

PMI PMBOK & ESTIMATING
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Christine Green, PMI PMBOK and Estimating

EDS, Delivery Excellence

EDS - Who we are

EDS has approximately 120,000 employees in 57 countries across the globe

EDS is a leading global technology services company delivering business solutions to its clients. EDS founded the information technology outsourcing industry more than 40 years ago. Today EDS delivers a broad portfolio of information technology and business process outsourcing services to clients in the manufacturing financial services, healthcare, communications, energy, transportation and consumer and retail industries and to governments around the world.

Agenda



- **Introduction**

- Project Scope and Time Management

- Estimating Process

- Applying Multiple Estimating Techniques

- Next Steps and References

- Questions

PMI PMBOK and IFPUG Guideline to Software Measure (GSM)

PMBOK, Third edition:

Key Process Areas:

- Estimating resources
- Estimating duration
- Estimating cost.

Estimating techniques:

- Expert Judgement
- Analogous Estimating
- Bottom-up Estimating
- Parametric Estimating
- Three-Point Estimate

GSM, Second edition:

Key Chapters:

- Estimating

Estimating techniques:

- Delphi
- Bottom-up Estimating
- Top-down Estimating
- Other Methods
- Tools
- Spreadsheets
- PM Tools
- Estimating Tools
- Metrics History

Estimating definitions in the PMBOK, GSM and CMMI

Using the PMI PMBook definition

- Estimating in the PMBook is not a unique process – but is mentioned in many knowledge area Processes
- Estimating focus for Software development projects is usually on Effort – since effort is the biggest variable cost for most projects
- Estimating in the GSM focuses separately on estimating
- Estimating in the CMMI Book does not go into details of estimating techniques – but does mention the process of estimating for software projects

ESTIMATING

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- Introduction
- **Project Scope and Time Management**
- Estimating Process
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- Questions

Project Scope Management - Create WBS



- **Create WBS** – Subdividing the major project deliverables and project work into smaller, more manageable components

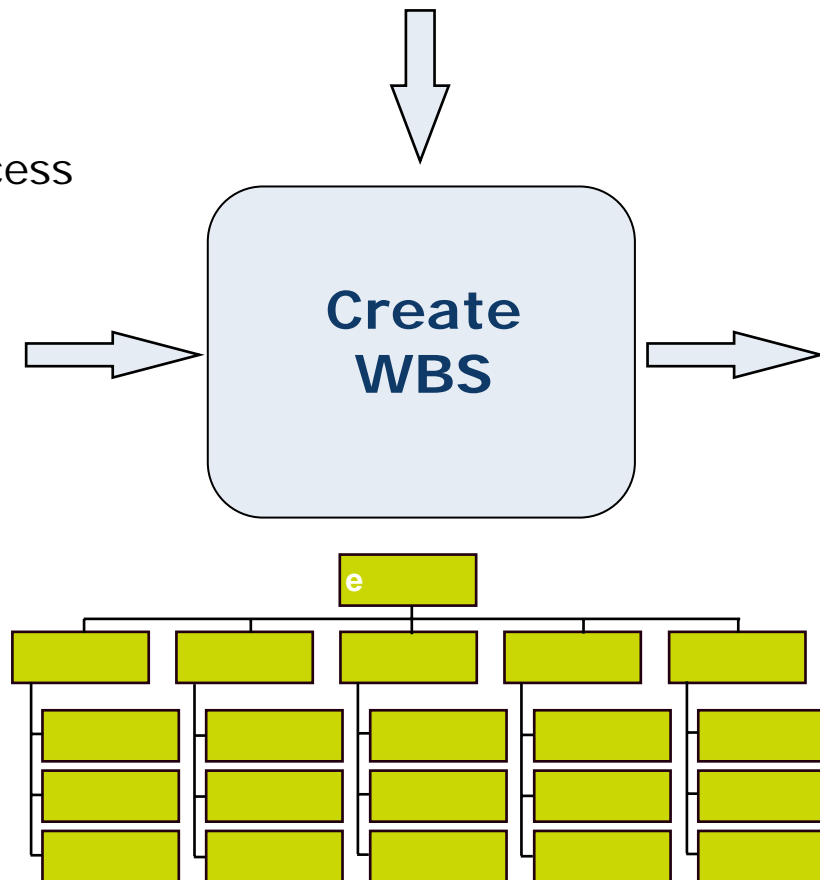
Project Scope Management - Create WBS

Tools and Techniques

- Work Breakdown Structure Templates
- Decomposition

Inputs

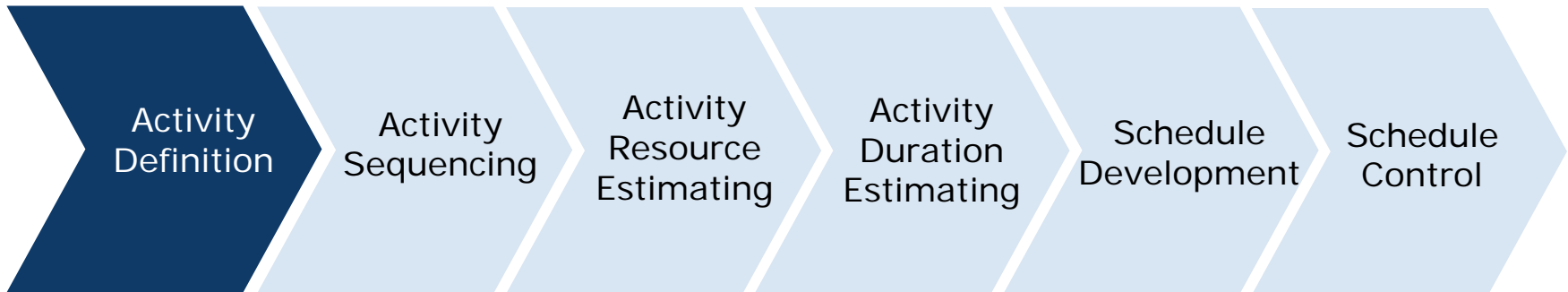
- Organizational Process Assets
- Project Scope Statement
- Project Scope Management Plan
- Approved Change Requests



