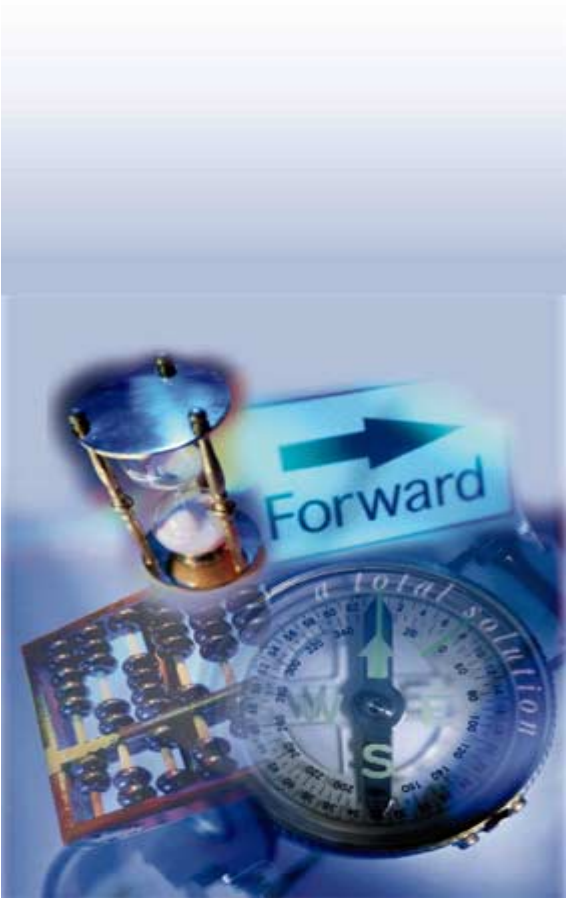
TOTAL METRICS

Functional Size Metrics



"Measuring the size of the software product from the perspective of what gets delivered to the user"

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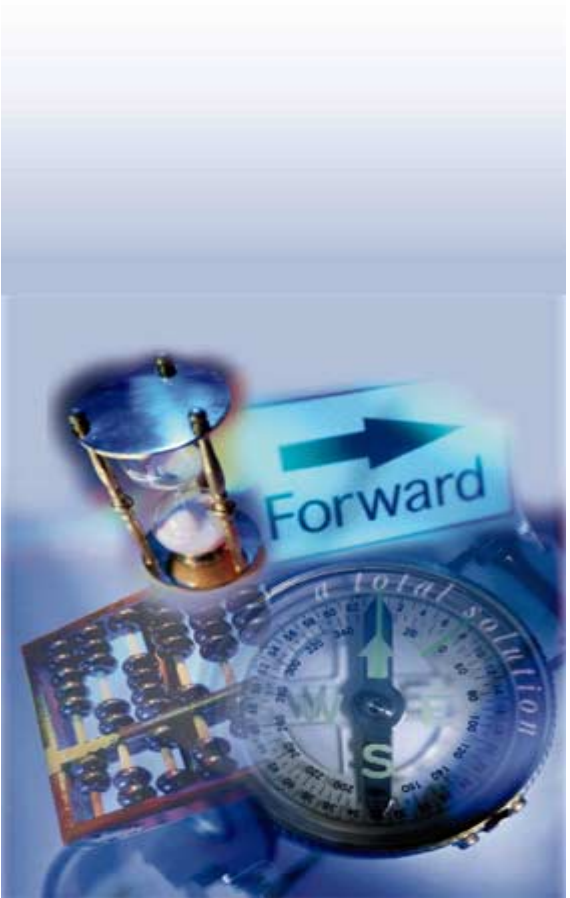
Pam Morris Profile

