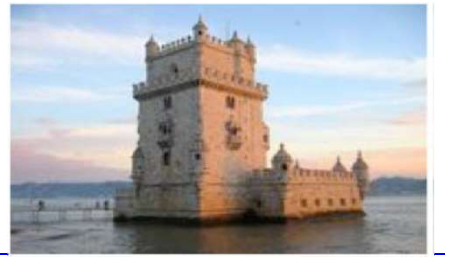
Humanist

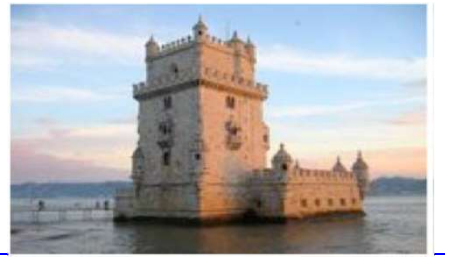


Safety according to ITS functions and different populations

Dr. Ralf Risser (FACTUM OG)

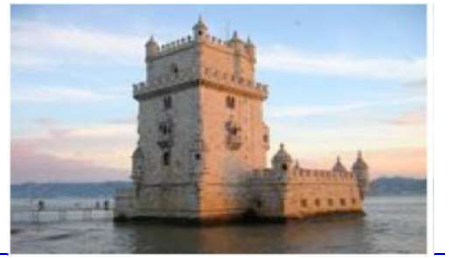
Humanist

ITS



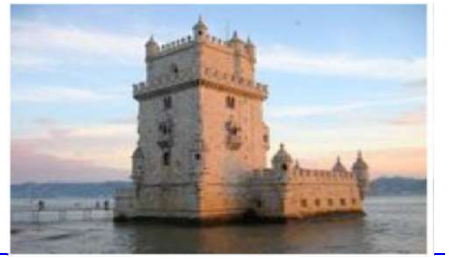
- In this lecture all electronics-based intelligent systems in transport are called ITS

Contribution of ITS?



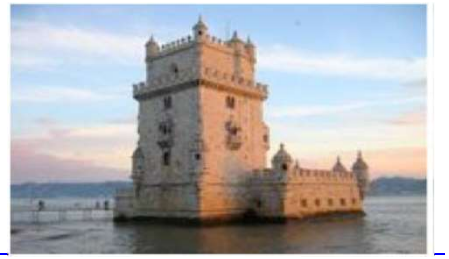
- Will ITS contribute positively to the society? Who knows?
- ITS has the potential to contribute to
  - a) Road Safety
  - b) Network Conditions
  - c) Environmental Conditions
  - d) User integration
  - e) Life quality

SWOT



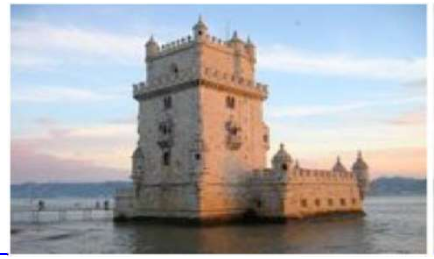
- To formulate hypotheses with respect to effects of ITS one can use SWOT analysis method
  - strengths
  - weaknesses
  - opportunities
  - threats

Segmentation



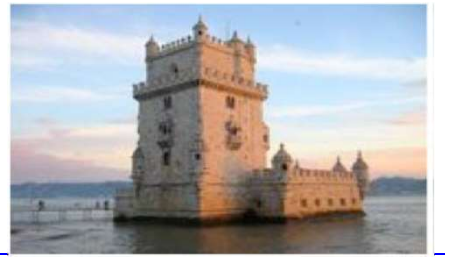
- Winners and losers
  - Could there be winners and losers among different groups of road users
- Different problems and advantages by different groups
  - Conditions for successful implementation = acceptance of relevant groups

Possibly affected areas



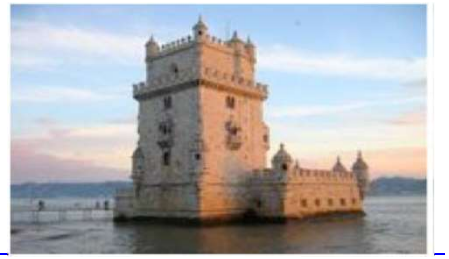
- Economy
- Comfort
- Traffic safety
- Individual security
- Mobility (individual and social)
- Aesthetics
- Environmental quality
- Social aspects (communication, comparison, fairness & equity)