Outputs

- Project Scope Statement (updates)
- Work Breakdown Structure
- WBS Dictionary
- Scope Baseline
- Project Scope Mgmt Plan (updates)
- Requested Changes

Project Time Management - Activity Definition



- **Activity Definition** – Identifying and documenting the work that is planned to be performed to identify the deliverables at the lowest level in the Work Breakdown Structure (WBS), the work package

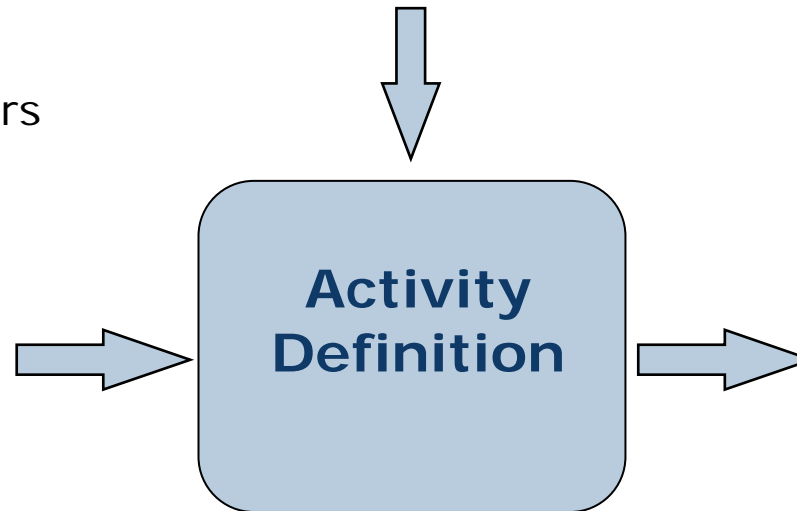
Project Time Management - Activity Definition

Tools and Techniques

- Decomposition
- Templates
- Rolling wave planning
- Expert judgment
- Planning component

Inputs

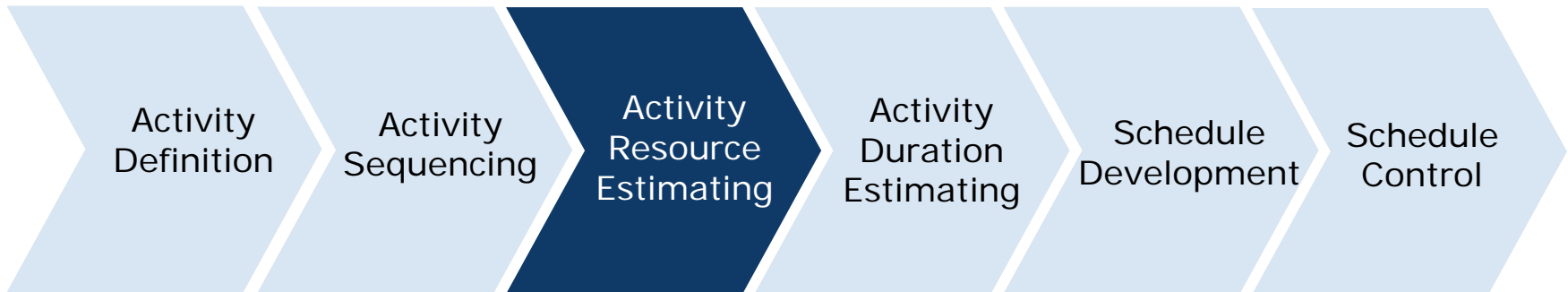
- Enterprise environmental factors
- Organizational process assets
- Project scope statement
- Work breakdown structure
- WBS dictionary
- Project management plan



Outputs

- Activity list
- Activity attributes
- Milestone list
- Requested changes

Project Time Management - Activity Resource Estimating



- **Activity Resource Estimating** – Determining what resources and what quantities of each resource will be used, and when each resource will be available to perform project activities

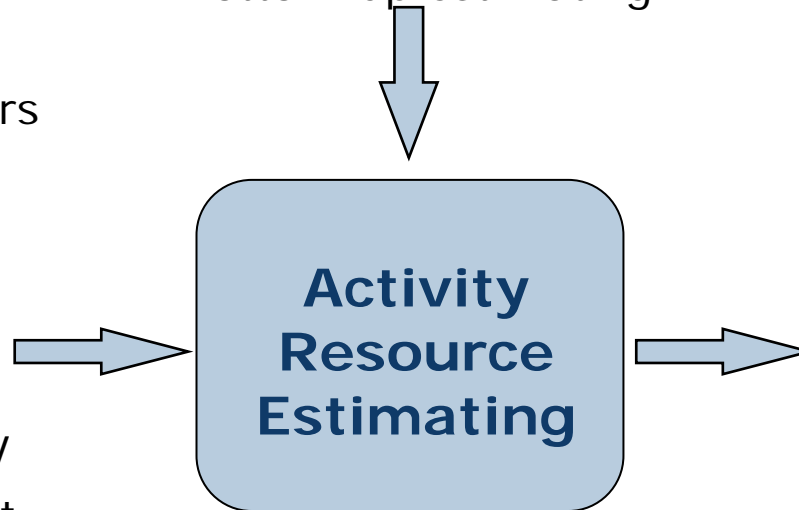
Project Time Management - Activity Resource Estimating

