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# Integrated Methodologies: SUITABILITY STANDARD

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TRL

# Introduction

## HUMANIST TF E Objective



- **Development of innovative methodologies to evaluate ITS safety and usability**
  - Conception and confrontation of methods and procedures for usability and safety evaluations of ITS

# What is a Method?

- **The combination of:**  
**Metric/Technique/Tool/Environment**

- When assessing usability and safety, different metrics (or measures) are used
- These metrics are collected using specific techniques and often require specific tools
- The metrics are collected in one or more physical environments



# Information about each method

- **Metric**
  - Measure used to assess safety and usability of ITS e.g. lane standard deviation, brake response time, subjective stress level
- **Technique**
  - Details of how the metric is determined e.g. deviation in distance between the vehicle centre and the road centre line
- **Tool**
  - Any equipment that is needed to capture the metric e.g. video camera, calibrated speedometer, questionnaire
- **Environment**
  - Physical situation in which the test is carried out. E.g. Instrumented vehicle, driving simulator

# Other Useful Information about methods

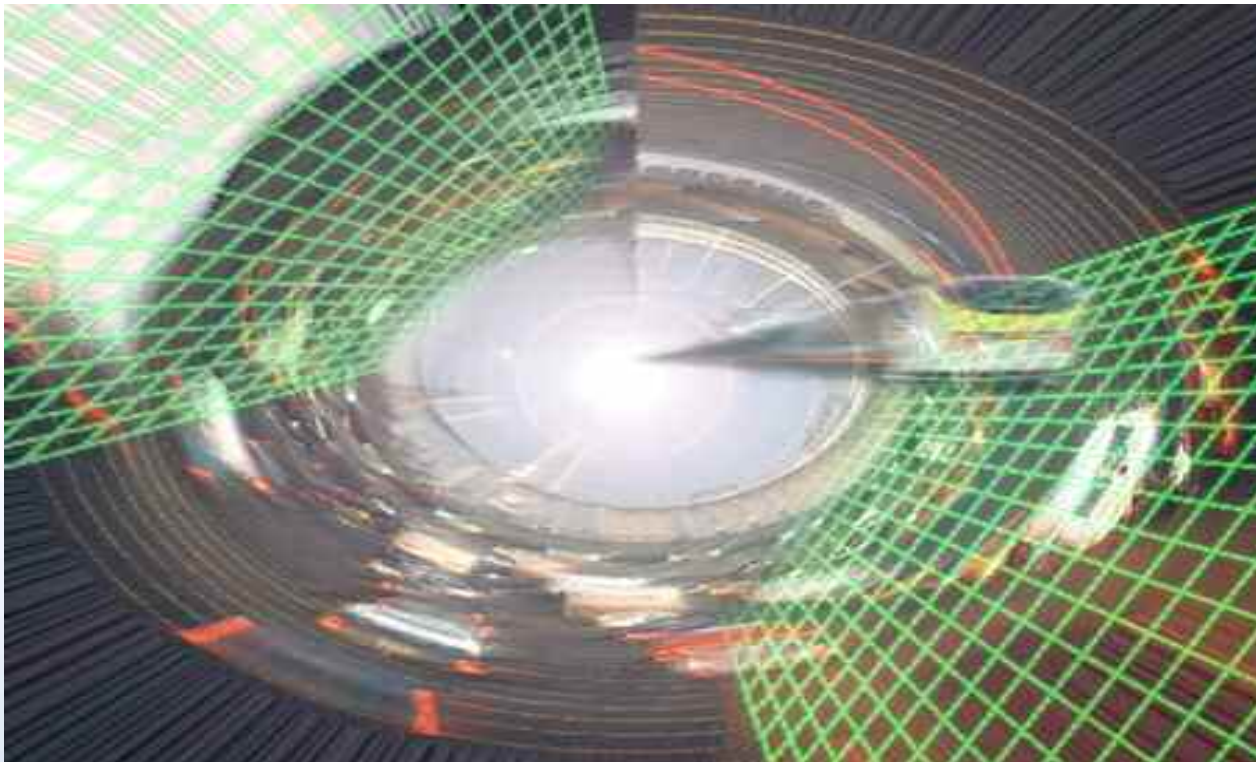
- **Aspect of the system/human investigated**
  - Describes how the metric assesses ITS safety and/or usability
- **Type of data**
  - Objective, subjective or observed (expert opinion)
- **Effectiveness**
  - How useful the measure is
- **Practical issues**
  - Issues to consider when using metric e.g. time, cost
- **References**
  - Organisation submitting the method entry
  - Organisation with experiences of its use
  - Scientific literature

