

The specialty company

**RELIABILITY AND ACCURACY
OF ESTIMATES**

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Reliability & Accuracy of Estimates

- Introduction
- Problem Definition
- Problem Evaluation
- Problem Solving
- Path forward
- Discussion



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Reliability & Accuracy of Estimates

- Introduction
 - Orlando 2003
 - My Rotary club
 - Do I have a real topic?
 - Literature survey : yes



Reliability & Accuracy of Estimates

- **Problem Definition: 2 issues!**
 - **Attitude or Content**
 - **Person or Deliverable**
 - **2 evaluations**
 - **2 solutions**



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Reliability & Accuracy of Estimates

- **Attitude and Person**
 - **ICEC Cannon of Ethics**
 - Hold paramount the safety, health and welfare of the public.
 - Perform services only in areas of their competence.
 - Issue public statements only in an objective and truthful manner.
 - Act for each employer or client as faithful agents or trustees.
 - Avoid deceptive acts.
 - Conduct themselves honorably, responsibly, ethically, and lawfully so as to enhance the honor, reputation, and usefulness of their professions.



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Reliability & Accuracy of Estimates

Definitions

(International Monetary Fund)

- **Reliability of an estimate refers to the closeness of the initial estimated value(s) to the subsequent estimated values.**
- **Accuracy of an estimate refers to the closeness between the estimated value and the (unknown) true value that the statistics were intended to measure**



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Reliability & Accuracy of Estimates

- **Reliability** of an estimate refers to the closeness of the initial estimated value(s) to the subsequent estimated values.
- Comparison of an estimate with other estimates.
- Time- and project progress related.
- Refers to the same scope for subsequent estimates.
- Reliability is primary a scope issue.



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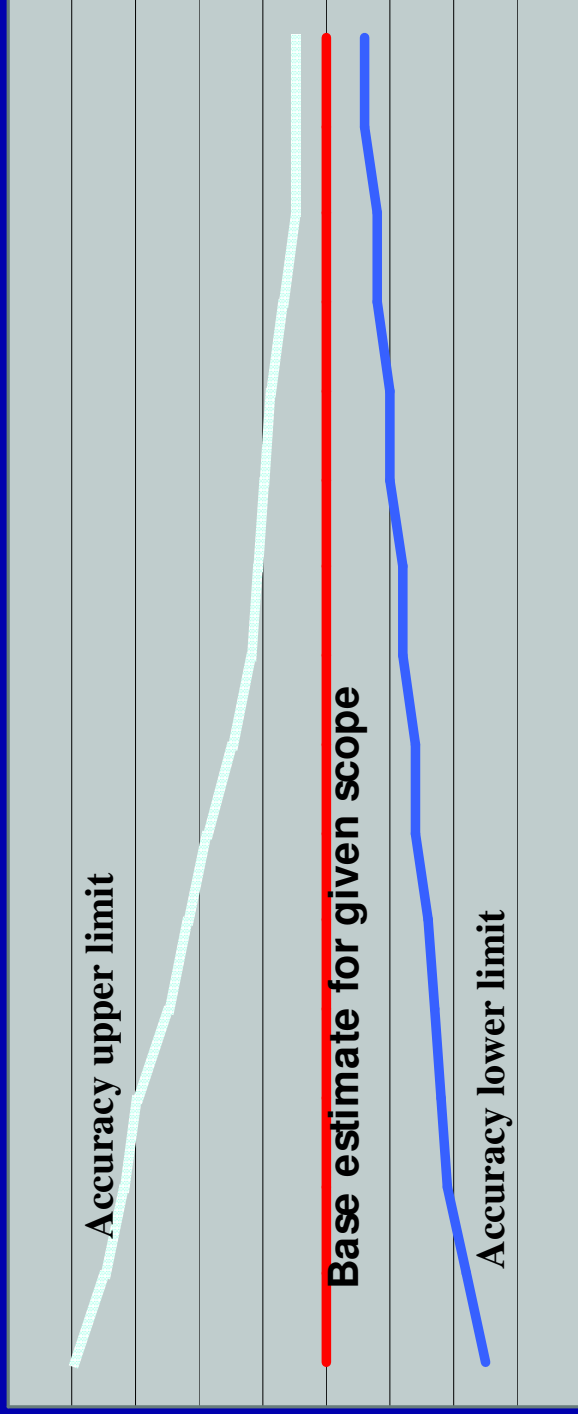
Reliability & Accuracy of Estimates

