«Insights into Software Benchmarking & Measurement»

June 27, 2025

Development & Enhancement Projects

Same productivity or not?

Luigi Buglione

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Dev & Enh project: same productivity?

Goals of the presentation

- ✓ **G1**. Understand ‘productivity’/PDR formulas…
- ✓ **G2**. Verify if DEV/ENH projects have (or not) the same productivity/PDR levels (and why)…
- ✓ **G3**. Discuss which standards could provide (some) help for improving the Estimation process….

Dev & Enh project: same productivity?
Who I am…

Luigi Buglione

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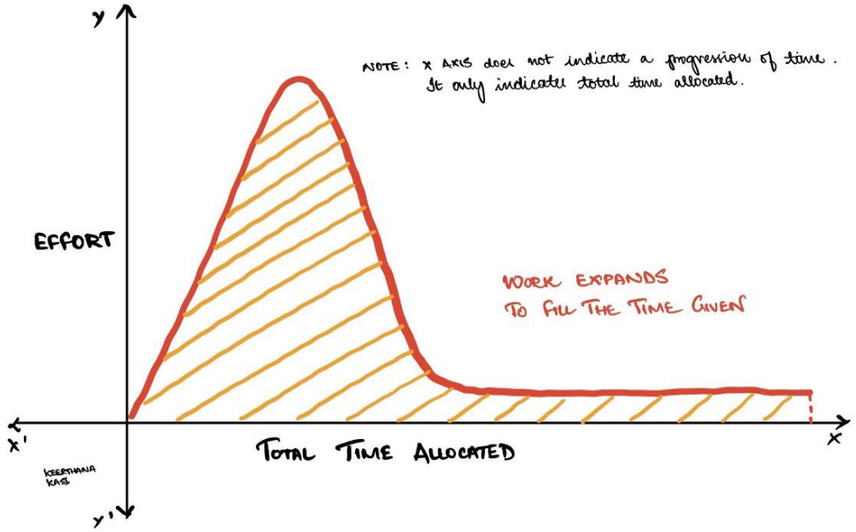
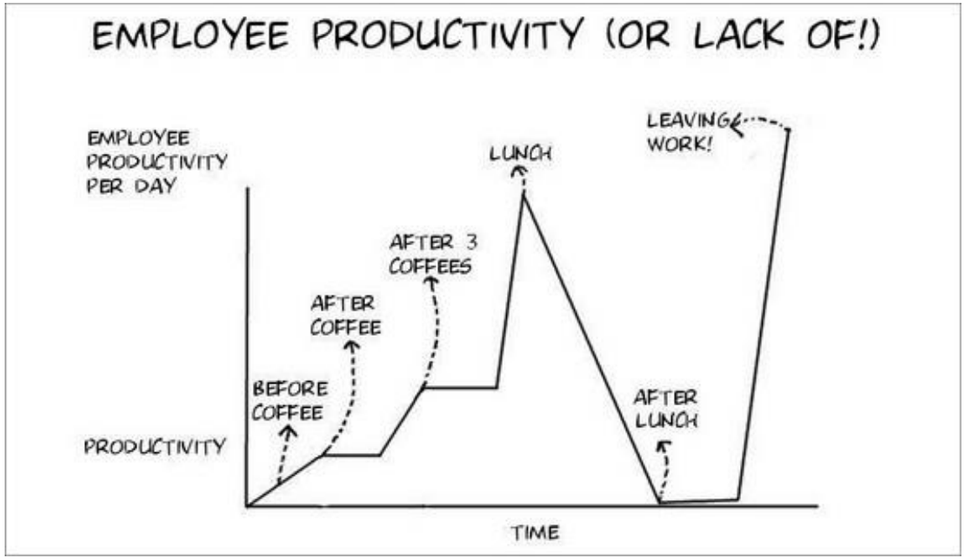
- *Linkedin: https://www.linkedin.com/in/luigibuglione/*
- *Participation in Software Measurement Associations:*
  - *ISBSG Vice-President*
  - *IFPUG Board member (Secretary & Director for Universities)*
  - *GUFPI-ISMA President*

Dev & Enh project: same productivity?

Let's start…

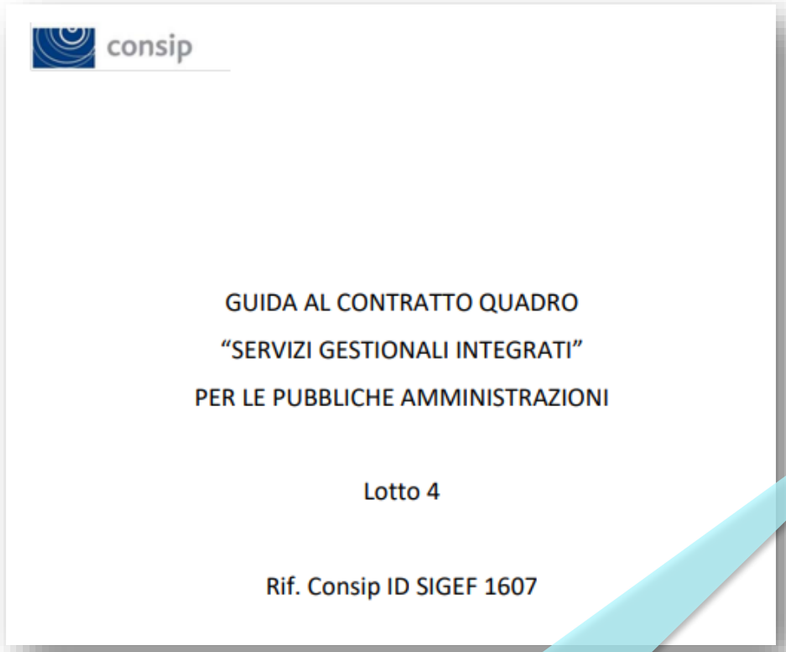




Which should be the *purpose* of our interest?

Dev & Enh project: same productivity?

Some premises…how Productivity (and PDRs) are dealt in ICT contracts? An example…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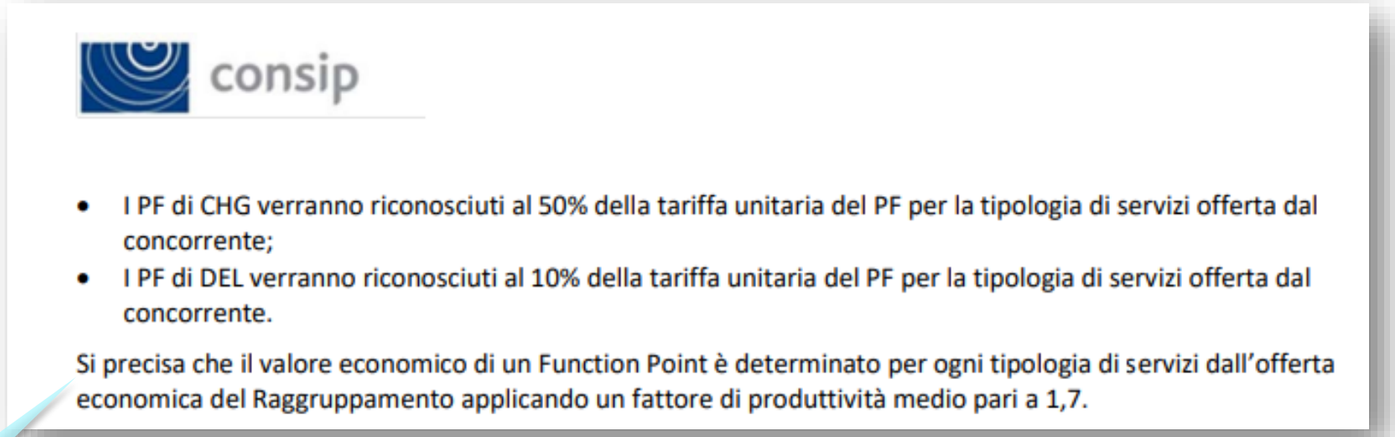
GUIDA AL CONTRATTO QUADRO

"SERVIZI GESTIONALI INTEGRATI"

PER LE PUBBLICHE AMMINISTRAZIONI

Lotto 4

Rif. Consip ID SIGEF 1607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- I PF di CHG verranno riconosciuti al 50% della tariffa unitaria del PF per la tipologia di servizi offerta dal concorrente;
- I PF di DEL verranno riconosciuti al 10% della tariffa unitaria del PF per la tipologia di servizi offerta dal concorrente.