Tools and Techniques

- Expert judgment
- Alternatives analysis
- Published estimating data
- Project management software
- Bottom-up estimating

Inputs

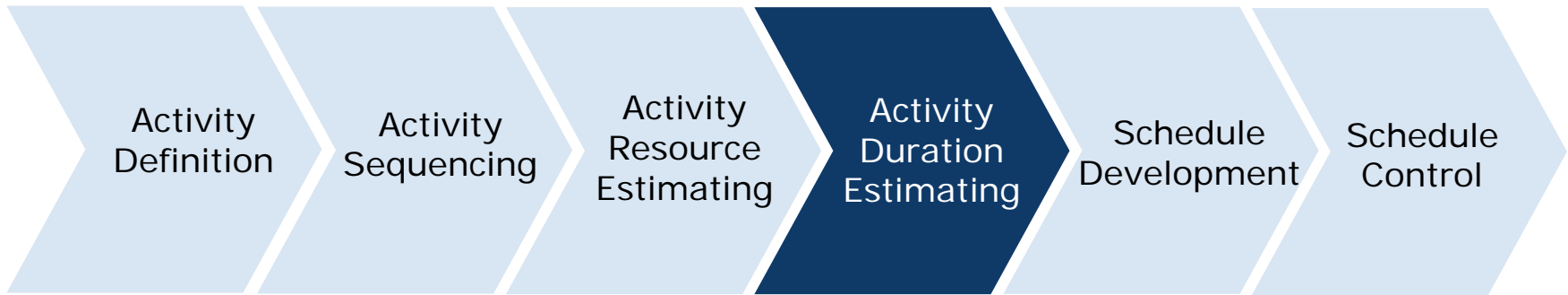
- Enterprise environmental factors
- Organizational process assets
- Activity list
- Activity attributes
- Resource availability
- Project management plan



Outputs

- Activity resource requirements
- Activity attributes (updates)
- Resource breakdown structure
- Resource calendars (updates)
- Requested changes

Project Time Management - Activity Duration Estimating



- **Activity Duration Estimating** – Estimate the amount of work effort, resources, and number of work periods needed to complete the schedule activity

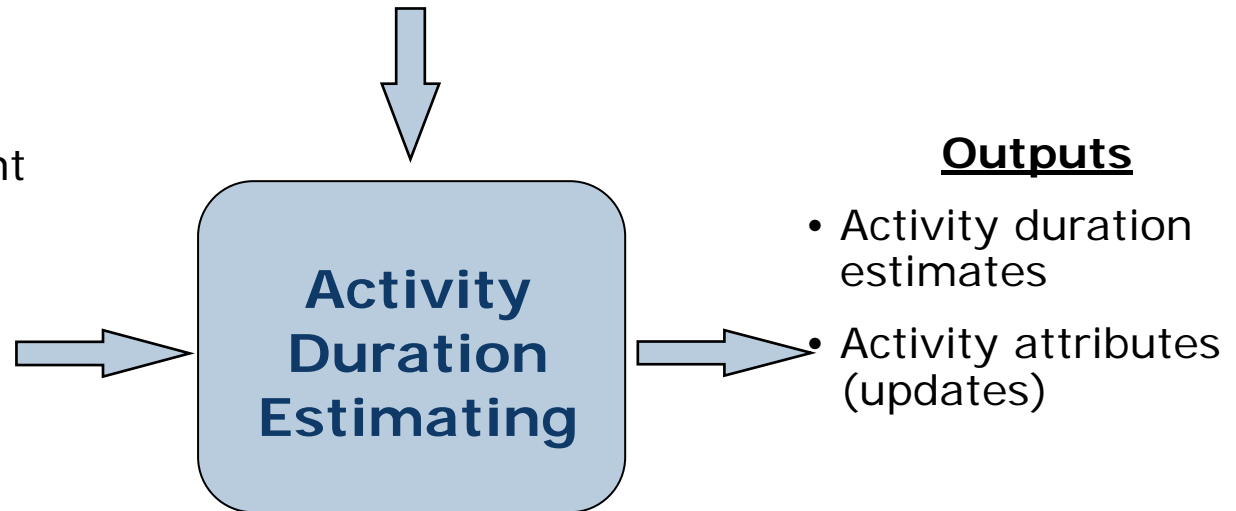
Project Time Management - Activity Duration Estimating

Inputs

- Enterprise environmental factors
- Organizational process assets
- Project scope statement
- Activity list
- Activity attributes
- Activity resource requirements
- Resource calendars
- Project management plan

Tools and Techniques

- Expert judgment
- Analogous estimating
- Parametric estimating
- Three-point estimates
- Reserve analysis



Outputs

- Activity duration estimates
- Activity attributes (updates)

Project Time Management - Activity Duration Estimating

Tools & Techniques

- Expert judgment – Project scope statement, WBS, and project schedule definition provided by experienced and skilled team members
- Analogous estimating – Using the actual duration of a previous, similar schedule activity as the basis for estimating the duration of a future activity
- Parametric estimating – A quantitative estimate determined by multiplying the quantity of work to be performed by the productivity rate, i.e., x units at y per unit
- Three-point estimates – Improving the estimate accuracy by considering most likely, optimistic, and pessimistic schedule activity durations
- Reserve analysis – Incorporating additional time (contingency reserves) into the overall project schedule as recognition of schedule risk

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Estimating and other related processes

Scope management

Estimating

Schedule development

Cost Management

Project Monitoring and Control

The focus is to create an estimate that is reliable, traceable, accurate and complete, and where estimates for the project can be used even when the its scope is changing.

