

20th IMEKO TC4 International Symposium
Measurement of Electrical Quantities

BENEVENTO - ITALY | SEPTEMBER 15 - 17 2014



Software Product Quality

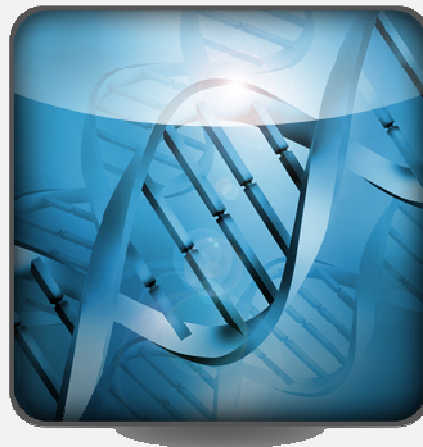
Some Thoughts about its Evolution and Perspectives

Luigi Buglione, *GUFPI-ISMA (Gruppo Utenti Function Point Italia – Italian Software Metrics Association)*



Goals of the presentation

- ✓ 1. Discuss the Quality issue in Software Projects
- ✓ 2. Introduce most known Software Quality product models
- ✓ 3. Propose possible perspectives and developments from an evolutionary perspective



GUFPI-ISMA



Gruppo Utenti Function Point Italia
Italian Software Metrics Association

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Gruppo Utenti Function Point Italia Italian Software Metrics Association
Il GUFPI-ISMA è l'associazione italiana per la promozione, la diffusione e lo sviluppo delle tecniche quantitative di misurazione del software, inclusi i metodi di misurazione della dimensione funzionale Function Point IFPUG e COSMIC.



NEWS:

6 agosto 2014

L'evento del prossimo [9 settembre a Milano](#) sarà valido per il CEP!
Vi aspettiamo!

16 luglio 2014

Patrocinio di CDTI e ITA-STQB per l'evento del prossimo [9 settembre a Milano](#)...!
Vi aspettiamo!
All'interno dell' [area eventi](#) inserito nuovo materiale (2007).

13 luglio 2014

Continua l'attività di recupero del materiale storico della nostra associazione.
All'interno dell' [area soci/documentazione](#) inserito nuovo materiale.
All'interno dell' [area eventi](#) inserito nuovo materiale (2007).

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Agenda



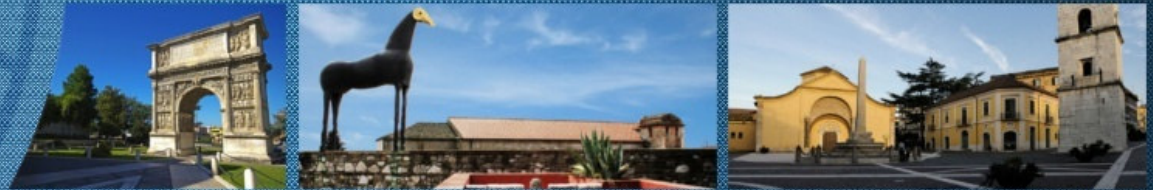
- **Introduction**
 - What is Quality?
 - Some basic questions
- **A Short History of Quality Models (QM)**
 1. FCM (Factor-Criteria-Model)
 2. Boehm's Quality Model
 3. ISO (9126 → 25010)
 4. Other possible QM
- **Possible Criteria for a QM**
 - Stakeholders
 - Grouping Criteria
- **Quality Models and the Next Decade**
 - Content, Usage
 - Perspectives/Viewpoint, Measurement
- **Conclusions & Next Steps**
- **Q&A**



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Introduction

What is Quality?



- (1)** degree to which a system, component, or process meets specified requirements ([*IEEE 829-2008 IEEE Standard for Software and System Test Documentation*, 3.1.25](#))
- (2)** ability of a product, service, system, component, or process to meet customer or user needs, expectations, or requirements ([*ISO/IEC/IEEE 24765:2010 Systems and software engineering--Vocabulary*](#))
- (3)** degree to which the system satisfies the stated and implied needs of its various stakeholders, and thus provides value ([*ISO/IEC 25010:2011 Systems and software engineering--Systems and software Quality Requirements and Evaluation \(SQuaRE\)--System and software quality models*, 3.1](#))
- (4)** degree to which a system, component, or process meets customer or user needs or expectations ([*IEEE 829-2008 IEEE Standard for Software and System Test Documentation*, 3.1.25](#))
- (5)** the degree to which a set of inherent characteristics fulfils requirements ([*A Guide to the Project Management Body of Knowledge \(PMBOK\(R\) Guide\) -- Fifth Edition*](#))

Three steps back...



