A (new) unified model of custom software costs determination in contracts.

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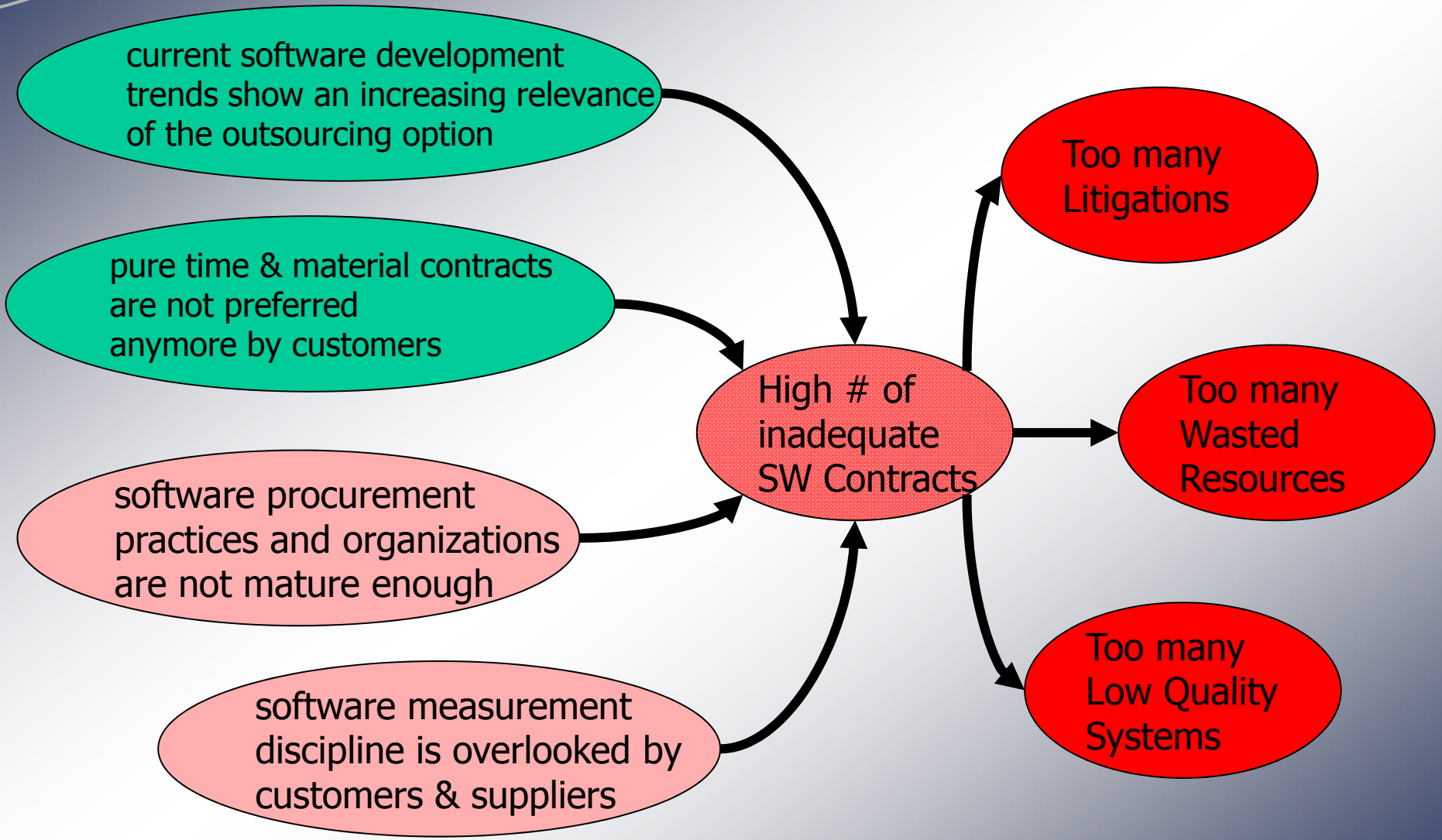
Preliminary considerations

The discipline and practice for software contracts is not as mature as in other industrial sectors.

- Legal expert
- Buyer
- Software manager
- Account
- Administrative

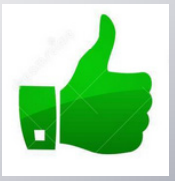
No “measurement culture” for software procurement

Houston, we have many problems!



Scope identification

- ex novo Development Activities
- extra-ordinary Functional Enhancement Maintenance (FEM)
- Custom Software
- Production cost
- Selling price



- Ordinary Maintenance
- Non Functional Maintenance
- COTS

A little ‘healthy provocation’…

- In 2014 AD, custom software is still valued in the market in the same way as oranges by the greengrocer:
  - Type of orange
  - Net weight in kg
  - Price per kg
  - Any transportation to home or collateral services…

Actually, in many custom software acquisitions the ‘collateral services’ component is even not considered …☹

Decoding the metaphor…

- The most popular “type of orange” corresponds to the technological environment of the custom software followed by the software application type.
- The most popular “weight unit” corresponds to IFPUG FP followed by COSMIC FP
- The most articulate and courageous “price engine” is a two-dimensional matrix in which the unitary price depends on two variables

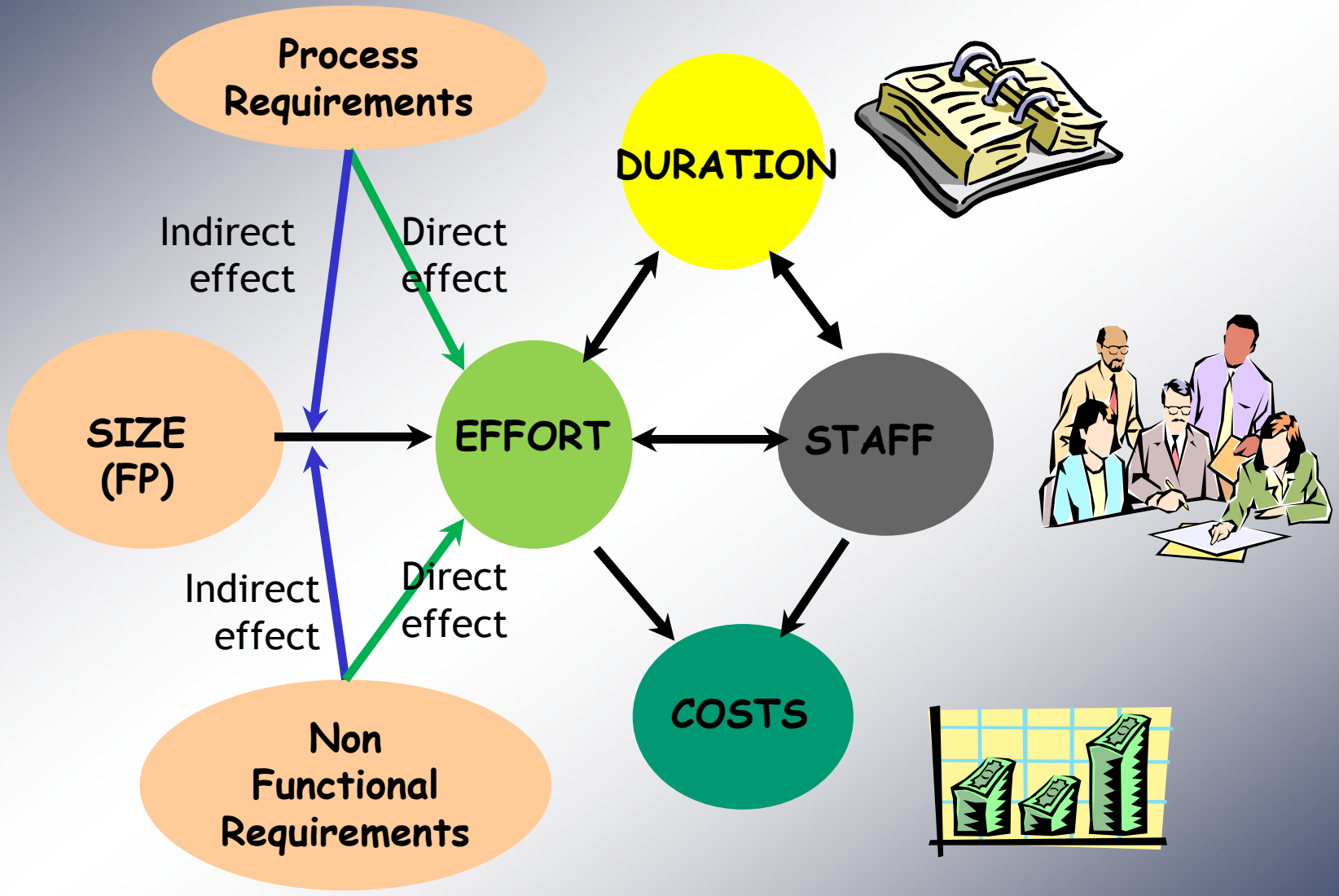
Is custom software like oranges ?