If one wishes to focus on estimating as a unique process, it is necessary to take an approach which differs from that defined in PMBOK and CMMI definition.

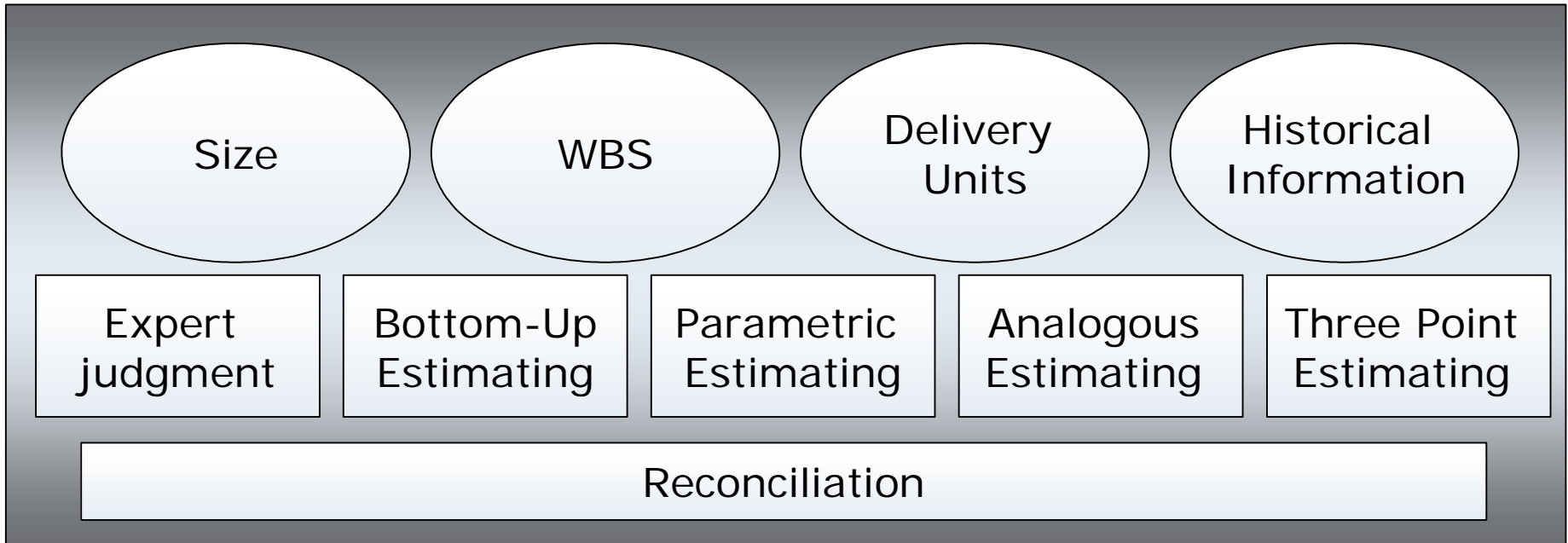
Estimates should be created so that they can continue to have validity as the Project Manager (PM), the Project team and the Clients defining the scope get wiser as the project runs

Estimating Process



The estimating process consist of some inputs, tools and techniques

A reconciliation of different estimates involving the estimator, the Project Manager and business and technical experts defines an agreed estimate