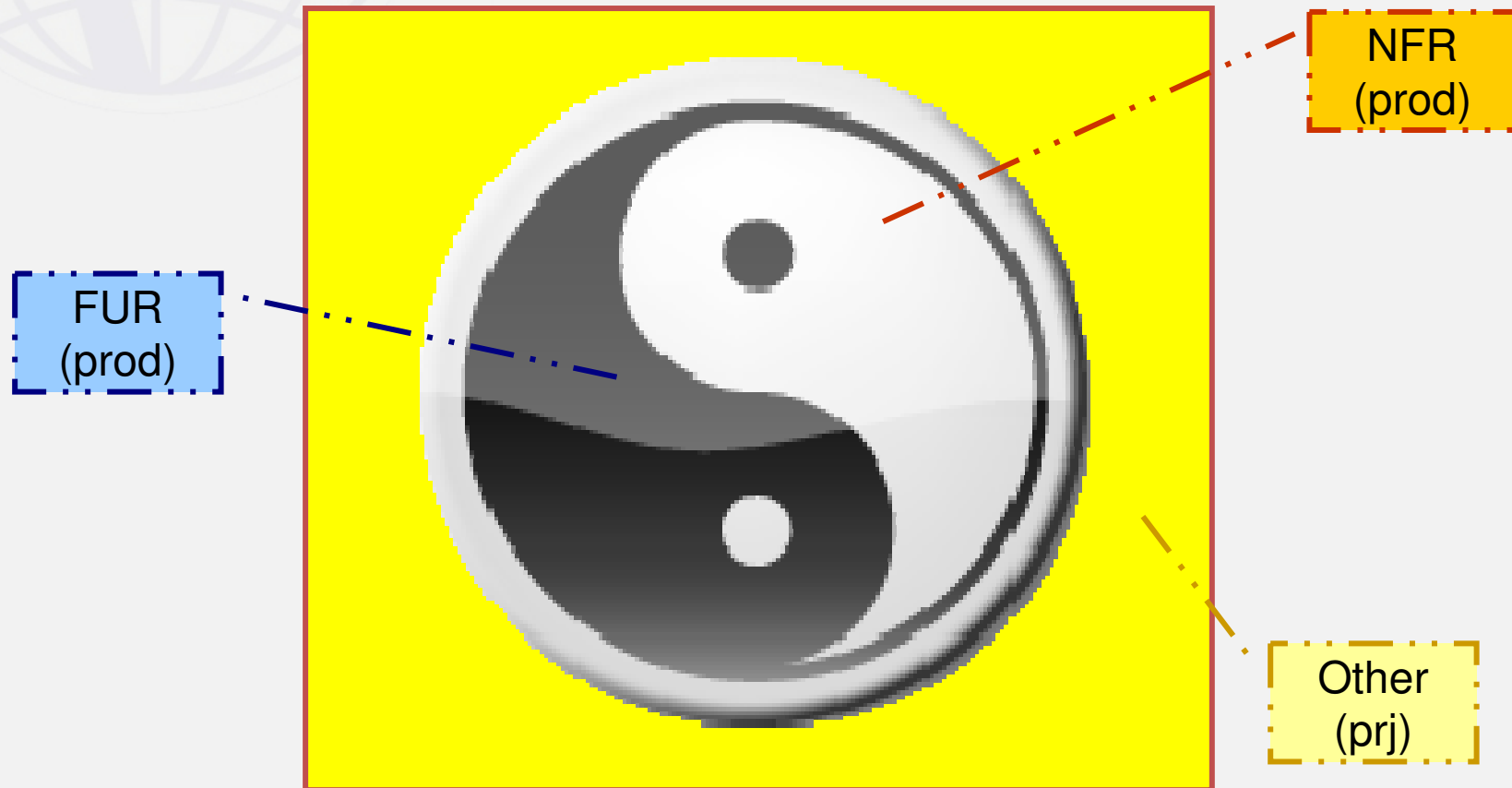
You cannot control what you cannot measure but...

...You cannot measure what you cannot define but...

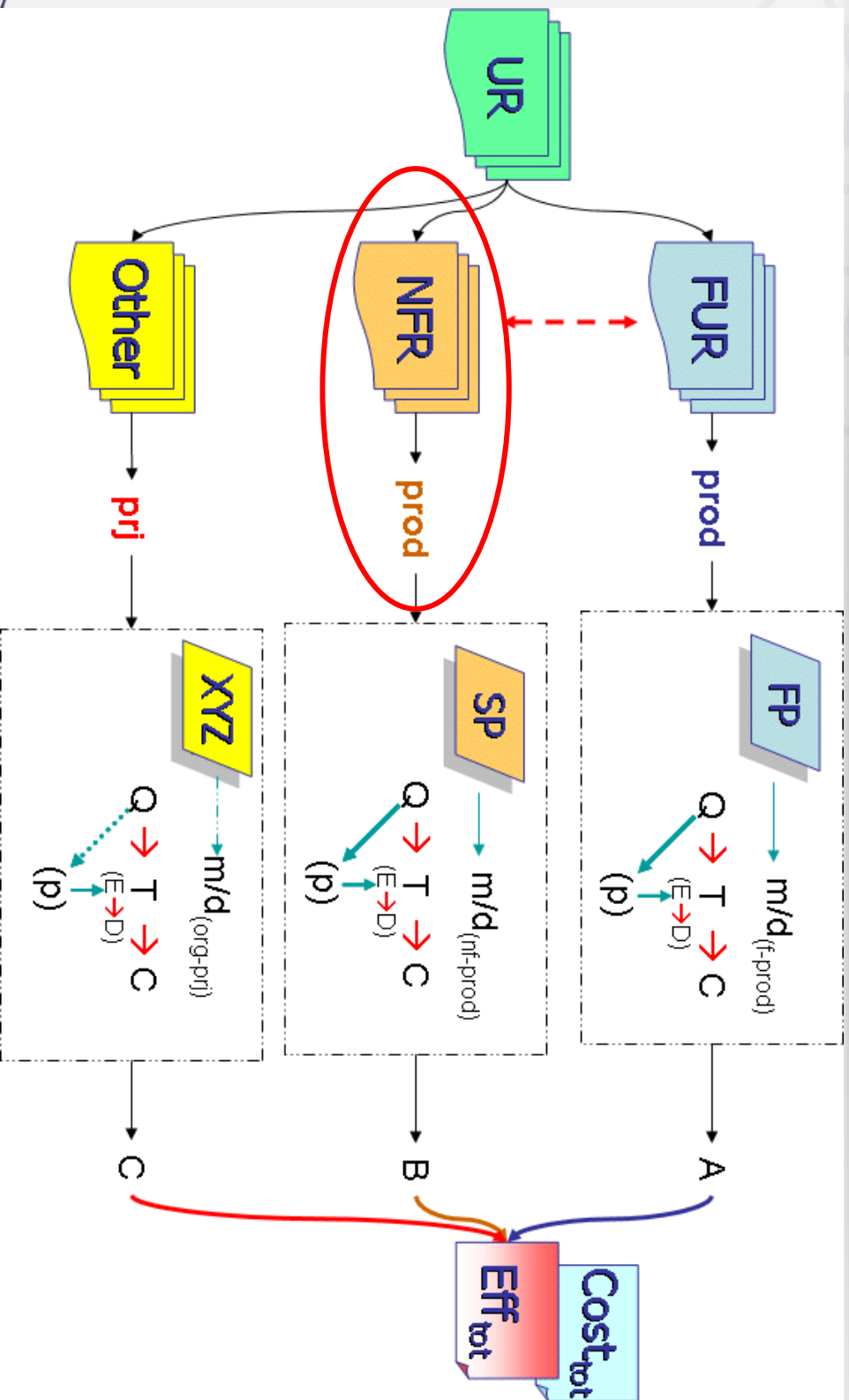
...You cannot define what you don't know...



