D8.2
Exploitation Plans

Safe tolerance zone calculation and interventions for driver-vehicle-environment interactions under challenging conditions

iDREAMS

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Glossary and abbreviations

Word / Abbreviation	Description
ADAS	Advanced Driver Assistance Systems
API	Application Programming Interface
B2B	Business-to-business
CA	Consortium Agreement
CAGR	Compound Annual Growth Rate
CSR	Corporate Social Responsibility

DESCA	Development of a Simplified Consortium Agreement
FMS	Fleet Management System
GDPR	General Data Protection Regulation
GPS	Global Positioning Service
GA	Grant Agreement
HMI	Human Machine Interface
i-DREAMS	smart Driver and Road Environment Assessment and Monitoring System
IP	Intellectual Property
IPR	Intellectual Property Rights
OBD-II	On Board Diagnostic
OEMs	Original Equipment Manufacturers
RTOs	Research and Technology Organisations
STZ	Safety Tolerance Zone
TRL	Technology Readiness Level
UBI	Usage-based insurance

Executive summary

The i-DREAMS project, a Research and Innovation Action, aims not only to advance state-of-the-art of scientific knowledge but also to create exploitable outcomes for societal and economic benefit. The goal of this exploitation plan deliverable is to develop a roadmap to market for the technology platform developed within the project.

The deliverable describes the different activities to understand market needs, identify unique contributions of i-DREAMS compared to existing market leaders, develop business cases, and explore the legal, ethical and administrative aspects of how consortium partners will pursue economic valorisation after the project concludes.

The telematics market is projected to have strong demand in the coming years, with increasing attention on driver safety. The outstanding advantages of the i-DREAMS solution are its comprehensive range of safety indicators and its holistic approach to monitoring driver behaviors and determining if drivers are operating within safe boundaries. The i-DREAMS platform integrates various factors, including driver background, real-time risk indicators, driver state, driving task complexity, and coping capacity, into a comprehensive framework for continuous assessment and intervention, both in-vehicle and post-trip. Potential customers who could benefit from the i-DREAMS solutions include private drivers, professional transportation companies (for cars, buses, and trucks), insurance companies that focus on usage-based insurance, and coaching companies.

The activities undertaken in the deliverable involve market outlook analysis, competitor analysis, benchmark analysis, business plan modeling, and legal and contractual analysis. Finally, a demoproject was conducted to test the i-DREAMS solution in the market with real users. The demoproject was aimed at validating the effectiveness of the i-DREAMS solution and its potential to create value for customers. The outcomes of the demoproject are used to refine the i-DREAMS solution and enhance its commercialization in the future.

1 Introduction

The goal of this section is to provide a brief outline of the objectives of this deliverable and how those are aligned and relevant with the overall project, and which approach was followed in order to achieve them.

1.1 About the project

The overall objective of the i-DREAMS project is to setup a framework for the definition, development, testing and validation of a context-aware safety envelope for driving ('Safety Tolerance Zone'), within a smart Driver, Vehicle & Environment Assessment and Monitoring System (i-DREAMS).

Taking into account driver background factors and real-time risk indicators associated with the driving performance as well as the driver state and driving task complexity indicators, a continuous real-time assessment is made to monitor and determine if a driver is within acceptable boundaries of safe operation (i.e. Safety Tolerance Zone). Moreover, the *i*-DREAMS platform offers a series of in-vehicle interventions, meant to prevent drivers from getting too close to the boundaries of unsafe operation and to bring them back into the safety tolerance zone while driving. The safety-oriented interventions are developed to inform or warn the driver real-time in an effective way as well as on an aggregated level after driving through an app- and web-based gamified coaching platform, thus reinforcing the acquisition of safer driving habits/behaviors. Consequently, the *i*-DREAMS platform allows the implementation of the two aforementioned safety interventions, meant to motivate and enable human operators to develop the appropriate safety-oriented attitude.