Size - input to estimating process

The sizing process determines size in relation to project outputs

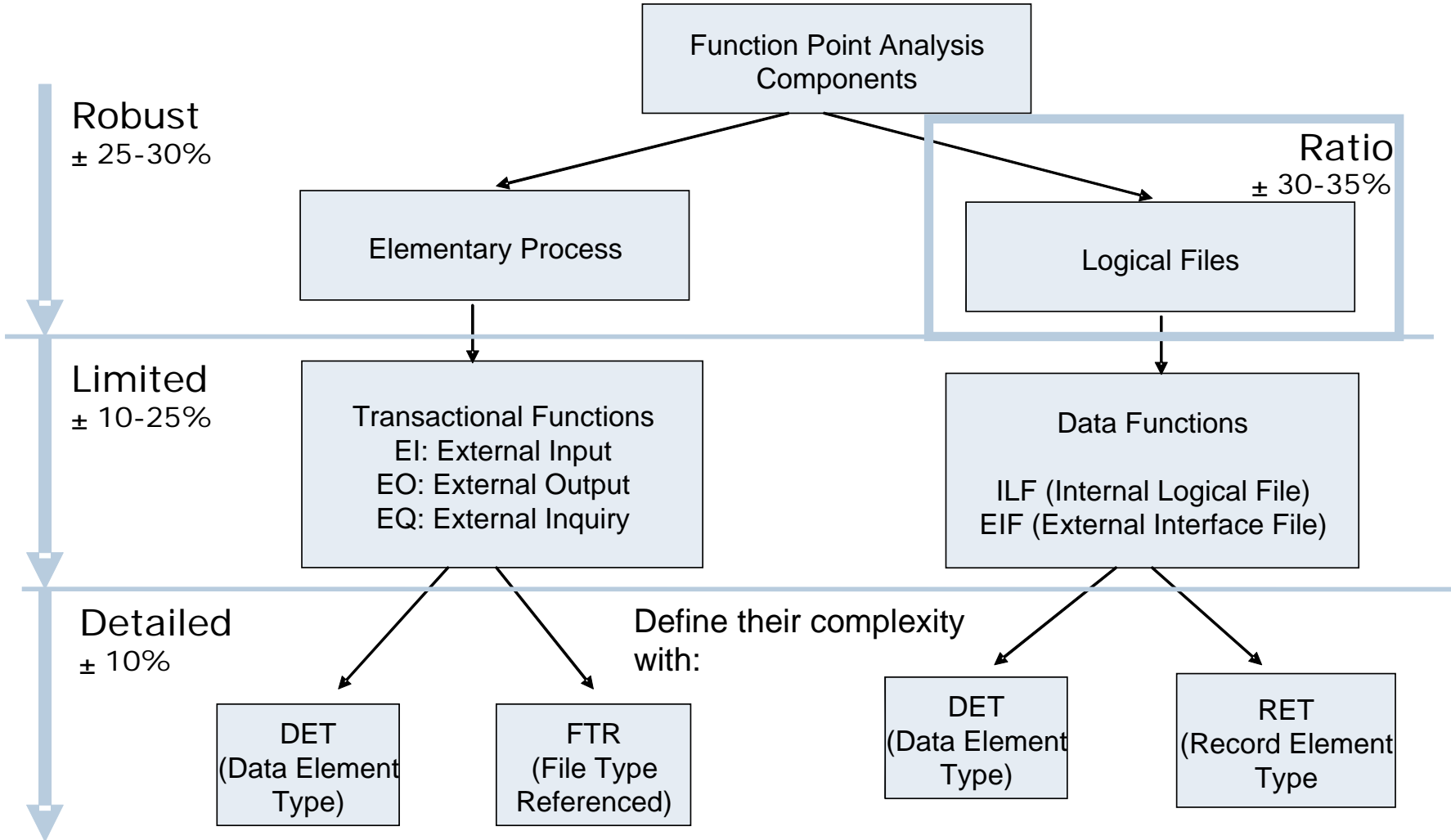
FPA - Function Point Analysis provides a good size measure that depicts the software requirements by functionality as recognized by the users.

SLOC - Source Lines of Code is also a frequently used size measure, but has the disadvantage of being heavily technology dependent.

Both of these are recognised as industry benchmark size measures and should therefore be used in order to ensure sizing consistency across different projects

Sizing consistency is also needed in order to utilise historical information and parametric estimating techniques

