SafetyCube
the European Road Safety Decision Support System
www.roadsafety-dss.eu

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25th IRTAD Meeting Marrakesh, October 13, 2017

The SafetyCube project

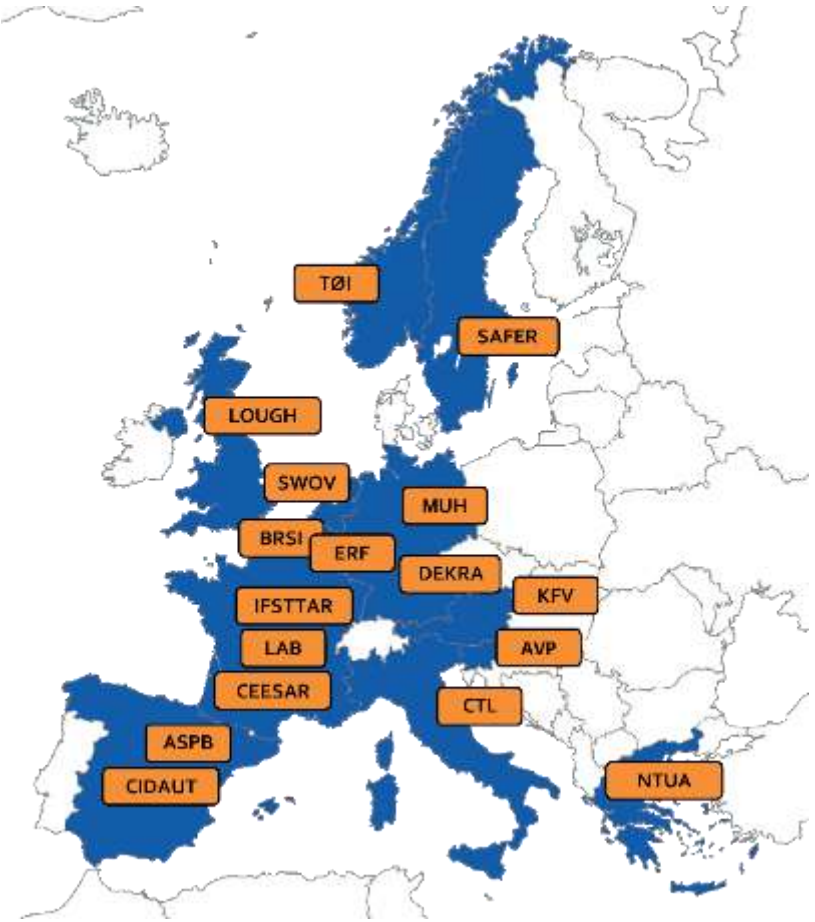
Funded by the European Commission under the **Horizon 2020** research framework programme

Coordinator: Pete Thomas, Loughborough University

Start: May 2015

Finish: April 2018

17 partners from 12 EU countries



SafetyCube DSS Objectives

The SafetyCube DSS objective
is to provide the European and Global road safety community
a user friendly, web-based, interactive Decision Support Tool
to properly substantiate their road safety decisions
for the actions, measures, programmes, policies and strategies
to be implemented at local, regional, national, European and international level.

The main contents of the SafetyCube DSS concern:

- road accident risk factors and problems
- road safety measures
- best estimate of effectiveness
- cost-benefit evaluation
- all related analytic background

Special focus on linking road safety problems with related measures.

Current Road Safety DSS Worldwide

- Crash Modification Factors Clearinghouse (www.cmfclearinghouse.org)
  by NHTSA (USA) - **5.151 CMF** on infrastructure only - on going

- Road Safety Engineering Kit (www.engtoolkit.com.au)
  by Austroads (Australia) - **67 treatments** on infrastructure only

- PRACT Repository (www.pract-repository.eu)
  by CEDR (Europe) - **889 CMF and 273 APM** on infrastructure only – high quality

- iRAP toolkit (toolkit.irap.org/)
  by iRAP - **58 treatments** (43 on infrastructure)

- Safety Performance Factors Clearinghouse (spfclearinghouse.org)
  by Tatum Group LLC, Dr. Andrew Kwasniak (USA) - **few SPF** – subscribers only

SafetyCube DSS Users

- **Public Authorities**
  local, regional, national, European and international
- **Industry**
  Infrastructure, Vehicle, Insurance, Technology
- **Research Institutes, Experts**
- **Non Governmental Organisations**
- **Mass Media**
- **Everyone**

