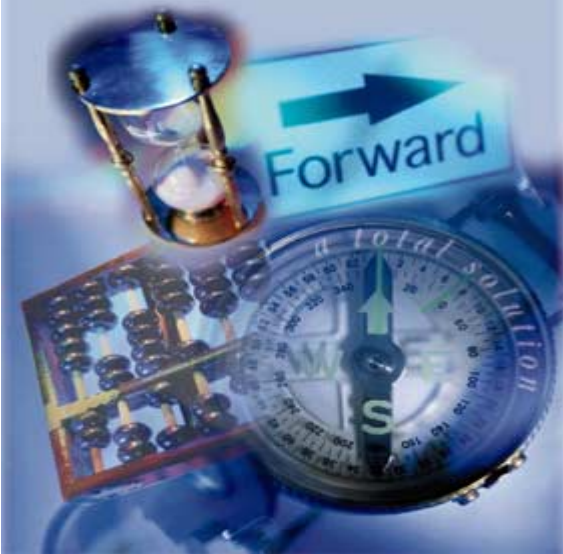


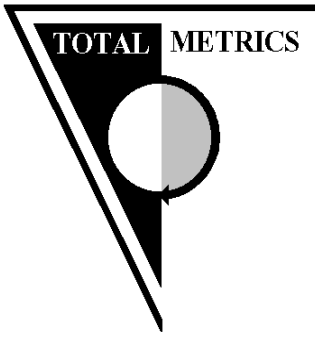
# Role of Measurement in Informed IT Decision Making

