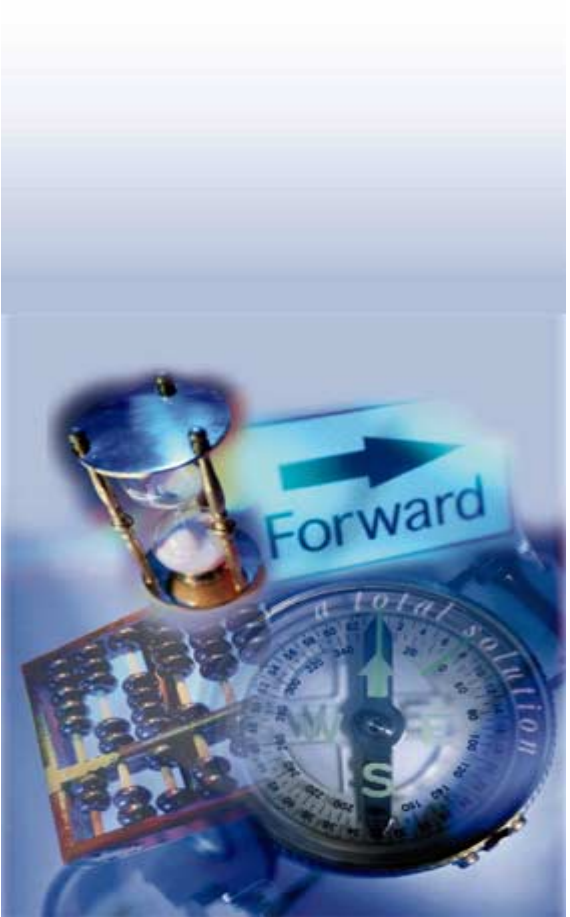
Role of Measurement in Informed IT Decision Making

Presented by : Pam Morris
TOTAL METRICS

6th Australian Management Performance Symposium
Canberra February 20th 2002

"Without objective data you are just another person with an opinion"



TOTAL METRICS

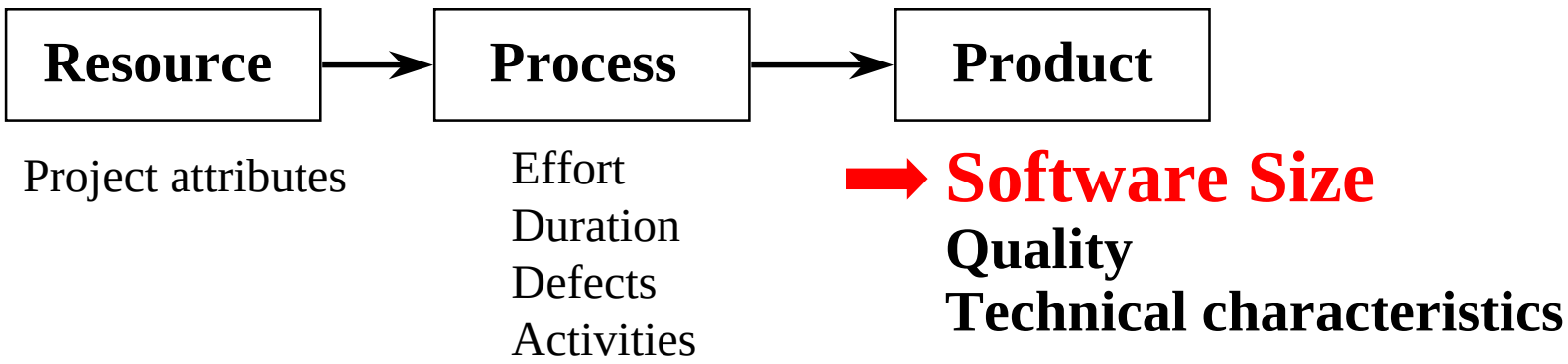
Agenda

- **Base Project measures - Product Size**
- **Using measurement for informed decision making - case studies**
- **Metrics resources**

Three Main Reasons for Implementing Software Measurement

- **UNDERSTANDING**
  - Better understand and model the software process and its products
- **IMPROVING**
  - Provide guidance on improving software process and its products
- **MANAGEMENT AND DECISION MAKING**
  - Facilitate better management of software process and its products