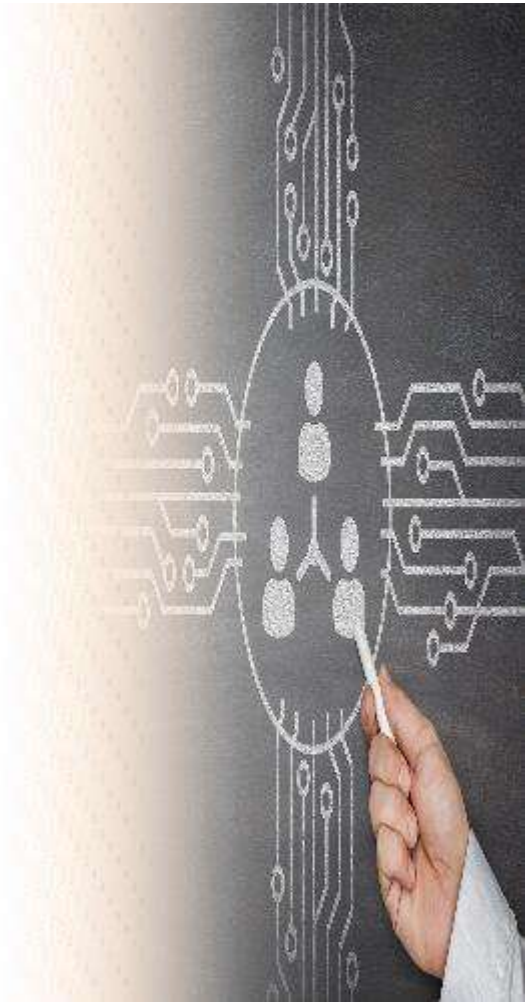
The SafetyCube DSS is intended to have **a life well beyond the end of the SafetyCube** research project.

It is developed in a form that can readily be incorporated within the existing European Road Safety Observatory of the European Commission DG-MOVE.

SafetyCube Methodology

1. Creating **taxonomies** of risk factors and measures
2. Exhaustive literature review and rigorous study selection criteria
3. Use of a template for **coding studies**, to be introduced in the DSS back-end database
4. Carrying out meta-analyses to estimate the effects of risk factors / measures.
5. Drafting **Synopses** summarising results of risk factors / measures.

- **Systems approach**: links between infrastructure, user and vehicle risks
- Emphassis on risk factors and measures of **priority issues** (VRUs, ADAS, speed management, distraction, etc.)
- Rigorous assessment of the **quality of the data / study methods**



SafetyCube Taxonomies

Three-level taxonomies
Separately for risks and measures

- **4 Categories**
  road user, infrastructure, vehicle, post impact care
- **88 Topics**
  e.g. distraction, roadside, crashworthiness
- **175 Specific topics**
  e.g. mobile phone use, no clear-zone, low pedestrian rating (NCAP)

Behavior	Infrastructure	Vehicle	Post Impact Care
Law and enforcement	Traffic flow	Frontal impact	Ambulances/helicopters
Education and voluntary training or programmes	Traffic composition	Side impact	Extraction from vehicle
Driver training and licensing	Formal tools to address road network deficiencies	Rear impact	Pre-hospital medical care
Fitness to drive assessment and rehabilitation	Speed management & enforcement	Rollover	Triage and allocation to trauma facilities
Awareness raising and campaigns	Road type	Pedestrian	First aid training drivers
	Road surface treatments	Child	
	Visibility / Lighting treatments	PTW	
	Workzones	Cyclist	
	Horizontal & vertical alignment treatments	HGV	
		Longitudinal	

Selection and Coding of Studies

Study search in key databases

(Scopus, TRID, Elsevier, Taylor & Francis, Springer etc.)