FPA counting approach - and accuracy

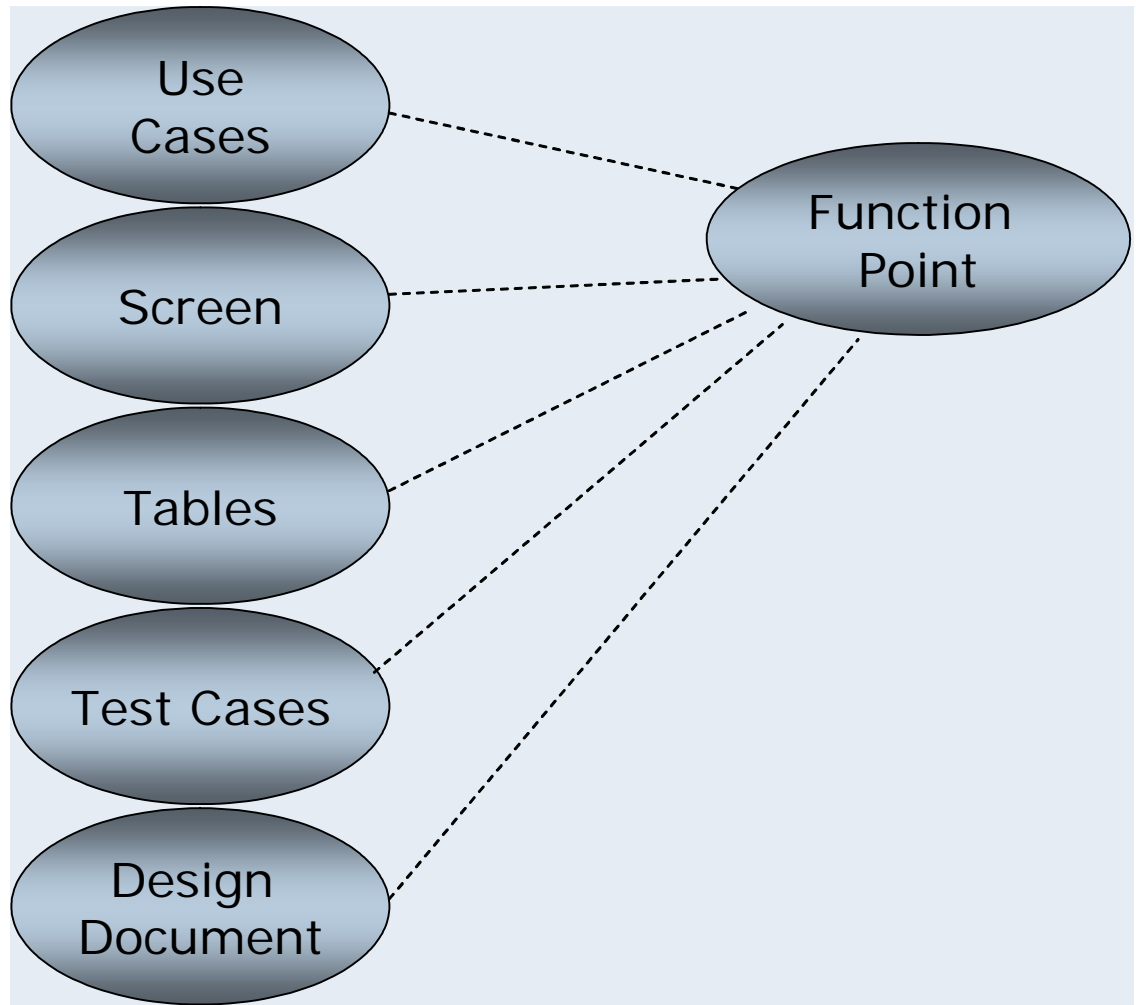


Sizing - Using Delivery Units and FPA

Delivery units are useful as a way determining size which is project specific

Delivery Units and size are usually closely related.

Could calibrate the link between the delivery units and the FPA



WBS - Task Based Estimating

- Task based estimating using the WBS structure is the most common approach to estimating and is well documented.
- There are a few key factors which should be considered from an estimating perspective:
 - A common phase based WBS structure
 - Relative effort by phase
 - The percentage distribution of project phases in terms of effort and duration

- **Main ROI**

- A list of tasks to be performed
- Work related view of the project
- A framework for tracking change against specific tasks
- A common framework for creating a historical database (assuming the use of a common WBS structure in the organisation).

Historical Information

Historical information should consist of measurement information

- Size
- Effort
- Defects
- CR
- Staff
- Duration

and in addition Project or Application Characteristics

- influencers
- characteristics information

In CMMI this is called the **Organisation's Measurement Repository**

Main ROI

- Reuse in future estimates and by other estimators in the same or different locations
- Reuse of lessons learned regarding defects etc..
- Data to be used for Measurement and analysis
- Tracking information by objective measured rather than subjective assessment
- Enables the development of internal benchmarks

"The disadvantage of men not knowing the past is that they do not know the present"
(G. K. Chesterton)

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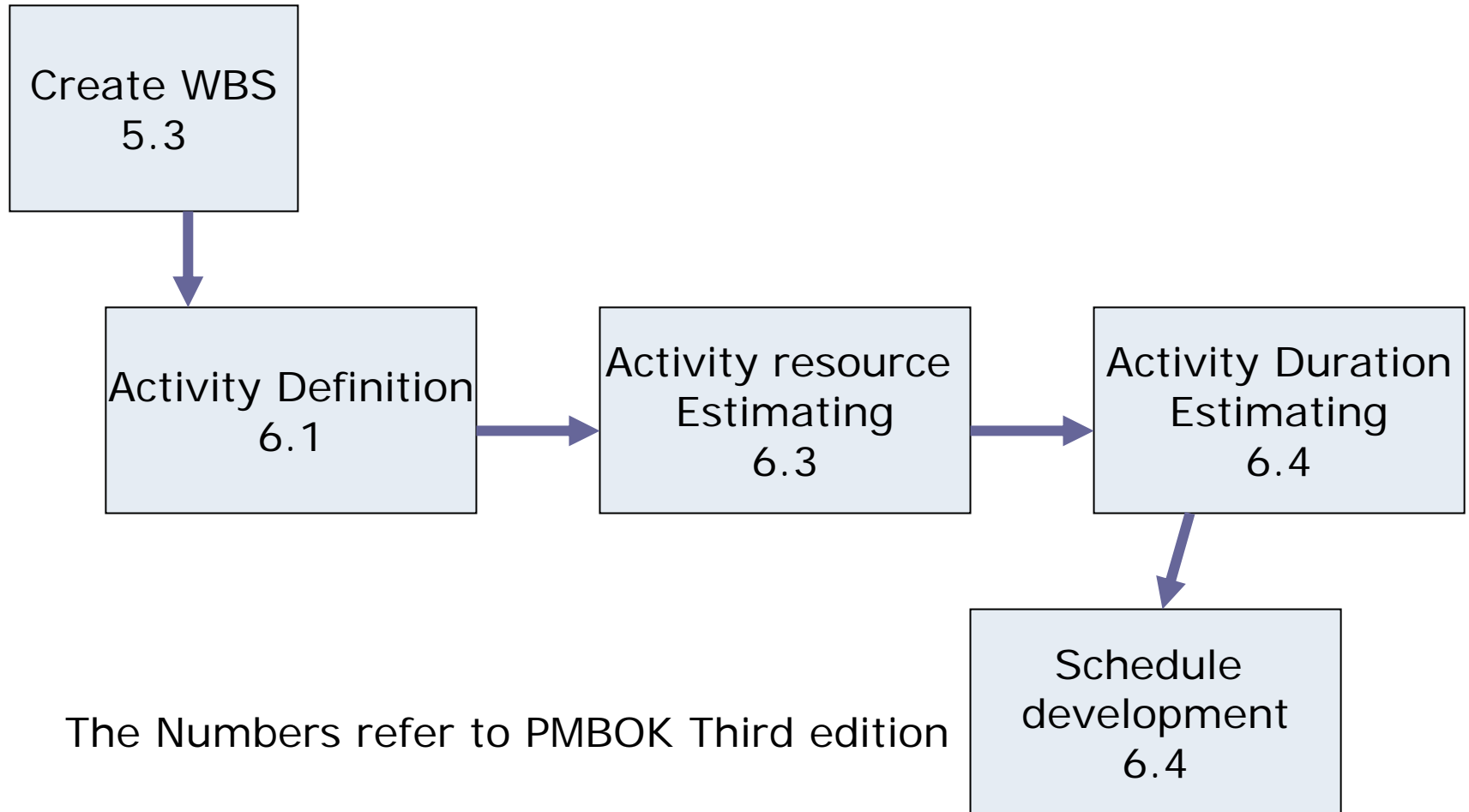
Using Multiple Estimating Techniques