Possible problems



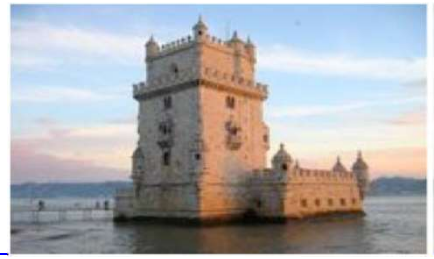
- Not being able to cope with an equipment (work load problems, perception problems)
- Non-wished-for effects, side effects, Behaviour adaptation problems on user side like
  - Delegation of responsibility
  - Generalisation of behaviour
  - Risk compensation
  - Behaviour transfer → information, instruction, warning

Aspects for analysis



- Structural aspect
- Will vs. Skill
- Typical safety problems
- Possible measures (ITS-based)

Problems



Will: They rather want to behave according to rules - no "will" problems (?)

Skill: Any ITS new variable, that may be consi-dered workload instead of assistance

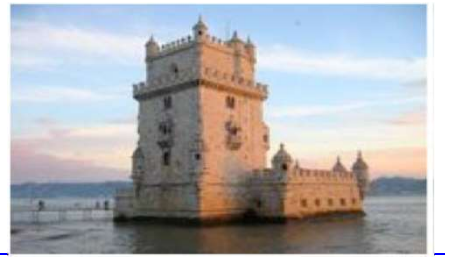
Old drivers

Typical problems

A Stuations with more variables to be kept under control simultaneously: intersections, moving into motorway lanes, city traffic with many different types of road users present

B Problems connected to physical preconditions: looking back, turning head, vision/peripheric vision

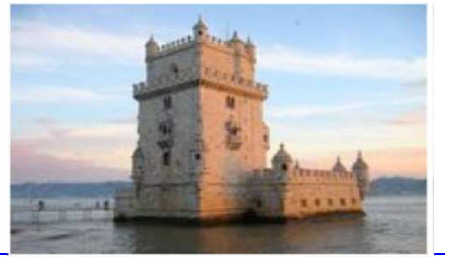
Measures A



- Infrastructure to be adapted (de-dynamise, homogenise traffic in intersection areas)
  - Infrastructure based electronic assistance for moving into motorway lanes, lane changes, etc.
  - Route guidance systems: potential to take away one task and increase spare capacity for traffic

Old drivers

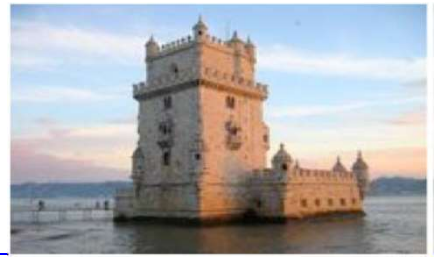
Measures B



- Head up display: potential to have several variables better in focus
- Video-supported rear view to facilitate checks of traffic at the rear
- Parking assistance and similar aids
- Others

Old drivers

Problems



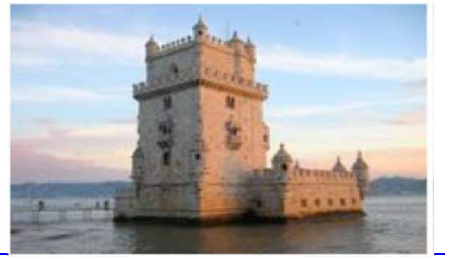
Young drivers

Will: Trend to drive fast, behaviour rather steered by extra motives, abiding rules not in focus

Skill: Handling quickly learned; interpersonal communication in traffic difficult to learn ⇒ when they are already really good in handling, still problems with communication

Structural problems: Peer group, dependence, they do things to impress peers/other sex

Measures



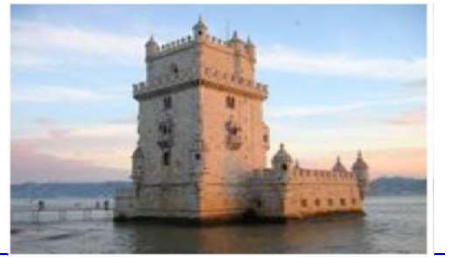
Young drivers

Measures "Will": Equipment or measures that inhibit certain types of risky behaviour (like excessive speed) can help ⇒ ISA, ACC

