Software Measurement

Analysis of ISO/IEC 9126 and 25010

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Purpose of the presentation

- To present 9126 quality model and actual quality model
- To give a complete picture from quality model through QMEs

Plan of the presentation

- Software properties
- Presentation of 9126 (generic)
- Presentation of 25010 (generic)
- Software product quality and quality in use characteristics and sub characteristics
- Data quality model and characteristics
- From Quality Model to QMEs (examples)
- Conclusion and next steps

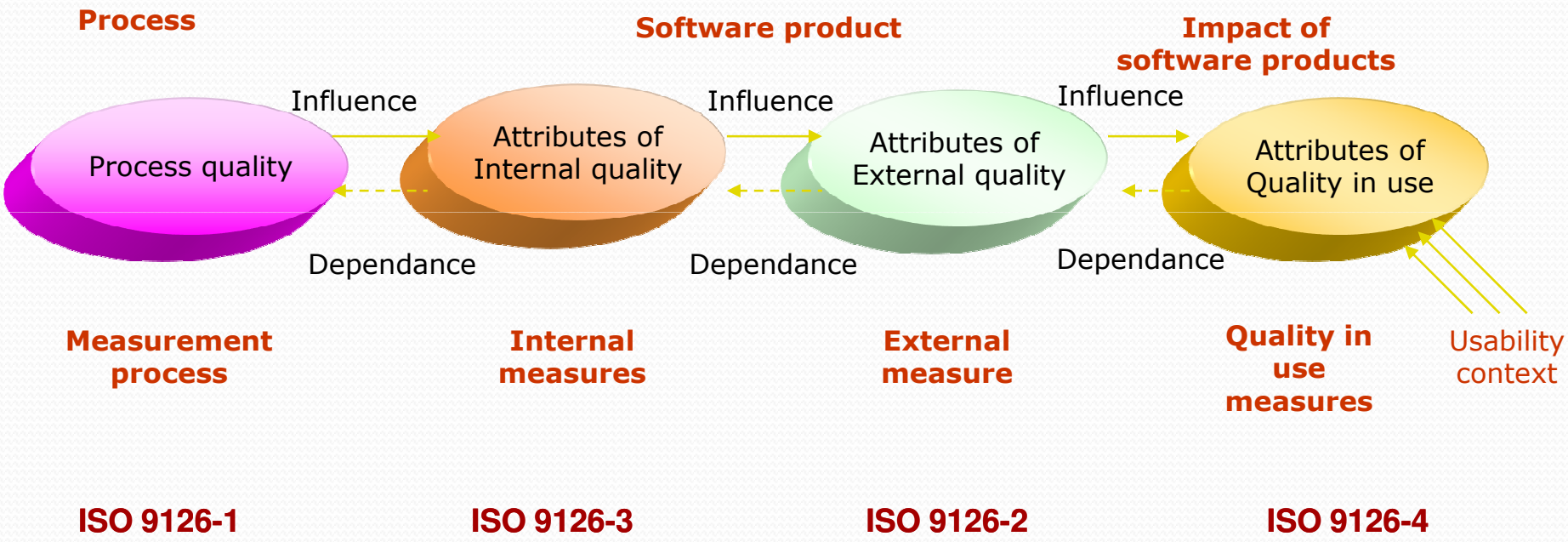
Software properties

Software properties	Inherent properties	Domain-specific functional properties
		Quality properties (functional suitability, reliability, performance efficiency, operability, security, compatibility, maintainability, portability,)
	Assigned properties	Managerial properties like for example price, delivery date, product future, product supplier

Presentation of 9126

- The ISO quality model has three sub-models of software products quality (internal quality, external quality and quality in use), 10 quality characteristics, 24 sub characteristics and more than 250 measures proposed to quantify these quality characteristics and sub-characteristics;
- Internal and external quality have the same characteristics and sub characteristics. The difference is in the "quality" measures. Quality in use has no sub-characteristics.