A Yin-Yang based-view



Business-Contractual Issues



Source: Buglione L., The Next Frontier: Measuring and Evaluating the NonFunctional Productivity, MetricViews, IFPUG Newsletter, Vol.6 Issue No.2, August 2012, pp.11-14, <http://www.ifpug.org/metricviews/>

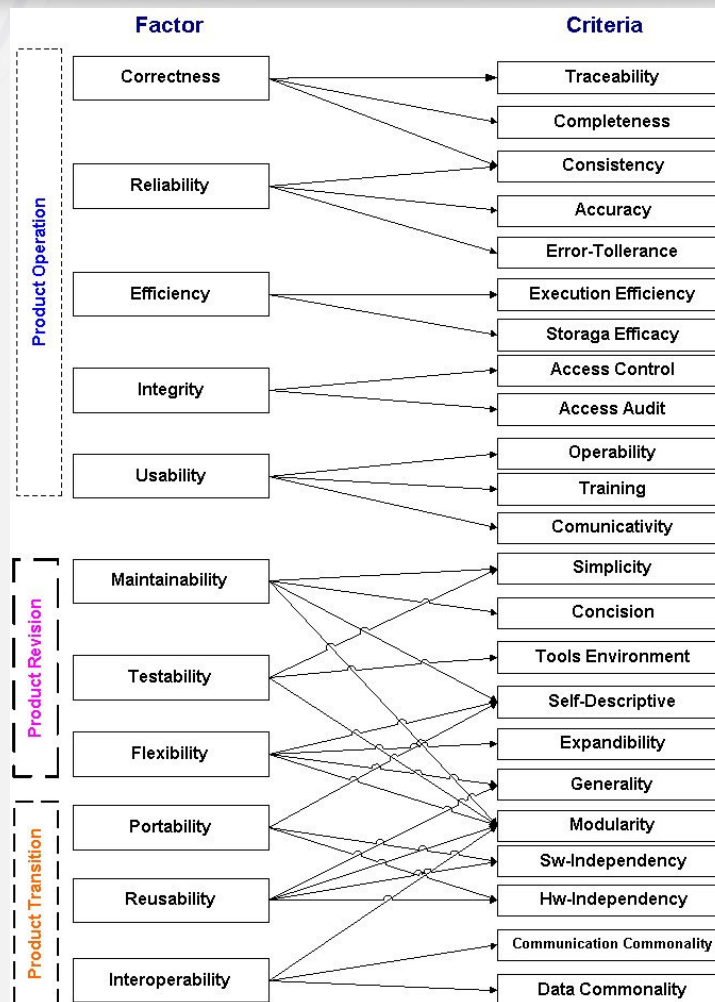
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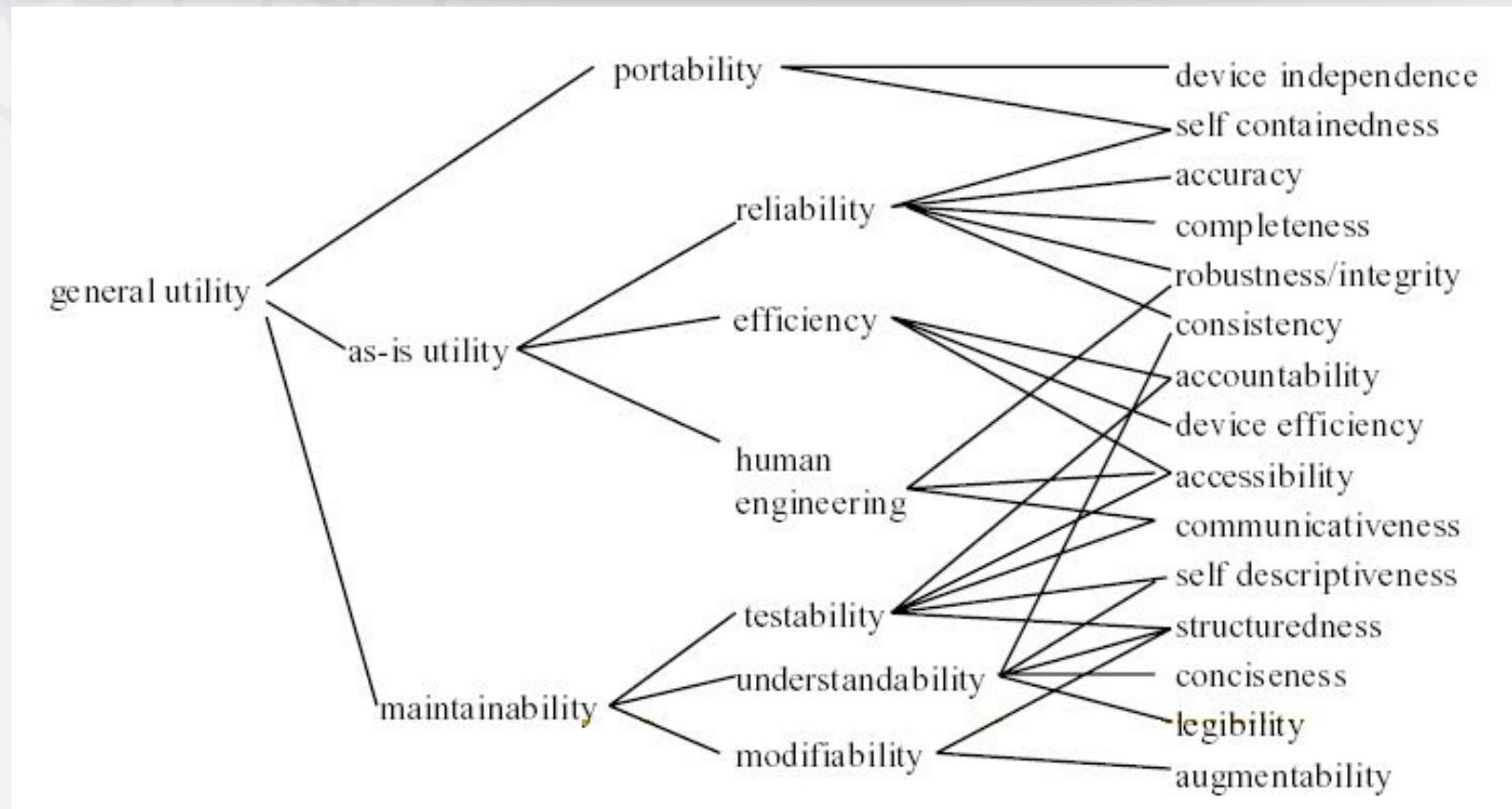