# Deliverable: Summary of properties of each method in a matrix

Metric	Technique	Tool	Environment	Aspect of the system/human investigated	Type of data obtained
Lane standard deviation	The deviation in horizontal distance between the vehicle centre and the road centerline		Driving simulator	Measures lateral control of driving performance which is an indirect measure of visual distraction from the road scene. This method has been found more sensitive as a measure of workload than secondary tasks.	Objective
Lane standard deviation		Videocamera on-board + computer vision analysis tool	Instrumented vehicle		Objective

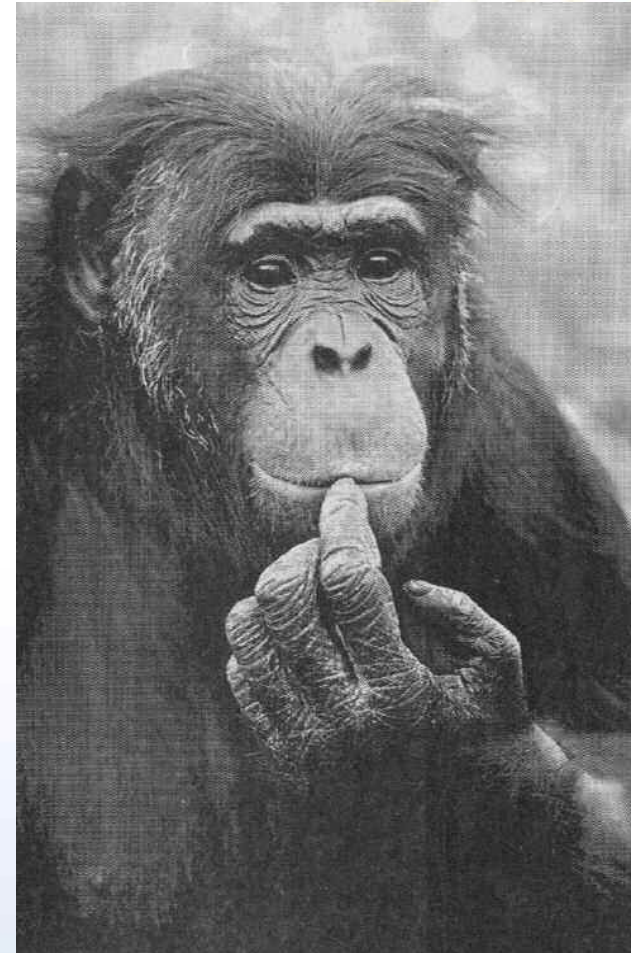
# Standards

## Presentation for Early Stage Researchers

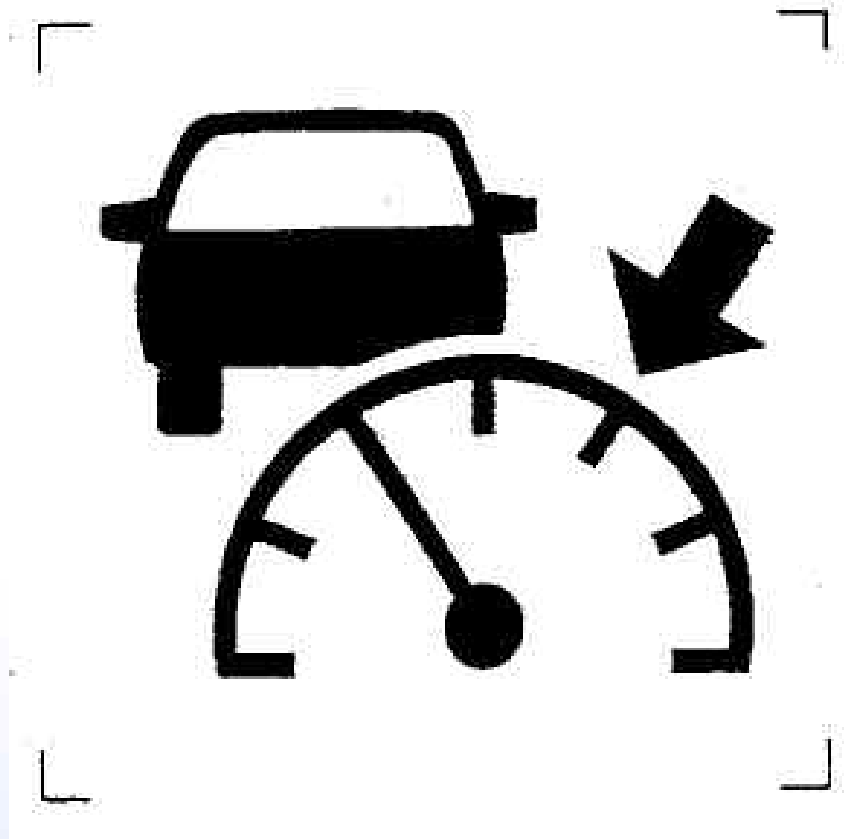


# What are Standards?

**“ Documented agreements containing technical specifications or other precise criteria to be used consistently as rules, guidelines or definitions of characteristics, to ensure that materials, products, processes and services are fit for their purpose ”**