Measures "Skill": ITS-equipment that supports interpersonal communication ⇒ difficult

All system that detect and remind of other road users ⇒ to make aware that preparedness to communicate is necessary

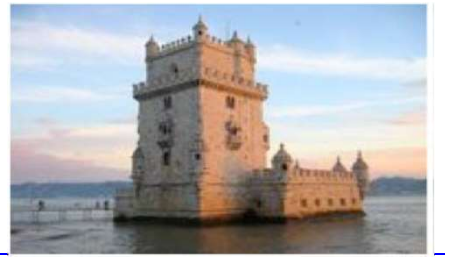
Peer groups



Young drivers

- Measures to control “peer group dependence” = devices that inhibit the most dangerous types of behaviour
- For instance:
  - Driver monitoring
  - ISA

Problems

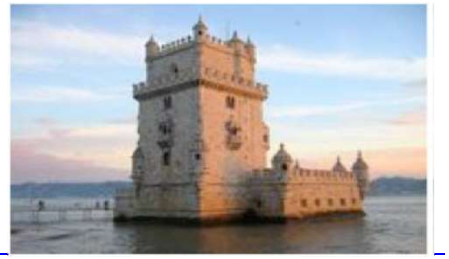


- Structural problems:
  - Time pressure
  - Work load
- "Will" problems: Compensate for tough job: trying to get home earlier, trying to get on faster

  Having more experience than others may mean not to have to respect "all those rules"
- "Skill" problems:
  - Maybe newcomers
  - And maybe consequence of structure problems

Experienced drivers

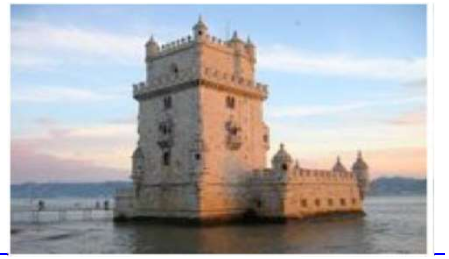
Measures structures



- Measures structural problems: Organising assistance, route guidance & general logistic help (“travelling salesman” support, etc.)
- BUT only in combination with structural support: laws, limitations to working times and travel-ling distances plus law-enforcement support

Experienced drivers

Measures will & skill



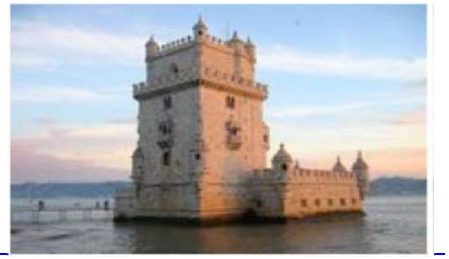
- Measures "will" problems: Assistance on structural problems
- Otherwise: Equipment to control drivers for instance driver monitoring and Black Box

  - Acceptability problems to be discussed

  - Acceptance problems to be discussed
- "Skill" problems: If speed is under control and if driving when being tired etc. is avoided ⇒ hardly any "skill" problems

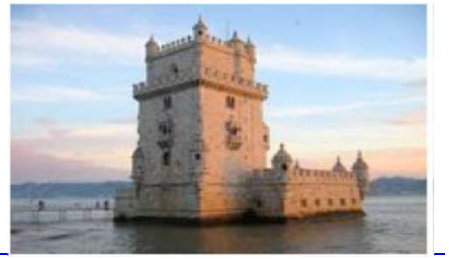
Experienced drivers

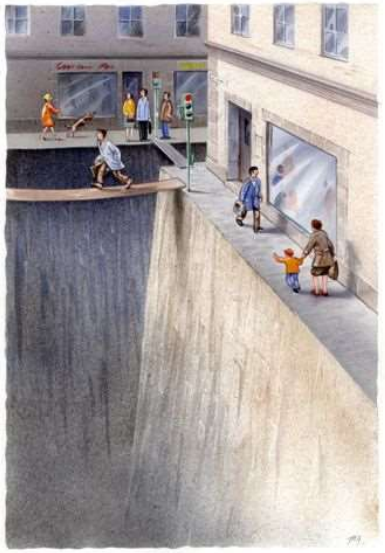
Problems & measures Overview



Groups	Structural problems	Possible aids	Will problems	Possible aids	Skill problems	Possible aids
Old	Living place country side, accessibility	Flexible PT, information about services (internet, mobile			Multitasking conditions	Obstacle detection, route guidance, parking assistance, lane change aids
Young	Peer group dependence	ISA ACC Driver monitoring	Show off Sensation seeking	ISA ACC Driver monitoring	Communication skills	ITS based training; tutoring function
Experienced	Time pressure work load, tiredness	Driver monitoring, black box; route guidance, logistic support	Compensation, extra motives	Driver monitoring, black box	When tired and worked out	Driver monitoring, black box;

