

The specialty company

RELIABILITY AND ACCURACY OF ESTIMATES

Steven Boeschoten

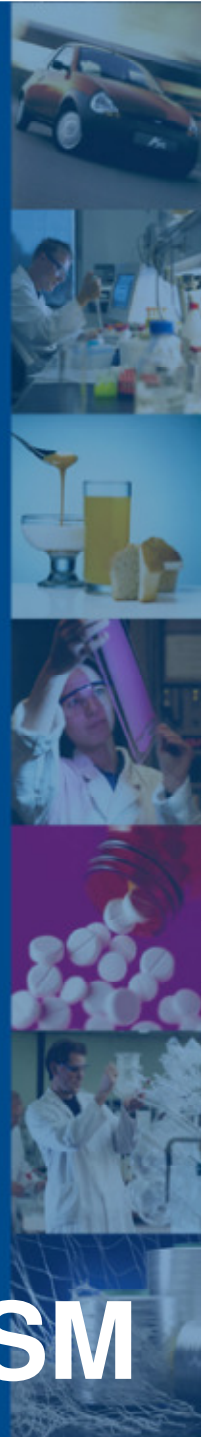


Unlimited. **DSM**



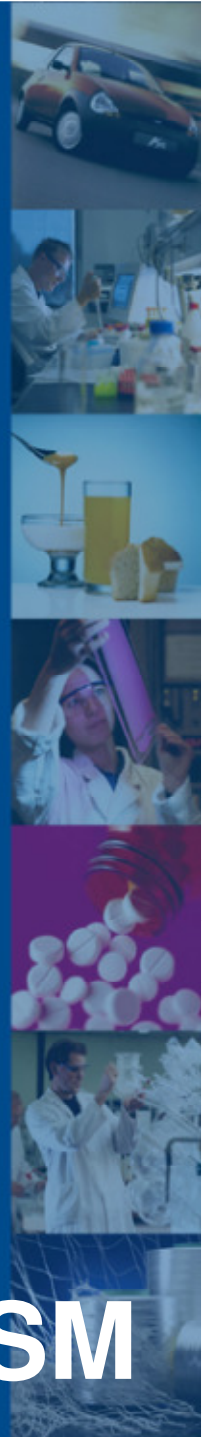
Reliability & Accuracy of Estimates

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



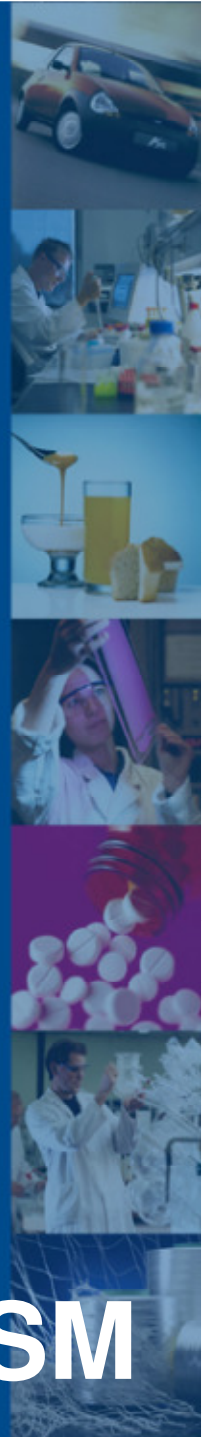
Reliability & Accuracy of Estimates

- 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**

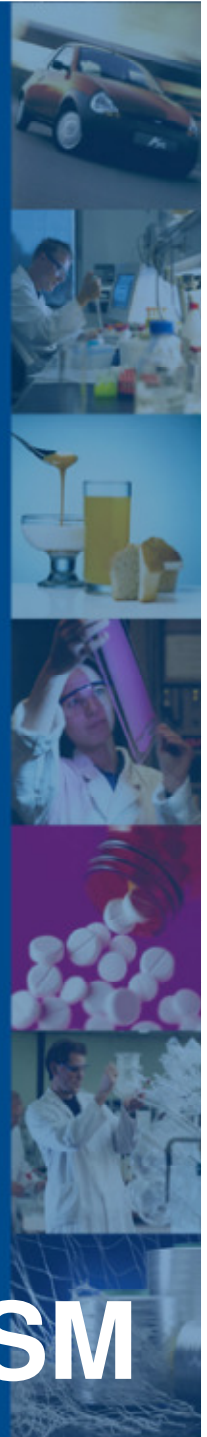