A short history of Quality Models

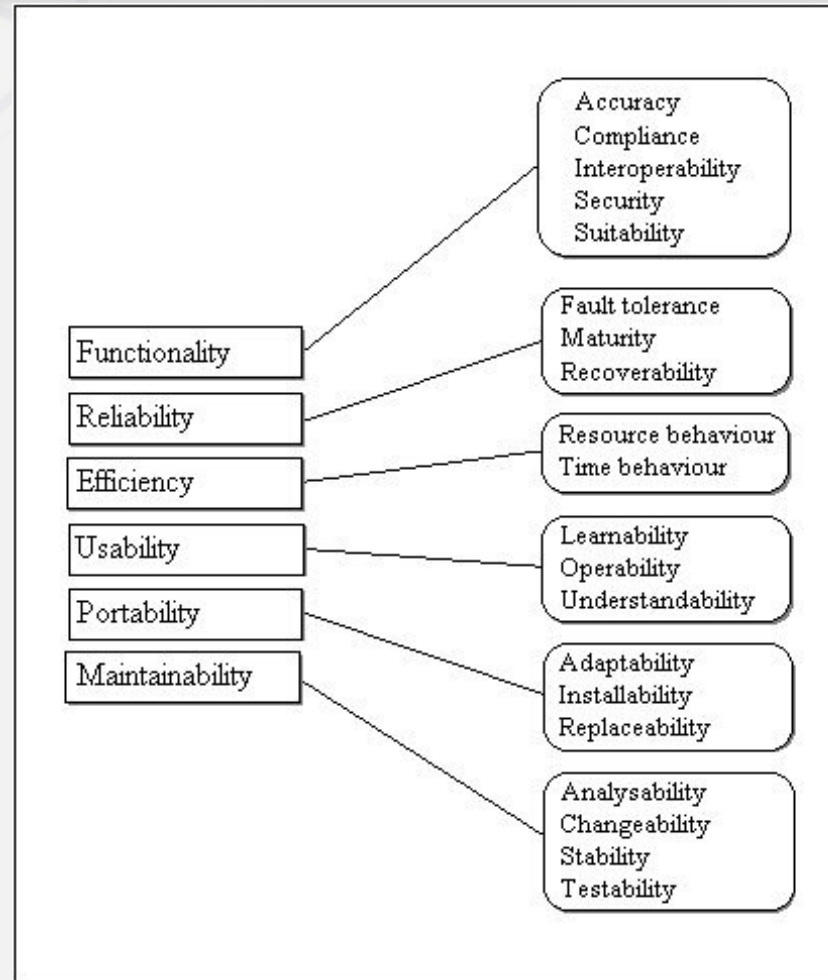
1977: Factor-Criteria-Model (FCM)



