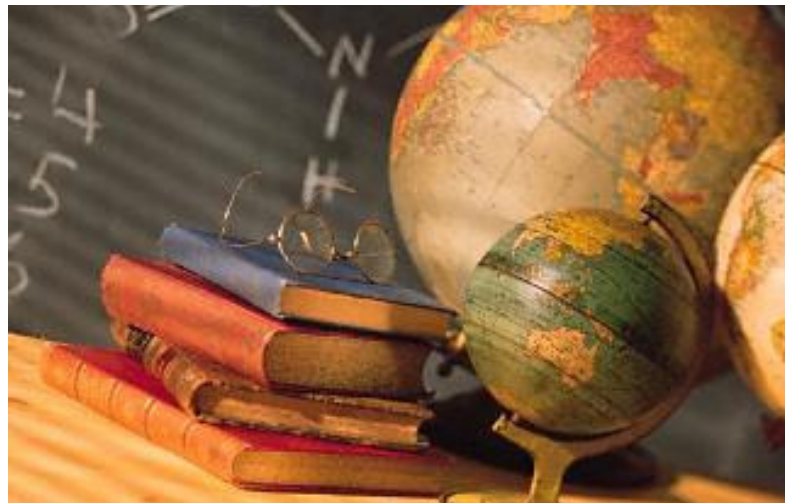*ÉCOLE DE TECHNOLOGIE SUPÉRIEURE – MONTRÉAL - CANADA*

Harmonization of Usability Measurements
In ISO/IEC 9126
Software Engineering Standards

Cheikhi, Abran & Suryn

Agenda

☞ **Motivations and Objectives**

☞ ISO/IEC 9126 Standards

☞ Analysis of the Usability in ISO 9126

☞ Recommendations to ISO 9126

☞ Conclusions

Motivations

☞ In Software Engineering, producing a usable product receives often attention only when a nonusable one is a failure

☞ Usability is not a luxury, but a fundamental quality characteristic

☞ To assess software usability, many models have been proposed by individual researchers and standards

Motivations

Dix et al. (1993)	Nielsen (1994)	ISO 9241 (1998)	ISO 9126 (2001)	Abran et al. (2003)
Effectiveness Efficiency Satisfaction Learnability	Effectiveness Efficiency Satisfaction Learnability	Effectiveness Efficiency Satisfaction	Understandability Learnability Operability Attractiveness Usability Compliance	Effectiveness Efficiency Satisfaction Learnability Security

☞ Different models with a variety of characteristics and their corresponding purposes

☞ None of which has yet include the concept of quality in use of ISO 9126

Motivations

☞ In ISO 9126 – Software Product Quality

– Two ways to assess usability of the software product before its delivery :

☞ Internal

☞ External

– How to assess the usability of the software product after its delivery ?

Objectives

☞ Review of the external usability characteristic of ISO 9126 standards : definitions and proposed measures

☞ Investigate the two harmonization issues :

  ☞ Does external usability characteristic really belong to the external quality view of ISO TR 9126-2 ?

  ☞ Can this usability characteristic be harmonized with the quality in use view of ISO 9126-1 and ISO TR 9126-4 ?

