

NASSCOM 2001

The Importance of the Size of Software Requirements

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Agenda

- Introduction
- A process maturity profile of the software community
- The significance of software size to the global economy
- A look at some uses of software size measures, illustrated by case studies
- A short history of Functional Size Measurement
- COSMIC
- Conclusion and a Challenge

Introduction

- The predictable acquisition and management of software projects is of considerable economic importance
- But many projects are doomed before the team starts work
- Management control is achieved only via feedback loops
- We must measure both the input to, and the output from, software projects

A process maturity profile of the software community

The SEI says

Sw Project Planning & Integrated Sw Management are among the 'least frequently satisfied' key process areas

May 1998

Software Quality Assurance and *Software Project Planning* are the least frequently satisfied KPAs among those assessed at ML1

In regard to Software Management, Organization Process Definition and Training Program are the least frequently satisfied KPAs among those assessed at ML2

August 1999

Software Quality Assurance is the least frequently satisfied ML2 KPA among those assessed at ML1

In regard to Software Management, Training Program and Organization Process Definition are the least frequently satisfied ML3 KPAs among those assessed at ML2

March 2000

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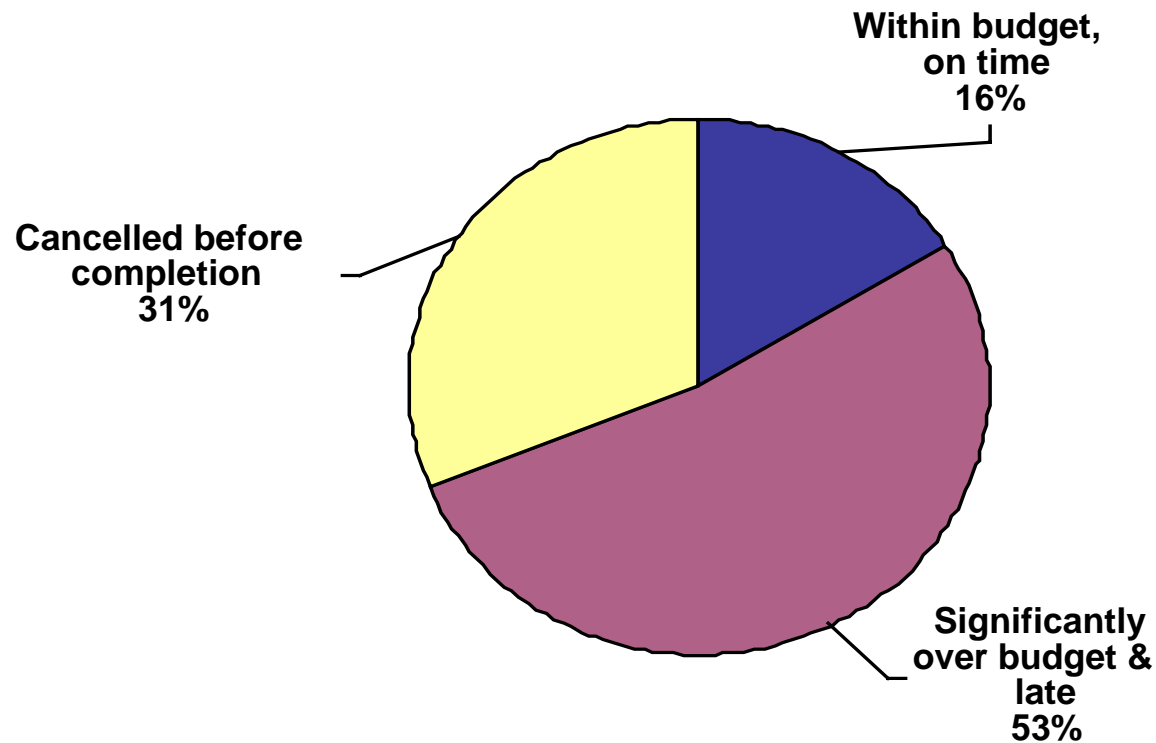
August 2000

Software Quality Assurance is the least frequently satisfied ML2 KPA among those assessed at ML1

In regard to Software Management, Training Program and Organization Process Definition are the least frequently satisfied ML3 KPAs among those assessed at ML2

Surveys report the majority of sw projects as over budget & late

Project performance to Summer 1999



Average growth in project costs was 89%

Ref: CHAOS Report, Standish Group, Summer 1999

'Inadequate planning' is identified as a 'key risk' to many projects

Planning weaknesses include...

- Inability to scope the project
- Over estimation of team productivity
- Lack of continuous planning
- Poor contingency preparation
- Resource & skill (un)availability

