

# ICORSI

Independent Council for  
Road Safety International

## International Symposium

### Road Safety Around the World: Future Concerns

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TATA TRUSTS

# **Road Users: Formal & Informal Rules**

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IFSTTAR

# Safe systems and road safety

## Wrong premises

- Human makes mistakes (Attribution bias)
- Decomposition into sub-systems with 4 pillars to ensure road safety

## Correct premises

- Human error is not absolute and relative to a reference; organisational failures contribute to accident
- System Safety as emergence from interactions

# Two systems of rules on the road

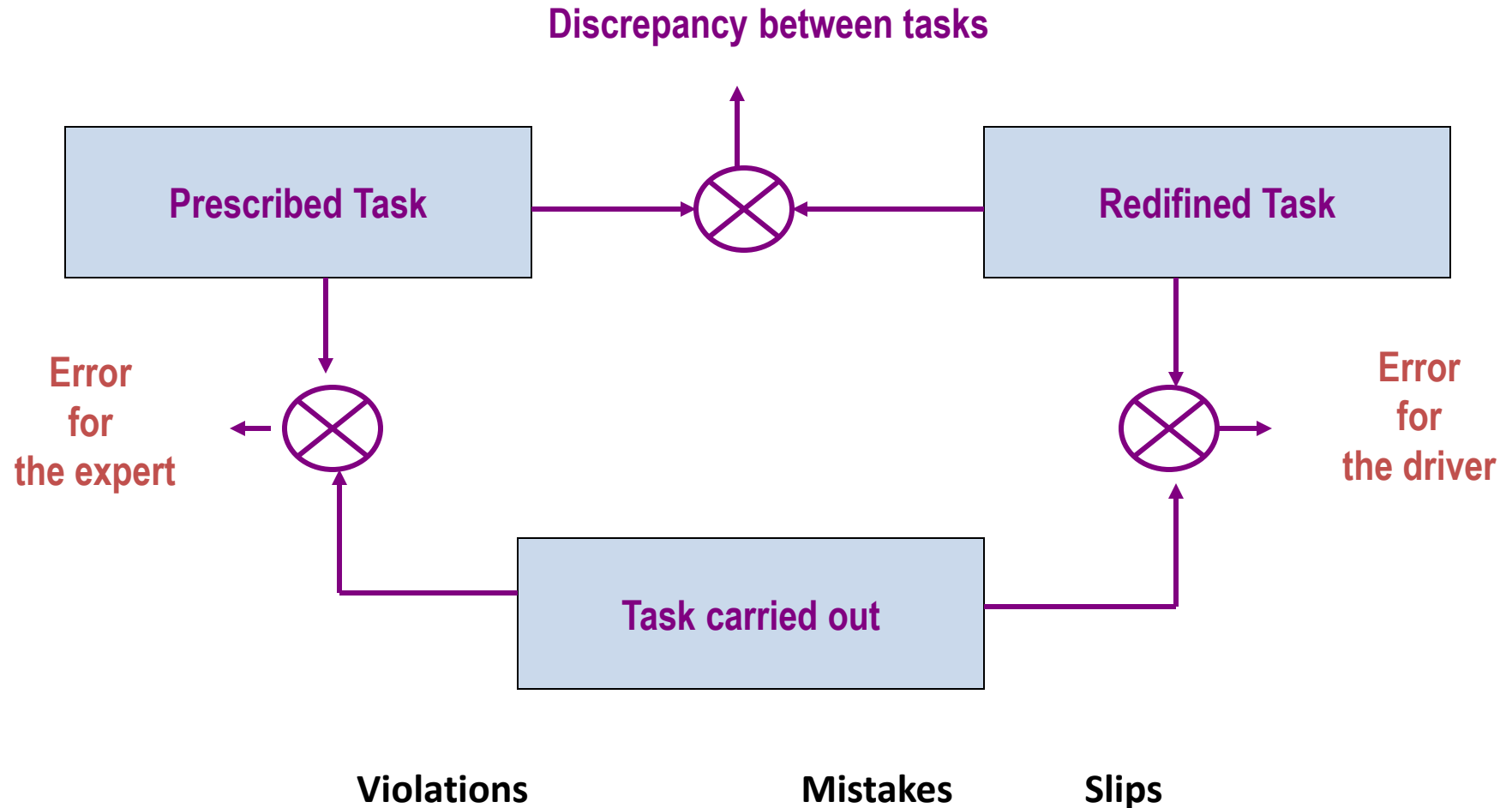
## Prescribed (or formal) task

- The task to be carried out as conceived by the designer of the system and/or the safety manager.
- It sets out (more or less explicitly) a number of prescriptions (Highway Code), which are supposed to influence and to some extent guide driver activity.
- In other words, the prescribed task defines **the expected driving behaviour**, what the driver should do (in terms of performance and/or procedures to follow).