1978: Boehm's QM

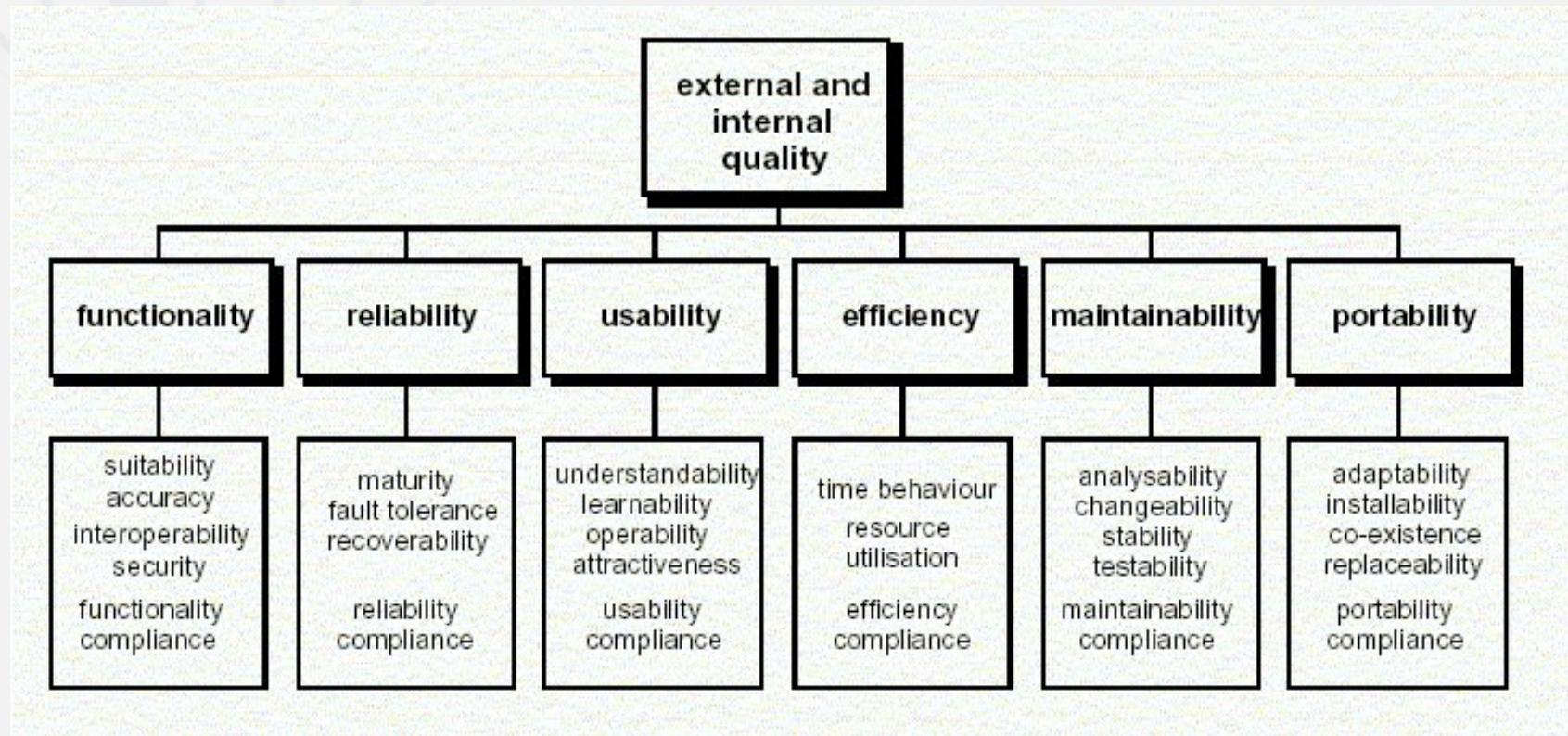


ISO/IEC 9126:1991



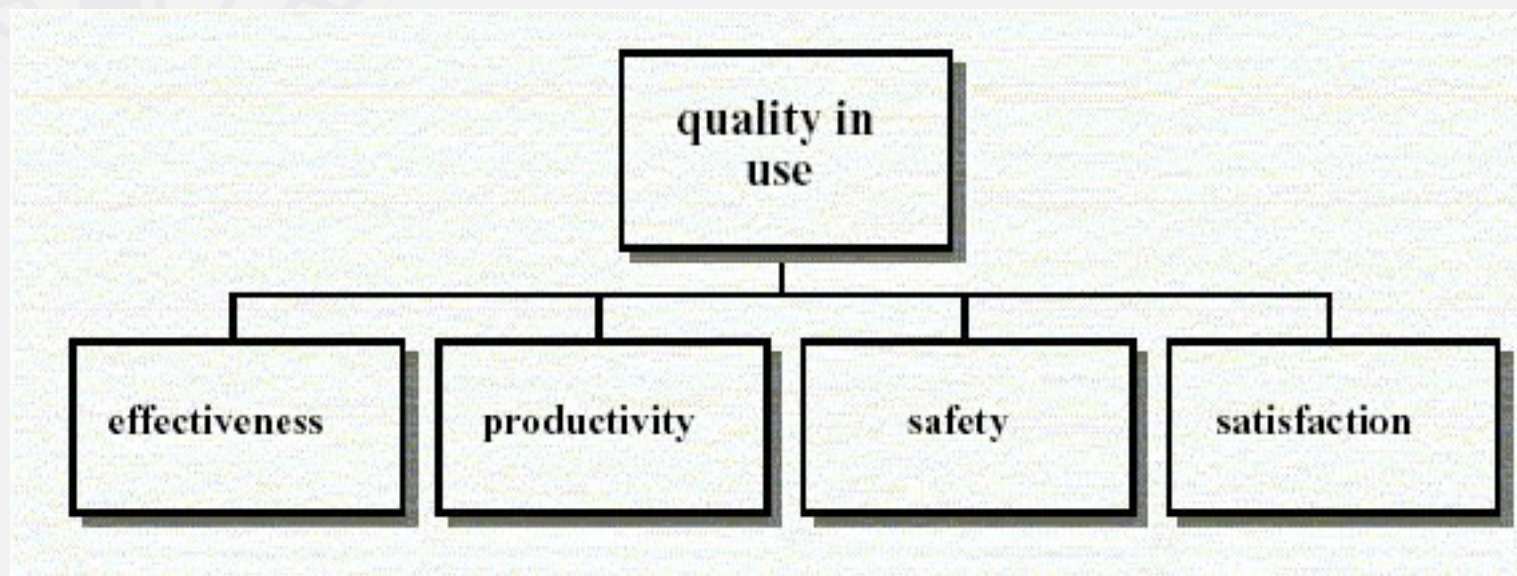
ISO/IEC 9126-1:2001

External-Internal Quality



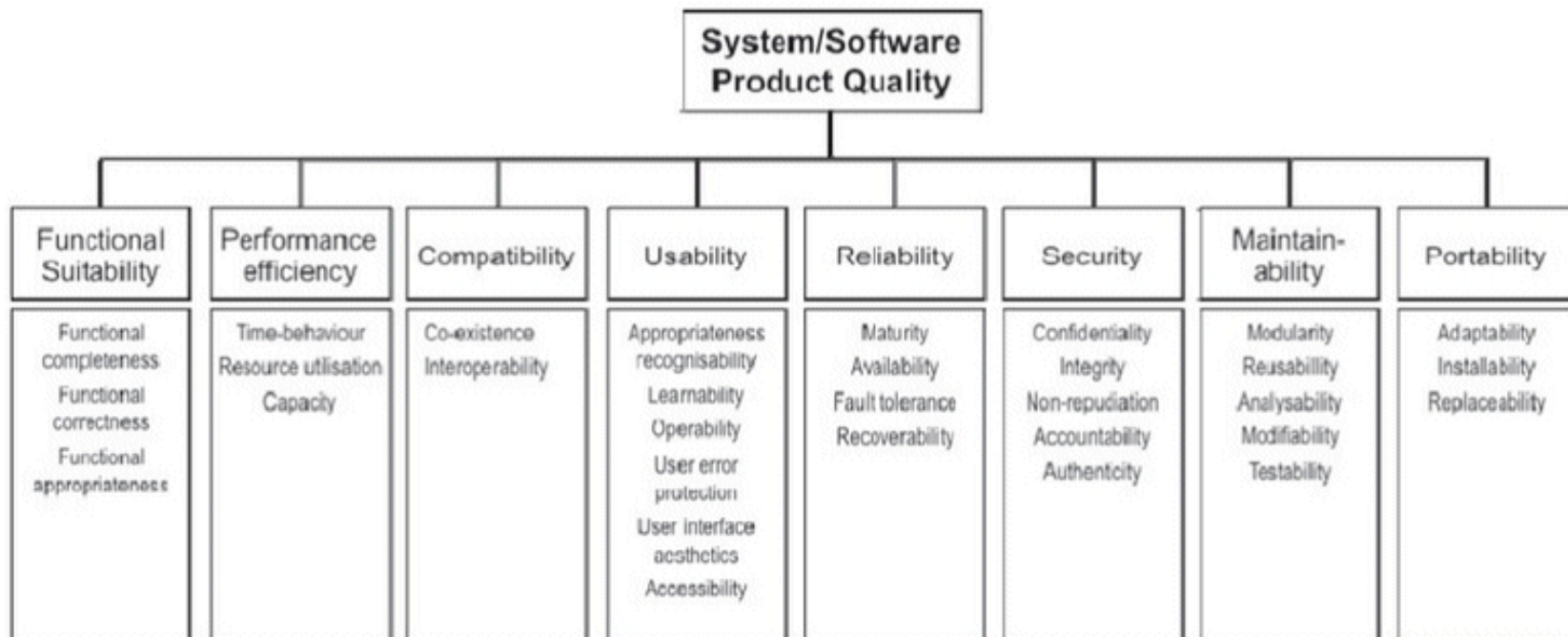
ISO/IEC 9126-1:2001

Quality in Use



ISO/IEC 25010:2011

SQuARE project (250xx series)



Other QMs



- FURPS(+) [Grady & Caswell, 1987]
 - ✓ Functionality, Usability, Reliability, Performance, Supportability, + (other new ones, 2° version)
 - ✓ 2 layers with sub-chars
- ECSS-E-10A + ISO 21351:2013 [2005→]
 - ✓ European Space Agency standards → <http://www.ecss.nl/>
 - ✓ Basis for ISO 21351 “Space systems -- Functional and technical specifications”
- IFPUG VAF [1979→2004]
- IFPUG SNAP [2007→]

IFPUG VAF

Value Adjustment Factor



Value	Characteristic
0	Not Present, No influence
1	Incidental influence
2	Moderate influence
3	Average influence
4	Significant influence
5	Strong influence throughout

Sl. No	Degree of Influence	Value (0-5)	Comments
1	Data Communications	0	
2	Distributed Data Processing	0	
3	Performance	0	
4	Heavily used configuration	0	
5	Transaction rate	0	
6	Online data entry	0	
7	End-user efficiency	0	
8	Online update	0	
9	Complex processing	0	
10	Reusability	0	
11	Installation ease	0	
12	Operational ease	0	
13	Multiple sites	0	
14	Facilitate change	0	
Total		0	

Value Adjustment Factor (VAF)	0.65
--------------------------------------	-------------

- Eliminated by ISO (ISO/IEC 14143-1:1998) because
 - ✓ not part of FUR (expression of NFRs)
 - ✓ not proportional to NFRs related-effort
- Not anymore in the IFPUG CPM v4.3+ (base) counting procedure

IFPUG SNAP

Software Non-functional Assessment Process



Categories (4) & Sub-Categories (14):

1. Data Operations

- a. Data Entry Validation
- b. Logical & Mathematical Operations
- c. Data Formatting
- d. Internal Data Movements
- e. Delivering Added Value to Users by Data Configuration

2. Interface Design

- a. UI Changes