- “Built on demand based on requirements” **versus** “Standard product with default characteristics”.
- “Many not evident and interdependent quality attributes” **versus** “Few evident quality attributes”.
- “Each supply is different from other supplies even in the same class” **versus** “within a specific class (type of oranges) all the supplies are very similar”.

Custom software as a market good.

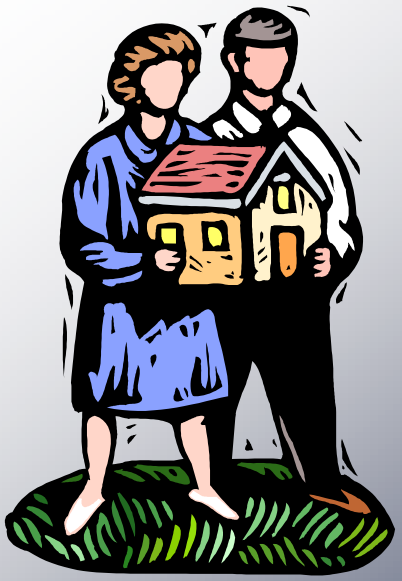
- Custom software is produced “on demand” based on customer’s requirements.
- Custom software is still a "labor intensive“ product and therefore its development cost is usually strongly correlated to the work to be done to release the required quantities.
- In a “perfect market”, selling prices should be strongly correlated with development costs.
- Two important modifiers are emerging...
  - The reuse of already done components
  - Automatic production technologies

Relations among variables



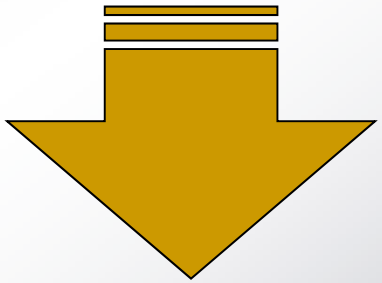
What kind of measures are available?

Technical vs. Logical



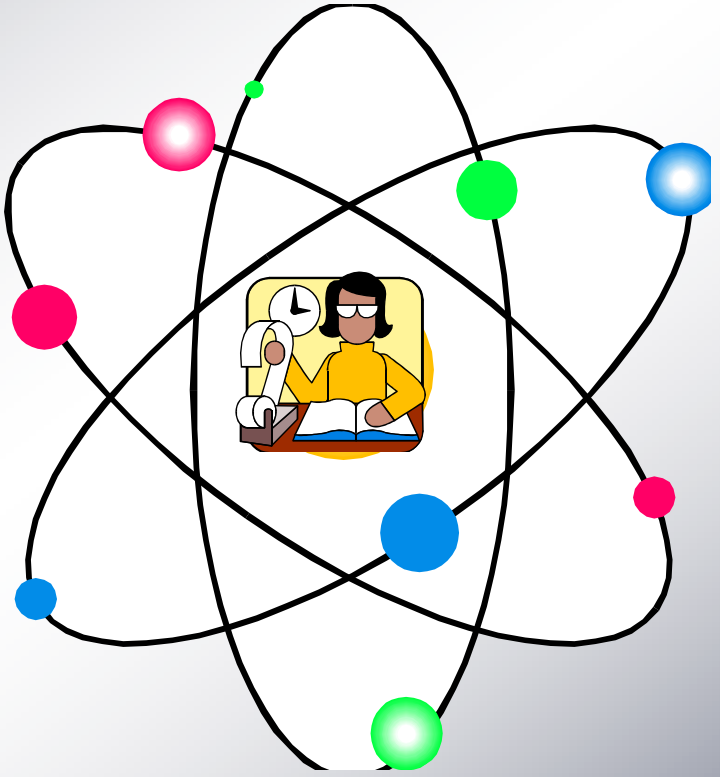
Technical metrics

LOC, number of programs, modules, reports, screens, classes, objects, components, boxes, widgets etc.

