

UFSC – Lecture @ INE5427 course on
'Planejamento e Gestão de Projetos'
Florianopolis (Brazil), Sept. 16 2010

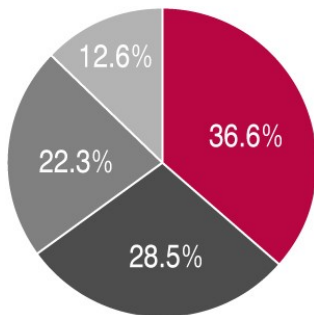
Project Management & Measurement



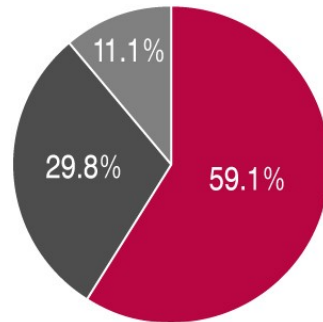
What Relationship?

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Industry Business Unit
Engineering.IT

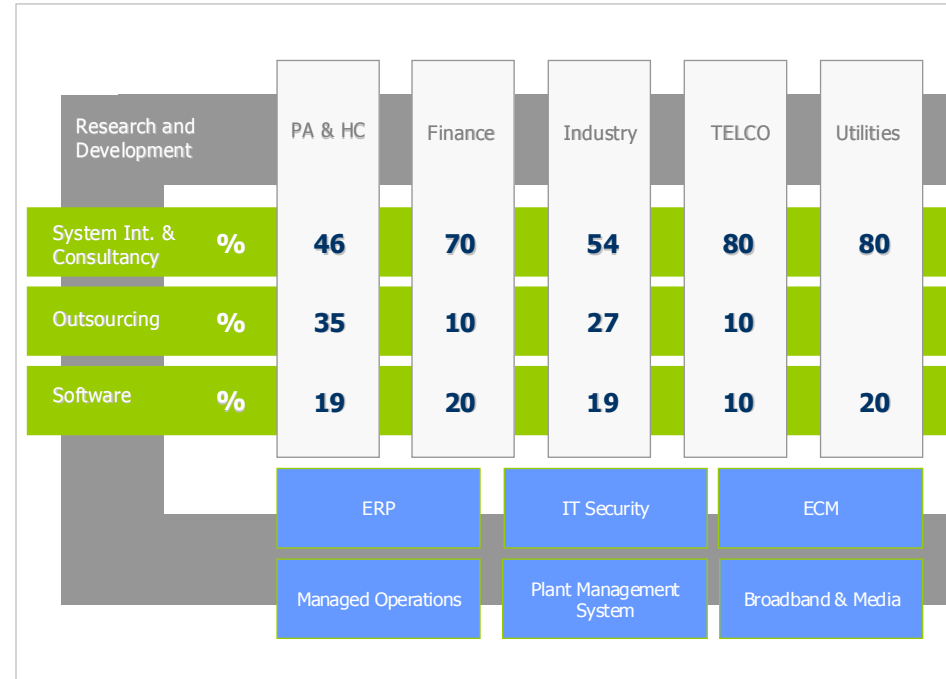
- The **first Italian ICT player**
- more than 730 M/€ revenues
- 1000 clients
- 6,300 IT specialists



- Public Administration
- Finance
- Industry
- Tlc



- System integration and consulting
- Outsourcing
- Software solutions



www.eng.it

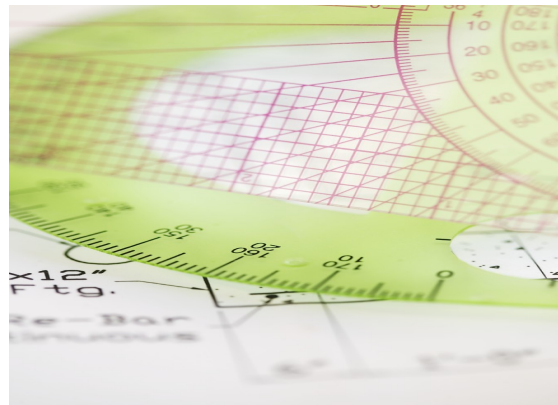


Misurare per Migliorarsi

www.eng.it



- ✓ **G1.** Discuss and provide evidence why Measurement is a distinct process than Project Management
- ✓ **G2.** Help project managers and estimators to obtain better estimates using their own historical data
- ✓ **G4.** Go into a deeper detail when gathering more granular data in your historical database, that help in consolidating CMMI ML2 goals and achieving faster ML3 ones with better PALs (Process Asset Libraries)
- ✓ **G5.** Stimulate improvements in your organization supporting more and more experience by quantitative data





• Introduction

- A bit of humour...
- IT project trends, Estimation Techniques

• Measurement Process

- **PM Frameworks:** PMBOK, Prince2, P3M3
- **SwEng:** CMMI-DEV v1.2, ISO/IEC 15504
- **Standards:** ISO 9001, ISO 20000-1:2005, ISO 15939

• Projects Repositories

- ISBSG r11
- Maturity Models and Historical Data

• An Improvement Proposal

- Effort profiles
- ...and your own effort profile?
- Q-RCA on main results

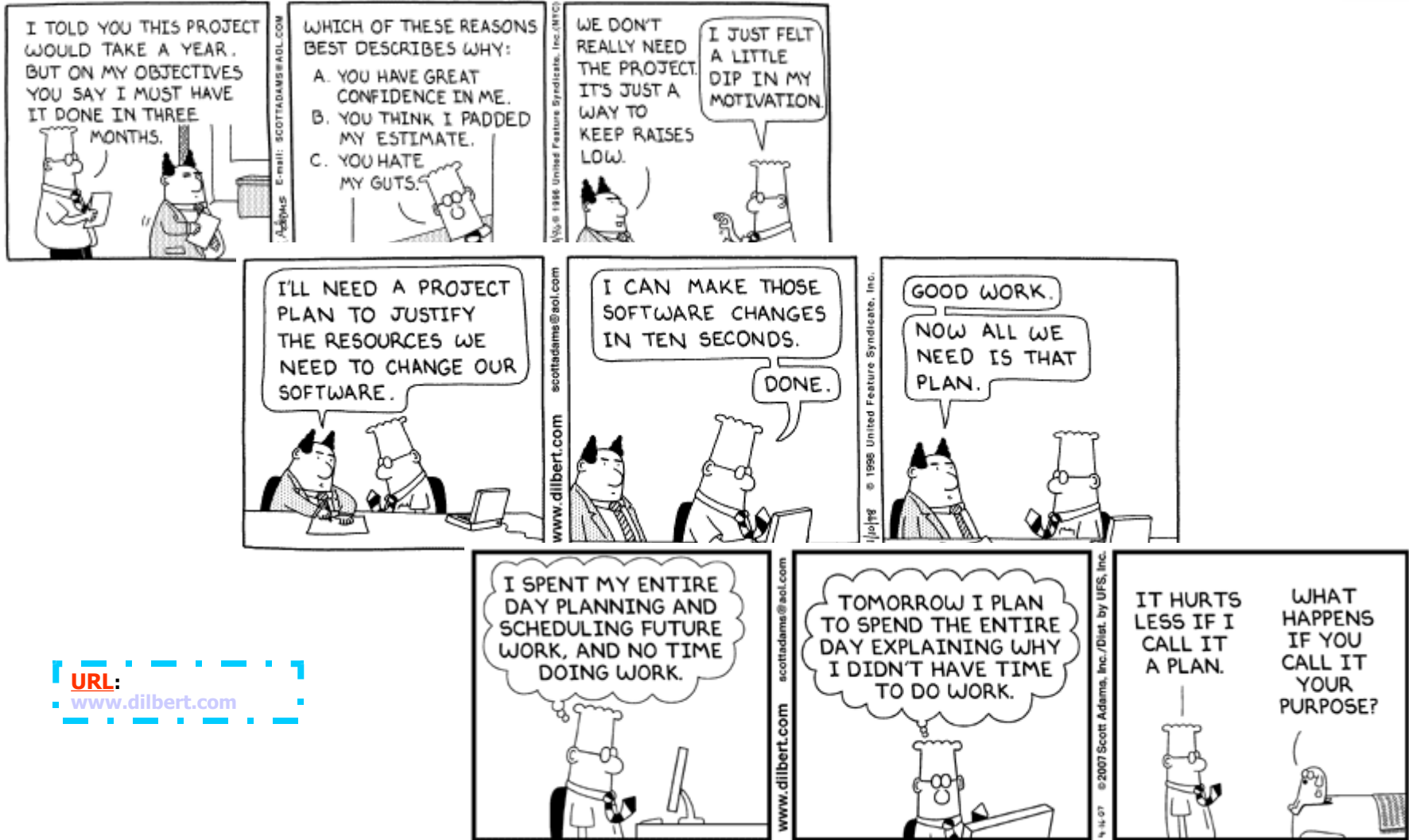
• Conclusions & Prospects

• Q & A



Introduction

A bit of humour...



URL:
www.dilbert.com

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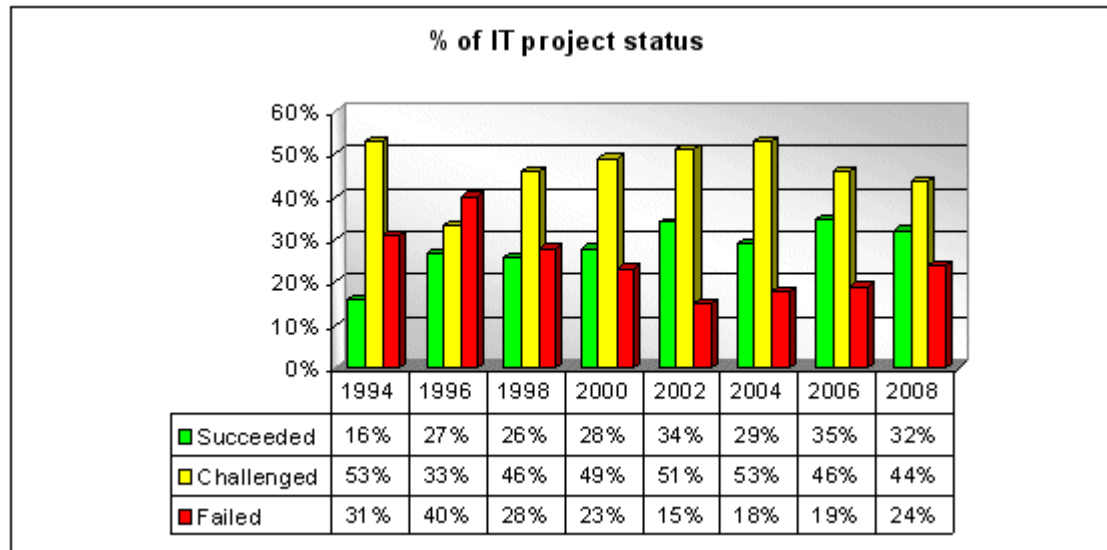
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URL: www.dilbert.com



