. Cost Performance Baseline** - is a time phased budget that is used as a basis against which to measure, monitor and control overall cost performance on the project.

Cost Performance baseline is displayed in the form of the s-curve below. (costs start out slowly , accelerate thru the project and slow down during testing and project closure.)



## (3) OUTPUTS

### Determine Budget Process



**2. Project Funding Requirements** – total funding requirements are determined from the COST BASELINE. Funding requirements are related to planned expenditures but are not identical to them. Funding often occurs in incremental amounts that are NOT continuous, and appear as steps.

### **3. Project Document updates:**

Project documents that may be updated during the determine budget process that include, but are not limited to:

- a. Risk Register updates
- b. Cost Estimate updates
- c. Project Schedule updates



## Project Management Process Groups

### Knowledge Areas

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- Scope
- Time
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# Controlling Cost

Monitoring/Controlling Process Group/  
Cost Management Knowledge Area

- 3. Control Costs Process** is the process of monitoring the status of the project to update the budget and manage changes to the cost baseline.

Updating the budget involves recording actual costs spent to date

**NOTE:** Increases to the authorized budget can only be approved through the PERFORM INTEGRATED CHANGE CONTROL PROCESS.. (requested changes must be approved)

**The project management effort involved in COST CONTROL is the analysis of the consumption of funds compared to the physical work being accomplished on your project for these expenditures.**

The cost control process involves the Management of the APPROVED PERFORMANCE BASELINE and CHANGES TO THE BASELINE!



# Controlling Cost

Monitoring/Controlling Process Group/  
Cost Management Knowledge Area

## **Project Cost Control INCLUDES:**

- Influencing the factors that create changes to the authorized cost baseline
- Ensuring that all “cost” impacting change requests are acted on in a timely manner
- Managing the actual cost changes when and as they occur
- Ensuring that cost expenditures do not exceed the authorized funding
- Monitoring cost performance to understand variances from the approved cost baseline
- Monitor work performance against funds expended
- Prevent unapproved changes from being included in the reported cost or resource usage
- Informing appropriate stakeholders of all approved changes and associated cost, and bring expected cost overruns within acceptable limits

# ★ Cost Control

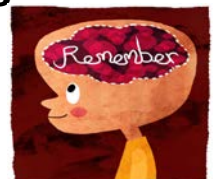


## Controlling Cost

Monitoring/Controlling Process Group/  
Cost Management Knowledge Area

### What is at the essence of COST CONTROL?

- **Being proactive and not waiting for cost changes to occur, but influencing the factors leading to the cost change**
- **Changing future plans when necessary or the way work is performed to insure what is executed matches costs in baseline**
- **Monitoring/Controlling your cost variance -positive variance is good, and negative cost variance is bad. Negative figures happen when you spend more on a project than allotted for in the budget, and positive figures occur when you spend less on your project than your budget predicted!**
- **Ideally, if your actual costs match what you budget your cost variance is ZERO.. But this is very difficult to achieve.**
- ***CONTROLLING COSTS IS NOT ONCE and DONE... It's performed throughout project***



# Control Cost Process

Monitoring/Controlling Process Group/  
Cost Knowledge Area



- Project Management Plan
- Project Funding Requirements
- Work Performance Information
- Organizational Process Assets

Inputs

Tools and Techniques

1. Forecasting
2. Earned Value Management
3. To-Complete Performance Index
4. Performance Reviews
5. Variance Analysis
6. Project Management Software

Outputs

- Work Performance Measurements
- Budget Forecasts
- Organizational Process Assets Updates
- Change Requests
- Project Management Plan Updates
- Project Document Updates



# ★ Cost Control



## (4) Inputs Control Cost Process

Cost Management Knowledge Area  
Monitoring/Controlling Process Group

- 1. Project Management Plan** contains the cost performance baseline (to compare with actual costs to determine what corrective action is necessary), and cost management plan that describes how project costs will be managed and controlled
- 2. Project Funding Requirements** are a part of the project plan against which actual funding is measured.. Positive or negative variances from the planned funding are evaluated for corrective action to be taken!
- 3. Work Performance Information** includes ALL information about the projects progress, such as which deliverables have started, their progress and which deliverables have finished. Information also includes costs that have been authorized and incurred.
- 4. Organizational Process Assets** are those organizational assets that can influence the control costs process include, but are not limited to:
  - Formal and informal hospital/departmental cost related polices, procedures guidelines
  - Cost control tools used in your healthcare organization
  - Monitoring and controlling methods used at your facility



# ★ Cost Control



## (6) Tools and Techniques Control Cost Cost Management Knowledge Area Monitoring/Controlling Process Group

1. **Earned Value Management** – is a tool/method for measuring actual performance against the original plan. EVM can help identify areas where the project is different from the plan, and identifies variances and trends that influence the Control Costs process.
2. **Forecasting**- as your project progresses, the project team can develop a forecast for the estimate at completion (EAC) that may differ from the budget at completion (BAC) based on the projects performance.

**NOTE:** Forecasting Estimate at Completion (EAC) involves making estimates and predictions of events and conditions in the project future, based on knowledge available at the time of the forecast.

3. **To-Complete Performance Index** (TCPI) is a calculated earned value projection of cost performance that must be achieved on the remaining work to meet a specified management goal (earned value target) such as the Estimate at completion (EAC), or Budget at Completion (BAC).

