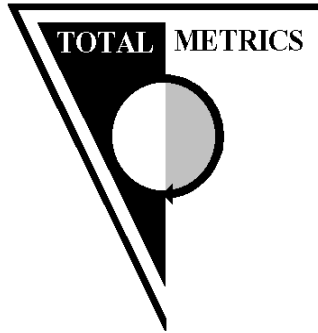


Software Measurement *Now and the Future*

JFPUG Conference Tokyo
April 2000

Pam Morris - Total Metrics



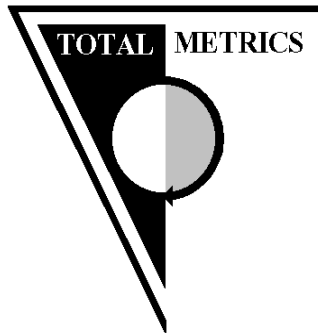


Pam Morris

(BSc. Grad. Dip Computing, Dip. Ed.)

- **Member of the IFPUG Counting Practices Committee since 1992**
- **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**
- **Chief Executive Officer of Total Metrics**

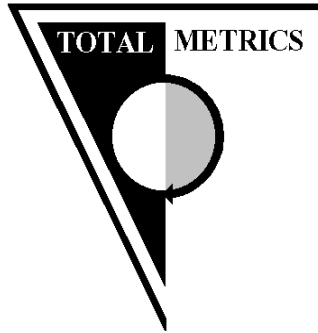




Aims of this presentation

- To talk about current status of Software Measurement and its use in Australia
- To describe the benefits found , issues experienced and the needs identified
- To report on a new measurement initiative - COSMIC , its aims, designs, principles, progress and interim findings.



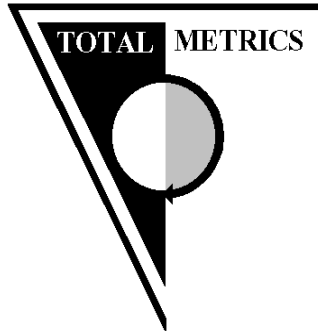


Current Status - Software Measurement in Australia

➤ Main areas of Use :

- Monitoring Outsourcing Agreements
- Evaluating Software Assets
- Estimating and Monitoring fixed price projects
- Process Improvement and Benchmarking

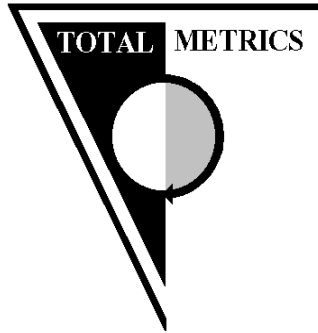




Outsourcing Agreements

- **Main areas of Use :**
 - **Portfolio Assessment**
 - **Performance Improvements**
 - **Productivity Rates**
 - **Estimating Enhancements**





Outsourcing Agreements

➤ Benefits

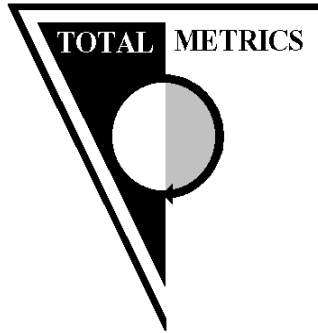
– Objective quantification of :

- performance targets based on outputs
- portfolio size

➤ Issues :

- FPA is not a ‘silver bullet’
- Focuses on functionality rather than ‘value’
- Need additional metrics

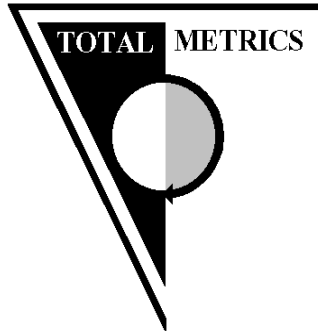




Software Assets

- **Main areas of Use :**
 - **Accrual Accounting**
 - **Value based on 'replacement cost'**

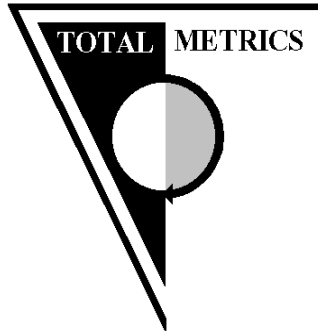




Software Assets

- **Benefits :**
 - Provides more realistic evaluation of software as a ‘capital asset’
- **Issues :**
 - high cost
 - need a more rigorous FPA standard
 - Need to value ‘knowledge capital’

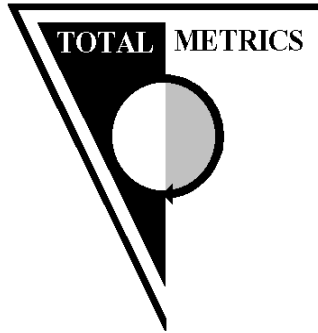




Estimating and Monitoring Fixed Price Contracts

- **Main areas of Use :**
 - **Estimating resources**
 - **Comparison of solutions**
 - **Negotiating scope**
 - **Dollar cost per unit delivered**
 - **Quantifying scope creep and rework**
 - **Evaluating Risk**