**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”***





# 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

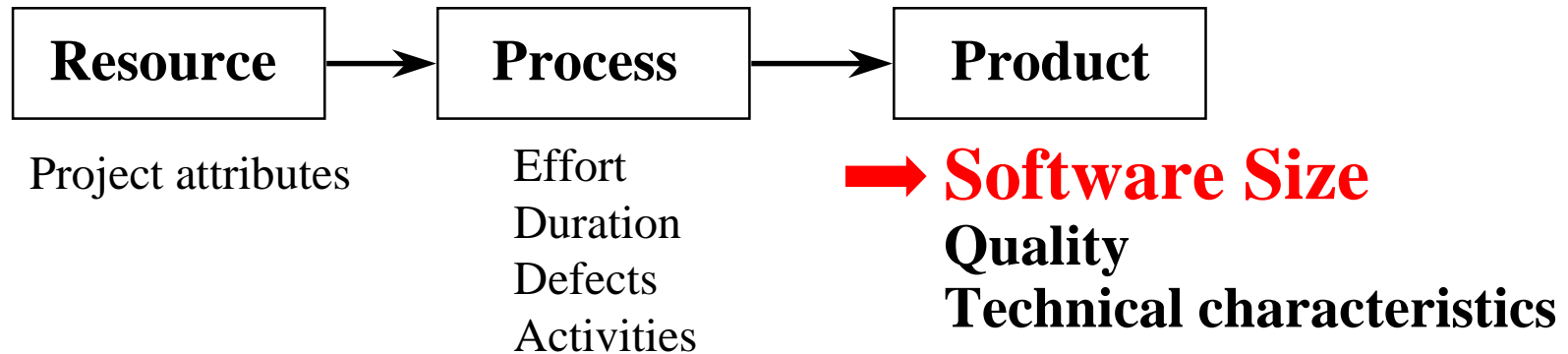
## ◆ IMPROVING

- 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

Units of Software Product Delivered

Person Hours of Effort

## ◆ Cost Effectiveness

Units of Software Product Delivered

Project Dollar Cost

## ◆ Product Quality

Defects Delivered

Units of Software Product Delivered

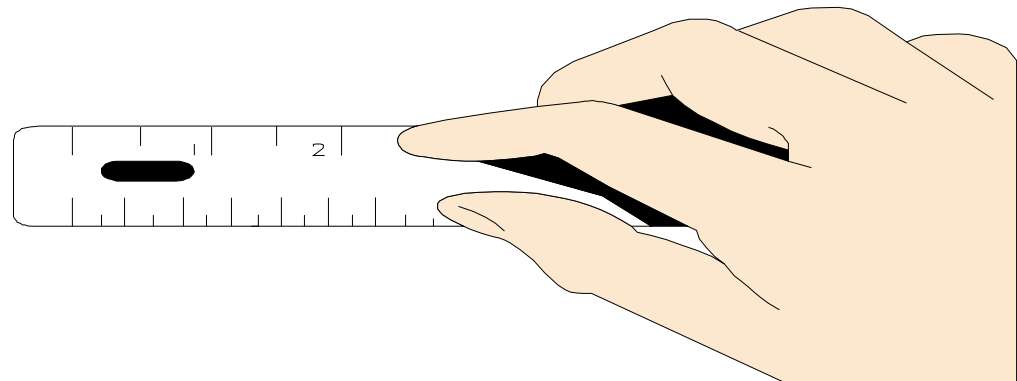
# Software Product Size

## ◆ Code Size

- Measure of **Source Lines of Code** (SLOCs, LOC, KLOCs)

## ◆ Functional Size

- Measured in **Function Points** 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*