Software **Project** related Measures



Product Measurement as an Indicator of Process Effectiveness

- Productivity Rates

$$\frac{\textbf{Units of Software Product Delivered}}{\text{Person Hours of Effort}}$$

- Cost Effectiveness

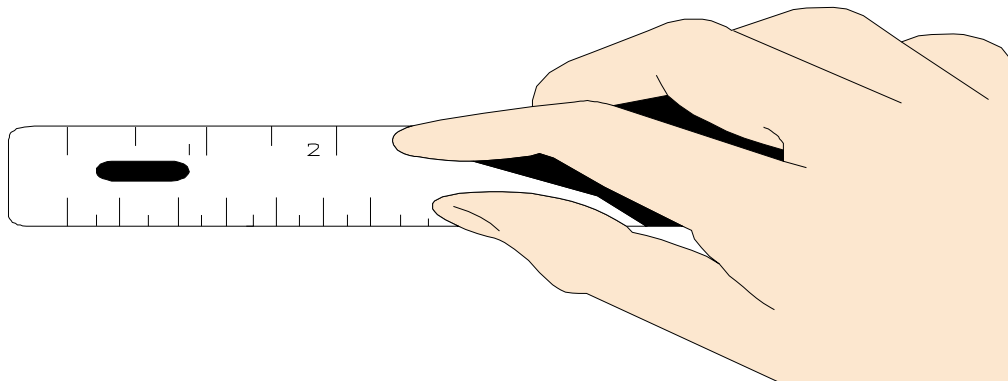
$$\frac{\textbf{Units of Software Product Delivered}}{\text{Project Dollar Cost}}$$

- Product Quality

$$\frac{\text{Defects Delivered}}{\textbf{Units of Software Product Delivered}}$$

Software Product Size

- **Code Size**
  - Measure of **S**ource **L**ines **o**f **C**ode (SLOCs, LOC, KLOCs)
- **Functional Size**
  - Measured in **F**unction **P**oints using technique called **Functional Size Measurement**



WHAT is Functional Size Measurement

- **ISO/IEC/JTC1/SC7 Standard #14143 definition**:

"Functional Size : A size of software derived by quantifying the ***functional user requirements***"