- Accuracy of an estimate refers to the closeness between the estimated value and the (unknown) true value that the statistics were intended to measure
- **Comparison of this estimate with as-built costs, the (unknown) true value for the same scope.**
- **Estimate process related**
- **No relationship with previous or subsequent estimates**
- **Accuracy is an estimate issue.**



Reliability & Accuracy of Estimates

The ideal situation



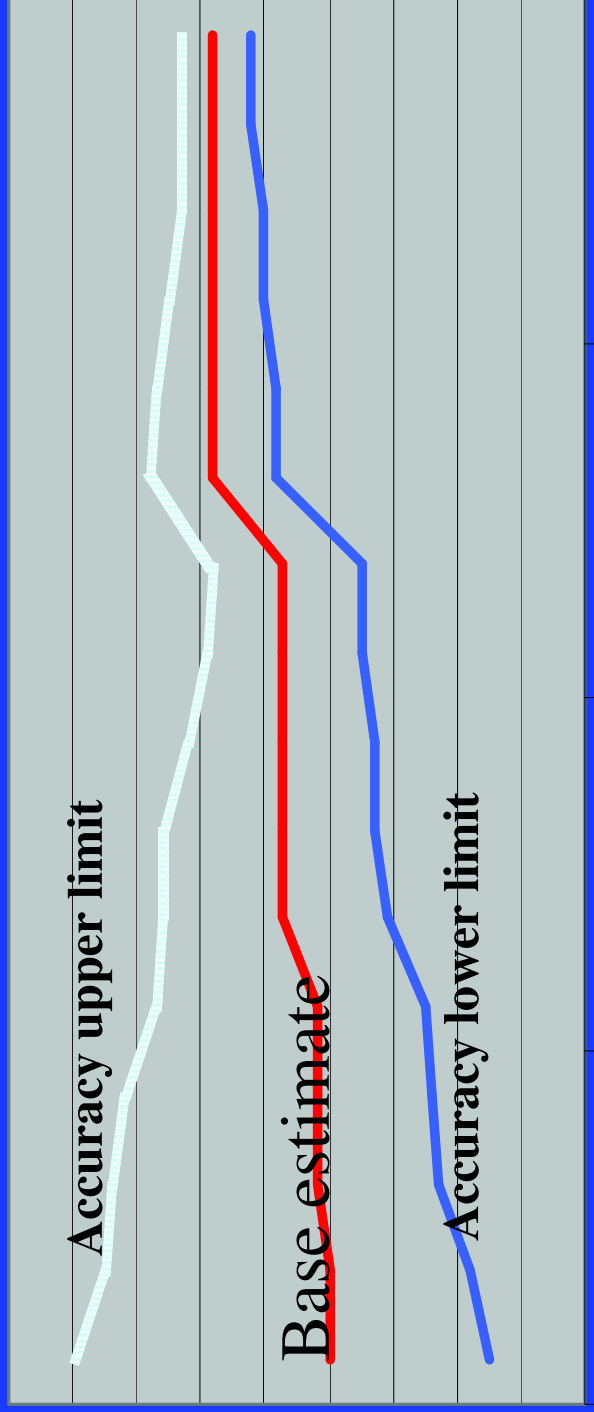
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Reliability & Accuracy of Estimates

