

The background of the slide is a blurred photograph of a road at dusk or dawn. A red traffic light is visible on the right side of the road, and the road surface is a reddish-brown color. The overall scene is out of focus, emphasizing the text in the foreground.

Human Factors at Level Crossings

Results of questionnaire

UN-ECE Group of Experts on Safety at Level Crossings

Subgroup on Human factors:

M. Cale - CogniTo

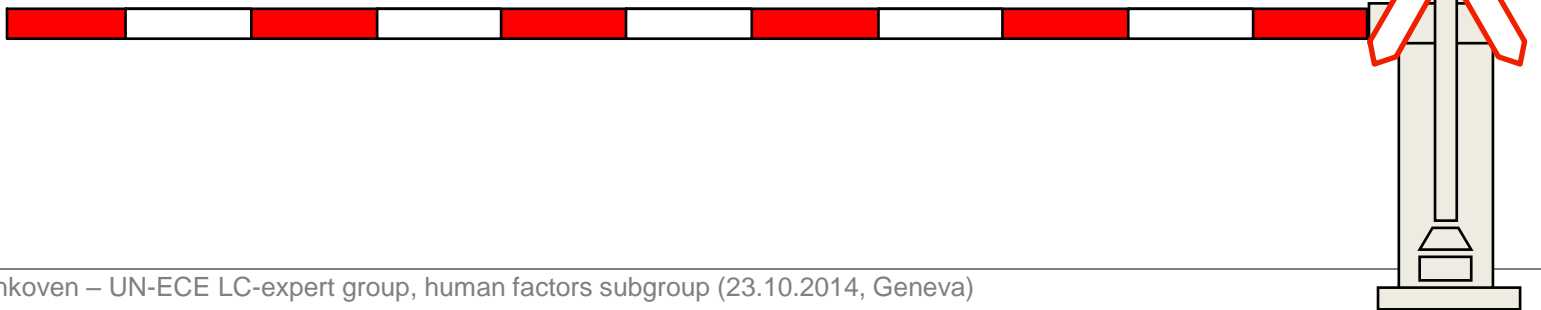
G. Dinhobl - ÖBB-Infrastruktur AG

J. Grippenkoven - German Aerospace Center e.V. (DLR)

Geneva, 23.10.2014

Content

- Results of human factors - questionnaire
- Conclusion
- Next steps - establish a LC-model
- Next steps – LCAD (Level Crossing Appreciation Device)
- Outlook: future steps



Schedule & Milestones

1. Review of (existing) studies:

- Human Factors at level crossings
- Psychological models

Draft
paper
available

9/2014

2. Model(s) for level crossing application, including a list about derived assumptions and hypotheses about human (mis-)behaviour at level crossings

1/2015

3. ~~Human Factors solutions~~ → **List of Tools**
existing tools and ‚theoretical‘ ones

5/2015

4. Suggestion(s) for further work/research: towards proving that our tools work

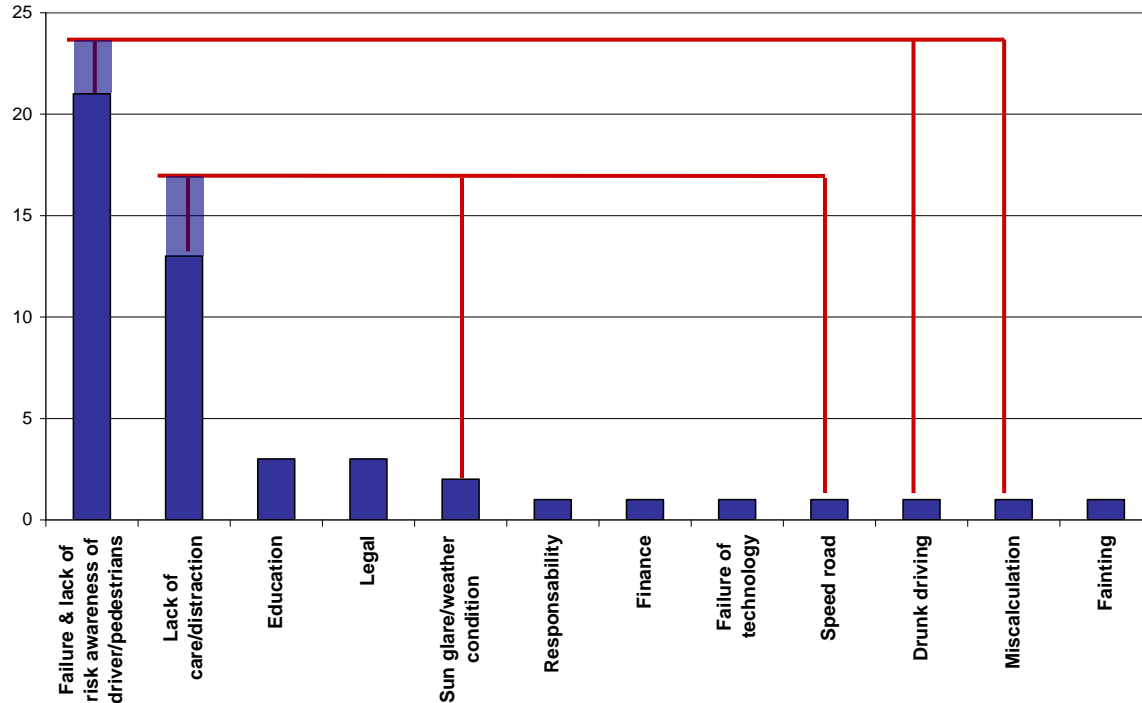
5/2015

Results of human factors - questionnaire

- 24 feedbacks received
- from 22 countries
- not included here: issues on 'survey of technology and technological solutions' (see Section III-e of report of last meeting) – questions
 - Question # 38: LC layout
 - Question #39: railside protection equipment
 - Question #44: ITS-solutions
- results by question:

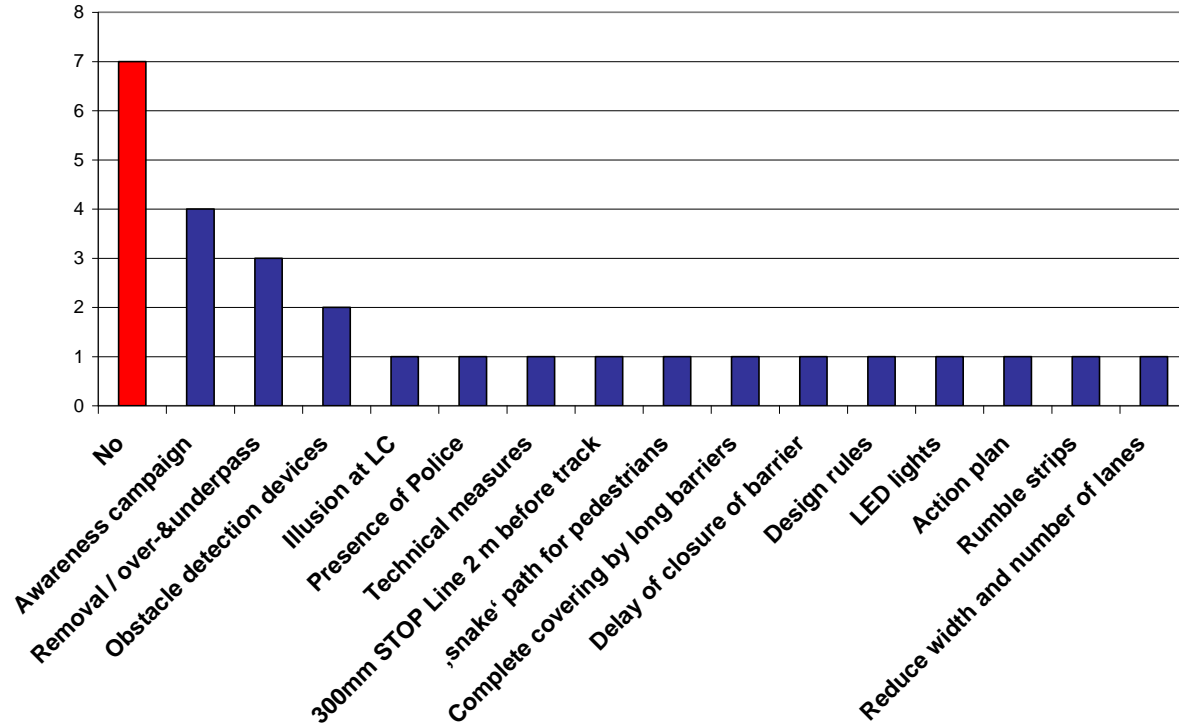
Q1:

What are the three main causes behind level crossing accidents in your country?



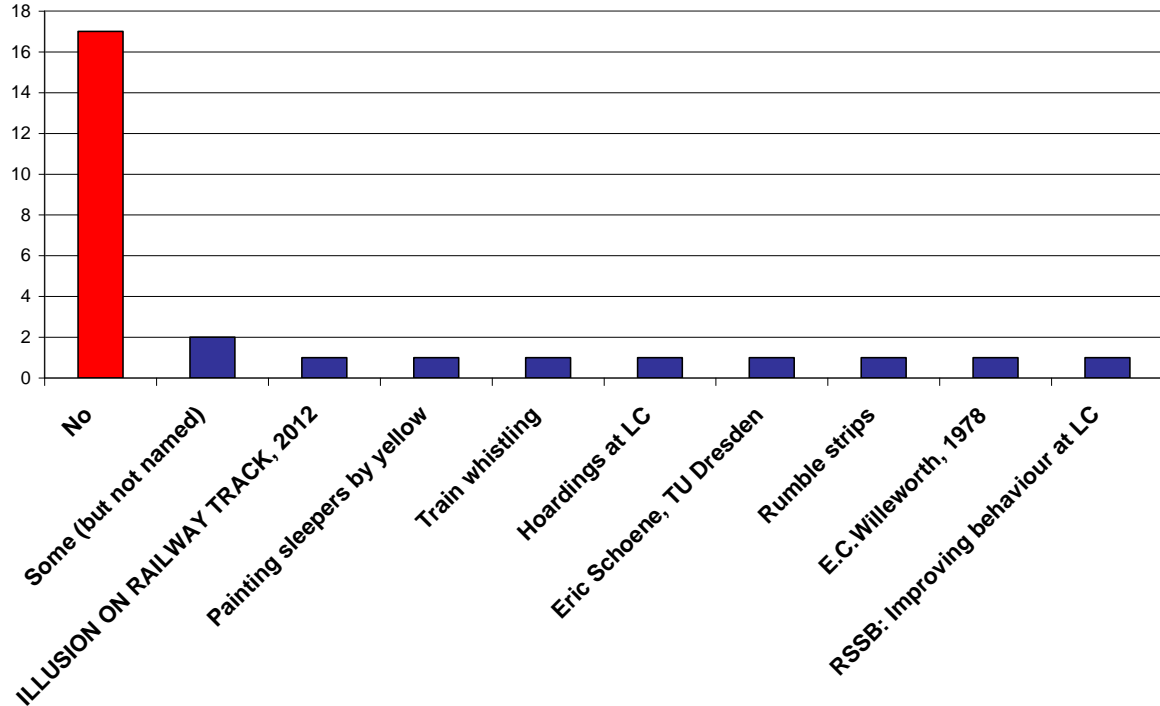
Q2:

Does your country have any solutions and/or creative and innovative countermeasures to solve these problems?



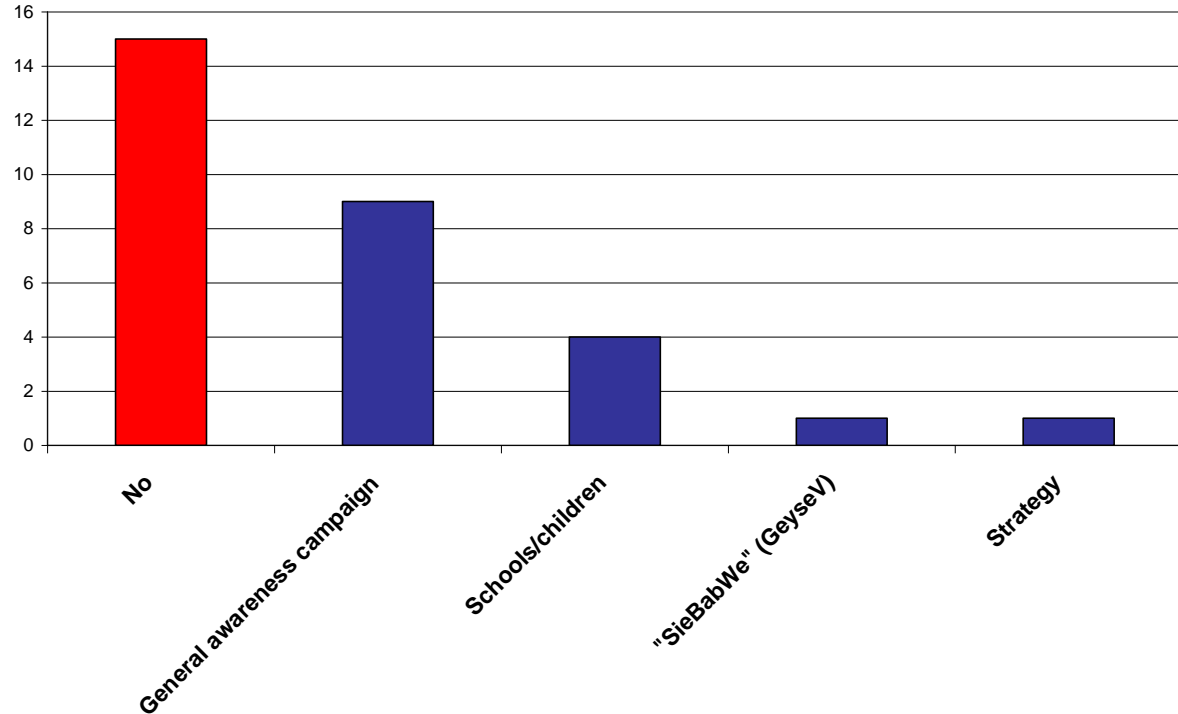
Q3:

Do you have any research studies or papers on human factors relating to the behaviour of road users around level crossings which you could share?