Specifically, the in-vehicle interventions are meant to assist and support vehicle operators in real-time (i.e. while driving). Depending on how imminent crash risks are, a distinction can be made between a 'Normal driving' phase, a 'Danger' phase, and an 'Avoidable Accident' phase. In the normal driving phase, no abnormalities in a vehicle operator's driving style are detected by the monitoring pillar of the i-DREAMS platform, and no sign of a crash course initiating is present. Consequently, no real-time intervention is required. In the danger phase, abnormal deviations from the vehicle operator's driving style are detected by the *i*-DREAMS monitoring module, and the potential for a crash course to unfold is present. A warning signal is issued in that case. In the avoidable accident phase, deviations from normal driving have evolved even further, and the risk for a crash to occur will become imminent if the vehicle operator does not adapt appropriately to the present circumstances. In that case, a more intrusive warning signal supports vehicle operators in avoiding a collision.

With regards to post-trip interventions, these are not operational while driving, but they are based on what happens during a trip. They hinge upon all the raw data that is captured by the *i*-DREAMS sensors, which is further processed and fused into information about a vehicle operator's driving style, how it evolved during a trip, how many (safety-critical) events occurred, and in which circumstances these events happened. This information is further translated into feedback consultable for vehicle operators via an app in a pre- or post-trip setting. To establish a longer-term relationship with individual vehicle operators, app-supported feedback is combined with the use of a web-based coaching platform, containing so-called gamification features meant to motivate drivers to work on a gradual and persistent improvement of their driving.

Fout! Verwijzingsbron niet gevonden. summarizes the conceptual framework, which was tested in a simulator study and three stages of on-road trials in Belgium, Germany, Greece, Portugal and the United Kingdom with a total of 600 participants representing car, bus, truck and tram/train drivers.
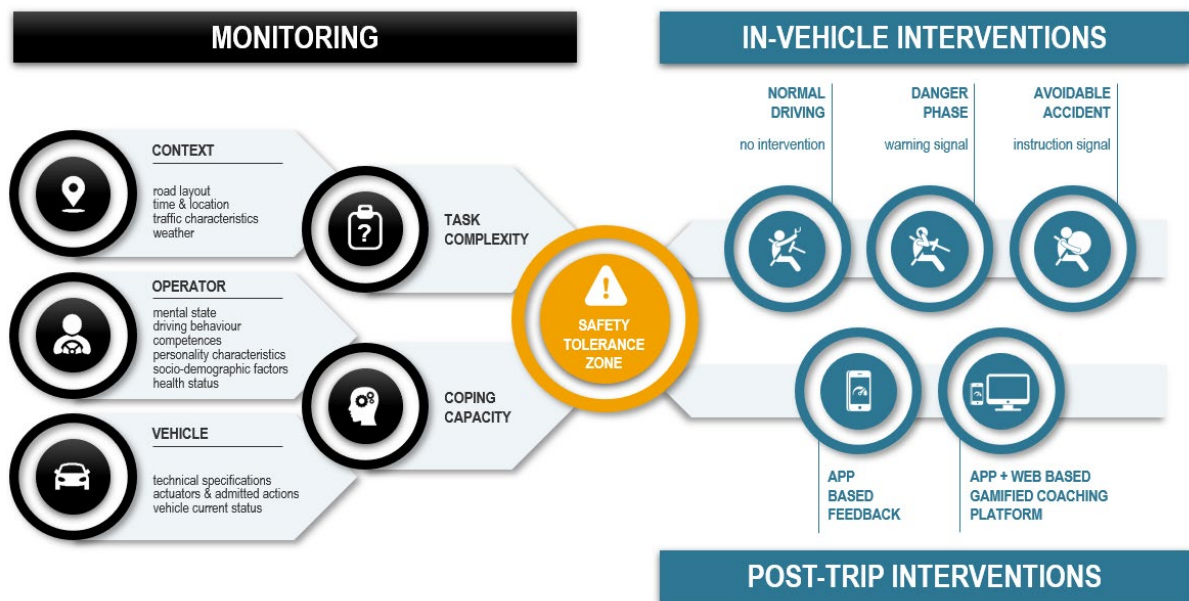
Figure 1 Conceptual framework of the i-DREAMS platform

The key output of the project therefore constitutes an integrated set of monitoring and communication tools for intervention and support, including in-vehicle assistance and feedback and notification tools as well as a gamified platform for self-determined goal setting working with incentive schemes, training and community building tools. Furthermore, a user-license Human Factors database with anonymized data from the simulator and field experiments was developed.