Welcome to reality

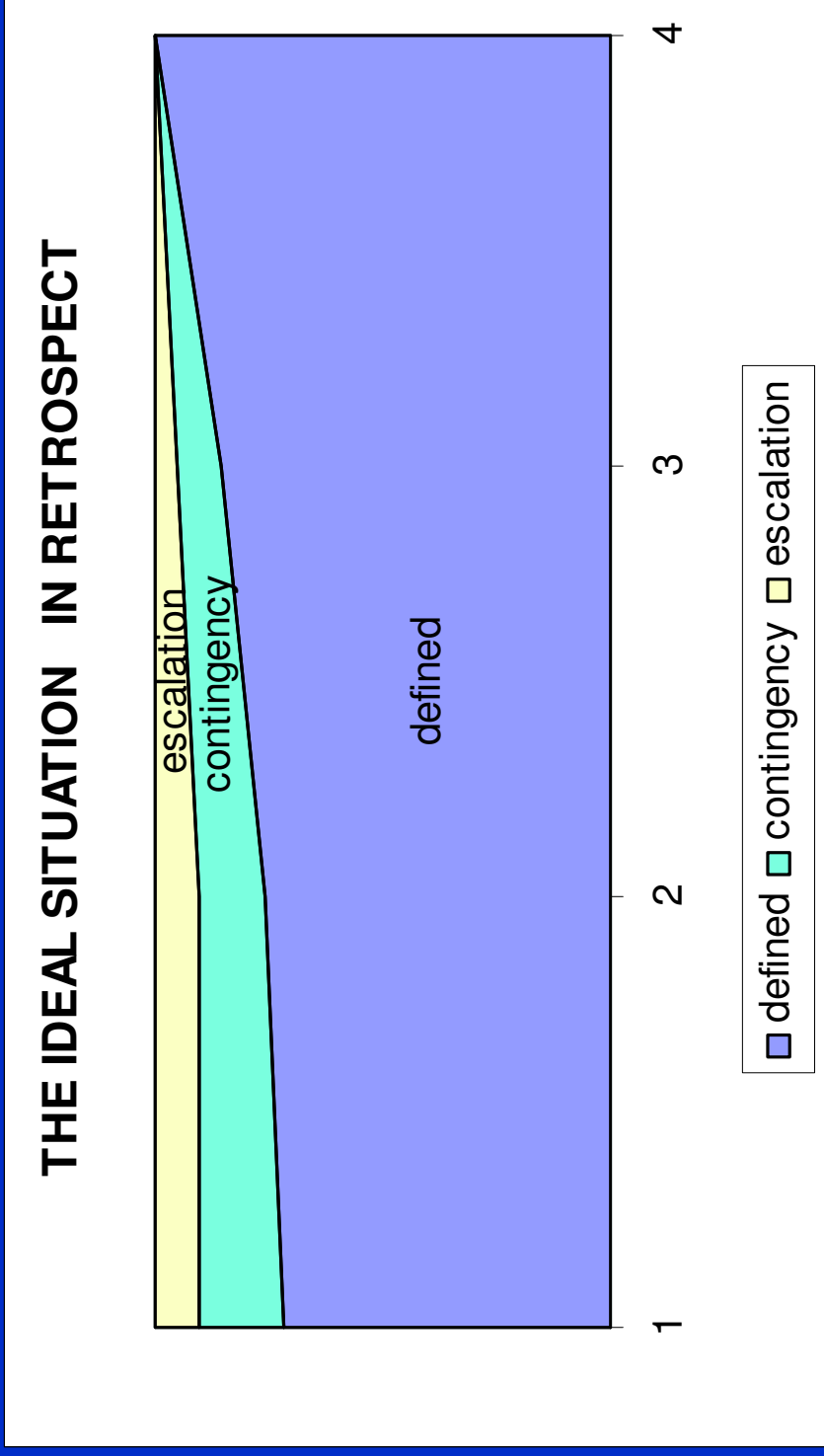


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