



“Sizing Requirements using COSMIC: Uses and Benefits”

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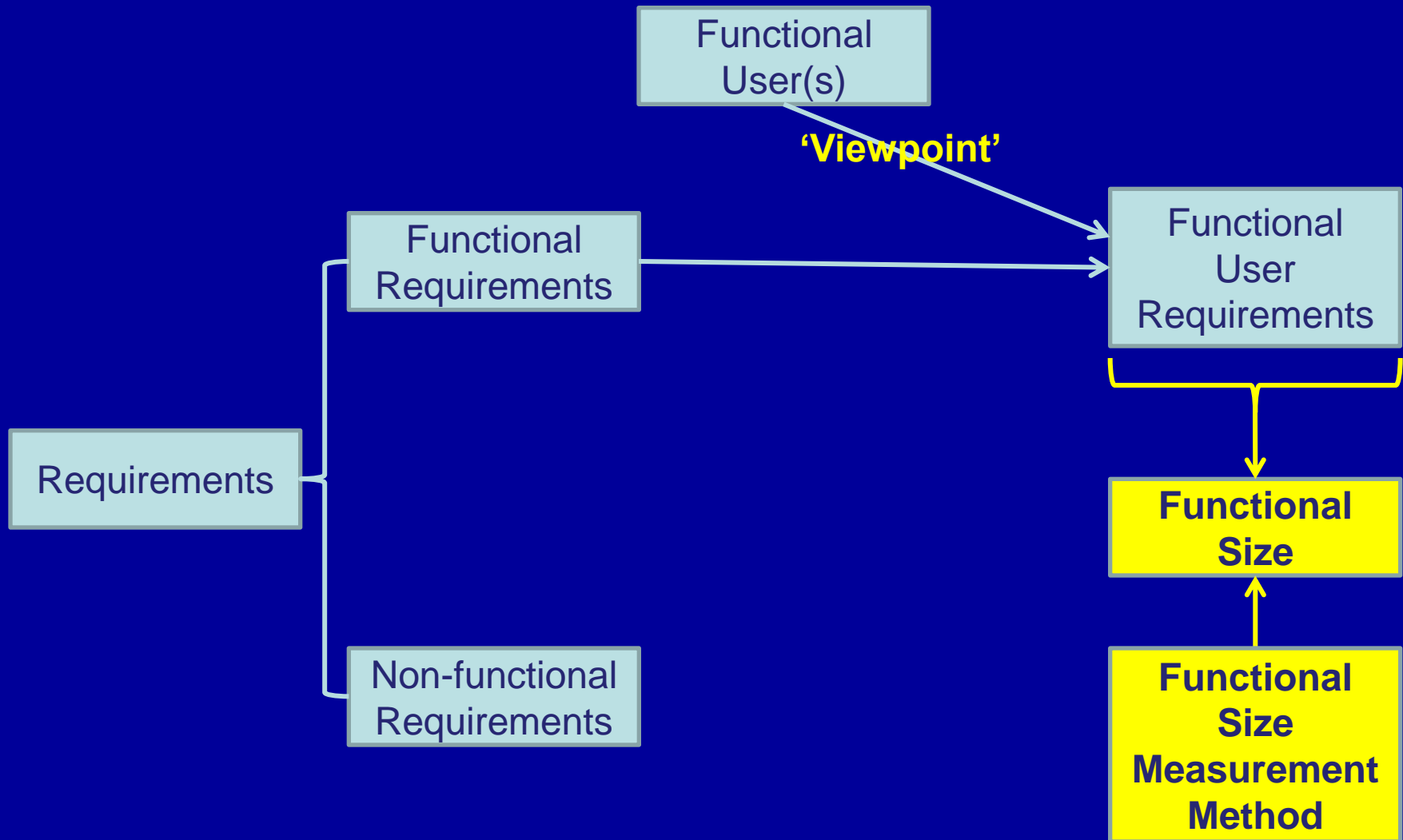


Agenda

- Measuring a functional size of requirements
- Some features of IFPUG & COSMIC Methods
- Some example benefits of using the COSMIC Method
- Summary



We use FSM Methods to measure Functional User Requirements (FUR)





Functional sizes are ideal for performance measurements and for estimating early in a project life