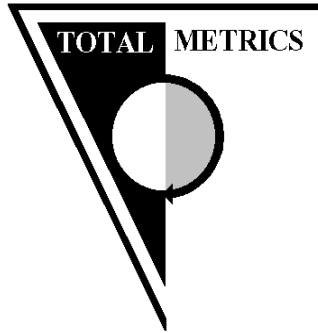


Estimating and Monitoring Fixed Price Contracts

➤ Benefits :

- Quantitative objective measure of delivered product size
- Realistic estimates
- Quantification of scope creep and rework
- Quantitative Risk evaluation



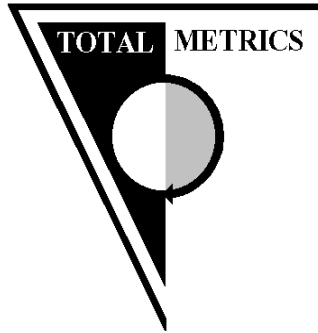


Estimating and Monitoring Fixed Price Contracts

Issues :

- Impact of productivity factors - project and product attributes
- Which ‘changes’ can be counted using FPA
- Sensitivity of FPA
- Different Interpretations of rules
- IFPUG not as effective in all software functional domains

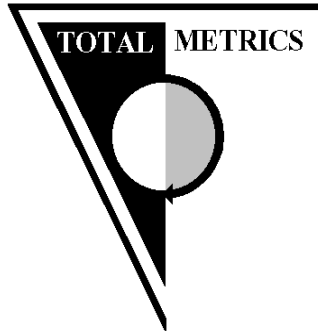




Process Improvement and Benchmarking

- **Main areas of Use :**
 - **Internal comparison**
 - **Spice / CMM assessment**
 - **External comparison**



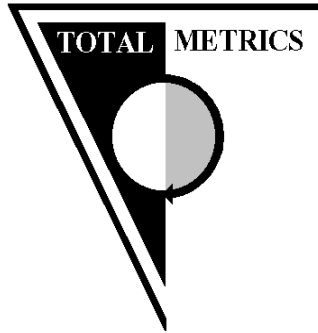


Process Improvement and Benchmarking

➤ Benefits:

- Quantitative comparison
- Capability to set targets and quantitatively monitor improvements
- Availability of external industry data



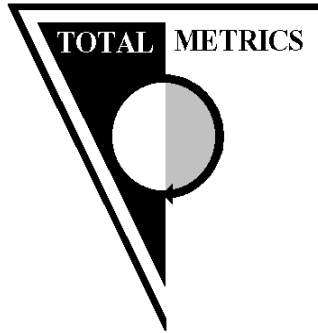


Process Improvement and Benchmarking

➤ Issues :

- Resources and cost
- Lack of available 'like' data
- Adhoc approach rather than 'balanced scorecard'
- Lack of available integrated metrics tools



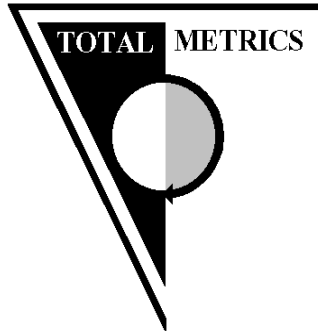


Industry Needs

➤ Wish List:

- Wider range of metrics for specific needs
- International standardisation of metrics
- **Better Metrics -**
 - simpler
 - more accurate
 - higher consistency
 - guaranteed repeatability
 - wider scope
- **Automated metrics collection , analysis and reporting**
- **Improved availability of industry relevant data**
- **Better understanding of metrics capability and measurement concepts**

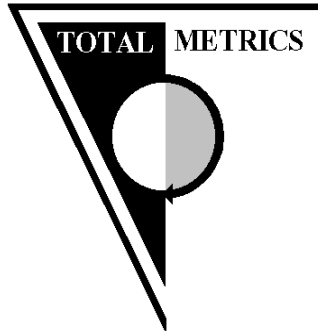




Current work towards the Future - Functional Size Measurement

- **ISO** (International Standards Organisation)
 - ISO/IEC 14143 Functional Size Measurement Standard
- **ISBSG** (International Software Benchmarking Standards Group)
 - accepting FSM results from new methods.
- **IFPUG** (International Function Point User Group)
 - updating CPM 4.1 - removing Adjustment Factors
- **COSMIC** (COmmon Software Measurement International Consortium)
 - research, development and trials of new FSM method

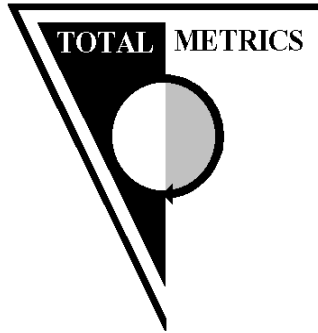




Aims of this presentation

- To talk about current status of Software Measurement and its use in Australia
- To describe the benefits found , issues experienced and the needs identified
- To report on a new measurement initiative - COSMIC , its aims, designs, principles, progress and interim findings.