- b. Help Methods
- c. Multiple Input Methods
- d. Multiple Output Methods

3. Technical Environment

- a. Multiple Platform
- b. Database Technology
- c. Batch Processing System

4. Architecture

- a. Component Based Sw Dev (CBSD)
- b. Multiple Input/Output Interface

- New NFR Sizing Method
 - ✓ unit of measure: SP (SNAP Points)
 - ✓ Separated by FP (from FURs)
 - ✓ overcome the VAF concept

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Possible criteria for a Quality Model

Stakeholders



- Essential to determine the right stakeholders (primary, secondary)
- Elicit implicit requirements (often mandatory ones are not elicited)
- New processes in PMBOK 5^o ed (2013) on Stakeholders Management
- Mostly NFR are impacted
→ ...quality

Grouping Criteria



- Time
 - ✓ SLC phases → ISO 12207 process schema
 - ✓ Determine the link between quality measures and when applying them
- Viewpoint/Stakeholder positioning
 - ✓ Internal, External, Quality-in-use viewpoints introduced by ISO 9126-1:2001 (based on previous ISO 14598-x series)
- Viewpoint/Context-Content
 - ✓ Different viewpoints/perspectives, as in a BSC (Balanced Scorecard) approach
 - ✓ Basic BSC → 4 perspectives (Financial, Customer, Internal Process, Learning & Growth)
 - ✓ Other possible schema: Time, Cost, Quality, Risk, ...

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Quality Models and the Next Decade

Content



- Content

- ✓ Attributes (aka 'characteristics') are important
- ✓ Not too many, not too few...analyze your product from more views
- ✓ Rule of thumb: 7 ± 2 (?)
- ✓ To be included into a Measurement Plan (ISO/IEC 15939:2007)
- ✓ Technique → EAM Analysis (Entity-Attribute-Measure)



E – Entity	(software) product	(software) product	project	(software) product
A – Attribute	SLOC length	Functionalities	???	Non-functionalities
M – Measure	LOC – Lines of Code	Function Points	Story Points?	(specific measures for NFRs)