# What does this symbol mean?

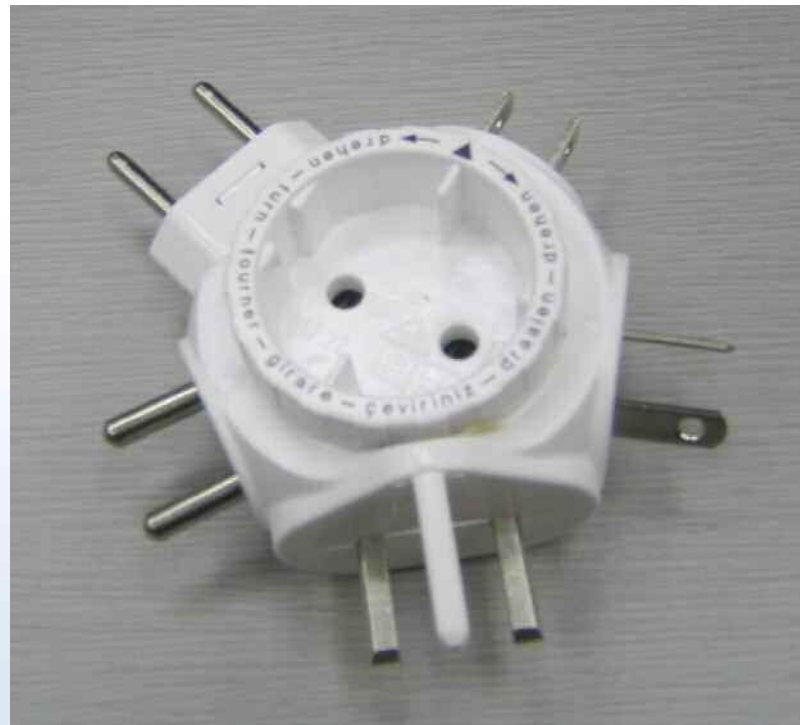


- **Adaptive Cruise Control**
- **From ISO STANDARD 15622**

# Why be interested in Standards?

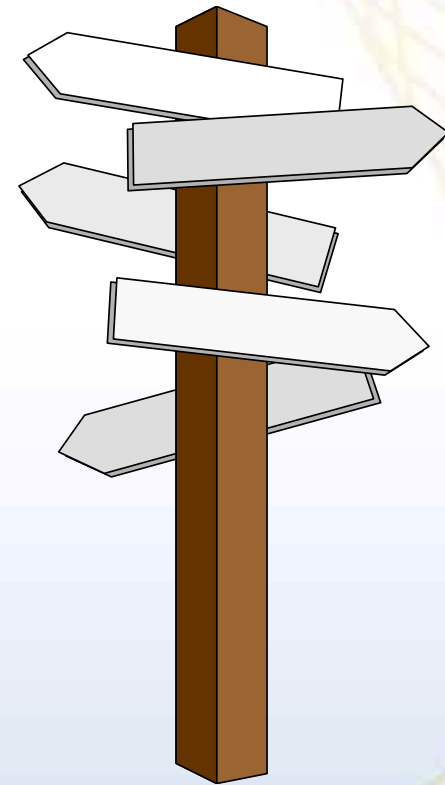
- **Alternative to de facto and proprietary approaches**
- **Economies of scale**
- **Lowers barriers to trade/opens markets**
- **Consensus over methods, tools metrics and acceptable limits**
- **Safety and consumer choice**
- **Intelligence on international activities**

# Examples of (non) Standardisation



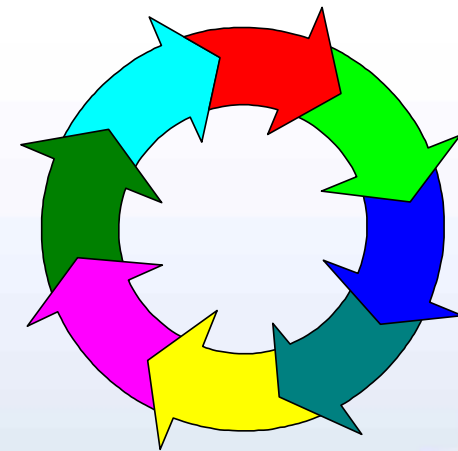
# Types of Standard

- **Procedural**
- **Design**
- **Performance**



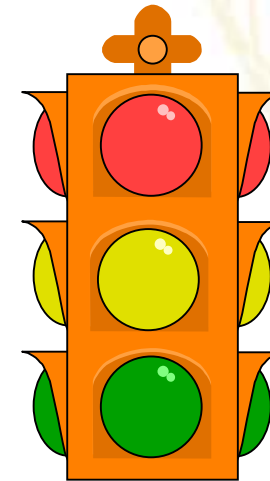
# Procedural Standards

- **Concern the process by which something is done**
- **May say little about what is actually done within the process**
- **Examples are ISO 9000 and ISO/TS 16949**
- **May be externally audited**