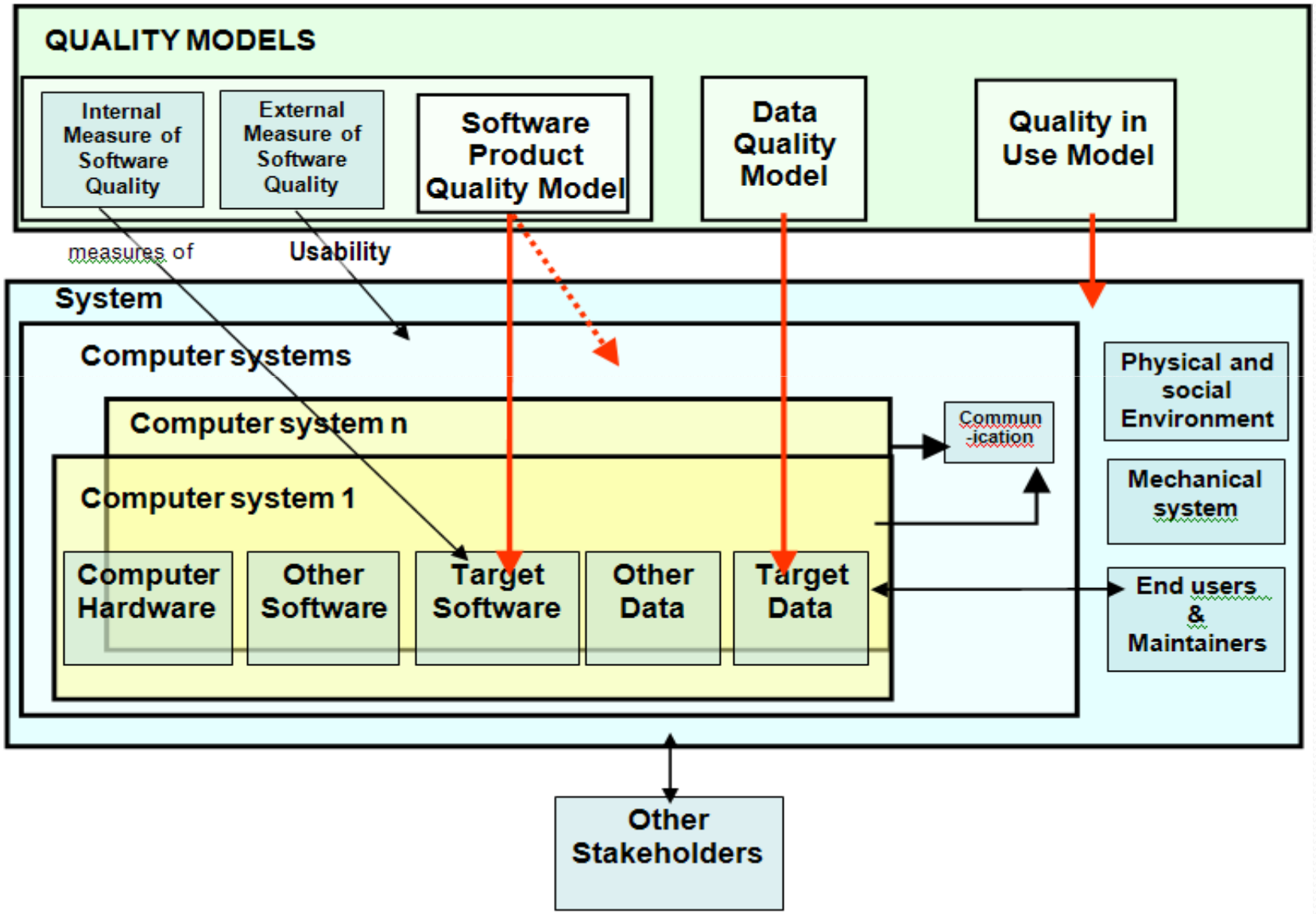
ISO 9126 vision for software quality



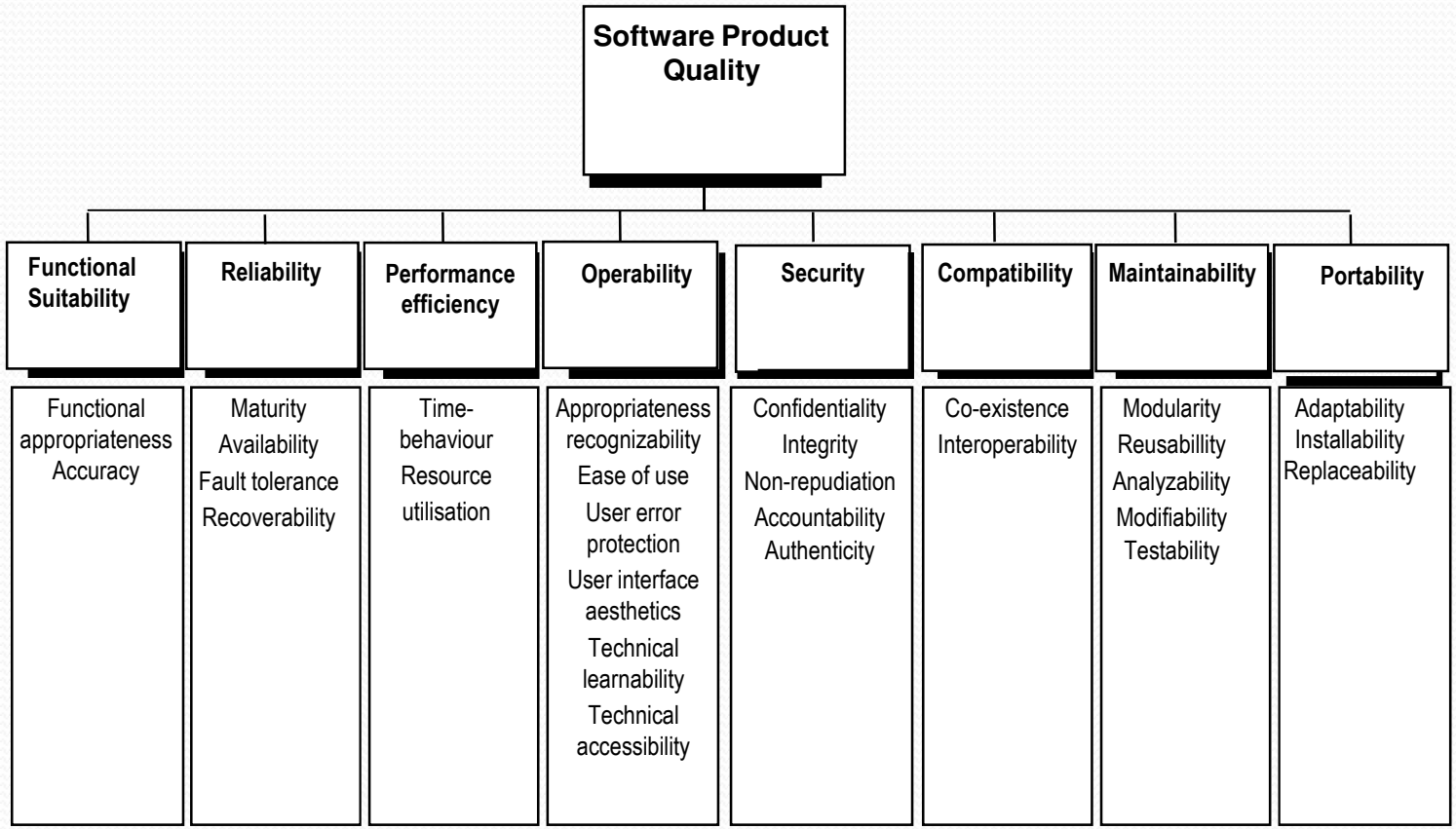
Presentation of ISO/IEC 25010

- This International Standard defines:
  - A software product quality model composed of eight characteristics, which are further subdivided into subcharacteristics that can be measured internally or externally.
  - A system quality in use model composed of five characteristics, which are further subdivided into subcharacteristics that can be measured when a product is used in a realistic context of use.