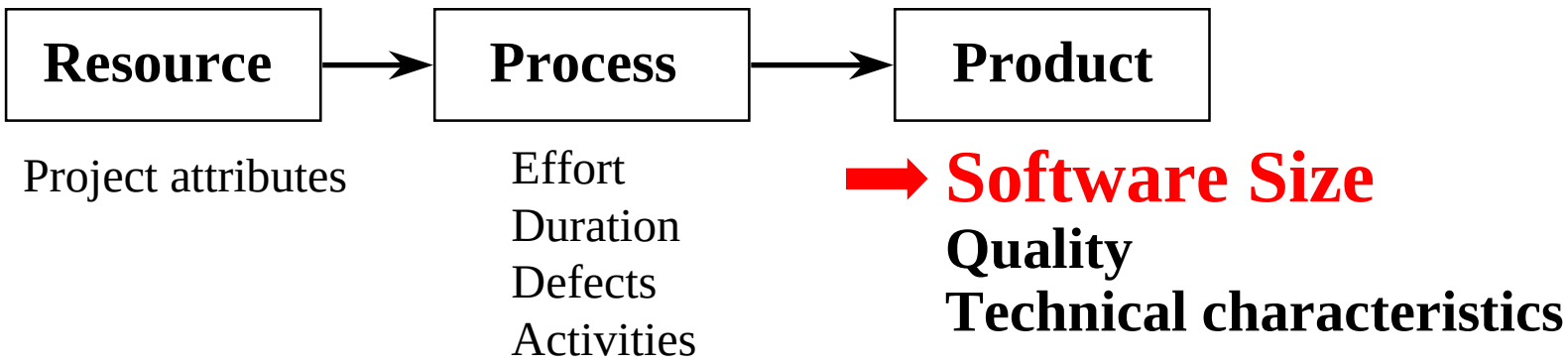
- CEO - Total Metrics Australia
- Member of the IFPUG Counting Practices Committee
- International Workgroup convenor and project editor ISO/IEC 14143 Functional Size Measurement Standards
- Executive Member of the Australian Software Metrics Association (ASMA)
- Core project member COSMIC Measurement Group



Summary of Topics

- **Overview** of Functional Size Measurement
- **Business Decisions -** contribution of Functional Size Metrics
- **ISO Standardisation -** functional size measures

Types of software measures



Metrics using Product Size

- Productivity Rates

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

- Cost Effectiveness

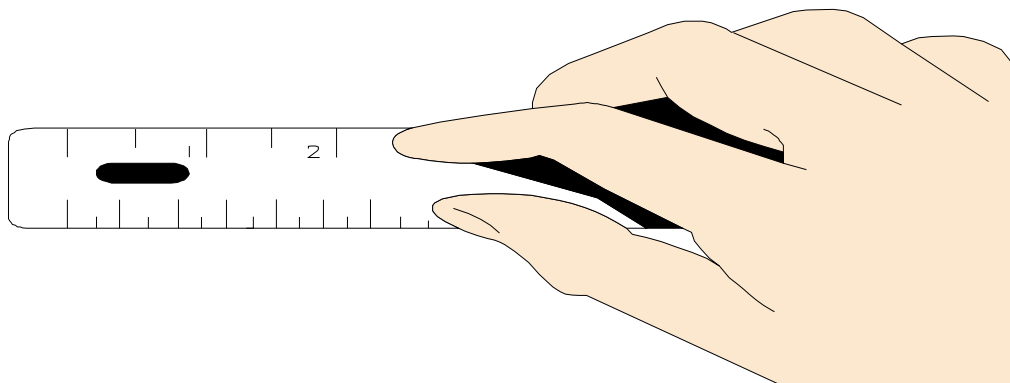
$$\frac{\textbf{Units of Software Product Delivered}}{\text{Project Dollar Cost}}$$