Si precisa che il valore economico di un Function Point è determinato per ogni tipologia di servizi dall'offerta economica del Raggruppamento applicando un fattore di produttività medio pari a 1,7.

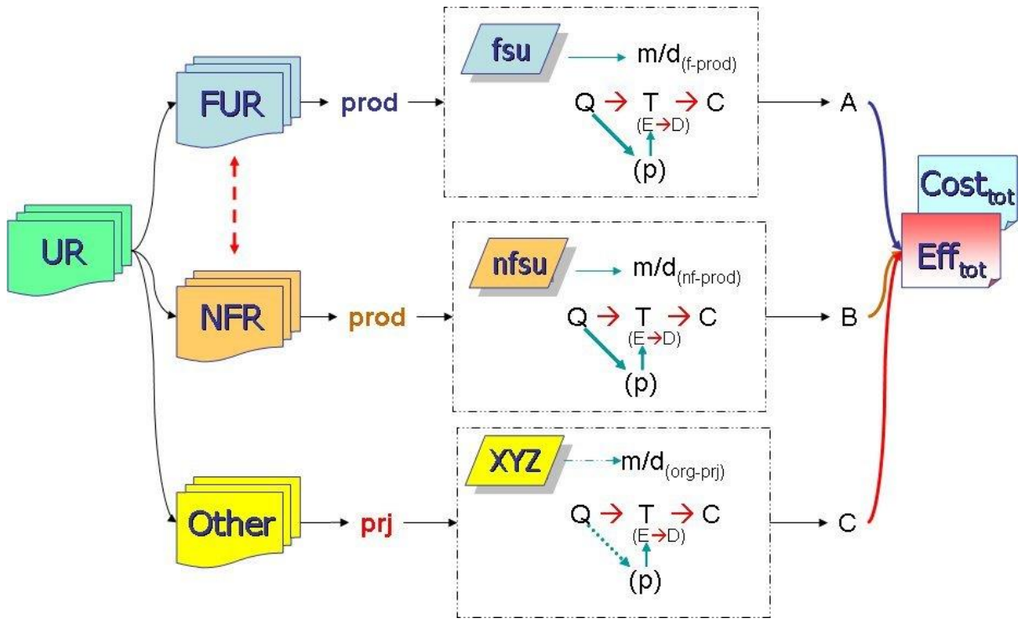
…for **each type of service**…applying an **average productivity** factor of 1.7 FP…

- **«Average» Nominal productivity (1.7 FP/day) ?!?**
- No mentioned the Functional Domain, the Project Type, Application Domain and all the other ISBSG suggestions from our D&E repository for properly classifying projects for better estimations

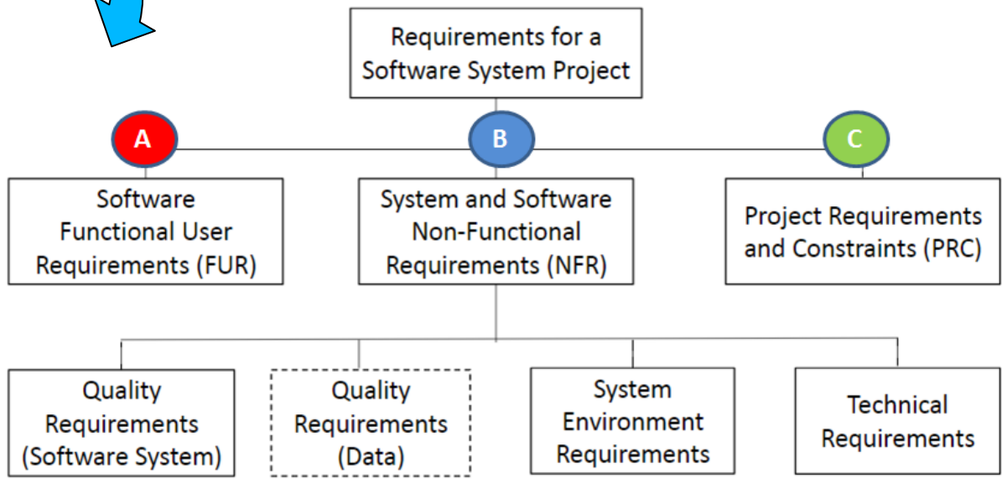
- **Is it a cultural issue?**
- **Is it too complex to consider what is in/out the Productivity (or PDR) formulas for implemeting a FUR (or a NFR)? And what about PRJ requirements?**

Dev & Enh project: same productivity?