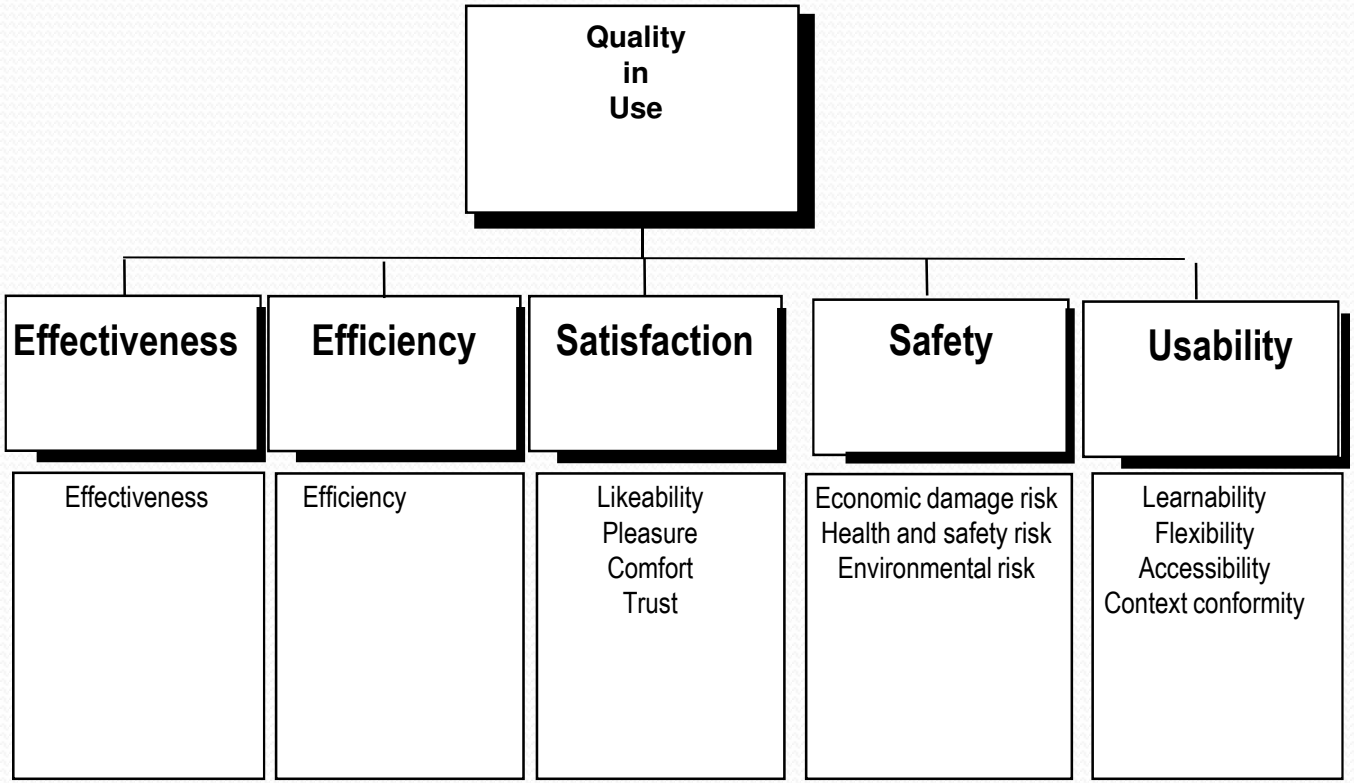
New quality models: ISO 25010



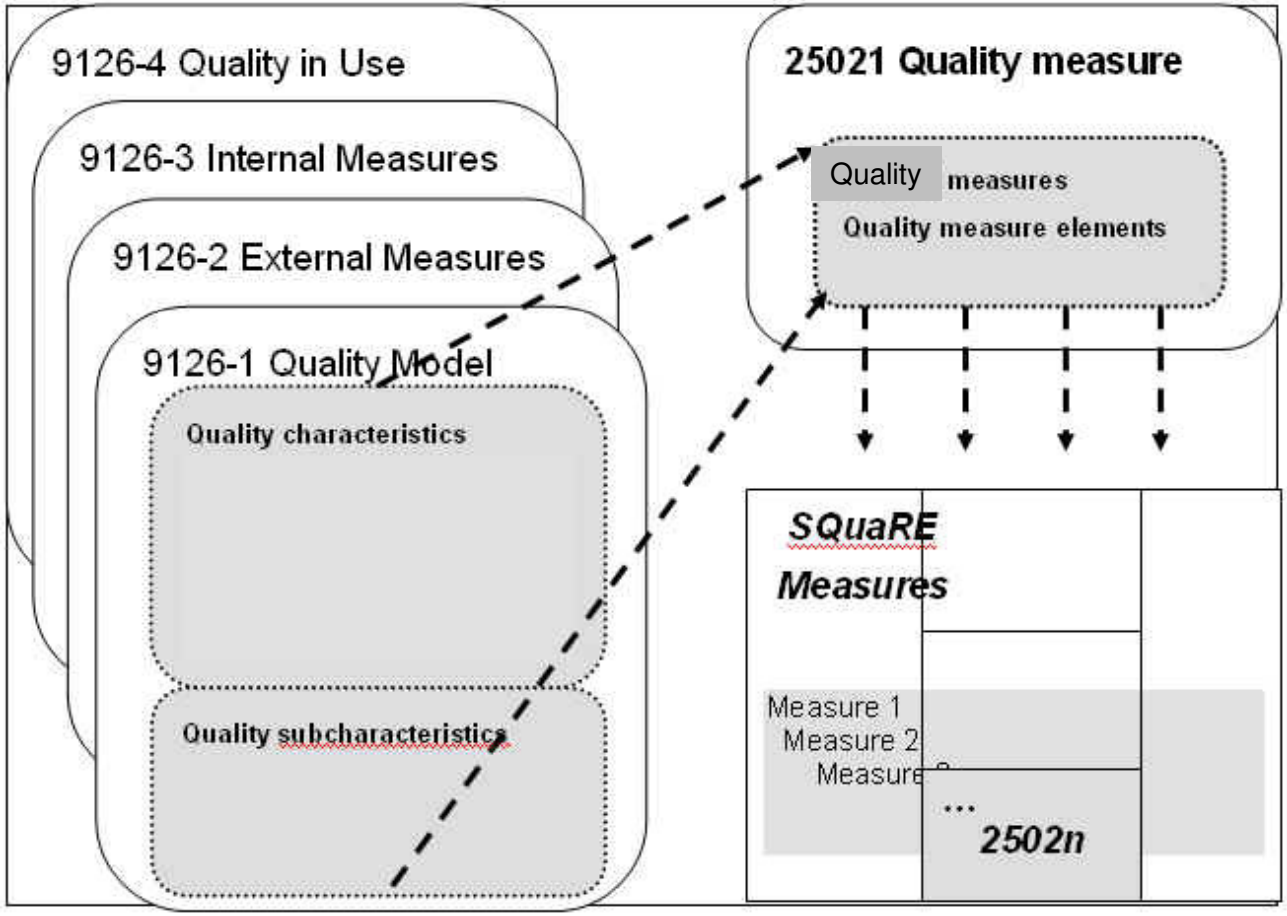
Software product quality



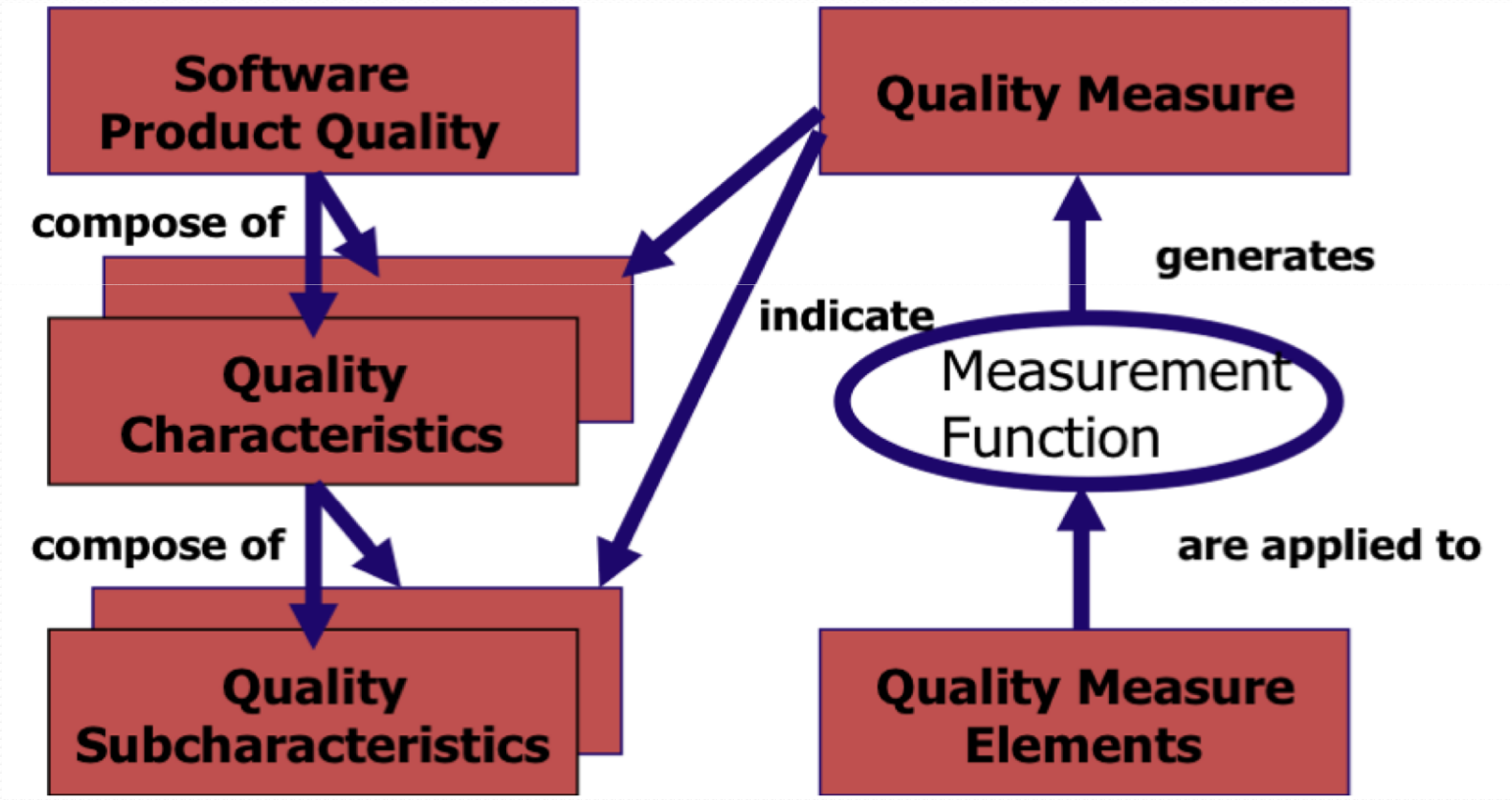
Quality in use



ISO 25021-TR and ISO 9126



From QME to Software Product Quality



Definition of Internal Quality measures

- Based on inspecting static attributes can be used to measure inherent properties of a software work product;
- Static analysis methods include inspection and automated analysis tools.
- Work products include requirements and design documents, code, and test procedures