- 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

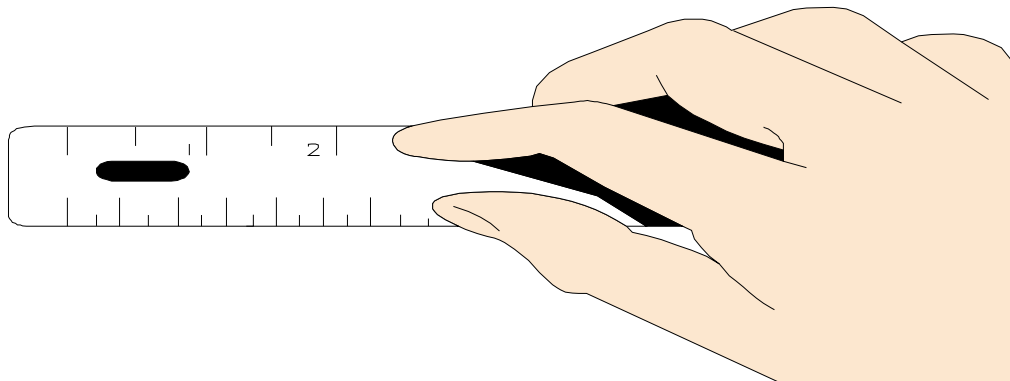
- **Data**

  eg. Job Details

  Employees

Functional Size Measurement Methods

- **IFPUG - Function Point Analsyis (most common)**
- **COSMIC-FFP - FSM Method (emerging leader)**
- **MarkII - FSM Method (mostly in UK)**