Example
Functional User Requirements

- **Processes**

  eg. Modify Job Details

  Enquire Job Details

  Report Job Allocations

- **Data**

  eg. Job Details

  Employee Data

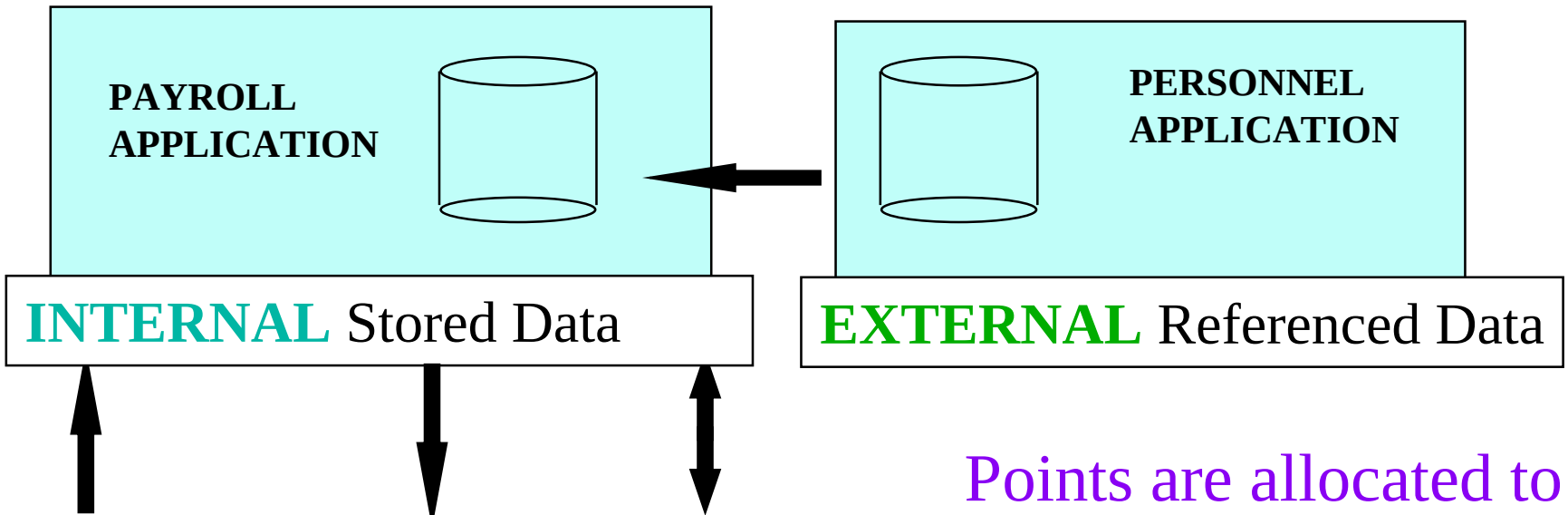
Origins of Functional Size Measurment

- Developed late 1970's by Alan Albrecht at IBM
- Needed a measure of size which was independent of language, tools, techniques and technology
- **Size = functions delivered to the user**
- Allowed comparative measures of productivity

Characteristics of Functional Size Measurement

- Measures Functional User Requirements
- external 'User' view
- applied any time in SDLC
- derived in terms understood by users
- derived without reference to:
  - effort
  - methods used
  - physical or technical components

Measured components



Data INPUT to Store

Information Extracted as OUTPUT

ENQUIRY on stored Data

Points are allocated to each **Transaction** and **Data File** based on the type and complexity of the function.

Functional Size

- For example: Functional Size

  = 675 (IFPUG 4.1 Function Points)

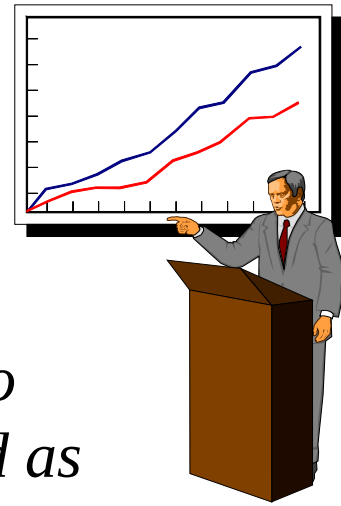
- Measures the size of the software '**problem**' not the '**solution**'
- Is the '**generic**' size of the software
- Measures the '**what**' NOT the '**how**'

Product Size and Management Decisions

- Tactical Decisions - project based
- Strategic decisions - portfolio based

“Measurement supports objective decisions”

Project Based - Evaluate Estimates



- **Situation** *: Urgent management requirement for software to support the Registration of Stock - needs to be implemented as soon as possible.*
- **Issue** *: Favoured supplier price is 3 times that expected. Is the price inflated or did the business get it wrong?*
- **Solution 1** - Put development out to Tender, use industry supplier's quotations to check initial proposal. **(Turnaround time 1 -2 months)**
- **Solution 2** - Measure the size in function points, use industry based productivity and cost figures to estimate likely cost and compare with initial proposal. **(Turnaround time 3 days)**

Registration Development Project

- Functional Size Measurement based on Functional Specification
- Calculated Functional Size Development Project = 899 IFPUG function points (medium size application)
- Developed independent estimate of Post - design phase based on industry productivity data