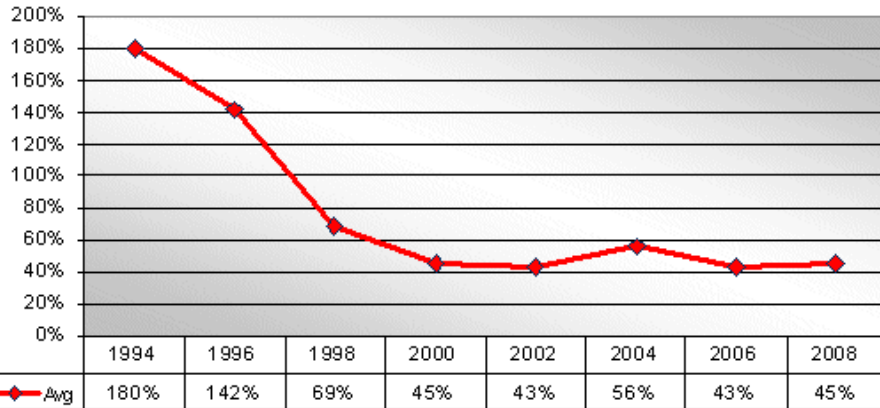


- Projects failure: three (3) major causes
 - ✓ Amount of Tracking & Control (**T&C**) resources
 - ✓ Lack of historical data
 - ✓ Limited ability of internal staff to estimate effort & costs
- Several studies confirmed these trends along ten (10) years
 - ✓ Chaos Report (Standish Group): figures from 1994 to 2008





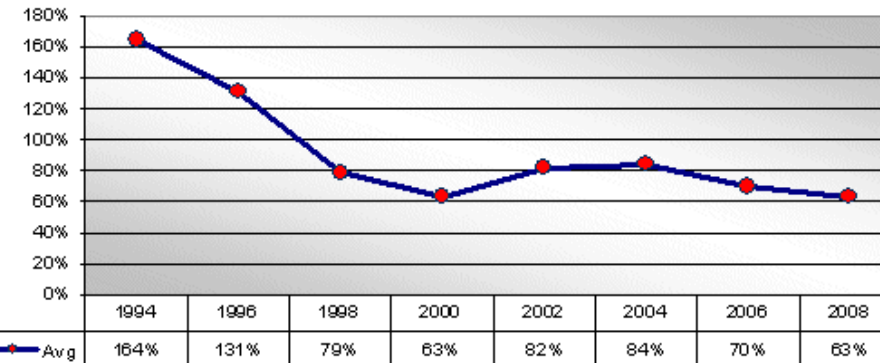
Avg % of Cost Overrun



Perspectives typically analyzed

- ✓ Time & Cost
- ✓ Typical PM approach
- ✓ Other viewpoints?
- ✓ Estimating (dis)ability: reskilling?

Avg % of Time Overrun



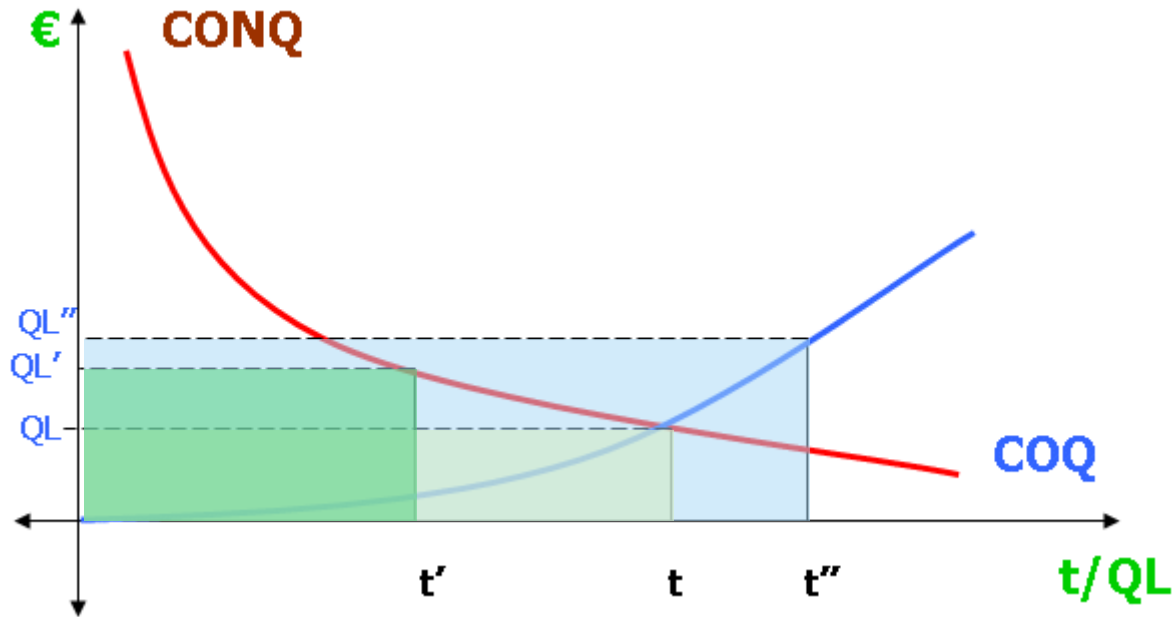
Q: so, which % of project budget for T&C process should be the proper one for improving results?





Introduction

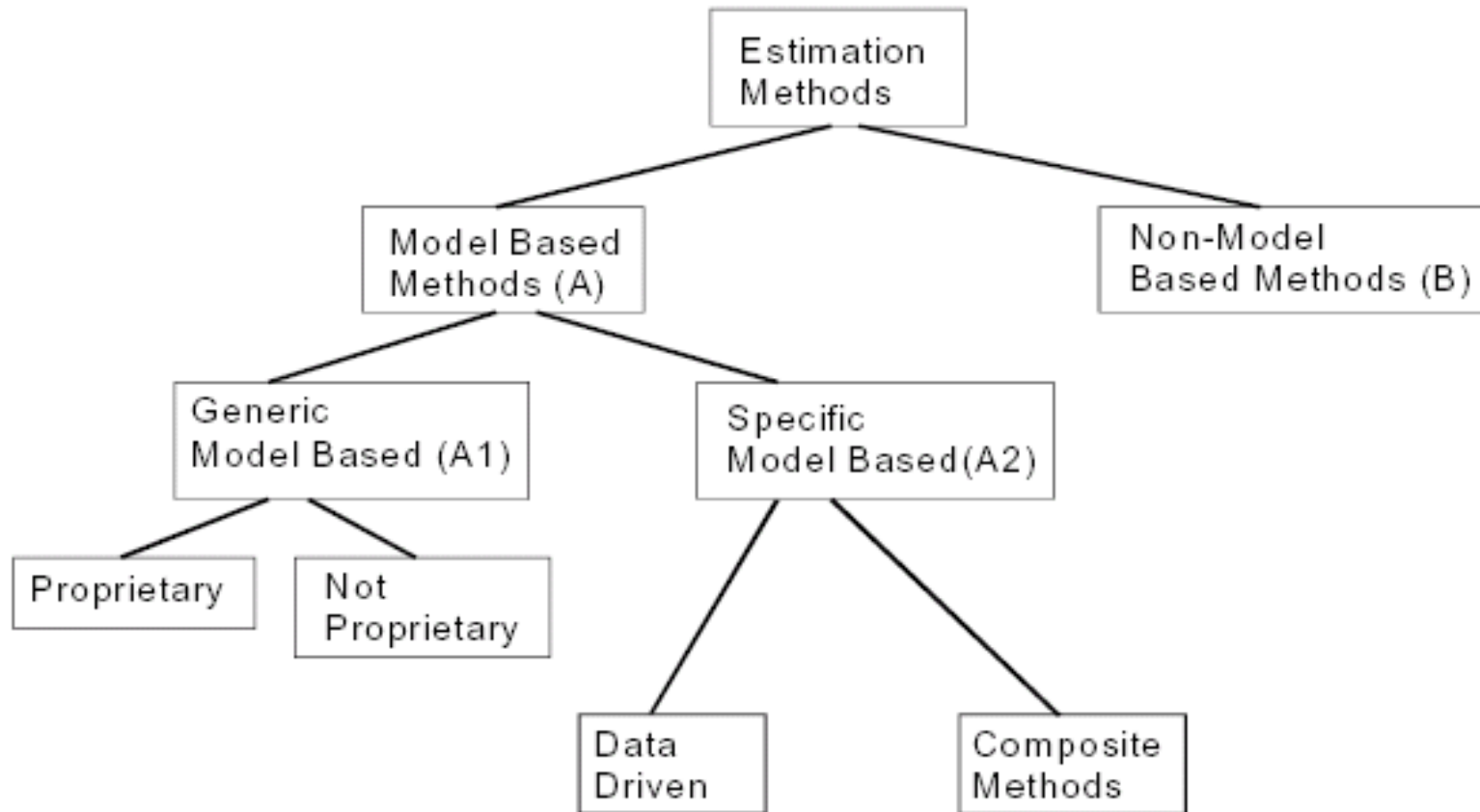
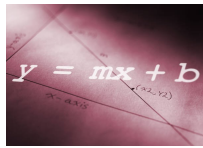
How to Control T&C Costs?



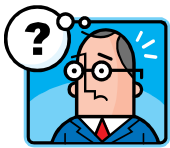
Legend:

- ✓ CONQ = Cost Of Non Quality
- ✓ COQ = Cost of Quality
- ✓ QL = Quality Level

- **Objectives:** determine the right Break-Even-Point (BEP) by:
 - ✓ **Improving Estimation abilities:**
 - ❖ Gathering & using historical data (e.g. CMMI PP, OPD), at least initially using external repositories for benchmarking purposes (e.g. ISBSG)
 - ❖ Do not using in a non-critical manner estimation models such as COCOMO or SLIM
 - ❖ Learn & apply Statistics (101-features!)
 - ✓ **Choosing & applying the proper number of measures for T&C process:**
 - ❖ How many measures we use? Are the right one? Are they properly linked through the *strategic map*? How much do they cost (% of project budget)?



Source: Briand L., Wiczorek I., Resource Estimation in Software Engineering, ISERN Technical Report 00-05, International Software Engineering Research Network, 2000, URL: <http://isern.iese.de/moodle/>



• RQ1

✓ Is Measurement a distinct process than Project Management?