1.2 About this report

The purpose of the i-DREAMS project as a Research and Innovation Action (RIA) is not only to contribute to the state-of-the-art of scientific knowledge, but also to create exploitable outcomes ready for societal and economic valorisation. This Deliverable describes how the i-DREAMS consortium has prepared the **'roadmap to market'** for the technology platform that has been developed within the project. For example, it describes the different activities that were undertaken by the consortium members since the start of the project to understand the needs of the market and to identify the specific (unique) contributions of i-DREAMS compared to existing driver improvement programs. However, the deliverable also looks at legal aspects, Intellectual Property and how the different consortium partners will take up economic valorisation after the project ends.

Aims and objectives

- To identify the market climate for solutions aiming to improve a safe driving style
- To identify the competitive landscape of solutions on the market that aim at improving a safe driving style
- To benchmark i-DREAMS against some of the leading solutions in the market
- Based on the benchmark analysis, to explore the most suitable 'business case(s)' for i-DREAMS
- To explore the legal, administrative and operational conditions involved in translating the identified business case(s) into a real roadmap to market

- To take the first step in implementing one of the identified business cases for i-DREAMS

Methodology

- A **market outlook analysis** will identify the general market climate for solutions such as i-DREAMS that aim at improving a safe driving style
- A **competitor analysis** is carried out to scan the market for existing solutions to improve a safe driving style
- In a **benchmark analysis**, the i-DREAMS platform is compared in-depth against some of the market's leading products and services on a set of relevant product features. Strengths and weaknesses of the different solutions are compared against the i-DREAMS solution
- Using the technique of a **business model canvas**, the most promising business case(s) for i-DREAMS will be explored
- A **legal and contractual analysis** is carried out to identify important conditions involved in translating the i-DREAMS solution into an economic activity
- In a '**demonstration project**', the final consolidated i-DREAMS solution for one of the selected business cases is tested in the market with real users in collaboration with a commercial partner interested to take up future valorisation of the i-DREAMS solution.

Structure

The remainder of this Deliverable is organized as follows.

In section 2 the competitor analysis will be described starting with a market outlook for solutions such as i-DREAMS aiming at improving a safe driving style. In the same section, the competitive landscape of existing products and solutions is investigated and i-DREAMS is compared against some of the leading solutions in the market.

In Section 3 several potential business cases (and markets) for the i-DREAMS solution are explored and each of them translated into a lean model canvas describing the specifics of the market solution for each use case.

Finally, section 4 investigates the practical steps toward valorisation of the different business cases by identifying the steps that need to be taken to translate the i-DREAMS solution into a product that is ready for market entry. More specifically, one specific business case is developed deeper into a demonstration project that has been set up with a potential valorisation partner interested to commercialize the i-DREAMS solution after the end of the project.

2 Competitor analysis

2.1 Market outlook

Telematics, the integration of telecommunications and informatics, has revolutionized the transportation sector by utilizing technology to enhance safety, performance, and efficiency. The use of advanced technology systems such as sensors, GPS, and other data-gathering technologies allows for the collection and processing of vast amounts of data about vehicles, drivers, and the driving environment. These data do not only support drivers locally in-vehicle but can also be transmitted to remote locations for advanced data processing, providing valuable insights and aiding decision-making. With the advent of big data and cloud computing technologies, the telematics industry has seen a significant acceleration in its capabilities and applications. These applications range widely from essential services such as fleet management, eco, safe driving, and compliances, to comprehensive services with location- and time-based evidence such as assets management, real-time tracking, vehicle-finder services, coaching…These technologies benefit a wide range of customers, including individuals, corporations, and governments. The global telematics solutions market is projected to reach $92.46 billion by 2027 from $21.66 billion in 2018, at 17.5% CAGR (Stratistics Market Research Consulting Pvt Ltd, 2020). The growth of the global telematics solution market is driven strongly by rising demands which results from three prevalent trends: the growth of the transportation market thanks to the booming of e-commerce, and the global phenomenon of usage-based insurance (UBI) which calculates the premium insurance based on real-world driving behaviors instead of the total miles as the traditional calculation, and the growth of demand of entertainment, sustainability, safety & security, and navigation purposes.