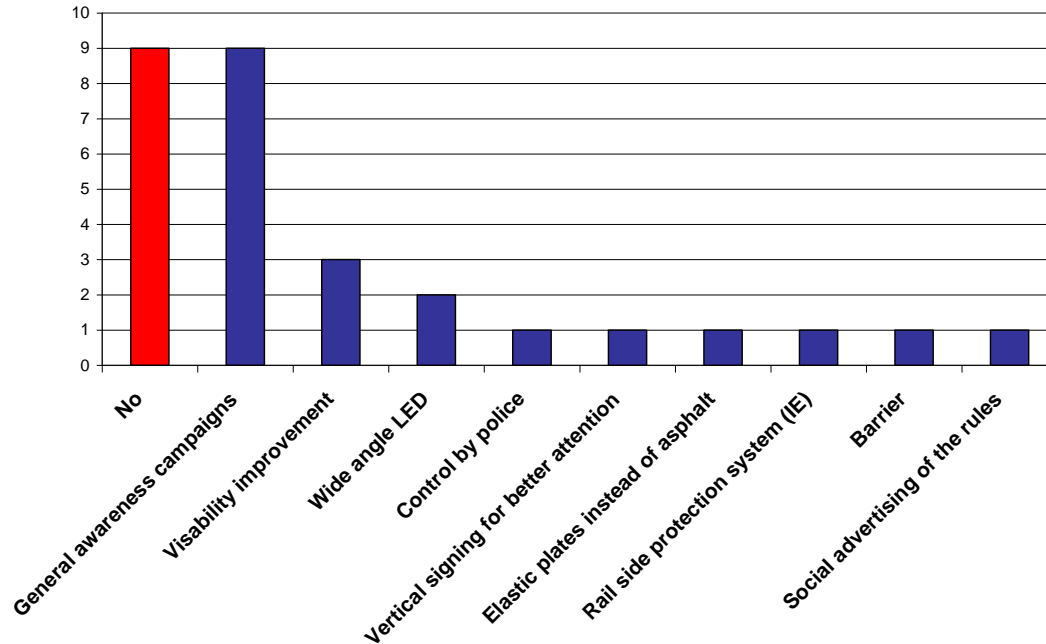
Q4:

Are there any educational programmes in your country that focus on the awareness of the road users concerning level crossings safety?



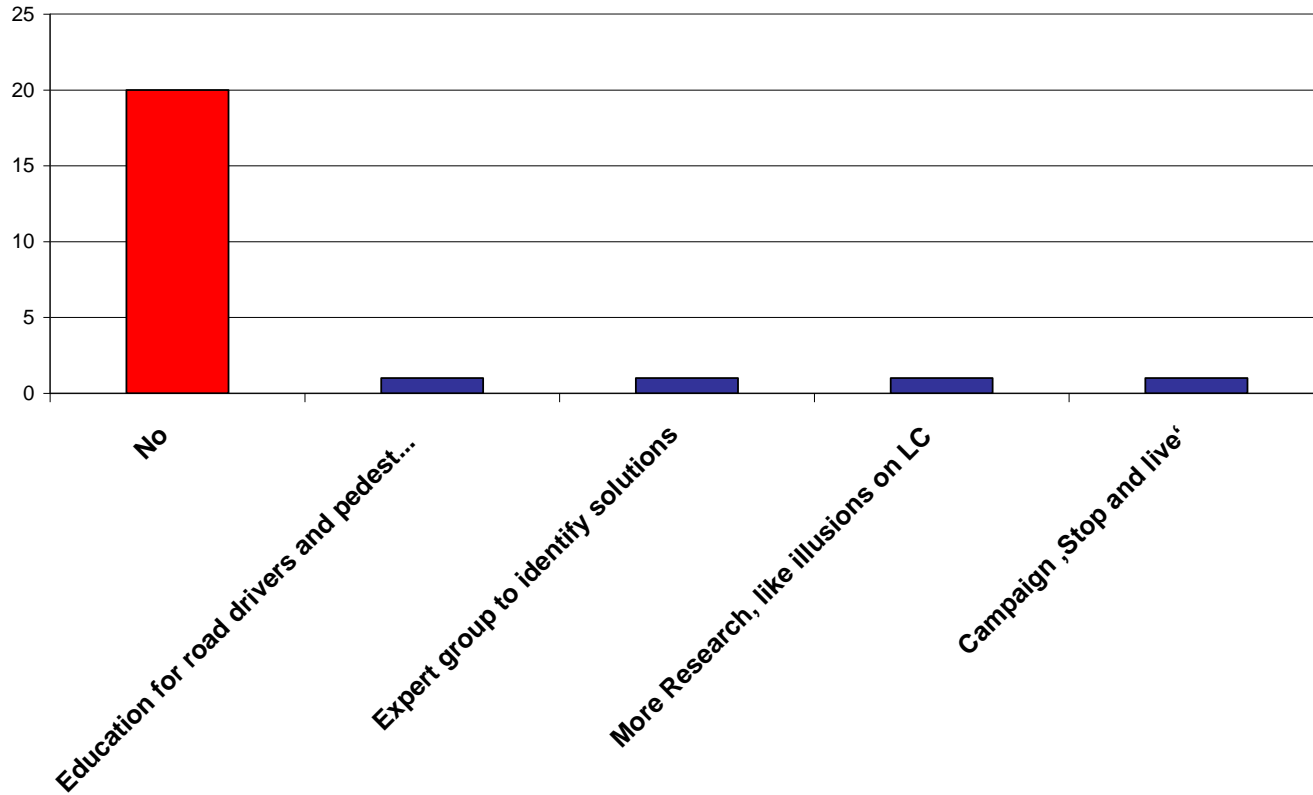
Q5:

Referring to the list of human factors at the start of this section E, has your country taken any action to improve safety at level crossings on the basis of these causative factors?



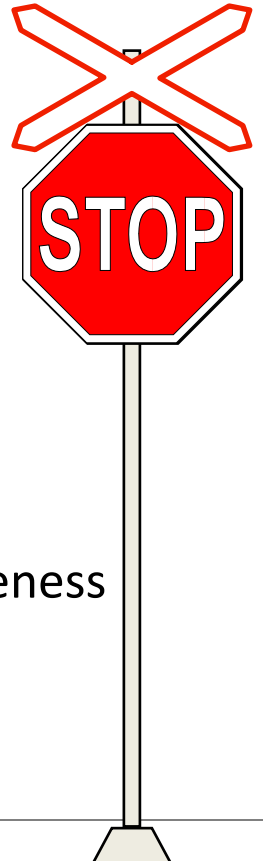
Q6:

Do you have any other comments?