# Design Standards

- **Specify principles and features appropriate to a product**
- **May contain options**
- **Minimum criteria**
- **Example is gearshift pattern for passenger vehicles**

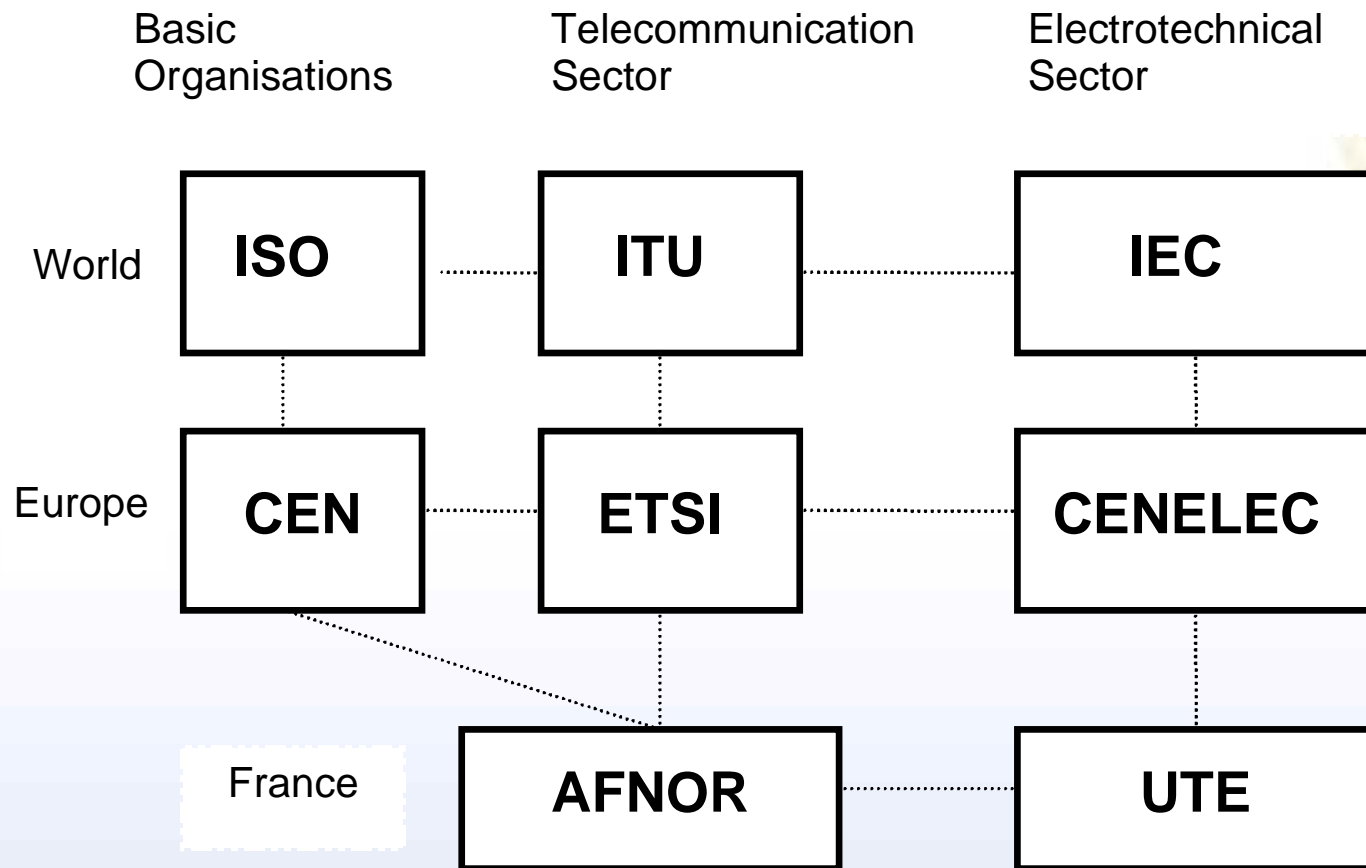


# Performance Standards

- **Specification of equipment performance (e.g. acceleration of at least  $0.4\text{m/s}^2$ )**
- **Specification of human performance**
- **Specification of design criteria based on human performance (e.g. reach envelopes)**
- **“what” rather than “how”**