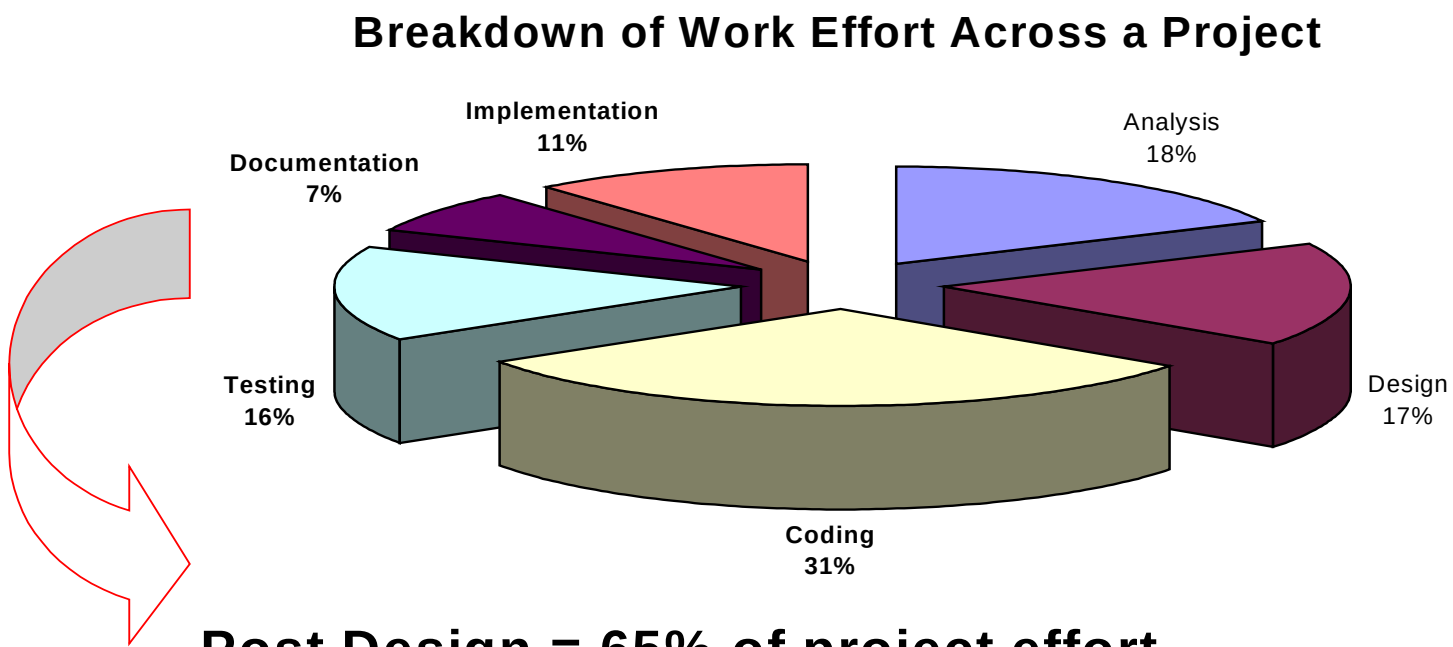
*Industry Figures for for C++

- **Productivity Data**
  - predicts **14 hours per function point** to build
- **Cost Data**
  - predicts **$1,234** per function point
- **Contractor Median Rates C++ = $90** per hour

* International Software Benchmarking Standards Group Release 6 - April 2000

Industry Figures for Projections

Project Lifecycle Profile (non-USA companies)
- effort breakdown
•Post- Design = 65% of Total Effort



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IT Performance Trends 2000 - Meta Group - Howard Rubens

Approximate Cost Projections

- **Industry *ISBSG Cost Data**
  - Median $1,234 per function point (899 fps)
    - **$1,109,366** for **total** project life cycle
    - **$721,087 post-design**
  - Median $119 per hour spent (at 14 hours/fp)
    - **$1,497,734** for **total** project life cycle
    - **$973,527 post-design**
- **Contracting Rates**
  - Median $90 per hour spent (at 14 hours/fp)
    - **$1,132,740** for **total** project life cycle
    - **$736,281 post-design**

*International Software Benchmarking Standards Group

Approximate Cost Projections

- **Summary**
  - project size = 899 adjusted function points
  - Industry figures *rough* prediction is that the cost for the:
    - Total project = **$1.1 to $1.5 million**
    - Remaining Post-Design = **$700k - $1000K**
  - project then used functional size for:
    - fixed price tendering (dollar cost per FP)
    - negotiating scope / price alterations
    - monitoring project performance
    - estimating defects
    - estimating support ratios

Later TM informed that the supplier bid was $780K. Project was immediately approved!

Project Based - Planning Future Direction

- **Situation** : *Just implemented new application to track agents, and new release is planned.*
- **Issue** : *Management believe that the original development cost too much and are hesitant to continue. Developers claim the system is very large and high costs were to be expected. Management is not convinced and do not want to throw good money after bad!*
- **Solution 1** - Accept developers appraisal as correct as they must know and approve new release, (**high risk of overspending again).**

- **Solution 2** - Roughly estimate the size in function points, use industry based productivity figures to predict what should have been the cost. **(Effort = 1 day)**

Industry figures for Cost Projections

- Size estimated to be between 900 and 1200 function points best guess=1100 function points
- Industry ISBSG Cost Data
  - Median $1,234 per function point (1100 fps)
    - **$1,357,400**
  - Median $90 - $119 per hour spent (at 14 hours/fp)
    - **$1,386,000 - $1,832,600**

Actual cost was almost 20 times this figure!