Productivity = software size / project effort

Speed = software size / project elapsed time

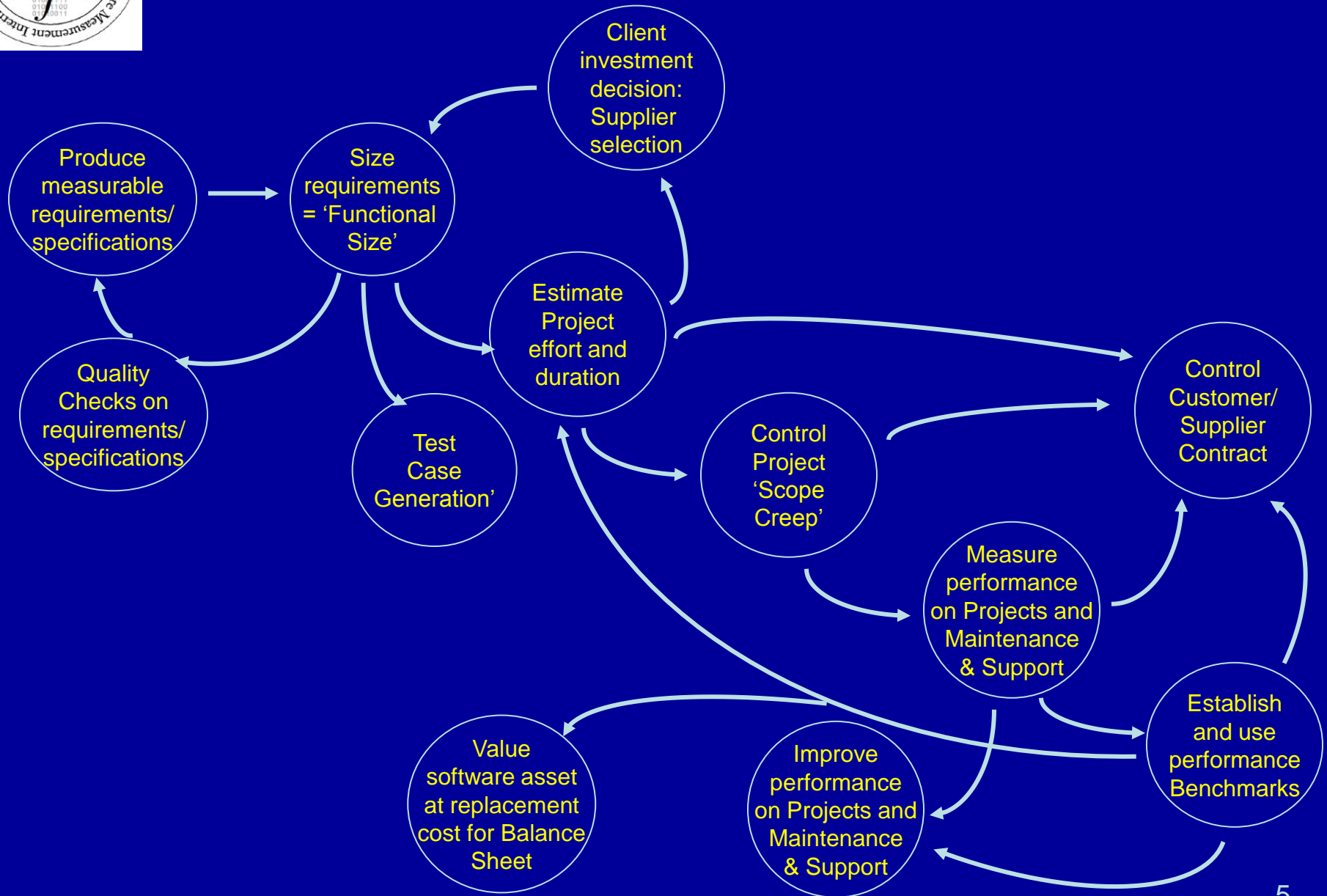
Defect Density = no. of defects / software size

Estimated new project effort = $\left\{ \frac{\text{Estimated software size}}{\text{Assumed project productivity}} \right\}$