- The booming of e-commerce

The global e-commerce market experienced a significant surge during the COVID-19 pandemic as people were forced to shop online due to lockdowns and social distancing measures. However, according to a study by Morgan Stanley (Morgan Stanley, 2022), this change in shopping behaviors is not temporary but has become a permanent shift in how people shop. That leads to the continued growth of the e-commerce market in the future, with the market potentially increasing from $3.3 trillion in 2022 to $5.4 trillion in 2026 according to the study. As a result, the e-commerce industry will continue to see steady growth in the future and will be a major driver for the telematics market as well, as the growth in e-commerce will increase the volume of transportation for deliveries, and telematics solutions can provide flexible scaling for this growing demand.

- The global phenomenon of usage-based insurance (UBI)

The UBI calculates the premium insurance based on real-world driving behaviors instead of the total miles as the traditional calculation. In recent years, the global UBI market has rapidly developed, replacing the old model of distance-based insurance. The market has predicted to reach $126 billion by 2027, leading to a growth of 23.0% in the period 2019-2027 (Research and Markets, 2020). Not only applying for professional vehicles, but UBI is also getting popular for private use as well. A survey about passenger vehicles, conducted by TransUnion (NYSE: TRU) in 2022 (TransUnion) showed an increase of 33% in the number of US consumers accepting UBI, as it allows them to lower their insurance premiums by demonstrating safe driving habits.

- The growth of the demand for entertainment, sustainability, safety & security, and navigation purposes

There are several explanations for this increasing demand. **Technological developments and smart vehicle demand:** The spread of telematics technology is growing as it becomes more affordable and accessible. Integrating IoT technology, including data connectivity, cloud,

mobility, big data, and sensors, is crucial for the successful implementation of smart transportation systems. From 2015 to 2020, 35-50% of new vehicles were equipped with telematics, expected to reach 90% by 2025 and almost 100% by 2030 (Market Research, 2021). The adoption of smart vehicles increases demand for telematics solutions, as companies aim to improve operations and customer experiences. Vehicles are becoming more personalized to fit individual needs and driving styles, offering advanced technology, convenience, and connectivity.

Sustainability of transportation operations: With the rising importance of sustainability in the transportation industry, companies are looking for ways to optimize their operations and reduce their environmental impact. Telematics solutions can help achieve these goals by providing real-time data on fuel consumption, vehicle performance, and route efficiency, allowing companies to make data-driven decisions to reduce waste and emissions. Additionally, telematics solutions can also improve supply chain visibility and reduce the likelihood of delays or shortages, addressing some of the top challenges faced by transportation companies today. As a result, the demand for telematics solutions is expected to continue to grow as transportation companies increasingly prioritize sustainability and efficiency.

The rise in government initiatives: A digital tachograph/electronic logging device (ELD) is a device that is used to record the amount of time that a commercial vehicle is in operation. Regulations on ELD and digital tachographs are one of the driving forces for digital transformation in transportation. ELD and digital tachographs became legally required in many countries. Under EU Regulation 2135/98, new commercial vehicles first put into service after August 5, 2004, were required to be fitted with digital tachographs. Digital Tachographs have been a legal requirement in the UK since 2006. In the United States, the use of ELD to measure the hours of service became mandatory for commercial vehicles on December 18, 2017, controlled by the Federal Motor Carrier Safety Administration (FMCSA, 2018). The Canadian ELD mandate came into effect on June 12, 2021, and was delayed until 2023 for some states. The regulations on digital tachographs and ELD are part of the efforts to improve safety on roads. These regulations are designed to prevent truck drivers from driving for long periods without rest, which can lead to fatigue and increase the risk of accidents. The use of ELD/digital tachographs is seen as an effective way to help ensure that truck drivers are complying with the hours of service regulations and are not driving for too long without taking a break. Government initiatives are heightening the demand for telematics hardware in the coming years and are making telematics infrastructure more available for services and solutions.

Demand for safety monitoring: Human factors are widely recognized as the leading cause of road accidents((Bucsuházy, et al., 2020), (Pakgohar, Tabrizi, Khalili, & Esmaeili, 2011), (Petridou E., 2000)). The current global driver shortage, one of the biggest challenges in the transportation sector worldwide ((Splitter, 2020), (Salzman, 2018), (Global Newswire, 2018), (Costello & Suarez, 2015)) is exacerbating concerns about transportation safety, by forcing businesses to hire inexperienced and low-qualified drivers who require extra guidance and monitoring. Telematics solutions can help to closely assist and monitor drivers in real-time and on an individual basis. By providing real-time information about a vehicle's mechanical systems, location, speed, driver's health status, and driving environment… Telematics systems can help to prevent accidents by alerting drivers to potential dangers on the road. Furthermore, telematics systems can provide valuable data to identify and address hazardous driving behaviors, such as aggressive acceleration or hard braking, helping to make roads safer for everyone. In addition, telematics systems can offer individualized feedback to drivers after trips, enabling them to improve their skills and performance.