Reliability & Accuracy of Estimates

- **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.**

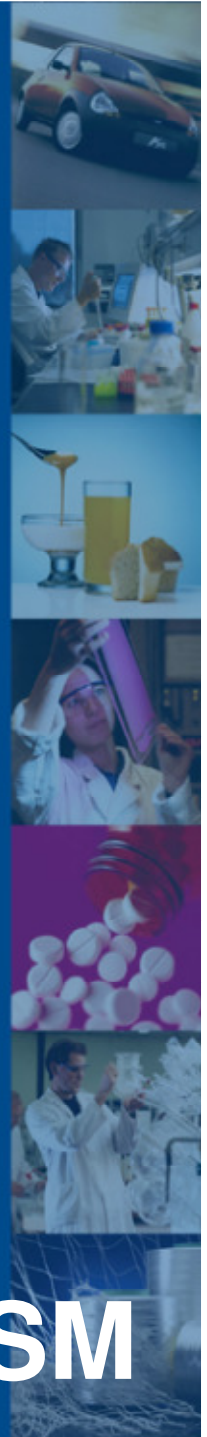


Reliability & Accuracy of Estimates

Definitions

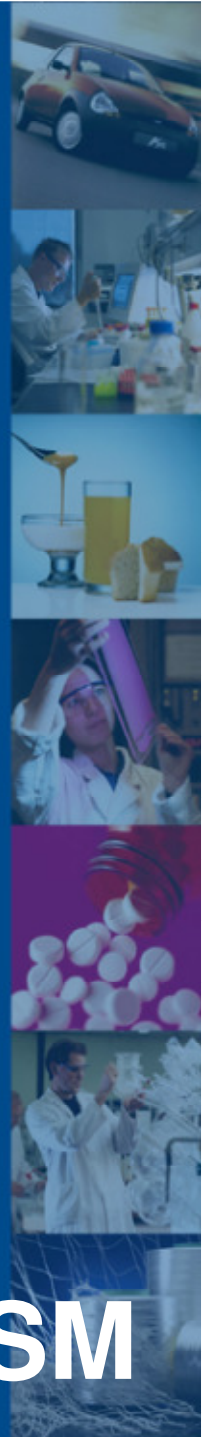
(International Monetary Fund)

- **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



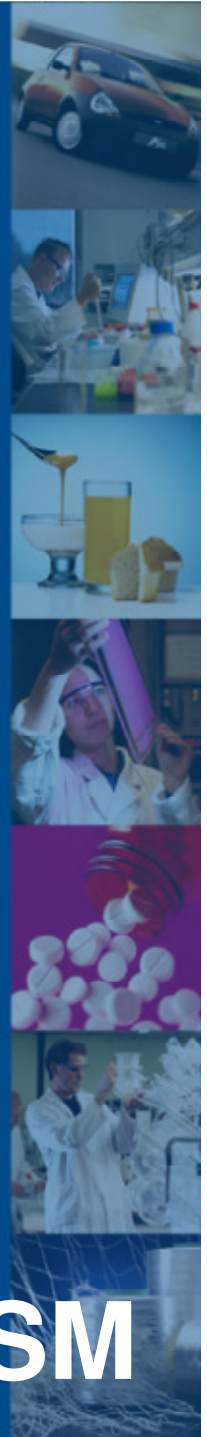
Reliability & Accuracy of Estimates

- **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.