$\times \left\{ \text{Adjustments for project-specific factors} \right\}$

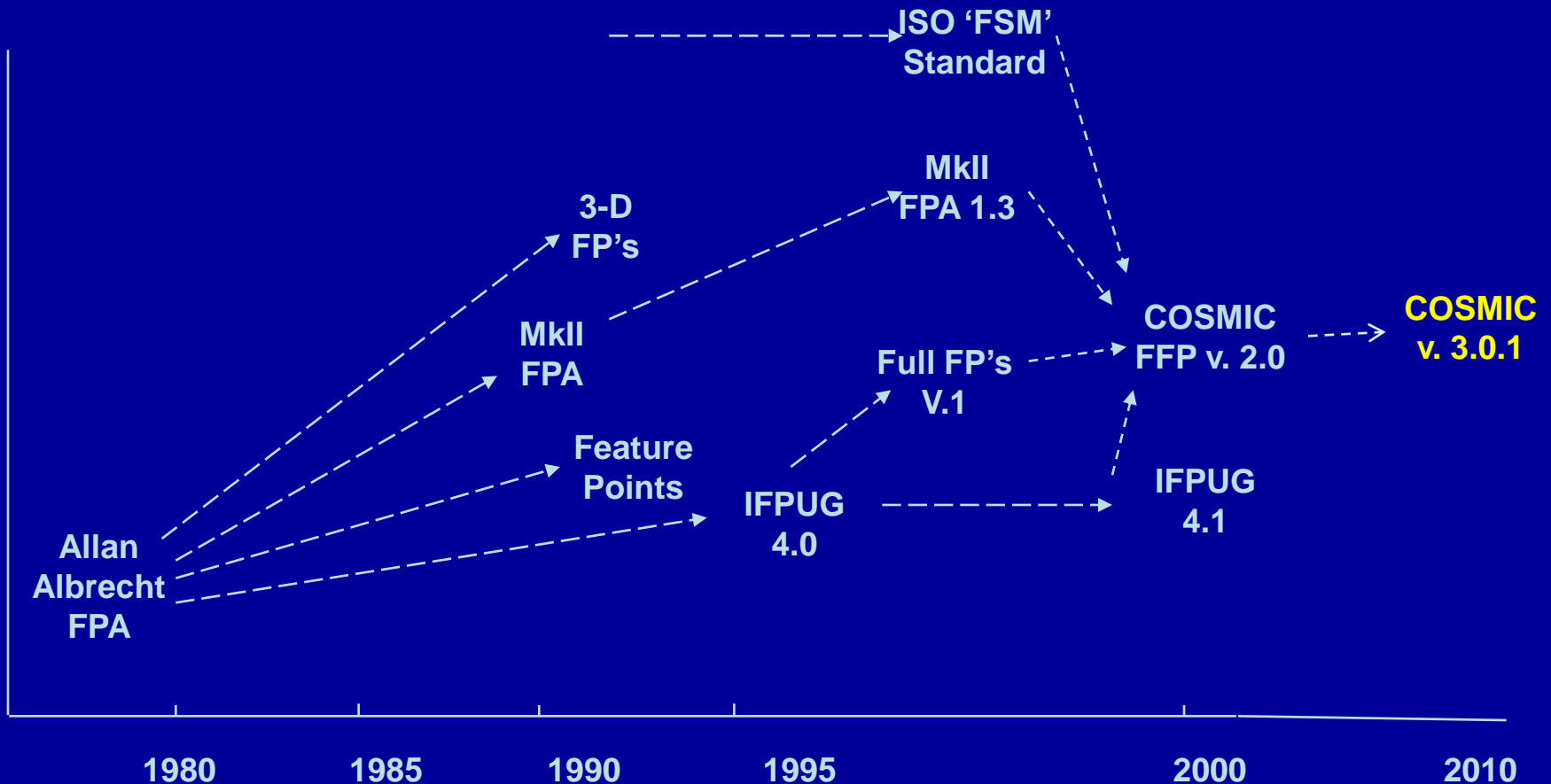


Uses of Functional Sizes: a 'mind map'





FSM Methods have been used for over 30 years





The Albrecht / IFPUG method was designed to size business applications

Functional User Requirements

Elementary Processes
(External Inputs, Outputs,
Inquiries)

Logical Files
(Internal, External
Interfaces)

'Weights' 3 – 7 FP's

7 – 15 FP's

(Also: a 'Value Adjustment Factor' intended to account for
Technical and Quality requirements)



COSMIC Aims

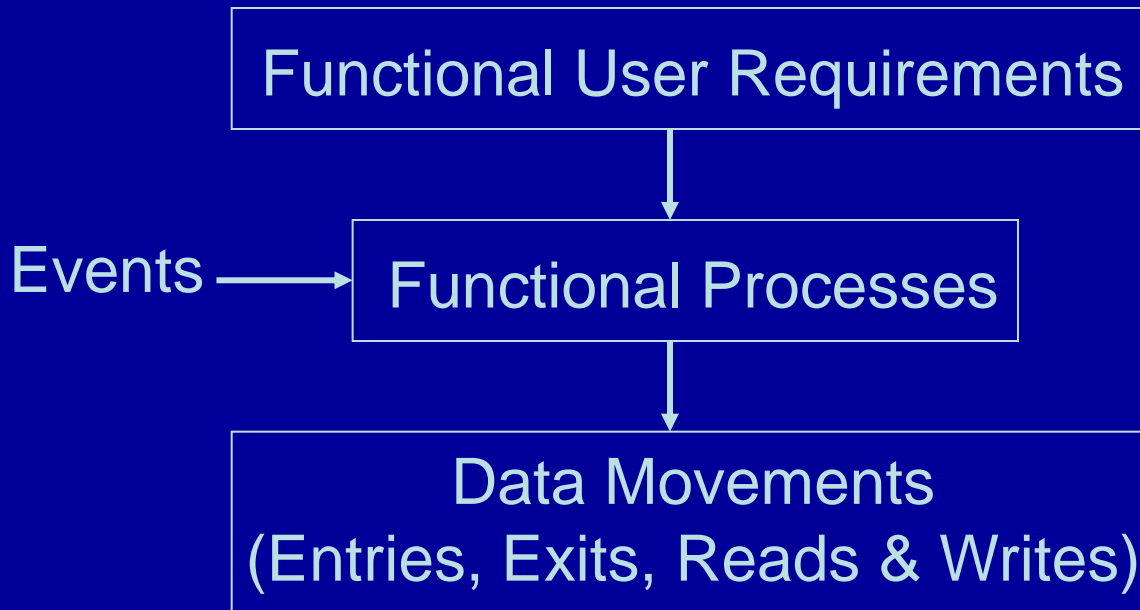
Initially: to develop, test, bring to market and seek acceptance of new, 'open' software sizing methods to support performance measurement & estimation, applicable for business, real-time & infrastructure software

Currently: to develop 'open' products ... to support the use of COSMIC sizing e.g.

- guidelines for applying the method
- certification examinations
- benchmark data
- estimating methods, etc