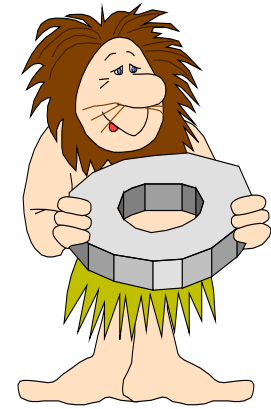
### ◆ Processes

eg. Modify Job Details  
Enquire Job Details  
Report Job Allocations

### ◆ Data

eg. Job Details  
Employee Data

# Origins of Functional Size Measurement

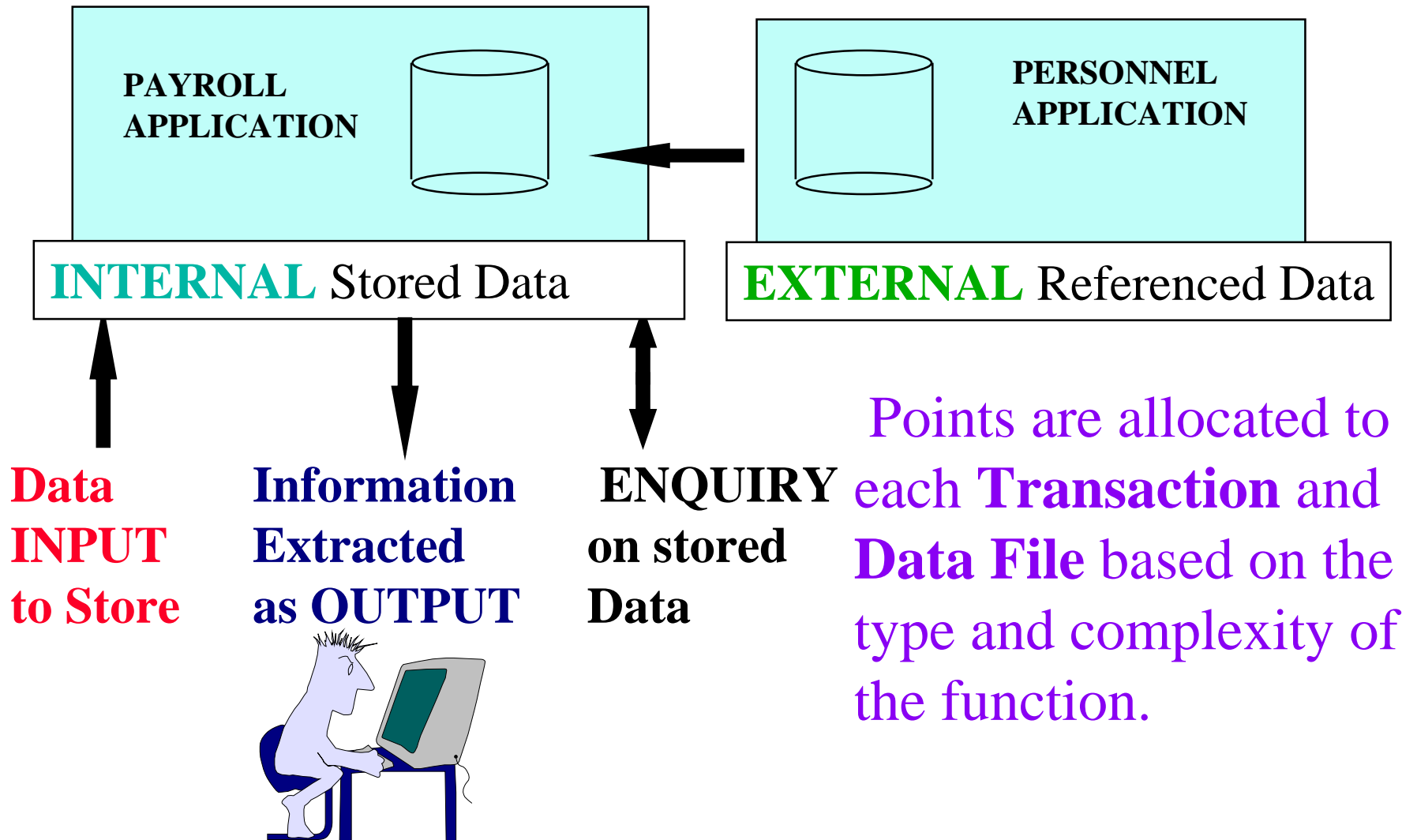


- ◆ Developed late 1970's by Alan Albrecht at IBM
- ◆ Needed a measure of size which was independent of language, tools, techniques and technology
- ◆ **Size = functions delivered to the user**
- ◆ Allowed comparative measures of productivity

# 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



# Functional Size

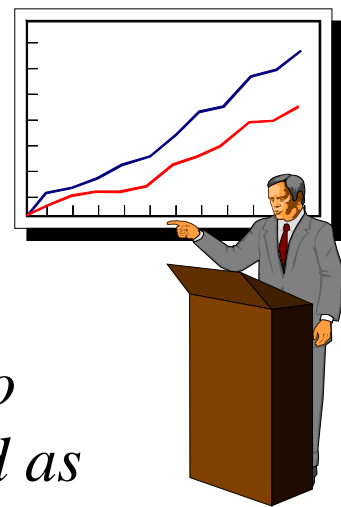
- ◆ For example: Functional Size  
= 675 (IFPUG 4.1 Function Points)
- ◆ Measures the size of the software ‘**problem**’ not the ‘**solution**’
- ◆ Is the ‘**generic**’ size of the software
- ◆ Measures the ‘**what**’ NOT the ‘**how**’