'COSMIC' - the COmmon Software Measurement
International Consortium



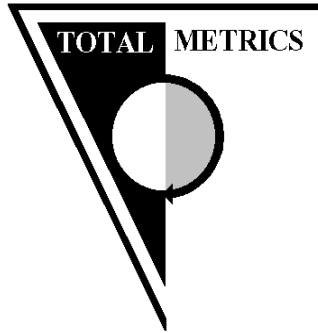
COSMIC FFP Field Trials Summary of Aims, Progress and Interim Findings

Presented on behalf of the COSMIC Core
Team *

April 2000

(* Alain Abran, Charles Symons, Jean-Marc Desharnais,
Peter Fagg, Pam Morris, Serge Oligny, Jolijn Onvlee,
Roberto Meli, Risto Nevalainen, Grant Rule, Denis St
Pierre)

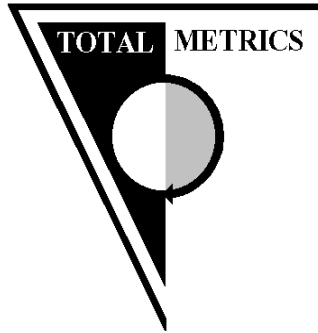




COSMIC FFP - Aims, Design Principles and Progress

- **To introduce the COSMIC project, its aims and structure**
- **To describe the current status of the project and interim findings**
- **To invite interested organisations to participate in the next stage of field-testing of the COSMIC principles**

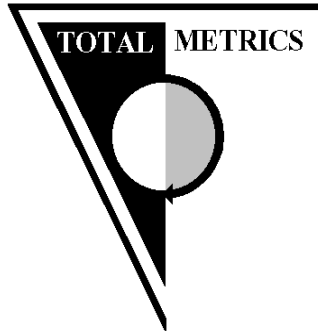




Why the focus on improving Functional Size Measurement (FSM)?

“The ability to measure the **size of software** is hugely important for software management and managing projects and contracts”



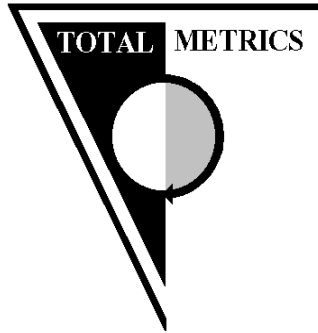


Industry needs better software sizing methods

Current methods for sizing requirements (i.e. 'Function Point' methods) are widely accepted in the MIS domain but are unsatisfactory as long-term solutions

- limited acceptance outside the traditional MIS world
- do not deal satisfactorily with 'non-functional' (= technical and quality) requirements
- rules are not always compatible with modern software requirements and development methods and are sometimes subjective in interpretation





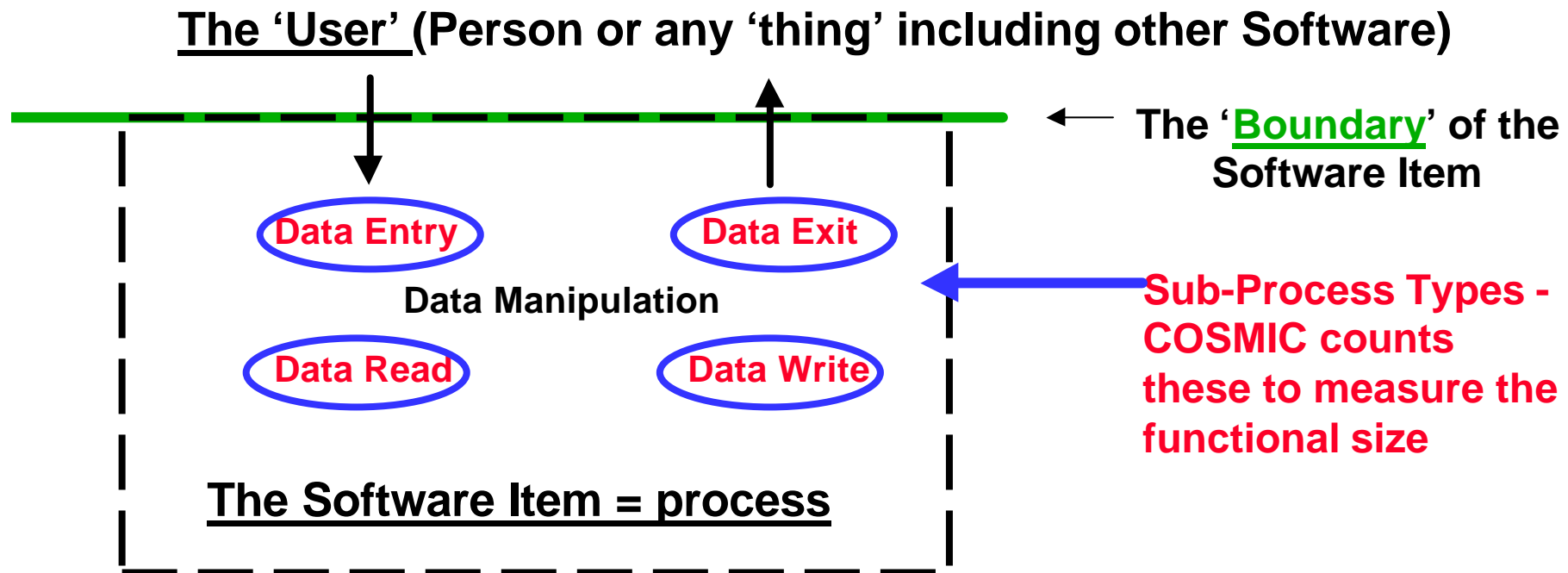
COSMIC design principles: summary



- **COSMIC started November 1998, 10 countries participated in development of the design.**
- **COSMIC's basic design principles were worked out and agreed by the Core Team**
- **The COSMIC method has achieved a number of "firsts" - the first Functional Sizing method to:**
 - **be designed by an international group of experts on a sound theoretical basis**
 - **draw on the practical experience of all the main existing FP methods**
 - **be designed to conform to ISO 14143 Part 1**
 - **be designed to work across MIS and real-time domains, for software in any architectural software layer**