- Use different Techniques
- Use different resources to perform the techniques
- Ensure the right people give input
- Ensure that apples are compared with apples
- Remember to document any assumptions, constraints or risks that are identified during estimating

Main ROI

- Using more than one technique - Validation of estimates
- More objective approach than usual bottom-up approach
- Peer review of estimates
- Ensure ability to track and monitor progress, productivity and Quality using historical information like expected defect etc.

Bottom-up estimate



The Numbers refer to PMBOK Third edition

Bottom-up estimating

- Make sure to include team approve/agreement of the lower level estimates
- **Should be linkable to the WBS**
- Look out for missing overhead – such as PM work, Review or Rework effort
- Create a bottom-up estimate so that it can be matched to other estimating technique outputs.

Main ROI

- Expert view of task's and deliverables
- Expert view on estimates
- Expert ability to identify issues (remember to record these) early in the life cycle
- Team agreement on tasks to be performed
- Decompose / roll-up activities to a level that makes reliable estimates

"The accuracy of bottom-up estimating is driven by the size and complexity of the work identified at the lower levels. Generally smaller work scopes increase the accuracy of the estimates. "

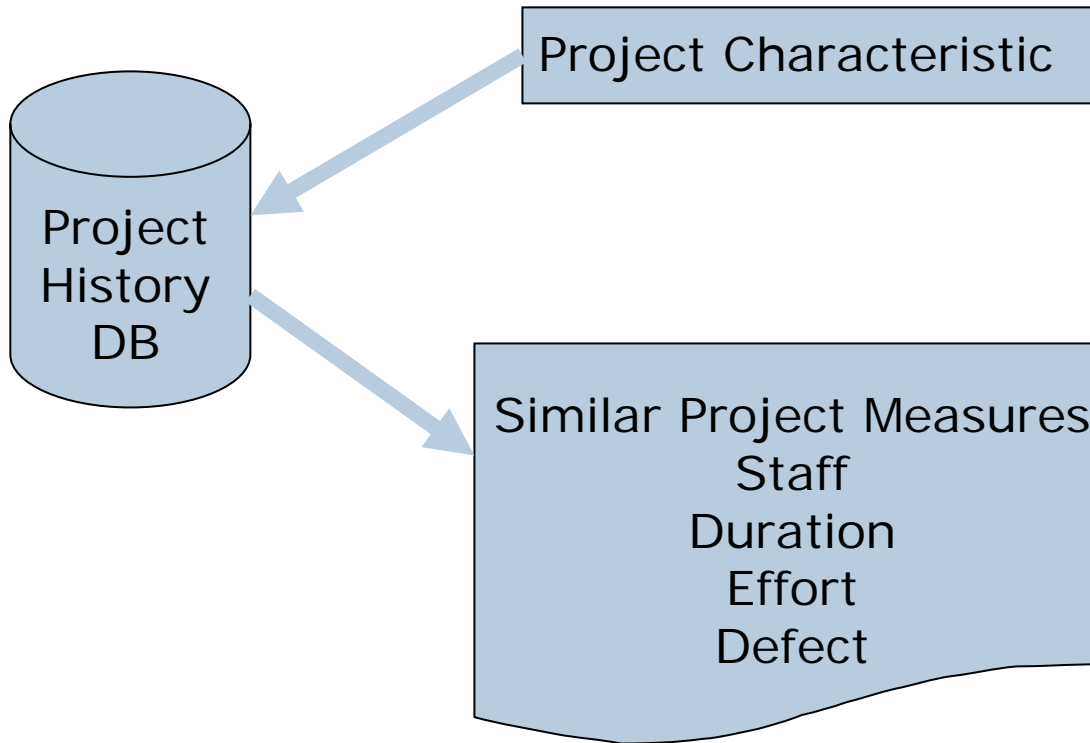
PMBook, Third edition

Three Point Estimating

Phase	Low	Most likely	High	Expected time	Variance
Refine Scope and Analyze Requirements	10	15	35	16	17
Design (High and low level design)	15	20	66	24	72
Produce (Coding, Code Review)	44	55	66	48	13
Unit & Integration Testing	60	88	130	80	136
Release (QC & Staging)	80	60	40	47	44
Acceptance Testing	10	15	20	13	3
Implement	8	16	32	16	16
Project Management (Start-up, Plan, Manage, Closedown)	20	30	40	27	11
Total	247	299	429	271	920

- Three point estimating is a statistical technique which can be used effectively together with bottom up estimating.
- The biggest benefit from using this estimating approach is the ability to **compare** the Expert Estimate with the variance. It is always recommended that **you should** investigate major variance.