Industry figures Effort Predictions

- Industry ISBSG Cost Data indicates a project Productivity rate of around **14 hours per function point**.
- Effort figures collected from the project indicated a project Productivity rate of around **65 hours per function point**.

Even allowing for techical complexity, large project team size (35) this is still low productivity!

Management decided not to proceed with second release before finding a way to improve productivity and reduce costs!

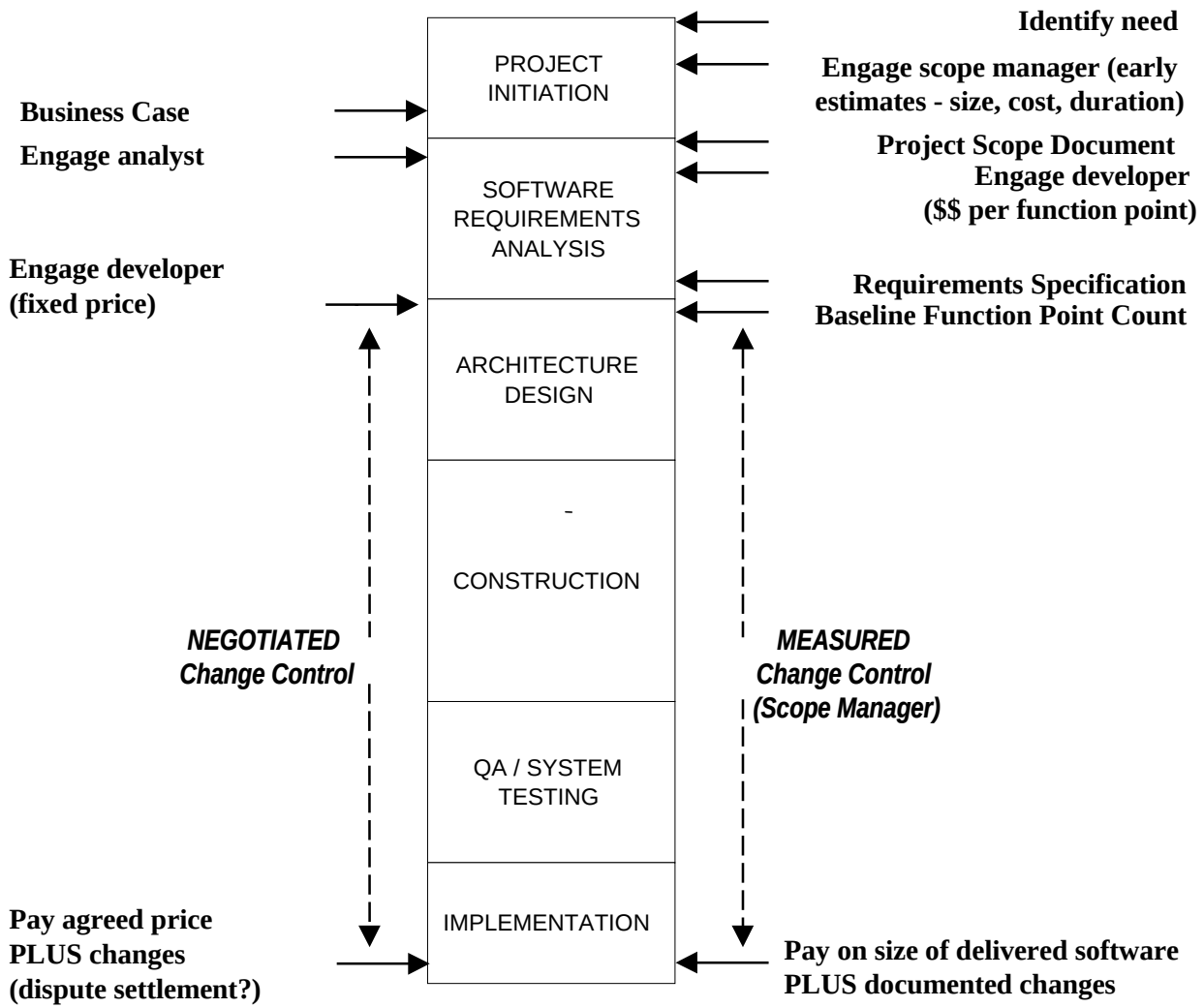
Project Based - Manage Outsourced Development