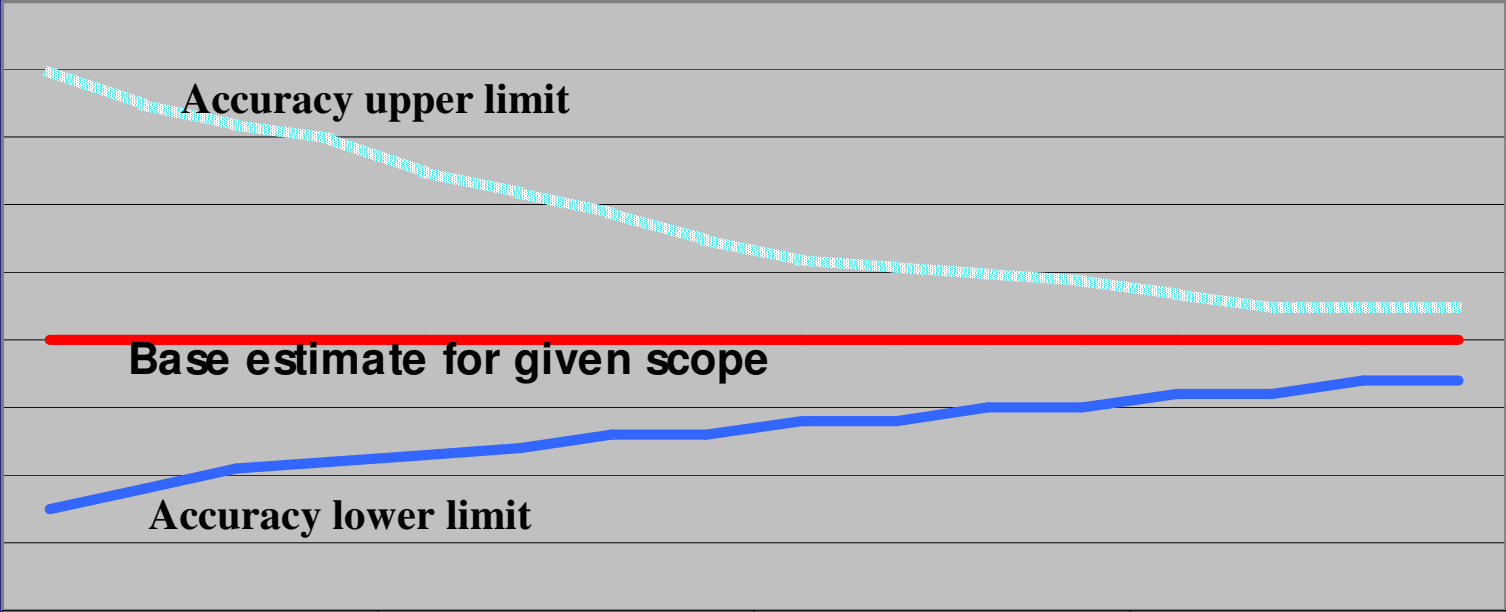
Reliability & Accuracy of Estimates

- **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.**



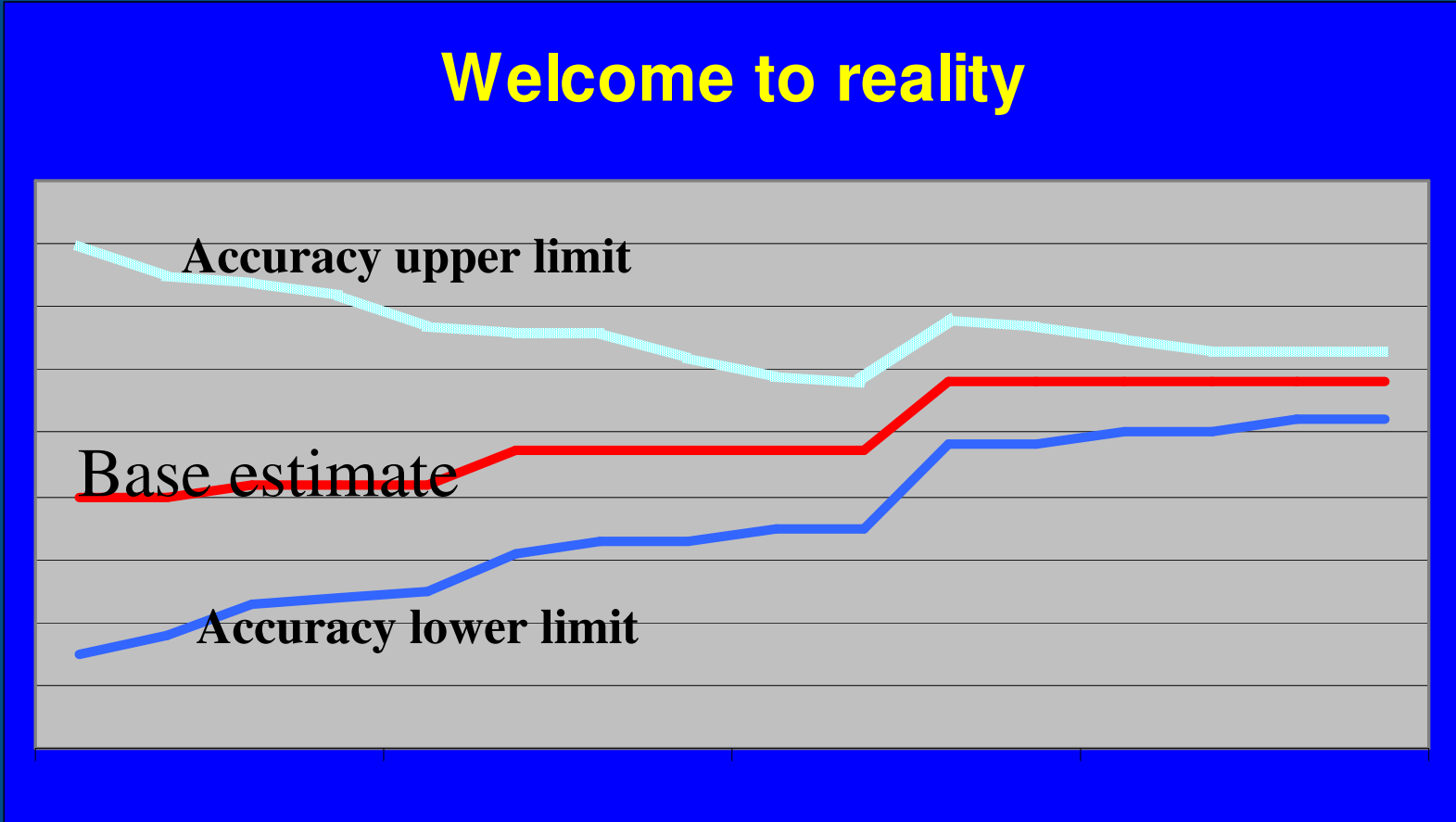
Reliability & Accuracy of Estimates

The ideal situation



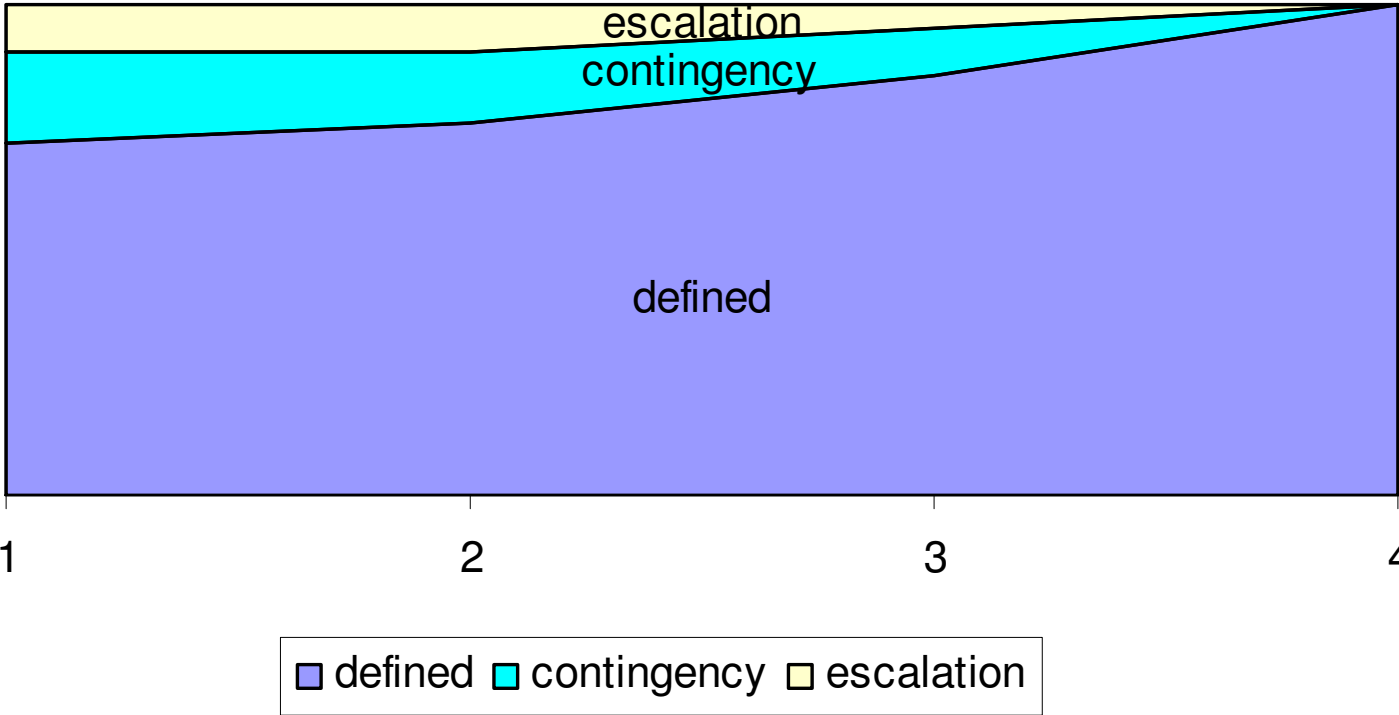