• RQ2

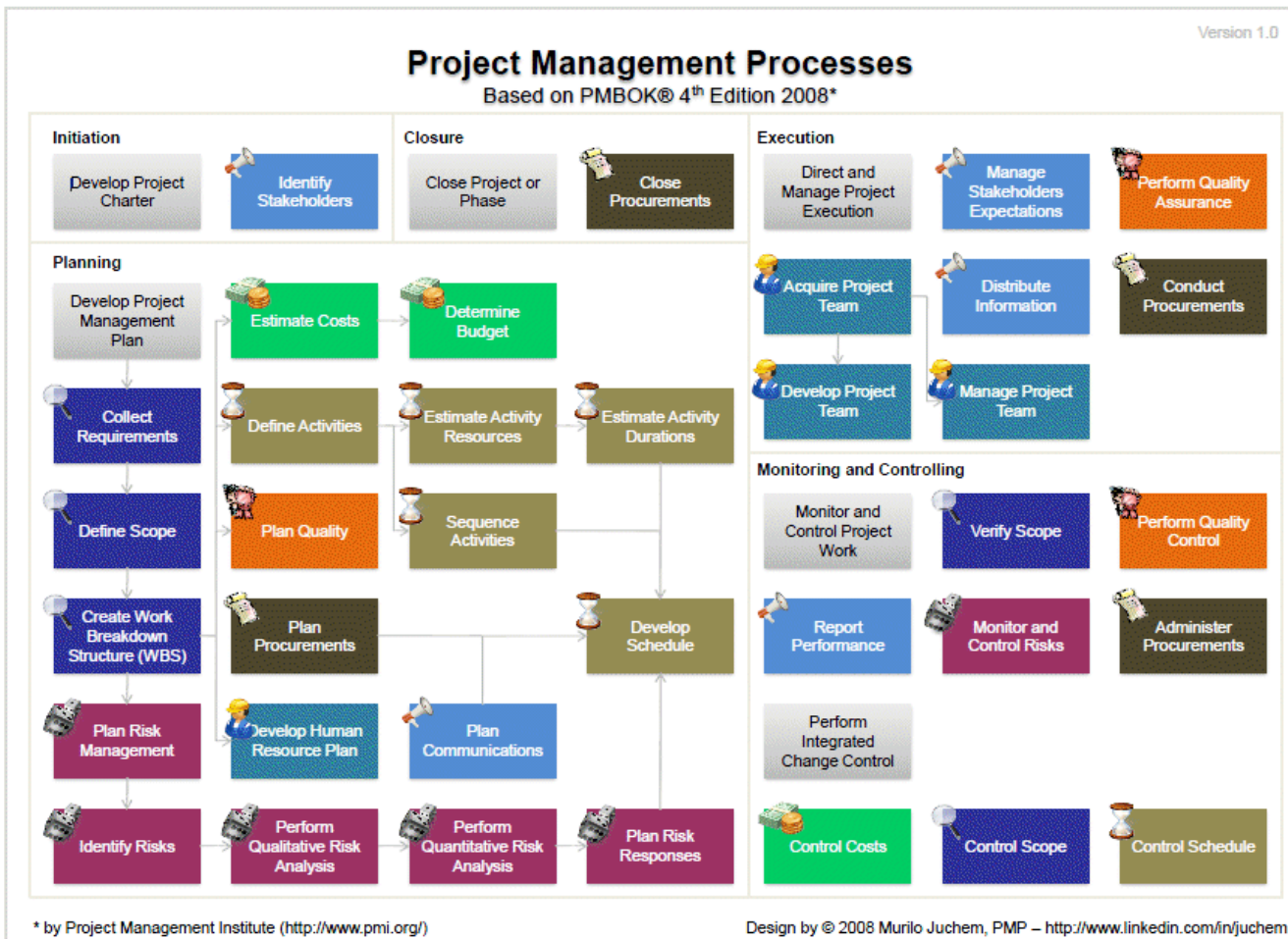
✓ If yes, how much does it cost?





- **Introduction**
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 - IT project trends, Estimation Techniques
- **Measurement Process**
 - **PM Frameworks:** PMBOK, Prince2, P3M3
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 - Effort profiles
 - ...and your own effort profile?
 - Q-RCA on main results
- **Conclusions & Prospects**
- **Q & A**

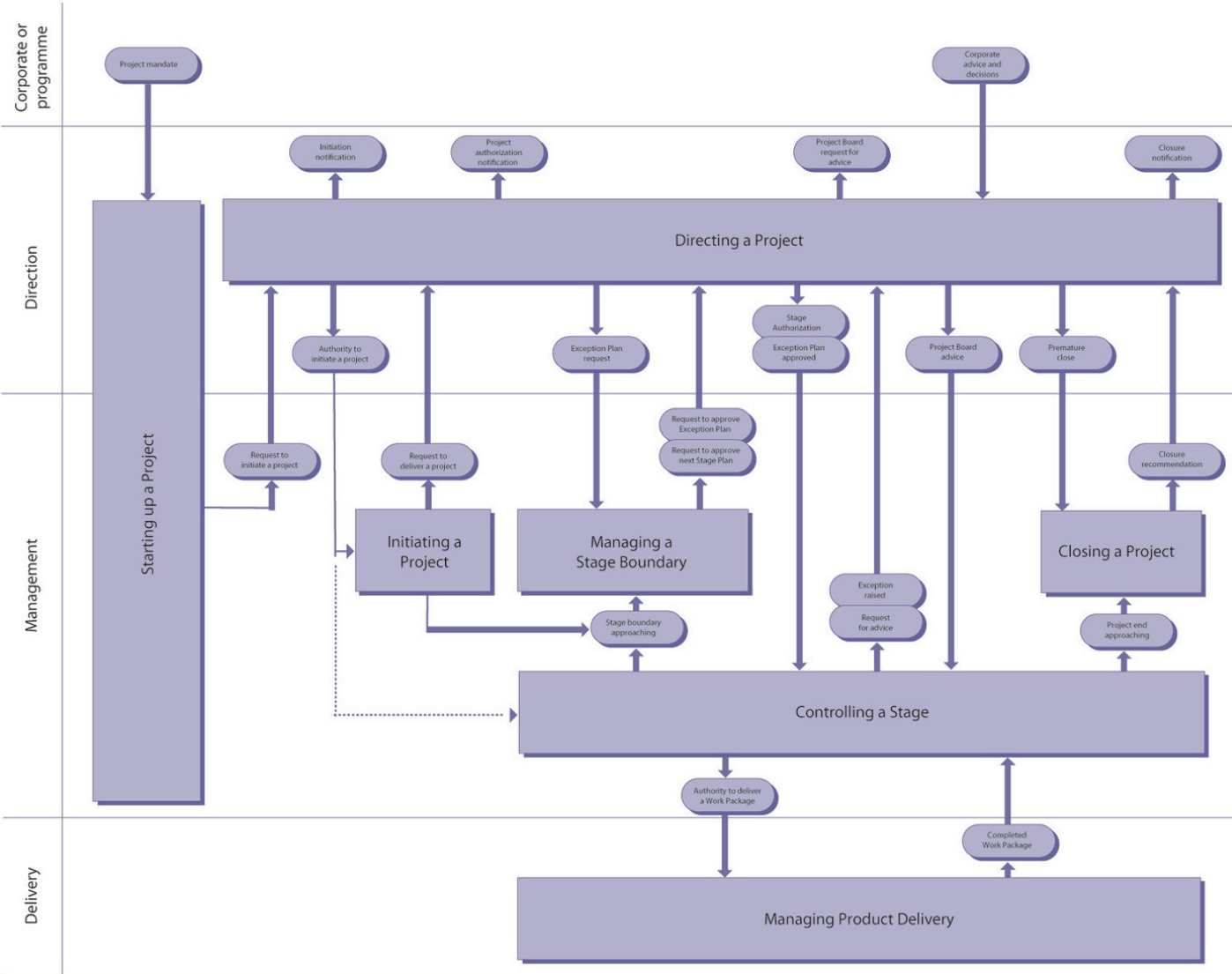




- **Evidences**
 - ✓ 5 process groups
 - ✓ No formal Measurement process
 - ✓ Chapters 6.3/6.4 are about 'duration' and not 'effort'

URL: www.pmi.org





- **Evidences**
 - ✓ 7 process groups - No specific measurement process
 - ✓ **PL** (Planning) contains an **Estimation** process
 - ✓ As in PMBOK, measurement activities split across several processes (e.g. in **IP1** - Planning Quality; **IP4** - Setting Up Project Controls)

URL: www.prince-officialsite.com

Level 1	
1.1	Project definition
1.2	Programme management awareness
Level 2	
2.1	Business case development
2.2	Programme organisation
2.3	Programme definition
2.4	Project establishment
2.5	Project planning, monitoring & control
2.6	Stakeholder management & communications
2.7	Requirements management
2.8	Risk management
2.9	Configuration management
2.10	Programme planning & control
2.11	Management of suppliers & external parties
Level 3	
3.1	Benefits management
3.2	Transition management
3.3	Information management
3.4	Organisational focus
3.5	Process definition
3.6	Training, skills & competency development
3.7	Integrated management & reporting
3.8	Lifecycle control
3.9	Inter-group co-ordination & networking
3.10	Quality assurance
3.11	Centre of Excellence (COE) role deployment
3.12	Organisation portfolio establishment
Level 4	
4.1	Management metrics
4.2	Quality management
4.3	Organisational cultural growth
4.4	Capacity management
Level 5	
5.1	Proactive problem management
5.2	Technology management
5.3	Continuous process improvement

Evidences

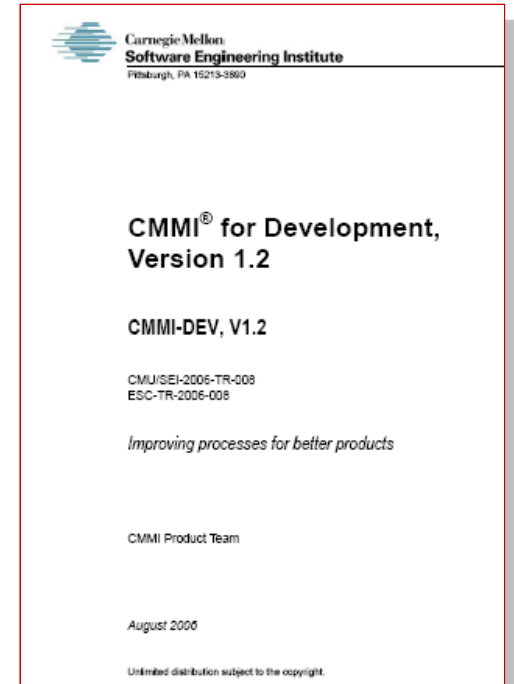
- ✓ Firstly released in 2006, current version is 2.1 (Feb 2010)
- ✓ 7 process groups - no formal Measurement Process
- ✓ Enhancement of the OGC's PMMM
- ✓ Self-assessment for determining the ML by questionnaire

Measurement is in...