# ★ Cost Control



## (6) Tools and Techniques Control Cost Cost Management Knowledge Area Monitoring/Controlling Process Group

- 4. Performance Reviews** can be helpful to uncover areas where costs may be under or over performing. This is used as part of the Earned Value Management to compare the plan with the actual results and forecast indexes and project trends.
- 5. Variance Analysis** measures magnitude of variance from your original cost baseline, and how variance is handled is determined by your cost management plan (part of the Overall project management plan), and positive variance is good, negative variance is not good, but both need to be analyzed to determine if corrective action is required. Remember, a perfect variance would be zero (where there is no variance from your cost baseline)
- 6. Project Management Software (PMIS)** is often used at hospital and healthcare organizations to monitor Earned Value, since the calculations we will be learning can be complex and very tedious.

# ★ Cost Control



## (6) Outputs for Control Cost Process Cost Management Knowledge Area Monitoring and Controlling Process Group

- 1. Work Performance Measurements** – these measurements show how the project is performing against the plan, and help to show variances and trends. We will learn how to calculate CV(Cost Variance), SV (Schedule Variance), CPI (Cost Performance Index), CPIC (Cumulative CPI) and SPI (Schedule Performance Index) ( which are particularly applicable Work Performance Measurements.
- 2. Budget Forecasts** are your projections for how much funding will be required and when it will be needed from where you are in your project forward, either a calculated EAC (Estimate at Completion) or a bottom -up Estimate at Completion value is documented and communicated to your project stakeholders.
- 3. Organizational Process Assets Updates** - your OPA's may be updated by the good and bad lessons learned from your project, including causes of variances, corrective actions taken and the reasons, and other types of lessons you may learn on project cost control that are beneficial to future projects.

# ★ Cost Control



## (6) Outputs for Control Cost Process

Cost Management Knowledge Area  
Monitoring and Controlling Process Group

- 4. Change Requests** – as you monitor and control costs, changes are sometimes requested and necessary. If the project is going to cost significantly more than the cost baseline projected, then certain changes may be required to get your costs back in line with the budgeted projection. These changes could be: increasing budget, reducing scope, changing scope to allow for a phase II of your project, and must be put into the PERFORM INTEGRATED CHANGE CONTROL PROCESS.
- 5. Project Management Plan Updates** - you should be documenting anything that impacts or changes the project plan, or changes to parts of the plan, such as a cost performance baseline change or a change to the cost management plan.
- 6. Project Document Updates** - project documents that may be updated in the control cost process include, but are not limited to cost estimates and basis of estimates.

# Project Cost Calculations

## Earned Value Management



### Three Basic Elements of EARNED VALUE MANAGEMENT:

1. **Planned Value (PV)** – how much work planned to this point in time

2. **Actual Cost (AC)**- money spent during given period of time

3. **Earned Value (EV)**- how much value you have earned to this point

**Planned Value – this is how much work was planned for this point in time. Also referred to as Budgeted Cost of Work Scheduled (BCWS).**

**PV or BCWV** = how much work should have been completed at a point in time based on the plan

**PV = Hourly Rate x Total Hours Planned or Scheduled**

**(NOTE: You can also calculate Planned Value by Multiplying Planned % Complete x BAC (Budgeted at Completion)**

**BAC (Budgeted at Completion)** is how much you originally expect the project to cost.. Or **BASELINE COST**= total budgeted cost for project



# Project Cost Calculations Earned Value Management



## Three Basic Elements of EARNED VALUE MANAGEMENT:

1. Planned Value (PV)

**2. Actual Cost (AC) – the money spent during a given period of time**

3. Earned Value (EV)

**Actual Cost** - also referred to as Actual Cost of Work Performed (ACWP), is the total cost taken to complete the work as of a specific reporting date (a given time period).

**AC or ACWP = Hourly Rate x Total hours spent**

**(or add up all the costs for the given period of time = the money spent during a given period of time on your project)**



# Project Cost Calculations Earned Value Management



## **Three Basic Elements of EARNED VALUE MANAGEMENT:**

- 1.Planned Value (PV)
- 2.Actual Cost (AC)

**3.Earned Value (EV) – how much value you have earned on the project**

**Earned Value**– this is also referred to as the Budgeted Cost of Work Performed (BCWP), Earned Value is the total cost of the work completed or performed as of a specific reporting date.

**EV = Total Budgeted at Completion X Actual % Complete**

Actual % Complete =  $AC / EAC$

Or Money Spent during a given period of time / projected total cost at completion

# Project Cost Calculations Earned Value Management



## Variances :

1. **Cost Variance (CV)**
2. **Schedule Variance (SV)**

**Cost Variance** – indicates how much over or under the budget your project is... (how much actual costs differ from planned costs)

**Negative Cost Variance** indicates the project is over budget (we are running higher on costs than planned- **not good**)

**Positive Cost Variance** indicates the project is under budget (we are doing good and **doing better on costs than we planned**)

$$\text{CV} = \text{Earned Value (EV)} - \text{Actual Costs (AC)}$$

# Project Cost Calculations Earned Value Management



## Variances :

1. Cost Variance (CV)

**2. Schedule Variance (SV)-the difference between where we expected to be in the schedule and where we actually are in the schedule**

**Schedule Variance** - how much ahead or behind the project is

**Negative Schedule Variance** indicates the project is **BEHIND SCHEDULE** (we are running slower than planned- **not good**)

**Positive Schedule Variance** indicates the project is ahead of schedule (we are doing good and **doing better on Schedule than we planned**)