# 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

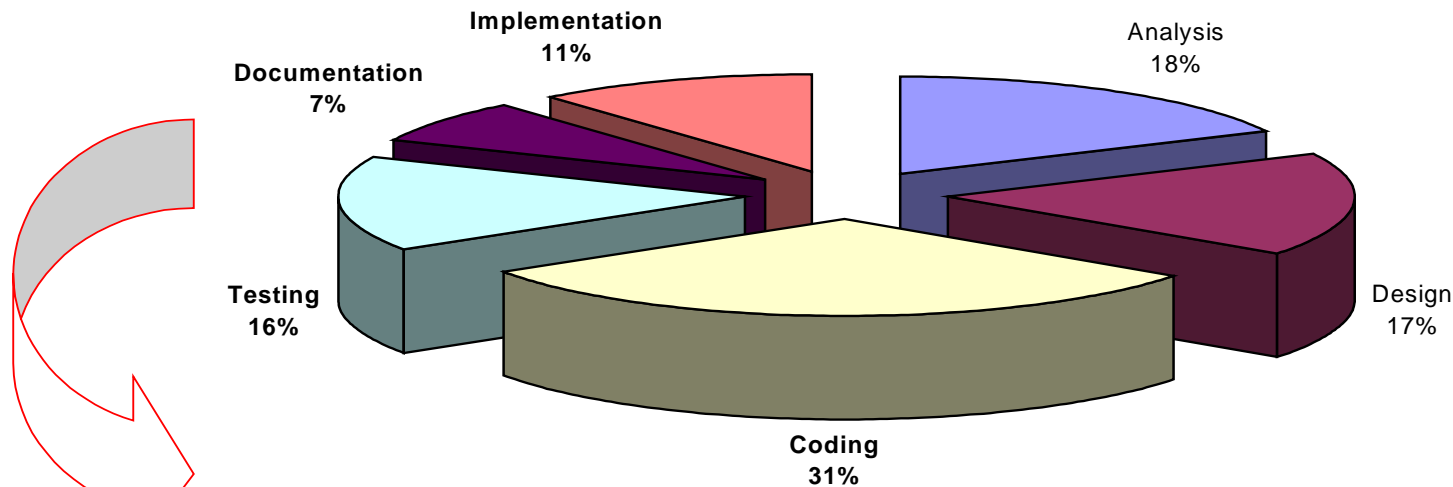
# Industry Figures for Projections

*\*Project Lifecycle Profile (non-USA companies)*

*- effort breakdown*

*•Post- Design = 65% of Total Effort*

Breakdown of Work Effort Across a Project



**Post Design = 65% of project effort**

\*  
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

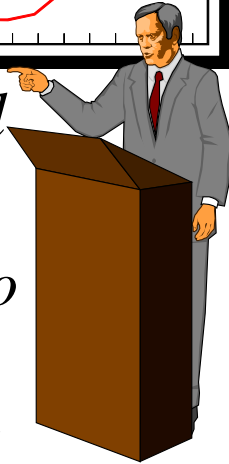
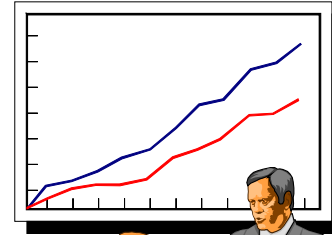
## ◆ Summary

- 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 technical 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!**

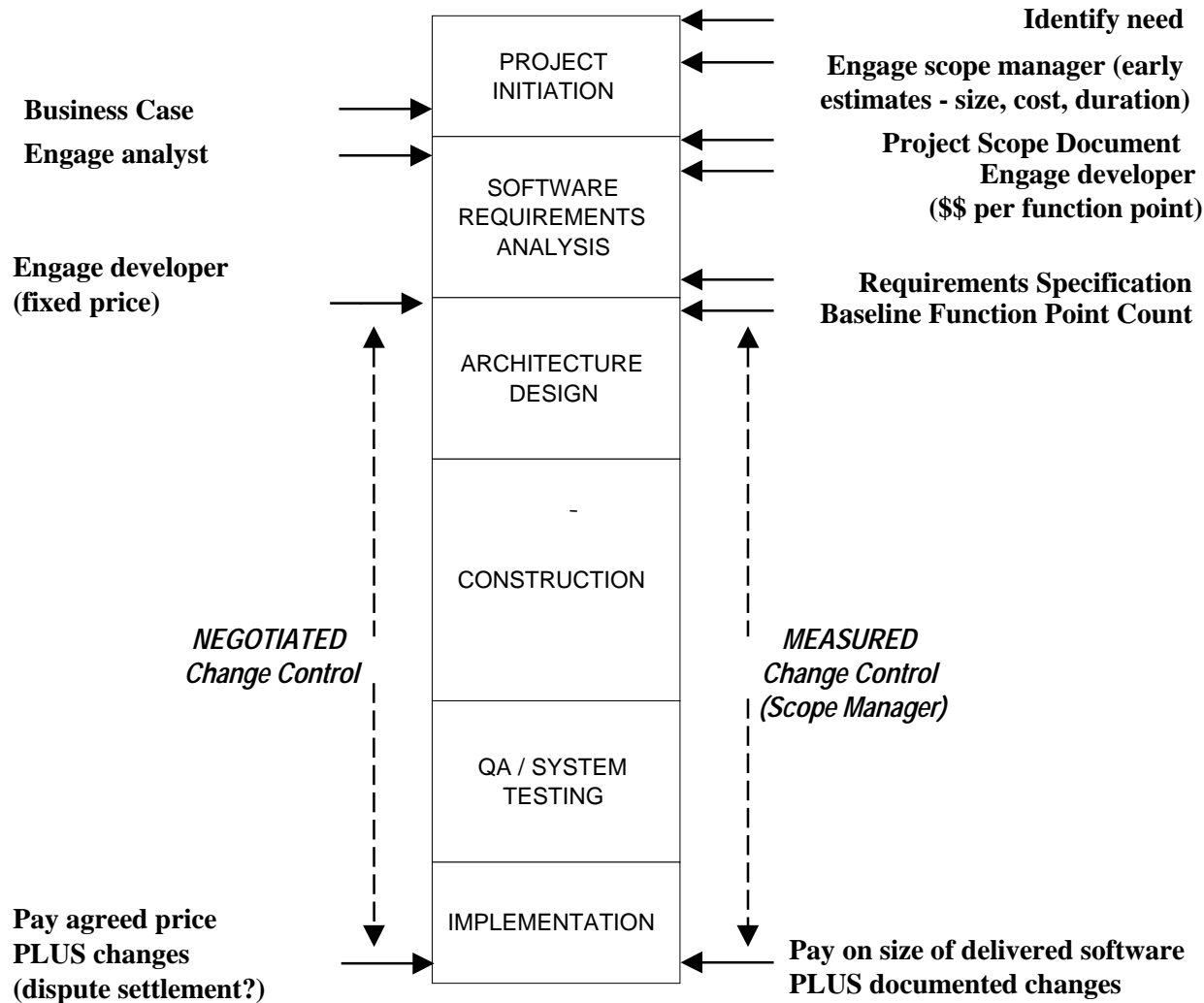
# Project Based - Manage Outsourced Development

