Evaluation based on drivers' needs analysis

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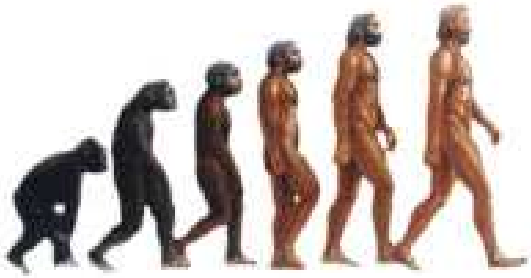
Question

- Why do we need e-safety sytems ?

Driving is an over-demanding, complex, variable and risky activity

- Often pushing human capacities to their limits
  - Leading to human functional failures ("human erro
  - Sometimes resulting into crashes
  - *In Europe, a number of fatalities equivalent to 20 Airbus A320 crashes per month…*

Human beings are not so much fitted for driving



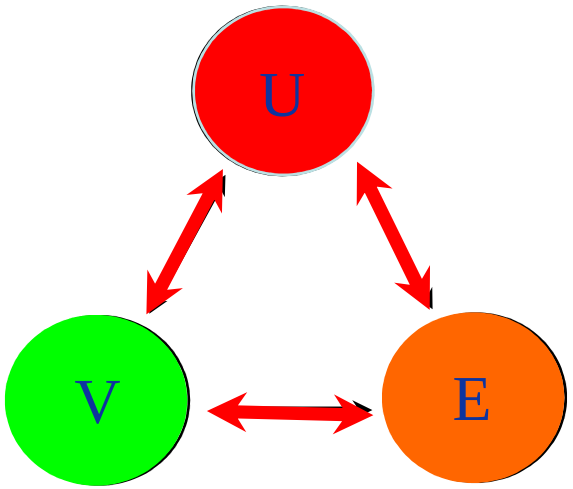
A disproportioned speed regarding human physical capacities elaborated through evolution

- Limits to vigilance and attention capacities
- Limits to perceptive ability and motor skills
- An important variety between road users (motivation, attitude, knowledge, ability, etc.)
- …

- But no other system is able to do better than human beings in everyday traffic

Road users in a safe system perspective

A system approach



A question of interactions

An objective of mutual adaptation

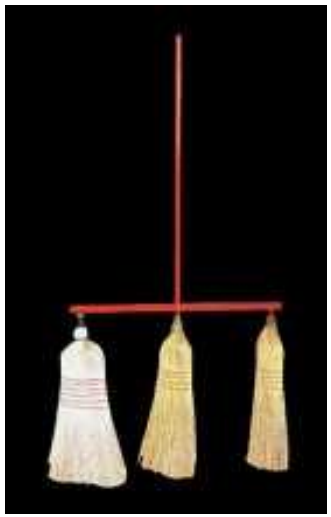
An ergonomics perspective

An ergonomics perspective

- A potentially ideal system is not ideal if not adapted to its users and its usage