**SV = Earned Value (EV) – Planned Value (PV)**

# Project Cost Calculations Earned Value Management



## Indexes :

1. **Cost Performance Index or Indicator ( CPI)**
2. Schedule Performance Index or Indicator (SPI)

**Cost Performance Index** – shows the efficiency of the utilization of resources on the project.

$$\text{CPI} = \text{Earned Value (EV)} / \text{Actual Cost (AC)}$$

**CPI above 1** indicates **good efficiency** in utilizing resources allocated

**CPI below 1** indicates **poor efficiency** in utilizing resources allocated

# Project Cost Calculations Earned Value Management



## Indexes :

1. Cost Performance Index or Indicator ( CPI)

**2. Schedule Performance Index or Indicator (SPI)**

**Schedule Performance Index** – shows the efficiency of time utilized on the project, and can be calculated

**SPI = Earned Value (EV) / Planned Value (PV)**

**SPI above 1** indicates project team is **very efficient** in utilizing **time** allocated to the project (more work completed than was planned)

**SPI below 1** indicates **poor efficiency** in utilizing **time** allocated to the project (less work is completed than planned)

# Project Cost Calculations Forecasting Estimates



## Estimates :

**1.EAC** – Estimate at Completion – the estimated cost of the project at the end of the project

**2.ETC** – Estimate to Completion – the estimated cost to complete the project (how much more will be spent, based on past performance)

**3.VAC** – Variance at Completion – the variance on the total budget at the end of the project

**(BAC )**– Budget at Completion = total budget allocated to project

**EAC = BAC / CPI** cost perf. index or  $EAC = BAC / (EV/AC)$

**ETC = EAC – AC** or Estimate at Completion – Actual Cost

**VAC = BAC – EAC** (budget at complete – est. at complete)



# Project Cost Calculations To Complete Performance Index (TCPI)



## **TCPI REMEMBER:**

The TCPI is calculated project of cost performance that must be achieved on the remaining work to meet a specified management goal such as the BAC or the EAC.

**TCPI = (BAC – EV) / (EAC – AC) remaining funds**

OR

Budgeted – earned value / est. at complete – actual costs

# Project Cost Calculations

## Cumulative CPI (COST PERFORMANCE INDEX)



**REMEMBER :  $CPI = EV / AC$  (earned value / actual costs);** CPI (COST PERFORMANCE INDEX) is the efficiency indicator of performance during a given period of time

**CUMULATIVE CPI =**

**TOTAL EV** earned value/**TOTAL AC** actual costs

So, cumulative CPI is just all periodic Earned Value Calculations for the project divided by all the periodic actual cost calculations for the project added together.

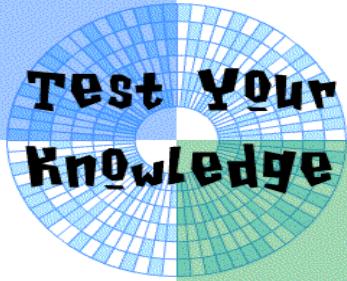
# Key 13 Project Cost Calculations



TERM/ABBREV.	Description	Formula
Planned Value (PV)	How much work should have been completed at this point	$PV = \text{Planned \% Complete} \times BAC$
Actual Cost (AC)	Money spent during given period of time	$AC = \text{sum of costs for the period of time}$
Earned Value (EV)	How much work was actually completed during period of time	$EV = BAC \times \text{Actual \% Complete}$
Budgeted at Completion(BAC)	How much was originally planned for the project to cost	$BAC = \text{total budgeted cost for project}$
Cost Variance (CV)	Difference between what was expected to spend and what spent	$CV = EV - AC$
Schedule Variance (SV)	Difference between where we planned to be and where we are	$SV = EV - PV$
Cost Performance Index (CPI)	Rate at which the project cost performance is meeting cost expectations	$CPI = EV / AC$
Schedule Performance Index (SPI)	Rate at which the project schedule performance is meeting schedule expectations	$SPI = EV / PV$
Estimate AT Completion(EAC)	Project total cost at completion based on performance up to a point in time	$EAC = BAC / CPI \text{ Cumulative}$
Estimate TO Completion(ETC)	Projecting how much more will be spent based on performance up to this point	$ETC = EAC - AC$
Variance at Completion(VAC)	Difference between what was budgeted and what will be spent	$VAC = BAC - EAC$
To Complete Performance Index (TCPI)	Performance that must be achieved in order to meet financial or sched. goals	$TCPI = (BAC - EV) / \text{remaining funds}$
Cumulative CPI (CPIC)	Rate at which project performance is meeting cost expectations from beginning to point in time	$CPIC = \text{SUM all EV} / \text{SUM all AC}$

# Project Cost Management

## Healthcare Project Management



**It's QUIZTIME!!!**  
**(remember to select the BEST answer)**

- 1. The project Cost Management Knowledge area consists of THREE essential processes required to insure cost effective completion of your project. They are:**
  - A. Define activities, Sequence Activities, Estimate Activity Durations
  - B. Develop Schedule, Estimate Costs, Determine Budget
  - C. Define Activities, Determine Budget, Control Costs
  - D. Estimate Costs, Determine Budget, Control Costs

# Project Cost Management

## Healthcare Project Management



1. **The project Cost Management Knowledge area consists of THREE essential processes required to insure cost effective completion of your project. They are:**
  - A. Define activities, Sequence Activities, Estimate Activity Durations
  - B. Develop Schedule, Estimate Costs, Determine Budget
  - C. Define Activities, Determine Budget, Control Costs
  - D. Estimate Costs, Determine Budget, Control Costs**

