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How Functional Size Measurement supports the Balanced Scorecard framework for ICT

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Agenda

- Introduction
- Balanced Scorecard (BSC) framework
- Functional Size Measurement (FSM)
  - Evolution of FSM
  - FSM and Technical Size Measurement (TSM)
- Joining FSM and BSC
- Concluding Remarks

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Introduction

Performance Measurement Models (PM):

such as the Balanced Scorecard (BSC) are well evaluated by Top Management, also in tailoring versions for software (the so-called “ICT BSCs”)

Missing elements: the I (indicator) element from the so-called GDI triad (Goal-Driver-Indicator)

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Introduction

Possible path to follow: it is currently hard to operationalize Software Intensive Organisations (*SIOs*) with measures, and a choice of measures has to be done. This has not been achieved well to date, and in such a multi-dimensional model as BSC.

Objective of the presentation: to show which measures can be recommended to SIOs wishing to implement an ICT BSC.

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BSc framework

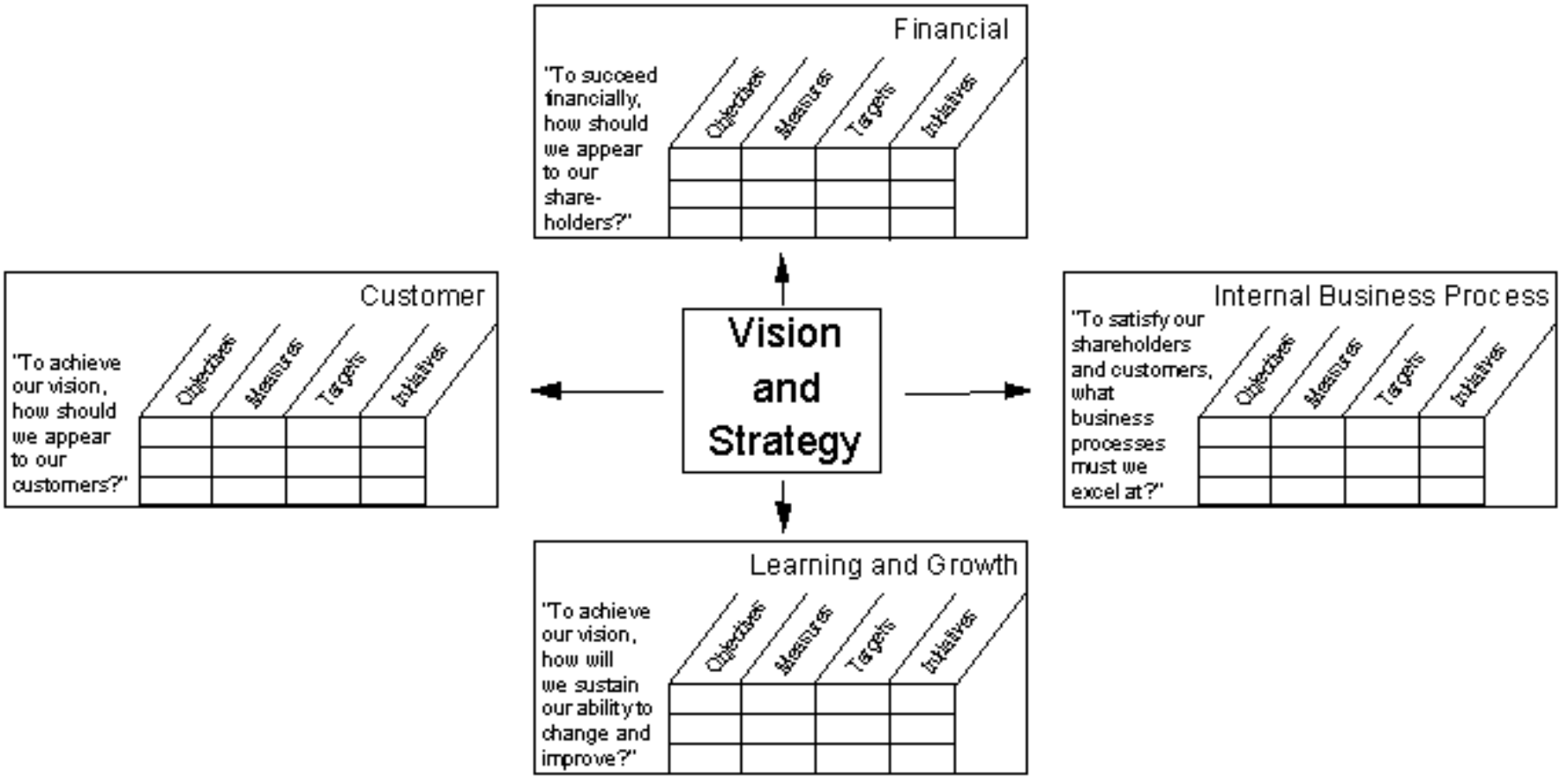
BSc is a multidimensional framework for "*translating (organisational) strategy into action*" at all levels of an enterprise, by linking objectives, initiatives and measures to an organisation's strategy