Study selection and prioritization criteria

- Studies with quantitative results
- Meta-analyses, or other high quality studies (peer-reviewed journals)
- Recent studies
- European studies

Coding of studies in a dedicated template

- Study design and methodology
- Results and their confidence intervals
- Study limitations

SafetyCube Synopses

139 Syntheses on risk factors / measures

Summary (2 pages)

- Effect of risk factor / measure and ranking (colour code)
- Risk / safety effect mechanisms
- Risk / safety effects size, transferability of effects

Scientific overview (4-5 pages)

- Comparative analysis of available studies
- Analysis results
  - *Meta-analysis*
  - *Vote-count analysis*
  - *Qualitative analysis*

Supporting document (3-10 pages)

- Literature search strategy and study selection criteria
- Detailed analyses

SafetyCube Links between Risks & Measures

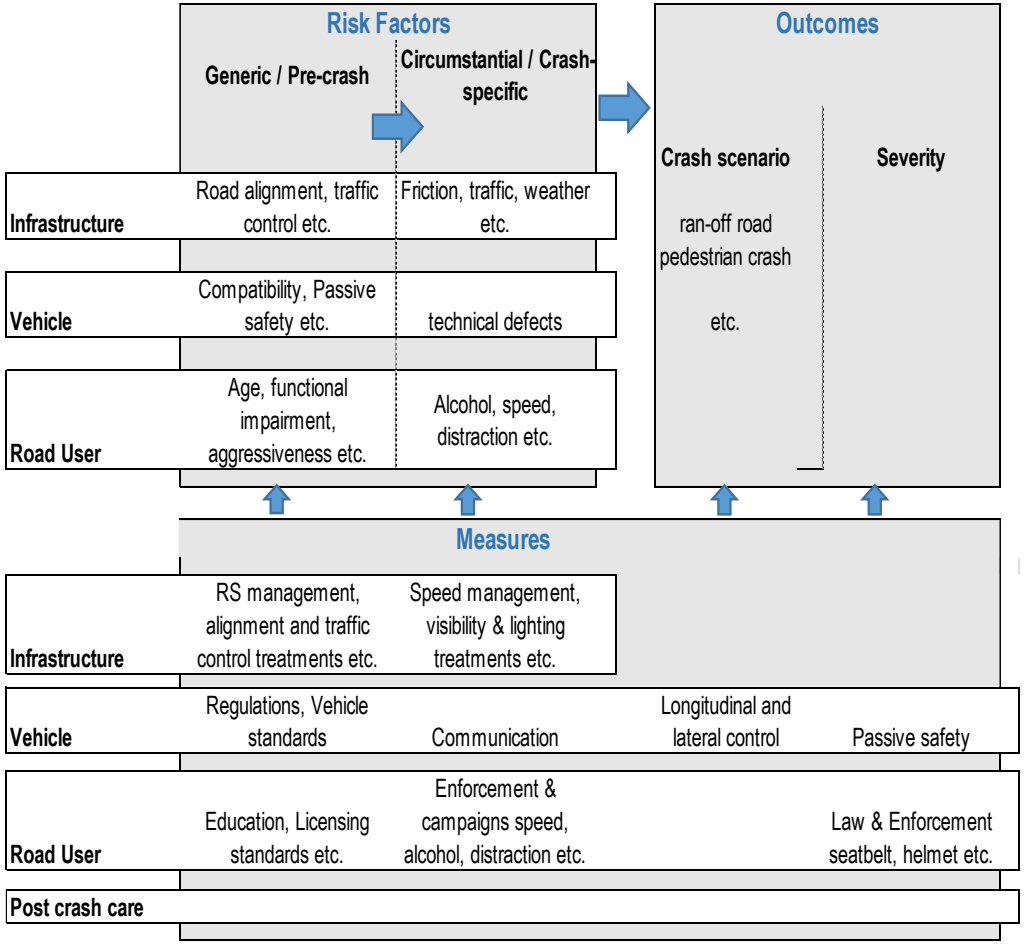
Based on a dedicated methodology

- **Sequence of crash events**
- Pre-crash events → crash → consequences/outcomes

- Risk factors can be:
  - *Generic (e.g. alignment deficiency)*
  - *Circumstantial (e.g. alcohol)*