Ref: 'Study of 1000 projects', Software Productivity Centre, Canada, Jan'2001

Sw Subcontract Management also is not 'fully satisfied' in many organisations

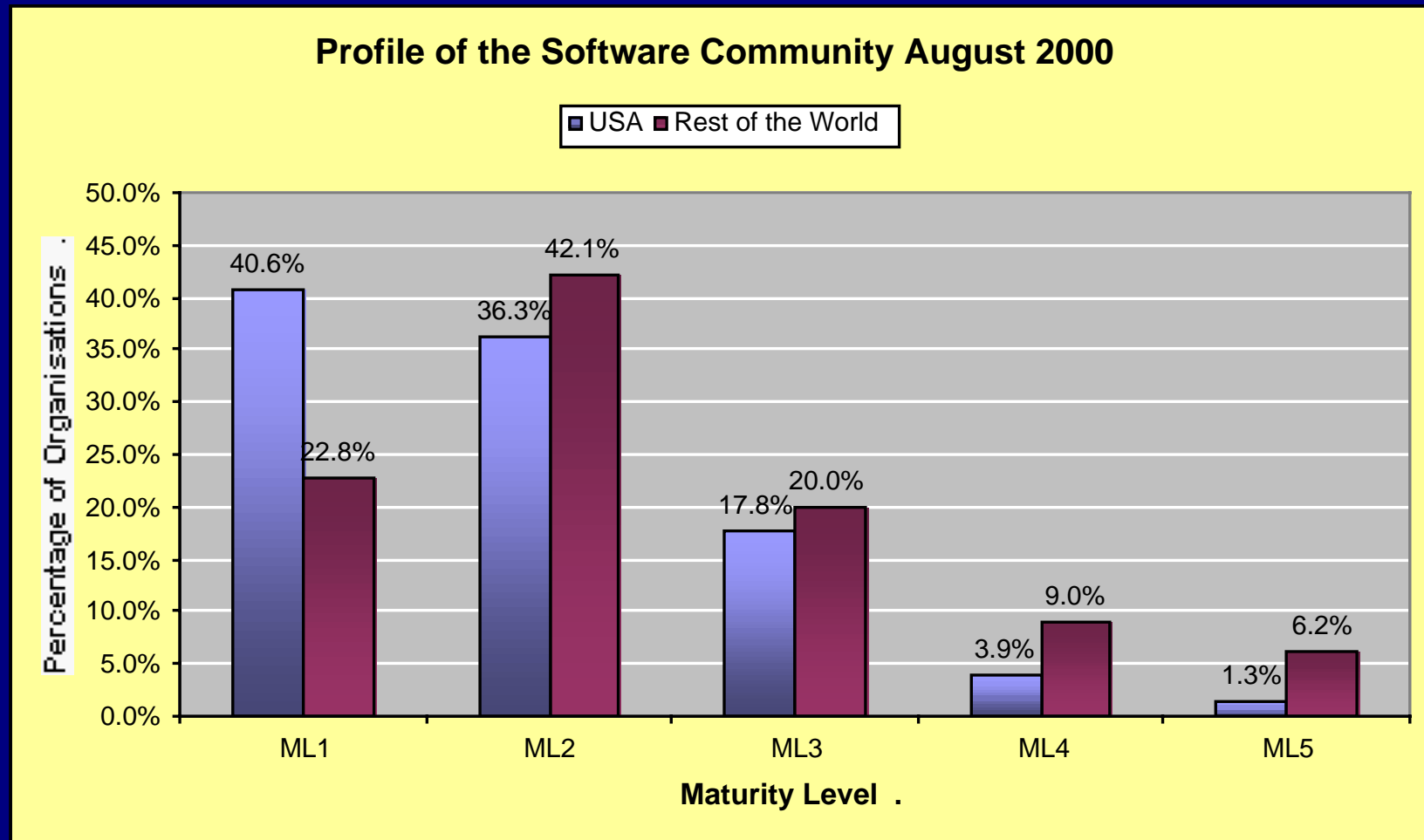
The SEI Sw Community Profile indicates...

- SSM is rated for only 38% of ML1 organisations
- Only 6% achieve a 'fully satisfied' rating

SMS notes...

- Contract negotiations are performed by lawyers & accountants, excluding PQMG, SEPG, SPO & Measurement specialists

Low maturity organisations are in the majority... this may include your customers



Ref: SEI 'Process Maturity Profile of the Software Community 2000 Mid-Year Update August 2000'

'Size' is crucial to software project planning, tracking and control

The Integrated Software Management key process area states...

- 'The management of the software project's **size**, effort, cost, schedule, staffing, and other resources is tied to the tasks of the project's defined software process.'

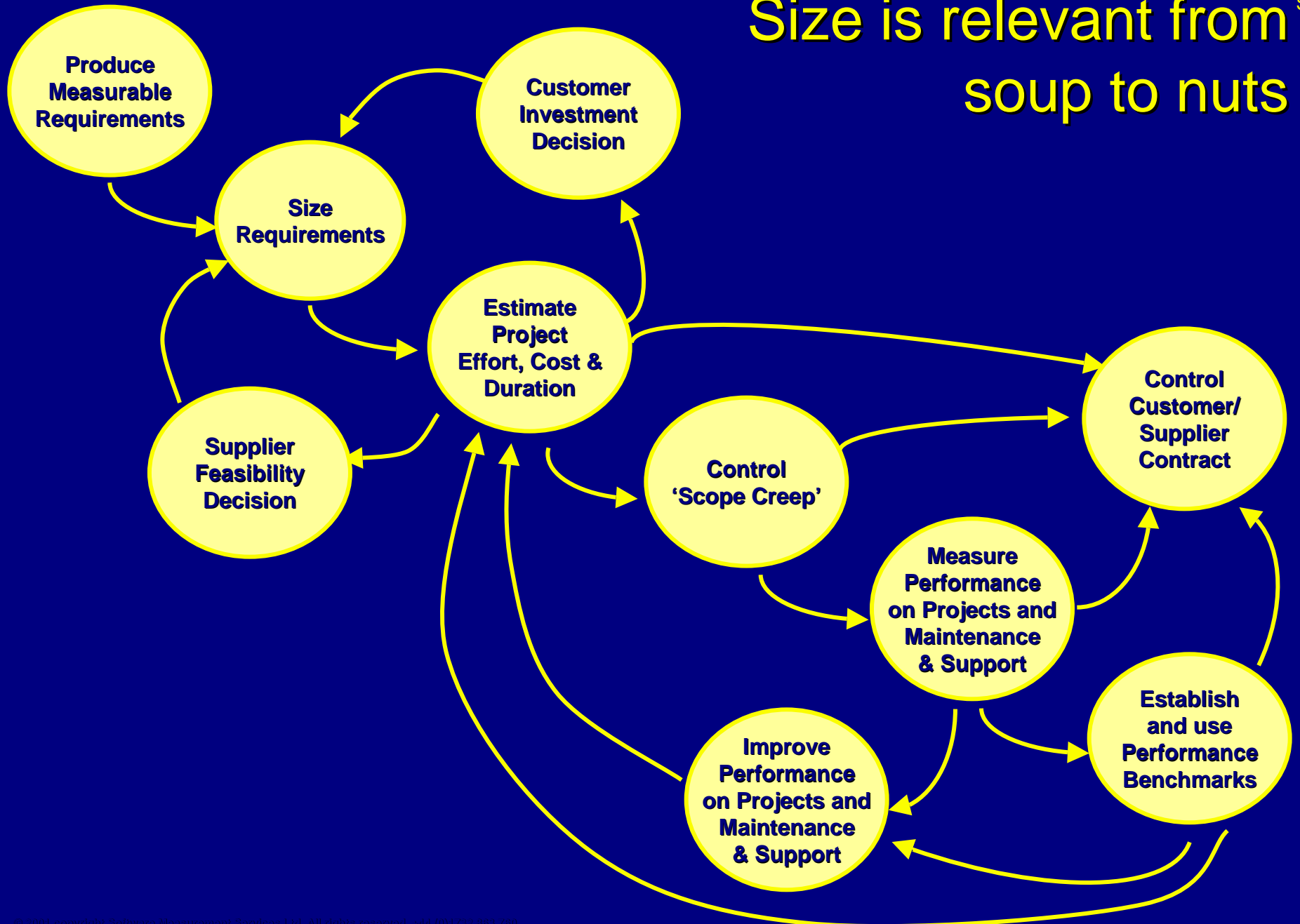
The significance of software size to the global economy