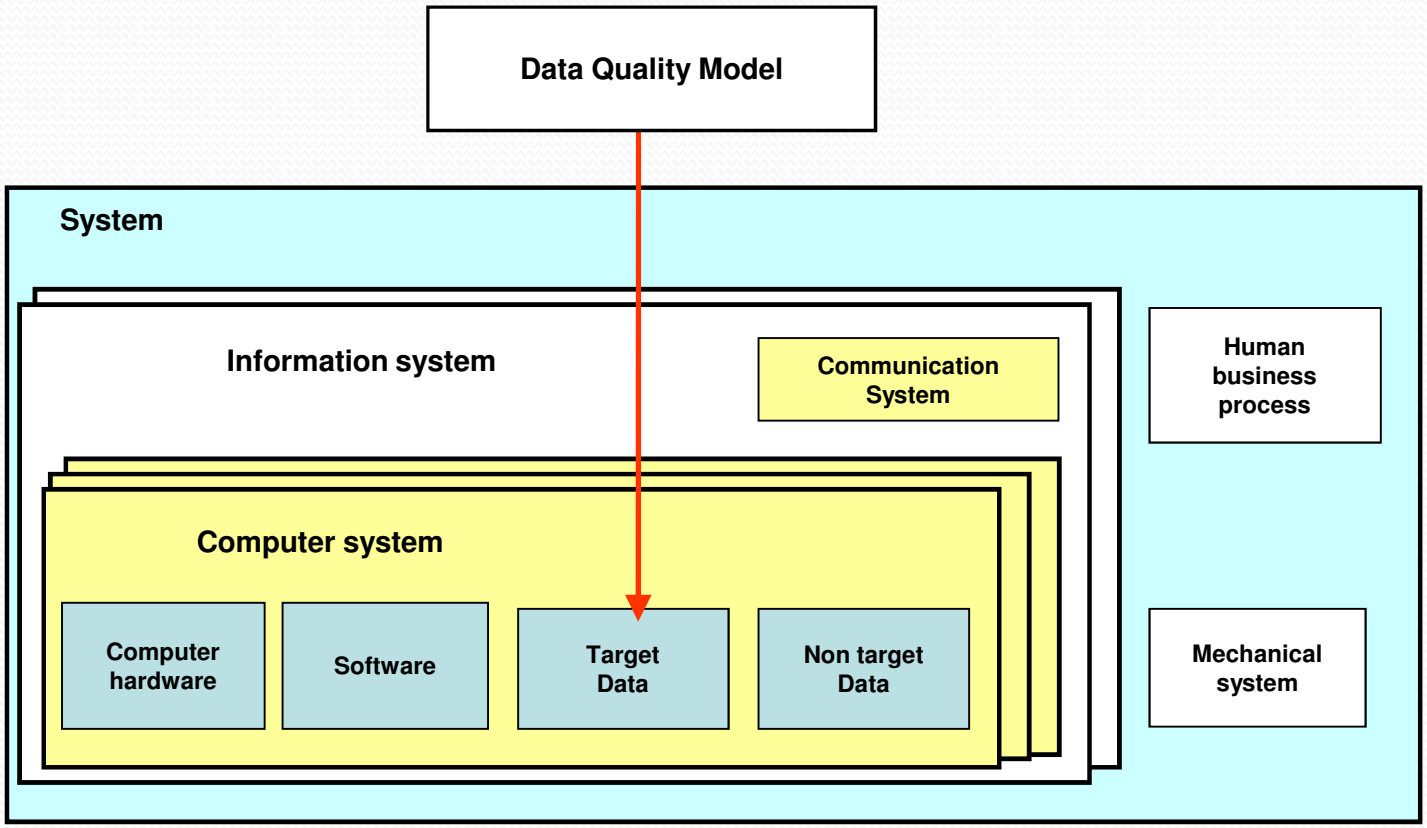
Definition of External Quality measures

- Measures of dynamic attributes can be used to measure inherent properties of a software intensive computer system.
- System-dependent properties of a software product.
- Measurement is performed when executing the software product in the system environment in which it is intended to operate.

Definition of quality in use

- Derived from testing or observing the results of real or simulated use.
- Measure intrinsic properties of a system that can include software, hardware, communications and users.
- Also system dependent properties of a software-intensive system or of a software product.
- Only achieved in a realistic system environment (in operation).