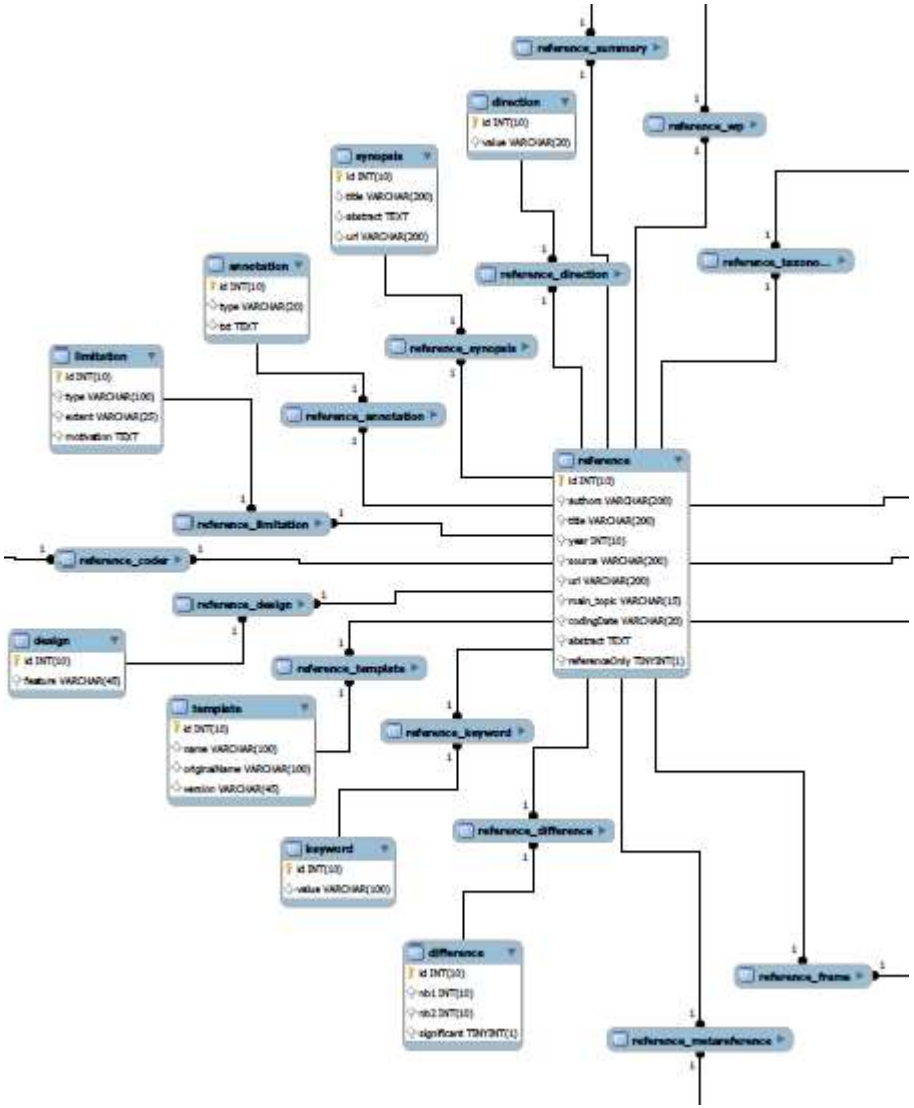
- Measures may address:
  - *Generic risks: (e.g. road safety audit)*
  - *Circumstantial risks (e.g. enforcement)*

Validated through studies and synopses results (ongoing)



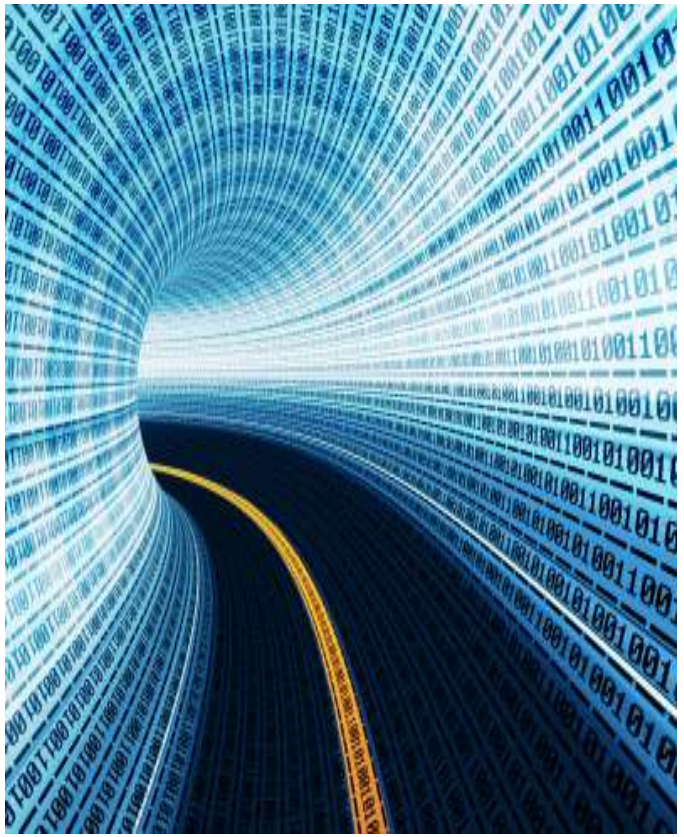
SafetyCube DSS back-end database

- **Coded studies, Synopses and Links** undergo a thorough checking and debugging process
- All inputs are eventually stored in a **relational database**, which serves as the back-end of the DSS
- Front-end DSS results are retrieved through the DSS search Engine (queries on the back-end database).