# Project Cost Management

## Healthcare Project Management



**Test Your  
Knowledge**

### **TRUE OR FALSE:**

- 2. The Cost Management Plan is developed in the Integration Knowledge area, done as a part of the develop project Management Plan process?**
- A. True
  - B. False



# Project Cost Management

## Healthcare Project Management



### TRUE OR FALSE:

2. **The Cost Management Plan is developed in the Integration Knowledge area, done as a part of the develop project Management Plan process?**
  - A. **True (and the Cost Management plan establishes level of accuracy, units of measure, organizational procedure links, control thresholds, rules of performance measurement, reporting formats, process descriptions)**
  - B. False

# Project Cost Management

## Healthcare Project Management



Test Your  
Knowledge

- 3. You are a project manager on the construction of a Large Children's Hospital NICU renovation project, you are adding six NICU rooms to the Neonatal intensive care unit. Each of the NICU rooms will be identical with the same hardware components, and the projected cost for the NICU project is \$100,000 and it is expected to take six weeks. At the end of week 3 you have spent \$18,000 per room, and have finished 2 rooms. Based on this information, *which of the following is true?***
- A. The Budgeted at Completion value is \$50,000
  - B. The Planned Value is \$25,000
  - C. The Budgeted at Completion Value is \$100,000 and the planned value is \$50,000
  - D. The Actual Cost is \$46,000.00



# Project Cost Management

## Healthcare Project Management

**3. You are a project manager on the construction of a Large Children's Hospital NICU renovation project, you are adding six NICU rooms to the Neonatal intensive care unit. Each of the NICU rooms will be identical, with the same hardware components, and the **projected cost for the NICU project is \$100,000** and it is expected to take six weeks. At the end of week 3 you have spent \$18,000 per room, and have finished 2 rooms. Based on this information, *which of the following is true?***

- A. The Budgeted at Completion value is \$50,000 (actually \$100,000).
- B. The Planned Value is \$25,000 (actually \$50,000).
- C. The Budgeted at Completion Value is \$100,000 and the planned value is \$50,000.**
- D. The Actual Cost is \$46,000.00 (actually \$36,000)

Term	Formula	Value
Budgeted at Completion (BAC)	The total budgeted for the cost of the project	\$100,000.00
Planned Value (PV)-how much work should be complete	<b>Planned %Complete X BAC</b> 3 wks/6 weeks x 100,000 50% x 100,000 =	\$50,000.00
Actual Cost (AC)-the actual money spent (sum of costs)	AC= \$ spent per room x 2 rooms \$18,000 x 2 rooms = \$36,000	\$36,000.00

# Project Cost Management

## Healthcare Project Management

Test Your Knowledge

4. Assuming the following table below and information from the previous question, is the project ahead or behind schedule?:
- A. Ahead of Schedule
  - B. Behind Schedule

Term	Formula	Value
Budgeted at Completion (BAC)	The total budgeted for the cost of the project	\$100,000.00
Planned Value (PV)-how much work should be complete	$\text{Planned \% Complete} \times \text{BAC}$ 3 wks/6 weeks x 100,000    50% x 100,000 = \$50,000	\$50,000.00
Actual Cost (AC)-the actual money spent (sum of costs)	$\text{AC} = \$ \text{ spent per room} \times 2 \text{ rooms}$ \$18,000 x 2 rooms = \$36,000	\$36,000.00
Earned Value –budgeted cost of work	$\text{EV} = \text{Actual \% Complete} \times \text{BAC}$ 2rooms/6rooms=33.3% 33.3% x 100,000=\$33,333.33	\$33,333.33
Cost Variance-difference between what we expected to spend and what was actually spent	$\text{CV} = \text{EV} - \text{AC}$ or $\text{CV} = 33,333.33 - 36,000 = -2,666.67$	-2,666.67
Schedule Variance – difference between where we planned to be and where we are	$\text{SV} = \text{EV} - \text{PV}$ or $\text{SV} = 33,333.33 - 50,000 = -16,666.67$	-16,666.67
Cost Performance Index- the rate at which project performance is meeting cost expectations	$\text{CPI} = \text{EV} / \text{AC}$ or $\text{CPI} = 33,333.33 / 36,000 = .9259$	.93
Schedule Performance Index – rate at which project is meeting schedule expectations	$\text{SPI} = \text{EV} / \text{PV}$ or $\text{SPI} = 33,333.33 / 50,000 = .66$	.66



# Project Cost Management

## Healthcare Project Management

**4. Assuming the following previous table and information from the previous question, is the project ahead or behind schedule?:**

A. Ahead of Schedule

**B. Behind Schedule (look at SPI- Schedule Performance Index)**

SINCE THE SCHEDULE PERFORMANCE INDEX is LESS THAN ONE or in this case 0.66 we can determine the project isn't doing as well as should be expected in terms of schedule and is running behind. (note: an SPI of 1 is exactly on schedule)

**Schedule Performance Index  $SPI = EV / PV$  or  $SPI = 33,333.33 / 50,000 = .66$**

# Project Cost Management

## Healthcare Project Management

A circular graphic with a grid pattern, divided into four quadrants of different colors (blue, white, green, and blue). The text "Test Your Knowledge" is written across the center in a bold, black, sans-serif font.