And a look at some uses of software size
measures, illustrated by case studies

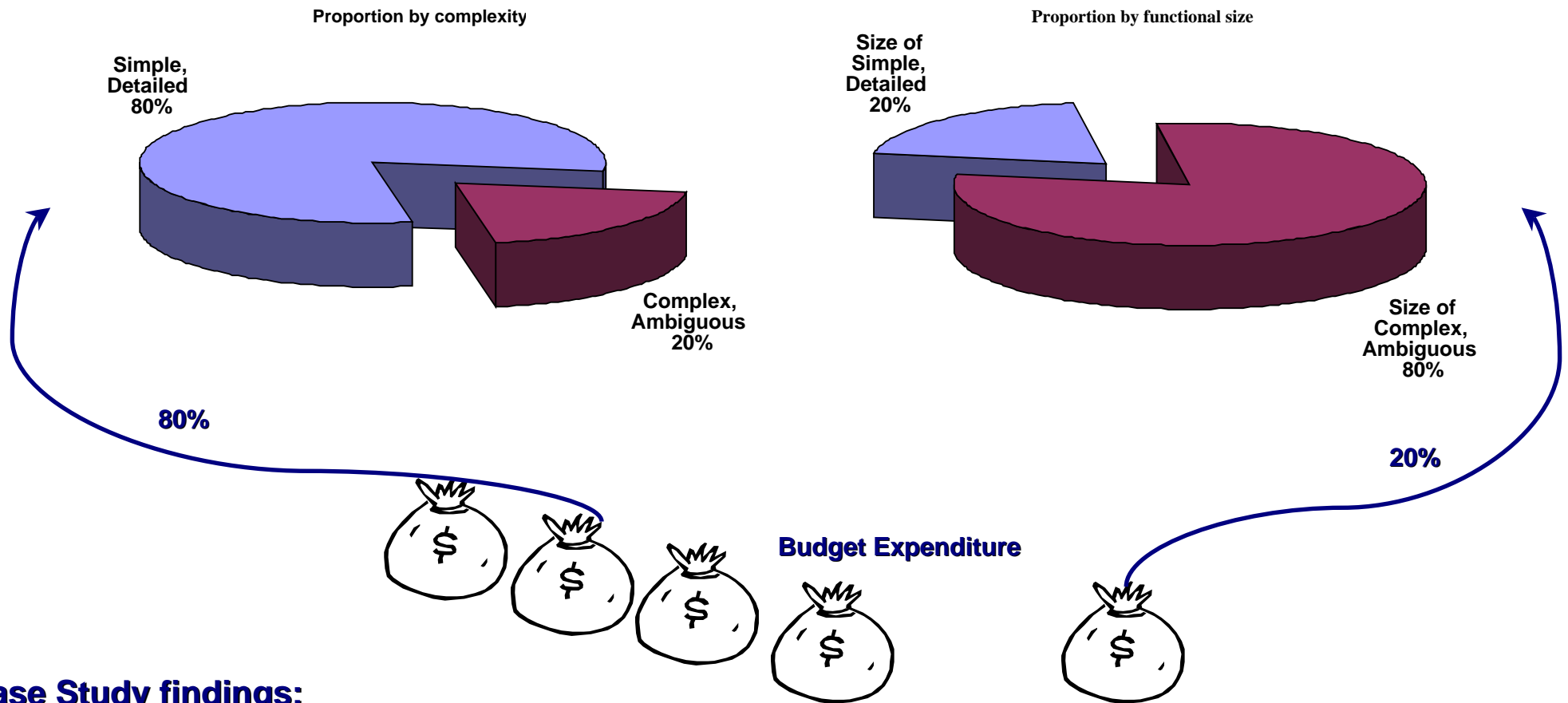
Software size is significant to the global economy

- Maybe 1% of the world's economy is accounted for by sw development & maintenance
- So the economic impact of the 84% of projects that fail is very serious
- Yet the software community mostly fails to measure the **output** of the software process!
- We **need** a measure of 'the information processing functionality delivered to users'

Size is relevant from soup to nuts



Functional size measures can be used to improve the analysis quality of Use Cases



Case Study findings:

Phase-1 of 4 overran

Project 5 times larger than planned

Supplier withdrew losing US\$7.5m

Customer left with nothing after 18 months

Functional size measures of requirements ensure estimates of effort, schedule and costs is firmly founded

When

As early as possible, using some tried and tested heuristics to estimate the functional size (the traditional 'back of the envelope' estimate)

After the information obtained during early functional size analysis has been used to resolve ambiguities and normalise the detail to a consistent level of granularity

Finally, just as the developed software is ready for User Acceptance Testing (UAT)