SafetyCube DSS Search Engine

- Fully **linked** search
  - *search a road safety problem alone or through the measures*
  - *search a measure alone or through the road safety problems*
  - *search for risks and measures related to specific road user groups or crash types (accident categories)*
- Fully **detailed** search
  - *search by any parameter in each data table in the database*
- Fully **flexible** search
  - *adjust and customize search according to results*
- Fully **documented** search
  - *access background information at any stage (supporting documentation, links, etc.)*



SafetyCube DSS Design Principles

- A **Modern** web-based tool
- Highly **Ergonomic** interface
- **Simple** structure
- Powerful **Search** Engines
- Fully **Documented** information
- Easily **Updated**

SafetyCube DSS Structure

Five entry points

Three Levels of Search

- Search pages
- Results pages
- Individual study pages

Two Interlinked Pillars

- Risk Factors
- Road Safety Measures

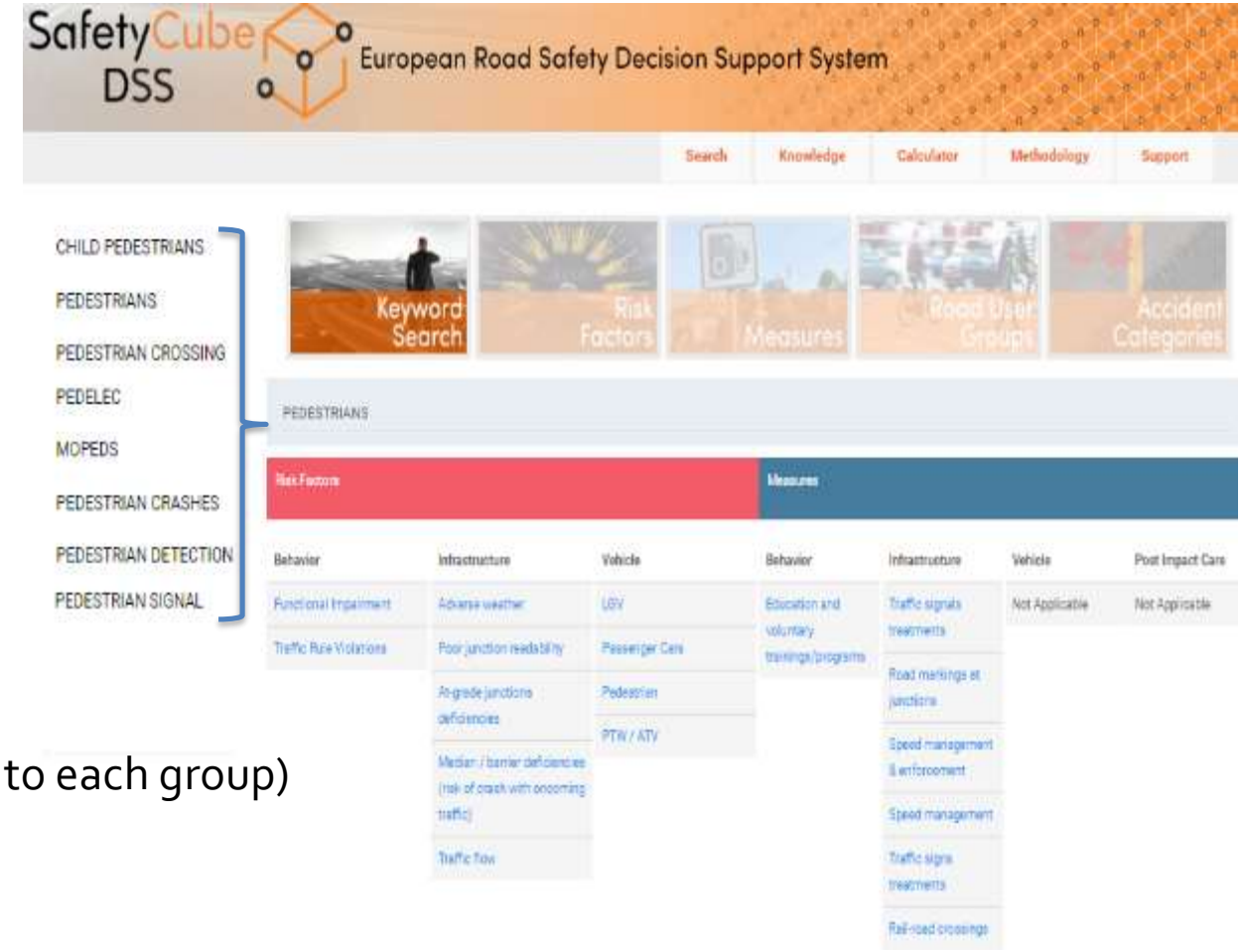