- ✓ 2.5 Prj Planning, Monit. & Control
- ✓ 4.1 Management Metrics
- ✓ 4.2 Quality Management

URL: www.p3m3-officialsite.com

CL	Focus	ACR.	KPA
5	Continuous Process Improvement	OID	Organizational Innovation & Deployment
		CAR	Causal Analysis & Resolution
4	Quantitative Management	OPP	Organizational Process Performance
		QPM	Quantitative Project Management
3	Process Standardisation	RD	Requirements Development
		TS	Technical Solution
		PI	Product Integration
		VAL	Validation
		OPF	Organizational Process Focus
		OPD	Organizational Process Definition
		OT	Organizational Training
		IPM	Integrated Project Management
		RSKM	Risk Management
		DAR	Decision Analysis & Resolution
		VER	Verification
2	Basic Project Management	RM	Requirements Management
		PP	Project Planning
		PMC	Project Monitoring & Control
		SAM	Supplier Agreement Management
		MEA	Measurement & Analysis
		PPQA	Process and Product Quality Assurance
		CM	Configuration Management
1	Initial	-	-

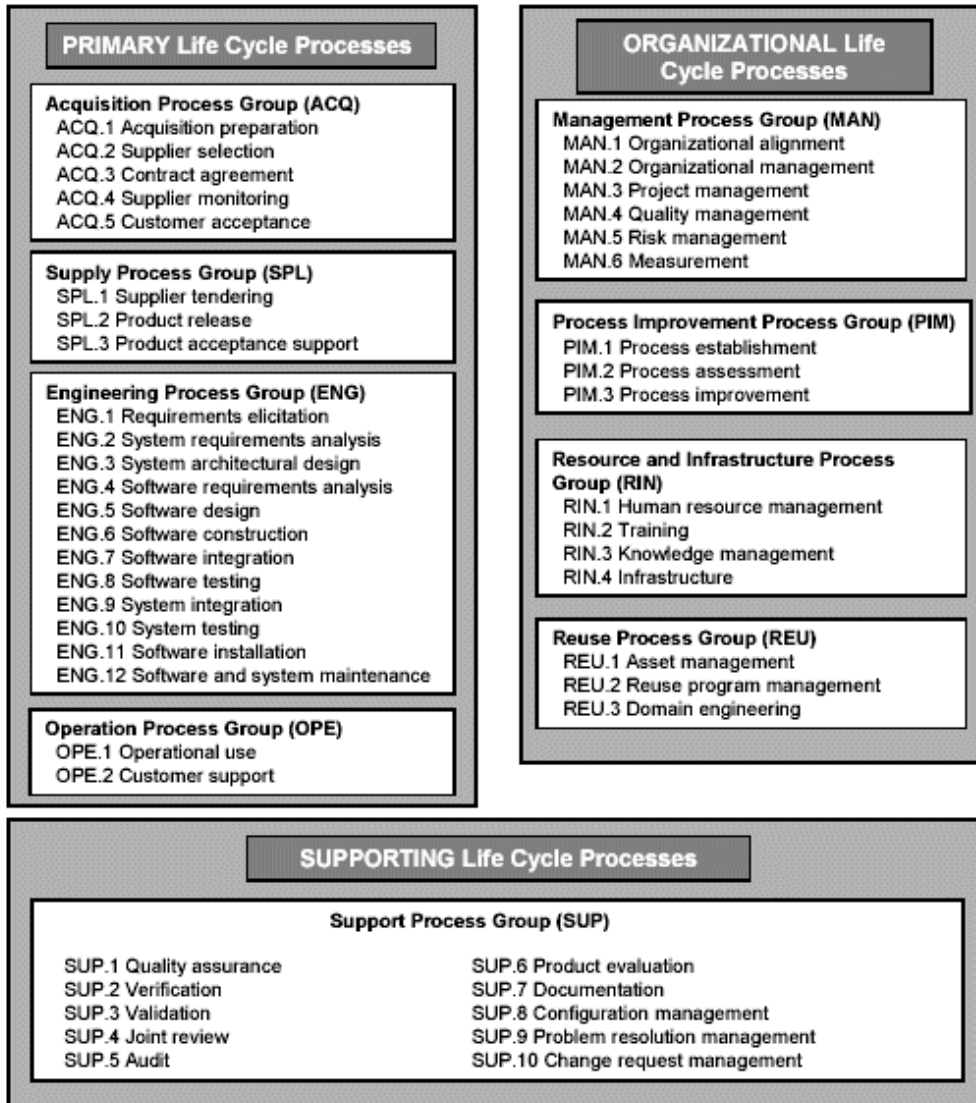


- **ML:** 5
- **PA:** 22
- **N.min PA :** ML1 (0)
- **N.max PA :** ML3 (13)

• **Measurement is in...**
 ✓ Measurement & Analysis (ME) → ML2

URL: www.sei.cmu.edu/cmmi





Evidences

- ✓ 3 main lifecycle process groups (primary, organizational, supporting)
- ✓ 9 process groups
 - Primary (ACQ, SPL, ENG, OPE)
 - Organizational (MAN, PIM, RIN, REU)
 - Supporting (SUP)
- ✓ 48 processes
 - Primary (22)
 - Organizational (16)
 - Supporting (10)

Measurement is in...

- ✓ MAN.6 – Measurement

URL: <http://www.spiceusergroup.org>



ISO 9001:2008(E)

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Measurement is in...

- ✓ Clause 8 (Measurement, Analysis and Improvement)





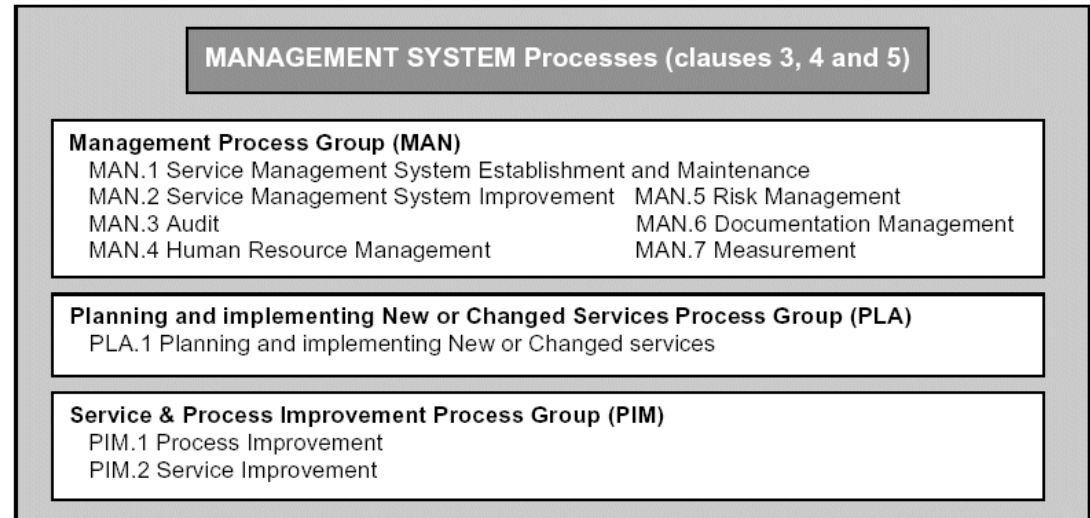
Processes Categories

✓ Management System (§3-5)

- MAN (7)
- PLA (1)
- PIM (2)

✓ Primary Process (§6-10)

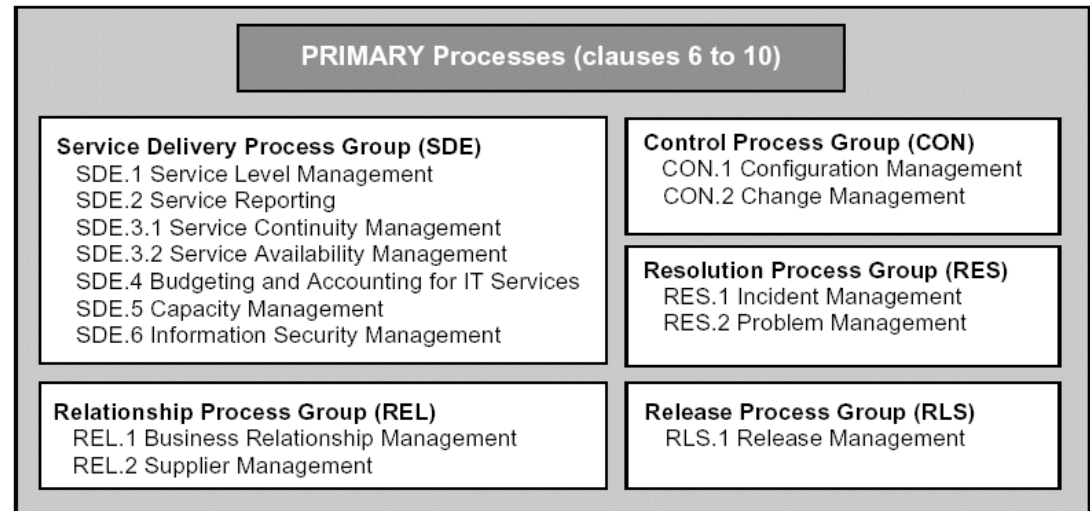
- SDE (6)
- CON (2)
- RES (2)
- REL (2)
- RLS (1)



Additional processes (app.C)

✓ Primary Process (§6-10)

- SDE.7 – Service Catalogue Management
- RES.3 – Customer Satisfaction
- REL.3 – Service Request Management
- REL.4 – Contracting
- REL.5 – Contract Management





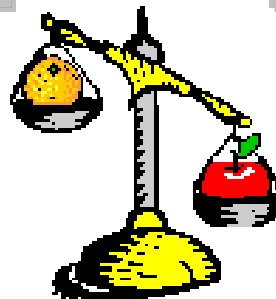
§ in ISO/ IEC 20000-4	§ Name	§ in ISO/ IEC 20000-1	§ Name
6.1.2	MAN.1 – Service Mgmt, Sys. Establishment & Maintenance	3.1 4	Management Responsibility Planning & Implementing Service Mgmt
6.1.3	MAN.2 – Service Mgmt Sys. Improvement	3.1 4	Management Responsibility Planning & Implementing Service Mgmt
6.1.4	MAN.3 – Audit (da: ISO/IEC 12207)	3.1 4.3	Management Responsibility Monitoring, Measuring & Reviewing (Check)
6.1.5	MAN.4 – HR Management	3.1 3.3 4	Management Responsibility Competence, Awareness & Training Planning & Implementing Service Mgmt
6.1.6	MAN.5 – Risk Mgmt	3.1	Management Responsibility
6.1.7	MAN.6 – Documentation Mgmt	3.2	Documentation Requirements
6.1.8	MAN.7 - Measurement	4.3	Monitoring, Measuring & Reviewing (Check)
6.2.2	PLA.1 – Planning & Implementing new/changed service	5	Planning & Implementing new/changed Service
6.3.2	PIM.1 – Process Improvement (da: ISO/IEC 12207)	4.4	Continual Improvement
6.3.3	PIM.2 – Service Improvement	4.4	Continual Improvement
6.4.2	SDE.1 – Service Level Management	6.1	Service Level Management
6.4.3	SDE.2 – Service Reporting	6.2	Service Reporting
6.4.4	SDE.3.1 – Service Continuity Mgmt	6.3	Service Continuing & Availability Mgmt
6.4.5	SDE.3.2 – Service Availability Mgmt	6.3	Service Continuing & Availability Mgmt
6.4.6	SDE.4 – Budgeting & Accountability for IT Serv.	6.4	Budgeting & Accountability for IT Services