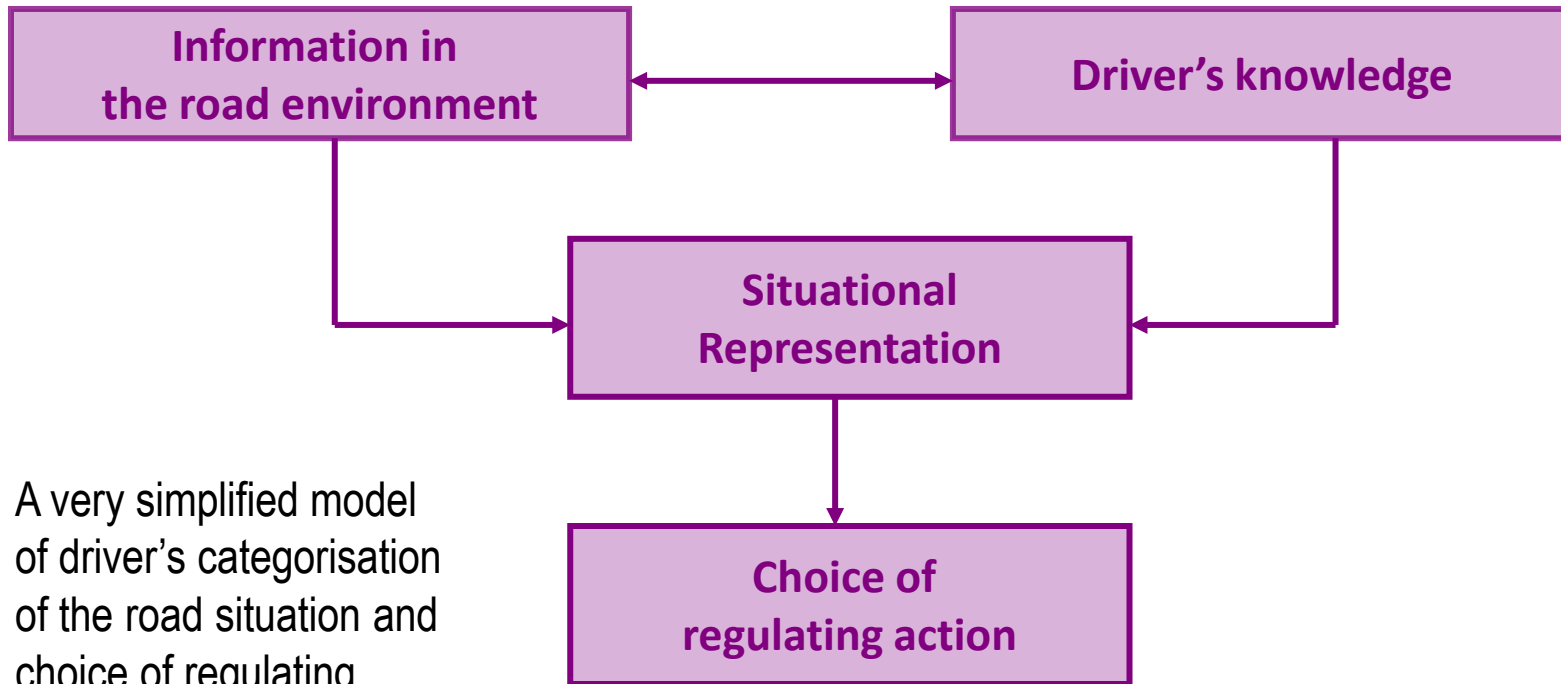
## Redefined (or informal) task

- What the driver actually does, the demands and constraints that s/he effectively takes into account.
- Identifying the actual task calls for a detailed analysis of driver behaviour with the aim of determining exactly how drivers organise and perform the driving task (ERGONOMICS):
  - What their goals and intentions are,
  - What information they select from the environment,
  - What motives and criteria underlie their decision-making,?
  - What regulating actions they take.