Why

At this stage this provides not only the data essential to test feasibility and for project planning, but it also identifies ambiguous use cases and those that are defined in insufficient detail

This produces the 'main' estimate for the phase and establishes the 'size baseline' against which all subsequent Requests For Change can be tracked

This final measurement of the functional size is used as a check to ensure that what was required has actually been developed and also enables refinement of the plans for the UAT and implementation steps

Precision

Usually to around $\pm 30-40\%$

Often better than $\pm 15\%$

Often better than $\pm 5\%$

Case Study findings:

Phase-1 of 6 appeared low productivity
 Delivery 3 times faster than previous
 Introduced FSM on subsequent phases
 Improved Use Cases and Scope Control

Inter-Counter Consistency of experienced analysts is +/- 5% and better than sw team

Project	Client	Method	Study Effort	Size	Difference	
			wh	fsu	#	%
A	Client 1	detailed	?	2236	0	0%
A	Consultant 1	fast estimate	11.25	1990	-246	-11%
A	Consultant 2	detailed	33.75	2289	53	2%
B	Client 2	detailed	?	744	0	0%
B	Consultant 3	detailed	15	752	8	1%

Case Study findings:

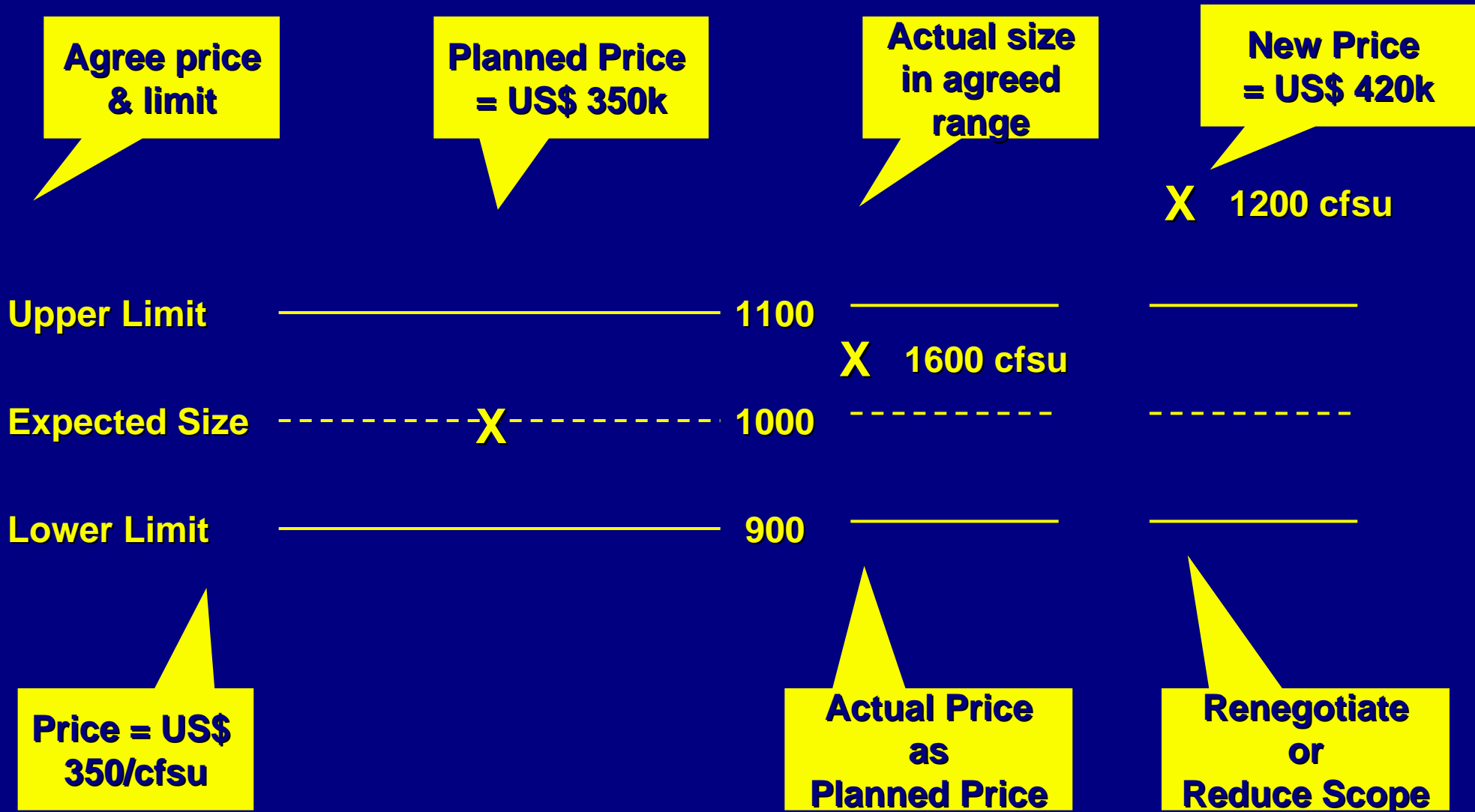
In blind tests, analysts showed little variance

Fast estimating agrees well with detailed measures

Experienced analysts can expect much better consistency than newly trained staff

Experts achieve an ICC within +/- 5% ... project staff achieve typically +/- 23%

Use FSM to evaluate and manage a project's feasibility and price



Limit scope creep and penalise late Requests For Change

For Change

Late changes impose disproportionate costs on the supplier. Therefore...