Test Your  
Knowledge

**5. What is a fixed cost?**

- A. A cost that stays the same throughout the life of the project
- B. A cost that differs on a project and varies with level of activity
- C. An expenditure that cannot be recovered
- D. A trade-off cost of what else could have been done with the same resources



# Project Cost Management

## Healthcare Project Management



### 5. What is a fixed cost?

- A. A cost that stays the same throughout the life of the project – such as a piece of hardware like a server
- B. A cost that differs on a project and varies with level of activity  
(Variable)
- C. An expenditure that cannot be recovered (Sunk Cost)
- D. A trade-off cost of what else could have been done with the same resources (Opportunity cost)

# Project Cost Management

## Healthcare Project Management



Test Your  
Knowledge

- 6. As a Clinical IT project Manager, your Project Management Office(PMO) has purchased a site license for a computerized cost estimating tool for use on a very large IT implementation project for XYZ hospital. This tool asks for specific characteristics about your project and provides estimating guides based on historical information, implementation techniques, supplies and materials to be used and best industry practices and standards. This tool is an example of:**
- A. Activity duration estimating
  - B. Analogous Estimating
  - C. Parametric Estimating
  - D. Bottom-up Estimating
  - E. None of the above

# Project Cost Management

## Healthcare Project Management



6. As a Clinical IT project Manager, your Project Management Office (PMO) has purchased a site license for a computerized cost estimating tool for use on a very large IT implementation project for XYZ hospital. This tool asks for specific characteristics about your project and provides estimating guides based on statistical calculations on historical information, implementation techniques, supplies and materials to be used and best industry practices and standards. This tool is an example of:
- A. Activity duration estimating (based on duration required to complete work)
  - B. Analogous Estimating (uses parameters such as scope, cost budget, and duration of a similar project)
  - C. **Parametric Estimating (statistical calculations between historical data and industry standards)**
  - D. Bottom-up Estimating (based on estimating a component of work, and individual work packages)
  - E. None of the above

# Project Cost Management

## Healthcare Project Management



Test Your  
Knowledge

- 7. Which of the following processes must occur before you can estimate costs?**
- A. Define Scope
  - B. Create WBS
  - C. Define Activities
  - D. All of the above

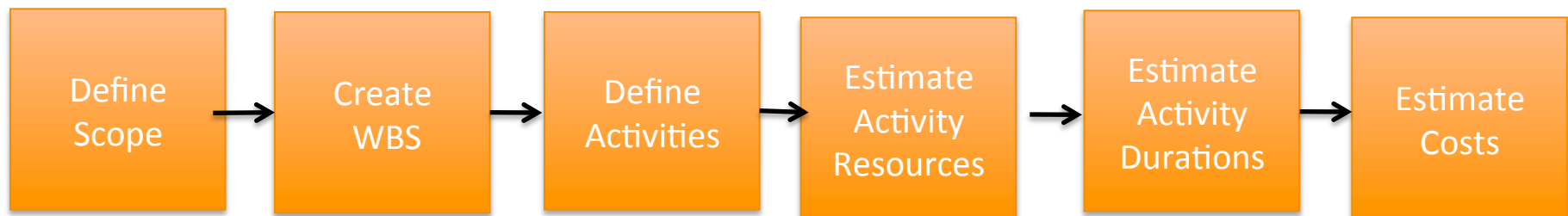
# Project Cost Management

## Healthcare Project Management



**7. Which of the following processes must occur before you can estimate costs?**

- A. Define Scope
- B. Create WBS
- C. Define Activities
- D. All of the above**



# Project Cost Management

## Healthcare Project Management

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Test Your  
Knowledge

8. \_\_\_\_\_ Estimating uses three estimates to define a range for an activities cost, Most Likely, Optimistic and Pessimistic.
- A. Bottom -up
  - B. Analogous
  - C. Three point
  - D. Parametric



# Project Cost Management

## Healthcare Project Management



8. \_\_\_\_\_ Estimating uses three estimates to define a range for an activities cost, Most Likely, Optimistic and Pessimistic.

A. Bottom -up

B. Analogous

C. Three point, where Expected =  $\frac{\text{Optimistic} + 4(\text{Most Likely}) + \text{Pessimistic}}{6}$

D. Parametric

# Project Cost Management

## Healthcare Project Management

A circular graphic with a grid pattern, divided into four quadrants of different colors (blue, white, green, and light blue). The text "Test Your Knowledge" is written across the center in a bold, black, sans-serif font.

Test Your  
Knowledge

### 9. TRUE or FALSE:

**The Determine Budget process aggregates the estimated costs of individual activities or “work packages” to establish an authorized COST BASELINE. Determine budget helps to “time phase” the costs so your hospital organization can plan for cash flow and expenditures.**

- A. TRUE
- B. FALSE

# Project Cost Management

## Healthcare Project Management



9. **TRUE** or **FALSE**:

**The Determine Budget process aggregates the estimated costs of individual activities or “work packages” to establish an authorized COST BASELINE. Determine budget helps to “time phase” the costs so your hospital organization can plan for cash flow and expenditures.**

**A. TRUE**

B. FALSE

# Project Cost Management

## Healthcare Project Management

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Test Your  
Knowledge

**10. The following is (or ) are Tools and techniques for the DETERMINE BUDGET PROCESS:**

- A. Cost Aggregation
- B. Reserve Analysis
- C. Expert Judgment
- D. Funding Limit Reconciliation
- E. All of the above