# Model of error analysis (Leplat, 1993)

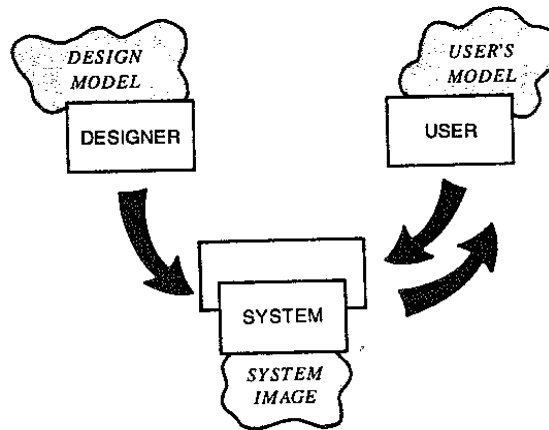


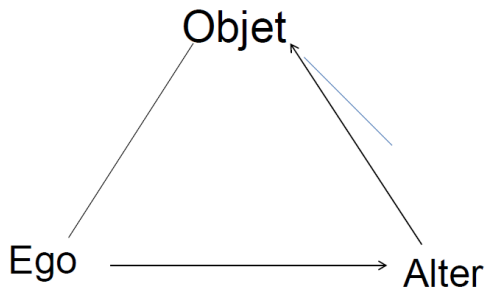
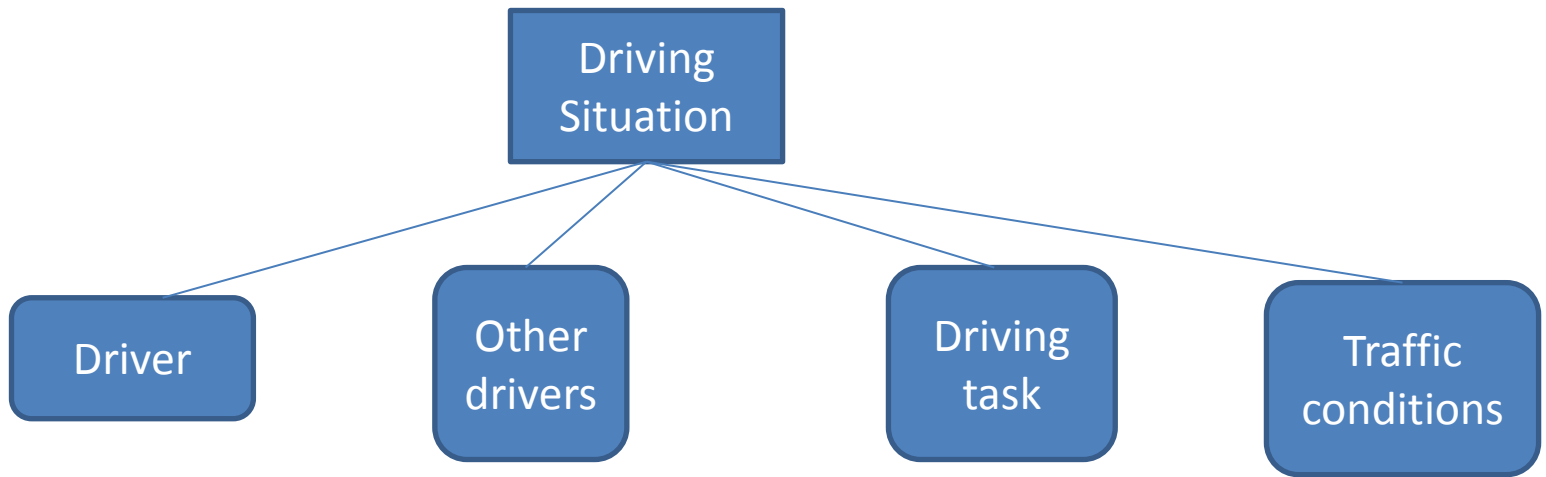
# Role of representation



A very simplified model of driver's categorisation of the road situation and choice of regulating action

Not the situation itself but its representation determines the behavior





Highway Code

Police

Complex and Insufficiently structured (F. Saad)

Source : Campos, Lagares from Abric

# Speed and speed limit representations

N = 1 005

Rangs moyens d'importance  
2

Danger	473/1,6	Plaisir	256/2,1
Accident	239/1,9	Imprudence	158/2,1
		Sport automobile	150/2,1
Vigilance	77/1,9	Peur	36/2,1
Excès de vitesse	61/2	Répression	112/2,3
Limitation	58/1,9	Gain de temps	143/2,1
		Voiture puissante	95/2,2