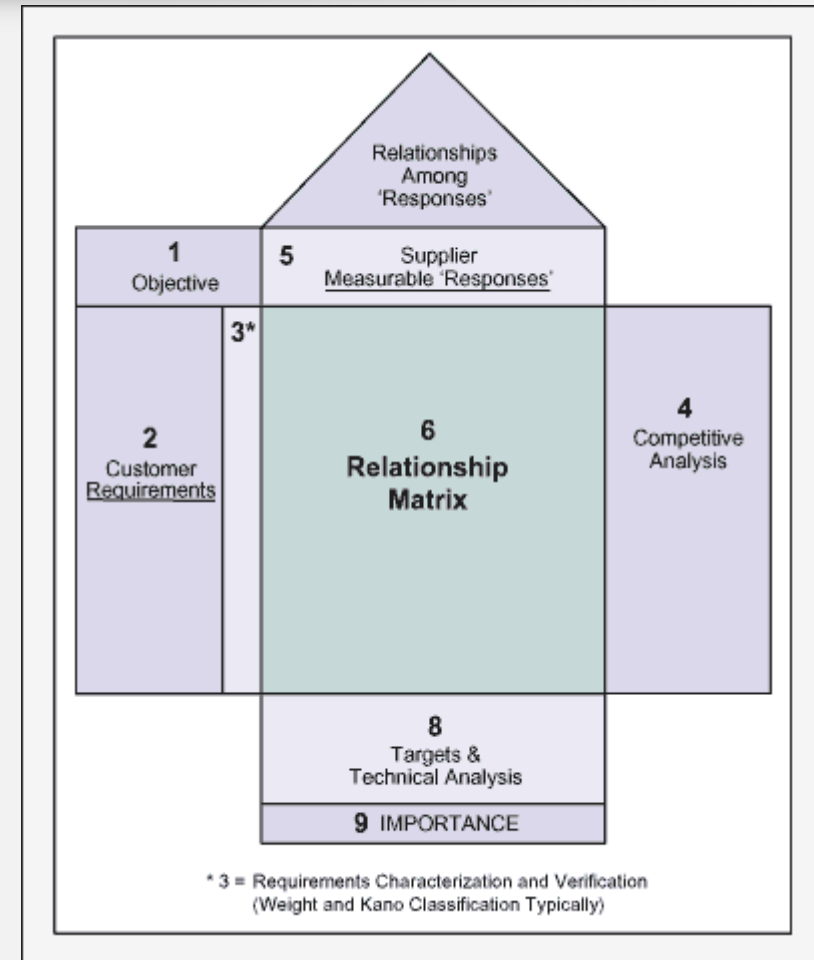
Source: Buglione L., Ebert C., *Estimation*, [Encyclopedia of Software Engineering](#), Taylor & Francis Publisher, June 2012, ISBN: 978-1-4200-5977-9

Usage

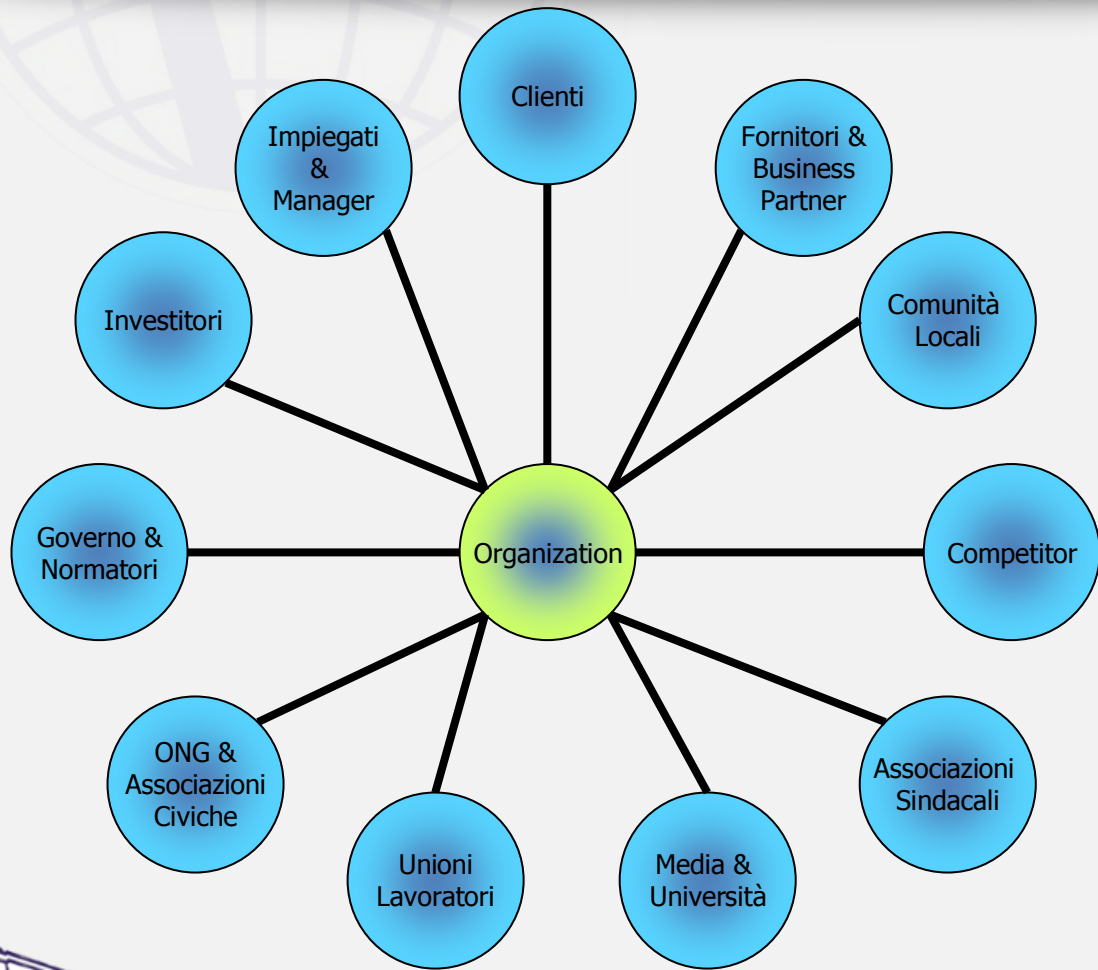


- Usage

- ✓ Not only a 'retrospective' evaluation, but start from the early SLC phases
- ✓ QM as 'Wishing list' for do not miss relevant requirements (implicit req's) yet from the beginning
- ✓ QFD (Quality Function Deployment)
→ TQM technique