The COSMIC Generic Software Model defines the measurement method

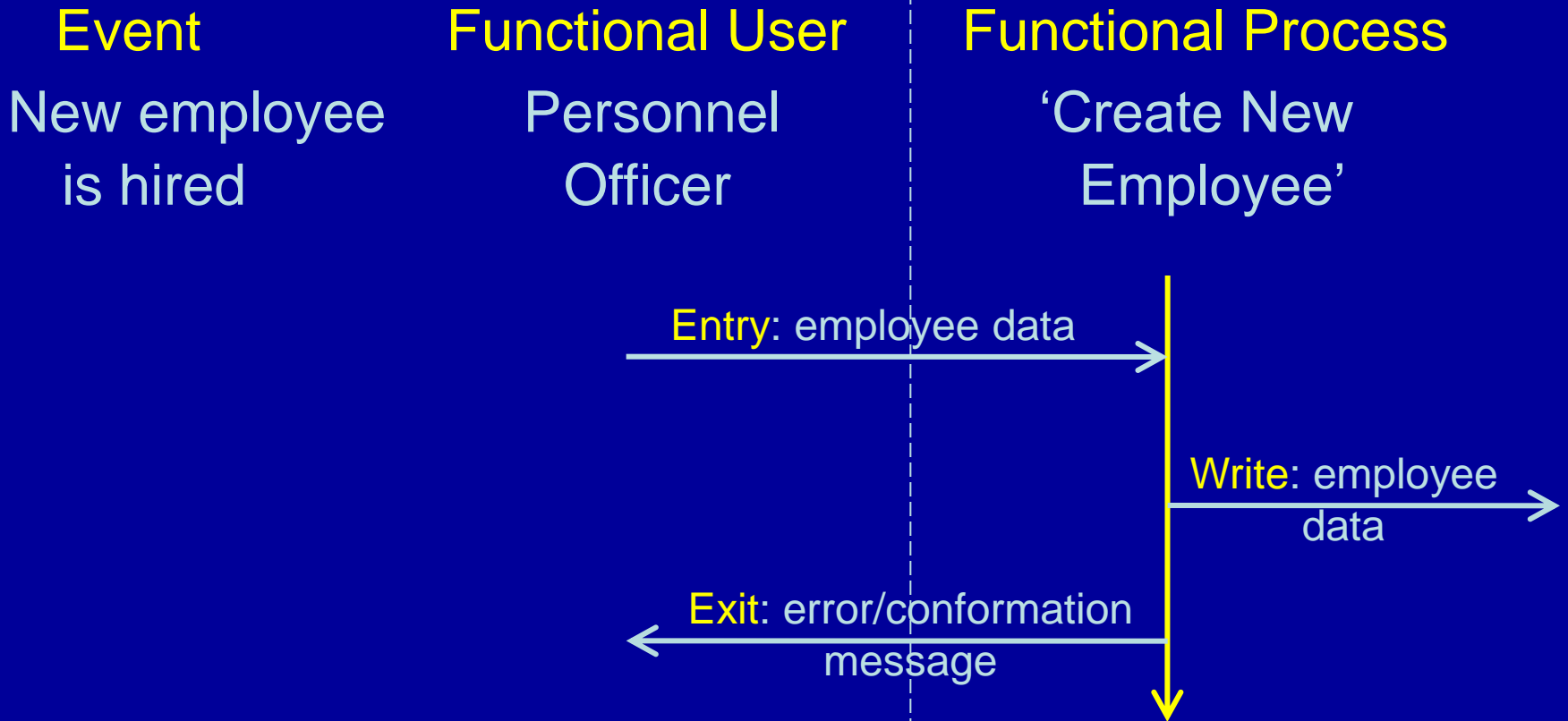


Entry = Exit = Read = Write = **1 CFP** – the unit of measure

Size of a Functional Process: Min = 2 CFP; Max = **No limit**



Functional Process: a highly simplified MIS example



Total Size of the Functional Process = 3 CFP

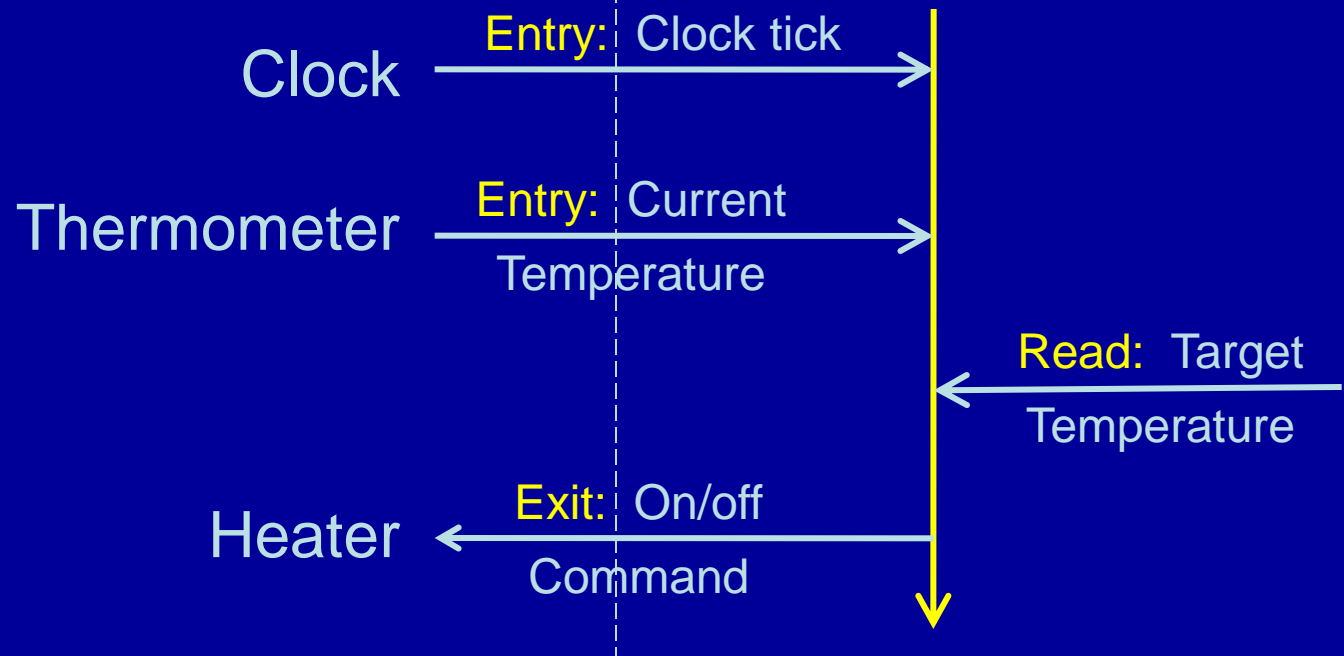


Functional Process: a simple Real-time example

Event
Clock tick

Functional Users

Functional Process
'Control Temperature'