- **Situation** *: New Software Application - development to be outsourced*
- **Issue** *: Very restricted budget, potential for changes to requirements - time and materials billing is not an option*
- **Solution 1 -** Accept fixed price quotations and expect very high penalties for changes.**(Potential for high quotes and budget blowout)**
- **Solution 2 -** Use ***SouthernScope*** methodology ie. Fixed priced quotations based on dollars per function point delivered. Pay an agreed penalty rate of dollars per function point changed. **(Budget can be agreed, monitored and controlled. Price for changes agreed up front)**

SouthernScope Methodology

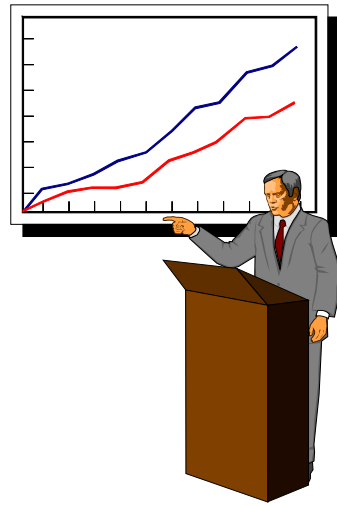
- Developed and used by Victorian Govenment
- Initially Size Projects using Function Points
- Suppliers quote fixed price *Dollars per function point*
- Penalties ie. +% *Dollars per function point* negotiated based on the phase of lifecycle the change is introduced
- Use independent scope manager to arbitrate

Classic Development versus *SouthernScope* Methodology



For details see: www.mmv.vic.gov.au/southernscope

Portfolio Based - Controlling IT Contracts

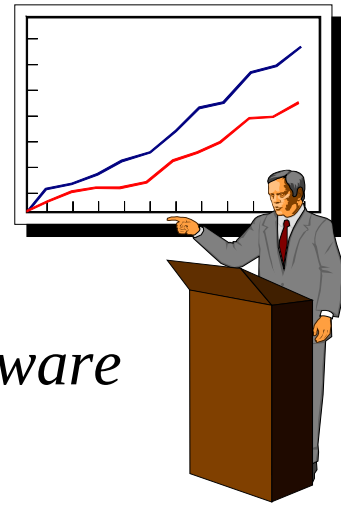


- **Situation** *: Organisational requirement to outsource IT*
- **Issue** *: How big is our IT portfolio? What should we expect to pay? How do we assess the benefits? How do we ensure we are getting value for money?*
- **Solution 1 -** Trust the outsourcing organisation to do the right thing and hope it is the best solution.**(Time to find out 3 - 5 years)**
- **Solution 2 -** Measure the portfolio size to establish reasonable contract price, establish current baseline productivity rates, set improvement targets to be achieved on a annual basis that incur penalties and bonuses. Regularly audit suppliers figures **(Objective measure of suppliers performance and early warning of non-performance)**

Contract - Service Level Agreements

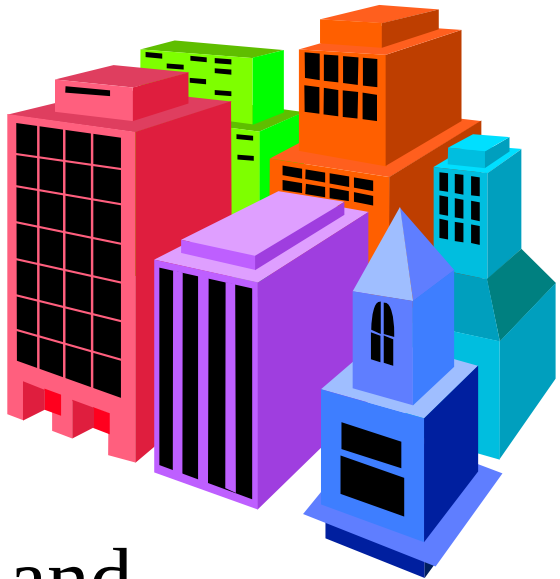
- **Productivity Measures:**
  - **Portfolio Assessment - Contract Negotiations**
    - overall size in function points eg. Large contracts approx 700K fps
  - **Performance Improvements**
    - development $/function point, delivery rates/ function point
    - CMM capability rating eg. Level 3 within 3 years
  - **Maintenance Productivity rates**
    - Turnaround time
    - $ / function points supported
  - **Estimating Enhancements**
    - establish enhancement productivity rate $/function points in different environment, client and supplier agree.