Some premises… the ABC Schema (2012) → IFPUG/COSMIC Glossary of NFRs (2015)…



URL: IFPUG MetricViews, Vol 6, No.2, Aug 2012 –. **http://goo.gl/hgrJt**

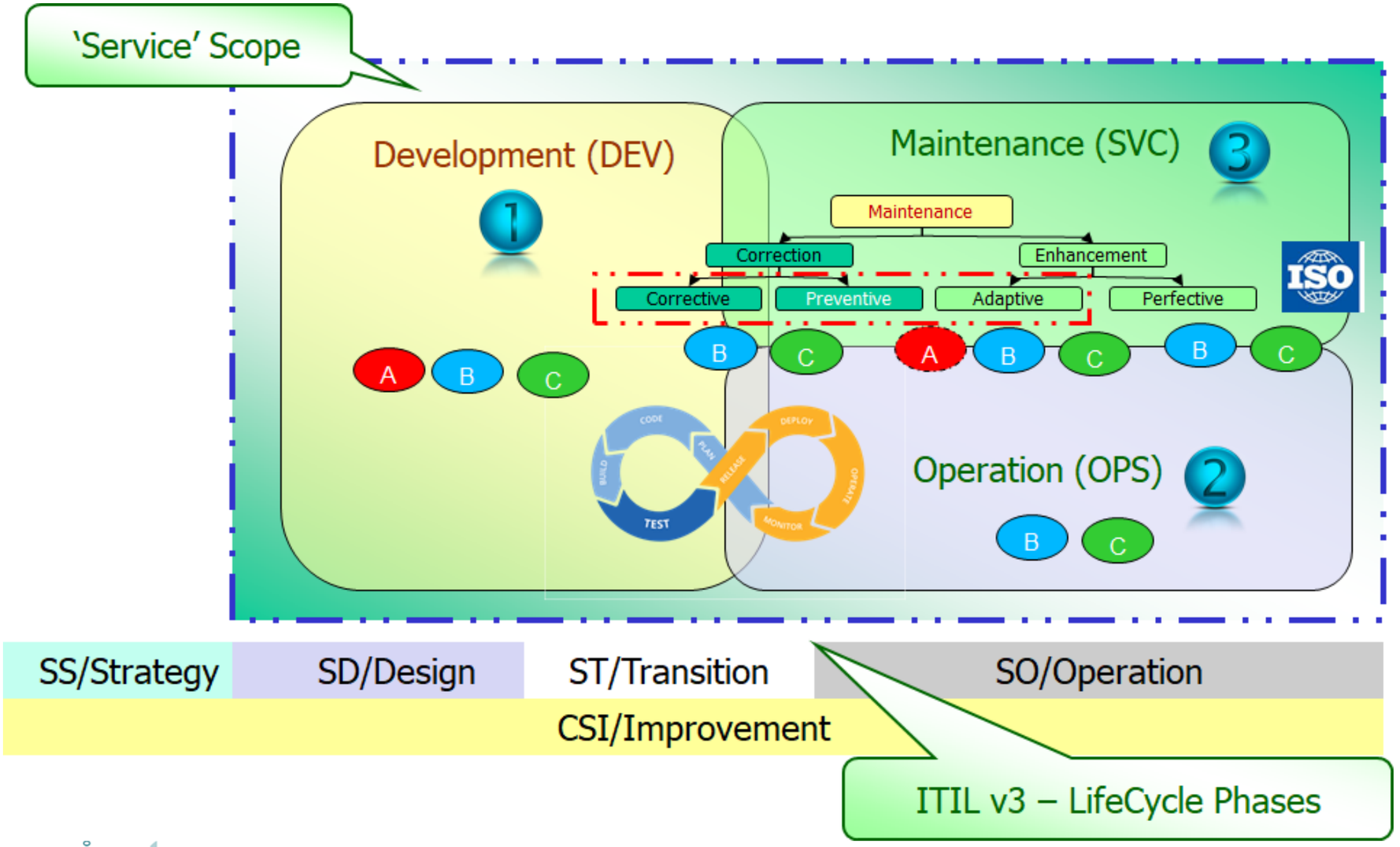


URL: IFPUG /COSMIC, Glossary of NFRs, 2015 – URL: http://www.ifpug.org/cosmic-and-ifpug-glossary-of-terms/

- **How can the ABC schema help when planning a project?**
- **Would we respect constraints about time, cost and productivity?**
- **Which is the effort% related to (whatever kind of) Function Points against the whole project effort?**
- **Which economic margins/losses could we obtain moving from «market prices»?**

Dev & Enh project: same productivity?

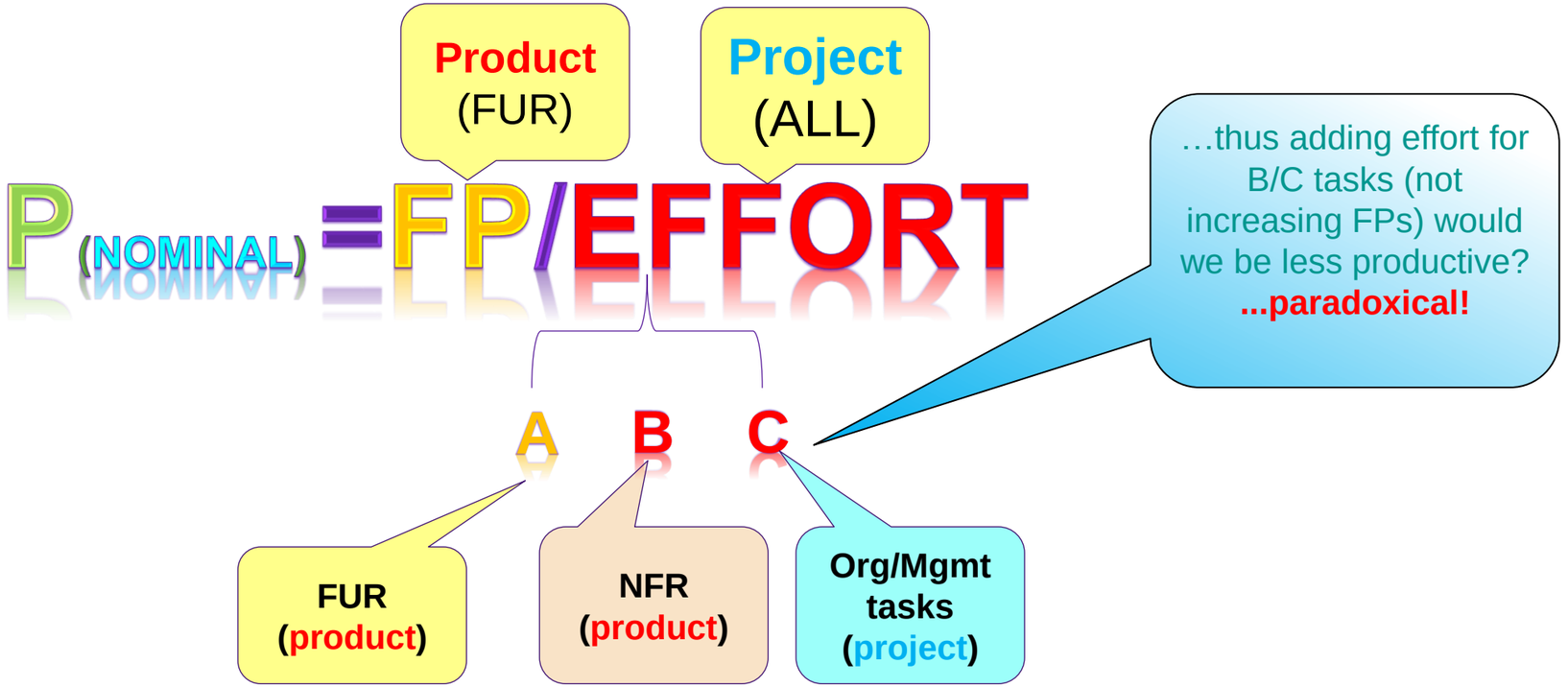
Some premises…Service+Sw Management: the “123 schema” + the “ABC” schema



- Each project has different characteristics (and different levels of productivity in software development...)
- The '123 schema’ splits the entire scope of the service into three possible sub-projects: DEV, OPS, SVC (Maintenance - ISO 14764)
- Combining this with the 'ABC schema’, a map of which requirements are applicable in which of the three parts (and which are not) is returned

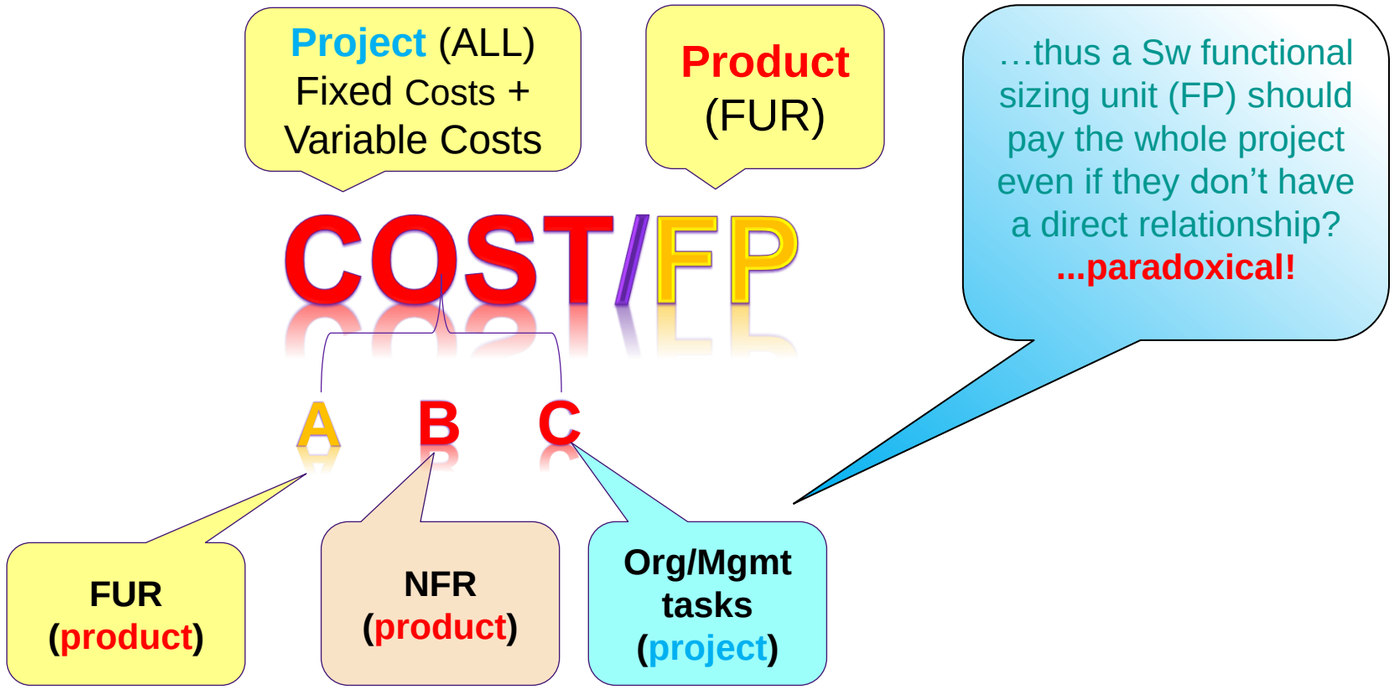
Dev & Enh project: same productivity?
Some premises…the (new) «productivity paradox» #1