SafetyCube DSS Menu

- **Search**
  Risk Factors & Measures
- **Knowledge**
  135 synopses
- **Calculator**
  Econ. Efficiency Evaluation (under development)
- **Methodology**
  System documentation
- **Support**
  Contact, help, feedback

SafetyCube DSS Search Pages

DSS Search through five entry points:

- **Keyword** search (all database keywords)
- **Risk factor** search (taxonomy)
- **Measures** search (taxonomy)
- **Road User Groups** (database keywords related to each group)
- **Accident Categories** (under development)



SafetyCube DSS Results Pages

Search results

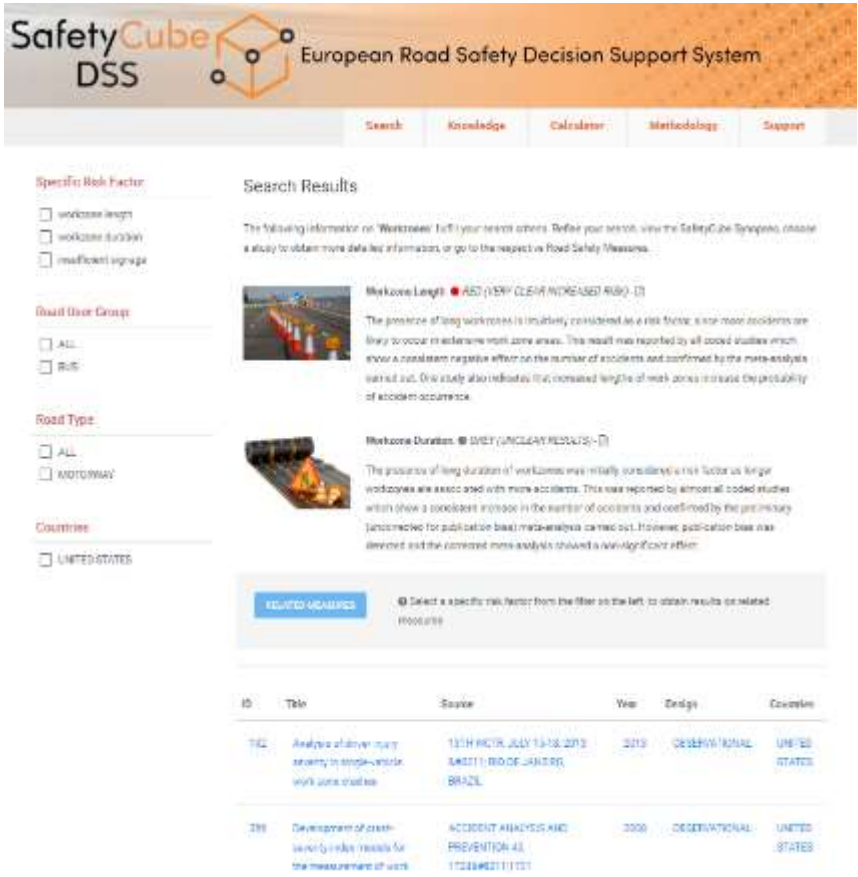
- Synopses, and their short summaries & colour codes
- Table listing the available studies

Refine search

- Specific Risk factor / Measure
- Other **search filters**:
  - Road user groups: All, car occupants, drivers, passengers, PTW riders, pedestrians, cyclists, HGV.
  - Road types: All, motorways, rural roads, urban roads
  - Country: EU, EU countries (all names), US and Canada, Australia, Asia.