Total Size of the Functional Process = 4 CFP



Different functional users see different sizes - examples

Functional User(s)



Whole business application

Human 'end users'



User interface

Business Rules

Data Services

Other components & human 'end users'

Application

SOA component

SOA component

Other SOA components or applications

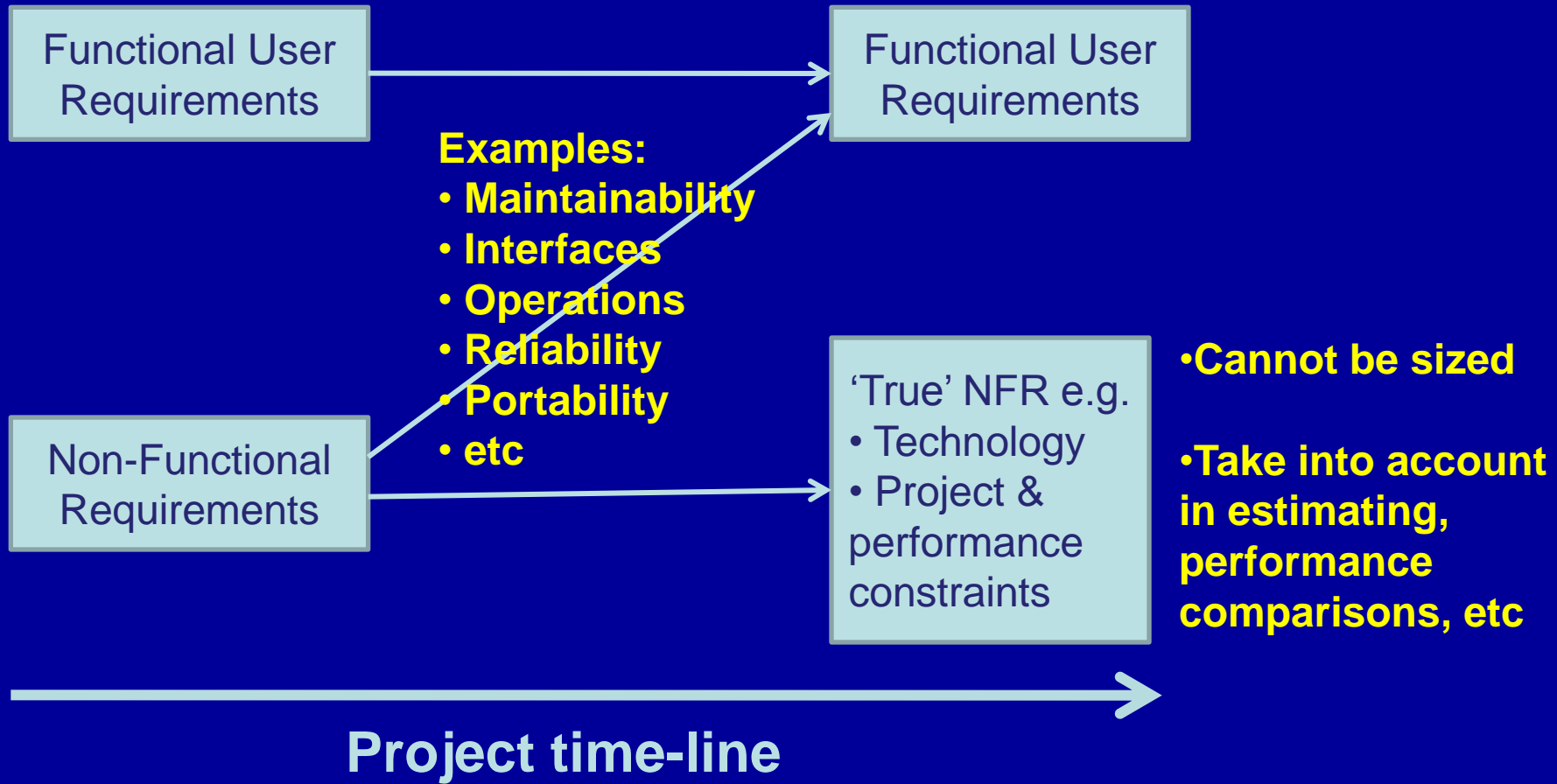


Mobile phone application

Human 'end users' or hardware devices & peer software?