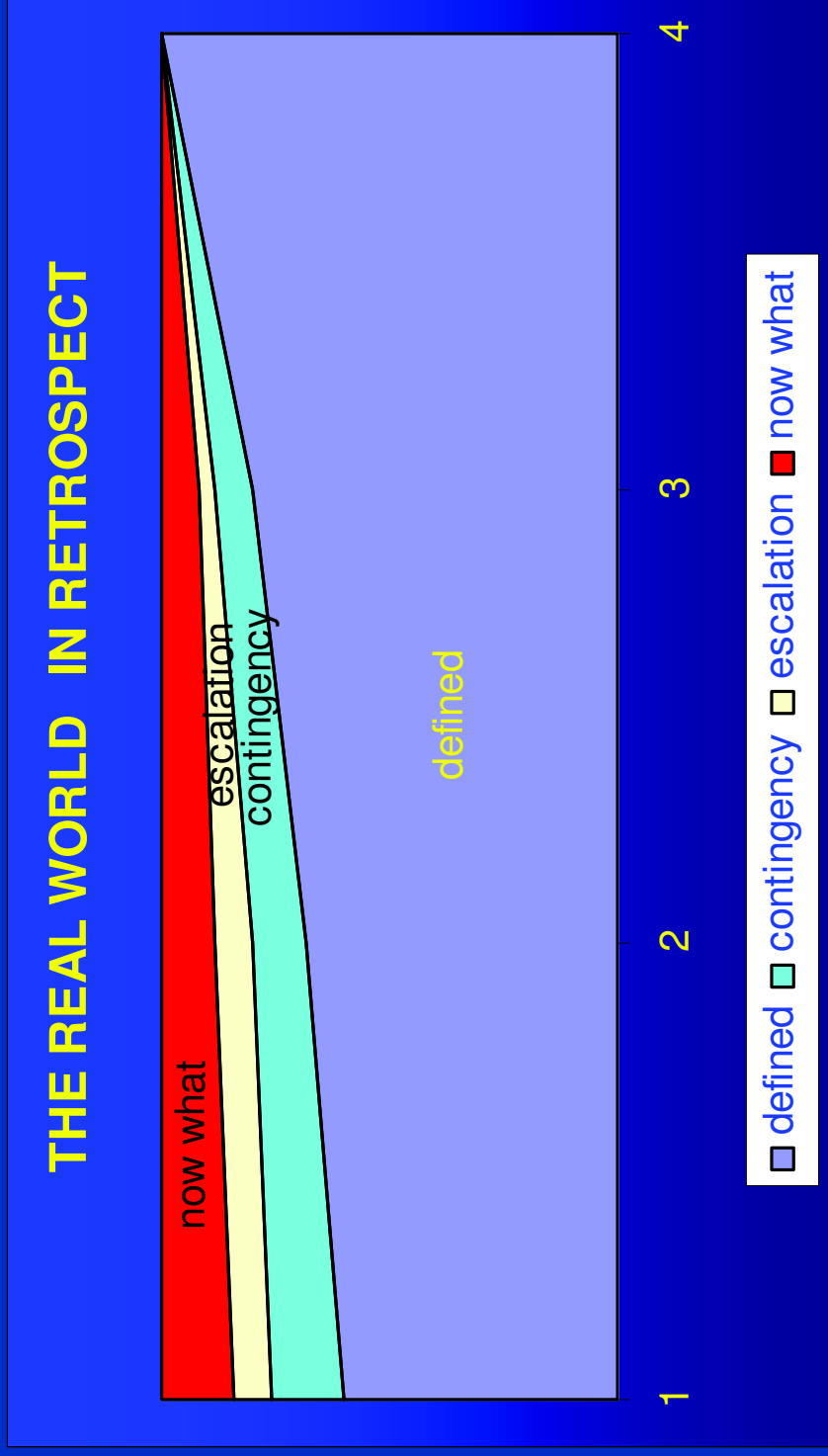


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Reliability & Accuracy of Estimates