# Project Time Management

## Healthcare Project Management



**10. The following is (or ) are Tools and techniques for the DETERMINE BUDGET PROCESS:**

- A. Cost Aggregation (provides Costs aggregated at the activity level then aggregated)
- B. Reserve Analysis (provides contingency and management reserves)
- C. Expert Judgment (provided by SME, group or person with specialized skills or education)
- D. Funding Limit Reconciliation (funds are reconciled with funding limits from your organization)
- E. All of the above**

# Project Cost Management

## Healthcare Project Management

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Test Your  
Knowledge

### 11. TRUE or FALSE:

**The Cost performance Baseline (an output of the Determine Budget process) is a time phased budget that is used as a basis against which to measure, monitor and control overall cost performance on the project.**

- A. TRUE
- B. FALSE



# Project Cost Management

## Healthcare Project Management

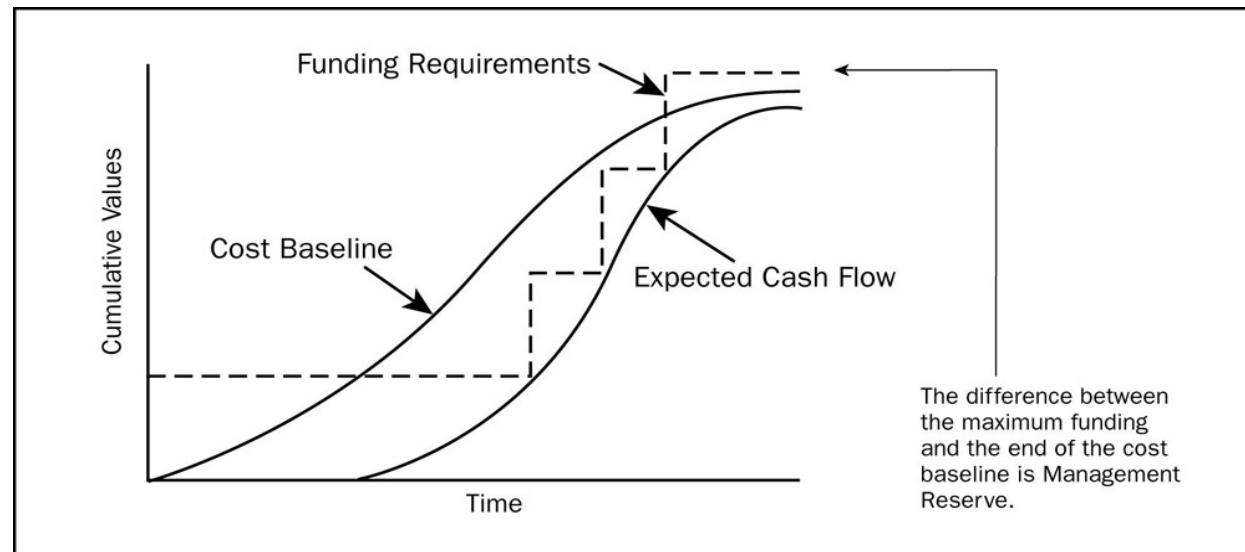


### 11. TRUE or FALSE:

**The Cost performance Baseline (an output of the Determine Budget process) is a time phased budget that is used as a basis against which to measure, monitor and control overall cost performance on the project.**

A. TRUE

B. FALSE



# Project Cost Management

## Healthcare Project Management

A circular graphic with a grid pattern, divided into four quadrants of different colors (blue, white, green, and light blue). The text "Test Your Knowledge" is written across the center in a bold, black, sans-serif font.

**Test Your  
Knowledge**

**12. The essence of COST CONTROL is...**

- A. Being proactive and not waiting for cost changes to occur, but influencing the factors leading to the cost change
- B. Changing future plans when necessary or the way work is performed to insure what is executed matches costs in baseline
- C. Both A and B
- D. None of the above

# Project Cost Management

## Healthcare Project Management



**12. The essence of COST CONTROL is...**

- A. Being proactive and not waiting for cost changes to occur, but influencing the factors leading to the cost change
- B. Changing future plans when necessary or the way work is performed to insure what is executed matches costs in baseline
- C. Both A and B**
- D. None of the above

# Project Cost Management

## Healthcare Project Management

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Test Your  
Knowledge

- 13. The Earned Value Management is a tool/method for measuring:**
- A. the type and quantities of people required to perform each activity
  - B. Actual performance against the original plan
  - C. duration of activities
  - D. None of the above

# Project Cost Management

## Healthcare Project Management



- 13. The Earned Value Management is a tool/method for measuring:**
- A. the type and quantities of people required to perform each activity
  - B. actual performance against the original plan , and EVM can help identify areas where the project is different from the plan, and variances and trends that influence the Cost Control Process**
  - C. duration of activities
  - D. None of the above

# Project Cost Management

## Healthcare Project Management

A circular graphic with a grid pattern, divided into four quadrants of different colors (blue, white, green, and light blue). The text "Test Your Knowledge" is written across the center in a bold, black, sans-serif font.

Test Your  
Knowledge

### 14.TRUE OR FALSE:

The three Basic Elements of **EARNED VALUE MANAGEMENT** are:

1. **Planned Value (PV)** – how much work planned to this point in time
2. **Actual Cost (AC)**- money spent during given period of time
3. **Earned Value (EV)**- how much value you have earned to this point



# Project Cost Management

## Healthcare Project Management



### 14. **TRUE** OR FALSE:

**The three Basic Elements of EARNED VALUE MANAGEMENT are:**

1. **Planned Value (PV)** – how much work planned to this point in time
2. **Actual Cost (AC)**- money spent during given period of time
3. **Earned Value (EV)**- how much value you have earned to this point

# Project Cost Management

## Healthcare Project Management

A circular graphic with a grid pattern, divided into four quadrants of different colors (blue, white, green, and light blue). The text "Test Your Knowledge" is written across the center in a bold, black, sans-serif font.