Results of questionnaire - conclusion (1): *What did we get?*

- **causes (Q1):**
 - lack of risk awareness
 - care(less)
 - distraction
- **solutions (Q2 & Q5):**
 - awareness
 - removal of LC
 - enhance visibility! (site-specific & wide-angle LED lights)
- **research (Q3):** only few existing
- **LC-educational programmes (Q4):** often included in general awareness campaigns
- **general (Q6):** education



Observations from the survey results

- Human factors as priority area in level crossing accidents identified by all responses
- Tools and solutions often have a technological focus and do not focus on human factors
- Tools and solutions are often based on impressions of singular incidents and
 - ...Not theory driven
 - ...Not structured
 - ... but by „trial & error“-method

⇒ Theories and models from the field of human factors can be used in order to describe the process of crossing a LX

Next Steps of LC-human factors subgroup

- **establish a LC-model** (of human information processing):
the basics / foundation of a 'toolbox'
- **LC assessment device:** the ,toolbox'

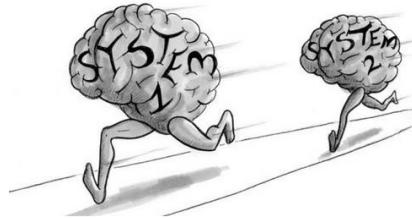
establish a LC-model - useful models

- Fast and Slow: Systems 1 and 2 (Kahnemann, 2011)
- 3-Levels of performance (Rasmussen, 1983)
- Model of information processing (Wickens & Hollands, 1999)

„Fast and Slow“: Systems 1 and 2 (Kahnemann, 2011)

System 1 – „Fast“

- Defining Characteristics:
 - Automatic
 - Effortless
 - Unconscious
- No sense of voluntary control
- „Seeing and acting“

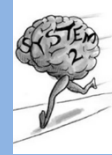
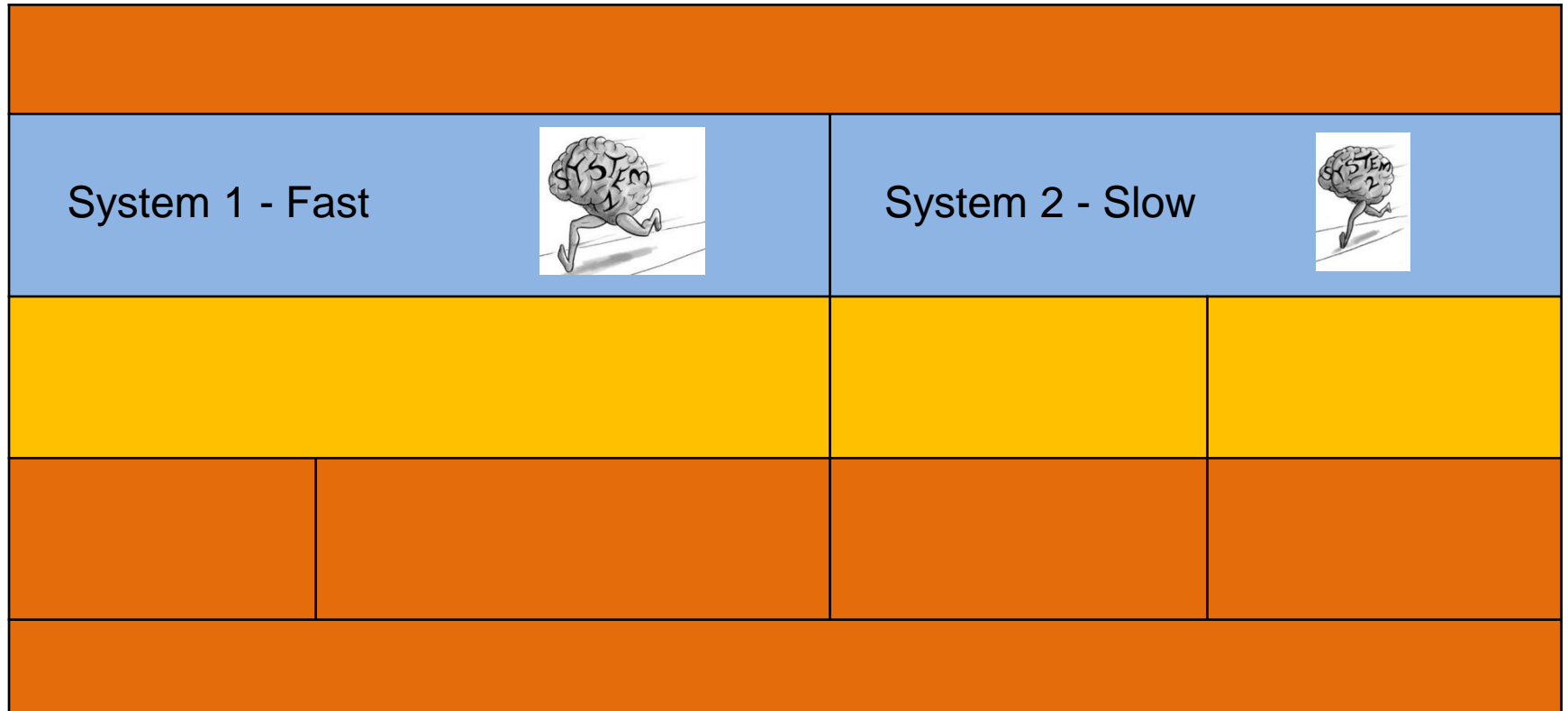