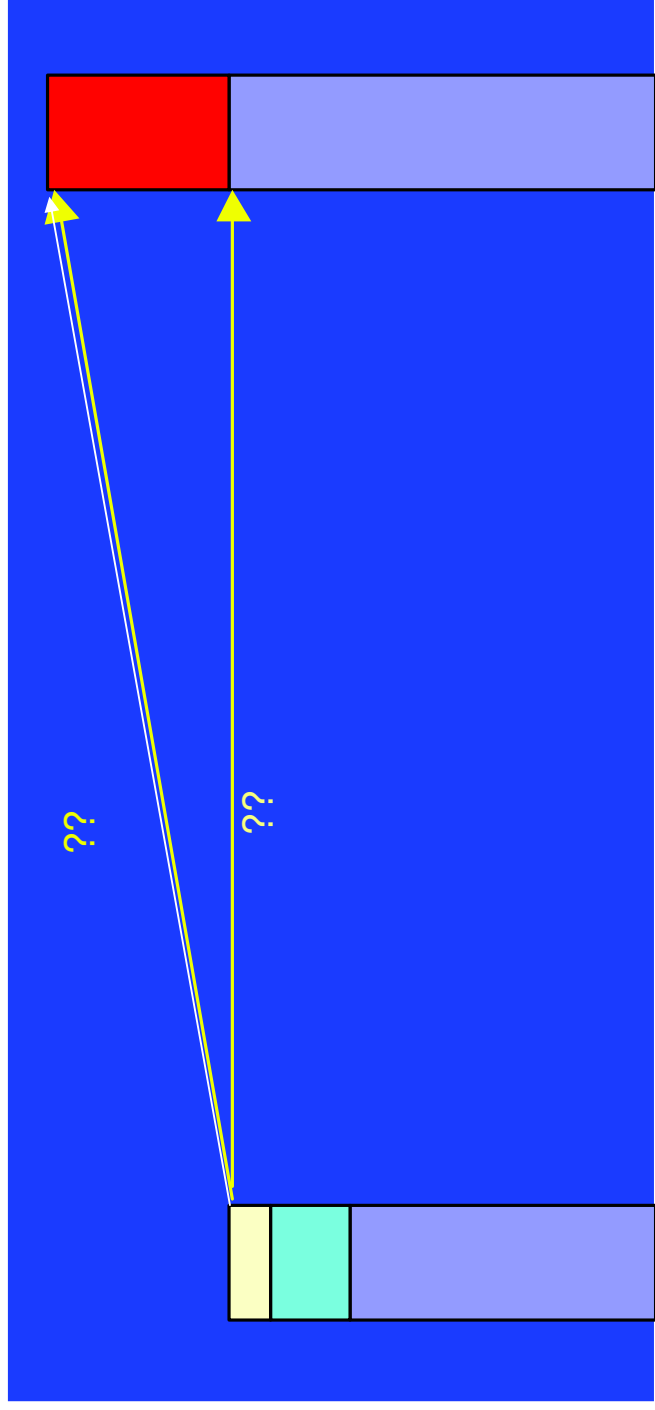
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Reliability & Accuracy of Estimates

CAN WE PREDICT THE OUTCOME ?



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Reliability & Accuracy of Estimates

General Project Data	Changes are covered by
Project Scope Description	???
Plant Production/ Facility Capacity	???
Plant Location	???
Soils & Hydrology	???
Integrated Project Plan	???
Project Master schedule	Escalation
Escalation Strategy	Escalation
Work Break Down Structure	----
Project Code of accounts	----
Contracting Strategy	Contingency
Engineering Deliverables	
Block Flow Diagrams	Contingency
Plot Plans	Contingency
Process Flow Diagram	Contingency
Utility Flow Diagram	Contingency
Piping & Instruments Diagram	Contingency
Heat & Material Balances	Contingency
Process Equipment List	Contingency
Utility Equipment List	Contingency
Electrical One-Line-Diagram	Contingency
Specifications & Datasheets	Contingency
General Equipment Arrangement Drawings	Contingency
Spare Parts Listing	Contingency
Mechanical Discipline Drawings	Field change allowance
Electrical Discipline Drawings	Field change allowance
Instrumentation/ Control System Discipline Drawings	Field change allowance
Civil/Structural/Site Discipline Drawings	Field change allowance



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Reliability & Accuracy of Estimates

- Reliability input
 - General Project data:
 - Capacity of Facility
 - Product Quality
 - Technology
 - Patents
 - Location
 - Execution Philosophy
 - Accuracy input
 - Engineering Deliverables
 - Diagrams
 - Drawings
 - Take off's
 - Schedules
 - Etc



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Reliability & Accuracy of Estimates

- **Reliability input**
 - **What is the impact of changes?**
- **Accuracy input**
 - **What is the impact of changes?**



Reliability & Accuracy of Estimates

- Changes
 - Changes with impact on reliability.
 - Changes in starting points: scope changes.
 - Changes with impact on accuracy.
 - Changes during engineering: scope variations.
 - Discoveries during engineering might result in scope changes.