Portfolio Based - Asset Evaluation



- **Situation** : *Federal Government requirement to value IT Software as part of the Capital Assets for Accrual Accounting*
- **Issue** : *IT software is one of many government departments major expenditures, needs to be depreciated as a capital asset. Government funding is tied to capital assets and their replacement value.*
- **Solution 1 -** Value software for what it cost to build 10 to 15 years ago **(does not take into account changing technology to replace it)**
- **Solution 2 -** Measure size of software portfolio determine 'replacement value' based on todays technology and $cost per function point **(Realistic value - accepted by Auditor Generals Office)**

Measurement is used by :



- **Software Houses**
  - developing fixed price quotes
  - managing project scope creep
- **Outsourcing Arrangements**
  - suppliers to constrain client changes and estimate costs
  - clients to verify suppliers claims, evaluate suppliers quotes, compare supplier performance

Measurement is used by :

- **IT departments**
  - estimate costs, schedules and resources
  - planning replacement software
  - developing budgets
  - evaluating packages
  - comparing tools, techniques, technologies

- **Organisations benchmarking IT**
  - performance
  - productivity
  - quality

More Information and Resources

- **Australian Software Metrics Association (ASMA)**
  - contact : Robyn Smith 03 844 0560
  - www.asma.org.au
  - asmavic@ozonline.com.au
- **International Software Benchmarking Standards Group (ISBSG)**
  - contact : Peter Hill 0411 111 439
  - www.isbsg.org.au
  - peter.r.hill@bigpond.com.au
- **Total Metrics**
  - contact : Pam Morris 03 9882 7611
  - www.totalmetrics.com
  - Pam.Morris@Totalmetrics.com

ISBGS

- The **International Software Benchmarking Standards Group**
  - non-profit international user group of metrics practitioners
  - maintains and exploits a repository of international software project metrics
  - to help improve the management of I.T. resources, by both business and government,
  - through improved project estimation and productivity, risk analysis and benchmarking.

ISBGS

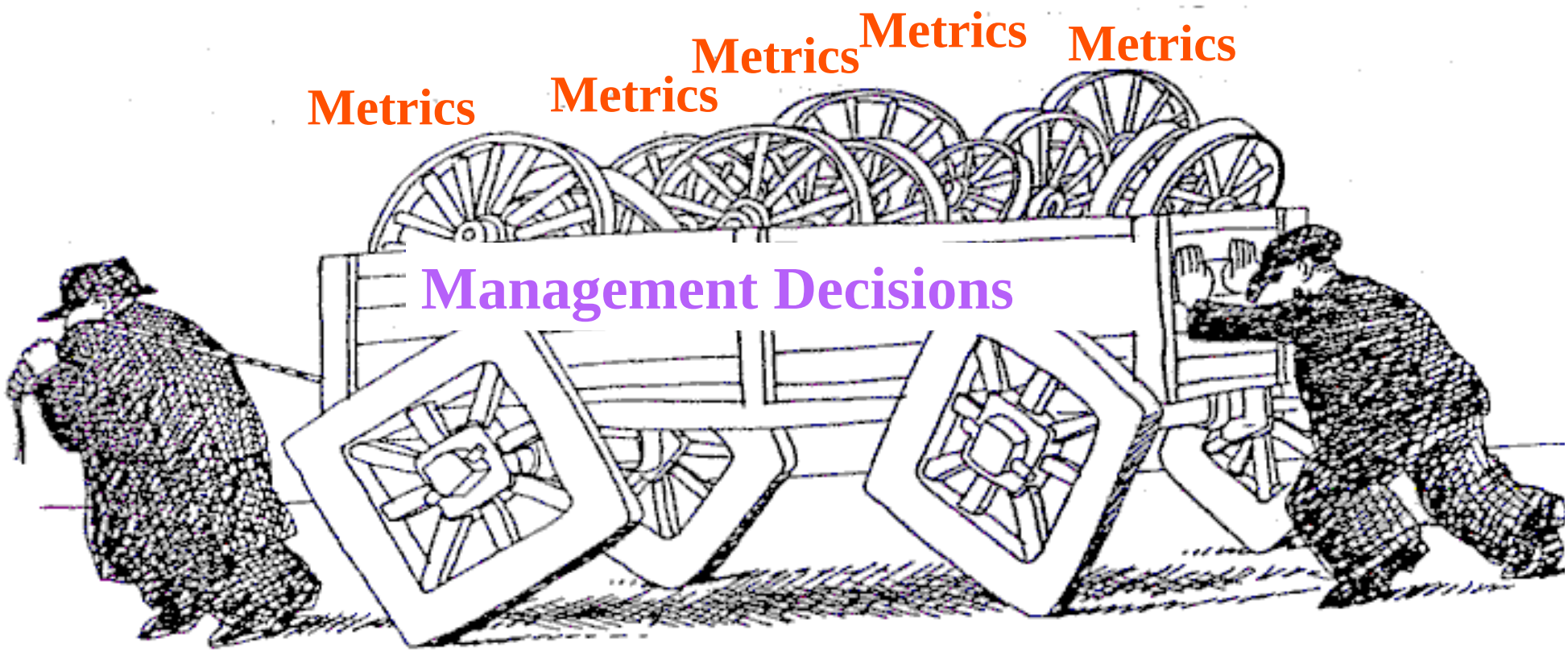
- 9 **countries actively participate in collection and standardisation of metrics (plus 7 others contribute project data)**
  - **Australia (ASMA)**
  - **Germany (DASMA)**
  - **India (NASSCOM)**
  - **Italy (GUFPI)**
  - **Japan (JFPUG)**
  - **Netherlands (NESMA)**
  - **Spain (AEMES)**
  - **United Kingdom (UKSMA)**
  - **United States of America (IFPUG)**