Links to related measures

- Select a specific risk factor / measure
- Get the list of related measures



SafetyCube DSS Individual Study Pages

Title, author, source, abstract

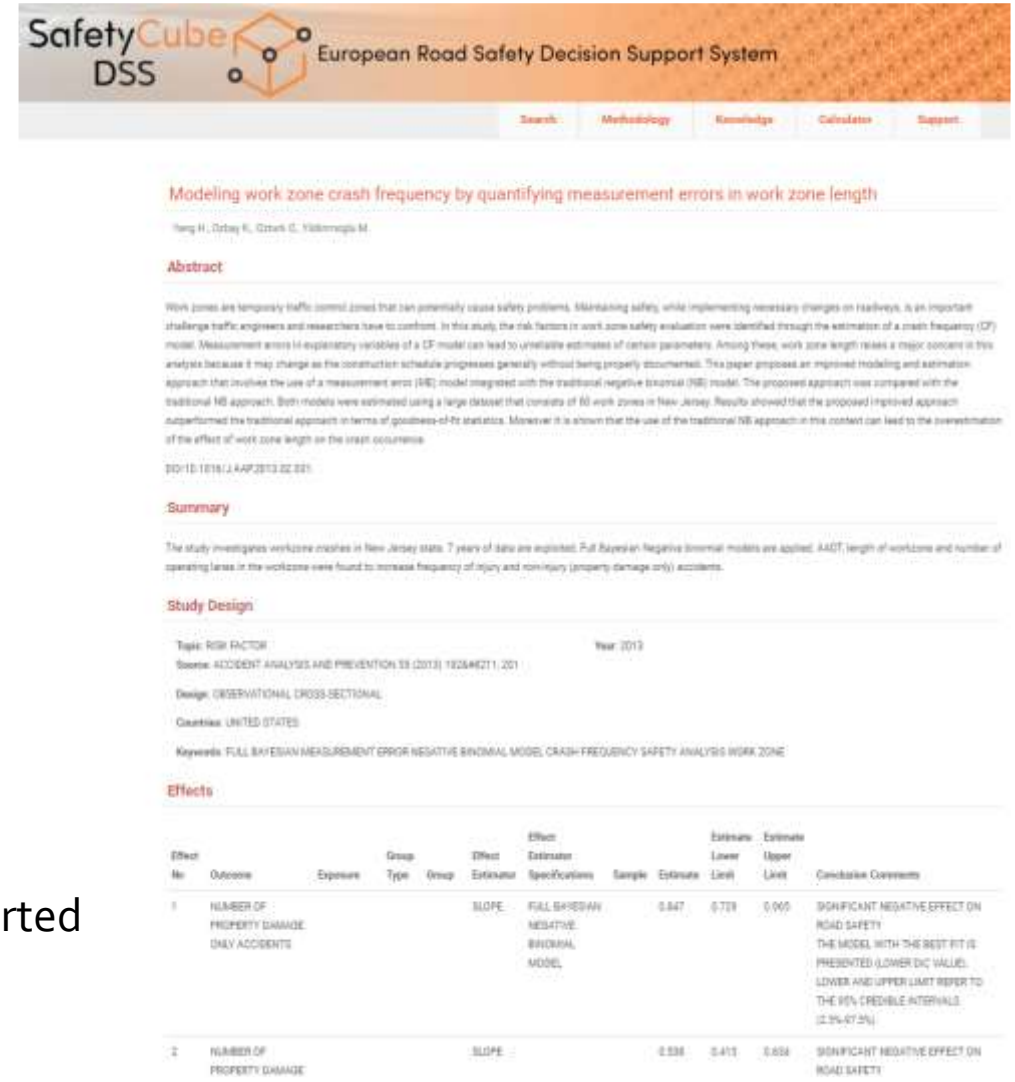
- Link to URL for full-text download (depending on Institute permissions))

Study design info:

- Country
- Research Method, Design, Sample
- Exposure/Control group
- Risk/Outcome Group
- Modifying Conditions
- Potential limitations

Study results:

- Table **listing the detailed effects** reported in the study



SafetyCube Related Risks / Measures

SafetyCube DSS Calculator

Economic Efficiency Evaluation Tool (E3)

- Combines information about the **effectiveness of a measure** (i.e. the percentage of crashes or casualties prevented) with the **costs** of this measure.
- Integrates updated information of **crash-costs in the European countries**
- Allows to express all costs and benefits of a measure in monetary values and conduct **cost benefit analysis**.