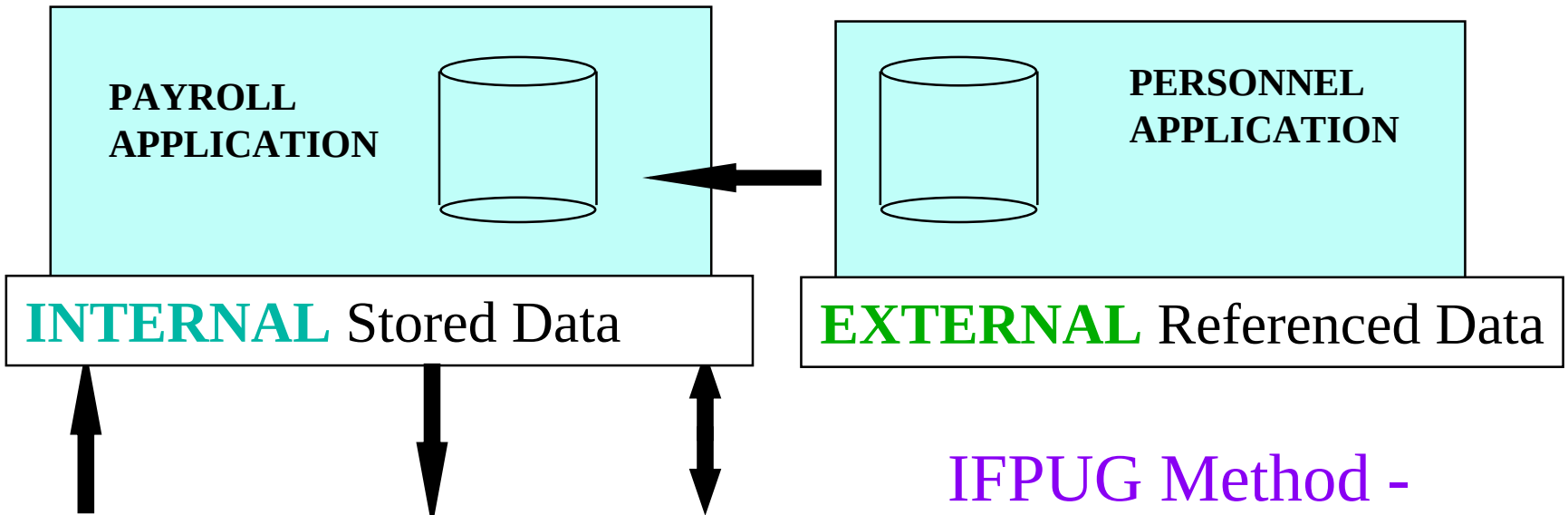
Origins of Functional Size Measurment

- 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

IFPUG Method - Measured components



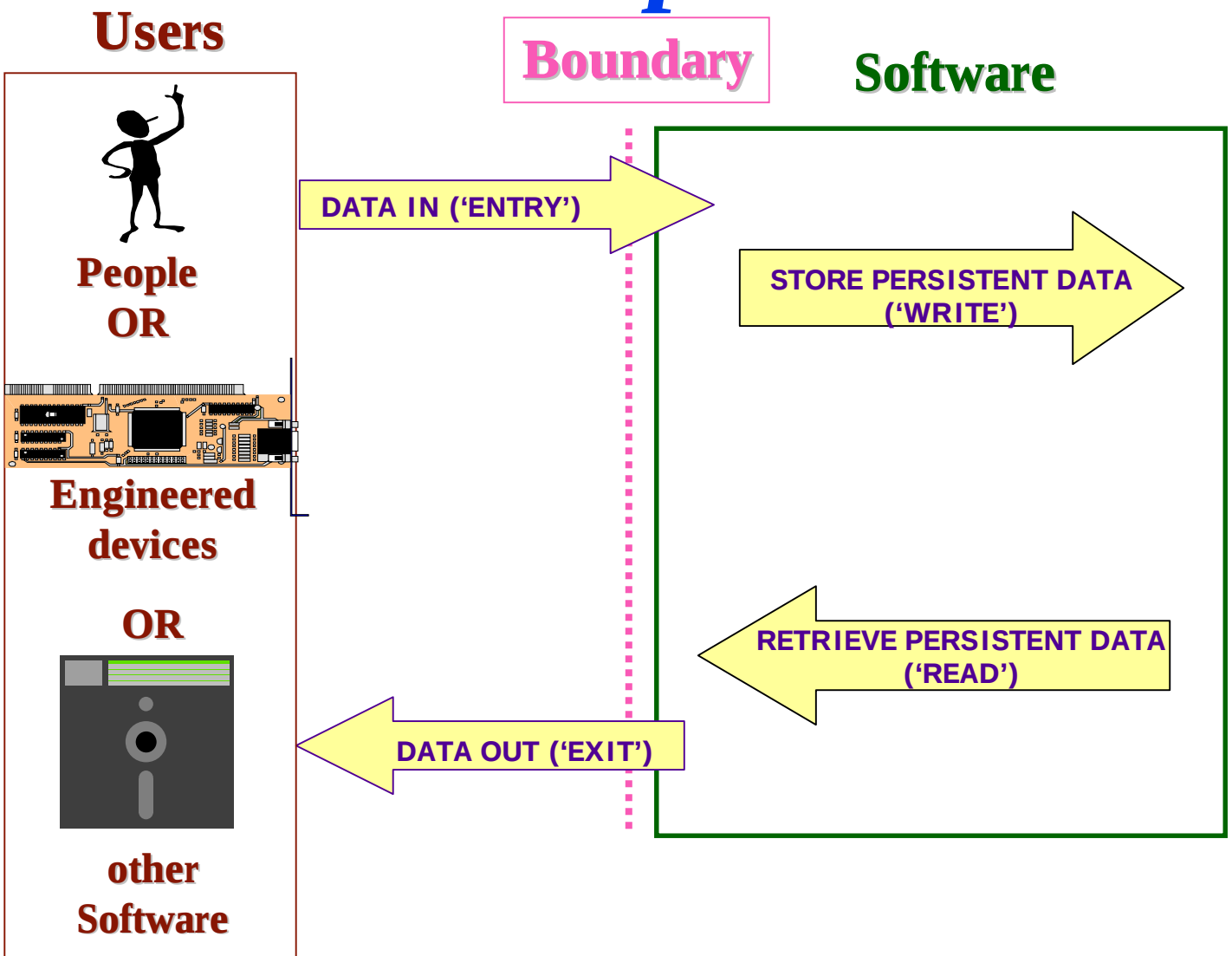
Data INPUT to Store

Information Extracted as OUTPUT

ENQUIRY on stored Data

IFPUG Method - allocates points to each **Transaction** and **Data File** based on the type and complexity of the function.

COSMIC - Measured components



COSMIC - allocates points to each **PROCESS** based on the number entries, exits, reads and writes performed.

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**'

TOTAL METRICS

Using Functional Size Measurement for Decision Making

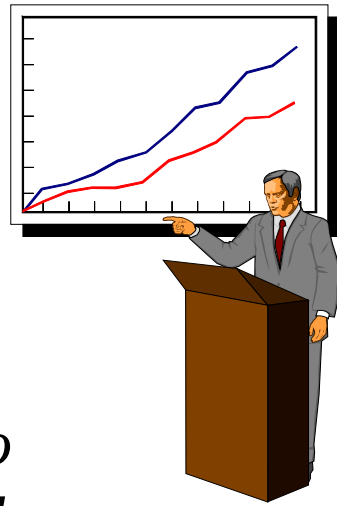
Australian Industry Case Studies

Size Contributions to 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 -** Have external company 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** = **$90** per hour