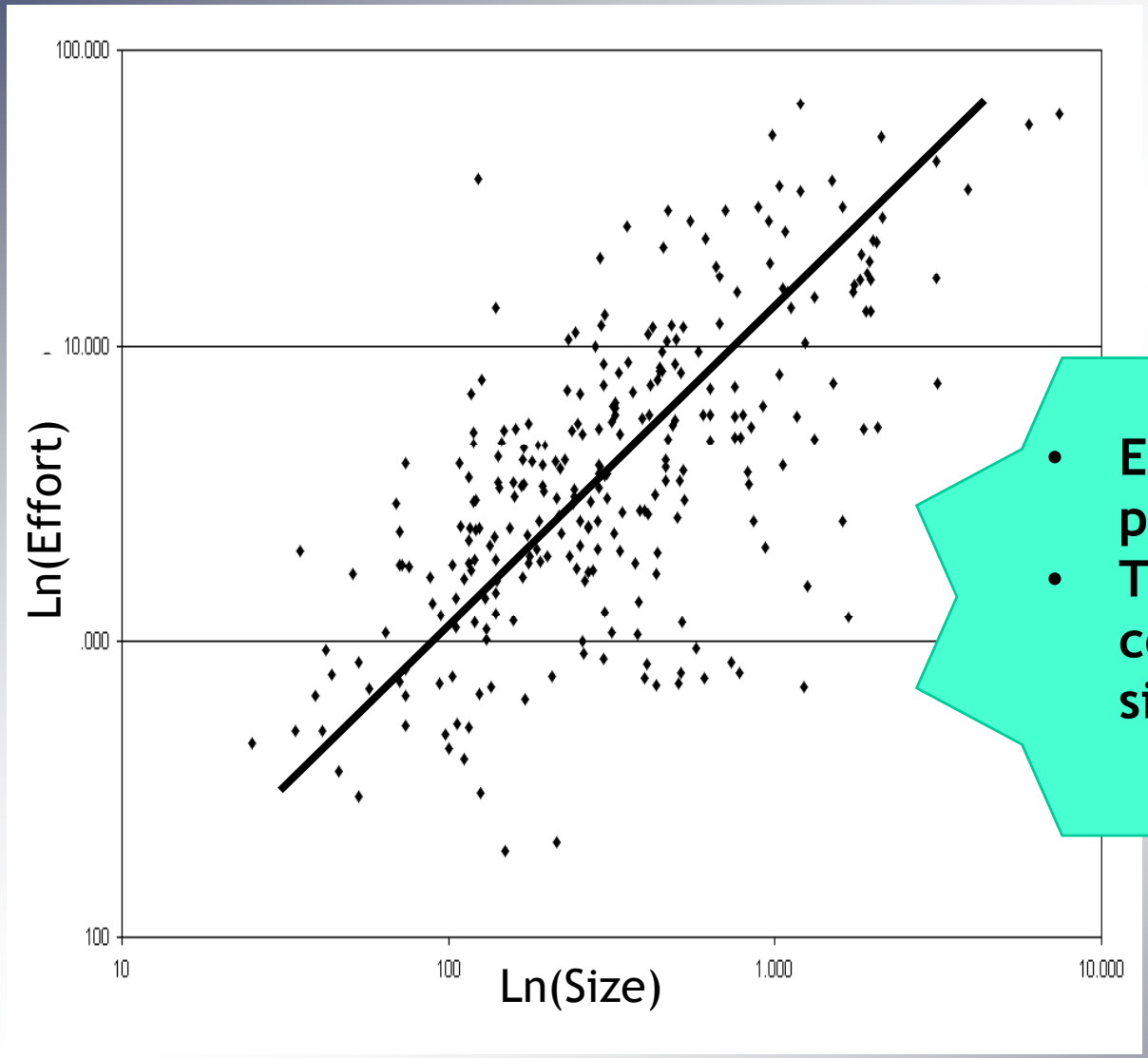


technology dependent

FSM (ISO 14143): a real revolution !



Effort = f(Size) ??



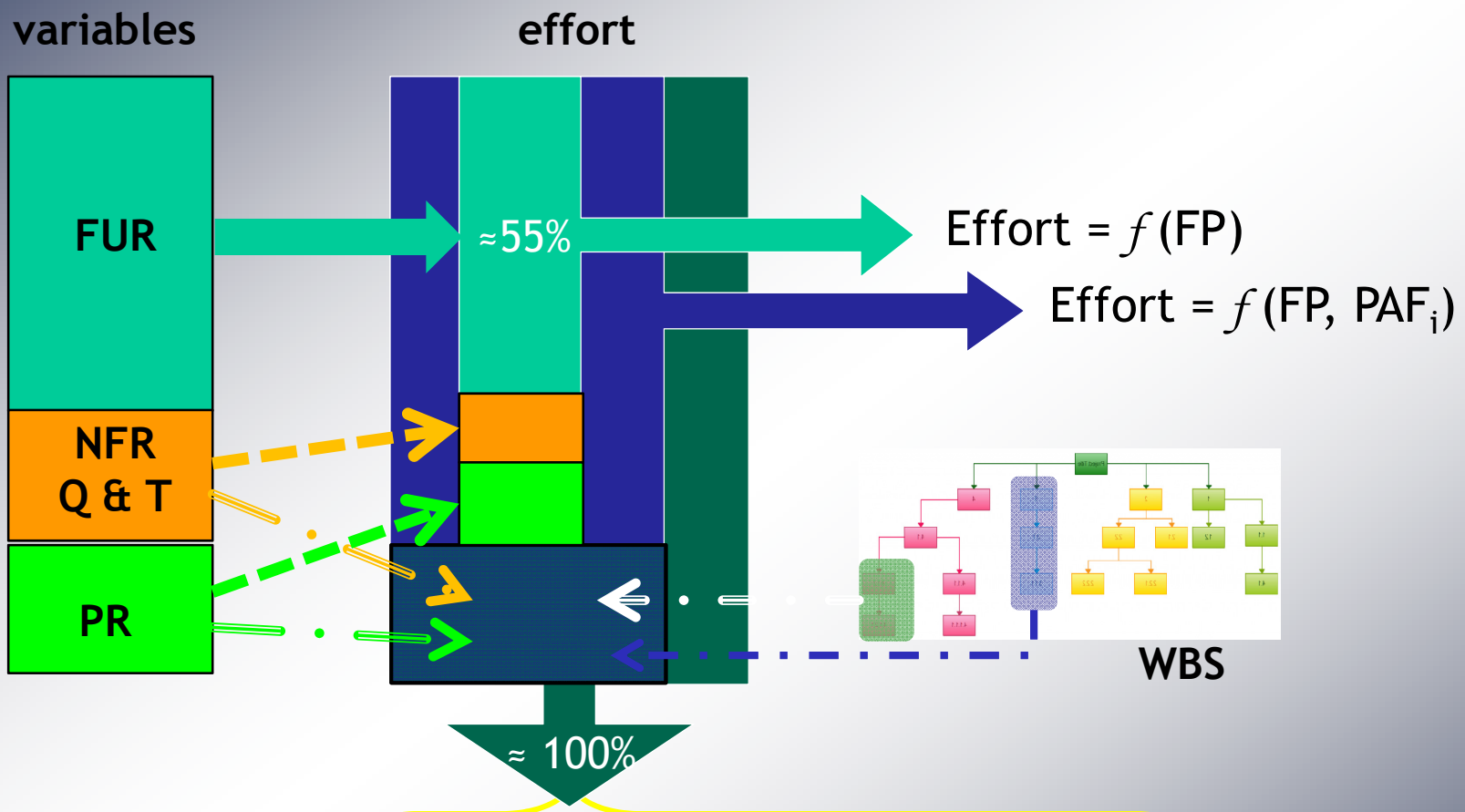
- Extremely variable productivity
- There is a correlation between size and effort

Not all costs are proportional to the FP

It makes no business and technical sense to "spread" the fixed costs of the project or related project components not proportional to FP on the price of the proportional component.

For example: the cost of installing an application does not depend on how big it is in FP but how many times it must be done and in what logistic situations

Effort derivation



$$\text{Effort} = f(FP) * \Pi_i PAF_i + \Sigma_j NFDE_j$$

FUR = Functional User Requirements
NFR = Non-Functional Requirements
PR = Process Requirements

PAF = Productivity Adjustment Factors
NFDE = Non Functional Dependent Effort

From effort to cost

Work costs and calendar duration summary						
Phase / Skill	Project Manager	Analyst	Software Designer	Programmer	Other	Work total cost
Project Management	€ 4.744,29	€ 922,50	€ -	€ -	€ -	€ 5.666,79
Quality control and Test	€ 1.186,07	€ 2.767,50	€ 658,93	€ -	€ -	€ 4.612,50
Functional Design	€ 889,55	€ 9.686,25	€ 2.470,98	€ -	€ -	€ 13.046,79
Technical Design	€ 296,52	€ 691,88	€ 1.976,79	€ 527,14	€ -	€ 3.492,32
Software Construction	€ 889,55	€ 1.383,75	€ 1.976,79	€ 5.139,64	€ -	€ 9.389,73
Final Test	€ 296,52	€ 691,88	€ 988,39	€ 1.317,86	€ -	€ 3.294,64
Roll out	€ -	€ -	€ -	€ -	€ -	€ -
Total	€ 8.302,50	€ 16.143,75	€ 8.071,88	€ 6.984,64	€ -	**€ 39.502,77**