Total Metrics - Measurement Resources

- **WWW site (*WWW.Totalmetrics.com*)**
  - **metrics News**
  - **metrics research papers and free downloads**
  - **links to other interanational metrics sites and metrics user groups**
  - **metrics events and conferences**
- **Quarterly Newsletter - Metrics related news (free)**

This presentation is available from DOWNLOADS on Total Metrics WWW Site

Decision making without Measurement Data



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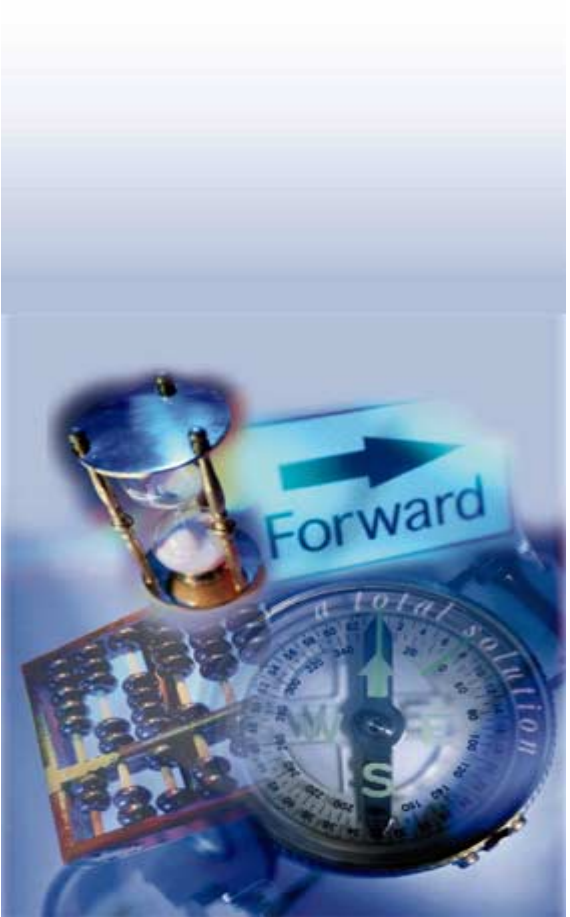

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Total Metrics Pty Ltd
Suite 1, 667 Burke Road
Camberwell
Victoria 3124 Australia
Ph 61 (0) 3 9882 7611
Fax 61 (0) 3 9882 7633
Pam.Morris@Totalmetrics.com

“ To measure is to know!”