$P = Q/T$



? **Which should be the *scope* of our interest?**

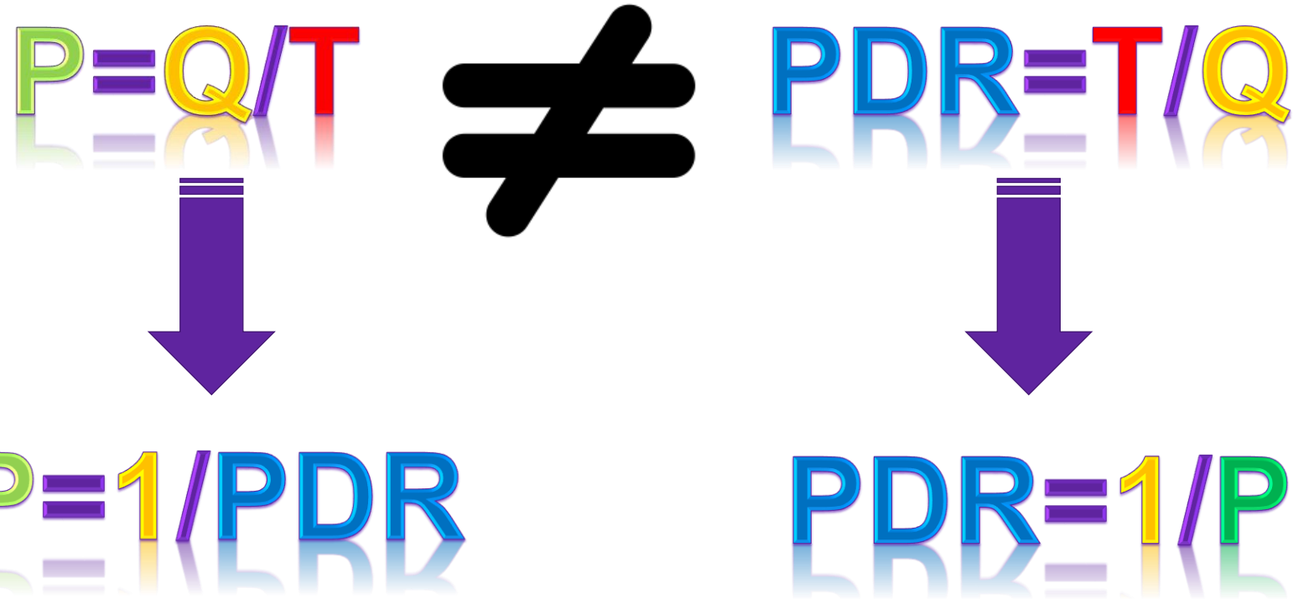
Dev & Enh project: same productivity?
Some premises…the (new) «productivity paradox» #2



? **Which should be the *scope* of our interest?**

Dev & Enh project: same productivity?

Some premises…Productivity and PDR: are they the same (or not)?



- Nominal Productivity is typically express in **person-day(s)**
- Project Delivery Rate (PDR) is typically express in **Man-Hour(s)**

Pay attention to absolute values without looking at the UoM!

- **Example: COBOL project**
  - → **Nominal Productivity could be approx 0.5 IFPUG FP/day**
  - → **PDR approx of 16 m-hrs/IFPUG FP (…or 2 m-day/ IFPUG FP)**

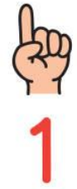
Dev & Enh project: same productivity?
Three (3) questions…

Q1: is it true that DEV/ENH productivities are the same (or not)?

Q2: Typically, are more productive DEV or ENH projects?

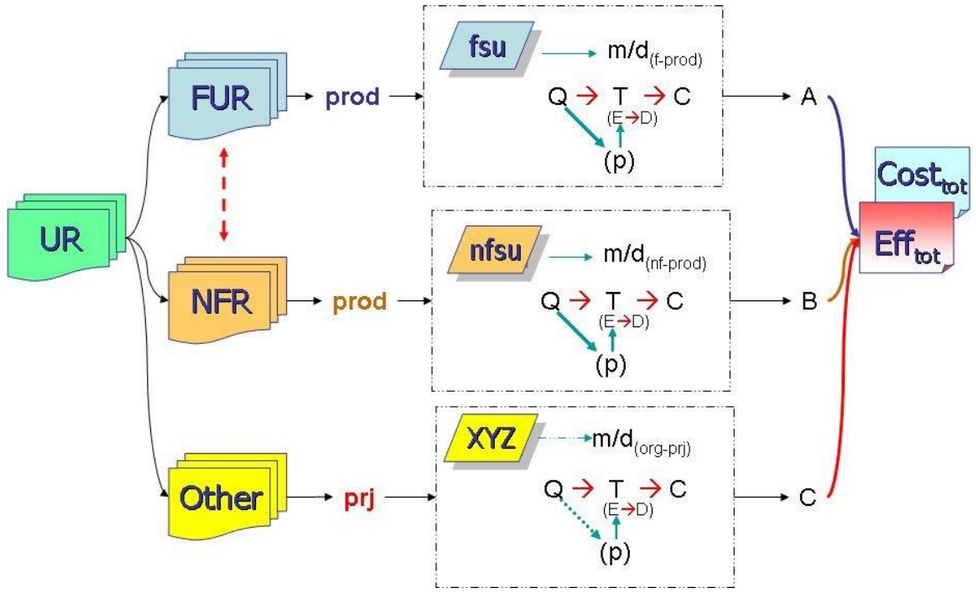
Q3: Who is the «role» that can determine/impact on productivity levels in a project?