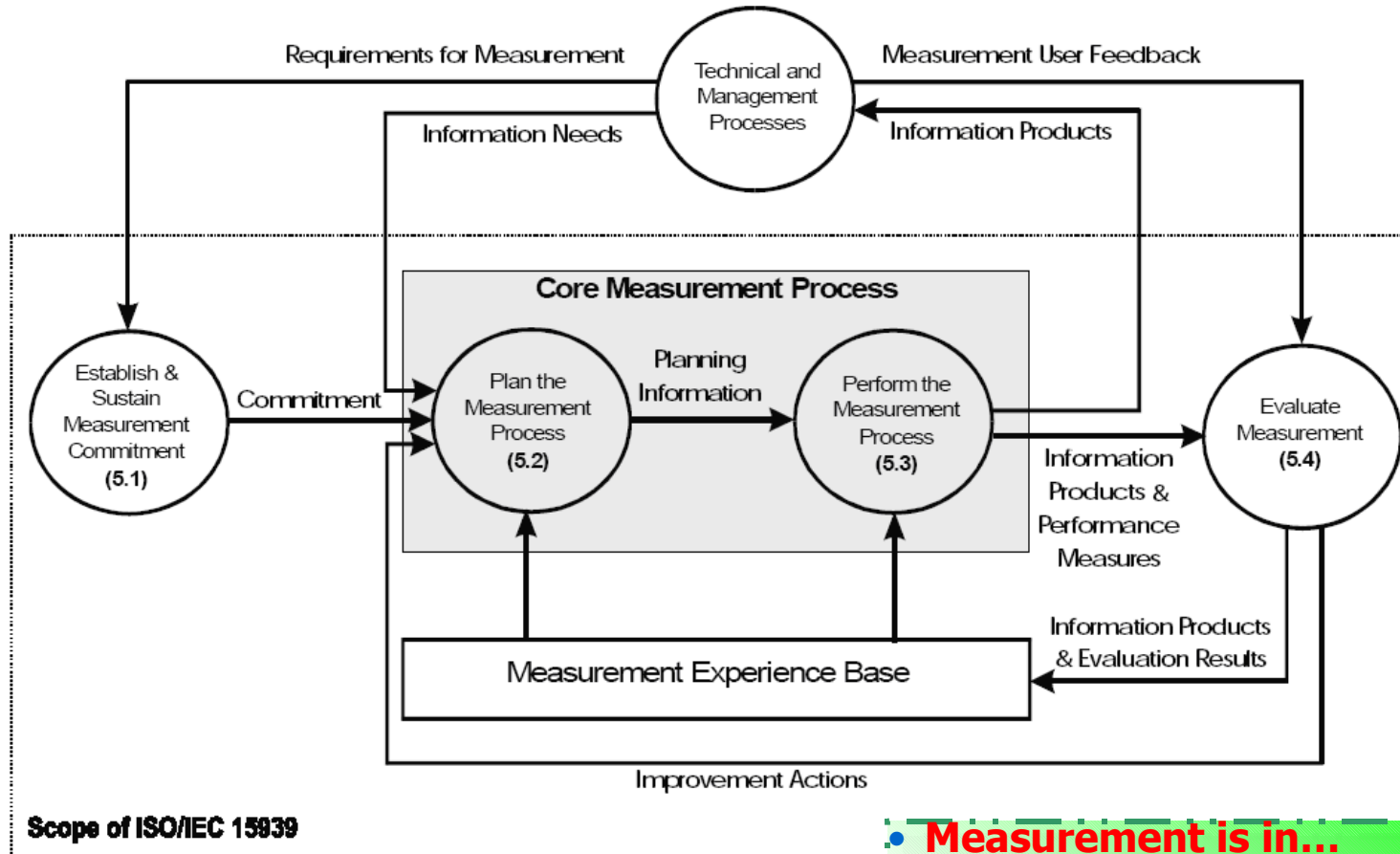


§ in ISO/ IEC 20000-4	§ Name	§ in ISO/ IEC 20000-1	§ Name
6.4.7	SDE.5 – Capacity Management	6.5	Capacity Management
6.4.8	SDE.6 – Information Security Management	6.6	Information Security Management
6.5.2	REL.1 – Business Relationship Management	7.2	Business Relationship Management
6.5.3	REL.2 – Supplier Management	7.3	Supplier Management
6.6.2	RES.1 – Incident Management	8.2	Incident Management
6.6.3	RES.2 – Problem Management	8.3	Problem Management
6.7.2	CON.1 – Configuration Management	9.1	Configuration Management
6.7.3	CON.2 – Change Management	9.2	Change Management
6.8.2	RLS.1 – Release Management	10.1	Release Management

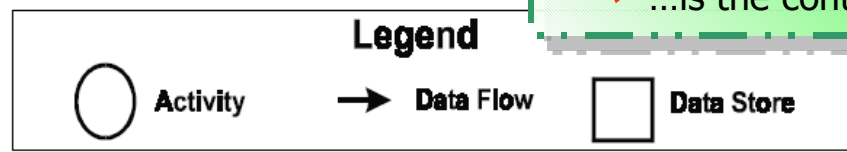
• **Measurement is in...**
 ✓ MAN.7 (Measurement)

• **Measurement is in...**
 ✓ Clause 4.3 (Monitoring, Measuring & Reviewing)





• **Measurement is in...**
 ✓ ...is the content of this standard



Measurement Process | Standards – IEEE SWEBOK (current)



The Software Engineering Body of Knowledge (SWEBOK) contains 10 Knowledge Areas (KA) easily mappable with ISO/IEC 12207:2008 processes.

KA01 - Requirements	KA02 - Design	KA03 - Construction	KA04 - Testing	KA05 - Maintenance
KA06 - Software Configuration Management				
KA07 - Software Engineering Management				
KA08 - Software Engineering Process				
KA09 - Software Engineering Tools and Methods				
KA10 - Software Quality				

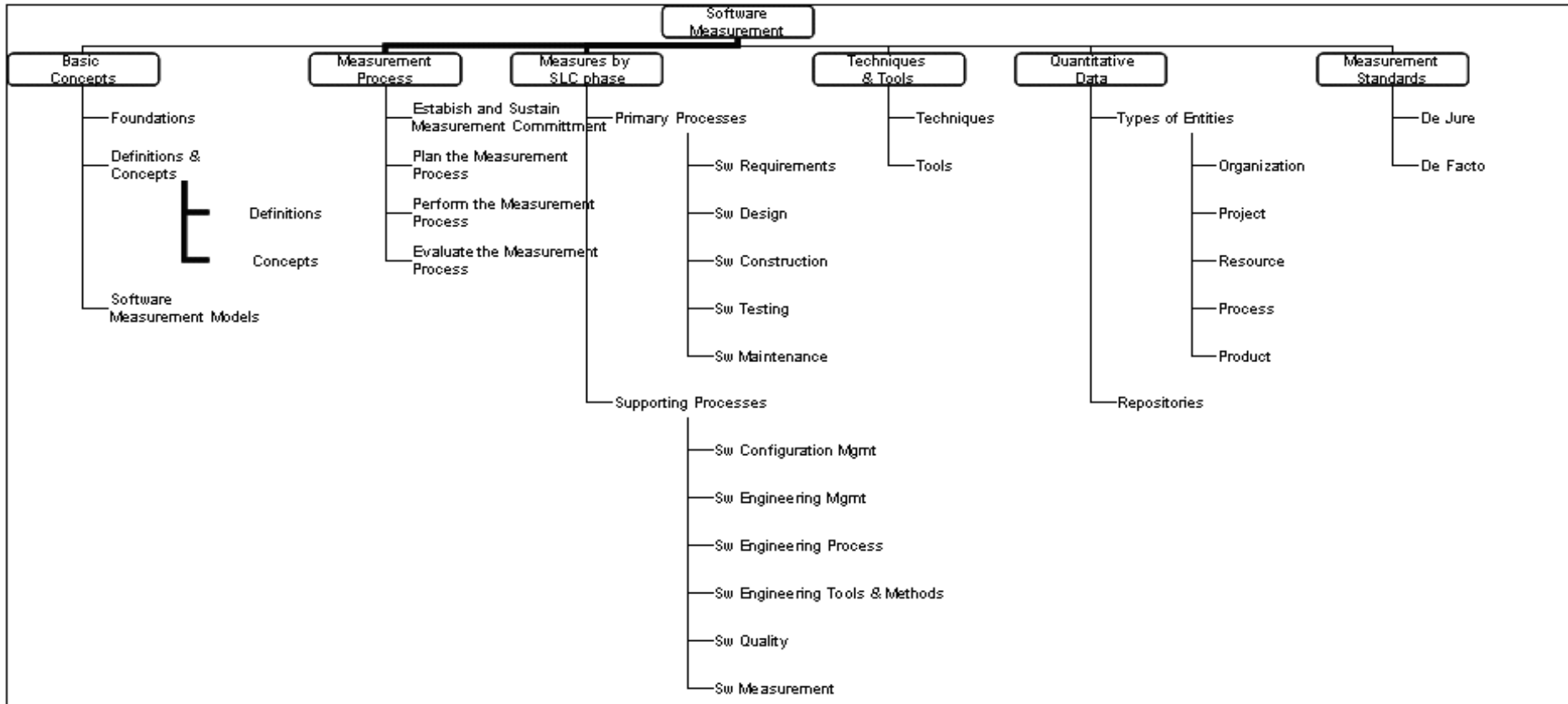
Primary KA

Support KA

• **Measurement is in...**
 ✓ ...not included, no KA on it, it's only a 'common theme'



KA11 – new (Software Measurement)



Source: L.Buglione & A.Abran, *Software Measurement Body of Knowledge - Overview of Empirical Support*, in "Innovations in Software Measurement", Proceedings of the 15th International Workshop on Software Measurement (IWSM 2005), 12-14 September 2005, Montréal (Canada), Shaker Verlag, ISBN 3-8322-4405-0, pp. 353-368, URL: www.swebok.org ; www.semq.eu/leng/swebok.htm