Perspectives



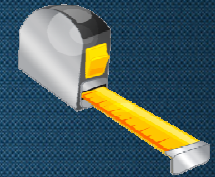
Typical
Primary
Stakeholders

Typical
Secondary
Stakeholders

Source: SRA, The Stakeholder Engagement Manual, 2005, URL: <http://goo.gl/TFNFjA>

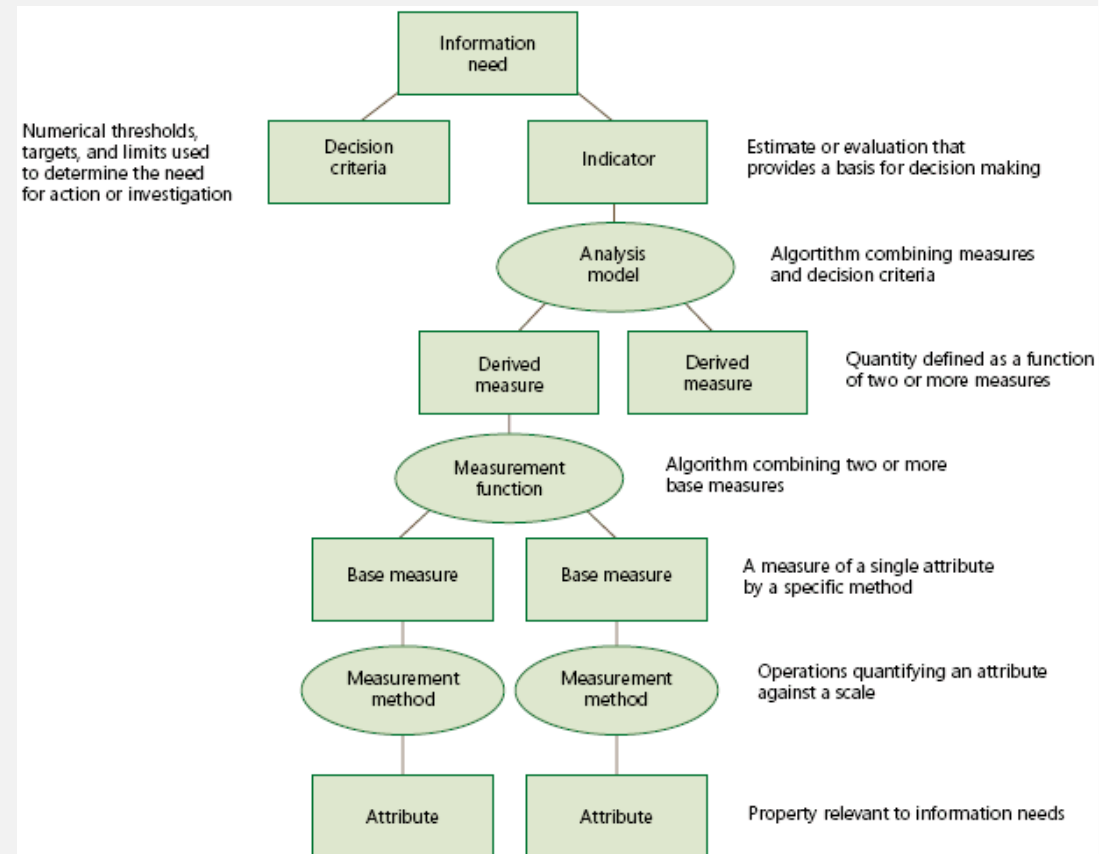


Measurement



- Measurement

- ✓ Last but not least (!)...quality needs to be measured
- ✓ QM are multi-tier models, typically three layers/tiers
- ✓ Layer 1-2 are about the characteristic/attribut
- ✓ Layer 3 is about the measures related to a sub-char
- ✓ Example: ISO/IEC 9126-x (parts 2,3,4)
- ✓ Example: ISO MIM (Measurement Information Model) from 15939:2007



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Conclusions & Next Steps

Conclusions & Next Steps



- **Quality Models (QM)**

- ✓ Good way to model product NFR
- ✓ Useful to stress the 'how/how to' part complementing functionalities (FUR)

- **QM Structure & Content**

- ✓ Several QMs, many overlapping chars, some different → depending on time and technology advancements (e.g. Smartphone and touching tech)
- ✓ EAM analysis, QFD and similar techniques useful for looking at different viewpoints

- **Next Steps**

- ✓ Observe your own product domain, apply the EAM analysis and 'define' what you need for obtaining your own QM
- ✓ Last but not least, build the third layer (e.g. GQM approach is there!)
- ✓ **...just try & see!**
- ✓ (but before take a look to the plenty of existing QMs...)



*All models are wrong. Some models are useful.
(George Box, Mathematician, 1919-2013)*

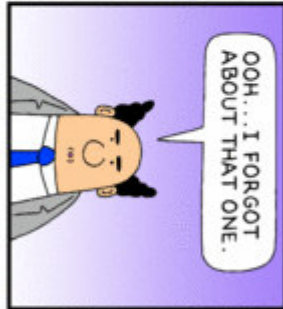




Lessons Learned...



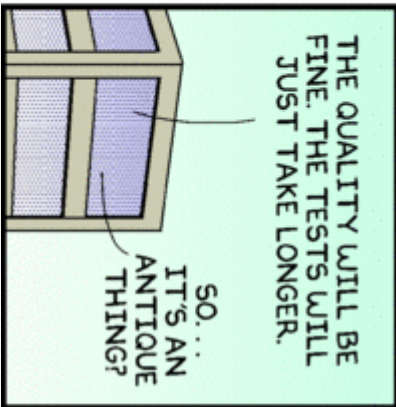
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SO... IT'S AN ANTIQUE THING?

URL: www.dilbert.com



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Q&A



Grazie per la vostra attenzione!
Thanks for your attention!



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