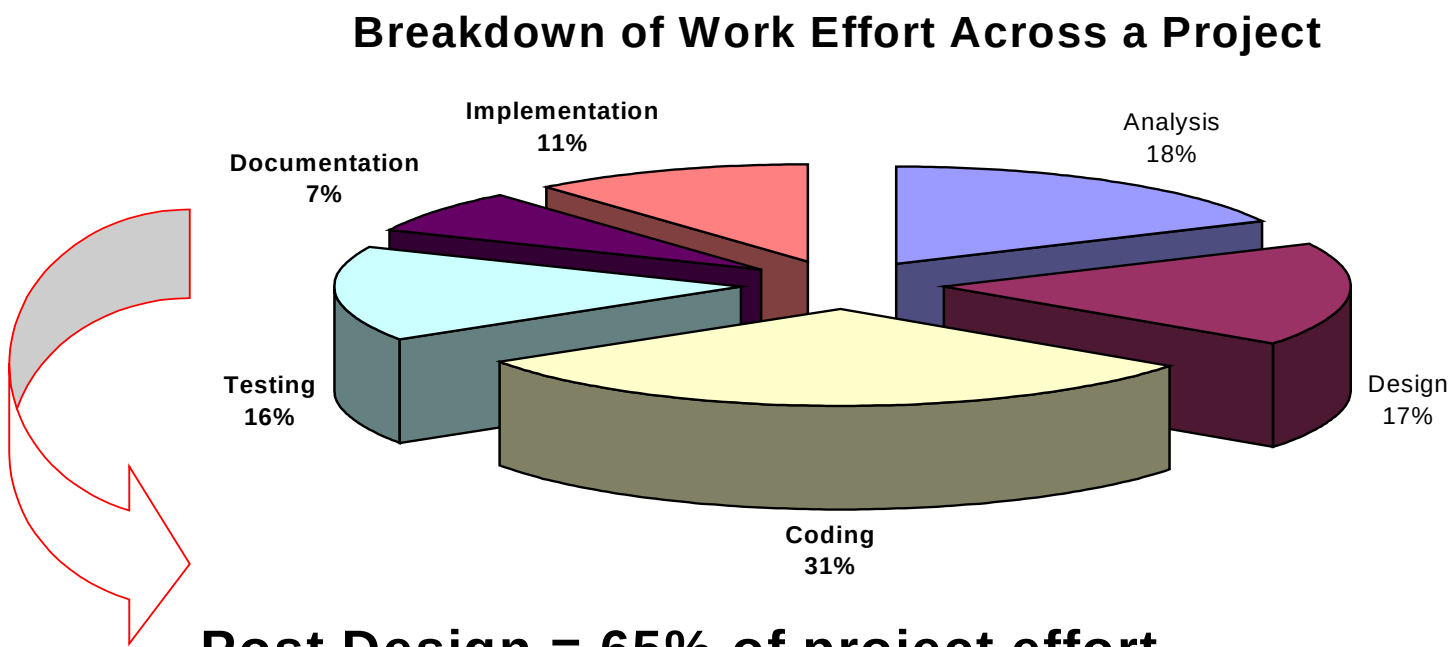
* International Software Benchmarking Standards Group Release 6 - April 2000

Industry Figures for Projections

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

***- effort breakdown**

***•Post- Design = 65% of Total Effort**



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**

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

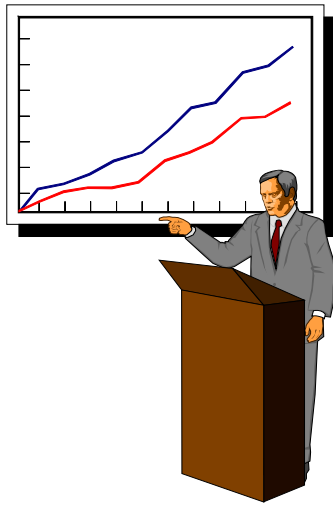
- **Situation** *: New Software Application - development to be outsourced*
- **Issue** *: Very restricted budget, potential for changes to requirements - time and materials billing is not an option*
- **Solution 1 -** Accept fixed price quotations and expect very high penalties for changes.**(Potential 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