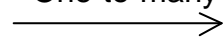
The COSMIC model showing the interaction of the Software Item being measured with the 'Boundary' of its Layer




Data Entries and Exits move data across the User/Software Boundary
Data Reads and Writes store and retrieve persistent data within the software item, as far as its 'User' is concerned

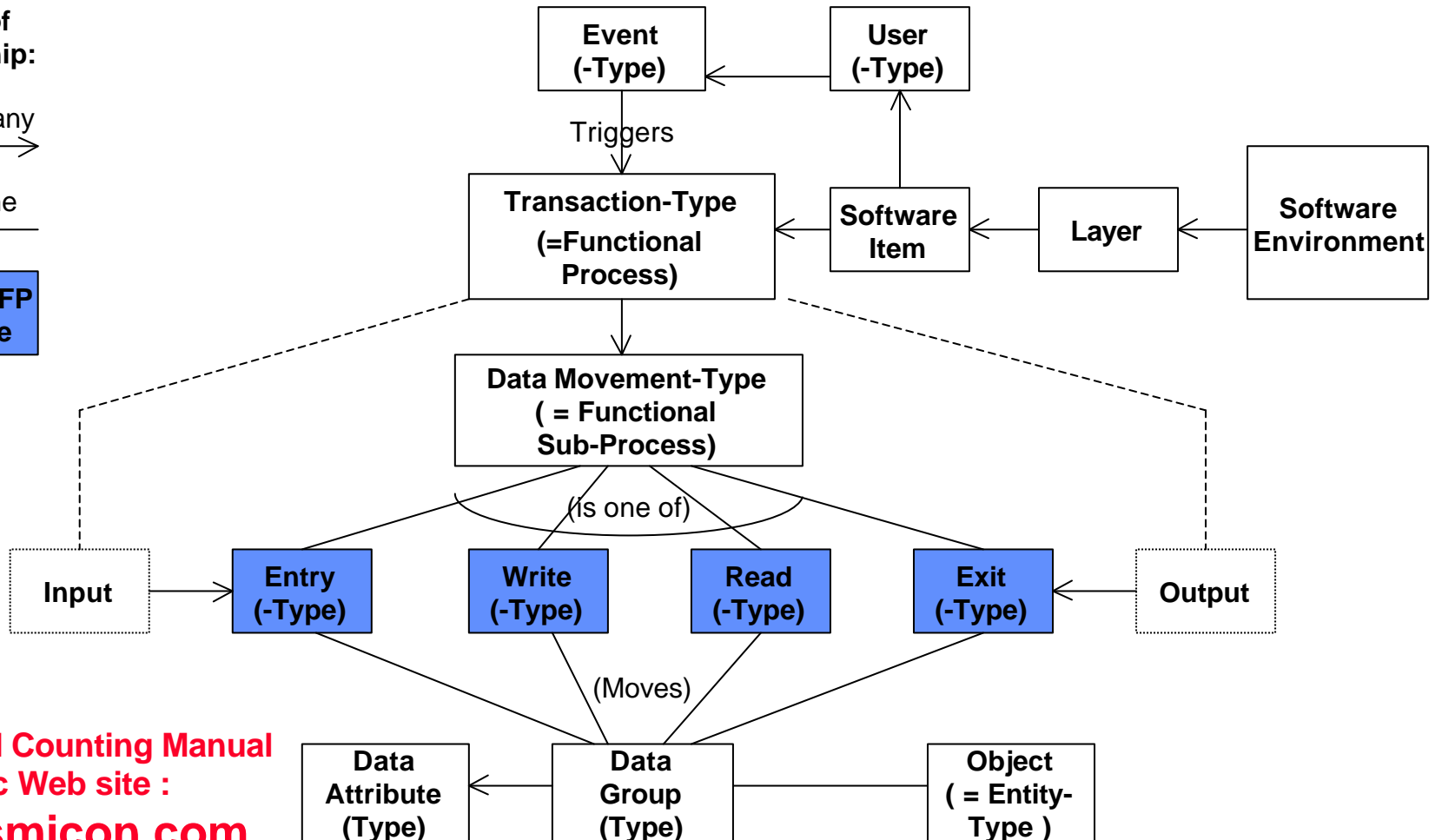
Summary: the COSMIC FFP Meta-model

Degree of Relationship:

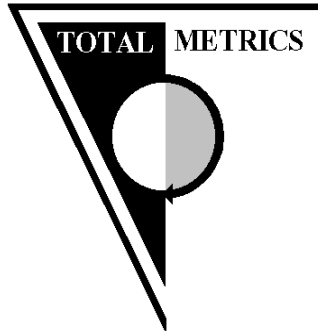
One-to-many


One-to-one


**COSMIC-FFP
 BFC-Type**



To download Counting Manual
 go to Cosmic Web site :
www.cosmicon.com



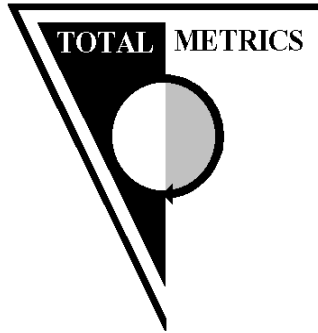
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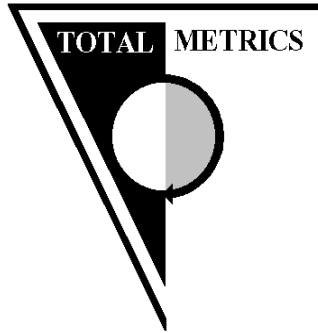




The Field Trial aim: to advance the Method's status from 'proposal' to 'proven'

- to test for a common, repeatable interpretation of the COSMIC Version 2 Measurement Manual under widely-varying conditions (organisations, domains, development methods, etc).
- to establish the detailed procedures, where necessary to ensure repeatable interpretation
- to test that the measures properly represent functionality and/or correlate with development effort
- to enable a full transfer of technology to the trial 'Partners'



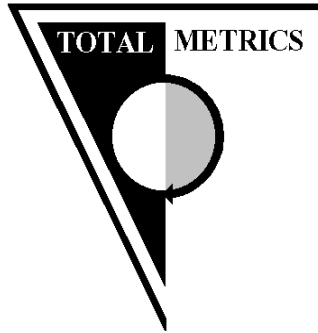


Specific and subsidiary aims

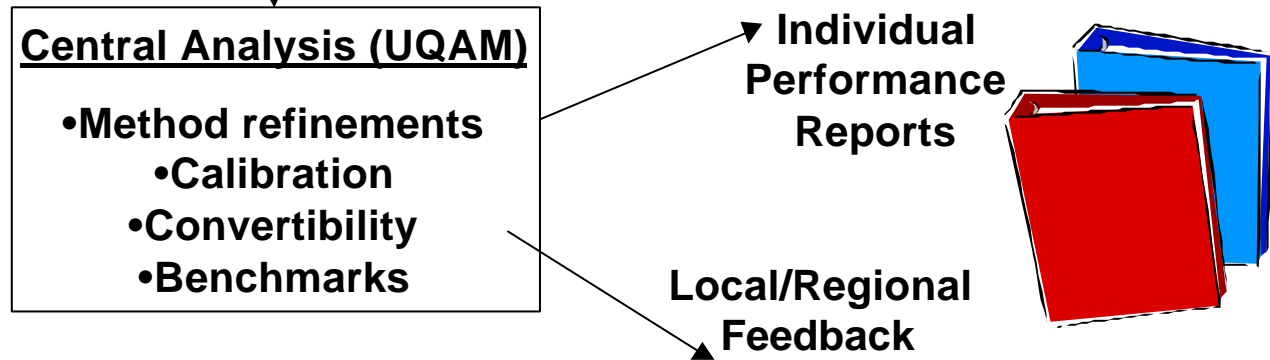
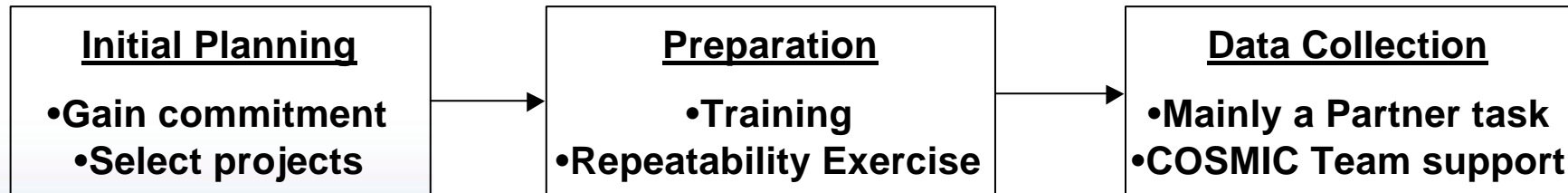


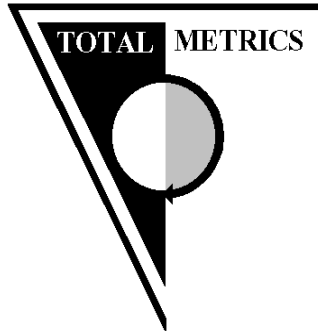
- to obtain data from up to 20 Partners, and/or for 50 - 100 software development projects
- to complete the trials by mid-2000 and to publish the 'field trials proven' version of COSMIC FFP, incorporating any refinements resulting from the trials
- to establish initial benchmarks for the method
- to size the same software by conventional FP methods, to examine convertibility
- to establish approximation rules for the full COSMIC FFP method, for use in sizing software early in its life





The Field Trials process





COSMIC FFP V2 Field Trials Organisations Participating (as at April 2000)

Started via Graduate students

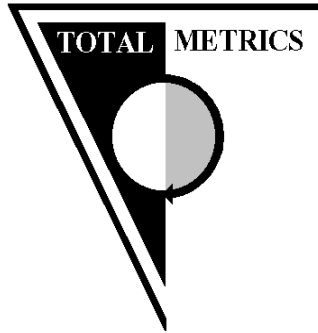
- Hydro Quebec (Canada, power utility, process control)
- Büren & Partner Software Design (German telecoms software)



Started or starting soon

- European Aerospace Co. and maybe a Nth American (avionics software)
- UK Bank (MIS systems)
- Two European telecommunications manufacturers
- European Telecommunications Operator
- Canadian software house
- Two Australian organisations(?)