# Standards Groups



# CEN TC278 Road Transport and Traffic Telematics

## CEN TC 278 WORKING GROUP

1	Electronic fee Collection
2	Freight and Fleet Management Systems
3	Public Transport
4	Traffic and Traveller Information
5	Traffic Control Systems
7	Geographic Data Files
8	Road Databases
9	Dedicated Short Range Communications
10	Human-Machine Interfaces
12	Automatic Vehicle and Equipment Identification
13	Architecture
14	Recovery of Stolen Vehicles

# ISO TC204 Transport Information and Control Systems

ISO TC 204 WORKING GROUP	
1	Architecture
3	TICS Database technology
4	Automatic Vehicle and Equipment Identification
5	Fee and Toll Collection
7	General Fleet Management and Commercial/Freight
8	Public Transport/Emergency
9	Integrated Transport Information, Management and Control
10	Traveller Information Systems
11	Route Guidance and Navigation Systems
14	Vehicle/Roadway Warning and Control Systems
15	Dedicated Short Range Communication for TICS Applications
16	Wide Area Communications/Protocols and Interfaces

# ISO TC22 Vehicles

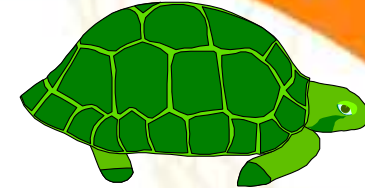
	ISO TC 22 (partial)
WG 5	Car Radio
	Type Pressure Monitoring
WG 13	Failure Modes and Effects Analysis
SC 2	Braking Systems and Equipment
SC 3	Electrical and Electronic Equipment
SC 8	Lighting and Signalling
SC 10	Impact Test Procedures
SC 12	Passive Safety Crash Protection Systems
SC 13	Ergonomics
SC 21	Electric Road Vehicles

# Some relevant Standards groups

- **CEN TC278 (Road Transport Informatics)**
  - WG 10 Human Machine Interface
- **ISO TC204 (TICS)**
  - WG14 Vehicle/roadway warning and control systems
- **ISO TC22 SC13 (Vehicle Ergonomics)**
  - WG3 Controls and telltales
  - WG5 Symbols
  - WG7 Hand Reach and R&H point
  - WG8 TICS On board - Man Machine Interface
- **ISO TC159 (Ergonomics)**
  - WG2 Ergonomics for people with special requirements
  - [SC 1](#) Ergonomic guiding principles
  - [SC 3](#) Anthropometry and biomechanics
  - [SC 4](#) Ergonomics of human-system interaction
  - [SC 5](#) Ergonomics of the physical environment

# Stages of a Standard in ISO

- **PWI Preliminary work item**
- **NWI New work item**
- **WD Working draft** **6 months**
- **CD Committee draft** **18 months**
- **DIS Draft International Standard**
- **FDIS Final DIS** **36 months**
- **Publication of the ISO Standard** **43 months**



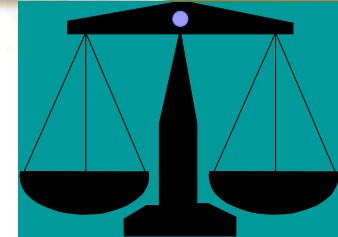
# Standards - Voting

- **ISO:**

**One vote per P-Member**

**2/3 majority of P-Members voting**

**Not more than 25% negative votes**



- **CEN:**

**Number of votes per member vary:**

**e.g. Germany 10, UK 10, Sweden 4, Iceland 1**

**71% of weighted votes for approval**

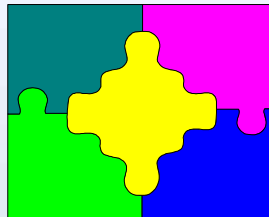
- **Some standards “parallel voted” in CEN and ISO**

# TC22 SC13 WG8 “TICS on Board MMI”

- **Dialogue management**      **ISO 15005**
- **Auditory presentation**      **ISO 15006**
- **Visual behaviour**      **ISO 15007-1 + TS**
- **Visual presentation**      **ISO 15008**
- **Suitability for use**      **ISO 17287**
- **Message priority**      **TS 16951**
- **Warning Systems (review)**      **TR 16352**
- **Occlusion**      **DIS 16673**
  
- **Preliminary Work Items:**
  - Warnings Integration
  - Lane Change Test
  - Driver Characteristics