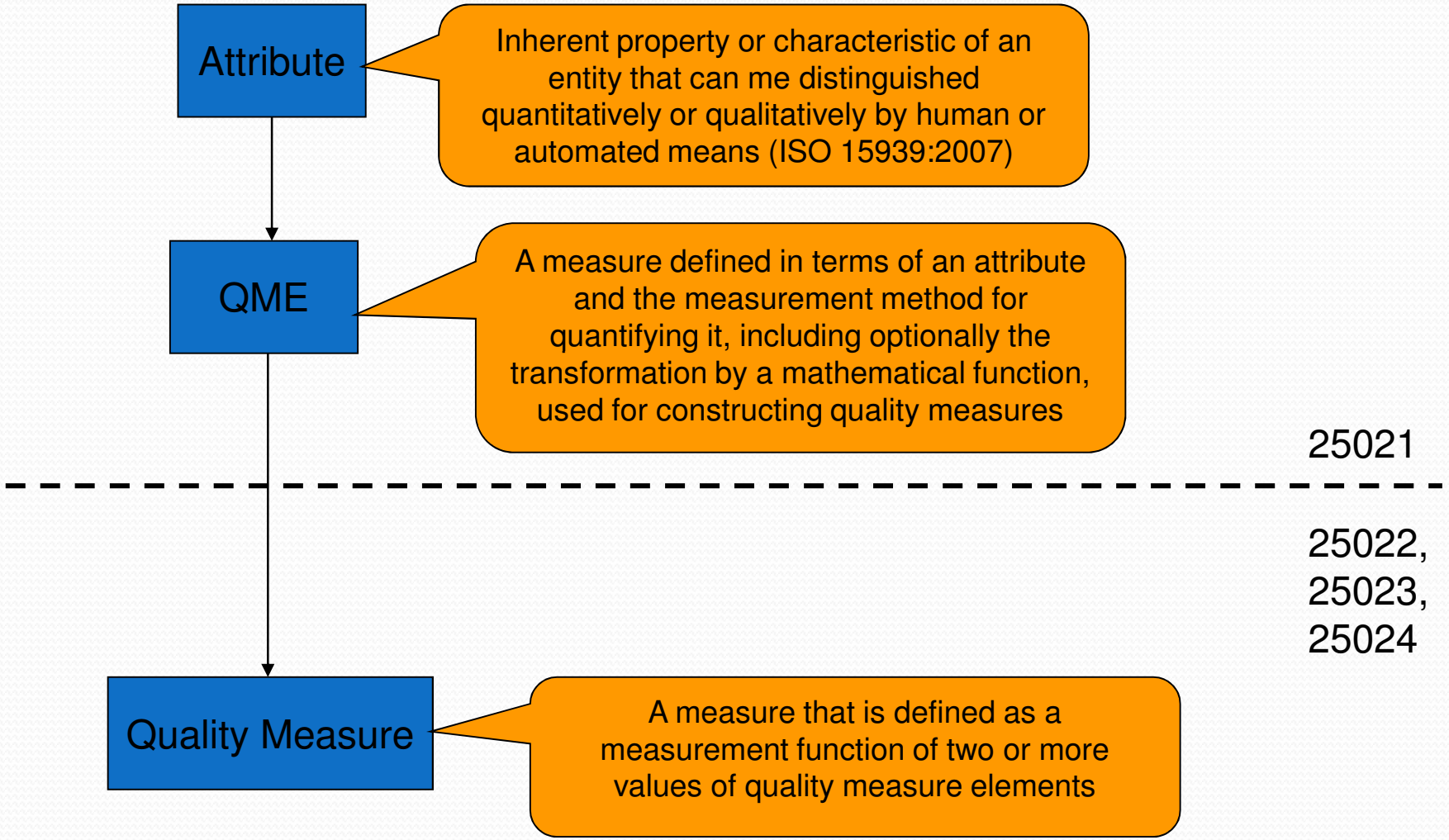
Data quality model



Data Quality Model (characteristics)

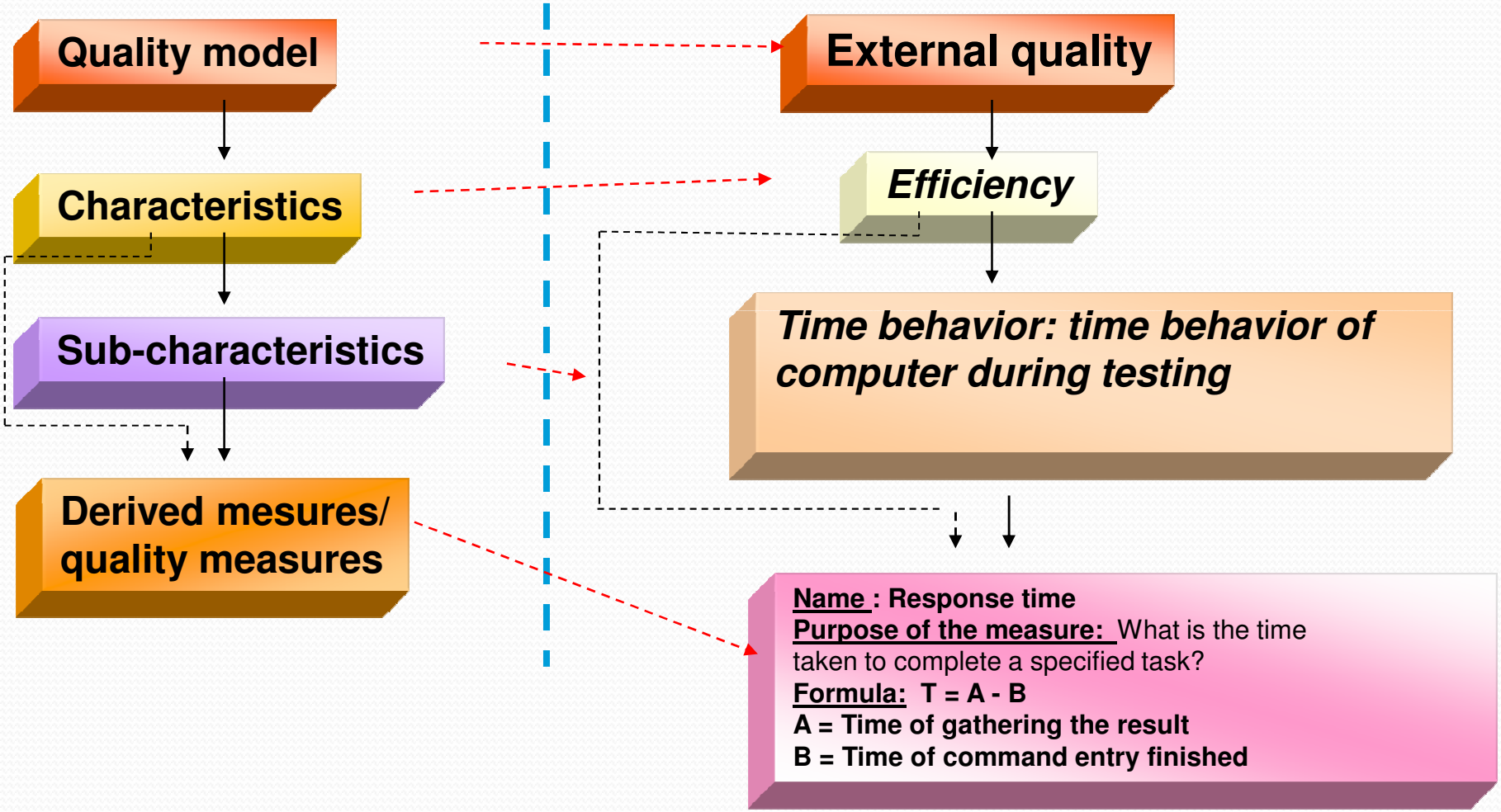
Characteristics	*DATA QUALITY*	
	Inherent	*System dependent*
Accuracy	X	
Completeness	X	
Consistency	X	
Credibility	X	
Currentness	X	
Accessibility	X	X
Compliance	X	X
Confidentiality	X	X
Efficiency	X	X
Precision	X	X
Traceability	X	X
Understandability	X	X
Availability		X
Portability		X
Recoverability		X