The COSMIC FFP method seems to be equally applicable to real-time software as to MIS software

- **IFPUG: classifying Elementary Processes as External Inputs, Outputs or Inquiries is OK in the MIS world, but often difficult for real-time software; the weights do not seem appropriate**
- **COSMIC FFP: the Measurement Model of Functional Processes decomposed into Data Movements (Sub-processes), seems equally easy to apply to MIS and real-time software**
- **Productivity measures indicate higher unit costs for real-time and telecommunications software than for MIS**





Bühren & Partner has developed a simple estimating formula based on COSMIC FFP

COSMIC FFP productivity measures fit a COCOMO-like formula:

$$\text{CFFP Productivity} = a + b * (\text{Size})^n$$

Estimation Method	Traditional / Expert	CFFP Prod. Function	Artemis KnowledgePlan
Absolute deviation range	-50% to +50%	-30% to +33%	-20% to +46%
Mean deviation	-14%	-2.3%	+1.2%
Standard deviation	34%	17%	26%

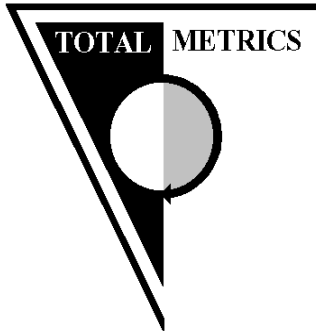
Notes:

Some project data used to calibrate productivity formula, which was then used to predict effort for other projects

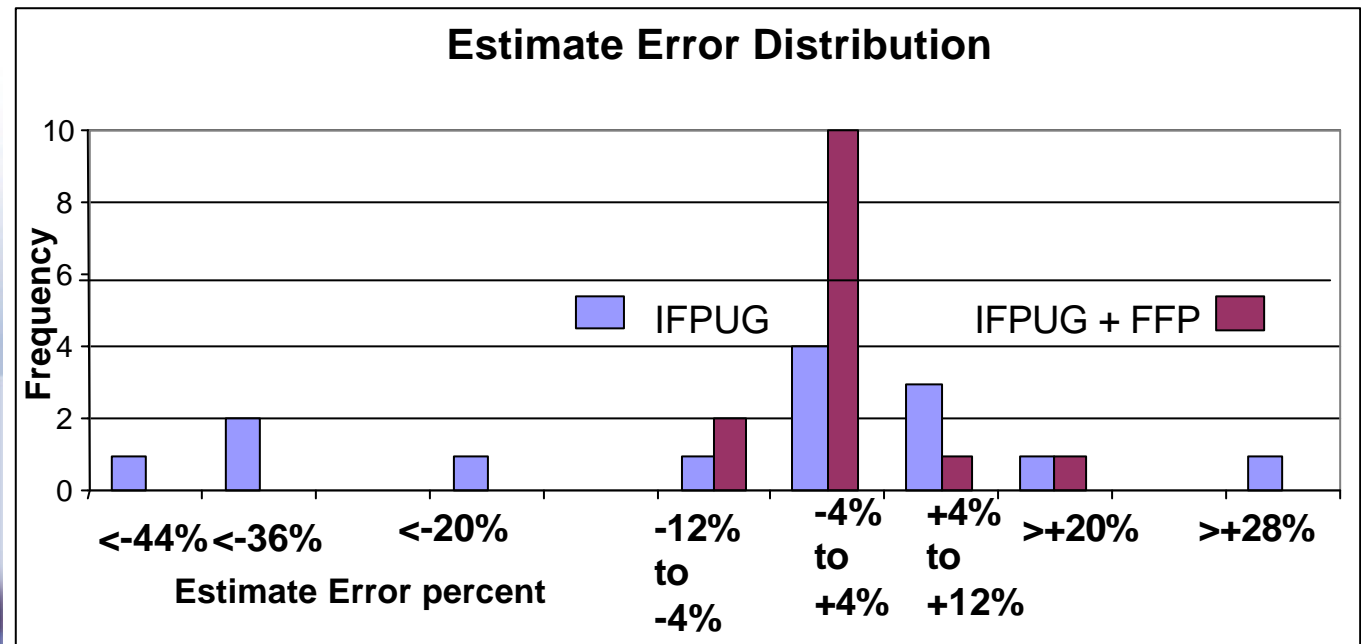
KnowledgePlan has not been set up for CFFP measurements and its performance can be improved by better calibration

Bühren will continue to use CFFP for productivity measurement and to improve its estimating (DSMA Fall 99 Conference)

Version 2 April © COSMIC 2000



Bootsma's IFPUG + FFP estimating model's accuracy is impressive

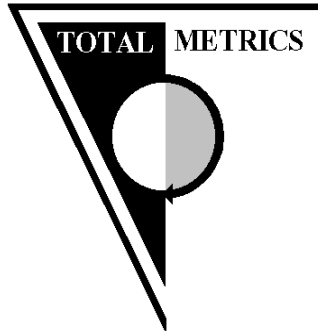


Standard deviations of Estimate Errors:

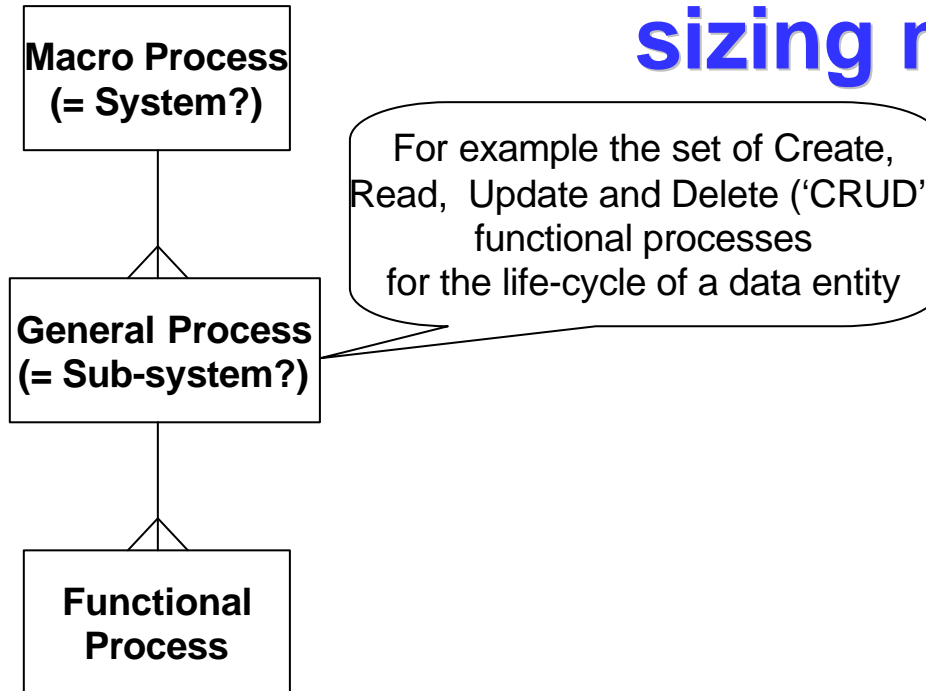
Only IFPUG = Std Dev of 22%

IFPUG + FFP = Std Dev of 7%





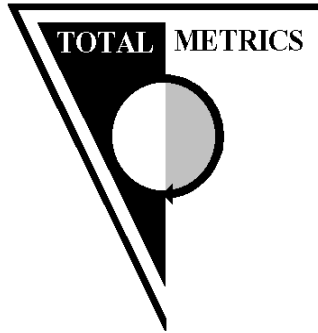
Proposals have been made for an approximate early CFFP sizing method



- Early life-cycle estimating is of great economic importance
- Research has started on how to define unambiguously and to size higher-level groups of processes for early estimating

R Meli, A Abran, Vinh Ho, Serge Oligny - in preparation





The initial, general feedback is very positive

- *'Easy to measure without being a measurement expert'*
- *'The functional sizes measured with COSMIC FFP for each of three parts (of a system) aligned with the perceived distribution of functional size'*

(ESI Software Inc., Canada)

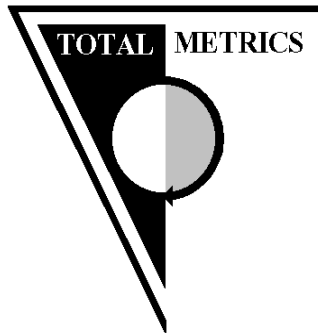
- *'Project Teams were able to grasp the elements of the method easily and were enthusiastic about the method'*
- *'Documentation and effort needed is similar to that for applying the IFPUG method, though there is an extra step to identify layers'*

(UK Bank)

- *'Results (are) so promising, I am sure we will continue the measurements...'*

(European participant)

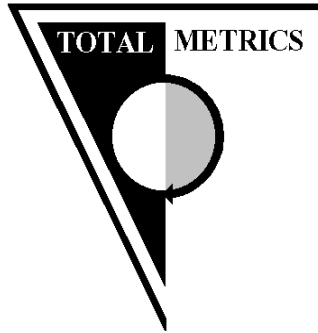




Research activities around COSMIC FFP

- Inter-measurer consistency study (Patrice Nolin, UQAM with Hydro Quebec);
- Conversion from FFP V1, MkII and IFPUG (Vinh Ho, UQAM)
- Early COSMIC-FFP (Chapter 7) - UQAM & R. Meli (Italy)
- Correlation of expert view of functionality with COSMIC FFP size, using AHP (Gerhard Wittig & Eberhard Rudolph, Australia)
- Procedure for UML-based specifications (Valerie Bevo, UQAM)
- Automatic measurement from source code (Vinh Ho, UQAM)
- Size contribution of Technical and Quality requirements (Chris Lokan, Australian Defence Academy & UQAM)
- Other aspects of size - algorithmic complexity Kececi (USNRC), Bootsma, (Nortel) planning to study
- Supporting requirements identification with CBR approach (Jean-Marc Desharnais, UQAM)