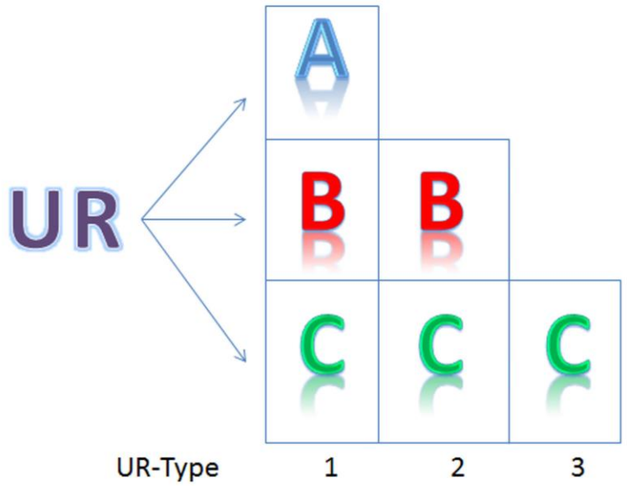
Dev & Enh project: same productivity?
Three (3) questions…

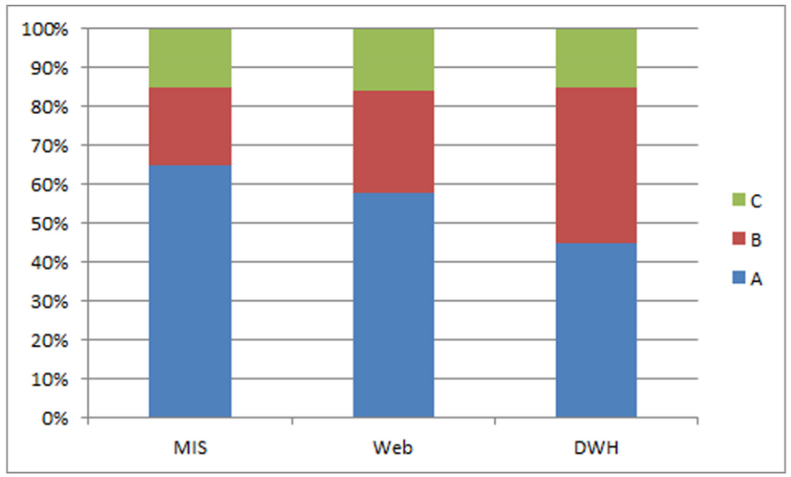


Q1: is it true that DEV/ENH productivities are the same (or not)?

A1: No, each project has a different balancing for effort derived by FURs, NFRs, and PRJ requirement types (‘ABC’ schema) → thus, its ‘nominal’ productivity value will vary even if the total number of m/hrs (or m/d) will be the same







Dev & Enh project: same productivity?
Three (3) questions…

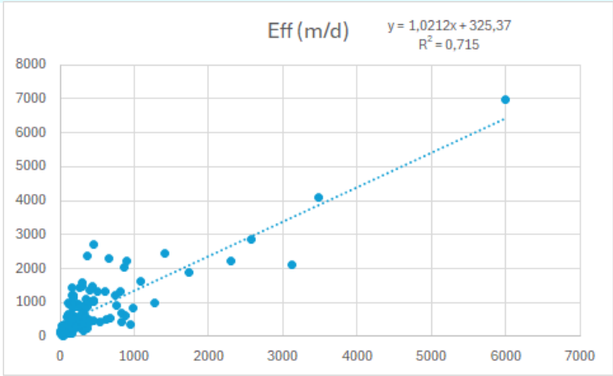
Q2: Typically, are more ‘nominally’ productive DEV or ENH projects?

A2: DEV projects **typically** express more FURs (thus more FPs) than ENH projects, when more NFR/PRJ requirements are present…see ISO/IEC 14764:2022 maintenance sub-categories for observing which one(s) can size FPs and which not…

Step	Attribute	Filter	Projects Excluded	Remaining Projects
0	---	---	---	10600
1	Count Approach	= IFPUG	3043	7557
2	Data Quality Rating (DQR)	= {A | B}	742	6815
3	UFP Quality Rating	= {A | B}	739	6076
4	Application Type	= {Business Application}	1868	4208
5	Primary PL	= {COBOL}	3693	515
6	Development Type	= {New Development}	367	**148**

N=	**138**	R^2	**0,7150**
Max	6000	6983	2,565
Avg	**443**	**745**	**0,598**
Median	**224,5**	**484**	**0,454**
Min	6	32	0,066

FP m/d Prod



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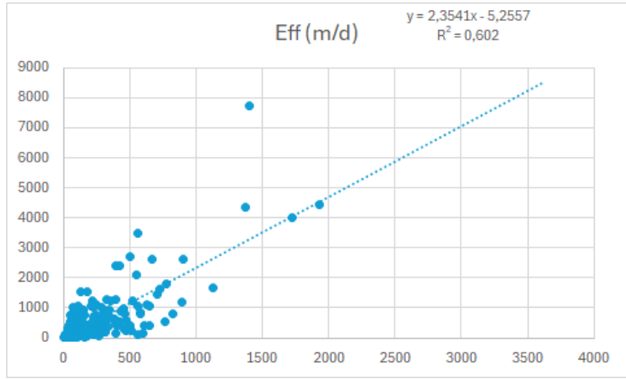
4	Application Type	= {Business Application}	1868	4208
5	Primary PL	= {COBOL}	3693	515
6	Development Type	= {Enhancement}	168	**347**

N=	**330**	R^2	**0,6020**
Max	3622	7736	7,000
Avg	**225**	**430**	**0,831**
Median	**102**	**197**	**0,562**
Min	6	11	0,067

FP m/d Prod



Dev & Enh project: same productivity?
Three (3) questions…

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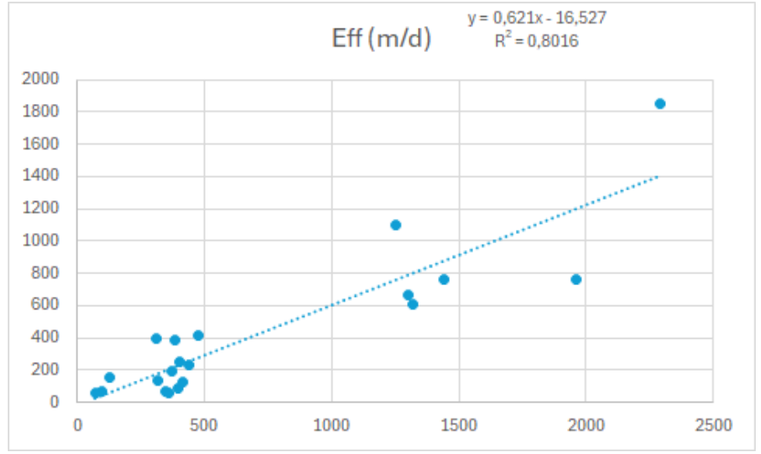
3	UFP Quality Rating	= {A | B}	739	6076
4	Application Type	= {Business Application}	1868	4208
5	Primary PL	= {.Oracle}	4127	81
6	Development Type	= {New Development}	58	**23**

N=	20	R^2	0,801624
Max	2288	1851	5,829
Avg	**756**	**421**	**2,168**
Median	**402**	**243**	**1,873**
Min	72	61	0,783

FP m/d Prod



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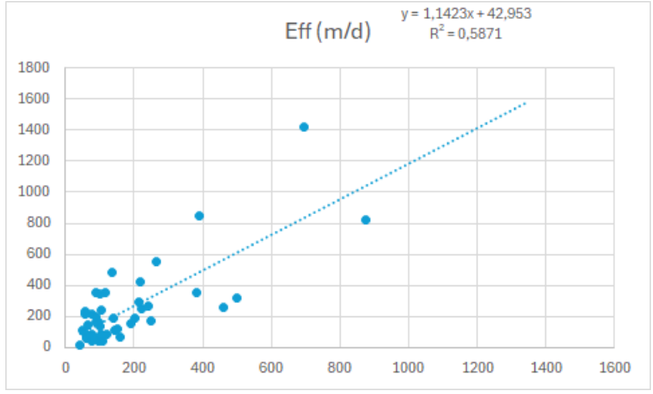
4	Application Type	= {Business Application}	1868	4208
5	Primary PL	= {.Oracle}	4127	81
6	Development Type	= {Enhancement}	23	58

N=	44	R^2	0,587086
Max	1338	1417	2,688
Avg	**214**	**248**	**0,995**
Median	**108,5**	**180**	**0,866**
Min	43	16	0,252