Implication of ergonomics

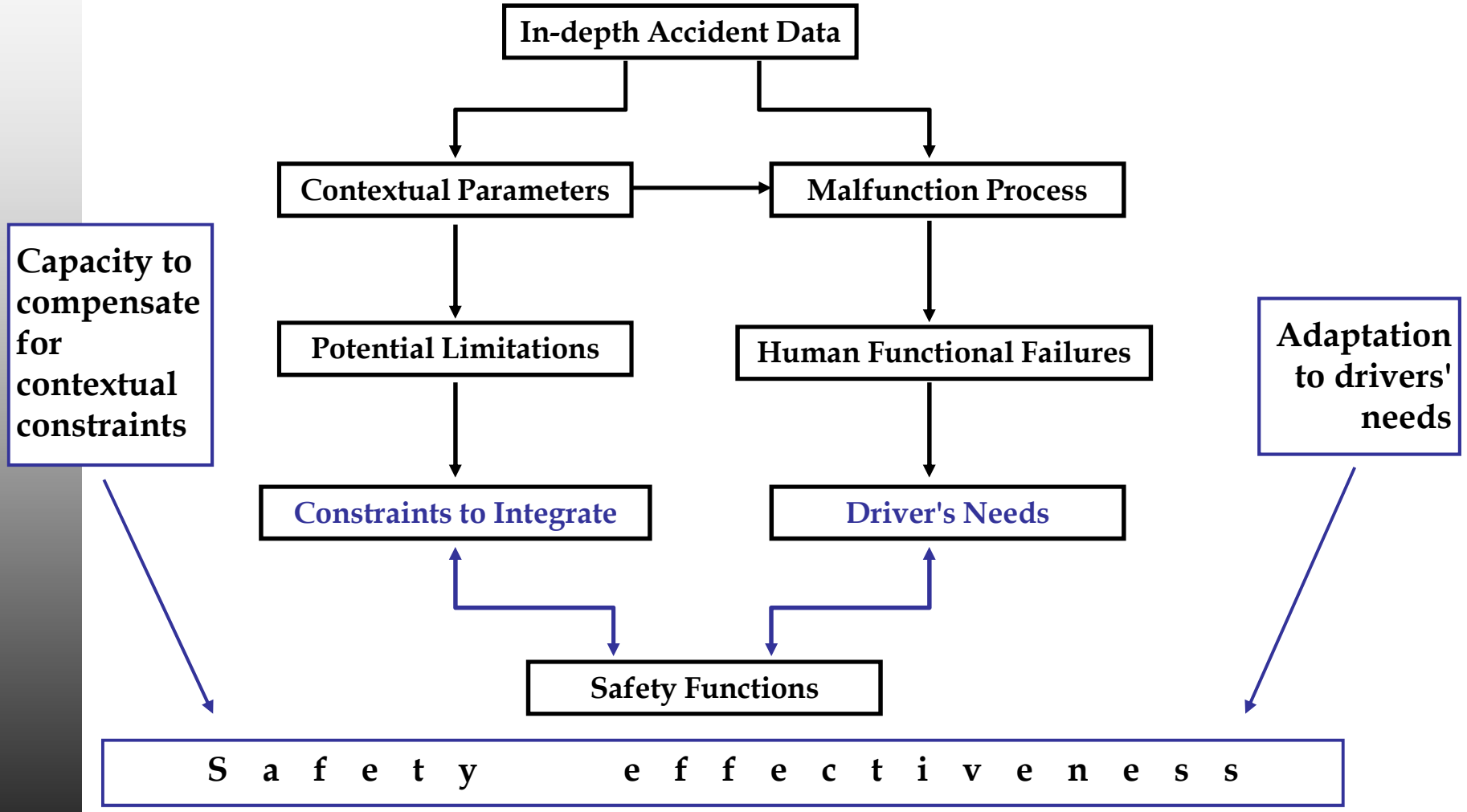
- An aid must fit with the effective needs of its users
- It must not be useless for them
- It must not provide additional difficulties



"Human errors" reveal safety needs

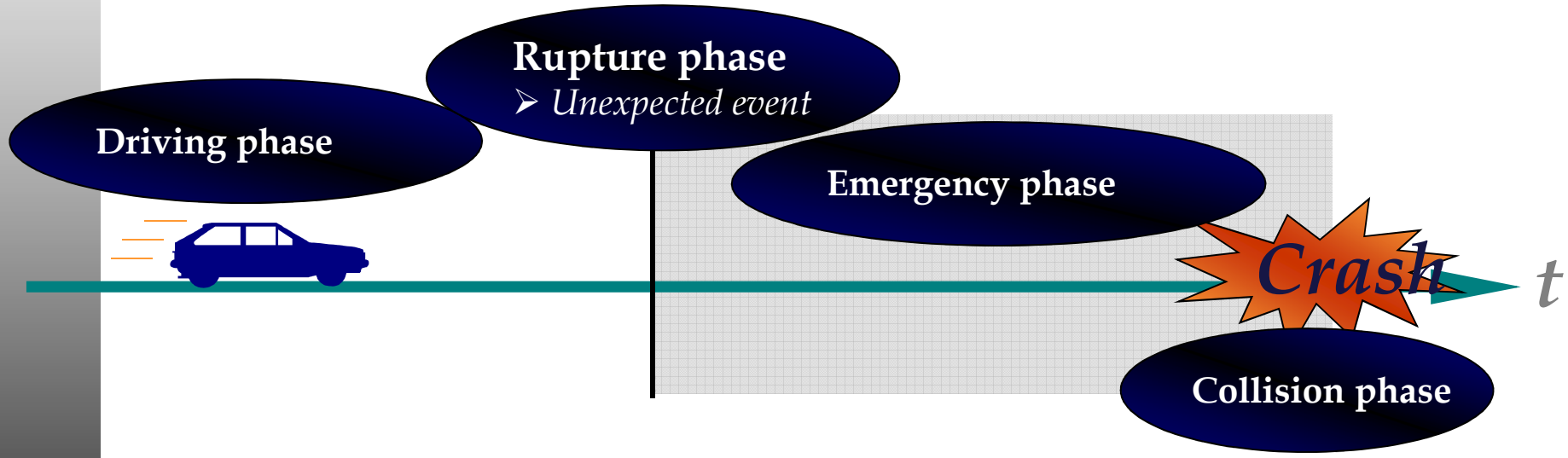
- Road accidents are the symptom that Driving is sometimes too much a complex activity for which drivers need an help
- Human functional failures ("errors") reflect drivers' needs
  - What lacked to the driver in order not to be victim of a crash
  - Information, automatism, protection, etc.
- ITS functions are (potentially) a means (among others) to compensate for these drivers' needs
  - If they are adequately defined for the real difficulties met by drivers in crash situations
    - In-depth accident data
    - Human centered model
  - If they are able to fit the constraints found in crash reality
    - (e.g. if the driver is looking behind, a signal on the dashboard is not appropriate…)