☞ Propose some additions to the ISO 9126 "Quality In Use" Model

Agenda

☞ **Motivations and Objectives**

☞ **ISO/IEC 9126 Standards**

☞ **Analysis of the Usability in ISO 9126**

☞ **Recommendations to ISO 9126**

☞ **Conclusions**

ISO/IEC 9126 – *Software Product Quality*

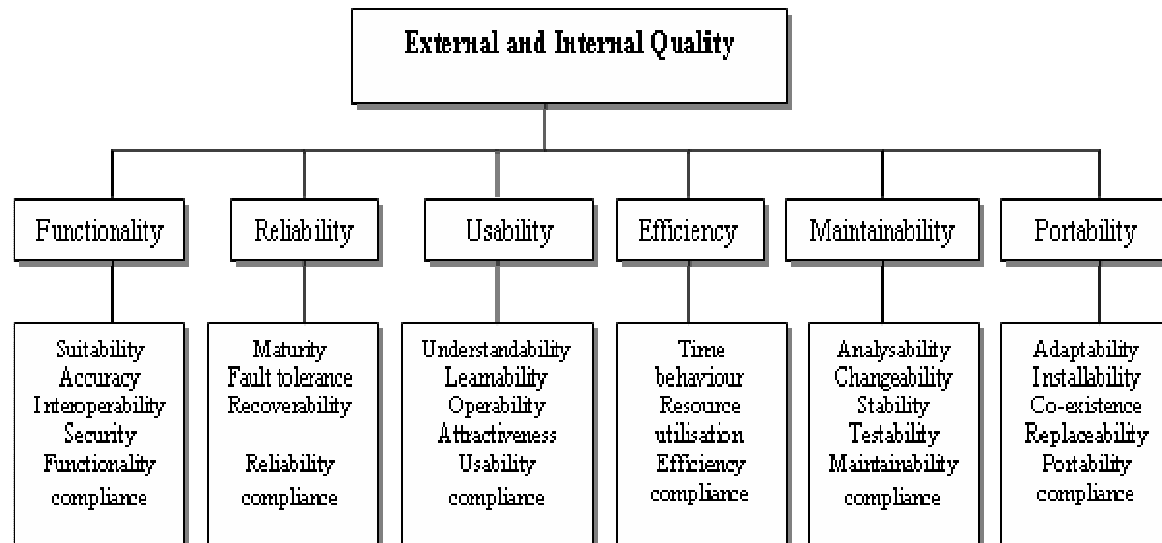- ☞ **1 International Standard:**
    - – ISO/IEC 9126-1: Quality Model
        - ☞ Internal & External Quality Model
        - ☞ Quality In Use Model

- ☞ **3 Technical Reports :**
    - ☞ ISO/IEC 9126-2: External measures
    - ☞ ISO/IEC 9126-3: Internal measures
    - ☞ ISO/IEC 9126-4: Quality In Use measures
    - – More than 200 measures
    - – Same structure of documentation

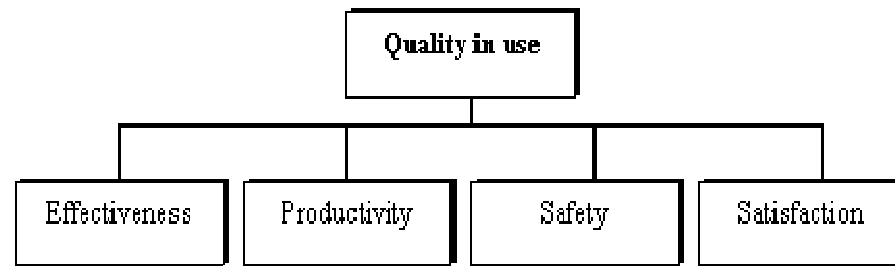# ISO/IEC 9126 – *Software Product Quality*

☞ **Internal quality :**

– Internal view of quality
– Quality of the software product without its execution
– Measure the static properties of the software itself

☞ **External quality :**

– External view of quality
– Quality of the software product during its execution
– Measure the behaviour of the computer-based system that includes the software

ISO/IEC 9126- *Software Product Quality*

Quality in use

- Effectiveness
- Productivity
- Safety
- Satisfaction

☞ Quality in use

  – Quality from the end-users viewpoint
  – Is the combined effect of internal quality and external quality
  – Measure :
    ☞ The effect of using the software in a specific context of use
    ☞ To which extent users can achieve their goals

ISO/IEC 9126 – *Usability & Quality in use*

Usability	Quality in Use
Early phases of software development process	Operation and maintenances phases
During the execution	During the execution
Before delivery	After delivery
Limited development constraints : short test period, a limited number of users and a temporary environment	Not so constrained: a long period of time for testing, real end-users and a real environment.
"capability of the software product to be understood, learned, used and attractive to the user, when used under specified conditions"	"the capability of the software product to enable specified users to achieve specified goals with effectiveness, productivity, safety and satisfaction in specified contexts of use"

Agenda

- ☞ **Motivations and Objectives**
- ☞ **ISO/IEC 9126 Standards**
- ☞ **Analysis of the Usability in ISO 9126**
- ☞ **Recommendations to ISO 9126**
- ☞ **Conclusions**

1st Analysis

Usability Concepts and Related Definitions

☞ Criteria for the 1st analysis :

  ☞ ISO 9126- 1 : definitions of the usability subcharacteristics
  ☞ ISO 9126-2 : external measures of usability subcharacteristics

☞ Two distinct context of analysis:

  ☞ 1st context: Link between the name of each subcharacteristic
    and its corresponding definition (objective)
  ☞ 2nd context: Methods of application of external measures

Usability Concepts and Related Definitions

☞ Observations :