Fréquence  
150

N = 1 005

Rangs moyens d'importance  
2

Sécurité	437/1,6	Répression	471/2,2
Respect des limitations	348/1,8	Contrainte	151/2,2
Prudence	306/1,9		
Danger	293/2		
Réglementation	39/1,8 29/1,9	Bien	125/2,1
		Bête	50/2,1
		Mal adaptée	50/2,1
		Signalisation	61/2,2

Fréquence  
150

Speed=Hazard

Speed=Hazard=Pleasure

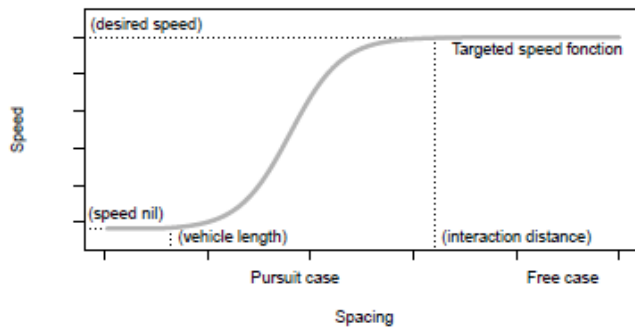
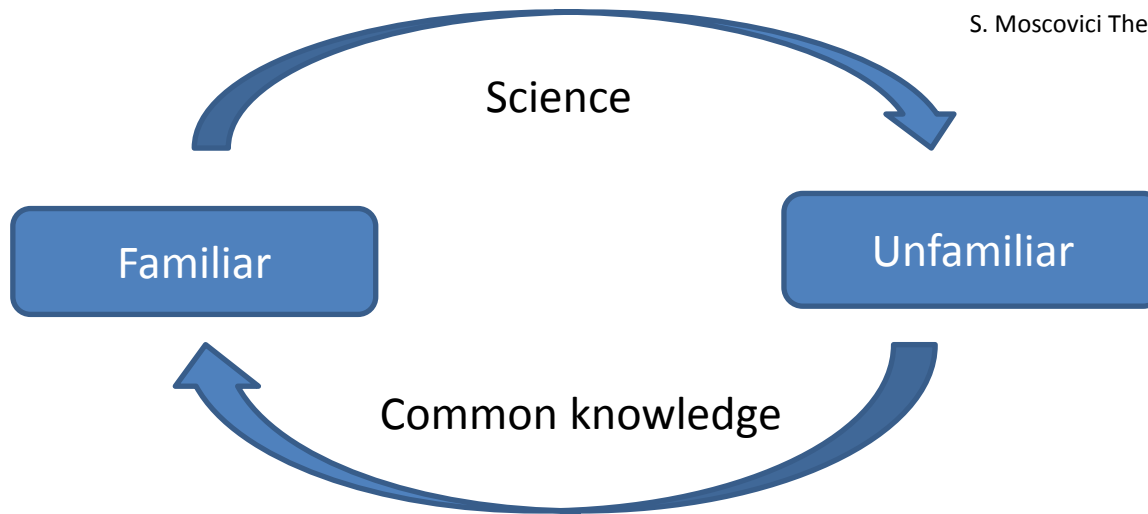
Speed=Hazard=Recklessness

PRUDENTS	DEFIANTS	HEDONISTS	PRAGMATISTS
Danger	Danger	-	-
-	Pleasure	Pleasure	-
-	-	Rapidity	Rapidity
-	-	Gaining time	Gaining time
-	-	-	Enforcement
-	-	-	Vigilance
N=216	N=56	N=42	N=80
55% of the population	14% of the population	11% of the population	20% of the population