From cost to price

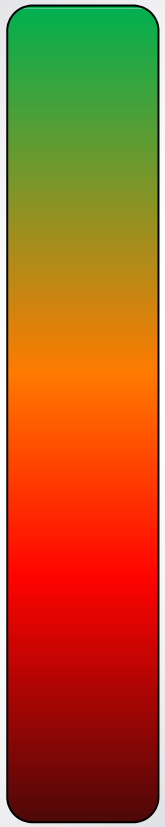
Margin

Contingency

General costs

Production costs

Price



Years‘90

Today

- **History of previous competitions**
- **Expectations / information on competitors**
- **Client ‘s available budget**

The goal

A model for market valuation of custom software must:

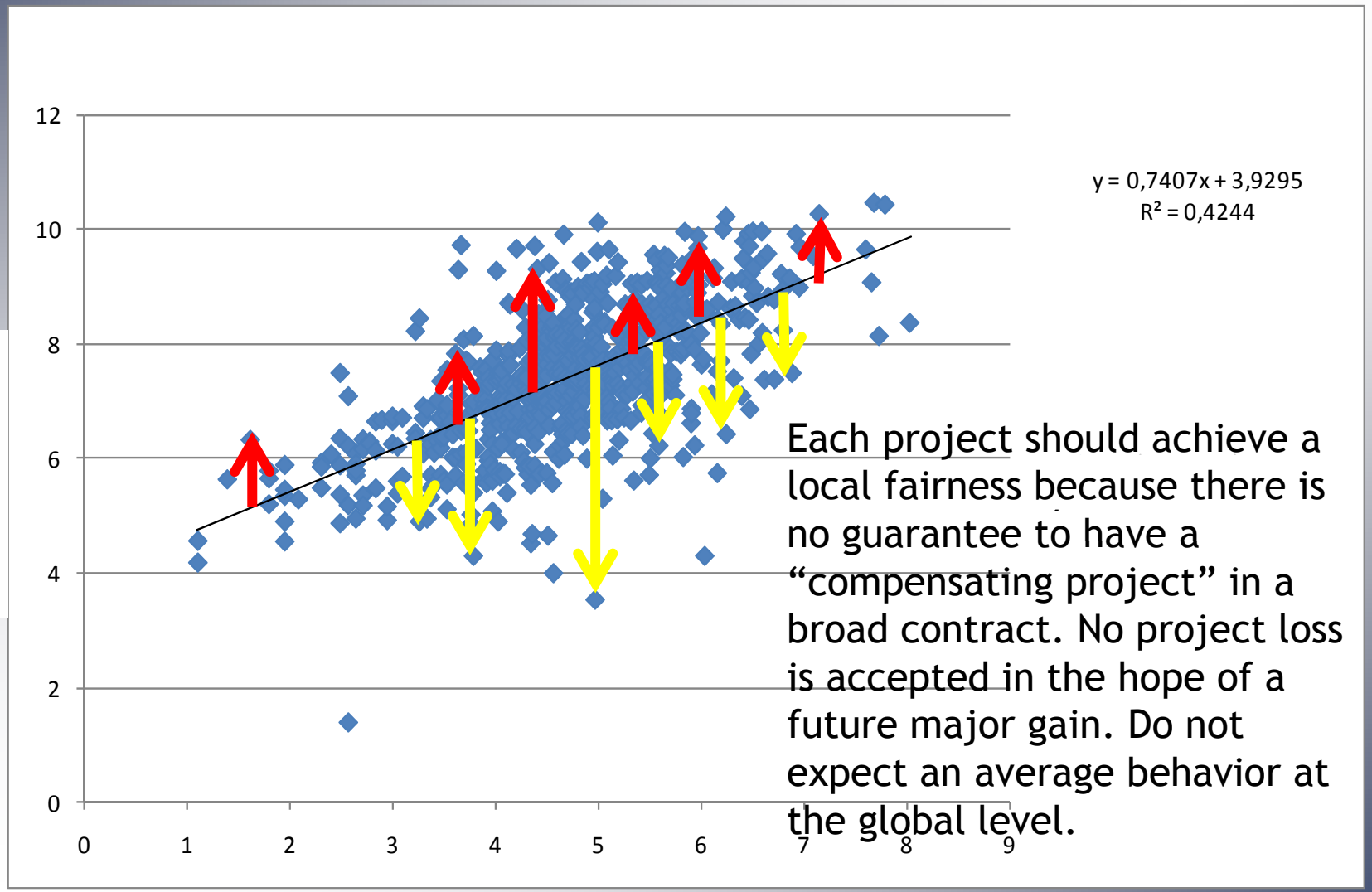
- Help to increase the predictability of the transactional costs
- Help to achieve the fairness of the transactions

… for the delight of customers and suppliers

Broad agreement

- General agreement between customer and supplier which defines the context in which individual supplies may take place with simplified procedures inheriting the general conditions and tailoring them to specific cases.
  - Rules to apply to specific supplies
  - Unitary Prices
  - Measuring Guidelines
  - Etc.

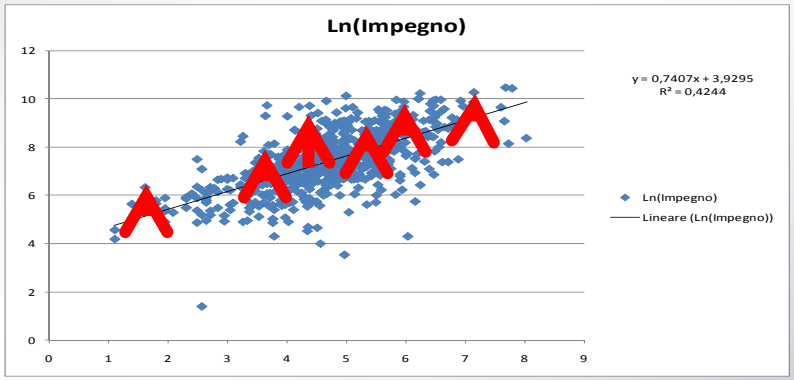
Global fairness vs. Local fairness

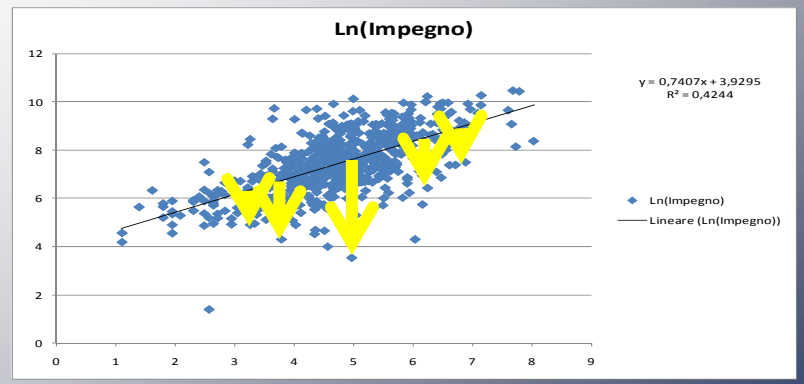


Each project should achieve a local fairness because there is no guarantee to have a "compensating project" in a broad contract. No project loss is accepted in the hope of a future major gain. Do not expect an average behavior at the global level.

