State-of-the-art Technologies for Post-trip Safety Interventions

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The i-DREAMS project

- **13 Project partners:**
  National Technical University of Athens, Universiteit Hasselt, Loughborough University, Technische Universität München, Kuratorium für Verkehrssicherheit, Delft University of Technology, University of Maribor, OSeven Telematics, DriveSimSolutions, CardioID Technologies, European Transport Safety Council, POLIS Network, Barraqueiro Transportes S.A.

- **Duration of the project:**
  48 months (May 2019 – May 2023)

- **Framework Program:**
  Horizon 2020 - The EU Union Framework Programme for Research and Innovation - Mobility for Growth

Background

- In recent decades, the introduction of **automotive telematics** and driver monitoring systems in the industry have created the ability to provide post-trip interventions to the driver
- **Post-trip feedback** gives drivers the opportunity to identify their weak points, adjust their potentially aggressive or dangerous behaviour and promote eco-driving style
- Through delayed feedback, driving skills during future trips could be improved and the driver could be reinstated in a **safe driving field**
- The intervention tools provide **guidance and notifications** to drivers with a focus on enhancing knowledge, attitudes, perception and eventually safety performance

Objectives

- **Review and assess** the state-of-the-art user feedback and post-trip safety intervention technologies for each transport mode:
  - Cars
  - Trucks
  - Buses
  - Rail (i.e. trams and trains)

- A **literature review** was conducted in order to identify measurement methods and their targeted operator state factors

Methodology

- In order to identify the **technologies most crucial for improving driver performance** after the trip:
  - the search terms were initially identified
  - the abstracts and titles were screened as per their relevance
  - the most relevant papers were overviewed
- Particular focus was given on the **driving performance characteristics** (i.e. speed, harsh events, distraction), the indicators used to measure those constructs and the technical equipment
- Relevant studies were located **using popular scientific databases** and repositories, such as ScienceDirect, Scopus, Google Scholar, and PubMed

Mode	Search terms	Screened papers	Included papers
Cars	"post-trip interventions" OR "post-trip feedback" OR "interventions" OR "feedback technology" AND "cars" AND "car drivers"	116	9
Trucks	"eco driving truck app" OR "safety app trucks" OR "trucker apps safe driving" OR "trucker apps feedback" OR "telematics trucks" OR "truck coaching app" OR "truck telematic driving behaviour" OR "truck driver behaviour app" OR "truck behaviour feedback"	44	4
Buses	"post-trip interventions" OR "post-trip feedback" OR "feedback" OR "interventions" OR "telematics" OR "feedback technology" AND "bus" AND "bus driver"	101	7
Rails	"post-trip interventions" OR "post-trip feedback" OR "feedback technology" AND "rail" AND "train drivers" OR "tram drivers"	10	0

Results - Cars

- **SAGA technology** provided feedback to drivers and encouraged them to adopt a safer behaviour by weekly summary reports through email
- IVDR systems, such as **DriveDiagnostics**, were found to have high performance and relatively low cost
- **Smartphones** offer a scalable, cheap and easily implementable alternative to current road monitoring methods, which can be easily transferred to other transport modes. The majority of applications were designed to detect harsh events and mobile phone use, analyse sensor data and provide a performance score
- **OSeven, Zendrive, TrueMotion, TheFloow, Sentiance, Octo Telematics and VivaDrive** were the most reliable smartphone applications which were evaluated for their acceptance and effectiveness

Results - Trucks

- The majority of **truck applications** provided visual post-trip feedback to fleet operators
- **D2go, Next Driver and Truck Hero** were the most effective technologies combining in-vehicle behavioural monitoring with immediate post-trip interventions
- **DAF Connect** the best eco-friendly solution proving delayed feedback and helped drivers to be more self-aware and motivated
- The benefits of using **gamification** with post-trip interventions increased motivation
- Although both **monitoring and gamified feedback** resulted in the best driving behaviour after the trip, such interventions should be provided in combination with other strategies (i.e. driver coaching and management commitment and support)

Results - Buses

- **Green Telematics and Scania Optimile Fleet Management** intervention systems were found to be the most comprehensive for practical implementation and operators had the opportunity to identify driver's performance and plan targeted training activities
- **DriveProfiler, Jaltest Telematics and Pure Telematics** technologies had a positive effect on bus driver's performance and provided detailed post-trip reports to the fleet managers from embedded smartphone applications and a web-based portal
- **FuelSave and Stratio Automotive** systems found to be the less effective solutions for post-trip interventions
- However, **detailed knowledge** relating to professional bus drivers' attitudes, perception, performance concerning economy and safety binomial is required in order to change and improve the behaviour

Results - Rail

- There was not a **diversity of technologies** and systems providing feedback to tram/train drivers

- None of the relevant studies identified in the review gave detailed findings on a post-trip intervention but instead theorised how a **gamified application** could work in the rail industry

Conclusions

- Post-trip feedback has the potential to affect **long-term behavioral change**

- **Car-specific interventions:**

  Driver telematics with gamification features, visual warnings and proposals for better driving performance were deemed more appropriate

- **Truck-specific interventions:**

  Although a combination of monitoring and gamified feedback resulted in the best driving behaviour after the trip, such interventions cannot be provided in isolation

- **Bus-specific interventions:**

  The benefits of post-trip intervention systems may vary depending on whether the employer has access to information about the individual drivers or not

- **Rail-specific interventions**:

  Visual warnings could enhance driver alertness in post-trip

Impact

- Based on the list of post-trip intervention technologies, **researchers and practitioners** could implement the technologies that aligned closely with their operation
- Priority should be given to the **form of feedback**, as well as the integration with the existing web-platforms and sensors
- Post-trip intervention platforms should not replace other intervention approaches but should act **as a complement to other actions** taken to improve road safety and eco-efficiency
- Identifying the most suitable interventions for triggering and accepting feedback will therefore **maximize the effect on safety** among all traffic users

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