Authors: Kaplan & Norton (HBS) in the early '90s, originating from a French method called *Tableau du Bord* (turn of 20th century)

Main measurement object: whole organisation / a SBU

Application: BSc is one of the most relevant management practices of last 75 years, according Harvard Business Review Journal

BSc framework



BSc in the ICT field

Two interesting tailored versions of the BSc for the ICT field were developed in the last few years:

- Balanced IT Scorecard (**BITS**) by the European Software Institute (**ESI**)
- **AIS BSc** by the Advanced Information Services Inc. (**AIS**)

Commonalities: both frameworks support 5 perspectives, adding the “People/Employee” one

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ESI BITS

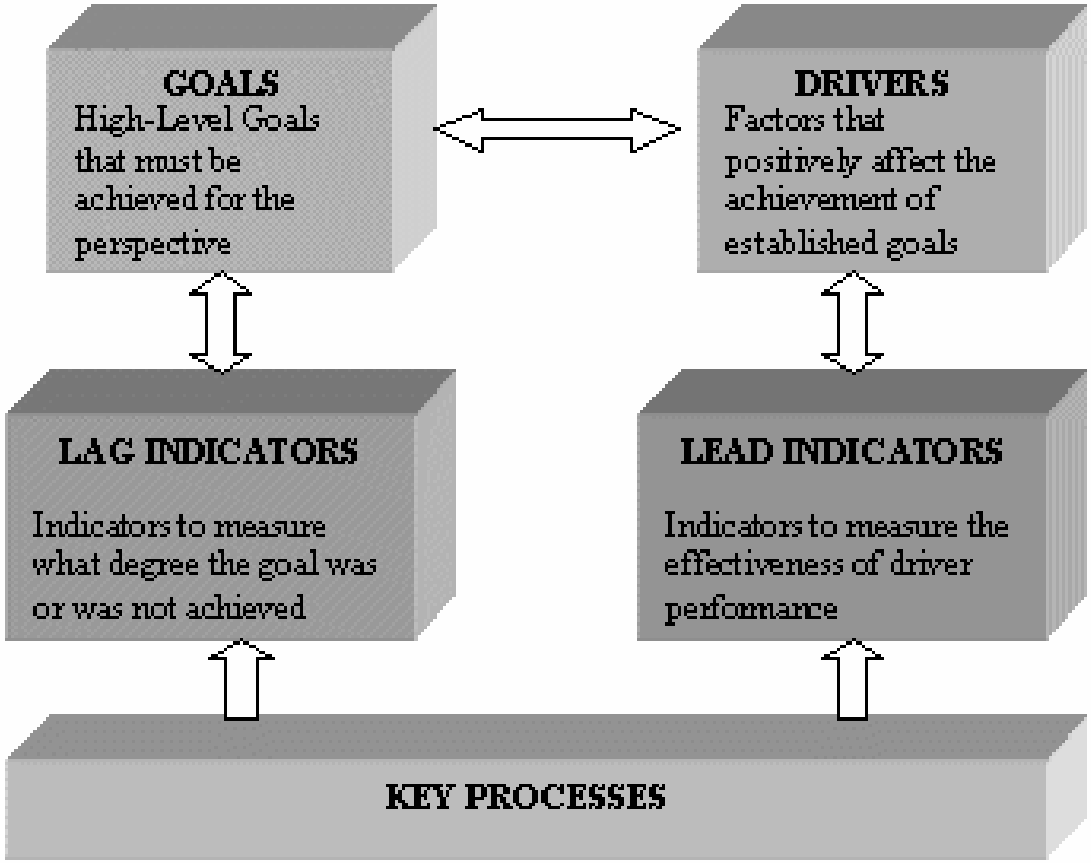
The perspectives, derived from the original framework and properly redesigned, are:

- **Financial**: *how do our software processes and SPI add value to the company?*
- **Customer**: *how do we know that our customer (int/ext) are delighted?*
- **People**: *is the people issues (competence, sarisfaction and retention) properly managed to implement a sustainable improvement program?*
- **Process**: *are our software development processes performing at levels sufficient enough to meet customer expectations?*
- **Infrastructure & Innovation**: *are the technology and organisational infrastructure issues being addressed to implement a sustainable improvement program?*

ESI BITS

The framework includes a set of goals, drivers, lead and lag indicators properly designed to cover a wide range of situations and organisation realities in the ICT field.

The figure shows the internal structure for each BITS perspective.



Source: ESI ©1999

ICT BSC: operational challenge

Main BSC elements: the so-called GDI elements. Actually GD are considered *structural elements* and a lot of attention has been paid to them, while few attention has been reserved to the *I* element, considered simply a *content element*.

Use of Measures in General Business Performance Analysis: measures need to be normalised based on the number of functional outputs of a production process (or of a business unit: i.e. how many hours by car, what is the asset cost by unit of production,...).

Why normalise?: it allows to use numbers for comparison purposes, that is they are necessary to produce reference numbers.

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ICT BSC: operational challenge

How can reference numbers can be derived in evaluating software processes? By figuring out how to measure the number of production units in software; since such a type of measure already exist in software, that is the Functional Size Measure (FSM), they are the type of measure to be used in ICT BSC since they measure the appropriate concepts and have the appropriate properties.

Solution Proposed: to use Functional Size Measures (FSM) such as Function Points (FPs) and the others techniques examined in the upcoming ISO/IEC 14143-x standard as the base for ICT BSCs.