Reliability & Accuracy of Estimates

Welcome to reality

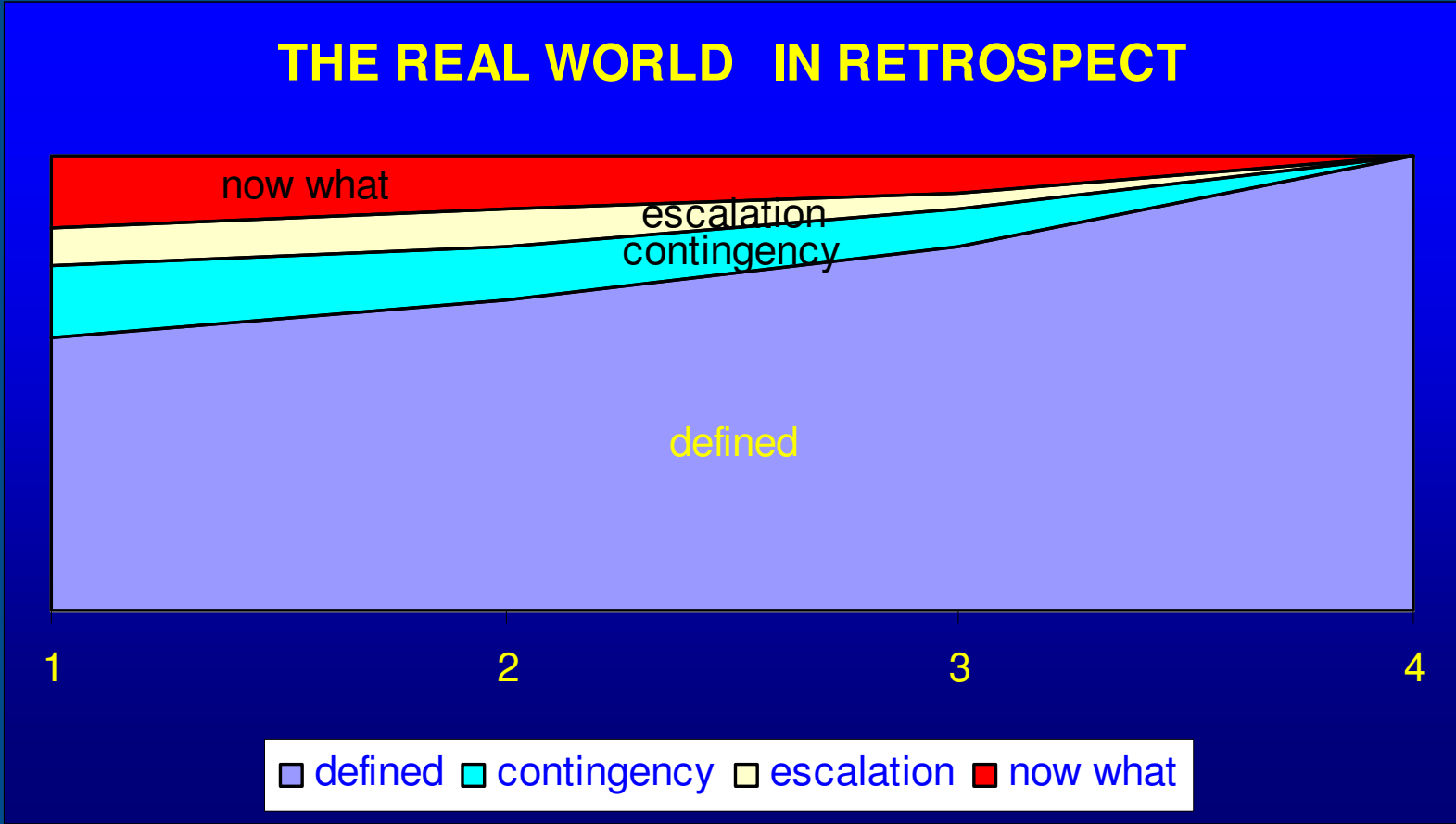


Reliability & Accuracy of Estimates

THE IDEAL SITUATION IN RETROSPECT

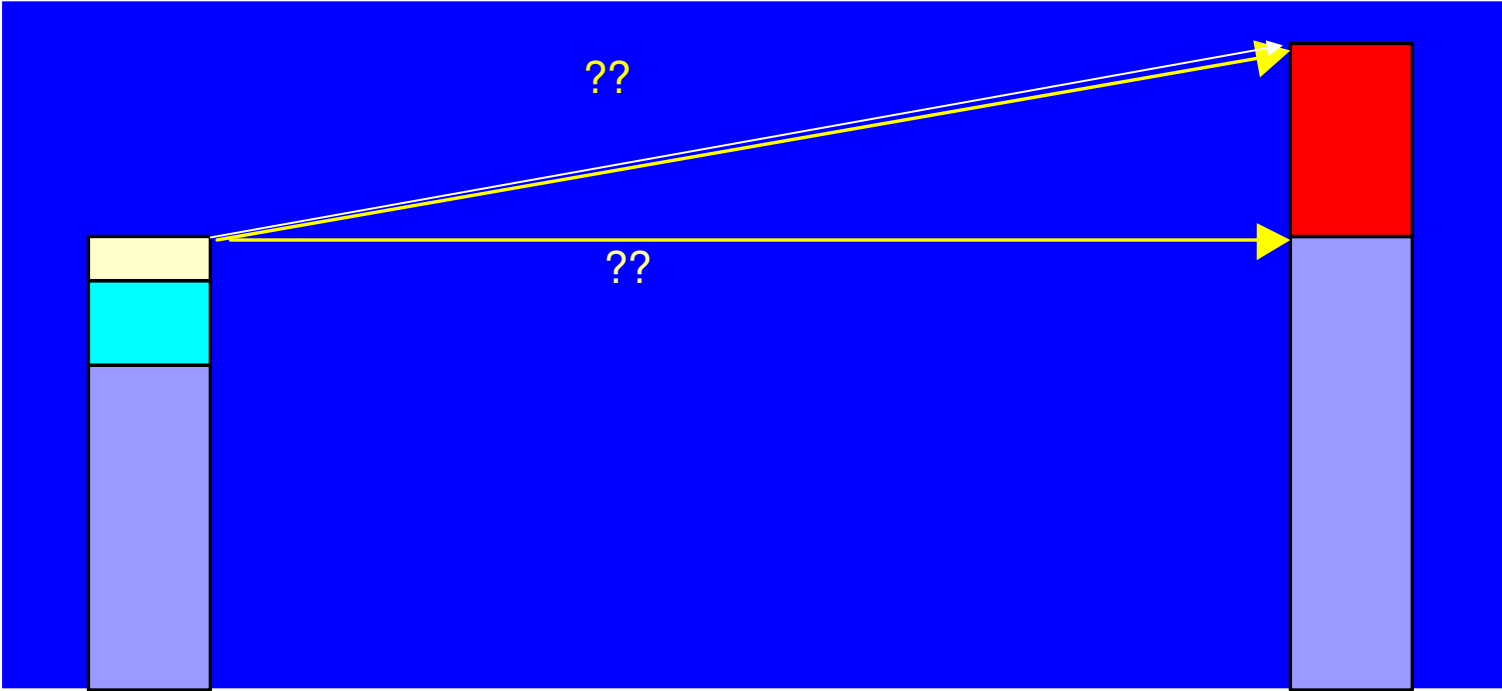


Reliability & Accuracy of Estimates



Reliability & Accuracy of Estimates