# Driving task and kinematics

S. Moscovici The phenomenon of social representations



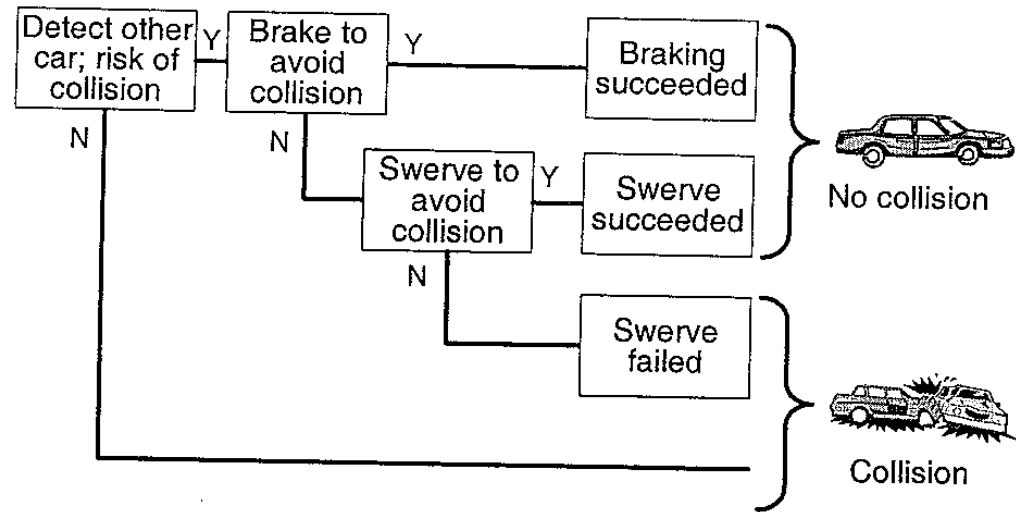
$$\dot{x}_n(t + T^r) = \mathcal{R} \{x_{n+1}(t) - x_n(t), \dot{x}_{n+1}(t)\}$$

Algorithms  
ACC Automatic Cruise Control  
Autonomous vehicle

Longitudinal and lateral Control of trajectory and speed  
- Car following

# Formal/informal knowledge about crash avoidance

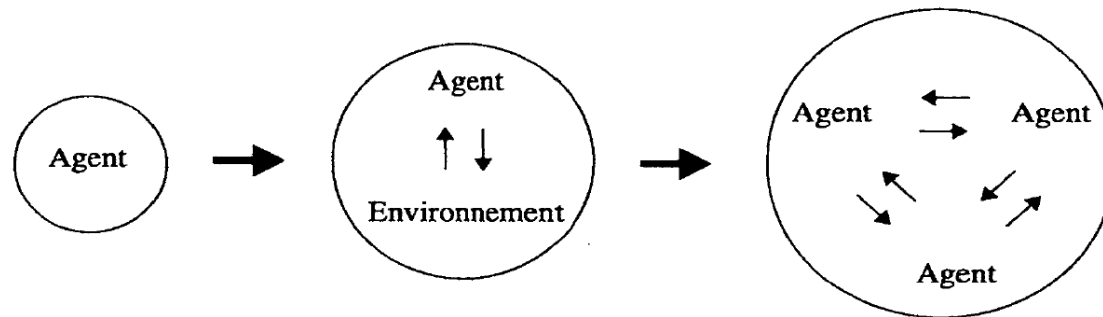
- Crash avoidance
  - Breaking
  - Swerving



- « Thanks to this popular physics we avoid collisions » . Not so good, then Driving aids :
  - *ABS Antiblockiersystem*
  - *ESC Electronic stability control*

# What kind of system ?

- Applying a systemic approach entails focusing on **interaction phenomena** between the driver(s) and the technical and organisational components of the system (vehicle, road infrastructure, legislation, traffic management,...) and hence **going beyond a simplified view of causality in analysing system malfunctions.**