Method

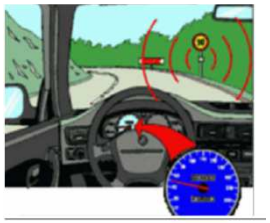

In-depth Accident Data
Contextual Parameters
Malfunction Process
Capacity to compensate for contextual constraints
Potential Limitations
Human Functional Failures
Adaptation to drivers' needs
Constraints to Integrate
Driver's Needs
Safety Functions
S a f e t y e f f e c t i v e n e s s

Accidents are sequential processes

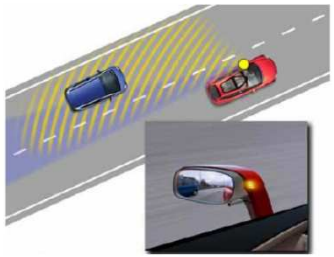
- The crash, a terminal event
  - which is built in successive stages
  - which must be analyzed by sequences



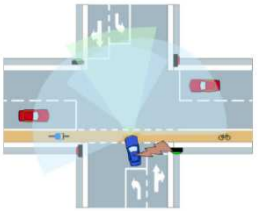
- At each stage of the process, different types of needs can be found
- Different safety functions may cover needs at the different phases



Apparatus



- Catalogue of safety functions
  - The most dedicated to safety
    - DaCoTa Deliverable D 5.2.3 : 21 Safety functions
      - E.g. "Blind Spot Detection", "Electronic Stability Control"…
    - + infrastructure based safety functions
      - E.g. "Rumble Strips", "Intersection Alert" ...



- 445 in-depth accident cases
  - Including two-wheelers and pedestrians
  - Case by case analysis
  - A time consuming but fruitful activity
    - Human failures and their factors
    - Drivers needs at the different phases
    - Adaptation of safety functions to drivers needs
    - Potential limits of efficiency

Hints of results

- Not to be considered in an overall way
- Differences in the capacity of safety functions to meet drivers needs according to:
  - The accident configuration (single vehicle / interaction with traffic)
  - The moment of the accident process (approach / rupture / emergency)
  - The road users involved (Car drivers / PTW riders / pedestrians)
- For example, for car drivers in interaction accidents
  - Approach phase
    - Intersection Control (30%), Intelligent Speed Adaptation (15%), Traffic Signal Recognition (14%)
  - Rupture phase
    - Collision Avoidance (29%), Intersection control (24 %), Intersection alert (15%)
  - Emergency phase
    - Collision Avoidance (40 %), Predictive Brake assist (19%)

Hints of results

- Potential limitations to safety functions efficiency
  - Linked to the driver
    - Counter motivations, Low vigilance, Distracted driving, etc.
  - Linked to external context
    - Situational constraints, Safety functions specifications, etc.

Most frequent limitations at the rupture accident phase

Potential limitations		Car drivers	PTW riders
Linked to driver's sate and motivation	Inattention, thoughts, concerns	**9,0%**	3,4%
	Passive distraction (e.g. scenery)	**7,5%**	1,7%
	Active Distraction	**5,0%**	1,7%
	Deliberate violation	2,7%	**8,6%**
Linked to contextual constraints	Reduced time / space condition	**8,6%**	**17,2%**
	Insufficient width of radar	**6,9%**	4,3%
	Visibility impaired by a vehicle	**5,5%**	**5,2%**
	Assistance trigger threshold	2,5%	**5,2%**

Conclusion

- A specific contribution to evaluation of safety functions efficiency
  - Directed toward road user's needs
- A methodology taking into account:
  - Human difficulties (functional failures)
  - Accident reality (context parameters)
- Allow defining:
  - Safety needs for different kinds of drivers, reflecting their accident-generating failures at the different stage of the process
  - The potential capacity of safety functions to meet these needs
  - The potential lacks in the functions efficiency
  - The conditions for improving their effectiveness

- ➢ Purpose is not to guess what the future will be
- ➢ But to define the conditions under which it could be better

DaCoTA

Thanks you

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