Analogues Estimating



The analogous estimating technique uses information from similar projects to establish a cost estimate based on the data available.

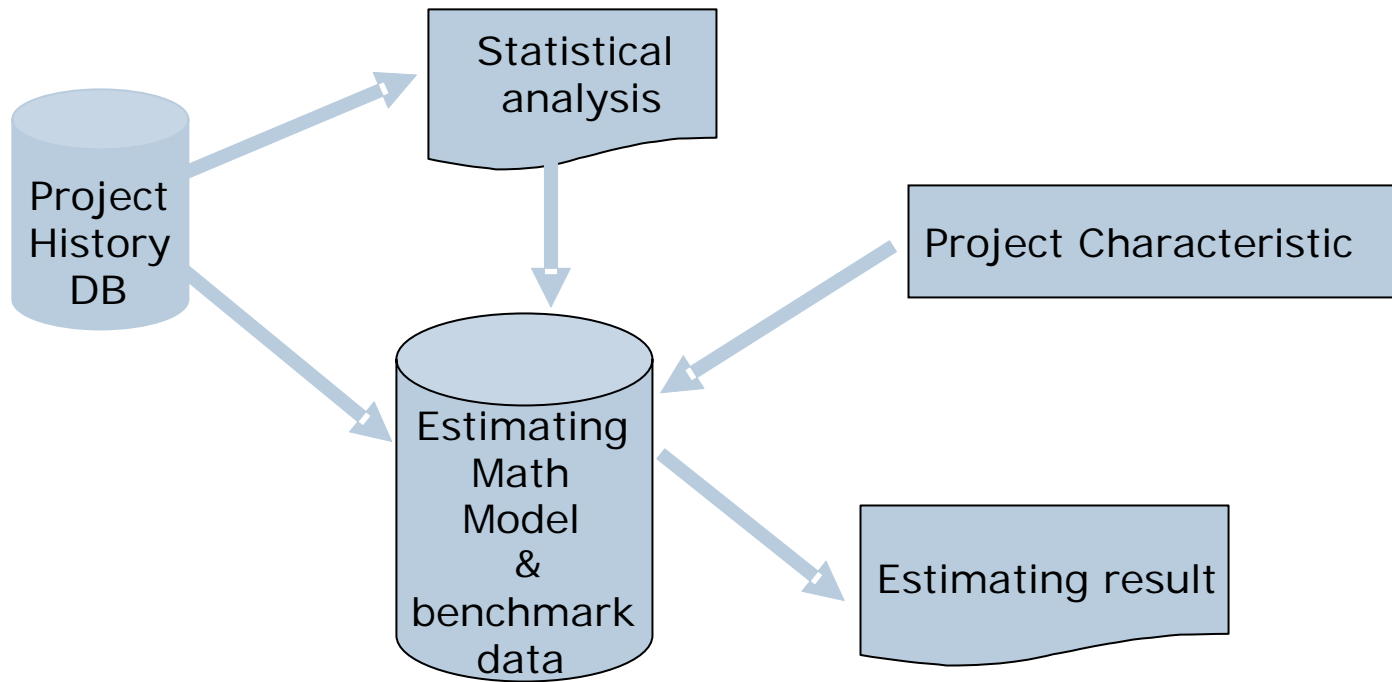
Often used as simple comparison of previous similar projects or past enhancements projects on the same application

Main ROI

- Usage of knowledge learned from previous project
- Learn from historical data & cross check with it

Be aware that when identifying analogues estimates – the project might benefit from the reuse of other areas from the project – ex. Work product, process definition etc.

Parametric Estimating



- Parametric estimating uses a mathematical model using various sources of data to create a series of views of possible delivery scenarios
- Use Parametric estimates to produce several scenarios.
- Create scenarios to show the impact of the constraints and influences affecting Productivity or Quality.

Main ROI from process perspective using Parametric Estimating

- Establish a range of possible and impossible region for estimates
- Allows comparison with internal and external data from successful projects
- Enables reports for
 - PMs and Programme Managers
 - Senior Managementand
 - clients

to demonstrate optimal delivery timescales and cost drivers and to demonstrate associated Risk with time or staff constraints

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Next Step - After the Estimate

- Develop schedule
 - Including impact of combining the staffing and duration constrains
 - Remember impact on effort of utilizing different staffing experience
- Cost Estimate
 - Staffing rate
 - Other cost associated with purchase
 - Travel, training etc...

Always Take CAR(e)

Constraints, **A**ssumptions, **R**isks

References

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- David Garmus, David Herron, *Function Point Analysis; Measurement Practices for Successful Software Projects*, Addison-Wesley, 2001
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- *Guidelines to Software Measurement*, Release 2, IFPUG, www.ifpug.org
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- Christine Green, *CMMI & FPA - – the link and benefit of using FPA when rolling out CMMI*, ESEPG & IFPUG conference 2004

The background consists of several overlapping, semi-transparent blue papers scattered across the frame. Each paper has a large, bold black question mark printed on it. In the bottom right corner, a silver metal paperclip is visible, holding one of the papers. The overall color palette is a range of blues, from light to dark, with the black question marks providing high contrast.

Questions?

Contact Information

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