FP m/d Prod

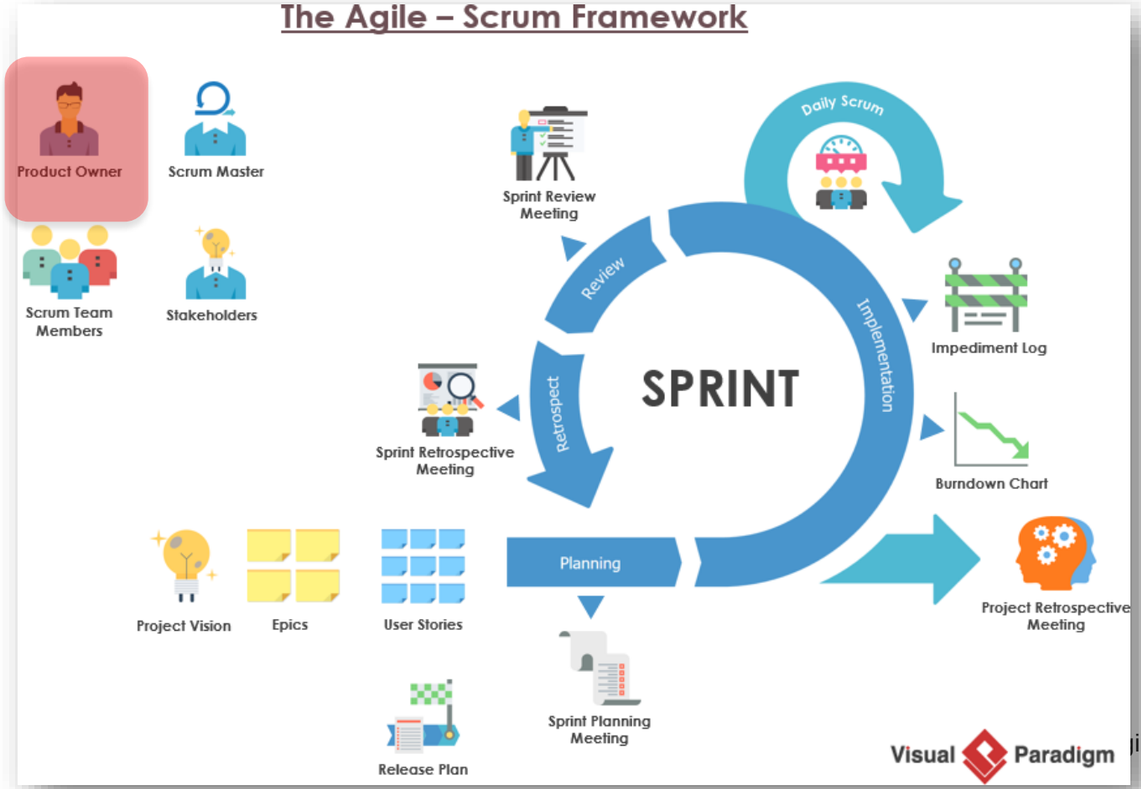


Dev & Enh project: same productivity?

Three (3) questions…

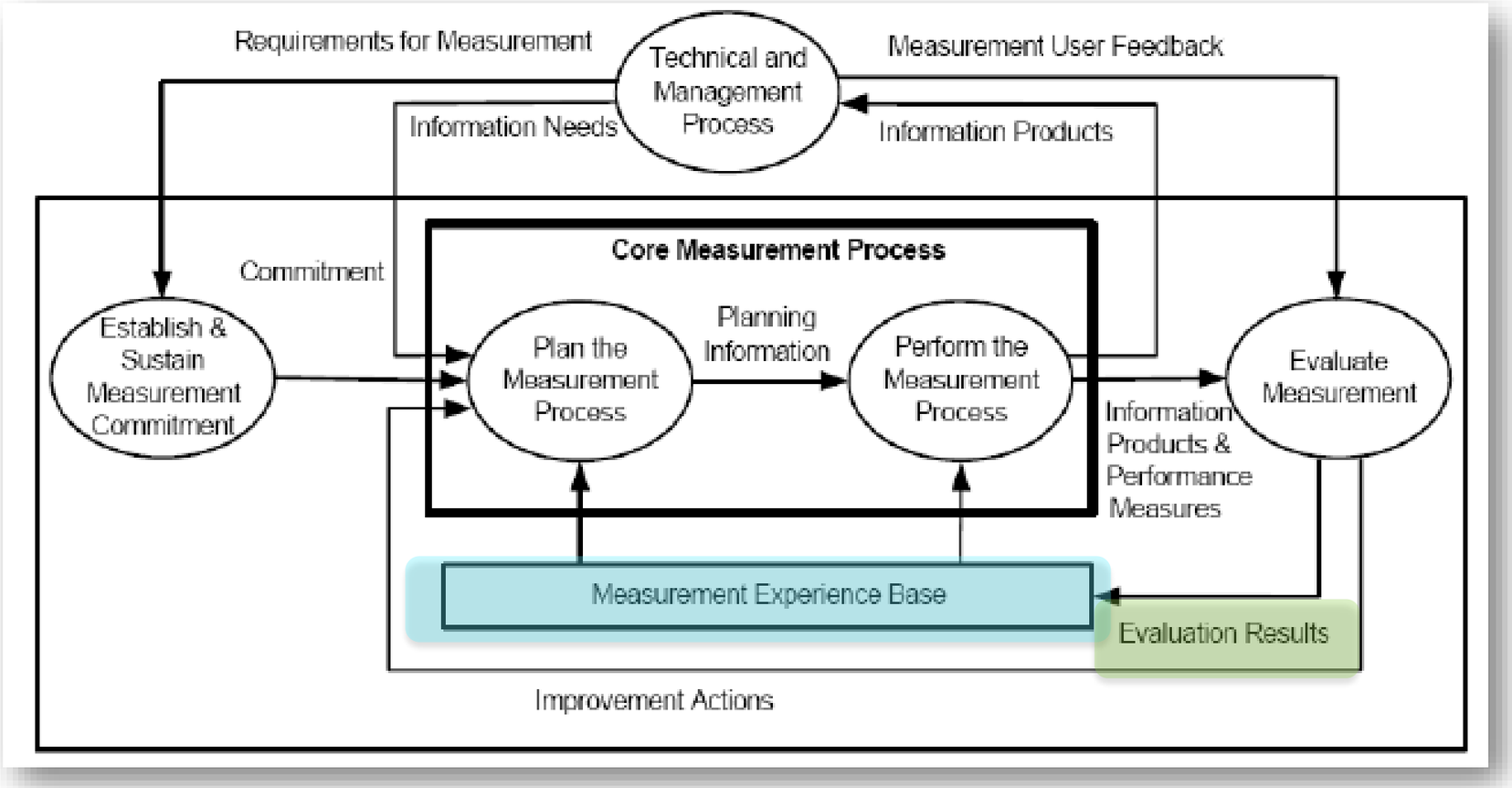
Q3: Who is the «role» that can (mostly) determine/impact on productivity levels in a project?