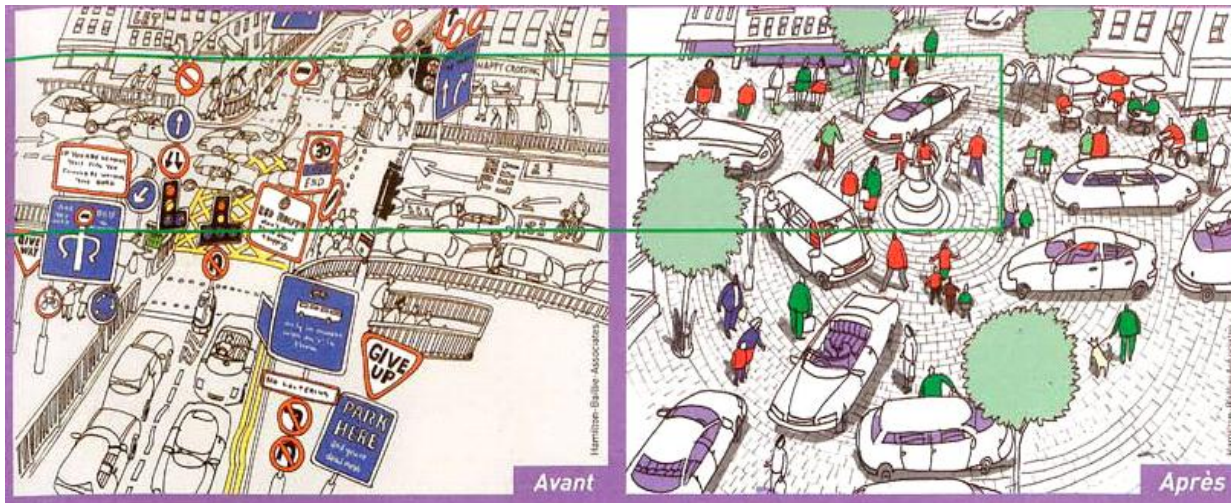


Social Situationism

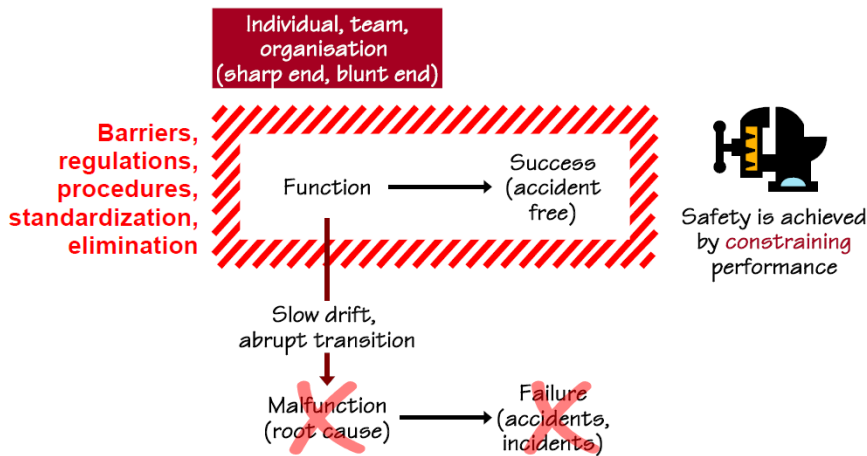
- Open system
- **Complex (/well structured) and tightly (/loosely) coupled system**

# Ruled safety and managed safety

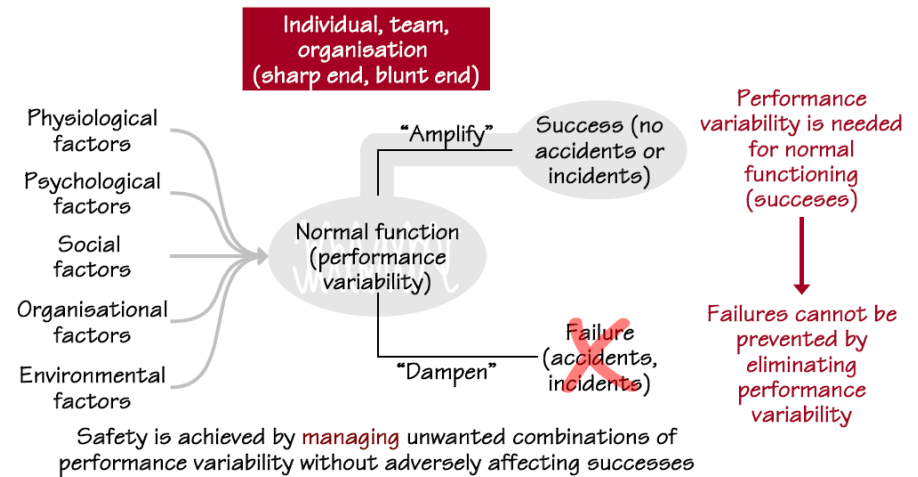
- Tractable and loose system
- Reified universe
- Heteronomous
- Ruled safety or safety by constraint
- Untractable and tight system
- Consensual
- Autonomous
- Managed safety (Hollnagel, 2014).



# Safety by constraints



# Safety by management



# Conclusion

- Incompleteness of formal rules and necessity to study informal rules with a pluridisciplinary approach (error model)
- Driving is social and the origin of rules is found into the social representations of the driving situation
- The existence of two formal and informal rule systems in road driving must be recognized and taken advantage of in order to reconcile two modes of safety: regulated and managed.

# Bibliography

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