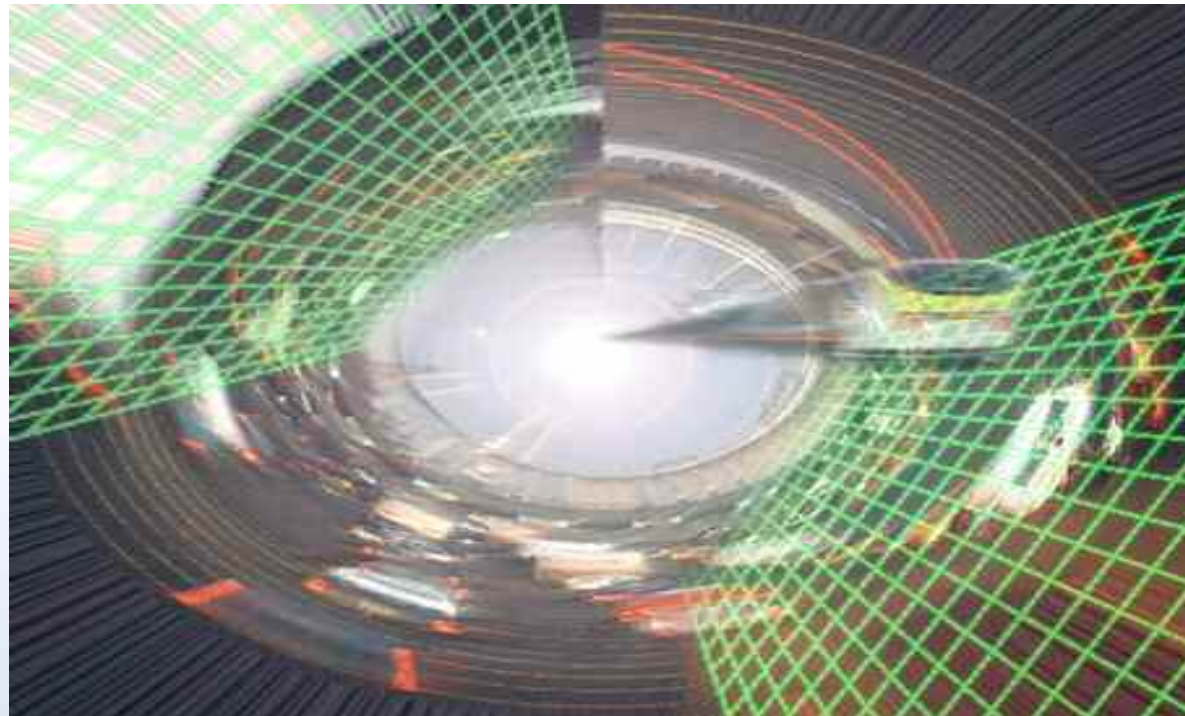
# Remarks on Standards (maybe for later discussion.. )

- **Standards: “Formal agreement by consensus of key stakeholders”**
- **May be used in conjunction with and quoted in European Directives or Type Approval**
- **Can represent “state-of-the-art”**
- **Full standards will always trail developments**
- **Supplementary approach to “Statements of Principle”, Legislation and Type Approval**