CAN WE PREDICT THE OUTCOME ?



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



Reliability & Accuracy of Estimates

- Reliability input

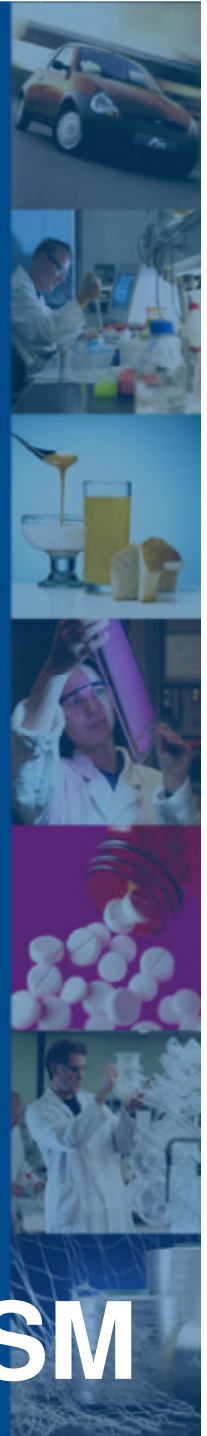
- General Project data:

- Capacity of Facility
 - Product Quality
 - Technology
 - Patents
 - Location
 - Execution Philosophy