System 2 – „Slow“

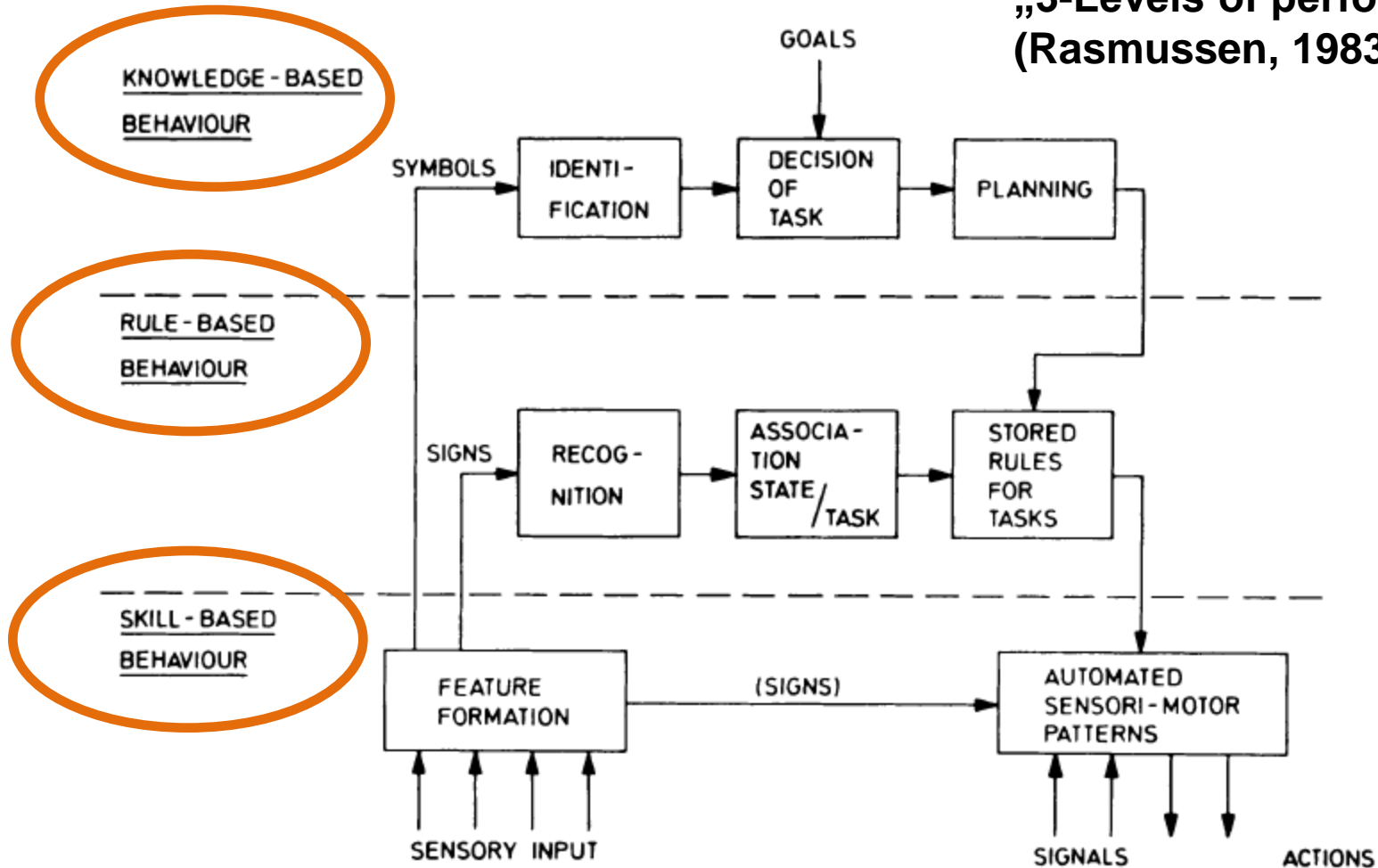
- Defining Characteristics
 - Controlled mental process
 - Effortful
 - Deliberate and conscious
- With Control or self-awareness
- „Reasoning and acting“



The „Toolbox“ 1st draft



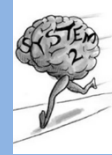
„3-Levels of performance“ (Rasmussen, 1983)



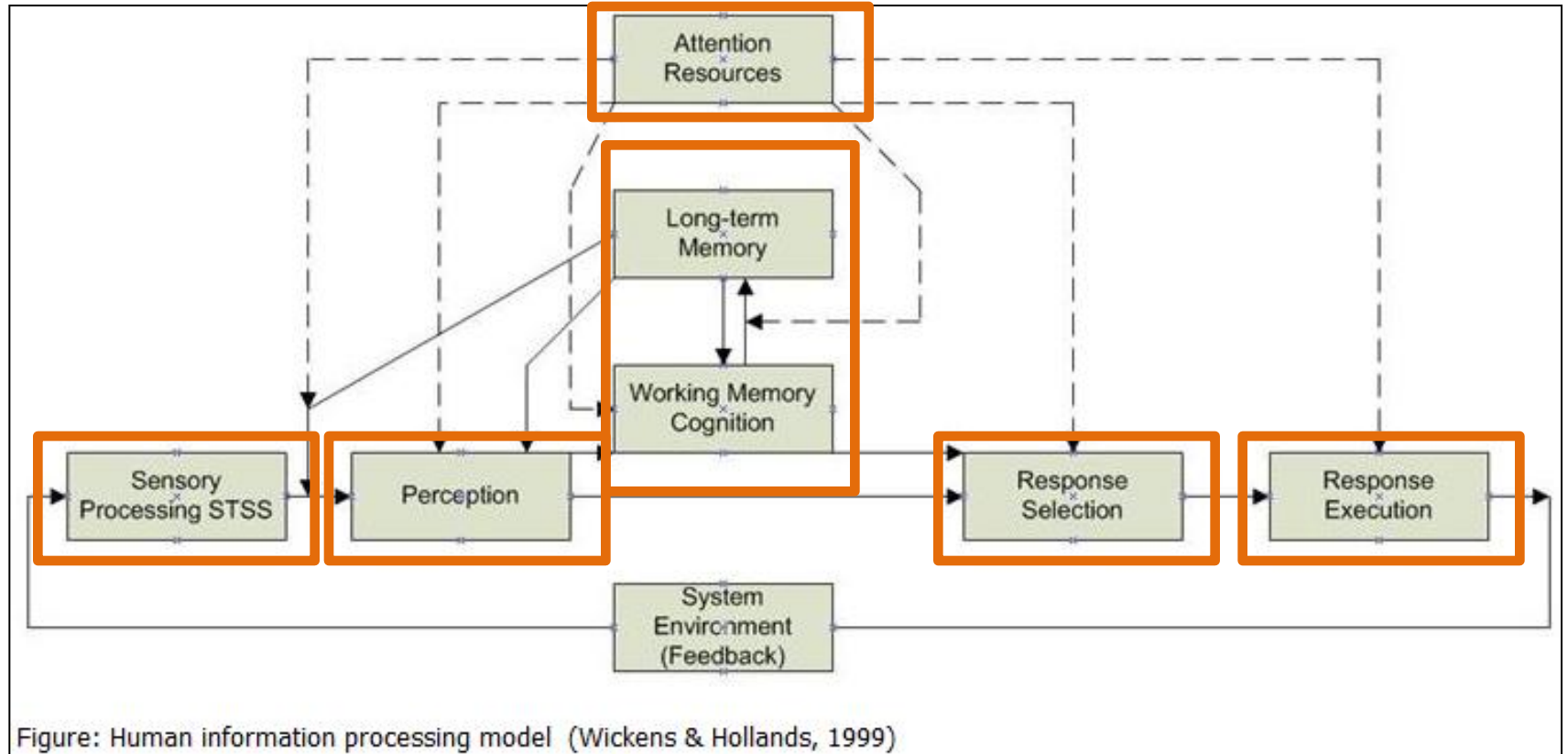


The „Toolbox“ 1st draft

System 1 – Fast			System 2 - Slow	
Skill – based behavior		Rule – based behavior	Knowledge – based behavior	





Information processing (Wickens & Hollands, 1999)