**Test Your  
Knowledge**

**15. In order to calculate Actual Cost, you simply add up all the costs for a given period of time, the money spent during a given period of time on your project ?**

- A. True
- B. False

# Project Cost Management

## Healthcare Project Management



**15. In order to calculate Actual Cost, you simply add up all the costs for a given period of time, the money spent during a given period of time on your project ?**

**A. True**

B. False

# Project Cost Management

## Healthcare Project Management

A circular graphic with a grid pattern, divided into four quadrants of different colors (blue, white, green, and light blue). The text "Test Your Knowledge" is written across the center in a bold, black, sans-serif font.

Test Your  
Knowledge

16. **EV- AC (Earned Value minus Actual Costs) equals which of the following variances?**
- A. Cost Variance
  - B. Schedule Variance
  - C. Cost Performance Index
  - D. Schedule Performance Index
  - E. None of the Above

# Project Cost Management

## Healthcare Project Management



- 16. EV- AC (Earned Value minus Actual Costs) equals which of the following variances?**
- A. Cost Variance**
  - B. Schedule Variance =  $EV - PV$
  - C. Cost Performance Index =  $EV / AC$
  - D. Schedule Performance Index =  $EV / PV$
  - E. None of the Above

# Project Cost Management

## Healthcare Project Management

A circular logo with a grid pattern, divided into four quadrants of different colors (blue, white, green, and light blue). The text "Test Your Knowledge" is written across the center in a bold, black, sans-serif font.

Test Your  
Knowledge

**17. You are a project manager on a project with CPI (cost Performance Index) of 0.88 and a SPI (Schedule Performance Index) of 1.21, this means:**

- A. You should not be managing this project
- B. The project is progressing slower and costing less than planned
- C. The project is progressing faster and costing more than planned
- D. The project is progressing faster and costing less than planned
- E. NONE OF THE ABOVE



# Project Cost Management

## Healthcare Project Management



- 17. You are a project manager on a project with CPI (cost Performance Index) of 0.88 and a SPI (Schedule Performance Index) of 1.21, this means:**
- A. You should not be managing this project
  - B. The project is progressing slower and costing less than planned
  - C. The project is progressing faster and costing more than planned, an SPI greater than one means the project is progressing faster than planned, a CPI that is less than one means the project is costing more than planned.**
  - D. The project is progressing faster and costing less than planned
  - E. NONE OF THE ABOVE

# Project Cost Management

## Healthcare Project Management



**Test Your  
Knowledge**

- 18. When you are reviewing a new project with your team and some experienced SME's from your hospital, a SME states "the last project we did like this cost our facility nearly \$10 million dollars in cold hard cash", the estimating method is?**
- A. Bottom-up Estimate
  - B. Top-down Estimate
  - C. Analogous Estimate
  - D. Gap Analysis Estimate
  - E. Order of Magnitude Estimate

# Project Cost Management

## Healthcare Project Management



- 18. When you are reviewing a new project with your team and some experienced SME's from your hospital, a SME states "the last project we did like this cost our facility nearly \$10 million dollars in cold hard cash", the estimating method is?**
- A. Bottom-up Estimate
  - B. Top-down Estimate
  - C. Analogous Estimate – using actual costs from previous projects / lessons-learned and historical data And OPA's**
  - D. Gap Analysis Estimate
  - E. Order of Magnitude Estimate

# Project Cost Management

## Healthcare Project Management

A circular graphic with a grid pattern, divided into four quadrants of different colors (blue, white, green, and light blue). The text "Test Your Knowledge" is written across the center in a bold, black, sans-serif font.