COSMIC has been used to size NFR of space systems that evolve into FUR*

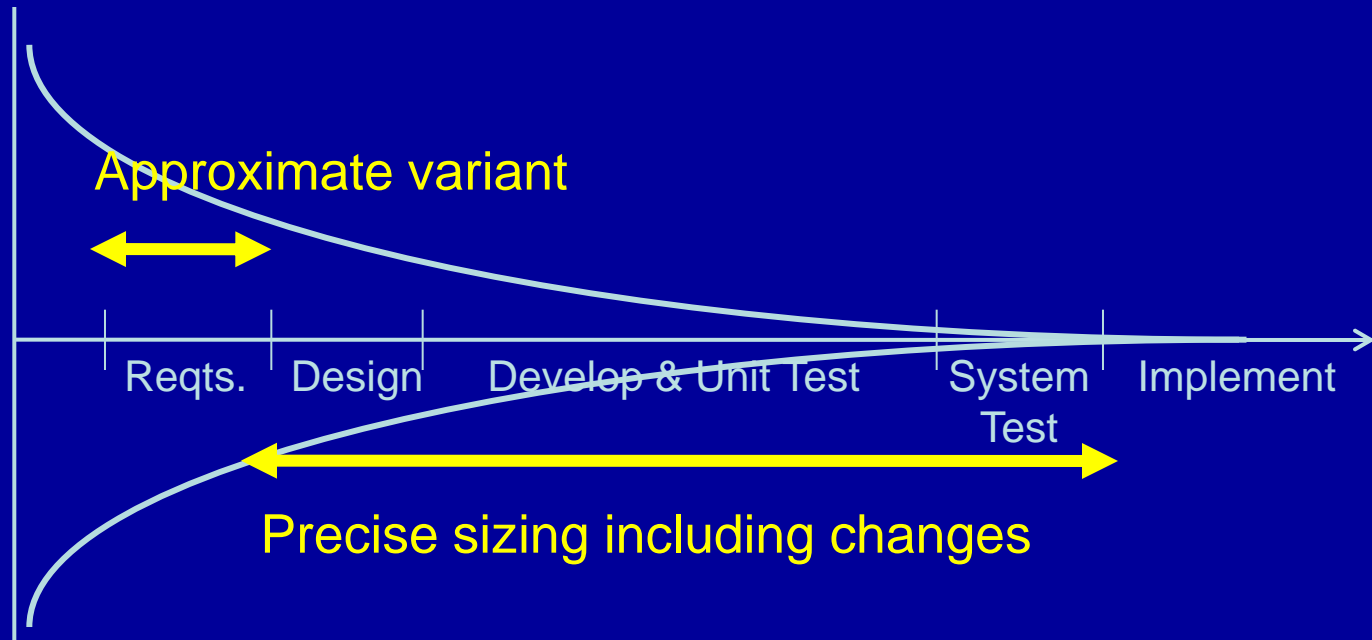


* (e.g.) Al-Sarayreh, K.T. and A. Abran, *Specification and Measurement of System Configuration Non Functional Requirements*, 20th International Workshop on Software Measurement (IWSM 2010), Stuttgart, Germany, 2010



The COSMIC method has variants to measure approximate sizes before FUR are detailed enough for precise sizing

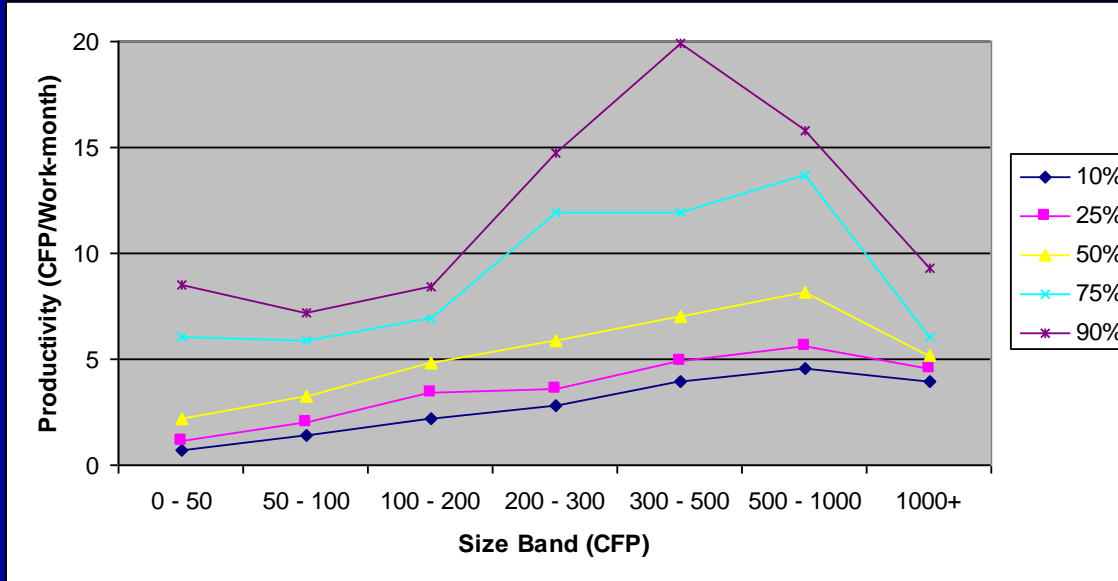
Uncertainty in whole system Functional Size



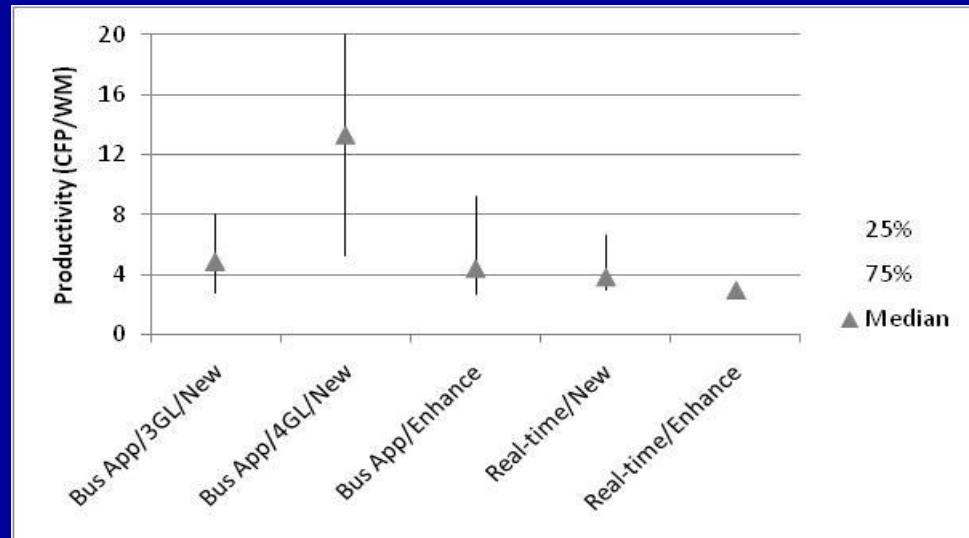
For an 'agile' project, every iteration and the cumulative product size can be sized precisely