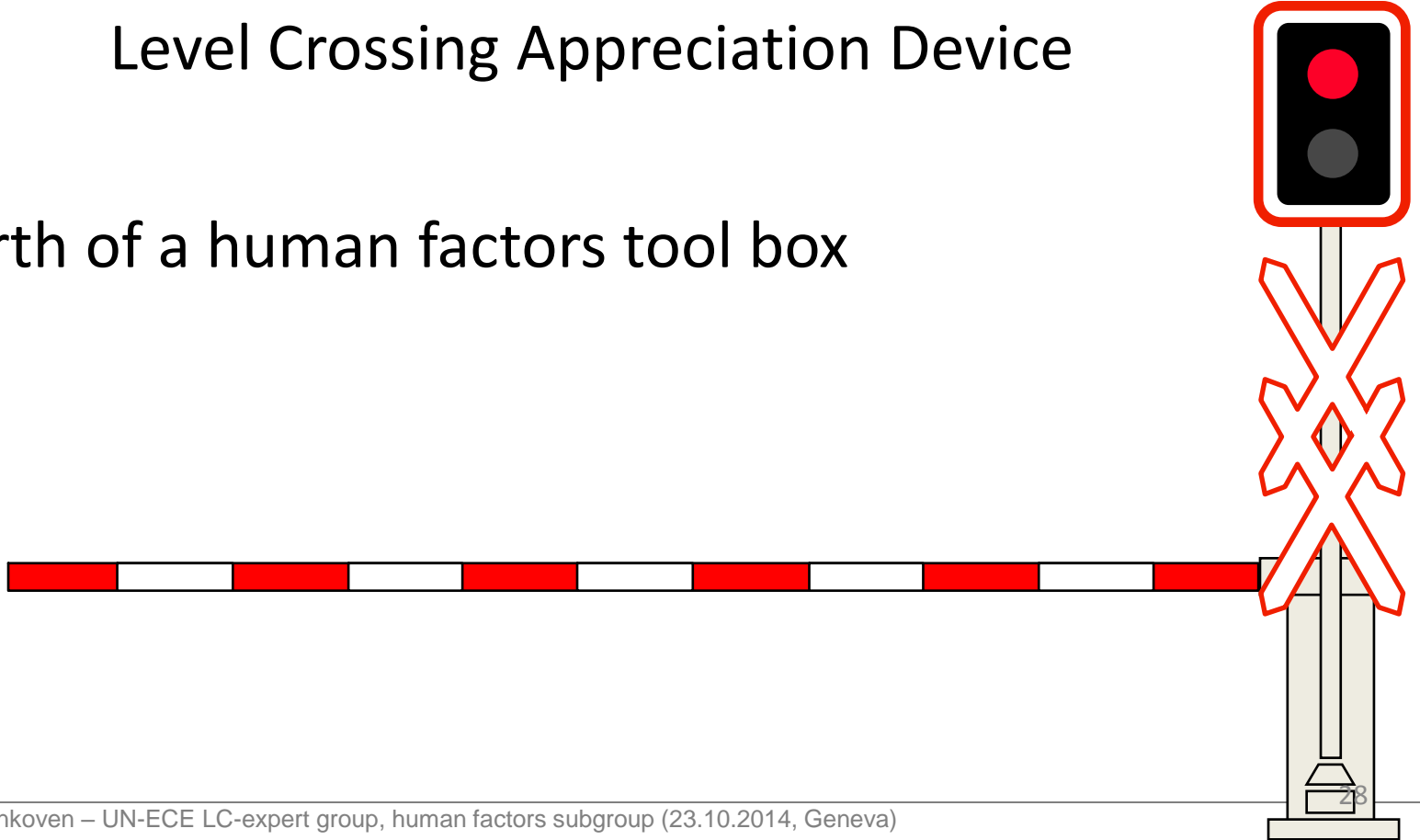
The „Toolbox“ 1st draft

Attention			
System 1 – Fast 		System 2 - Slow 	
Skill – based behavior		Rule – based behavior	Knowledge – based behavior
Sensory processing	Perception	Cognition	Motivation
Performance			

LCAD

Level Crossing Appreciation Device

The birth of a human factors tool box



LCAD

Five groups of functions

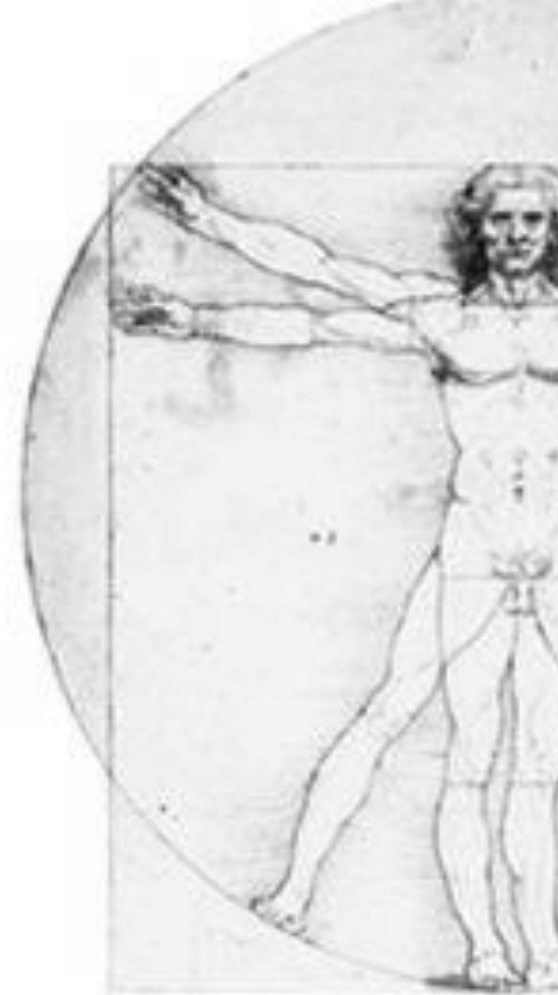
1. Attention

2. Perception

3. Cognition

4. Motivation

5. Performance



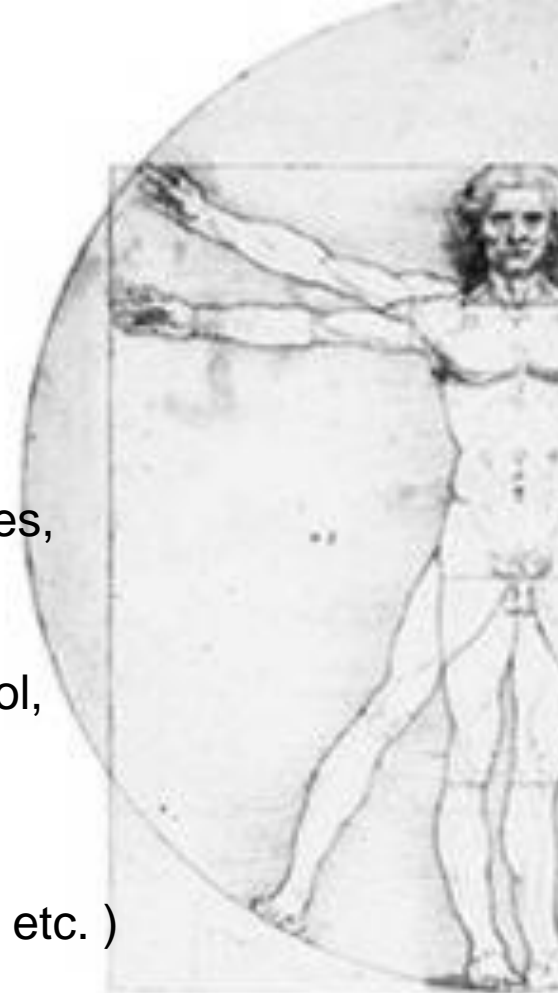
1. Attention

Monitoring the road

Refraining from distracting activities (cell phones, GPS, radio, food, drink etc.)