- ◆ **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

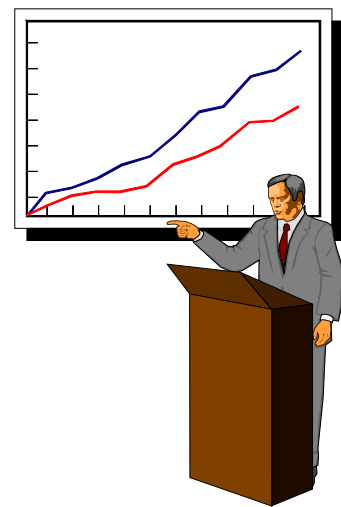
- Developed and used by Victorian Government
- Initially Size Projects using Function Points
- Suppliers quote fixed price *Dollars per function point*
- Penalties ie. +% *Dollars per function point* negotiated based on the phase of lifecycle the change is introduced
- Use independent scope manager to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

# Classic Development versus *SouthernScope* Methodology



For details see: [www.mmv.vic.gov.au/southernscope](http://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

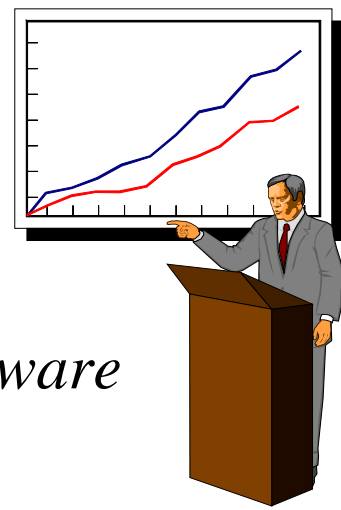
### ➤ Maintenance Productivity rates

- \* 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 today's technology and \$cost per function point (**Realistic value - accepted by Auditor General's 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](http://www.asma.org.au)

- [asmavic@ozonline.com.au](mailto:asmavic@ozonline.com.au)

- ◆ **International Software Benchmarking Standards Group (ISBSG)**

- contact : Peter Hill 0411 111 439

- [www.isbsg.org.au](http://www.isbsg.org.au)

- [peter.r.hill@bigpond.com.au](mailto:peter.r.hill@bigpond.com.au)

- ◆ **Total Metrics**

- contact : Pam Morris 03 9882 7611

- [www.totalmetrics.com](http://www.totalmetrics.com)

- [Pam.Morris@Totalmetrics.com](mailto: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