Test Your  
Knowledge

### 19. TRUE OR FALSE:

**Earned Value is the value of all work that has been completed so far in the project?**

- A. True
- B. False

# Project Cost Management

## Healthcare Project Management



### 19. TRUE OR FALSE:

**Earned Value is the value of all work that has been completed so far in the project?**

**A. True**

B. False

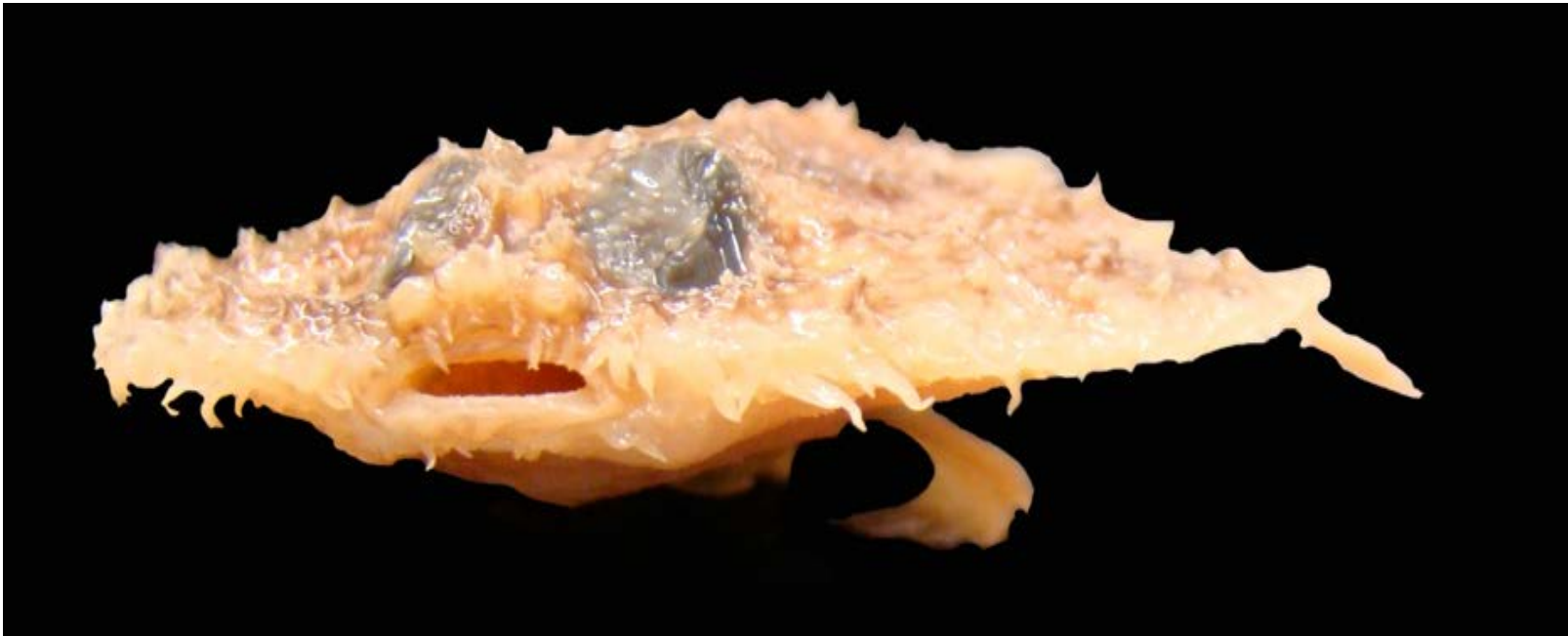


# Project Cost Management

## Healthcare Project Management

**FUN QUESTION:**

**What is this a picture of?**







# Project Cost Management

## Healthcare Project Management

### FUN ANSWER OF THE DAY

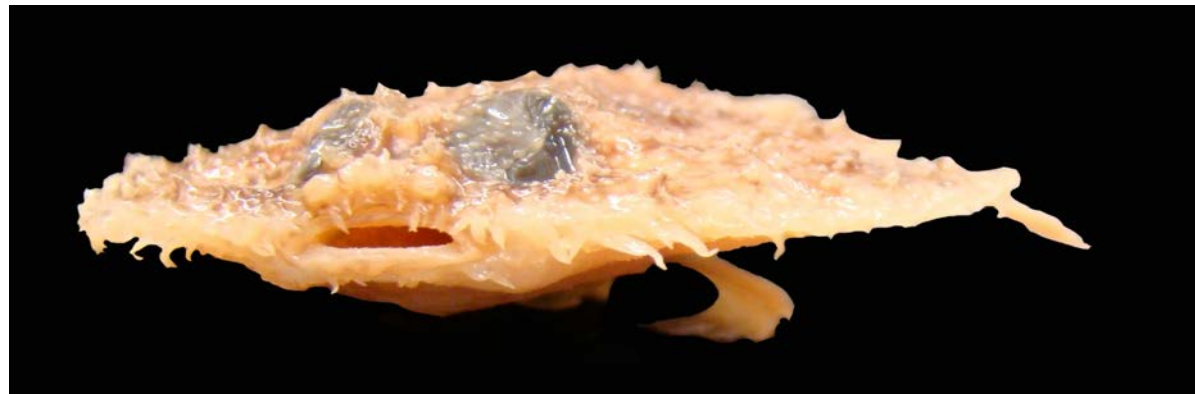
**A FISH...** This is the LOUISIANA PANCAKE BATFISH. This species was discovered just before the Gulf of Mexico oil spill in 2010 and its entire known distribution is in the region of the spill. It is also a remarkably hideous (in a good way) animal. It is flat like a pancake, spikey, hops on its fins and has huge bulging eyes. Its discovery and precarious existence due to the oil spill was the lead article on [cnn.com](http://www.cnn.com) and a number of other outlets.

**Reference:** Ho, H.-C., P. Chakrabarty and J.S. Sparks. 2010. Review of the *Halieutichthys aculeatus* species complex (Lophiiformes: Ogcocephalidae), with descriptions of two new species. *Journal of Fish Biology* 77(4):841-869.

**Type Material:** Holotype – American Museum of Natural History (AMNH), New York, USA. Paratypes – AMNH; California Academy of Sciences (CAS), San Francisco, California, USA; Louisiana State University, Museum of Zoology (LSUMZ), Baton Rouge, Louisiana, USA and National Museum of Natural History (USNM), Smithsonian Institution, Washington D.C., USA.

**Type Locality:** Gulf of Mexico, U.S.A., Florida, 29°31' N, 87°37' 45"W.

**Etymology:** The specific epithet, *intermedius*, refers to 'intermediate'



**THANK YOU**  
**Questions?**

**“About the time we can make ends meet,  
somebody moves the ends.”**

**~Herbert Hoover (1874-1964)**

**Mary Moewe, Account Executive**  
**Northeast Region**  
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