- Accuracy input

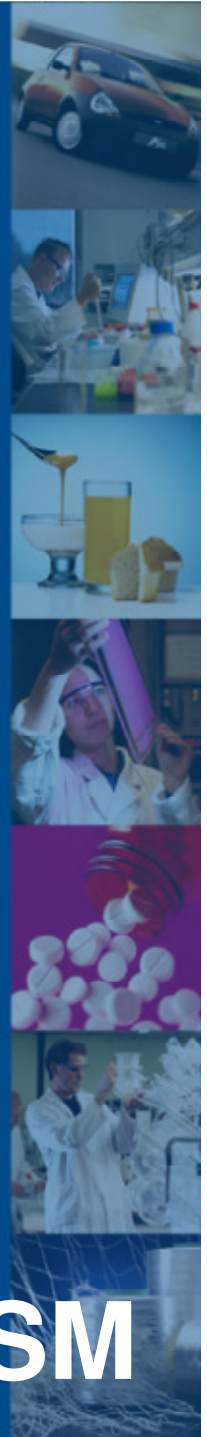
- Engineering Deliverables

- Diagrams
 - Drawings
 - Take off's
 - Schedules
 - Etc



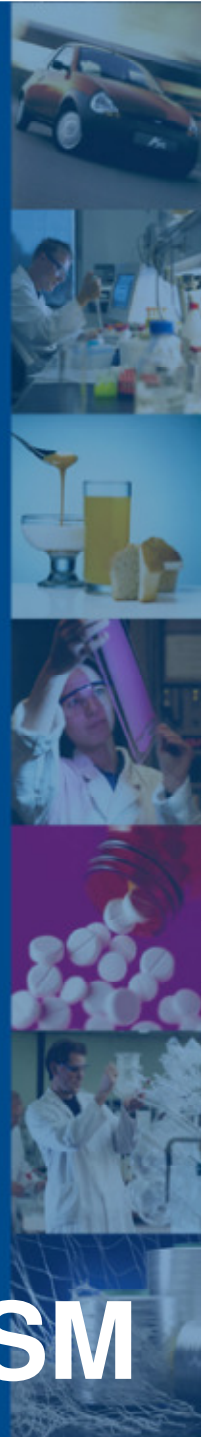
Reliability & Accuracy of Estimates

- **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.