- Perform cost-benefit analysis with **own input data**.
- Select one of the **SafetyCube examples** of cost benefit analyses
  - *Measures with high effectiveness*
  - *For which reliable cost information could be found*

- Under development and coming soon …

SafetyCube DSS Knowledge Wealth

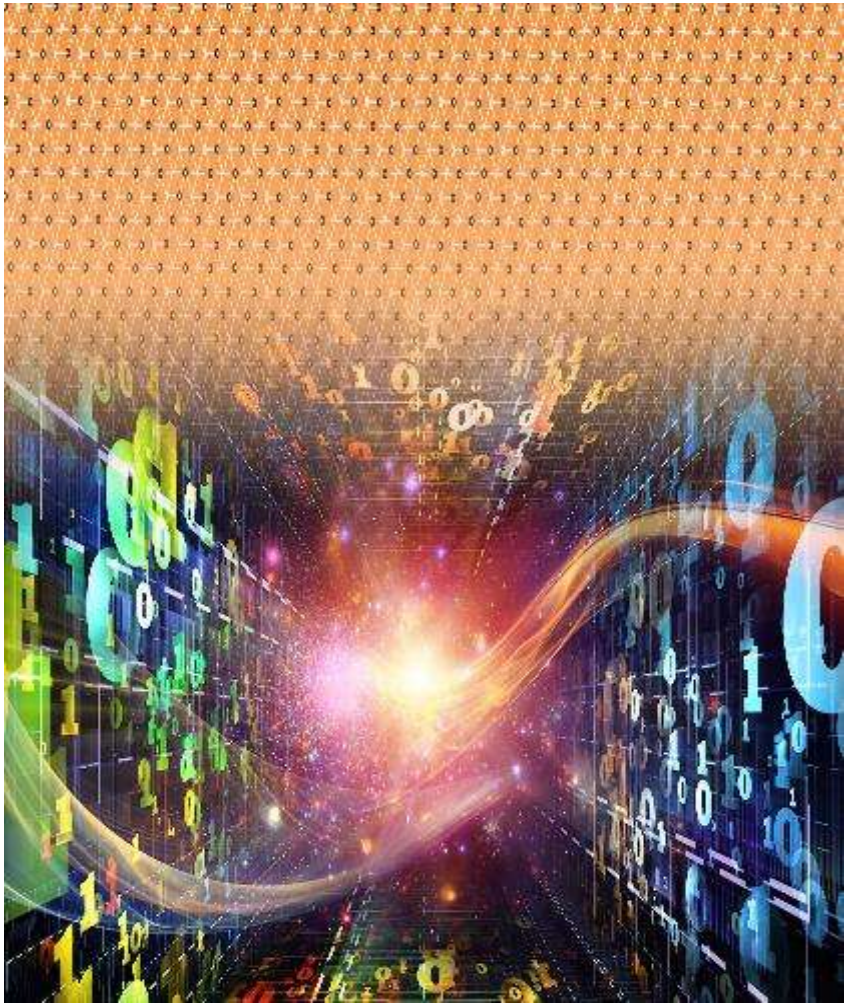
SafetyCube DSS will eventually include by April 2018:

- more than **1,200 studies**,

- with more than **7,500 estimates** of risks/measures effects on:
  - behaviour,
  - infrastructure,
  - vehicle, and
  - post impact care

- more than **150 Synopses**

- more than **50 cost-benefit analyses** (adjustable)



Development and Operation Phases

- SafetyCube DSS **Pilot Operation**
  - *Started early 2017*
  - *User feedback exploited*
- SafetyCube DSS **Opening**
  - *October 2017*
- Continuous **Enhancement and Update**
  - *Until April 2018 (end of SafetyCube project)*
  - *And beyond…*

Example questions addressed

- how important is my road safety problem?
- who else is having similar problems?
- what solutions are usually proposed for my problem?
- how efficient are the solutions proposed?
- which is the most efficient solution?
- and if I have a combination of problems …

… then use SafetyCube DSS to have the answers

Delivering a long waited powerful tool

- SafetyCube DSS is the first integrated road safety support system **developed in Europe**

- SafetyCube DSS **offers for the first time** scientific evidence on:
  - risks and not only measures
  - risks and measures not only on infrastructure
  - a very large number of estimates of risks and measures effects
  - links between risks factors and measures

- SafetyCube DSS aims to be **a reference system** for road safety in Europe, constantly improved and enhanced

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