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Reliability & Accuracy of Estimates

- Changes
 - Scope changes are not covered in the estimate
 - Scope variations are covered under contingency.
- Owner does not accept a higher figure as long he does not changes his starting points!!



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Reliability & Accuracy of Estimates

- Variations occur in changes in engineering input:
 - Process engineering information
 - Equipment & Mechanical
 - Process Control and Automation
 - Architectural & Civil
 - Electrical
 - Project schedule



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Reliability & Accuracy of Estimates

- Changes occur in business input:
 - Facility
 - Capacity
 - Product
 - SHE
 - Product Quality
 - Technology
 - Patents
 - Location
 - Execution philosophy



Reliability & Accuracy of Estimates

- Changes occur in business input:
 - Can these changes be predicted?
 - We do not have a crystal ball, the answer is NO.
 - Scenario analysis will help, but for each scenario a separate estimate must be prepared.

However:



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Reliability & Accuracy of Estimates

- A rating system might help:
 - Rate the business input
 - Facility ; Product Quality ; Technology
 - Patents ; Location ; Execution philosophy
 - Use the rating as an input for the estimate process.
 - Do not start if the rating is too low



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level 1 level 2 level3 level 4

level 3

level 2

level 1

FACTOR

FACILITY max 25 points

Annual capacity Max 15 points	Capacity based on confirmed long-term sales plans 15 points	Capacity confirmed	Assumed; No firm figures 2 points
Operational requirements Max 5 points	Operating manuals , plans etc available 5 points	Operating philosophy & automation philosophy 2 points	No Information available 1 point
Safety Health Environment (SHE) Max 5 points	All Recommendations from SHE assessment planned 5 points	Preliminary SHE assessment available 2 points	SHE Requirements not identified 1 point

PRODUCT Max 30 points

Product quality Max 20 points	Re-supply to market 20 points	Quality checked with market 10 points	Theoretical 5 points
Raw materials Max 10 points	Facility operational 10 points	assumed of quantities & quality 5 points	assumed of quantities & quality 2 points

TECHNOLOGY Max 30 points

Technology Maturity Max 15 points	Full scale 15 points	Lab scale 5 points	Theoretical 2 points
Technology status Max 10 points	Extension of existing technology 10 points	New for the company 2 points	New for the industry 1 point
Patents Max 5 points	Existing patents 5 points	Patents position unknown 2 points	Patents position unknown 2 points

LOCATION Max 5 points

Site selection Max 5 points	Site selected; All required information available, 5 points	Site selected; no information on soil & hydrology; No utility check 2 points	No information available 1 point
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SCHEDULE Max 10 points

Time to market Max 5 points	Detailed project planning 5 points	Agreed project planning 4 points	Preliminary project planning 2 points	Only assumed milestones 1 point
Execution Plan Max 5 points	Contracting strategy, Contract parties involved. 5 points	Involved parties identified globally 4 points	Agreed execution philosophy 2 points	Assumed execution philosophy 1 point

Reliability & Accuracy of Estimates

- Weighting of topics is arbitrary and should be business and project-specific
- Fill in rating with key stakeholders
- Agree in advance on the lowest acceptable rating



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Reliability & Accuracy of Estimates

- Path Forward:
 - Analyze large project database for correlation between reliability topics and project outcome.
 - **WARNING: a correlation on one issue might cancel out the correlation on another issue!!**
 - **A Reliability reserve as % of the estimate might be the future.**



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Reliability & Accuracy of Estimates

- Path Forward:

I will be back.



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DISCUSSION



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