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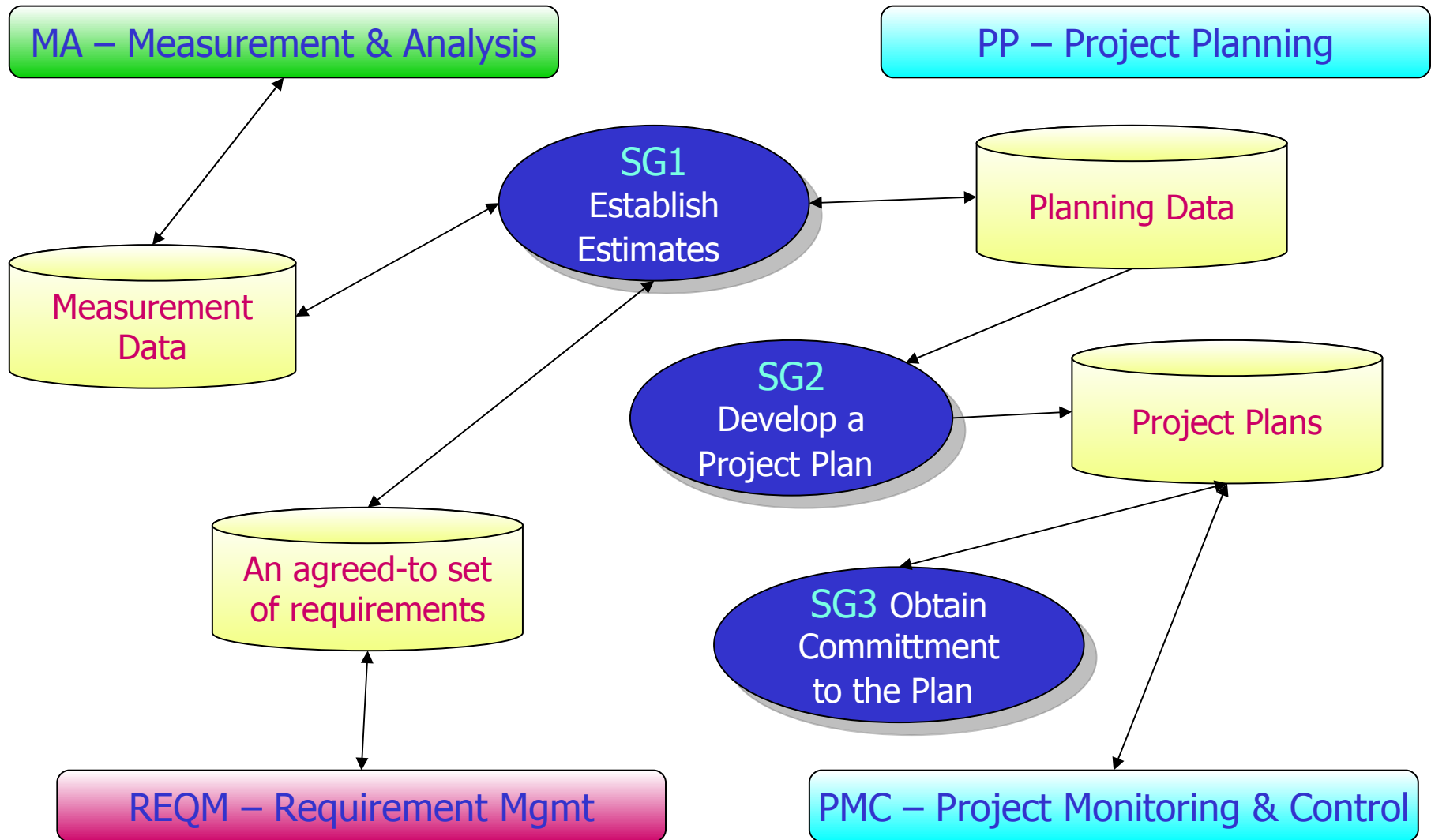


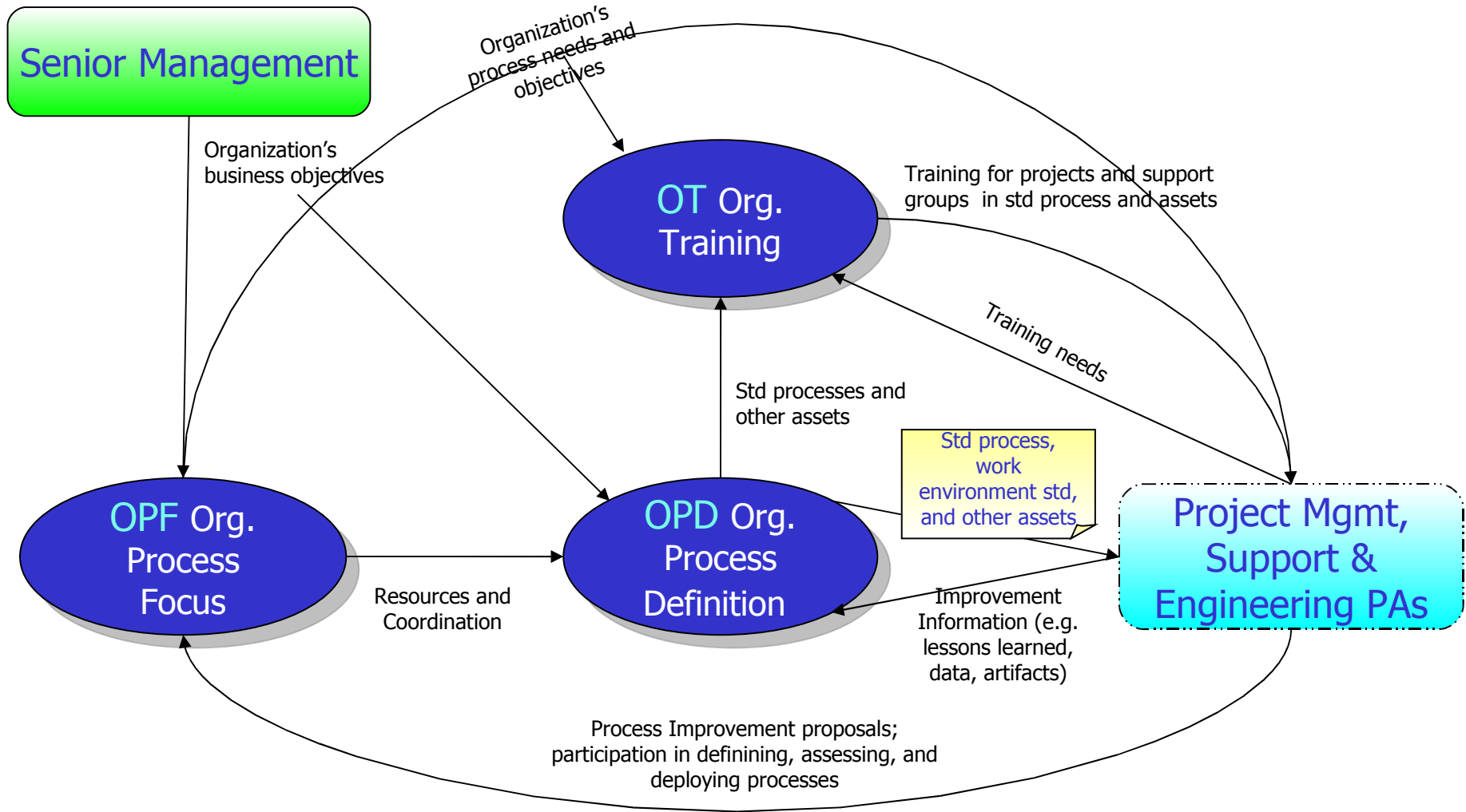
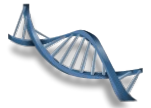
- The International Software Benchmarking Standards Group (ISBSG) is a non-profit born in 1997 for exploiting IT history data for improving estimates
- Current version is r11 (June 2009), containing 5052 projects, periodically updated
- 100+ attributes per project
- URL: www.isbsg.org

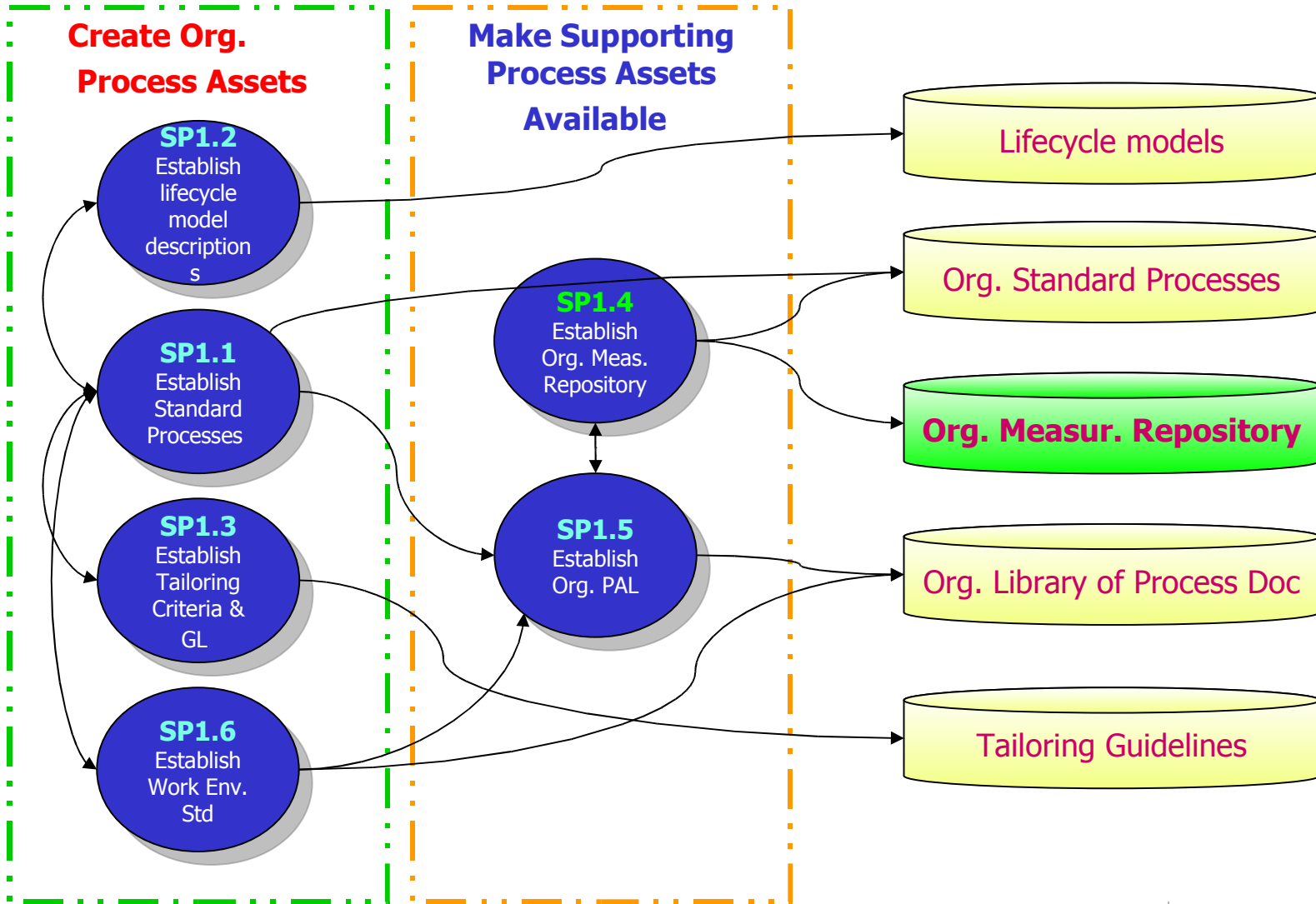
ISBSG Delivering IT Confidence Data Release 11 1 June 2009													
Project ID	Rating		Software Age	Sizing				Effort			Productivity		
	Data Qua	UFP rating	Year of Project	Count Appro	Functional S	Adjusted Fun	Value Ad	Normalis ed Wor	Normalised	Summary	Normalis ed Lev	Normalis ed PDF	Pre 2002 PDR (afp)
10001	D	A	1998	NESMA	237	254		1850	1850	1850	7.8	7.8	7.3
10011	B	A	1996	IFPUG	443	443		856	856	796	1.9	1.9	1.8
10012	B	A	2002	IFPUG	76	74	0.98	1100	1100	1100	14.5	14.5	14.9
10014	B	A	2004	IFPUG	3	3	1.09	28	28	28	9.3	9.3	9.3
10015	B	A	2000	IFPUG	382	478	1.25		23913	22000		62.6	46.0
10026	B	A	2000	IFPUG	620	620		18160	18160	18160	29.3	29.3	29.3
10038	B	A	2004	COSMIC	227	227		8185	8185	7440	27.6	27.6	25.1