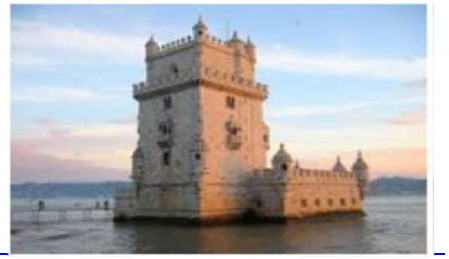
The public space





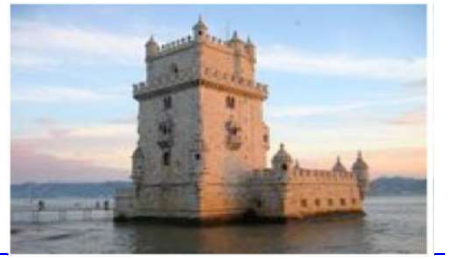
- New equipment affects the public space = the space used by all
- Implementation → What effects in the public space to be expected?

Acceptability vs. Acceptance



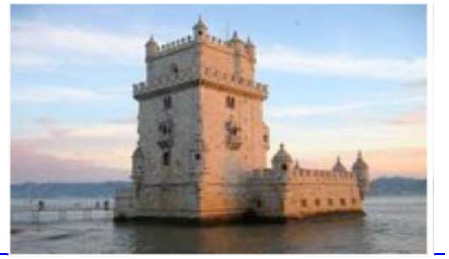
- Acceptability vs. Acceptance
  - acceptance = whether I accept something
  - acceptability = whether something is acceptable, is to be accepted

Change in communication



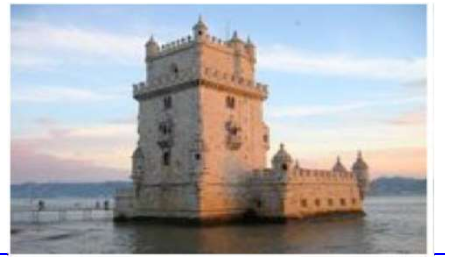
- Car drivers' perception of vulnerable road users → influenced by the equipment
- Frequency of communication with other road users → change
- Quality of interpersonal communication (e.g., friendliness, consideration, etc.) → change

Some results

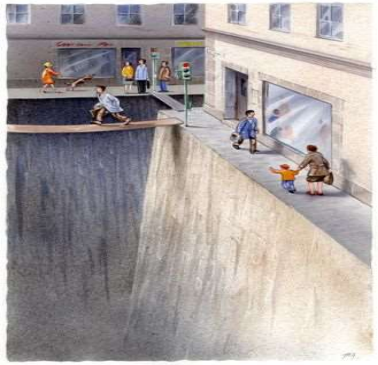


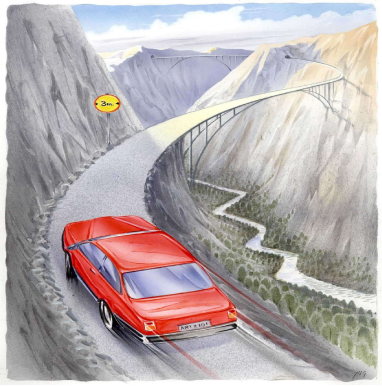
- AICC: Reduced attention to VRU
- STORM: Reduced attention to VRU
  - STORM = dual mode route guidance
- ISA: Mixed results
  - City busses Lund → worse
  - Personal cars: better and worse

ISA



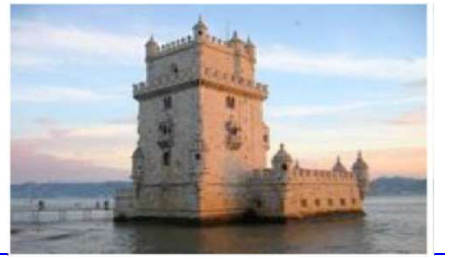
- Interaction with pedestrians with/without ISA