Usability Subcharacteristics	Objectives	Methods of Application
Understandability	To understand To be used for particular task	Test conducted by the user Test of the product in use
Learnability	To learn	Test conducted by the user Test of the product in use
Operability	To operate To control	Test conducted by the user Test of the product in use
Attractiveness	To be attractive	Test conducted by the user
Usability compliance	To adhere	Test conducted by the user

Usability Measures proposed in ISO 9126-2

☞ Criteria for the 2nd analysis :

  ☞ Name of the measure
  ☞ Method of application

Criteria / Categories	Name of measure : Ends		Method of application	
	With "In Use"	**Without "In Use"**	**User Test**	**Test of the product in use**
1st Category		X	X	
2nd Category	X			X
3rd Category		X	Not clear	Not clear

2nd Analysis

Usability Measures proposed in ISO 9126-2

☞ Observations :

Usability Subcharacteristics	Number of all external quality measures	Number of measures for Category I	Number of measures for Category II	Number of measures for Category III
Understandability	7	5	1	1
Learnability	6	4	2	
Operability	12	5	6	1
Attractiveness	2	2		
Usability compliance	1	1		
Total	**28**	**17**	**9**	**2**

Analysis of the Usability in ISO 9126 - *Summary*

☞ Harmonization issues responses : Affirmative

☞ Usability characteristic is an essential part of the external quality view of ISO TR 9126- 2.

☞ Usability characteristic can also constitute a part of the quality in use view of ISO 9126-1 and ISO TR 9126-4 through understandability, learnability and operability subcharacteristics
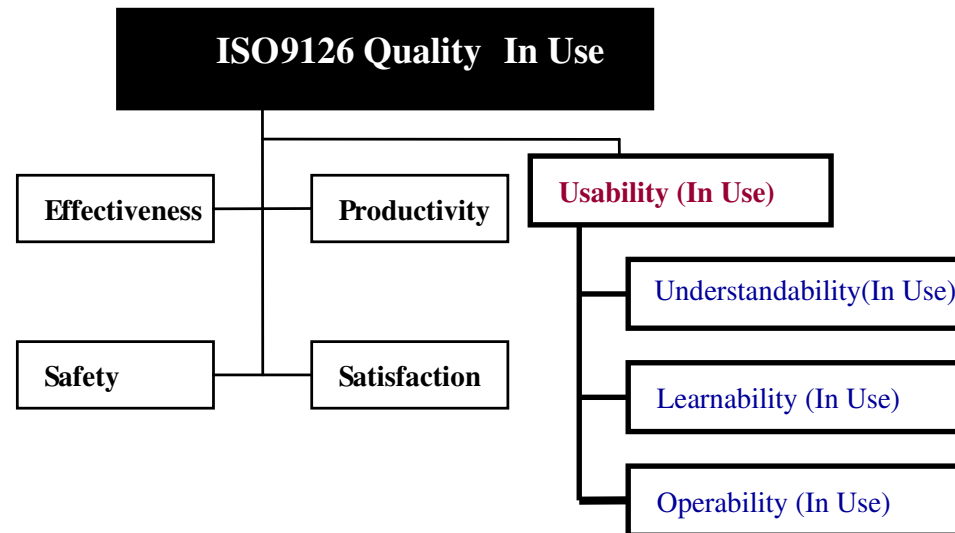
Agenda

- ☞ **Motivations and Objectives**
- ☞ **ISO/IEC 9126 Standards**
- ☞ **Analysis of the Usability in ISO 9126**
- ☞ **Recommendations to ISO 9126**
- ☞ **Conclusions**

Recommendations to ISO 9126-

Enhanced "Quality In Use" Model

Agenda

☞ **Motivations and Objectives**

☞ **ISO/IEC 9126 Standards**

☞ **Analysis of the Usability in ISO 9126**

☞ **Recommendations to ISO 9126**

☞ **Conclusions**

Summary & Conclusions

- State of the art of Usability:
  - Rich body of definitions, models and measures among researchers and standards
  - But not homogeneous

- Usability in ISO 9126 :
  - Only the internal and the external usability of the software product, before its delivery, is addressed
  - Usability as a part of "quality in use" of the software product, after its delivery, is not considered

Summary & Conclusions

☞ Analysis of usability in ISO TR 9126-2:

  ✍ Usability is well positioned within the external quality model of ISO 9126-2 technical report

  ✍ Usability can constitute also a characteristic of "quality in use model" (ISO 9126-1 and 4) through understandability, operability and learnability suchcharacteristics

☞ Enhanced model of quality in use (ISO 9126-1):

  ✍ Interesting initial work

  ✍ But still to be tackled by the ISO 9126 Group

Thank You !

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