# SUITABILITY STANDARD

**Contribution to “Integrated Methodology” Development**



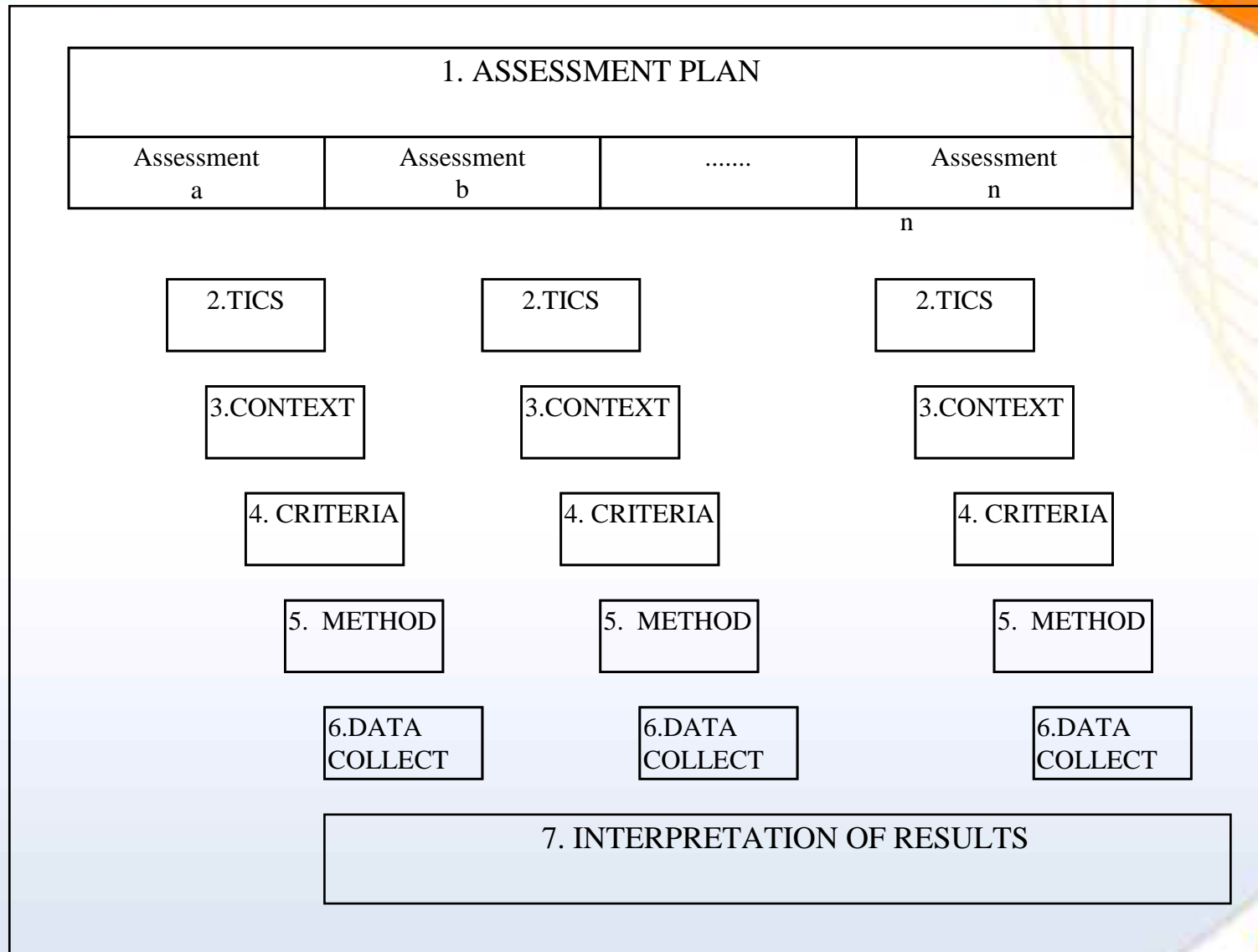
# Suitability

- **Definition of Suitability:**
  - degree to which TICS use is appropriate in the context of the driving environment based on compatibility with the primary driving task.
  - NOTE Suitability focuses on a sub-set of usability comprising:
    - interference (with the driving task)
    - controllability
    - efficiency
    - ease of use while learning about a TICS
- **But for “integrated methodology” purposes, replace “*suitability*” with “*assessment*”**

# **“Shall” clauses**

- **The intended use of the TICS and its context of use shall be defined**
- **TICS functions that are not intended to be used while driving shall be identified**
- **Steps taken to prevent the use of functions not intended to be used while driving shall be described**
- **Steps taken to prevent reasonably foreseeable misuse shall be described**
- **The way in which TICS failures will be apparent to the driver shall be described**
- **Suitability assessment shall take account of the intended use and context of use of the TICS**
- **Information concerning suitability, including assessment results, shall be recorded and documented**

# Assessment Process



# STAGE 1: Assessment Planning

PLAN

TICS

CONTEXT

CRITERIA

METHODS

DATA

INTERPRET

- **Strategic planning of overall goal and individual assessments (a...n) involving different:**
  - TICS representations
  - contexts of use
  - criteria for assessment
  - methods and data collection
- **Resource allocation to the individual assessment tasks**
- **Assessment schedule**
- **Note: Inexperienced users and/or other safety concerns may necessitate conducting preliminary tests of the TICS under controlled conditions before more detailed assessments**

# STAGE 2: TICS

PLAN

TICS

CONTEXT

CRITERIA

METHODS

DATA

INTERPRET

- Describe the TICS
- Undertake task analysis to understand driver/TICS interaction

Selection	Explanation
Design cycle stage	I.e. when in the TICS product design cycle (e.g. concept, prototype, post-launch)
TICS component(s)	The TICS or its subsystem(s), function(s) or mode(s) which are being investigated

# STAGE 3: Context and Restrictions

PLAN

TICS

CONTEXT

CRITERIA

METHODS

DATA

INTERPRET

- **For field trials aspects the context could include:**
  - user population and sample profile
  - vehicle, traffic and road characteristics
  - ambient conditions (e.g. weather, day/night, ...)
  - specific or critical driving situations to be studied (e.g. approaching traffic congestion or approaching traffic lights)

# Example Context

Aspect of description	Example
Vehicle	Saloon cars or delivery trucks. Not suitable for use with metallated windscreens. Not designed for vehicle speeds less than 60 km/h. ...
Driver	- All able-bodied drivers.  or, - Professional taxi driver  or, - Requires knowledge of ... computer system
Road	Inter-urban roads of carriageway width > 3.2 m. Road curvature not less than 500 m.
Traffic	All mixed traffic but not intended in traffic of speed less than 60 km/h. Cyclists are not detected by the TICS.
Other environmental	- Does not work in rain (precipitation > .../hour).  or - Intended for use only when visibility <50 m  or, - Requires daylight or ambient illumination > ...
Provider infrastructure	Requires GPS signals and RDS-TMC service over FM.  or - Requires roadside beacons ...  or - Requires leaky coax of specification ...