Schedule											
Project Elapsed Time	Project Inactive Time	Implementation Date	Project Activity Scope	Effort Plan	Effort Specify	Effort Design	Effort Build	Effort Test	Effort Implement	Effort Unphased	
6	0	0 Oct-1998	Planning;Specification;Build;Test;Implement	100	400		1000	200	150	0	
2.6	0	20-Jun-96	Planning;Specification;Build;Test							796	
	0	Mar-2002								1100	
	0									28	
3	0	Apr-2000	Specification;Build;Test;Implement								
7	0	30-Jun-00	Planning;Specification;Build;Test							18160	
	0	01-Jun-2004		0	0	433	1932	4324	760	0	
2.6	0	25-Dec-00	Planning;Specification;Build;Test							596	











- **Introduction**
 - A bit of humour...
 - IT project trends, Estimation Techniques
- **Measurement in PM Frameworks**
 - PMBOK, Prince2, P3M3
- **Measurement in SwEng Frameworks**
 - CMMI-DEV v1.2, ISO/IEC 15504
- **Measurement in Standards**
 - ISO 9001, ISO 20000-1:2005, ISO 15939
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Profile #	# projects	Planning	Specification	Design	Build	Test	Implement	I don't know	Full Life Cycle	Blank	Total
1	11				v						
2	2				v		v				
3	19				v	v					
4	13				v	v	v				
5	1			v	v	v					
6	29							v			
7	5								v		
8	1			H/L	v	v	v				
9	3						v				
10	5	v									
11	20	v			v						
12	7	v			v		v				
13	64	v			v	v					
14	37	v			v	v	v				
15	3	v					v				
16	9	v	v								
17	68	v	v		v						
18	39	v	v		v		v				
19	405	v	v		v	v					
20	350	v	v		v	v	v				
21	1	v	v	v	v	v					
22	4	v	v	v	v	v	v				
23	5	v	v			v					
24	1	v	v			v	v				
25	1	v				v					
26	1	v				v	v				
27	0		v								
28	8		v		v						
29	3		v		v		v				
30	349		v		v	v					
31	92		v		v	v	v				
32	1006									v	
Total	2562										v

- Dery & Abran identified 32 'effort profiles' from the analysis of the ISBSG r9 (2005) database, containing 3024 projects, focusing on the 2562 ones sized with IFPUG FPA method for a sake of consistency
- They used the 6 main ISBSG SLC phases
 - Planning, Specification, Design, Build, Test, Implement)
 - + I don't know, Full lifecycle, Blank

Q: ...but how much effort for Measurement?

Source: Dery D., Abran A., Investigation on the Effort Data Consistency in the ISBSG Repository, IWSM 2005, Montréal (Canada), pp.123-136, URL: <http://publicationslist.org/data/a.abran/ref-2040/909.pdf>

1. Choose your own SLC phase/process taxonomy
2. Map your own processes to such schema
3. Re-classify your effort data on such schema
4. ...count!

- An example on ISBSG r11, choosing only projects with effort assigned (53), supposing to have to determine a proper % for **PM effort** in next projects, for IFPUG-based projects [data expressed in man-hours (m/hrs)]

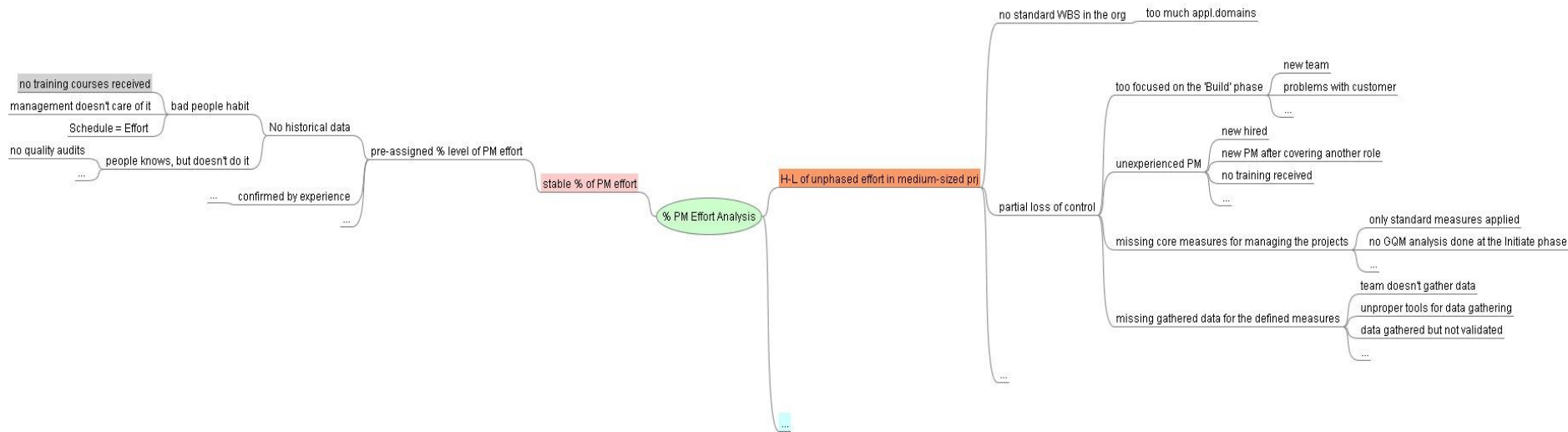
	UFP	Eff.Tot (hrs)	Prod	Plan	Specify	Design	Build	Test	Implemer	Unphase
1	19	50	0,38	5	0	6	30	12	2	
2	32	714	0,04	98	65	40	349	256	4	0
3	41	503	0,08	155	41	23	281	153	5	0
4	46	140	0,33	10	4	22	72	40	2	
5	57	1546	0,04	264	109	80	556	697	104	0
6	71	2101	0,03	60	236	450	700	670	45	0
7	71	190	0,37	16	8	34	97	47	4	
8	88	2457	0,04	113	146	996	479	218	202	416
9	98	1082	0,09	109	229	132	316	392	13	0
10	99	1038	0,10	27	96	78	523	313	28	0
11	118	1495	0,08	21	90	436	606	339	24	0
12	120	3637	0,03	171	93	198	1164	1320	318	544
13	129	2175	0,06	284	307	371	882	398	199	18

	UFP	Eff.Tot (hrs)	Prod	Plan	Specify	Design	Build	Test	Implemer	Unphase
Max	4104	16093	1,70	1807	5192	3423	7764	5280	2648	5490
Avg	567,25	4071,96	0,21	388,74	446,45	627,09	1795,70	752,57	199,08	391,38
Median	339,00	2520,00	0,14	224,00	223,00	219,00	1164,00	508,00	48,00	0,00
Min	19	50	0,02	0	0	0	30	6	0	-38
% Avg		100%		10%	11%	15%	44%	18%	5%	10%
% Median		100%		9%	9%	9%	46%	20%	2%	0%