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

Portfolio Based - Controlling IT Contracts

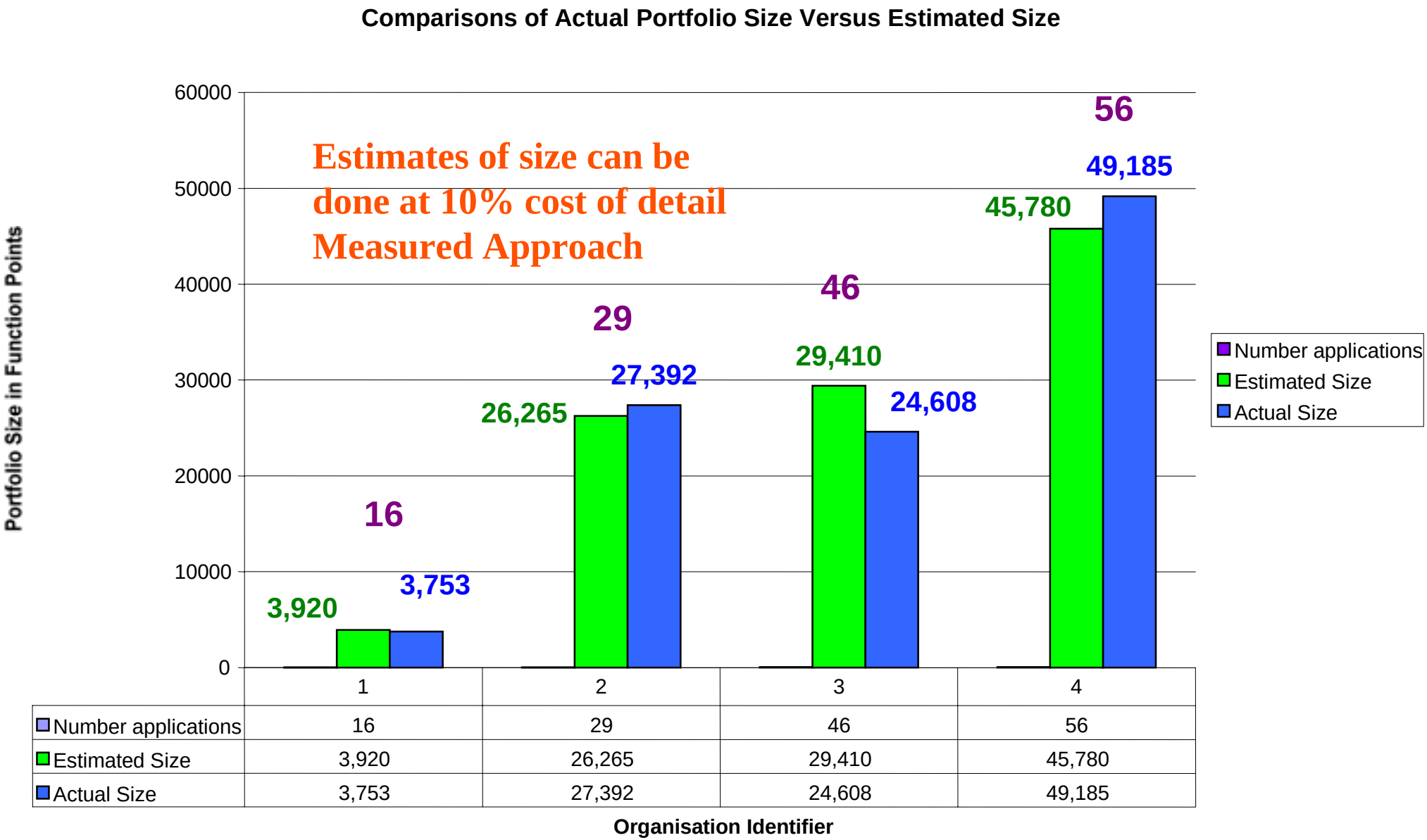


- **Situation** *: Organisational requirement to outsource IT*
- **Issue** *: How big is our IT portfolio? What should we expect to pay? How do we assess the benefits? How do we ensure we are getting value for money?*
- **Solution 1 -** Trust the outsourcing organisation to do the right thing and hope 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