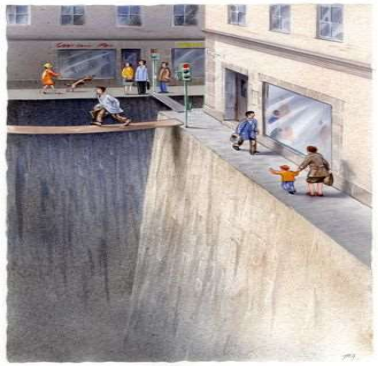


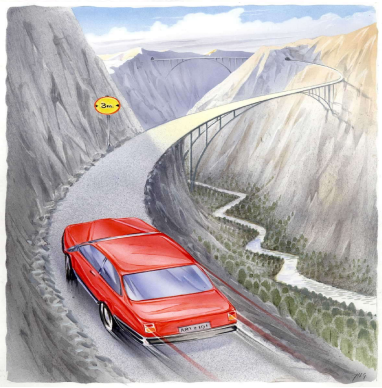
Interaction with pedestrians at crossings	**Without ISA**		**With ISA**		**The difference with ISA**	**Sign. level**
	n	**%**	**n**	**%**	**%**	
Yields early	**64**	**54**	**78**	**68**	**+14**	(p<0.05)
Yields late	**7**	**6**	**5**	**4**	**-2**	
Pedestrian insists on priority	**5**	**4**	**2**	**2**	**-3**	
Pedestrian waits at roadside	**29**	**25**	**25**	**22**	**-4**	
Forces pedestrian to stop	**13**	**11**	**5**	**4**	**-8**	
Puts pedestrian in danger	**0**	**0**	**0**	**0**	**0**	
Total	118	100	115	100		0.146

Different needs



- Car drivers' (N=630) and pedestrians' (N=564) views on effectiveness of measures for achieving appropriate speeds (1=very good, 5=not good at all):

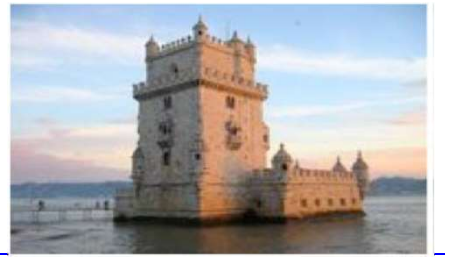




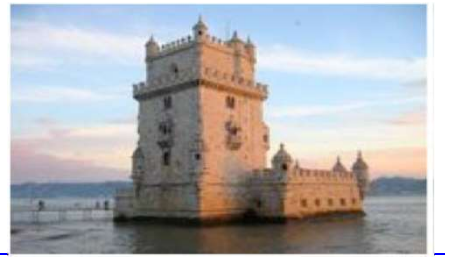
	good (%)		not so good (%)	
CD = car drivers, P = pedestrians:	CD	P	CD	P
a) Speed humps	**60**	**67**	**34**	**26**
b) Rumble strips	49	50	38	34
c) Stationary radar	**58**	**68**	**31**	**21**
d) More enforcement by police	**61**	**72**	**30**	**21**
e) Non stationary speed checks	**57**	**68**	**31**	**16**
f) More and better road paintings	69	66	31	17
g) Better info about relation between speed and accident risk	67	66	21	22
h) Automatic speed limiter in the car that cannot be overridden	**33**	**41**	**48**	**37**
i) Automatic speed limiter in the car that can be overridden	34	34	43	38
j) More frequent and well perceivable signs	70	66	23	24
k) Higher fines for speeding	**50**	**60**	**40**	**29**
l) Clear and well indicated speed limits	78	78	14	11

Source: Risser & Lehner 1998, EU-project MASTER

More possible effects

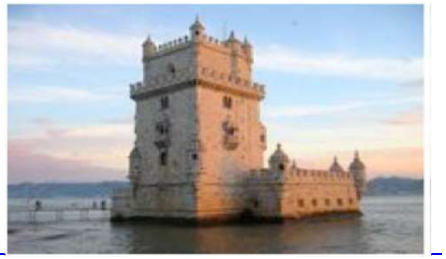


- Changes in interpersonal communication → changes in social climate
- Comfort of car users changes → changes in subjective safety, being less afraid something could happen
- → Stress for vulnerable road users as a potential outcome