Attribute and QME



Modèle de qualité ISO 9126:2002

Examples

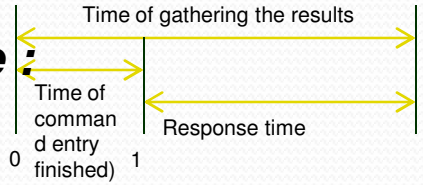


Mesure

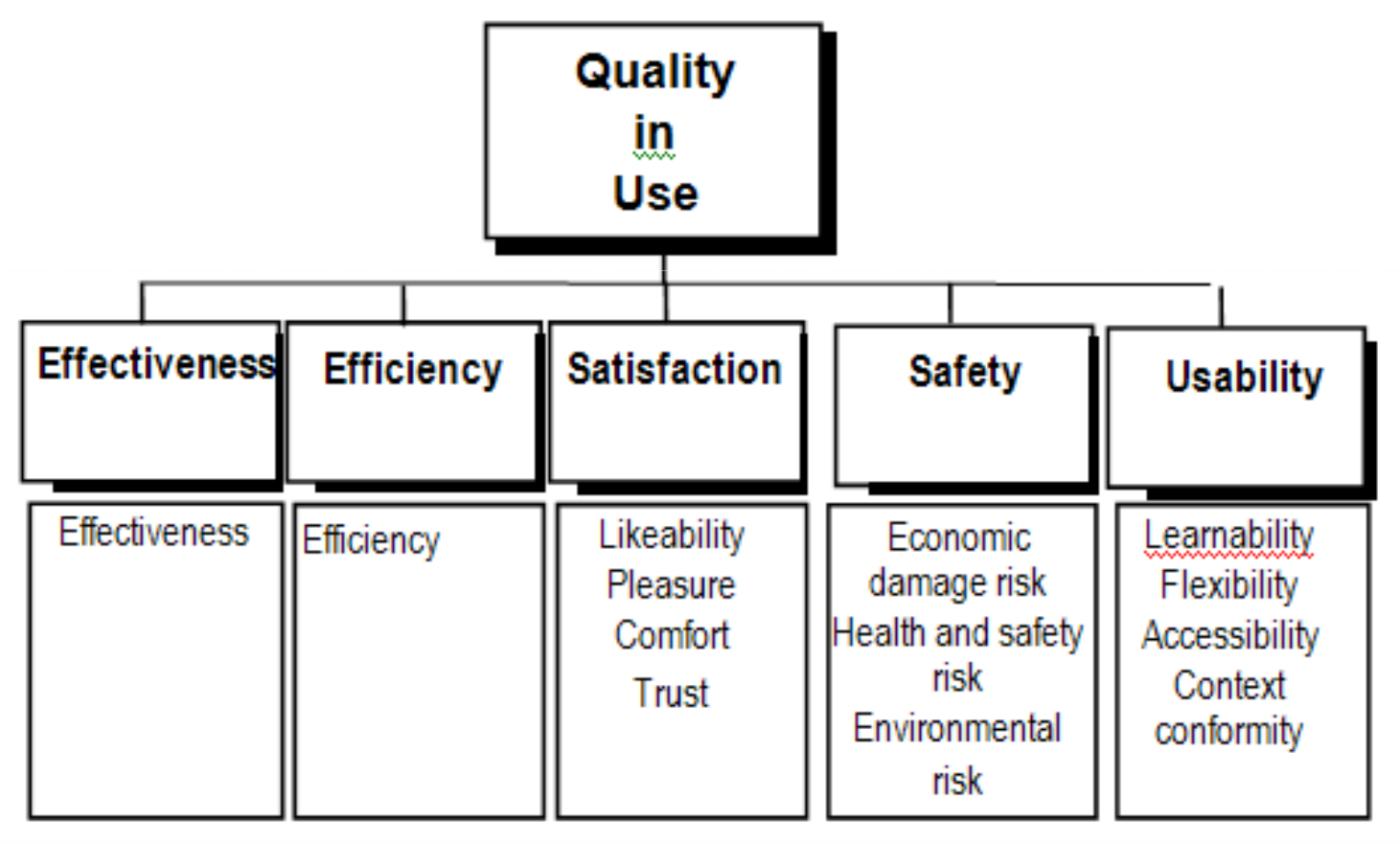
Characteristics: ***Efficiency***
Sub-characteristic: ***Time behaviour***
Example of measure: ***Response time***

External time behaviour metrics	**a) Response time**								
Metric name	Purpose of the metrics	Method of application	Measurement, formula and data element computations	Interpretation of measured value	Metric scale type	Measure type	Input to measure-ment	ISO/IEC 12207 SLCP Reference	Target audience
Response time	What is the time taken to complete a specified task? How long does it take before the system response to a specified operation?	Start a specified task. Measure the time it takes for the sample to complete its operation. Keep a record of each attempt.	T = (time of gaining the result) - (time of command entry finished)	0 < T The sooner is the better.	Ratio	T= Time	Testing report Operation report showing elapse time	5.3 Sys./Sw. Integration 5.3 Qualification testing 5.4 Operation 5.5 Mainte-nance	User Developer Maintainer SQA