- Try to restrict Requests For Change (RFC)
- Surcharge late RFC
- Size each RFC and evaluate its impact

For example

- Calculate the price of each RFC using
Size x Unit Price x (Month Number/10)^{1.74}



Use FSM to manage long-running outsourced contracts & partnerships

- Use FSM to track supplier price/performance
- Establish agreed baselines of application size
- Measure & account for sw development annually
- Verify & validate the practices and results
- Use independently standardised techniques
- Periodically audit procedures using a 3rd Party

Case Study: a Retail Bank

Annual review of multi-year outsourced contract – several hundred engineers

All sw development & enhancement measured by project teams – 30 staff trained

Supplier's QA staff perform local reviews – 2 trained specialists

Annual FSM Audit by SMS – taking between 20 – 30 work days

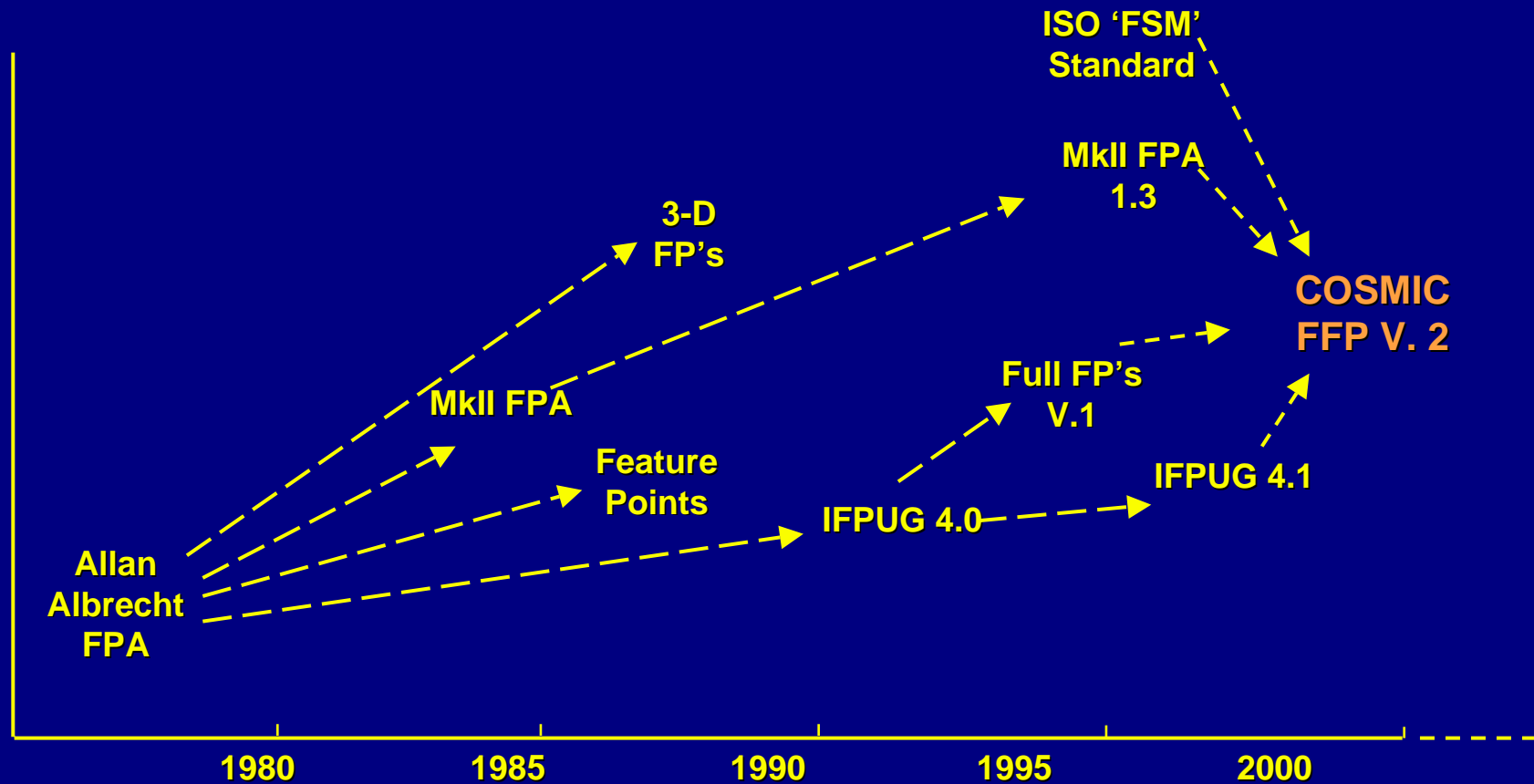
Mean size error per project +/- 2-2.5% ... Size error across all work < +/- 1%