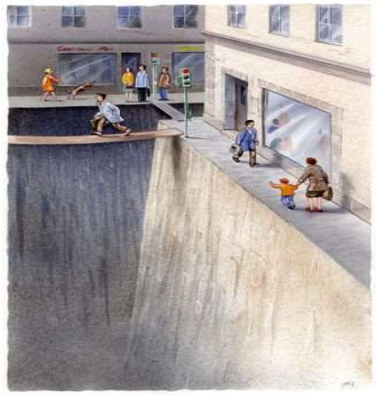


- Quality of life in residential areas:
  - Accessibility, spontaneous mobility of pedestrians
  - Comfort & useability
  - Subjective safety
  - Parents' feeling about the safety of children/partners

QoL

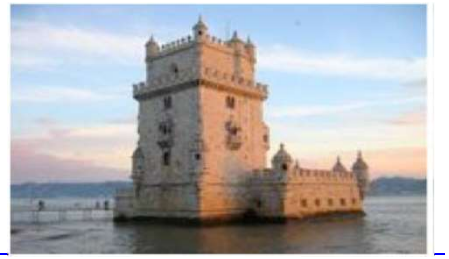


- Relationship of quality of life with mobility parameters:



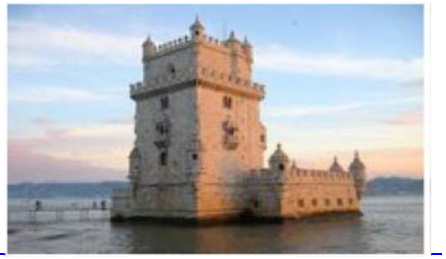
Improvements → Improvements of the QoL?	Correlation with QoL	
Comfort for pedestrians	**0,50**	**high**
Usability for elderly and disabled person	**0,48**	**high**
Feeling safe	**0,47**	**high**
Social interaction with other persons	**0,47**	**high**
Traffic safety	**0,45**	**high**
Children`s safety	**0,44**	**high**
Smooth traffic flow for pedestrians	**0,44**	**high**
Beauty and aesthetics of the urban space	**0,43**	**high**
Dwelling in this area is more enjoyable than before	**0,42**	**high**
Safety of elderly and disabled person	**0,40**	**high**
Equity between road users	*0,38*	*moderate*
Environmental quality (air, noise)	*0,38*	*moderate*
Smooth traffic flow for car drivers	0,15	no
Comfort for car drivers	0,02	no

Evaluation methods

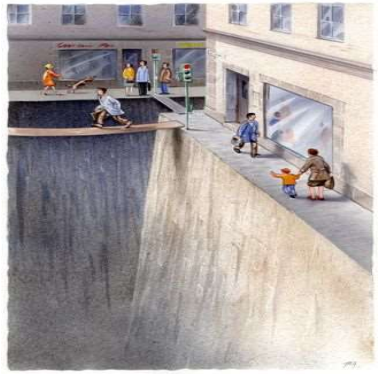


- Verbal data (heuristic, qualitative, standardised/quantitative)
- Behaviour registration and counting (traffic amounts, speeds, etc.)
- Behaviour observation
- Simulator work

An attempt of weighting



- Research methods



Methods for prospective analysis of new car equipment

Analysed aspects: Methods	**a**	**b**	**c**	**d**	**Value**
(1) Round Table discussions with road users	*(x)*	x	x	x	**3.5**
(2) Traffic Safety Checklist		**X**	x	x	**4.0**
(3) Interviews with car drivers	*(x)*	*(x)*	*(x)*	x	**2,5**
(4) Systematic behaviour observations	**X**	*(x)*		x	**3,5**
(5) Simulator		*(x)*		x	**1.5**
(6) Test rides combined with discussion	**X**	x	x	x	**5.0**
(7) Traffic simulator		**X**			**2.0**
(8) Round-tables with experts, Delphi Studies	x	x	x	x	**4.0**
(9) representative questionnaire with road users		x	**X**	x	**4.0**
(10) field survey		x	x	x	**3.0**

a) Effects under real traffic conditions
b) Effects on the traffic system
c) Effects life quality
d) Safety relevance of the system with regard to vulnerable road users