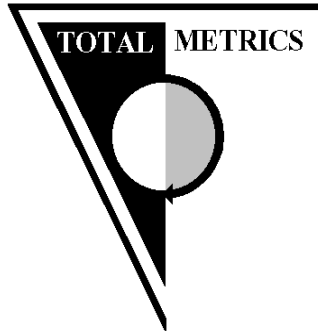




COSMIC FFP Tools, ISBSG benchmarks

- **Hierarchy Master - FFP v. 1 fully supported, V. 2 in development (Jin Ng, Australia)**
- **Sphera (Italy) - measurement support and estimating tool for V. 2 in development (Roberto Meli, Summer 2000)**
- **Commitment to deliver Field Trial results to ISBSG (and to trial participants)**

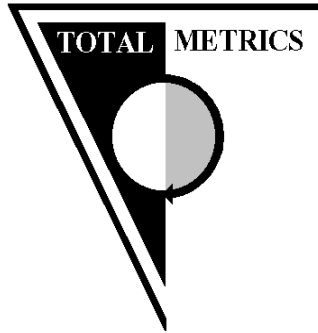




There is strong international interest

- The COSMIC Measurement Manual has been translated into French, Italian, **Japanese**, Spanish. German to come
- The Measurement Manual has been downloaded from over 30 countries
- We continue to present talks about COSMIC FFP at international conferences, e.g.
 - ESCOM April
 - ESEPG Amsterdam, June
 - IWSS 2000, Berlin, October
 - FESMA Madrid, October
 - Australia, Japan and North America
- The French Association pour *l'Etude de Métriques en Informatique* is setting up a Study Group on COSMIC FFP

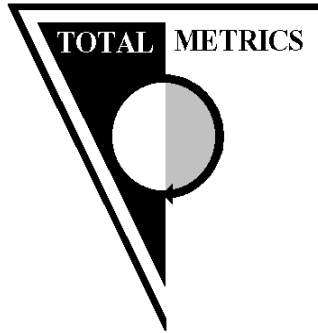




And planning further ahead.....

A proposal has been submitted by the Canadian National Body to ISO/IEC/JTC1 SC7 (Software Engineering) for a New Work Item to start putting the COSMIC FFP method through the ISO standardisation process working within the framework of ISO 14143





Conclusion - we're making great progress!

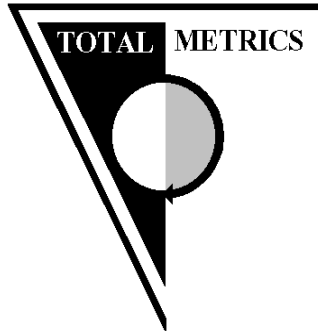


- The acceptance from those who have tried the method seems good in both MIS and real-time environments
- All the questions that have been raised have been solved , however we need
 - to do more work on defining layers
 - decide the final weightings
- Most organisations are taking longer to get started and to collect data than we had hoped, but we are getting there
- Our project has stimulated a great deal of research

The COSMIC Core team would like to thank the trial participants, the researchers, especially in UQAM, and others who have helped for their support and interest.

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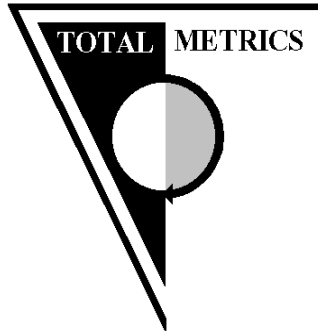




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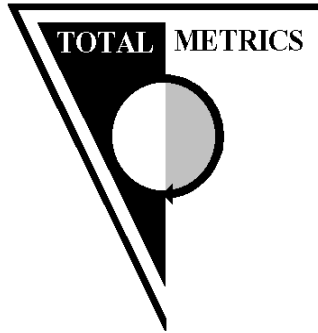
We need your help!



The COSMIC Team **is seeking JAPANESE software producers or users in the MIS and real-time domains who:**

- can appoint a software measurement expert to review the applicability of the COSMIC approach in their organisation
- can provide example software requirements and development effort data to help test and calibrate the COSMIC methods with support from a COSMIC Team member
- can contribute financially to the project costs



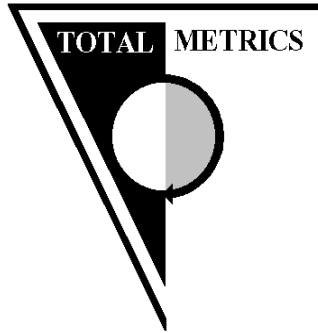


Participants in the COSMIC field-testing should gain significant benefits



- Early access to the new ideas and the opportunity to influence them
- Measurement of own pilot projects with the new method:
 - measurement data
 - confidential report of corporate measurements
 - mentoring during pilot projects & results analysis
- Pre-release technology transfer during pilot projects





Organisations wishing to participate in the field-testing phase should contact any COSMIC Core Team member



Principle contact addresses:

Web-site: www.cosmicon.com

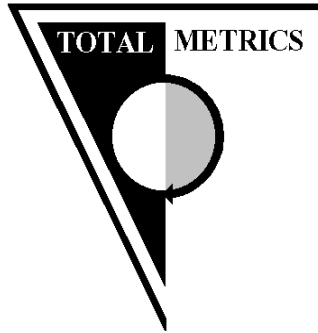
Alain Abran: abran.alain@uqam.ca

Charles Symons: charles_symons@compuserve.com

Pam Morris: Pam.Morris@Totalmetrics.com

Further details: www.lrgl.uqam.ca





Thank You for Listening



For more information please email :
pam.morris@totalmetrics.com