Size measurement enables management of maintenance & support groups

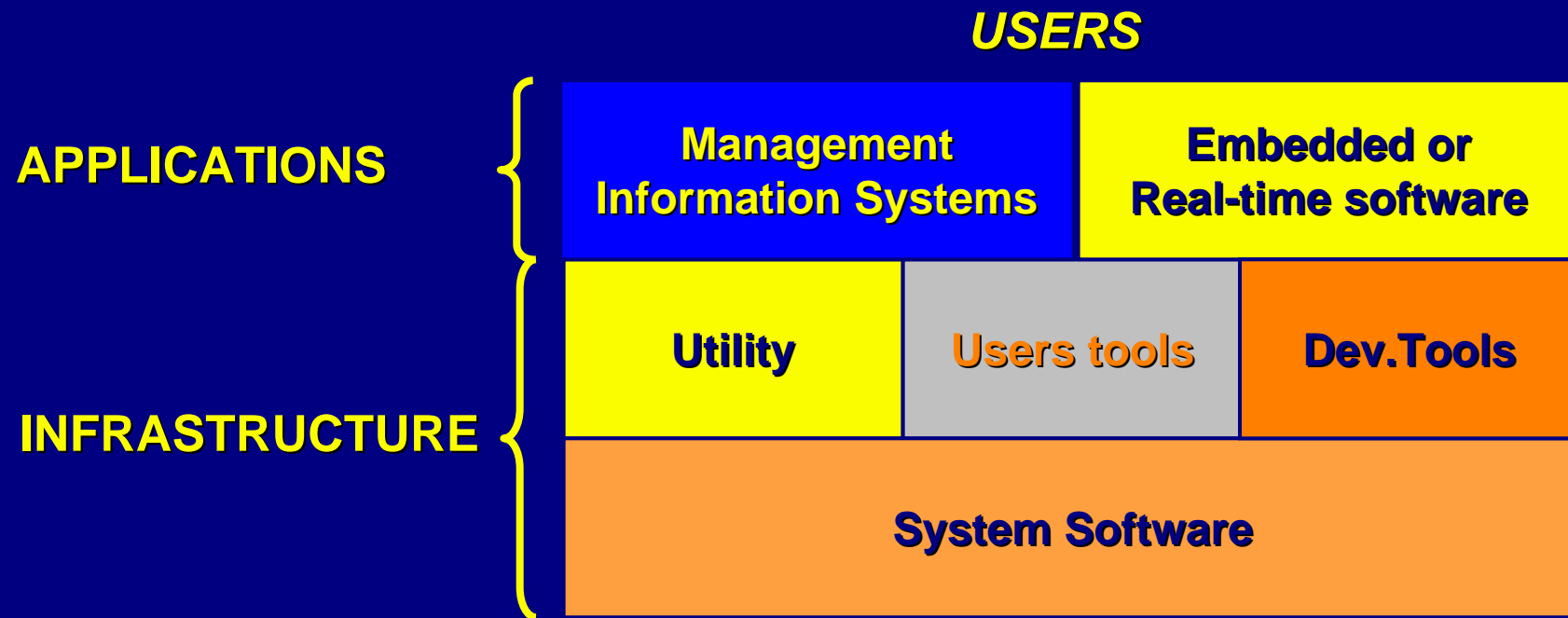
Metric	Definition	Unit
Unit Support Cost	<u>Total Size of the Software Portfolio</u>	<u>cost</u>
	Total Cost of M&S Group	US \$
Support Capability	<u>Functional Size Supported</u>	<u>cost</u>
	Full Time Equivalent person	FTE
Defect Density	<u>No. of Defects Detected during period</u>	<u>defects</u>
	Functional Size of the Application	cost

A short history of Functional Size Measurement

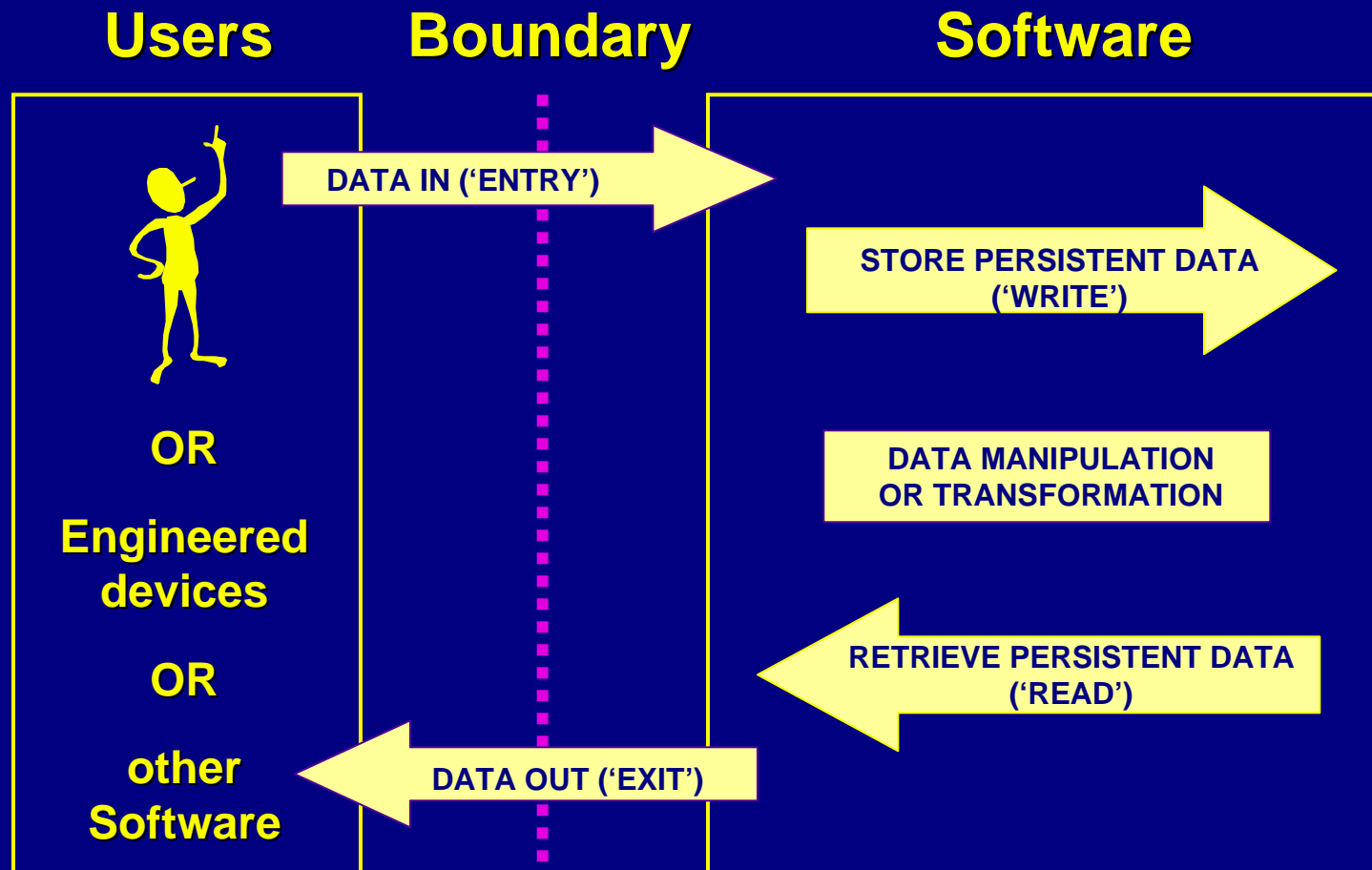
It has taken over 20 years of evolution to develop a widely applicable FSM