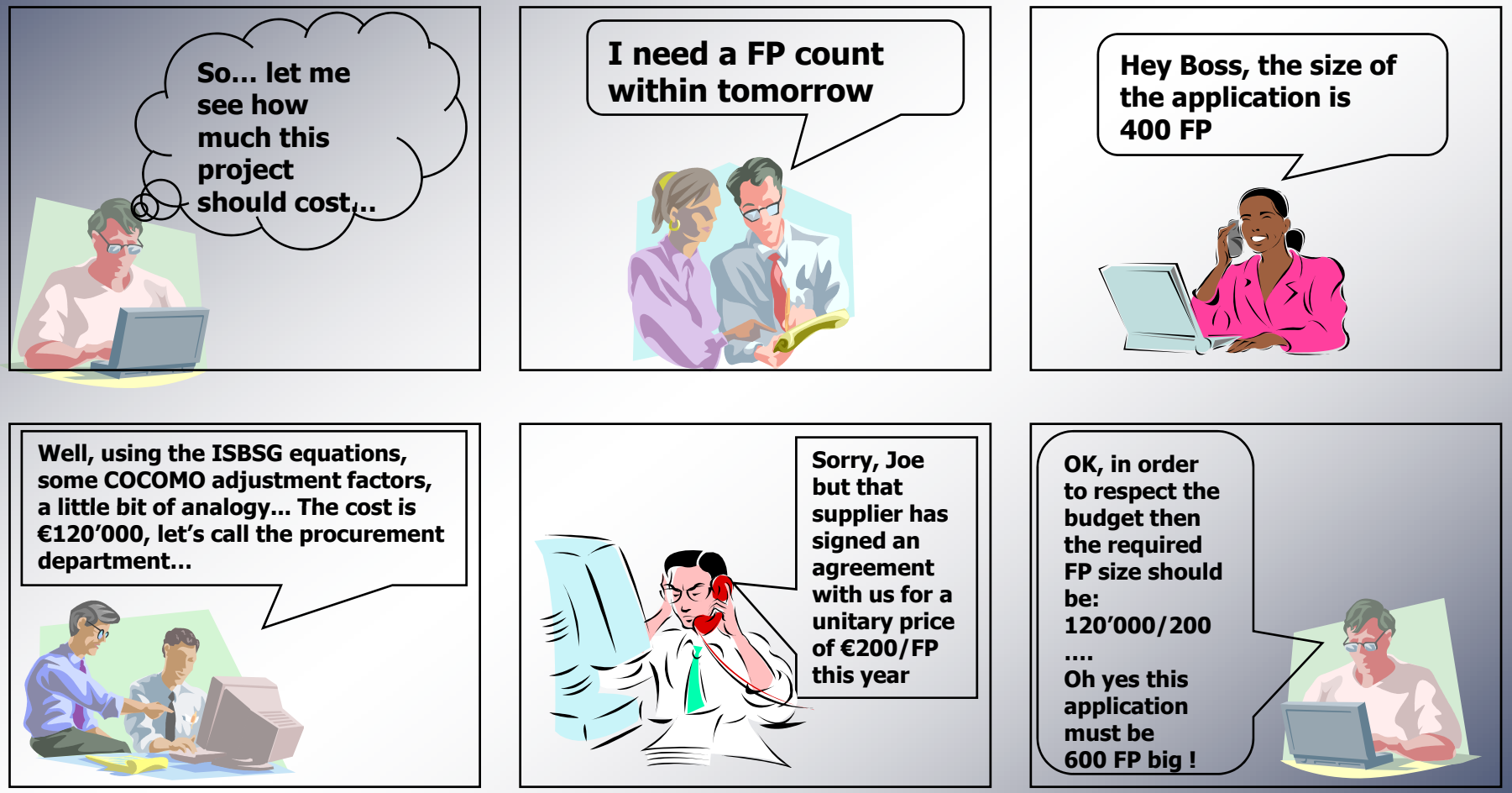
The first very common error !

- To have only one (or few) “fixed” or “constant” unitary price for all the initiatives in a broad contract.
  - No warranty that, during the specific contract, the projects will be equally distributed around the “average”.
  - Compensations tend to happen at the “project level” in any case but… they may be “biased” depending on the power of the contractual parts.





A typical workaround



Lack of control

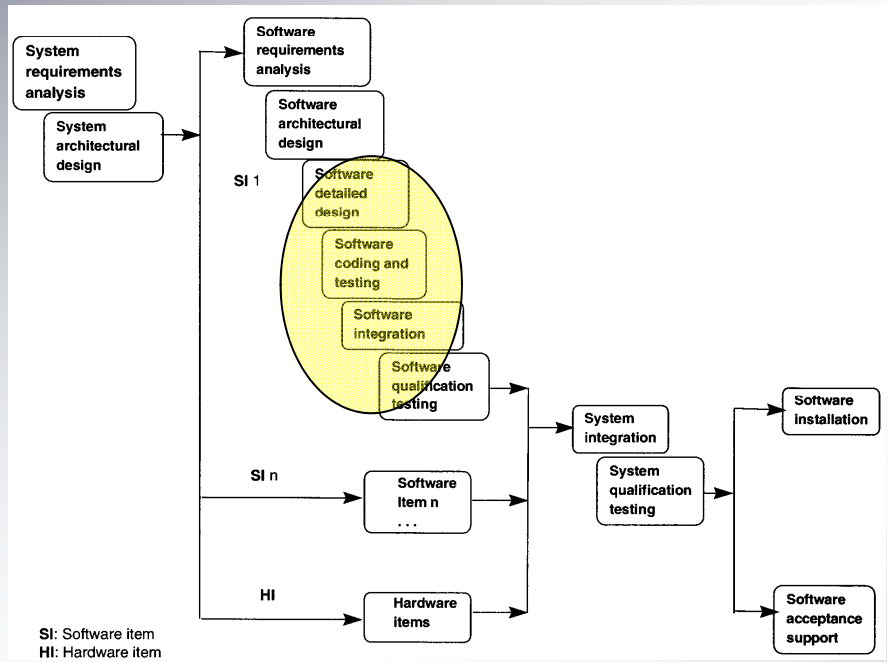
If no control is done on the delivered FP quantities on which the supplier's invoices are based then there is the eventuality that the contractual price is not the "actual" price used to manage the contract.

What elements are to be considered ?

- Scope of the supply
- Software size
- Reuse - Replication
- Software quality
- Technical constraints
- Production factors
- On going Change Request
- Early termination