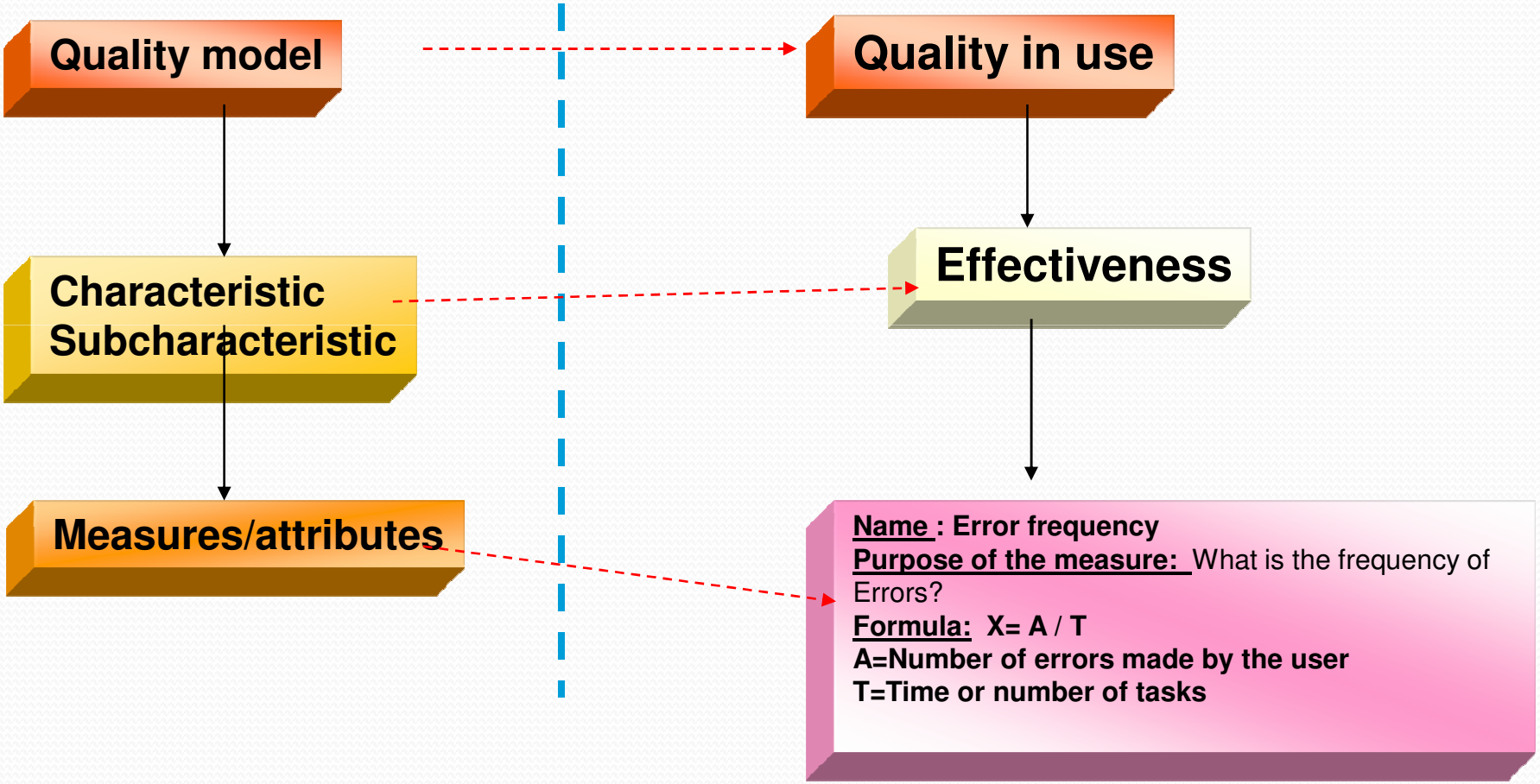
Example :



Quality in use characteristics



Quality in use: example



Error frequency in 9126

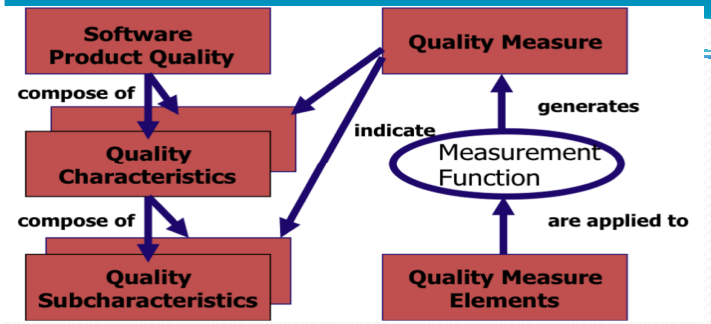
Error frequency	What is the frequency of errors?	User test	X = A/T A = number of errors made by the user T= time or number of tasks	0<= X The closer to 0 the better.	Absolute	A = Count	Operation (test) report User monitoring record	6.5 Validation 5.3 Qualification testing 5.4 Operation	User Human Interface designer

NOTE This metric is only appropriate for making comparisons if errors have equal importance, or are weighted.

Comparison

Differences between internal, external and quality in use measures

Target properties of measure	Software product properties	System behaviour properties	Impact of system / software properties
Type of measure	Inspection of static attributes	Test or modelling of dynamic attributes	Test or observation of results of real or simulated use
Type of properties of software product	Inherent	System-dependent	System-dependent
Type of properties of software intensive system		Inherent	System-dependent
Type of properties of system including software, hardware, communications, users and other stakeholders			Inherent



Link between QMs and QMEs

Quality Measure Element

A measure defined in terms of an attribute and the measurement method for quantifying it, including optionally the transformation by a mathematical function, used for constructing quality measures

Measurement Method

Logical sequence of operations, described generically, used in quantifying an attribute with respect to a specified scale. [ISO/IEC 15939:2007].

Attribute

Inherent property or characteristic of an entity that can be distinguished quantitatively or qualitatively by human or automated means. A QME captures information about a single attribute.

Conclusion

- ISO 25010 model is somewhat different from ISO 9126 model:
  - Relations between system and software in the new model with introduction of the data model (ISO 25012)
  - Quality in use has 5 characteristics instead of 4 without productivity and compliance but adding efficiency, satisfaction and usability
  - Integration of internal and external characteristics and sub characteristics with 2 new characteristics: security and compatibility
  - From there new attributes should be added
  - Data quality model characteristics are not a part of 25021

Next steps

- New or actual characteristics and sub characteristics need new quality measures
- New quality measures could need new QME
- New quality measures could also used actual QME
- Some actual QMEs could be obsolete

Note: Sub committees 25022, 25023 and 25034 is working closely with the sub committee 25021