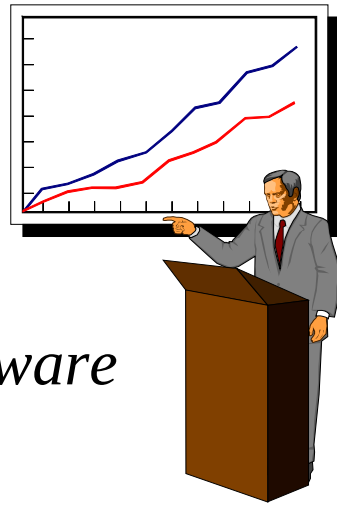
- **Productivity Measures:**
  - **Portfolio Assessment - Contract Negotiations**
    - **overall size in function points** eg. Large contracts approx 700K fps
  - **Performance Improvements**
    - **development $/function point, delivery rates/ function point**
    - CMM capability rating eg. Level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

Estimated Portfolio Size Versus Detailed Measured Size



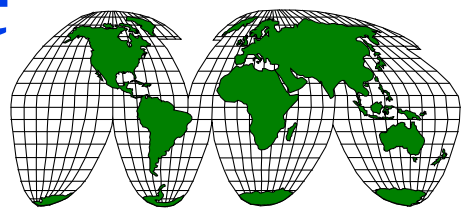
	1	2	3	4
Number applications	16	29	46	56
Estimated Size	3,920	26,265	29,410	45,780
Actual Size	3,753	27,392	24,608	49,185

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 governement 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)**

WHO is using Functional Size Measurement?



- Functional Size Measurment is the method of choice for measuring software world wide
- International User Function Point User Group (IFPUG) has over 1200 member organisations in 30 countries
- ASMA (Australian Software Metrics Association) established since 1990 members (VIC, NSW, QLD, ACT)

WHICH Organisations?

- **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, compare suppliers

WHICH Organisations?

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

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

WHAT are the Advantages of Using Functional Size Measurement

- Able to be used **early** in the life cycle
- **Independent** of technology, design and methods
- Easily **understood** by User
- Gives **consistent** results (± 10%)
- **Standardised** and established method
- **Fast** - the time to count is minimal compared to time to develop (< 1%)

Functional Size Measurement ISO/IEC 14143 Standards

PART 5 -
Classifications

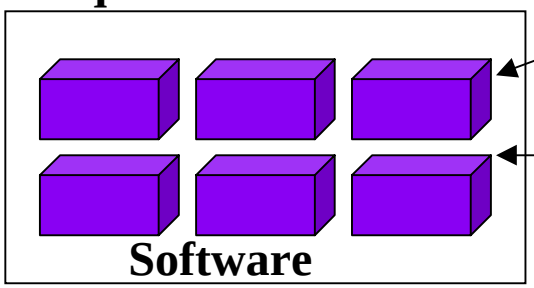
Classifies

Functional User Requirements

Uses

PART 4 -
Example Requirements

Provides

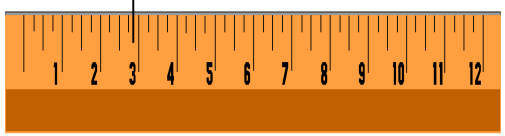


Against

PART 3 -
Performance Test Criteria

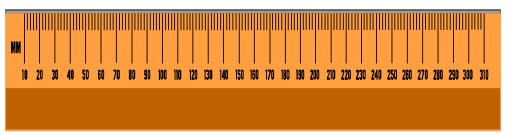
Measure

Tests



PART 2 -
Conformance

Checks



Against

Functional Size Methods

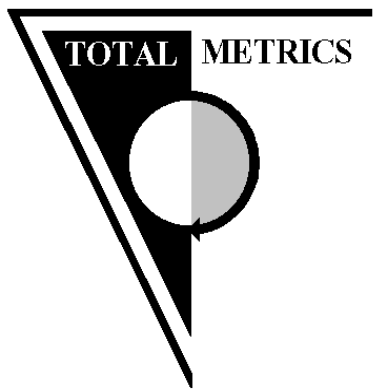
Defines

PART 1 -
Definitions

IFPUG, COSMIC-FFP, MARKII

Size Methods currently being Approved by ISO

Thank You and Good Luck with your Functional Size Measurement !



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