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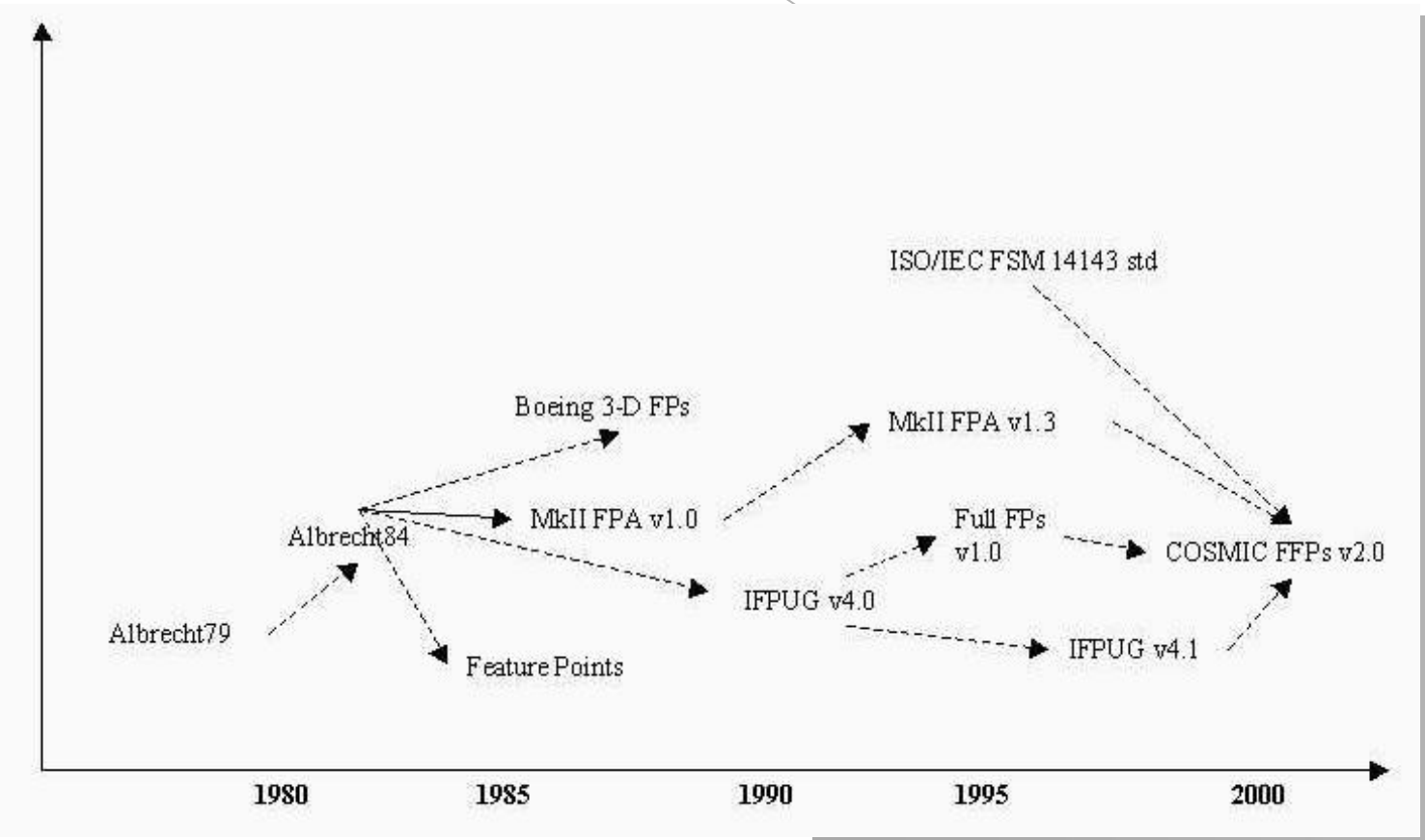
Functional Size Measurement

Evolution of FSM methods:



ISO/IEC 14143: is the 5-part upcoming standard for FSM

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FSM and Technical Size Measurement (TSM)

The Software Measurement arena includes two kinds of supporters:

- *Functional Size Measurement* (**FSM**) methods, such as FPA
- *Technical Size Measurement* (**TSM**) methods, such as LOCs, # of programs, modules, reports, screens, widgets...

Basic Difference: the perspective FSM and TSM face off in measuring software.

- FSM attains to the “logical size” of a software (the *what*)
- TSM attains to the “technical size” of the software (the *how*)

FSM and Technical Size Measurement (TSM)

Question:

a contract for a software service can focus on software size from a

- logical viewpoint (FSM) -> *the producer will release the minimum amount of software technical items at the expected quality level*
- technical viewpoint (TSM) -> *the producer will release an unjustified increase of those measures, the functionalities required being equal. This will generate un-maintainable, incomprehensible, inefficient systems and the paradox that the customer could pay more for suppliers who are less efficient than others (for example, implementing the same functionality using more code).*

Which viewpoint is preferreable?

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FSM and Technical Size Measurement (TSM)

And in the ICT BSC?:
A BSC strategy should usually use more FSM than TSM!