Reliability & Accuracy of Estimates

- Changes

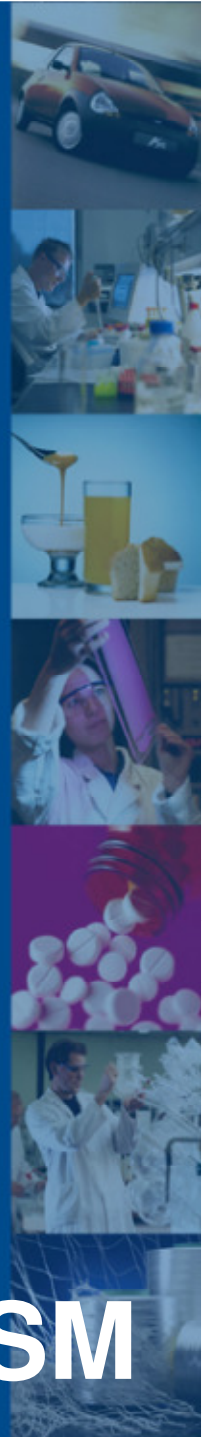
- Scope changes are not covered in the estimate
- Scope variations are covered under contingency.

– Owner does not accept a higher figure as long he does not changes his starting points!!



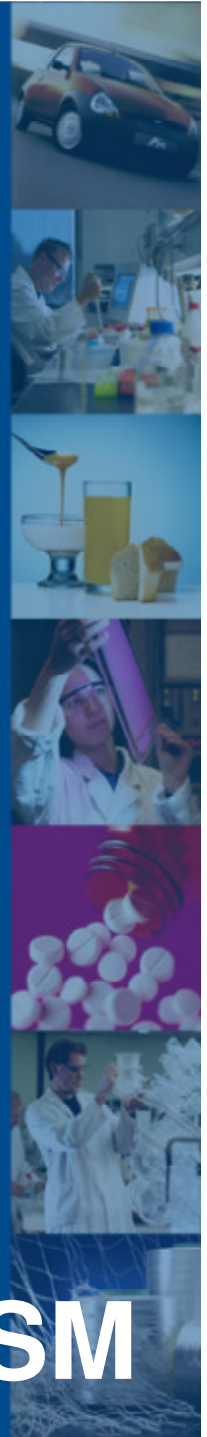
Reliability & Accuracy of Estimates

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



Reliability & Accuracy of Estimates

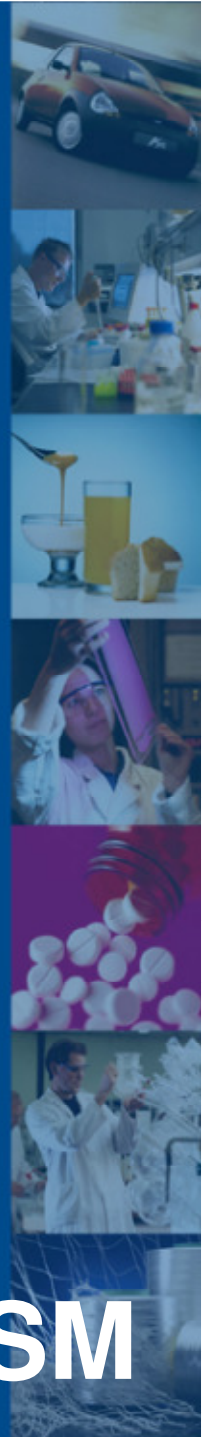
- Changes occur in business input:
 - Facility
 - Capacity
 - Product
 - SHE
 - Product Quality
 - Technology
 - Patents
 - Location
 - Execution philosophy



Reliability & Accuracy of Estimates

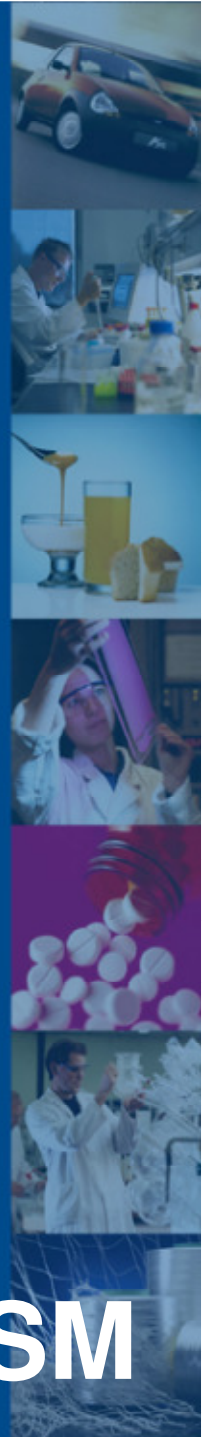
- Changes occur in business input:
 - Can these changes be predicted?
 - We do not have a crystal ball, the answer is NO.
 - Scenario analysis will help, but for each scenario a separate estimate must be prepared.