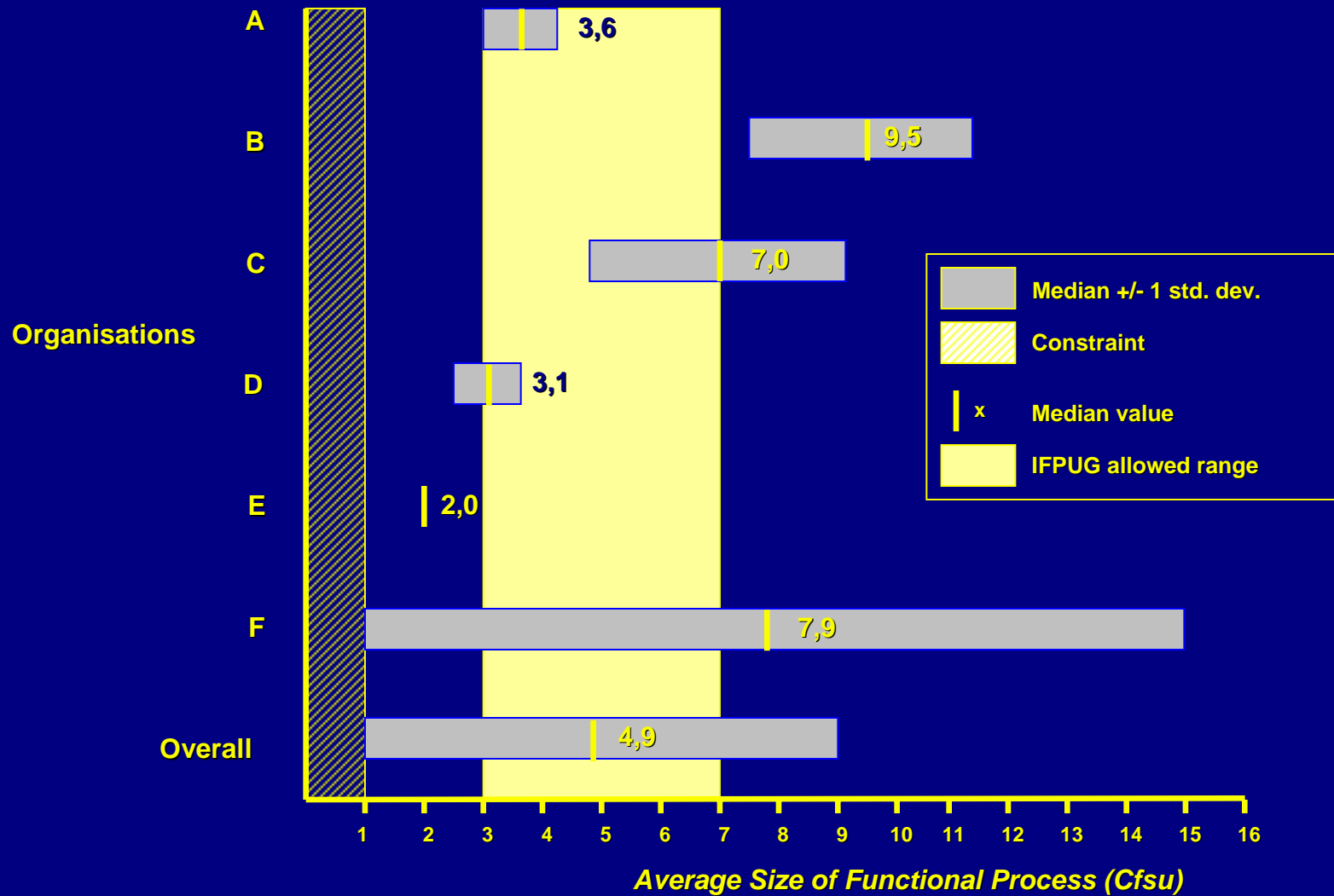
COSMIC has been designed for the various different kinds of software



COSMIC accommodates the “users’ view” of software requirements



The size range of Functional Processes is much wider than the IFPUG ranges



The COSMIC–FFP method has achieved a number of ‘firsts’

COSMIC is the first FSM method to be:

- Designed by an international group of experts based on sound theory & much experience
- Based on the practical experience of all the main existing FSM methods
- Designed to conform to ISO 14143 - 1
- Designed to work across MIS and real-time domains, for software in any layer or peer element
- Widely tested in field trials before being finalised in domains including avionics, banking, energy, telecoms, defence & small business systems
- Fully in the public domain from the outset