A3 Typically, who's providing requirements is the «customer» / product owner → thus, as well as in agile projects, the management for the productivity thresholds (UCL/LCL) should be shared for a common goal, providing 'stable' proportions for a certain time slice according to the «ABC» effort distribution



Task	CMMI PA	CMMi Group	Req-Type	person/hrs	A	B	C
Project Management				**16 hrs**			
Planning	PP	Prj Mgmt	C	16 hrs			16
Monitoring & Control				**3 hrs**			
Meeting #01	PMC	Prj Mgmt	C	1 hr			1
Meeting #02	PMC	Prj Mgmt	C	1 hr			1
Meeting #...	PMC	Prj Mgmt	C	1 hr			1
Quality Assurance (QA)				**9 hrs**			
Product QA	PPQA	Support	B	6 hrs		6	
Process QA	PPQA	Support	C	3 hrs			3
Analysis				**20 hrs**			
Req. Elicitation - Functional	RD	Engineering	A	12 hrs	12		
Req. Elicitation - Non-Functional	RD	Engineering	B	8 hrs		8	
User Requirements (UR)				**18 hrs**			
UR - Functional	RD	Engineering	A	8 hrs	8		
UR - Non-Functional	RD	Engineering	B	6 hrs		6	
FP-sizing	MA	Support	C	4 hrs			4
Design				**28 hrs**			
Functional Spec's	RD	Engineering	A	28 hrs	28		
Architectural Spec's				**14 hrs**			
Architectural Spec's - Funct	RD	Engineering	A	5 hrs	5		
Architectural Spec's - Non-Funct	RD	Engineering	B	9 hrs		9	
Test Plan				**30 hrs**	**0**	**0**	
TP - Functional part	VER	Engineering	A	12 hrs	12		
TP - Non-functional part	VER	Engineering	B	18 hrs		18	
Construction				**80 hrs**			
Construction	TS	Engineering	A	62 hrs	62		
Customization	TS	Engineering	B	8 hrs		8	
Fixing bugs	TS	Engineering	B	10 hrs		10	
V&V				**56 hrs**			
Black-box	VER	Engineering	A	20 hrs	20		
White box	VER	Engineering	B	36 hrs		36	
Release				**4 hrs**			
Release F-xyz	VAL	Engineering	C	4 hrs			4
					147	101	30 278
				%	53%	36%	11%
					A	B	C

Dev & Enh project: same productivity?
ISO/IEC 15939 – Measurement Process



- Historicizing data is fundamental for a proper benchmarking process
- See ISO/IEC 15939:2017 (R2022)

Dev & Enh project: same productivity?
ISO/IEC 29155-x – Benchmarking Framework


INTERNATIONAL STANDARD

ISO/IEC 29155-1

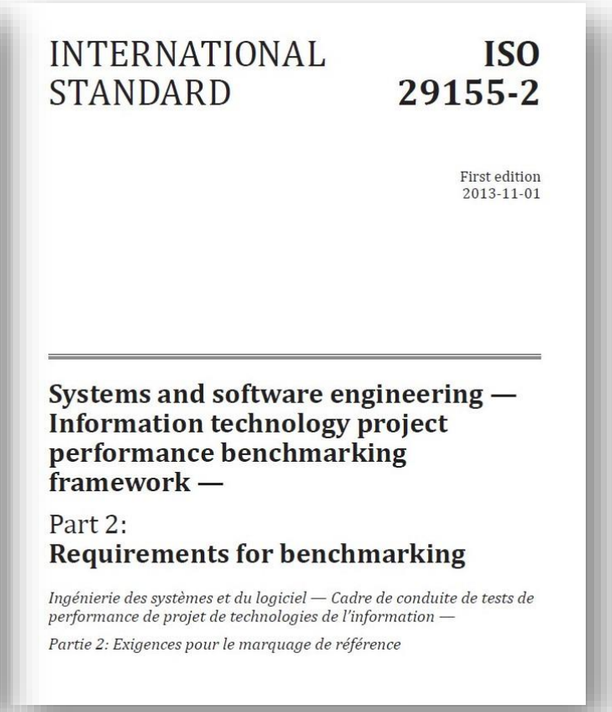
Second edition
2017-12

Systems and software engineering — Information technology project performance benchmarking framework —

Part 1:
Concepts and definitions

Ingénierie des systèmes et du logiciel — Cadre de conduite de tests de performance de projet de technologies de l'information —

Partie 1: Concepts et définitions


INTERNATIONAL STANDARD

ISO 29155-2

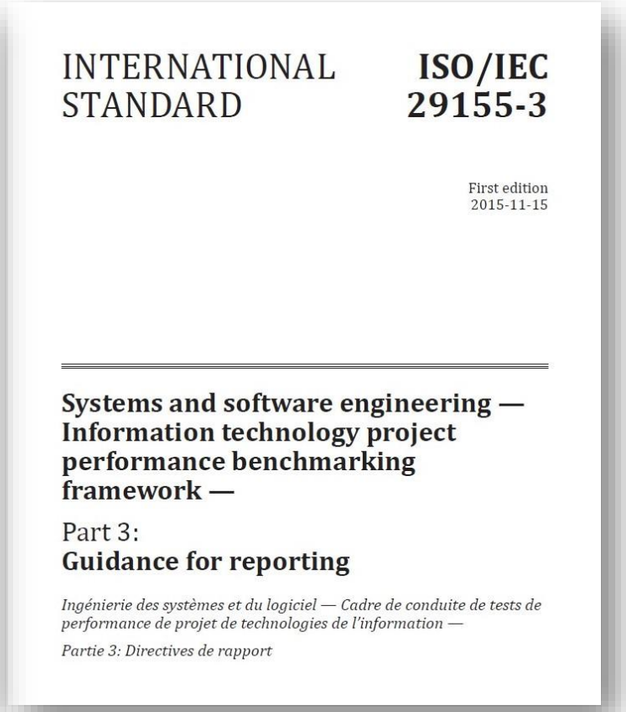
First edition
2013-11-01

Systems and software engineering — Information technology project performance benchmarking framework —

Part 2:
Requirements for benchmarking

Ingénierie des systèmes et du logiciel — Cadre de conduite de tests de performance de projet de technologies de l'information —

Partie 2: Exigences pour le marquage de référence


INTERNATIONAL STANDARD

ISO/IEC 29155-3

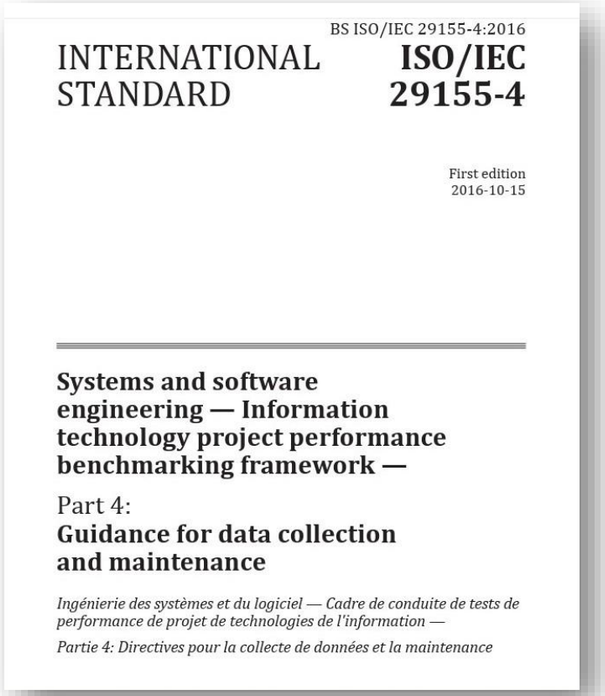
First edition
2015-11-15

Systems and software engineering — Information technology project performance benchmarking framework —

Part 3:
Guidance for reporting

Ingénierie des systèmes et du logiciel — Cadre de conduite de tests de performance de projet de technologies de l'information —

Partie 3: Directives de rapport


BS ISO/IEC 29155-4:2016

INTERNATIONAL STANDARD

ISO/IEC 29155-4

First edition
2016-10-15

Systems and software engineering — Information technology project performance benchmarking framework —

Part 4:
Guidance for data collection and maintenance

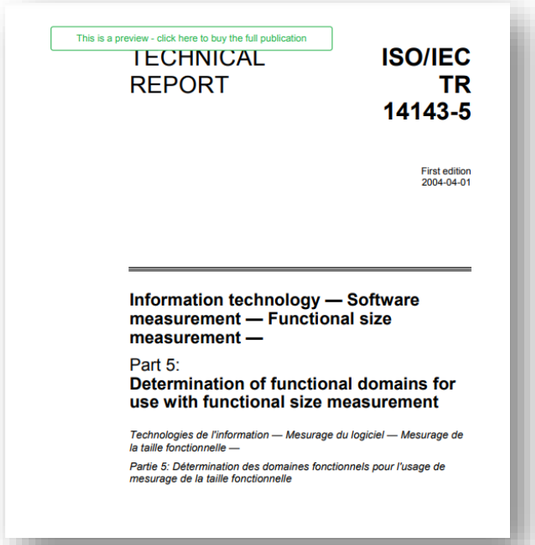
Ingénierie des systèmes et du logiciel — Cadre de conduite de tests de performance de projet de technologies de l'information —

Partie 4: Directives pour la collecte de données et la maintenance

- A multi-part standard created (also) by/withing ISBSG people for describing concepts and best practices about a proper benchmarking process
- Classifying projects in the proper manner is the way to obtain comparable data…

Dev & Enh project: same productivity?