However:



Reliability & Accuracy of Estimates

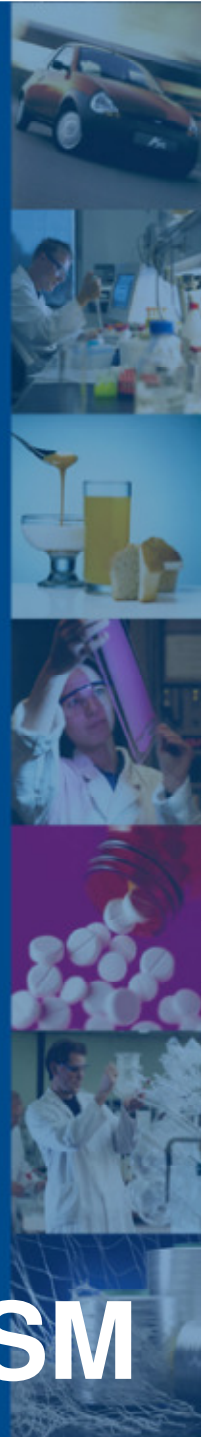
- A rating system might help:
 - Rate the business input
 - Facility ; Product Quality ; Technology
 - Patents ; Location ; Execution philosophy
 - Use the rating as an input for the estimate process.
 - Do not start if the rating is too low



FACTOR	level 1	level 2	level3	level 4
FACILITY max 25 points				
Annual capacity Max 15 points	Capacity based on confirmed long-term sales plans 15 points	Capacity based on confirmed long-term sales plans 15 points	Capacity confirmed 5 points	Assumed; No firm figures 2 points
Operational requirements Max 5 points	Operating manuals , plans etc available 5 points	User Requirements Specifications 4 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	All Recommendations from SHE assessment identified. 4 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 approved 15 points	Quality checked with market 10 points	Theoretical 5 points
Raw materials Max 10 points	Facility operational 10 points	Final study 7 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	Pilot Plant scale 10 points	Lab scale 5 points	Theoretical 2 points
Technology status Max 10 points	Extension of existing technology 10 points	New application for known technology 7 points	New for the company 2 points	New for the industry 1 point
Patents Max 5 points	Existing patents 5 points	New patent approved 4 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; All required information available, but not yet assessed 4 points	Site selected; no information on soil & hydrology; No utility check 2 points	No information available 1 point
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

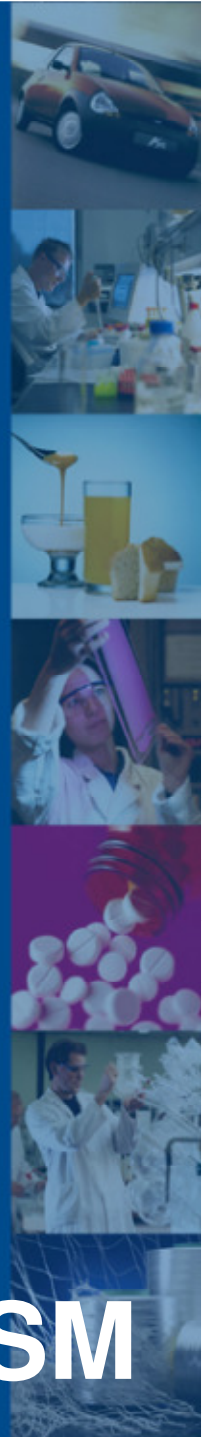
Reliability & Accuracy of Estimates

- 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



Reliability & Accuracy of Estimates

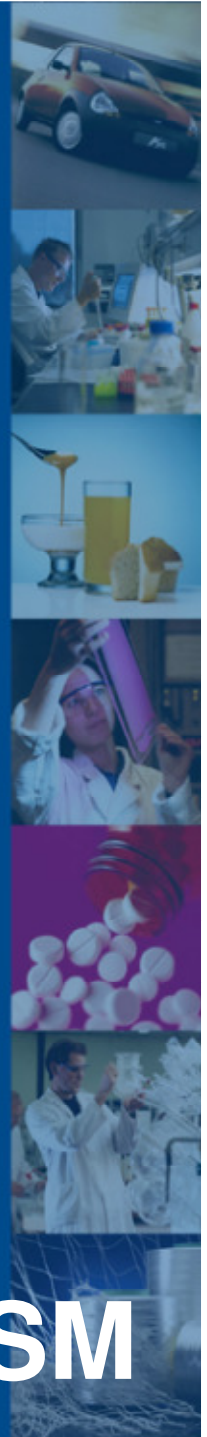
- **Path Forward:**
 - **Analyze large project database for correlation between reliability topics and project outcome.**
 - **WARNING: a correlation on one issue might cancel out the correlation on another issue!!**
 - **A Reliability reserve as % of the estimate might be the future.**



Reliability & Accuracy of Estimates

- Path Forward:

I will be back.



Reliability & Accuracy of Estimates

DISCUSSION