As with any industry, telematics is likely to face a range of challenges and obstacles in the future. Some potential headwinds that the industry may face include:

- Increasing competition: As the market for telematics solutions continues to grow, the industry will become increasingly competitive. The growing market attracts initiatives from OEMs and start-ups. This could lead to downward pressure on prices and margins, as well as increased pressure to innovate and differentiate products and services.
- Regulatory challenges: The telematics industry is subject to a range of regulations and standards (in safety, environment, and privacy…) both at the national and international levels.
- Technological challenges: The telematics industry is heavily dependent on technology, and as such, it is subject to the challenges and uncertainties that come with technological innovation. Companies in the industry may need to invest in new technologies and capabilities to stay competitive.
- Macroeconomic and geopolitical challenges: Like any other industry, telematics is subject to economic forces and trends. Economic downturns, shifts in global trade, global supply chains, and energy prices all impact the industry and create headwinds for companies operating in the space.
- Risk of data leaking, network and data security as telematics companies collect and process sensitive data such as personal information, GPS information…

Overall, the demand for telematics solutions in the transportation industry continues to grow as organizations seek to improve efficiency, safety, and compliance. Telematics solutions offered by i-DREAMS which focuses on road safety show clear demand from the transportation and logistics industry.

2.2   Competitive landscape

In order to position i-DREAMS products, we conducted a survey of 39 companies (Table 1) that are actively engaged in providing telematics solutions in transportation and logistics. Please note that the list is not exhaustive and was based solely on publicly available information. Based on the services and products offered by these companies, the telematics solutions were grouped as follows:

• Fleet management: This telematics solution monitors and manages large fleets of vehicles, such as trucks, buses, and other commercial vehicles. It involves tracking the location, speed, and movement of vehicles in real-time, and updating the central control remotely. Such information can help fleet managers to have quick visibility of operations.

• Compliances: This telematics solution keeps track of vehicle health and improves overall compliance processes. The solution is useful for both internal and external auditing. Some compliances are required, such as the tachograph, the hours of service, driver-vehicle inspection reports, vehicle maintenance, and driver identity.

• Eco-driving and route optimization: This telematics solution provides navigation and routing information to drivers and helps optimize routes based on factors such as traffic, weather, and vehicle load. This can help reduce travel time, improve fuel efficiency, and increase customer satisfaction. Telematics solutions support eco-driving by providing real-time information and feedback to drivers on factors that affect fuel consumption and emissions.

• Driving safety: This telematics solution monitors and improves vehicle and driver safety and security. This can include features such as collision detection and avoidance, as well as tracking and reporting on driver behaviors and vehicle performance. This can help reduce accidents and other incidents and improve the overall safety of vehicles and their occupants. Telematics systems can also improve in-vehicle safety by providing real-time alerts and warnings to drivers.

• Post-trip intervention and coaching: This telematics solution provides real-time data and insights about driver performance. Coaches can use this information to provide immediate feedback to drivers and help them improve their driving techniques and strategies. The coaching can be automatically generated based on the driver's performance or an actual coach, remote or offline. Furthermore, to increase the incentive of drivers, some gamification features are added, such as driving challenges, competitions, and reward systems…

This survey analyzes 39 companies of varying sizes and operations to provide an overview of business activities in the market. The majority of these companies (77% and 72%) focus on fleet management and compliance, respectively, while 59% of them offer eco-driving features, mainly focusing on fuel consumption and emission visibility. In the aspect of driving safety, 69% of the companies provide drivers with an overall safety report on their driving behaviors and vehicle performance, while 59% provide real-time warnings during the trips. The post-trip analysis received less attention, with only 54% of companies providing an overall driving performance score, and only 33% tracking driver performance improvement. Approximately 28% provide personalized coaching services through online or offline channels. Only 18% of the companies provide gamification features such as driving challenges, badges, and prizes to incentivize driver motivation.