ISO/IEC 14143-5 - Determination of functional domains for use with functional size measurement



- The **CHAR technique** is another input for creating clusters of ICT projects for a better and proper comparability…

Table A.5 — Human resources FUR evaluation

CHAR	Rating (see Table A.1)	CHAR Group	Rating (see Table A.2)	Functional Domain (see Table A.3)
Response	Negligible	Control- and Communication-Rich	negligible	**Information System**
Interfaces	Negligible			
System Management	Negligible			
Complex Data	Present	Data-Rich	Dominant	
Persistence	Present			
Manipulation	Present	Manipulation- and Algorithm-Rich	present	
Scientific/Engineering	Negligible			
Adaptive	Negligible			

Table B.3 — Mapping of software 'types' against the model of BFC Types

Term for 'Type of Software'	BFC Types (or their characteristics) typically found in the FUR of the Type of Software				Comment
	1. Transaction Class	2. Data Types	3. Information Creation Function Type	4. Requirement for Retention of Data Types	
Management Information Systems (Business transaction processing) Decision Support Business (Business Enterprise) Human resource Word Processing Spreadsheet	Passive	(Any)	Simple Boolean. Simple Arithmetic. Std. math's/stats.	Indefinite	Functional Domain 2. Business Data-Processing Application, as in Table B.2
Embedded Traffic Control	Pro-active	DET, Data Group	Simple Boolean. Simple Arithmetic.	Duration of processing	Functional Domain 4. 'Simple Process Control Software', as in Table B.2
Process Control (or 'Control System') Avionics Operating Systems E-mail Message router Device (printer, disk, etc) driver	Passive, Pro-active and Interruptible	DET, Data Group, Data Relationship	Simple Boolean. Simple Arithmetic. Business Domain-specific algorithms.	Indefinite	Functional Domain 5. 'Complex Process Control Software', as in Table B.2

Dev & Enh project: same productivity?

A new competence: the Measurement Specialist (April 26, 2021)…now in English!

NORMA ITALIANA

UNI 11621-6

APRILE 2021

Versione inglese del luglio 2024

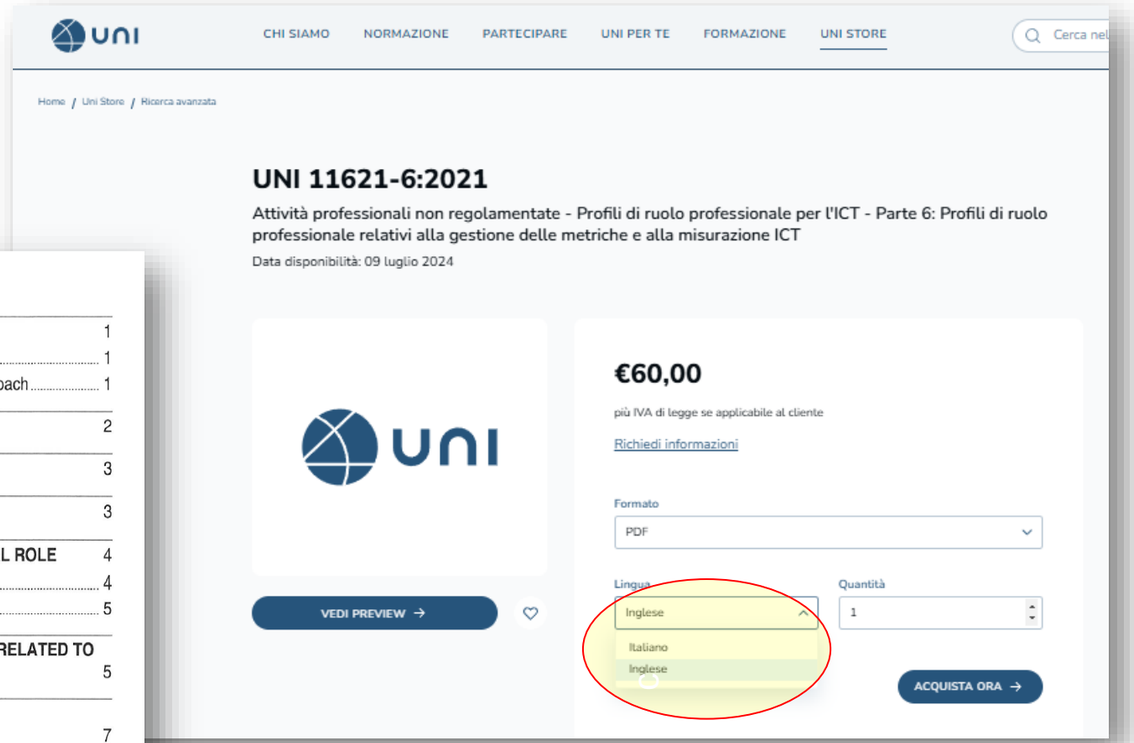
Unregulated professional activities – ICT professional role profiles – Part 6: ICT Professional role profiles for ICT metrics and measurement

Attività professionali non regolamentate – Profili di ruolo professionale per l'ICT – Parte 6: Profili di ruolo professionale relativi alla gestione delle metriche e alla misurazione ICT

TESTO INGLESE

ICS 35.020

CONTENT



http://store.uni.com/catalogo/uni-11621-6-2021

Dev & Enh project: same productivity?

Some conclusions…

✓**Productivity/PDR…nominal or not? That's the question!** → Fundamental to consider what is IN/OUT of the Effort values…all the PROJECT effort or only FUR-related effort? Also here, absolute value will vary in a significant way…fundamental to declare from the beginning the applied formula in order to minimize any potential estimation error.

✓**DEV, EHN, OPS** → Different project types should use and size different requirements types (see the «ABC schema»), producing different productivity/PDR levels

✓**Projects have not all the same productivity/PDR** → DEV projects typically count more functional elements than an ENH projects, determining a higher productivity (logical files not always are added/changed/deleted), but it depends on the % of ABC requirements in any project scope to be analyzed (and sized)…try with your own projects!

✓**Who can (mostly) impact on productivity levels?** → Customers/Product Owners are the ones providing requirements that must/should split each time into FUR/NFR/PRJ types…in any project the effort distribution by requirement type is 'original' and it is not possible to suppose a 'standard' distribution

✓**Standards can help…** → ISO 15939, 14143-x, 29155-x are good examples of how to measure, store and compare historical data for improving the Estimation process…why don't look at them?

✓**ISBSG D&E 2024 repository can help…**→ the current version of our D&E repository includes 12,521 projects and it's a very good source of information for any benchmarking analysis…**why don't try?**

An optimist will tell you the glass is half-full;
the pessimist, half-empty; and the engineer will tell you the glass is twice the size it needs to be

(Unknown)

Dev & Enh project: same productivity?

A bit of humour…

https://dilbert.com/

Dev & Enh project: same productivity?

Q & A

Thanks for your attention!