The ISBSG now has comprehensive COSMIC benchmark data



'The Performance of Real-Time, Business Application and Component Software Projects', COSMIC/ISBSG, September 2009
www.isbsg.org





IFPUG v COSMIC methods: Some key differences

| | IFPUG | COSMIC |
|------------------------------------|---------------------------------|-------------------------------------|
| Design domain of applicability | Business Apps | Business, Real-time, Infrastructure |
| Compatible with modern RE methods? | No | Yes |
| Basis of sizing model | Ad hoc | SE Principles |
| Calibration of sizing model | IBM estimating methods (1970's) | Not needed |
| Component size limit? | Arbitrary cut-off | No limit |



**A few examples that reveal the
benefits of using COSMIC sizing**



COSMIC size measurements are much more differentiating than IFPUG's

Example: batch processes*

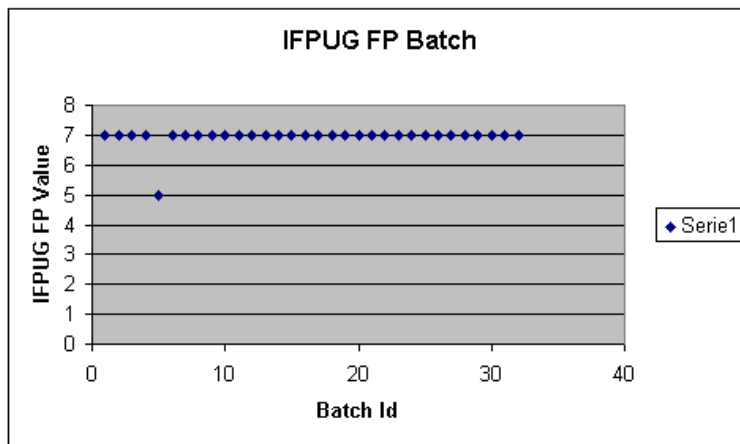


Figure 3 – Distribution of IFPUG FP Batch

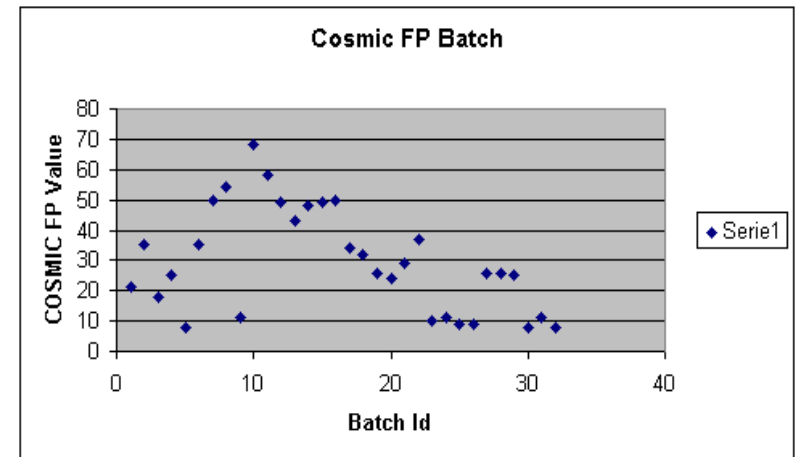


Figure 4 – Distribution of COSMIC FP Batch

This difference in precision could be very important for performance measurement & estimating

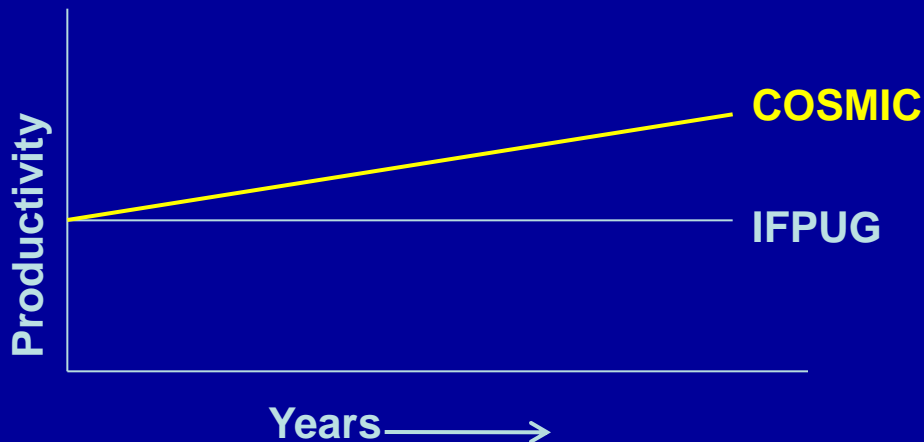
* Gianfranco Lanza, CSI-Piemonte presentation, SMEF 2009, Rome



Software development productivity improvement revealed

A major European bank

- Invested heavily in process improvement
- Measurements of productivity using IFPUG showed no improvement
- Re-measured some projects using COSMIC
 - **productivity had improved!**