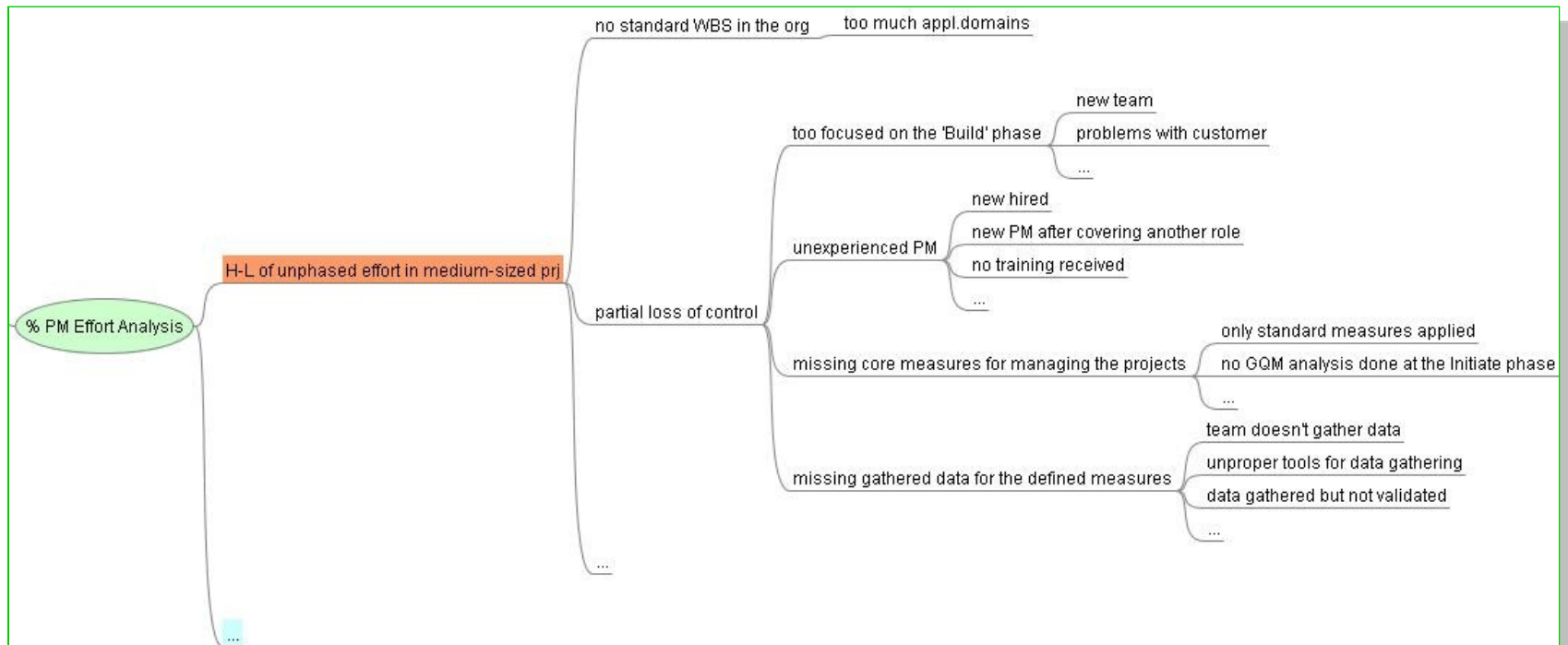
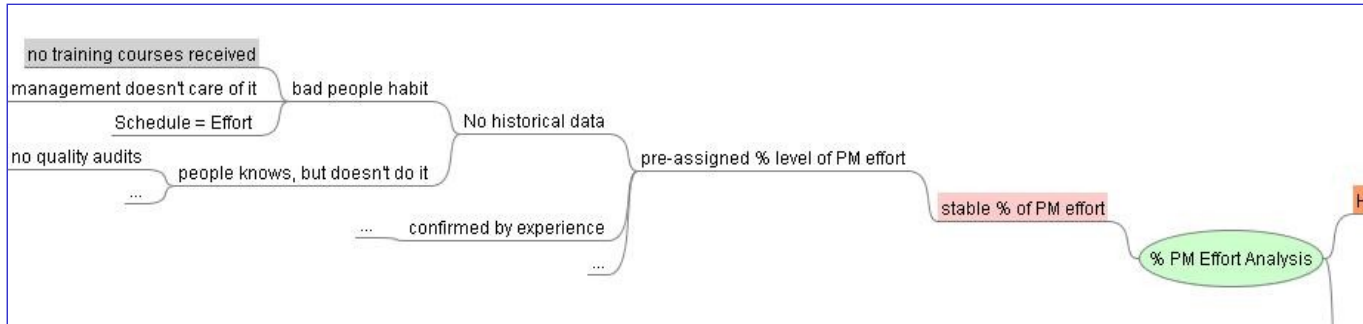
- The answer would be: c.a. 9-10% → to deeply analyze variations for project clusters by homogeneous functional size
 - ✓ Small (1-449 UFP) [n=30] → confirmed 9-10%
 - ✓ Medium (450-900 UFP) [n=14] → reduced to 7% (both avg and median)
 - ✓ Large (901+ UFP) [n=9] → confirmed 9-10%
- An avg 10% value for **unphased** effort
 - ✓ to furtherly analyze to which tasks and related processes should it be assigned
 - ✓ Small (1-449 UFP) [n=30] → c.a. avg 4%
 - ✓ Medium (450-900 UFP) [n=14] → c.a. avg 19%
 - ✓ Large (901+ UFP) [n=9] → c.a. avg 31% (but just 1 outlier out of 9 projects)
- Next step: start gather your own effort data on Measurement!

An Improvement Proposal | Q-RCA on main results

- Example based on main evidences presented for PM
- Run a **Q-RCA** (Quantitative Root-Cause Analysis) till the right level of granularity (*5Why's game*) for setting up an improvement plan
- On the main leaves put the main elements to analyze, running the 5Why's game and derive the main control measures to (possibly) insert in your measurement plan



Source: Buglione L., Strengthening CMMI Maturity Levels with a Quantitative Approach to Root-Cause Analysis, Proceedings of the 5th Software Measurement European Forum (SMEF 2008), Milan (Italy), 28-30 May 2008, ISBN 9-788870-909999, pp. 67-82
www.dpo.it/smef2008/papers/SMEF08_proc_107_Buglione.pdf





- **Introduction**
 - A bit of humour...
 - IT project trends, Estimation Techniques
- **Measurement in PM Frameworks**
 - PMBOK, Prince2, P3M3
- **Measurement in SwEng Frameworks**
 - CMMI-DEV v1.2, ISO/IEC 15504
- **Measurement in Standards**
 - ISO 9001, ISO 20000-1:2005, ISO 15939
- **Projects Repositories**
 - ISBSG r11
 - Maturity Models and Historical Data
- **An Improvement Proposal**
 - Effort profiles
 - ...and your own effort profile and meas.cost?
 - Q-RCA on main results
- **Conclusions & Prospects**
- **Q & A**





- **PM & Measurement**

- ✓ They are two separated but strictly interrelated processes, with different natures
- ✓ Any process should follow a PDCA cycle
- ✓ A process must have an owner → measurement as an activity in many processes → too many owners → no coordinated actions → too many/too few measures → unbalanced and unpredictable cost for measurement, as well as its returned informative value for decision-makers

- **Measurement and PM Frameworks**

- ✓ Measurement seen/perceived as 'part of' PM processes, as an *activity*
- ✓ No framework/model has a formal 'Measurement' process defined
- ✓ Questions: how much does it cost to measure? And the impact on COQ/CONQ?

- **Measurement and SwEng/Standards**

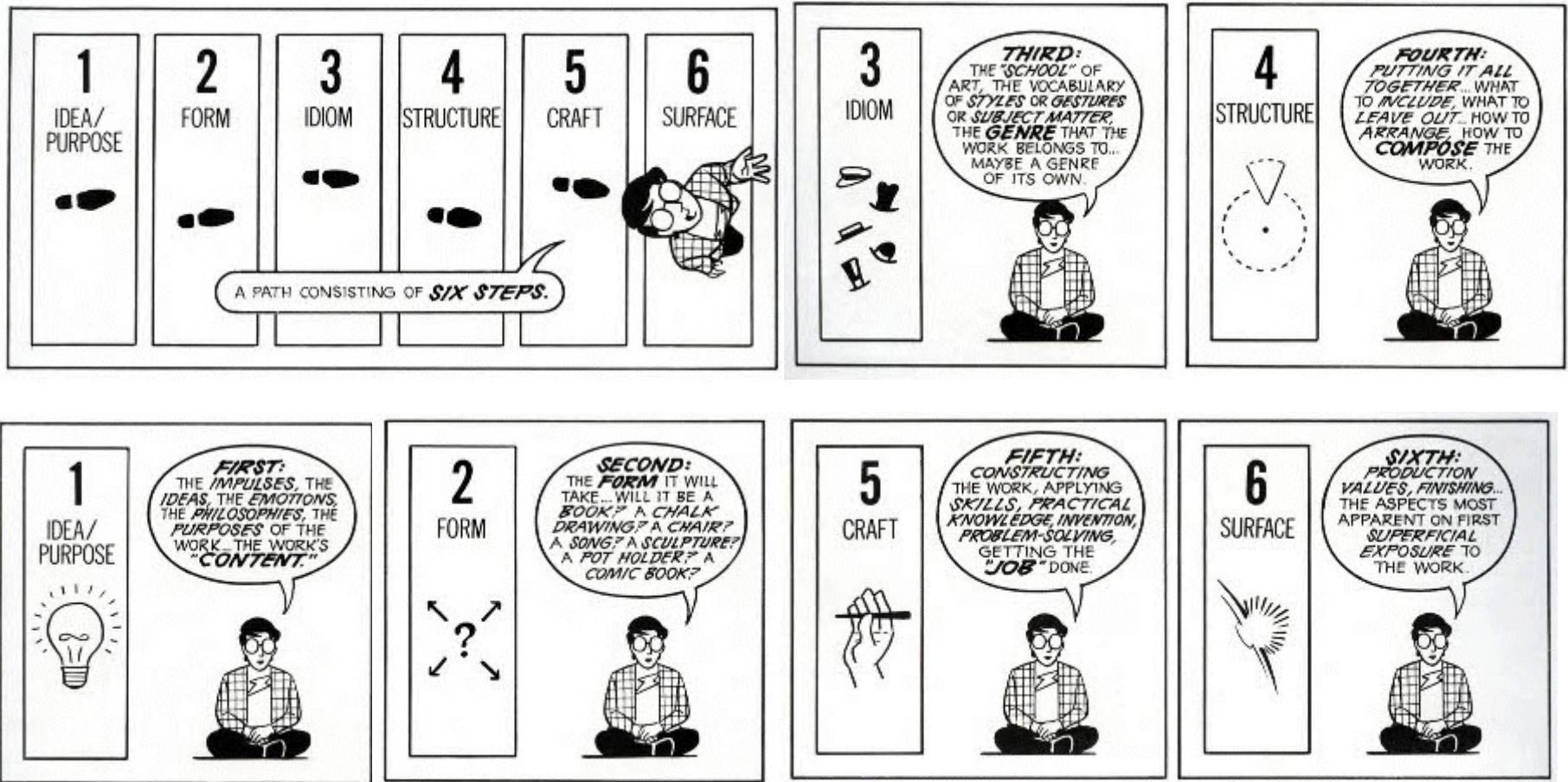
- ✓ Here Measurement has been yet recognized as a process → more mature domain than PM?
- ✓ "A measurement plan is more than a plan of measure" (S.L. Pfleeger)

- **Some lessons learned**

- ✓ Gather your own *project historical data* (PHD) at the proper level of granularity, it's one of the two real and valuable assets providing value to any organization
- ✓ ...and the second one are *people*, the real 'engine' within any organization
- ✓ Search and use tools for easy gathering and classifying of projects' efforts
- ✓ Refer to standard taxonomies for processes and activities, possibly external ones, in order to avoid misunderstandings and too subjective interpretations
- ✓ ...put it live!

Analyze facts and talk through data

(Kaoru Ishiwaka, TQM guru)



Source: http://blog.visualmotive.com/wp-content/uploads/2009/12/mccloud_understanding_comics.jpg





Obrigado pela sua atenção!
Thanks for your attention!



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Luigi Buglione

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