Scope of the supply

- It does not influence size
- It does influence unitary prices



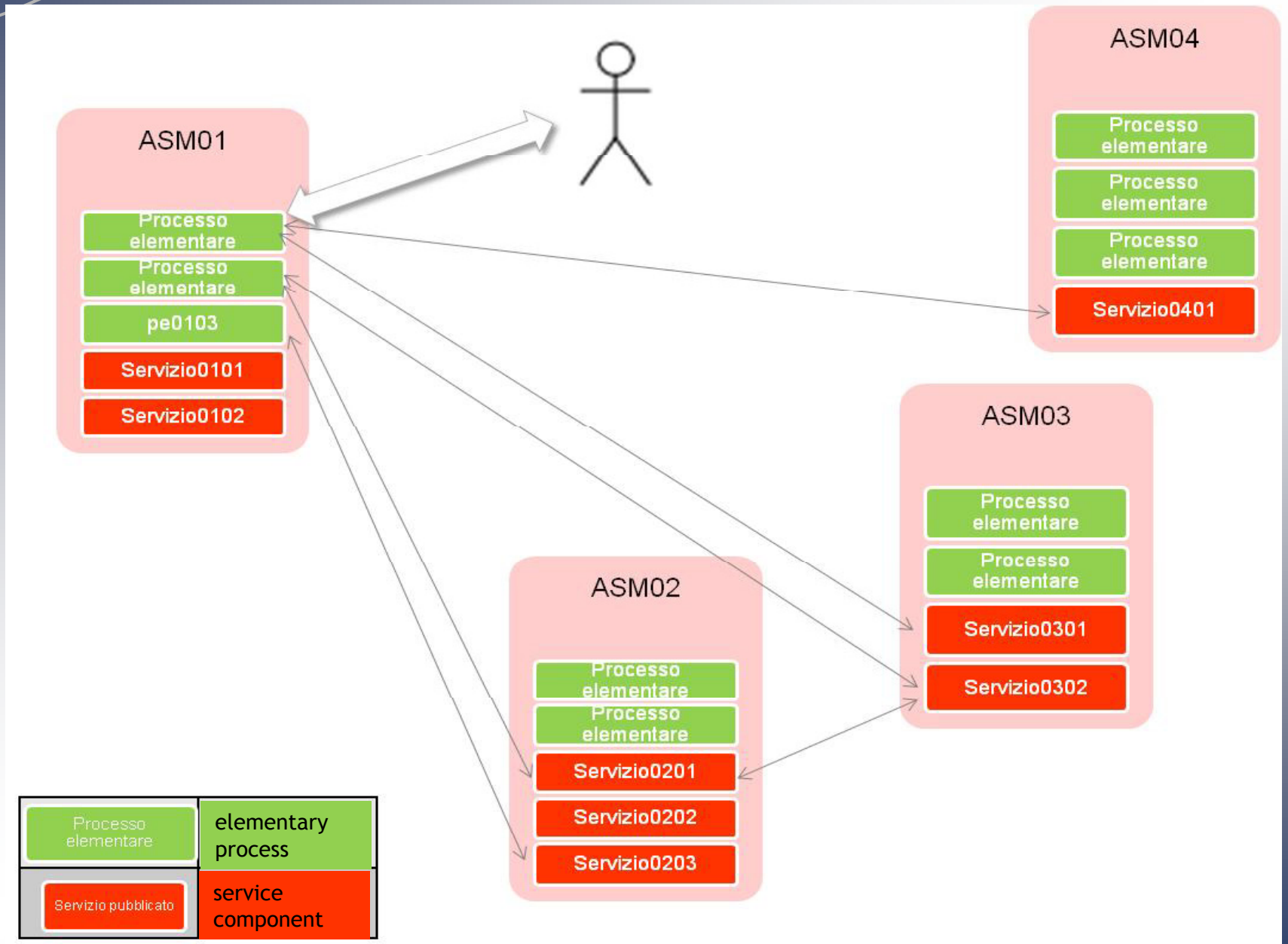
Software size

YES, Function Points !

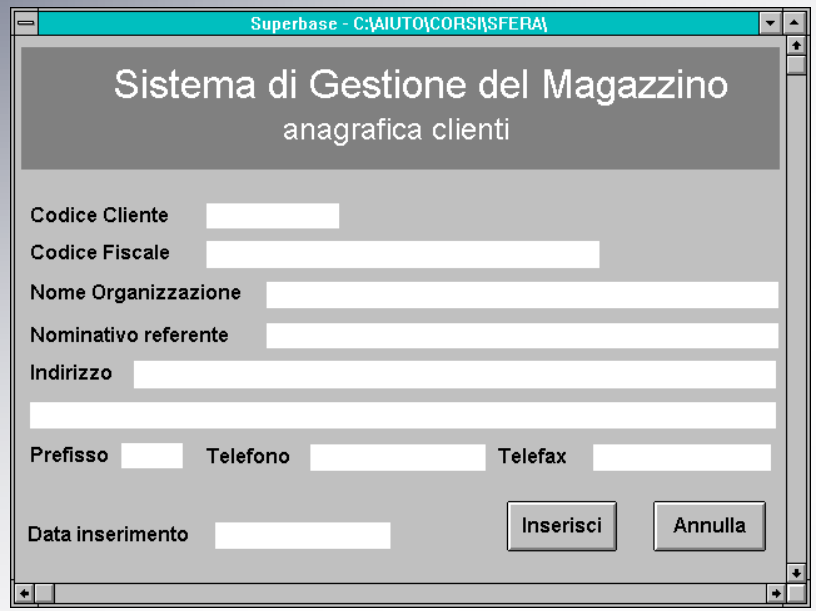
Generic Reuse

- The Generic Reuse is a mean of interception of reuse of specifications, code documentation and test cases based on the recognition of "functional similarities" between transactions and logical archives.

Component Reuse



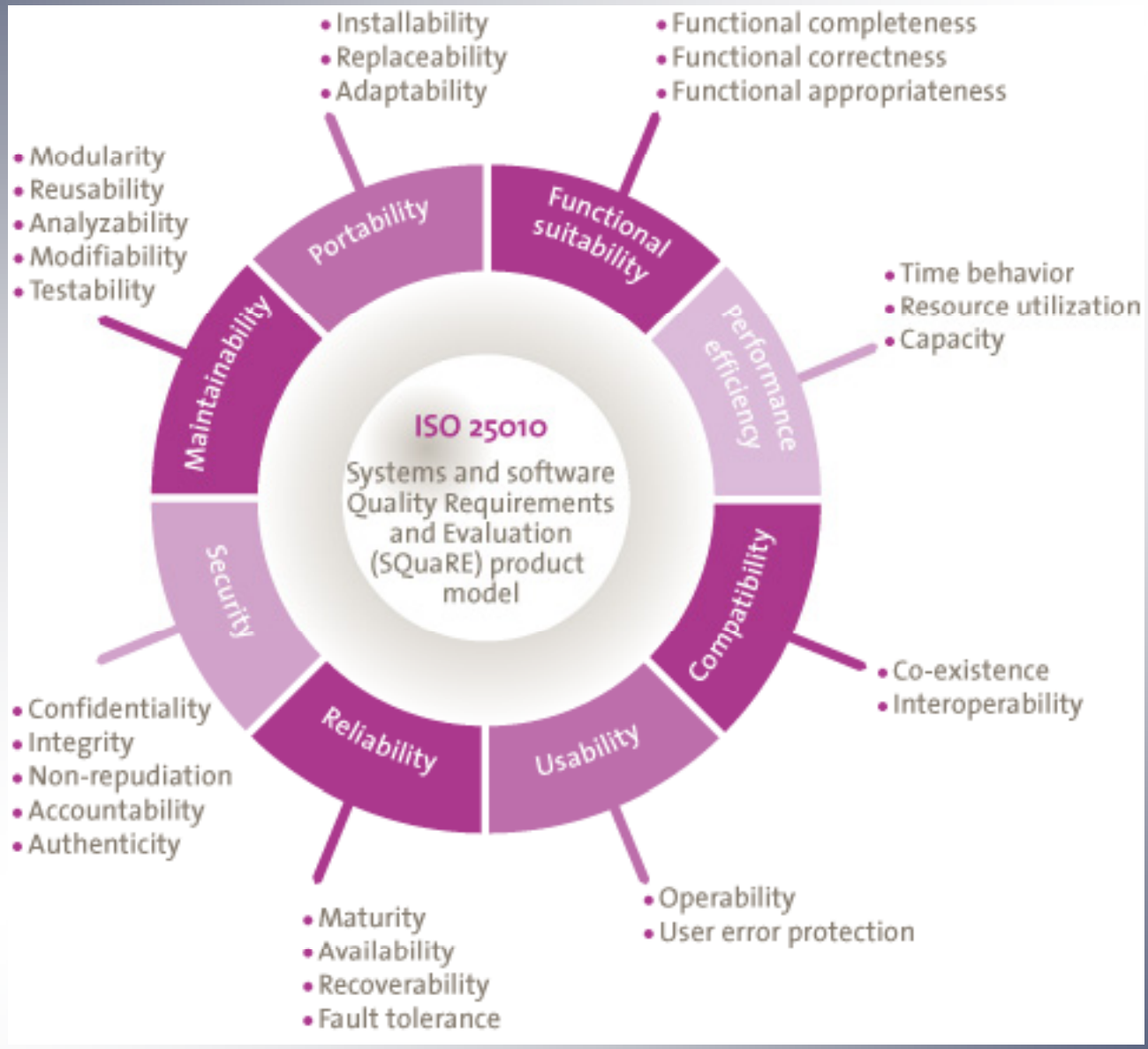
Replication



Same functionalities (EI,EO,EQ, ILF,EIF)