# STAGE 4: Definition of assessment criteria

PLAN

TICS

CONTEXT

**CRITERIA**

METHODS

DATA

INTERPRET

- Individual assessment should be “operationalised” by identifying specific variables (also called metrics or indicators) to be measured and the criteria for success
- Examples: Speed, headway, TLC, SDLP, Occlusion etc. (see Matrix TF E)
- The variables may provide evidence contributing to more than one aspect of the overall assessment
- Sources for criteria include standards and the proposals from Brookhuis

# Brookhuis proposal 1

<b>FOLLOWING TOO CLOSELY</b>	<b>Absolute change</b>	<b>Relative change</b>
time headway to lead vehicle (TTC)	< 0.7s	- 0.3s
<b>STRADDLE LANES</b>	<b>Absolute change</b>	<b>Relative change</b>
steering SD	> 1.5°	+ 0.5°
lateral deviation (SD) of vehicle	> 0.25m	+ 0.04m
min time-to-line crossing (TLC) right lane	< 1.3s	- 0.3s
min time-to-line crossing (TLC) left lane	< 1.7s	- 0.2s
median TLC (right lane)	< 3.1s	- 0.7s
median TLC (left lane)	< 4.0s	- 1.4s
<b>DRIVING TOO FAST</b>	<b>Absolute change</b>	<b>Relative change</b>
vehicle speed	Limit + 10%	+ / - 20%

# Brookhuis proposal 2

Measure	Speed	Absolute criteria
SDLP	>50km/h+	0.25
SD Steer	at 60 km/h	1.7°
	>80 km/h - 120 km/h	1.5°
Median TLC	60km/h	6.0s
	80km/h	5.7s
	100km/h	5.0s
	120km/h	4.2s
15% TLC	60km/h	3.8s
	80km/h	3.5s
	100km/h	3.1s
	120km/h	2.9s
Min TLC at different speeds		1.1s

# STAGE 5: Selection of Assessment Method

PLAN

TICS

CONTEXT

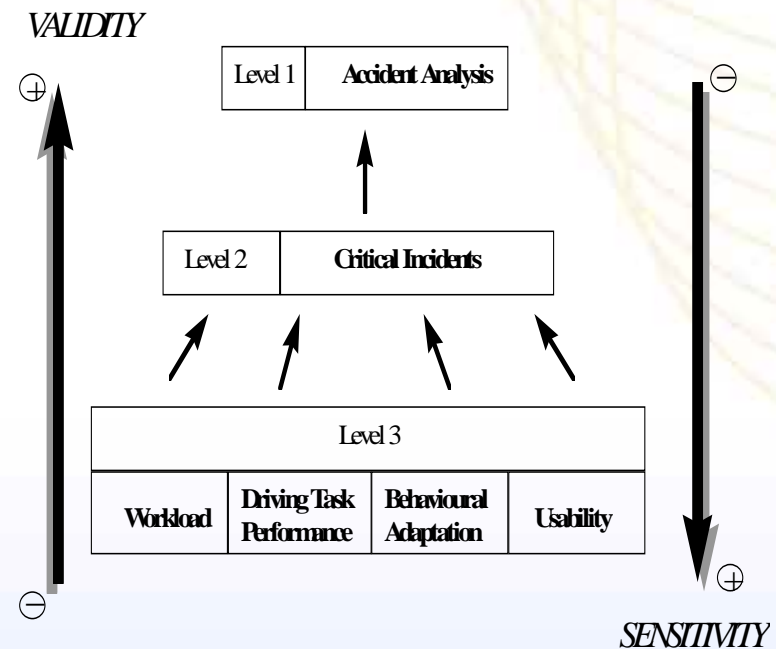
CRITERIA

**METHODS**

DATA

INTERPRET

- Method selected (and the techniques and tools used) depends on the variables identified during Stage 4 (for example whether qualitative or quantitative data are required)
- Important factors are validity, reliability and sensitivity
- Choice may also be influenced by equipment cost, availability, ease of use and time required



# STAGE 6: and STAGE 7:

PLAN

TICS

CONTEXT

CRITERIA

METHODS

DATA

INTERPRET

- **Stage 6: Performing the assessment and analysing the data**
  - Data collection and preliminary data analysis
  - Also record when the assessment was performed, who was involved (e.g. qualifications and affiliations of the assessors)
- **Stage 7: Interpretation of results**
  - Results obtained from all the individual assessment should be studied and compared with the criteria identified in Stage 4
  - Repetition or redesign of tests, iteration through TICS design or reassessment of the assessment plan may be required before an overall assessment can be made

# Assessment Process