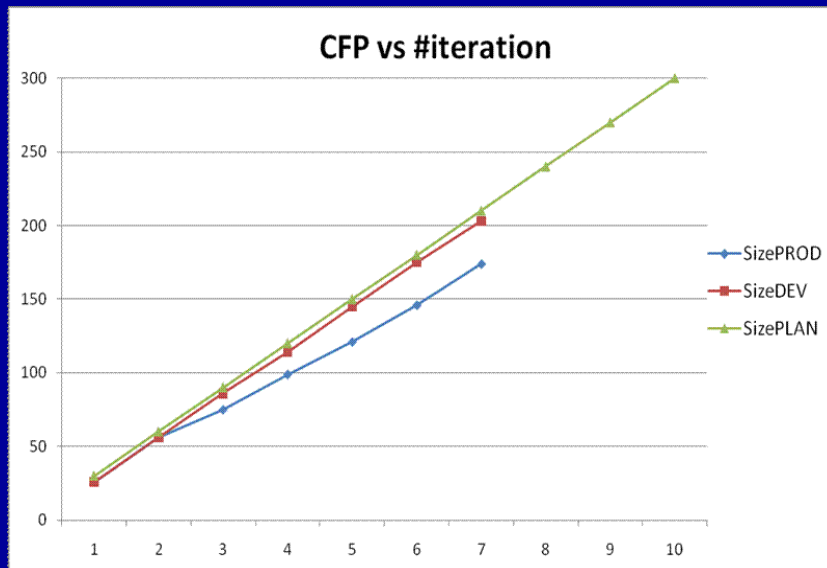
(transactions had become 'more complex' = larger over time)



There is a lot of positive experience using COSMIC in 'agile' projects

Story Points

- Subjective measure
- In practice measures 'effort', not 'size'



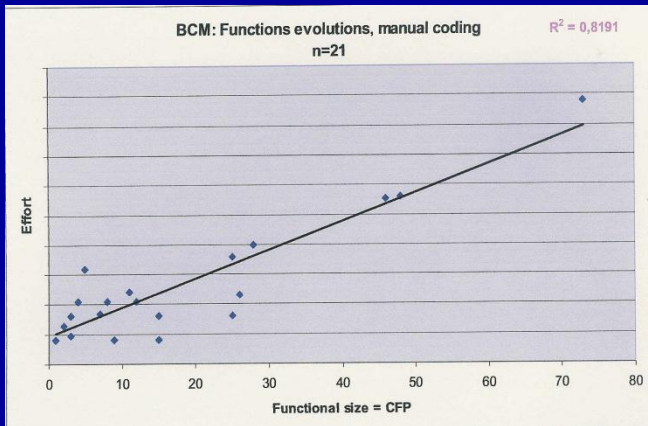
COSMIC

- Objective sizing
- Initial project estimation
- Sprint estimation & project re-estimation
- Process improvement monitoring
- Benchmarking
- Re-work measurement
- EVA

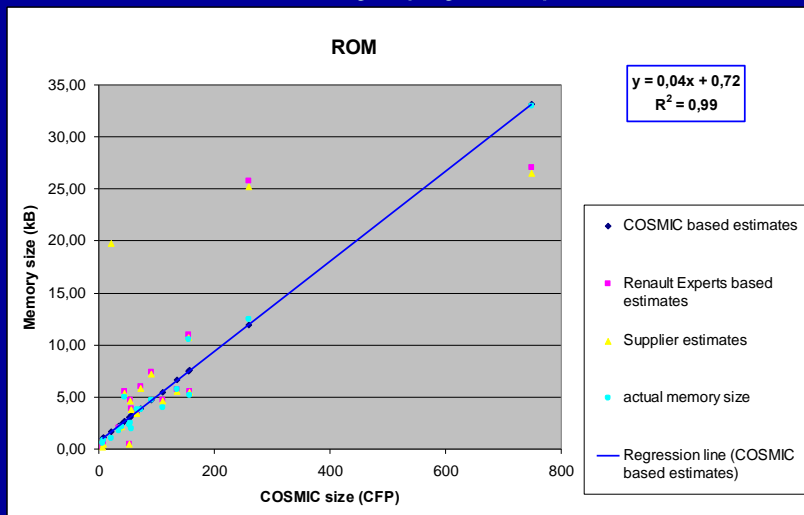


Renault and Saab* estimate development effort and memory sizes for ECU's from CFP

Renault: Devt. effort vs CFP size



Renault: Memory (bytes) vs CFP size



Renault now uses COSMIC FSM to estimate:

- Development effort
- RAM & ROM sizes

Next step:

- Measure sizes automatically from specifications

* Papers available on www.cosmicon.com



The COSMIC method is now being used world-wide

A selection of users

Finance

- European Union T&CUD
- National Bank of Canada
- Rabobank
- REEAL Insurance
- UK Revenue & Customs

Software Houses

- Atos Origin
- Cognizant Technologies
- CSC India
- Siemens IT S&S
- Sogeti Nederland

Some well-known names

- El Corte Ingles (Spain)
- Foxconn (China)
- Endesa (Spain)
- Ericsson
- Eurocopter (EADS)
- Hitachi (Japan)
- Nokia
- NTT-East (Japan)
- Renault

Recommended by:

- US Government Accountability Office



Many software customers & suppliers are now gaining major benefits from using COSMIC

- Improved estimating accuracy
- Improved project control on scope, effort and quality
- Easy to learn and to use; good acceptance by project staff → low implementation costs
- The widest applicability of any FSM method
- 'Open' and future-proof; (ISO/IEC standard 19761:2011)



**Thank you for your
attention**

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