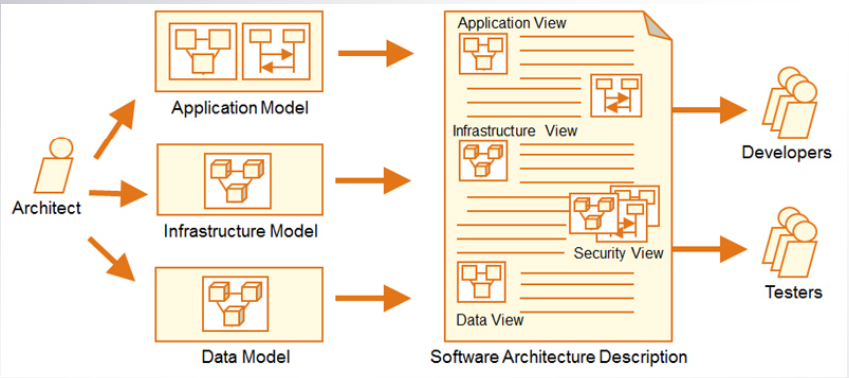
Different platforms

Product Quality



Technical constraints

Imposed by Customer's requirements !

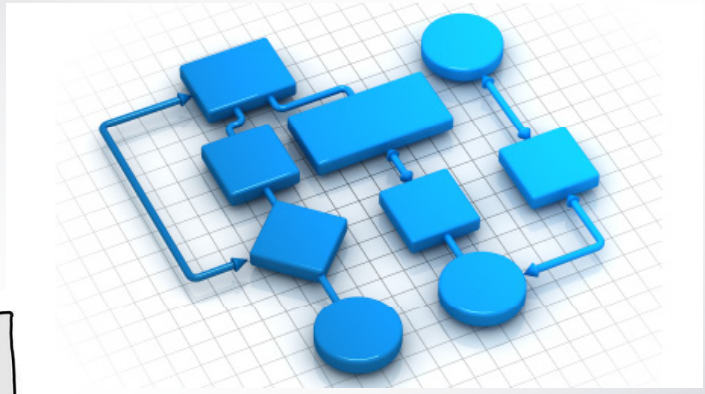


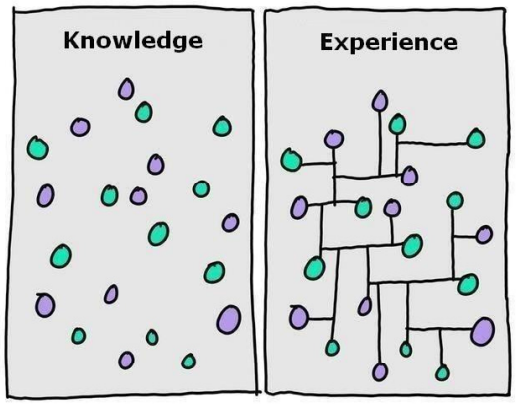
Architecture

Programming Language

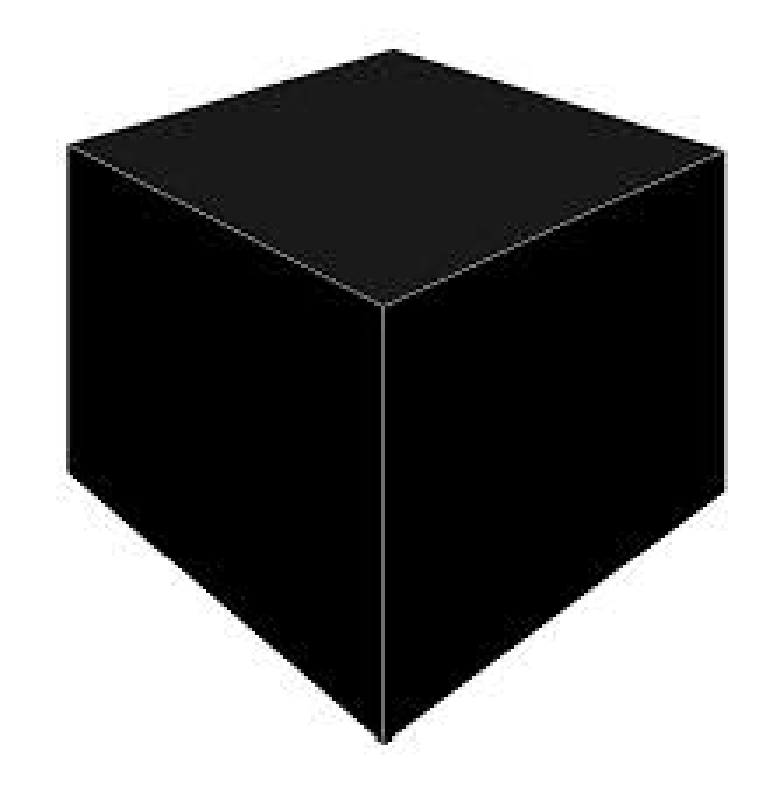
etc. etc.

Production factors





Only visible factors please !



Unifyed Cost Model

$$Price = CFM * AUP + \Sigma_j NFDP_j$$

- From NFR
- From process requirements

- Reuse by similarity
- Reuse by component
- Replication
- On going CR

- NUP - Nominal Unitary Price
- PAF from NFR
- PAF from process requirements

CFM = Contractual Functional Measure
AUP = Adjusted Unitary Price
NFDP = Non Functional Dependent Price
PAF = Productivity Adjustment Factor

Simple tender rules

DICH

– che la percentuale di sconto "Sc_T", che sa
riferimento del Contratto (giorni-persona e
Tabella 1:

Only one tender discount

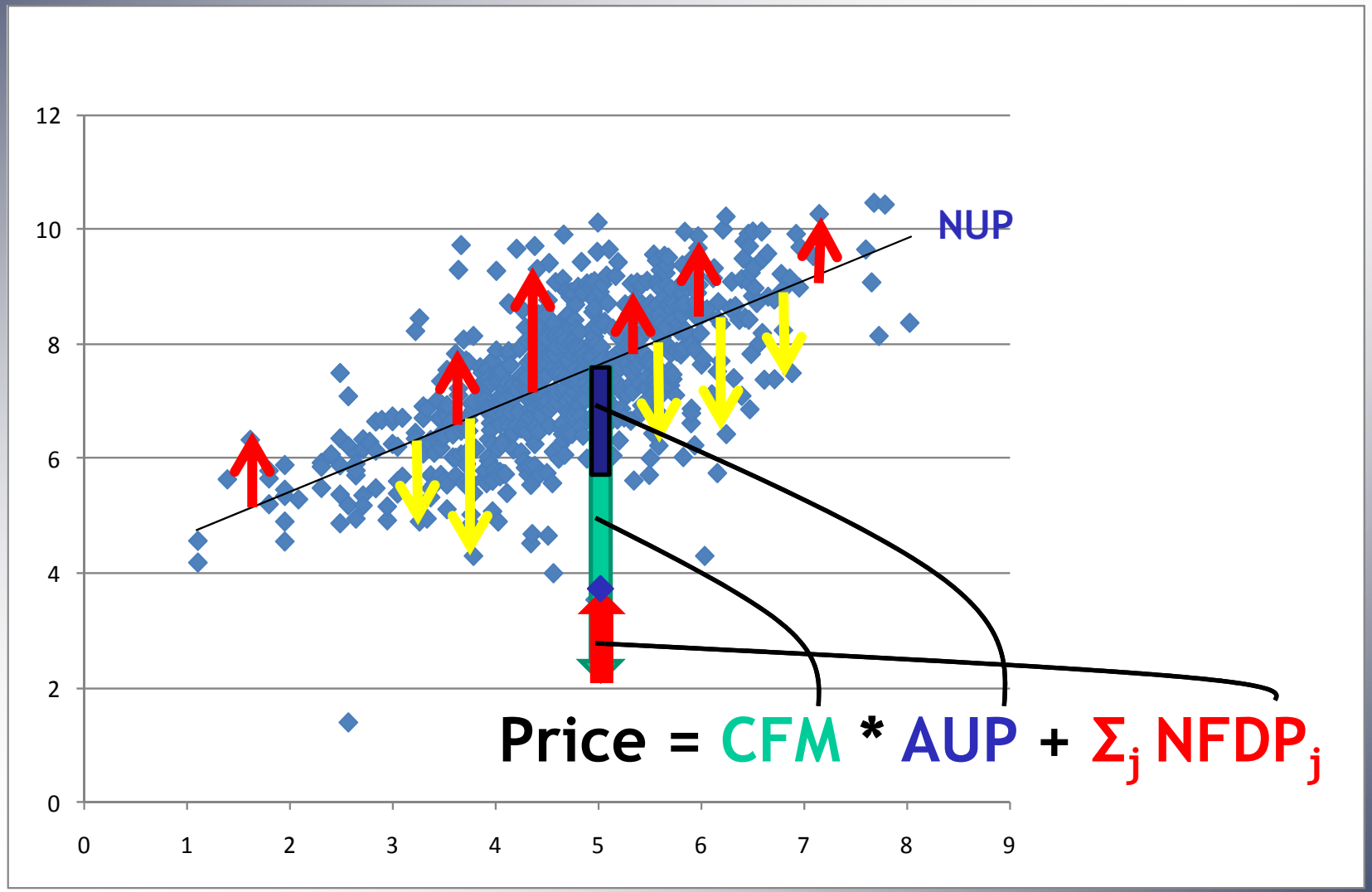
Sc_T PERCENTUALE OFFERTA DI SCONTO UNICO SU TUTTE LE TARIFFE UNITARIE DEL LISTINO DI RIFERIMENTO	IN CIFRE Sc_T = _____ %
	IN LETTERE Sc_T= _____ per cento

Tabella 1 - PERCENTUALE OFFERTA DI SCONTO UNICO APPLICATA ALLE TARIFFE UNITARIE

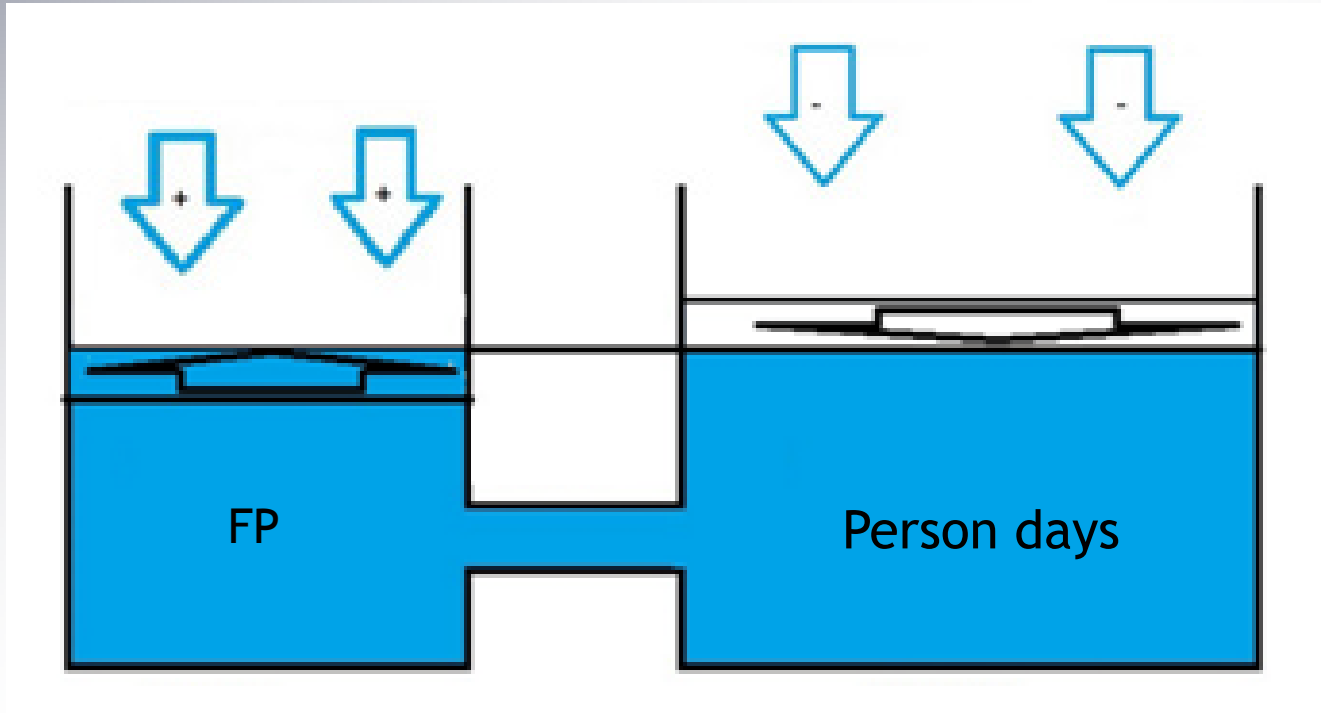
30%

Code	Description	Required Volume	Unitary Price	Maximum Value	Offered Value
C1-A	Functional Dependent Price (FDP)	50'000 FP	250,00 €/FP	12'500'000,00€	8'750'000,00 €
C1-B	Non Functional Dependent Price (NFDP)	1'000 PD	350,00 €/PD	350'000,00€	245'000,00 €
…	…	…	..	…	

general fairness vs. local fairness



Resource migration



Simple as a form….

Project Price

Contractual Functional Measurement (CFM)		0
Nominal Unitary Price (NUP)		€ -
Production Model Correction (PMC)		1.00
NUP General Adjustment Factor (GAF)		1.00
Adjusted Unitary Price (AUP)		€ -
Functional Dependent Price (FDP)	€	-
Non Functional Dependent Price (NFDP)	€	-
Total Price	€	-

Professional Mix Unitary Price (PMUP)	€ -

Non Functional Dependent Factors

	Person days	Price
NFDF 1	0	€ -
NFDF …	0	€ -
NFDF N	0	€ -

Non Functional Dependent Price (NFDP)	0.00	€ -

Conclusions

- Software is a complex asset and can not be acquired by the same rules of a vegetable food .
- The functional measure is a primary driver of cost because it is linked to the needs and the value for the user but needs correctives.
- The corrective actions may impact the size in itself (reuse / replication), the unitary price of the size or may be not proportional to the size.
- A new contractual cost model must take into account all these aspects but merely those visible in the customer-supplier relationship.
- The model requires a local calibration to be adapted to different companies.

Any question ?