But...
TSM could be useful in the case of a strongly reuse-oriented environment.
Two possible viewpoints:

- Functional Reuse: *reuse of user of user recognisable and existing logical data structures and functionalities to build up new logical features*
- Technical Reuse: *reuse of existing physical data structures and software items (modules, objects, programs etc.) in order to build up new technical items to be used in the construction of new logical features*

FSM and Technical Size Measurement (TSM)

So...

Functional and Technical Reuse can be combined in several ways.

Best Savings: measuring both reuse type levels in the project in order to build the proper reuse strategy

ICT BSC perspectives “touched” by reuse:

- Process (Pr) -> *with reference to the “Application Dev. And Maintenance” Goal, “Reuse” Driver*

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How FSM can strengthen ICT BSCs

4 main points can be stressed in supporting the title of this slide:

❶ a measurement plan is more than a plan of measure

❷ measurement plans: strengths and weaknesses

❸ how to use FSM-based measures into organisations

❹ FSM-based measures fit into the ICT BSC measurement framework

In particular, points No. 3 and 4 must be detailed...

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❸ How use FSM-based measures into organisations

• **Extension of FPA usage**: from the '80s FPA has been used more and more not only for sizing software, but also for other usages, from Benchmarking to BPR

• **IFPUG Studies**: in previous works IFPUG started to split a series of FP-based ratios by intended Audience and Usage areas

• **Mapping GQM vs IFPUG 1992 document on measurement**:

Element	Correspondent Section Title
G – Goal	Development / Maintenance
Q - Question	Scenario
M - Measure	Measures

• **weaknesses**: IFPUG missed the "strategy" issue (***a BSC is more than GQM!***). In such a case, they would not have been a properly "value chain" from the Project up to the Corporate level

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❹ FSM-based measures fit into the ICT BSC

CONVERGENCE POINTS	COMMENTS
Alignment with business objectives	*prioritisation of effort and resources*
Balanced Set of Measures	*provides a global and complete perspective*
Integration of Measurement into development and support processes	(*improved project and process control*

FSM-based measures and ICT BSC perspectives

	Goal/Objective	Driver	Indicator	Comments / Effects
Financial (F)				
❶ Financial (F)	Asset Management	Existing asset utilisation	• Total Assets (FPAV) / # employees ($)	
			• **FPAV – FP Asset Value**	
			• **PS – Portfolio Size**	
	Revenue & Profitability	Revenue Growth	• Revenues / FPAV (%)	
			• Revenues from new customers / Total Revenues (%)	• *New customers acquired using FSM as a contractual condition for measuring the project – Derived (Improve project governance)*
		Profitability	• Profits / FPAV (%)	
	Financial Management	Organisational Investments	• Investments in IT	
		Project Investments	**PCFP – Project Cost per FP – Function points**	
			• **ECFP – Enterprise Cost per FP**	
			• **AMCFP – Application Maintenance Cost per FP**	

FSM-based measures and ICT BSC perspectives

❷ Customer (C)

GOAL/OBJECTIVE	DRIVER\	INDICATOR\	COMMENTS / EFFECTS
CUSTOMER (C)			
Customer partnership and involvement	Collaboration	• % projects using integrated teams	
		• **SR – Stability Ratio**	
Customer satisfaction	SLA	• % SLA met	• *if the agreement uses FSM as a basis for the contract*
Business Process Support	Innovation usage	• % IT solutions supporting process improvement projects	• *project measurement using FSM*
	Requirements Management	• Requirement Turnover Index [MELI01] RTI = $[(\Sigma_j \text{ CRFS}_j)/ \text{ Final FS}_{\text{units}}] * 100$ • CRFS = Change Request Function Size units	• *Showing the level of turbulence in requisites during the development phase*
	Problem Management	• **DR – Defect Ratio**	
		• **AR – Application Reliability**	
Business Growth	Market Share	• % Market share	• *increasing % using FSM as an initial contract condition*

FSM-based measures and ICT BSC perspectives

❸ Process (Pr)