Influence of problematic factors (fatigue, alcohol, emotional state etc.)

Factors competing for attention (kids in car, advertisements, other vehicles, radio program etc.)

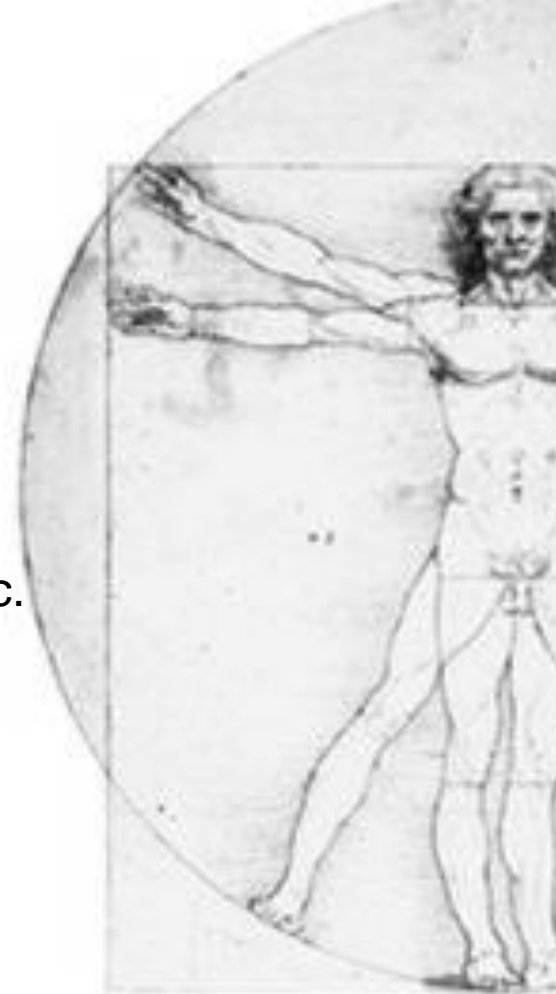


2. Perception

Perception of signs, lights, markings and barriers

Perception of distance, speed, changes in road etc.