Conclusion

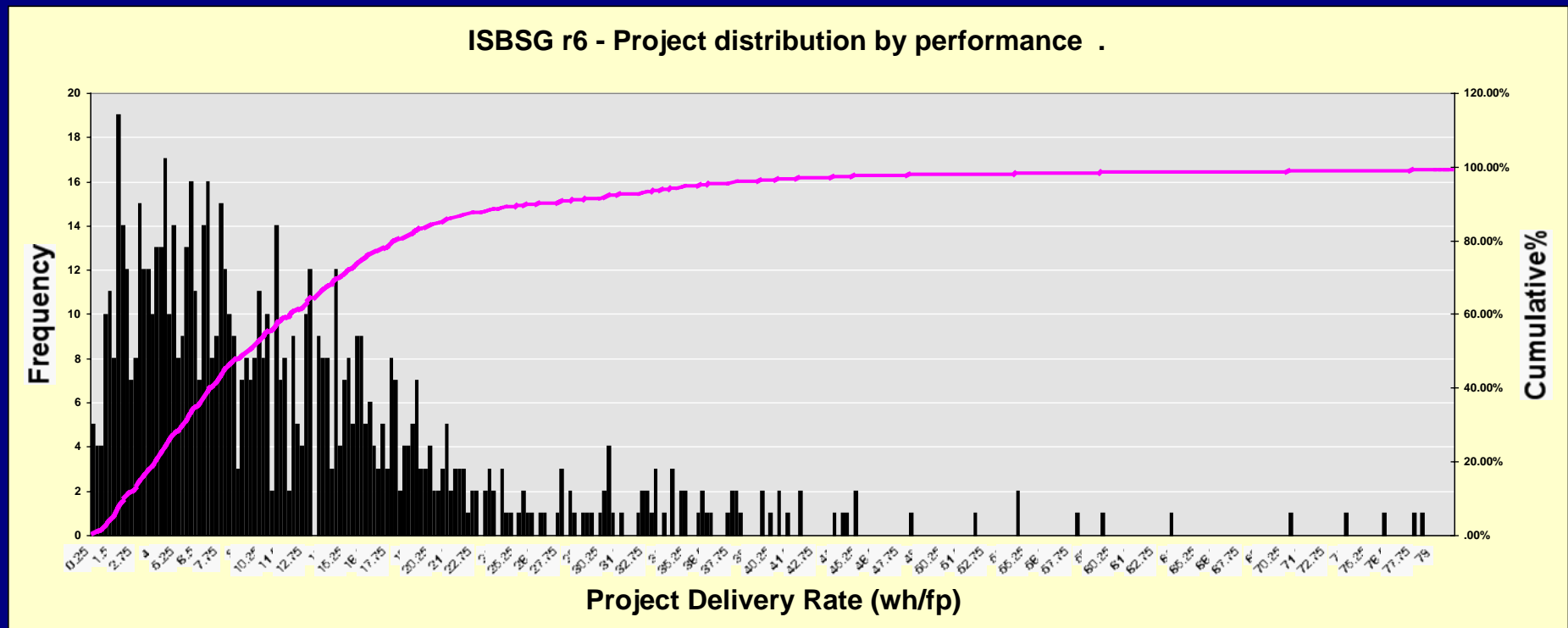
- The software community cannot go on delivering projects late & over budget
- COSMIC size measurement enables us to measure output & close the control loop
- The CMM & high-maturity organisations have shown that better management is possible
- There are no more excuses
- If they can do it, you can do it.
-

So do it !

A Challenge

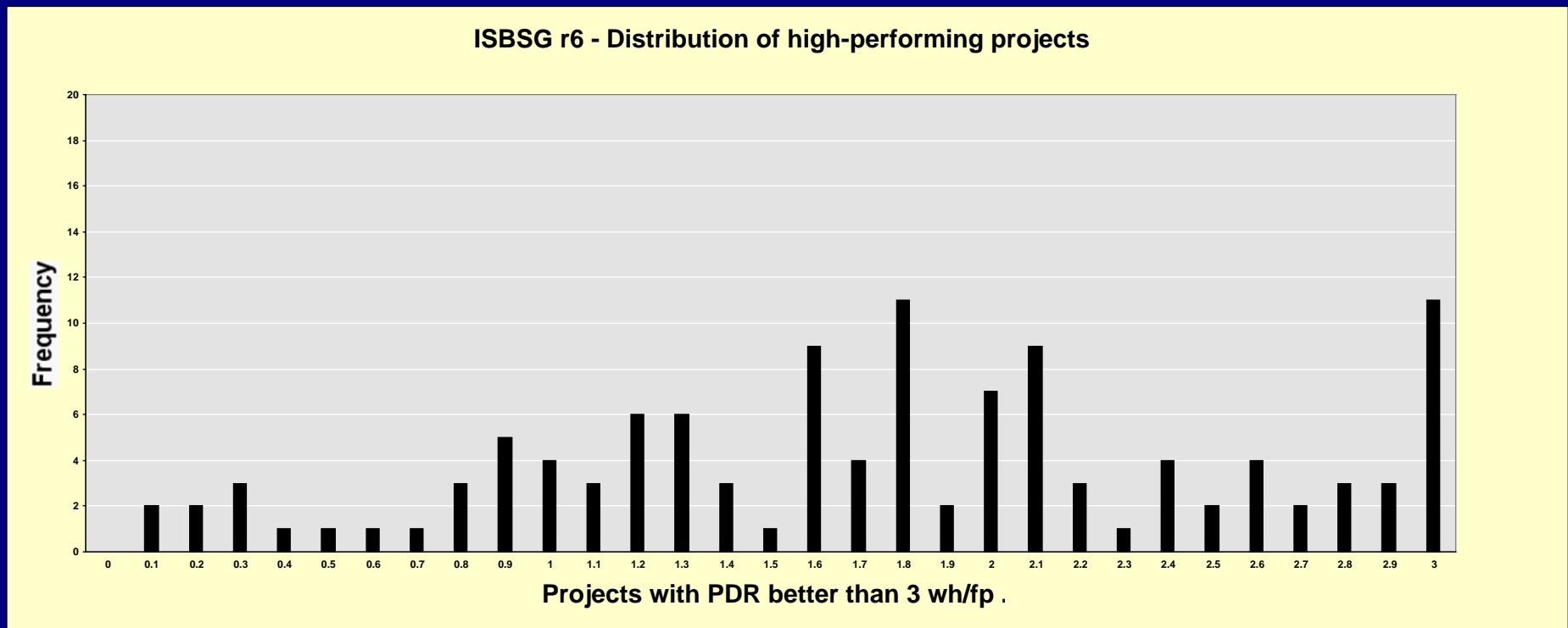


Project performance varies very widely covering nearly 3 orders of magnitude



- Project Delivery Rate ranges from 0.2 to nearly 80 work hours per function point

The best performing projects achieve a Project Delivery Rate of 0.2 wh/fp



- Who will be the first to consistently achieve PDR in the range 0.1 – 1 wh/fsu ?
- Will it be you ?

Available resources

Complete COSMIC documentation on the Web

- Concepts and definitions
- Measurement Manual
- Publications
- www.lrgl.uqam.ca/ffp.html
- www.cosmicon.com

Training & consultancy support is available from

- Software Measurement Services – PG_Rule@compuserve.com
- AmitySoft – jayakumar@amitysoft.com
- ResourcesOnNet – unnati@giasdl01.vsnl.net.in