	Goal/Objective	Driver	Indicator	Comments / Effects
Process (Pr)				
	Application Development & Maintenance	Size	• **FS_{unit} – Functional Size unit,**	*According to the FSM method used, it can be expressed for instance by:* • ***FP –** Function Points* • ***C_{fsu}** - COSMIC functional size units –*
			• **PS – Portfolio Size**	
		Effort	• **WE – Work Effort**	
		Productivity	• **PDR – Project Delivery Rate**	
			• **EP – Enterprise Productivity**	
		Support	• **ASR – Application Support Rate**	
			• **DDR – Duration Delivery Rate**	
			• **AMPL – Application Maintenance Load per Person**	
		Defectability & Test	• **RCR – Repair Cost Ratio**	
			• **SR – Stability Ratio**	
			• **DR – Defect Ratio**	
			• **TPR – Testing Proficiency Ratio**	
			• **MTTR – Mean Time To Repair ratio**	
			• **AR – Application Reliability**	
			• **DER – Defect Detection Ratio**	
			• # defects / 100 **FS_{unit}** according to user acceptance	
		Reuse	• **FR – Functional Reuse %**	
			• **TR – Technical Reuse %**	

FSM-based measures and ICT BSC perspectives

❹ People (Pe)

	GOAL/OBJECTIVE	DRIVER	INDICATOR	COMMENTS / EFFECTS
PEOPLE (PE)				
	Core Competencies & Skills	Core Competencies & Skills	• Feedback from FSM-based courses (I&I)	
		Effects of Training	• **DER – Defect Detection Ratio**	

FSM-based measures and ICT BSC perspectives

❺ Innovation & Infrastructure (I&I)

	Goal/Objective	Driver	Indicator	Comments / Effects
Innovation & Infrastructure (I&I)				
	Workforce Improvements	Workforce Competency and development	• IT expended on Training / IT expenses (%)	• *Leverage on the increased forecasting ability of Project Managers (Process perspective) and on their increased satisfaction (People perspective)*
			• % of staff trained in relevant standards or new technologies	• *Training in functional measurement for planning and governance*
			• % employees skilled in advanced application measurement methods	
		Tools & Products	• Investment in new product support and training ($)	• *For FSM-based tools or for courses about FSM-based techniques*
	SPI Improvements	Methodology currency	• % projects measured using recognised methods	
		Support	• **PDR – Project Delivery Rate**	
			• **ASR – Application Support Rate**	
			• **DDR – Duration Delivery Rate**	
			• **AMPL – Application Maintenance Load per Person**	
			• **RCR – Repair Cost Ratio**	

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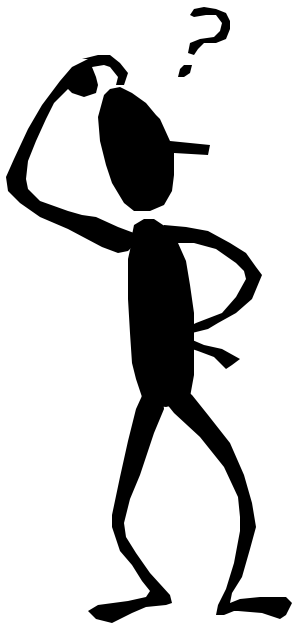
Concluding Remarks

- Functional measures are among the most important types in SwEng
- PM frameworks has paid strong attention only to the *GD* elements and not to the *I* one from the BSC GDI triad
- FSM-based measures (ISO/IEC 14143 std) can properly fit the multidimensional nature of an ICT BSC, providing ratios for all the ICT BSC perspectives, but pay carefull attention to the Reuse aspects also from the Technical Size Measurement (TSM) area
- Most impacted perspectives: Process (Pr) and Financial (F)
- Less impacted perspectives: Customer (C) and People (Pe)
- Linkages between perspectives: C <- Pr and Pe <-I&I
- Evolve the usage of FSM-based measures in ICT BSC for a more objective value in measuring software-related topics, if possible

Question Time



Thank you for your attention!

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