Perception of the behavior of other road users



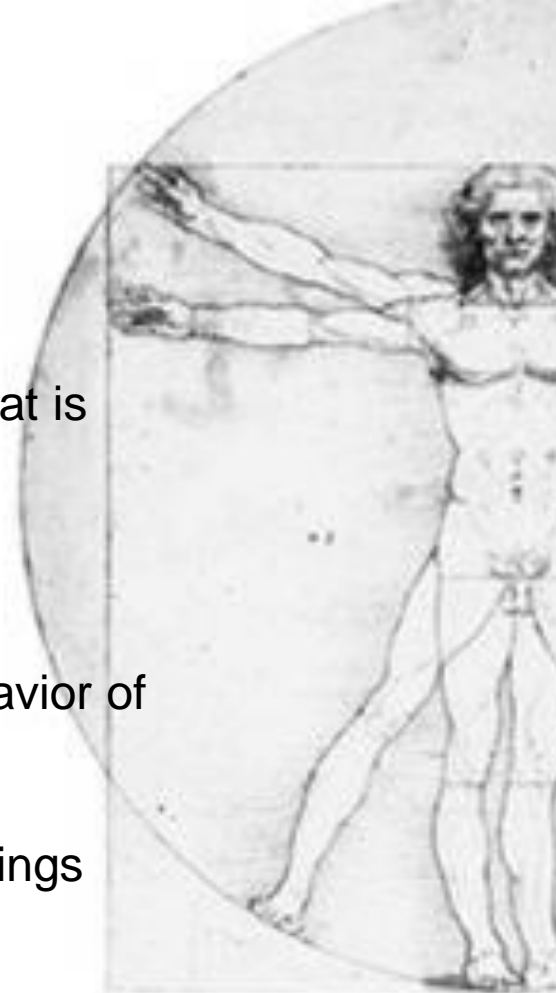
3. Cognition

Realizing that one is approaching a LX and what is expected

Recognizing dangers and limitations

Being able to predict occurrences and the behavior of other road users

Availability of knowledge relating to level crossings



4. Motivation

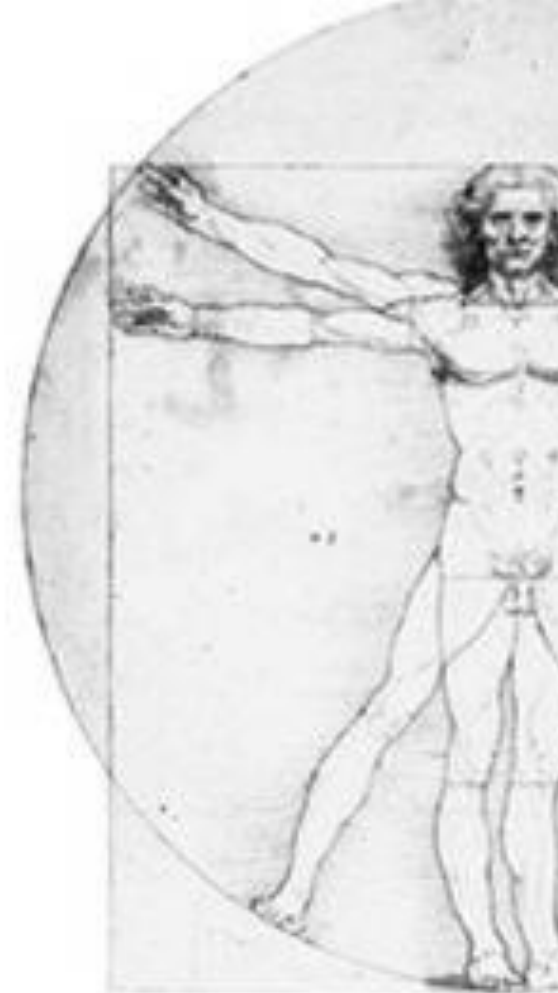
Understanding dangers entailed

Social pressure, current and/or local norms

Self esteem

Target risk

Exaggerated feeling of control



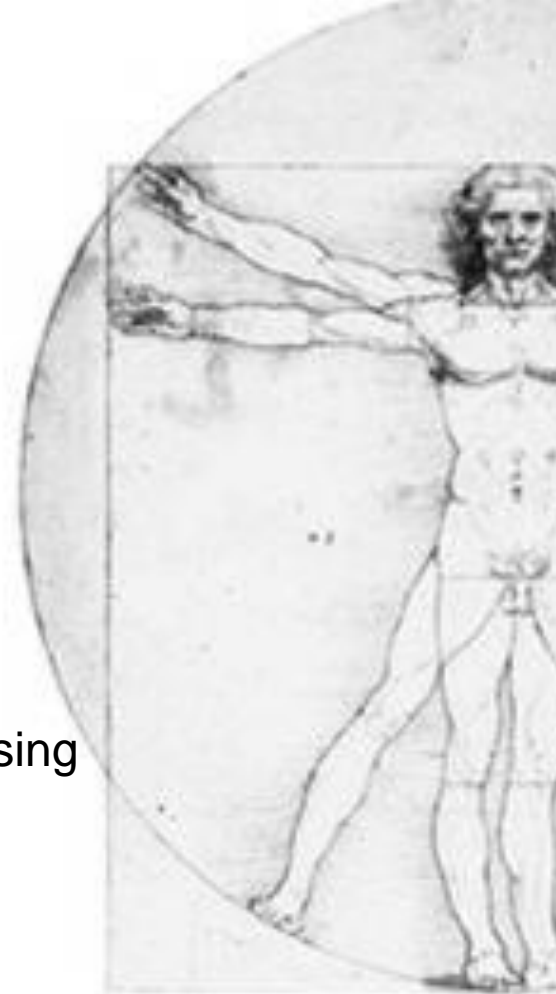
5. Performance

Ability to control the vehicle over the rails

Choice of speed and distance from the curb

Being able to choose when to stop

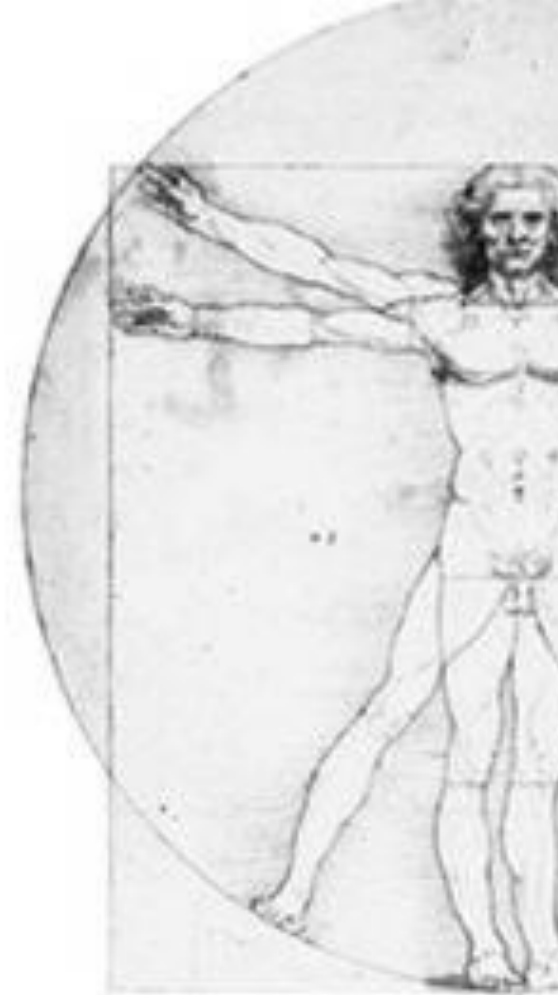
Adaptation to road surface, visual clarity, opposing traffic etc.



LCAD

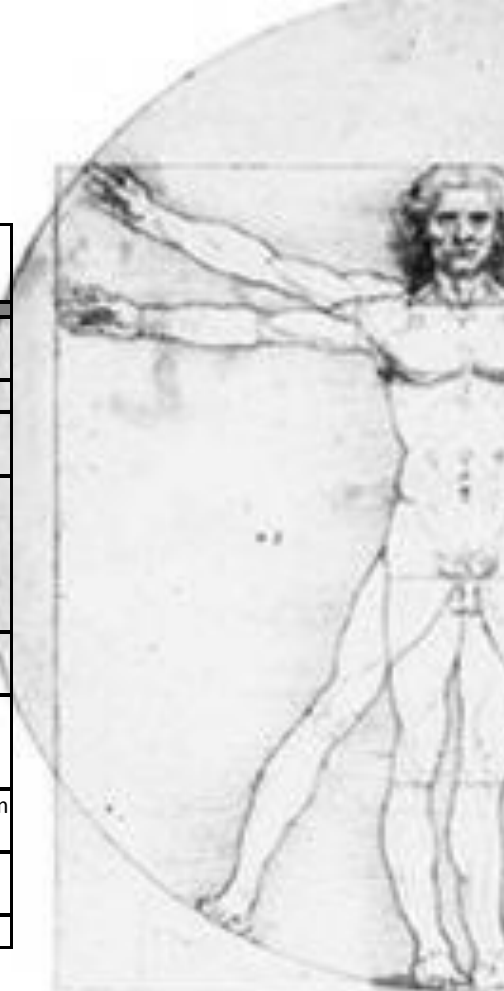
Accident Types

Function	ac 1	ac 2	ac 3	ac 4	ac 5	
Attention	X			X		
Perception		X	X	X		
Cognition		X				
Motivation	X				X	
Performance			X			



LCAD

Accident	Driver	History and Environment	LX in accident direction / opposite direction
Date of accident	Fatigue indicator	How many additional accidents are known from the past five years?	What is the average speed 500 m before the lx ?
Exact position	File of driver	Fatalities / injured / damage / damage to LX	What is the average speed 250 m before?
Season	Does driver live close to lx?	Is the setting urban or rural ?	What is the average speed 150 m before?
Time 00:00-06:00 07:00-18:00 18:00-22:00 22:00-24:00	Age	How many other accident were recorded during the past five years in a 2km radius ?	What is the average speed 50 m before?
Reason for trip	Gender	Estimate the number of vehicles passing lx daily	How many meters before lx do you recognize it clearly ?
Number of people in vehicle	Years of Education	What is the average speed in a 2km radius	Are the required signs available ?
Estimated speed of vehicle	Driver's explanation (if available)	Estimate the number of accidents per vehicle in a 2km radius	Are there additional or not standard signs ?
Vehicle condition		Estimate number of DUI per vehicle in a 2km radius	How many signs are there in the 150 m before the lx ?
Third party involvement		What is the recommended speed at the LX ?	How many signs are there in the 50 m before the lx ?
Other		Estimate enforcement/driven km in a 2km radius	

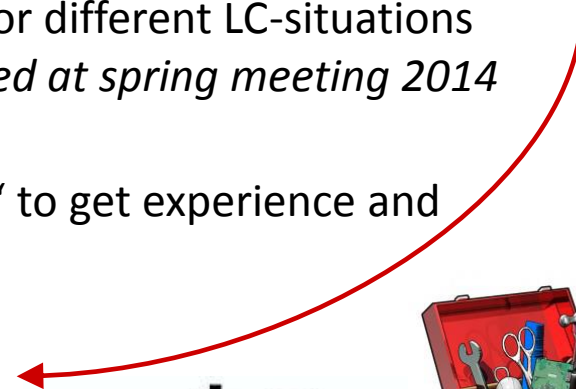


Outlook: Future Steps of LC-human factors subgroup



Up to next meeting in January 2015

- **model:**
to finish a model to identify and evaluate solutions for different LC-situations (accident investigation and LC planning) - *as presented at spring meeting 2014*
- **LCAD:**
first steps with ‚Austrian accident investigation body‘ to get experience and first examples



*Thank you for your attention
& your (future) support!*