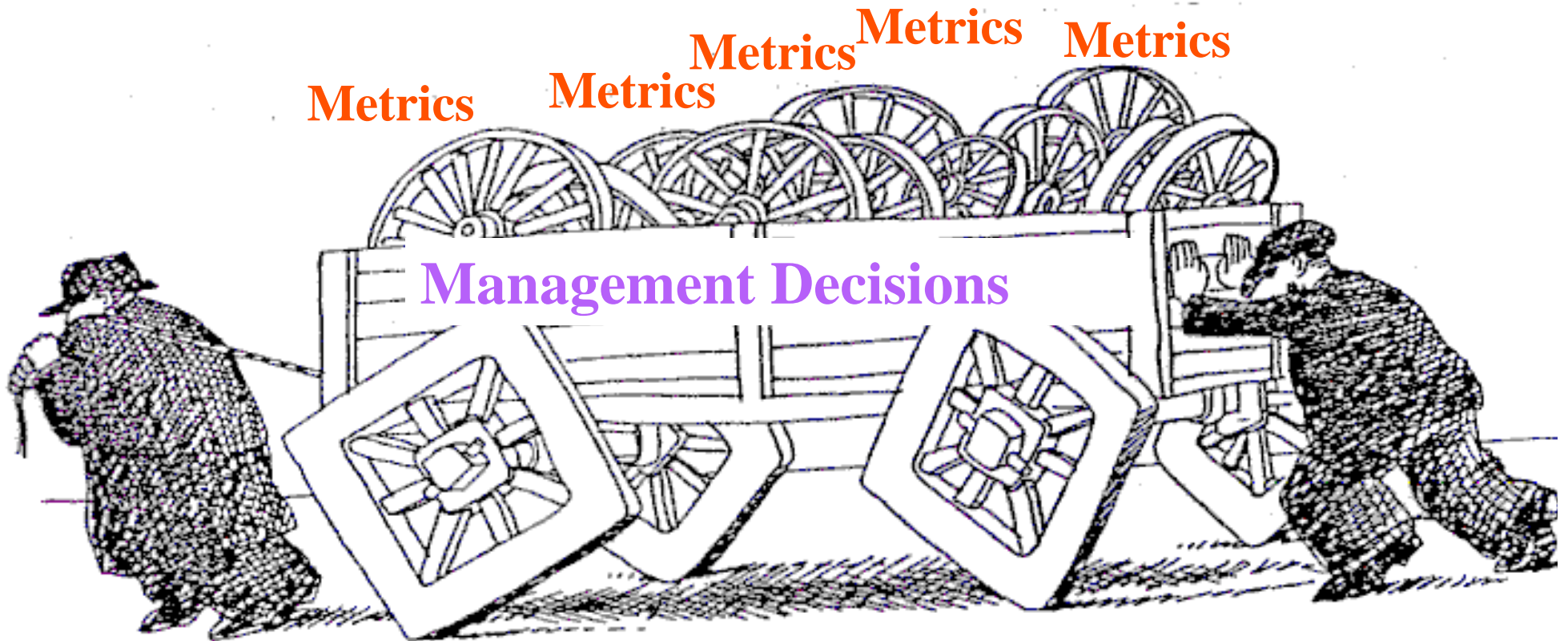
◆ 9 countries actively participate in collection and standardisation of metrics (plus 7 others contribute project data)

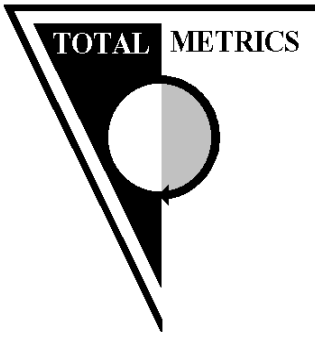
- [Australia](#) (ASMA )
- [Germany](#) (DASMA)
- [India](#) (NASSCOM)
- [Italy](#) (GUFPI)
- [Japan](#) (JFPUG)
- [Netherlands](#) (NESMA)
- [Spain](#) (AEMES)
- [United Kingdom](#) (UKSMA)
- [United States of America](#) (IFPUG)

# Total Metrics - Measurement Resources

- ◆ **WWW site ( [WWW.Totalmetrics.com](http://WWW.Totalmetrics.com) )**
  - metrics News
  - metrics research papers and free downloads
  - links to other international metrics sites and metrics user groups
  - metrics events and conferences
- ◆ **Quarterly Newsletter - Metrics related news (free)**

# Decision making without Measurement Data





# Role of Measurement in Informed IT Decision Making

***The End***

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*“ To measure is to know!”*