Several original equipment manufacturers (OEMs) and commercial vehicle manufacturers have developed their own telematics systems, such as Fleet Board from Daimler Group, Dynafleet from Volvo Group, VDO from Continental AG, IVECO ON from IVECO, and Webfleet from Tom Tom. Furthermore, some telematics hardware and software companies are consolidating through acquisitions to complete their ecosystems, including Zonar and Continental AG, VeriLocation, and Isotrack.

	Company Products	Website	Fleet management & tracking	Compliances	Eco-driving Route optimization	Driving Safety		Post-trip intervention and coaching			
						Driving tracking and reporting	*Real-time warning*	*Driving performance evaluation (score)*	*Coaching online/ offline*	*Evaluate the improvement*	*Gamification*
1	ZF openmatics	https://aftermarket.zf.com/go/en/openmatics/home/	x	x		x	x	x			
2	Webfleet (TomTom) - DKV eco-driving	https://www.webfleet.com/fr_be/webfleet/	x	x	x	x	x	x	X (warning, suggestion)	x	
3	Samsara	https://www.samsara.com/fleet/gps-fleet-tracking/what-is-telematics	x	x	x (coaching tips)	x	x (in-cab alerts)	x	x	x	x
4	Fleetboard-Parent organization: Daimler AG	https://www.fleetboard.info/#/	x	x	x (coaching tips)	x (more about efficiency)		x (more about efficiency)			
5	Netradyne/ Driveri	https://www.netradyne.com	x (fleet safety)	x		x	x	x			

#	Tool	URL									
6	Volvo Bus Telematics (service offered by Volvo)/ Dynafleet for trucks	https://www.volvobuses.com.au/en-au/our-offering/services/vehicle-management.html	x	x	x	x (more about efficiency)					
7	IVECO bus (Bus manufacturer)/ IVECONNECT	https://www.iveco.com/belgium-nl/diensten/pages/iveco-on-fleet.aspx#overview	x	x	x	x	x (info, for smooth driving, increase passenger comfort)	x (mission evaluation)		x (follow-up)	
8	MAN (Digital service)	https://www.digital.man/de/en/overview.html	x	x					X (remote coaching with tips about safety and eco-driving)	x	
9	Next Driver	https://www.nextdriver.nl/aanpak			x	x		x	X (coach and driver can contact via app)	x	
10	GreenRoad	https://greenroad.com/solutions/#driverSafety			x	x	x	x		x	x
11	Trimble Transport	https://www.trimbletl.com/	x	x	x	x	x	x	x	x	x
12	Trasics telematics/ Tx eco	https://www.transics.com/	x		x	x	x	x			x

#	Tool	URL									
13	Vdo tis-web fleet (Siemens)	https://www.fleet.vdo.com/		x							
14	Frotcom FMS	https://www.frotcom.com/nl-NL/homepage	x	x	x	x		x	x (remote coaching)		
15	Lightfoot Real Time	https://www.lightfoot.co.uk/#	x	x	x	x					
16	ACTIA	https://www.actia.com/en/solutions/electronic-vehicle-management/telematics-and-connectivity	x	x	x						
17	Verillocation	https://www.verilocation.com/driver-performance/	x	x	x	x	x	x		x	
18	Zonar coach	https://www.zonarsystems.com/solutions/fleet-health-solutions/	x	x	x	x	x (coaching)	x			x
19	Fleetistics	https://www.fleetistics.com/	x	x		x					
20	D2go	http://d2go.io/				x	not mentioned clearly	x	x	x	x (Badges & medals)

21	DAF trucks	https://www.daf.co.uk/en-gb/daf-stories/daf-connect-customers	x	x		x	x (real-time report)		X (offline)		x (challenges)
22	Scania Fleet	https://www.scania.com/	x	x		x		x	x (coach offline, based on performance data)	x	
23	Omitracs	https://www.omnitracs.com/solutions/transportation-management-system-solutions	x	x	x	x				x	
24	Autoliv	https://www.autoliv.com/company					x			x	
25	SmartWitness	https://www.smartwitness.com/KP1S.html	x (data management)	x		x (camera)		x (+risk prediction)			
26	Guardian (seeing machine)	https://www.seeingmachines.com/guardian/				x	x				
27	E-horizon Road weather	https://marketplace.geotab.com/solutions/weather-telematic					x				

		s-road-hazard-alerts/									
28	Safe drive system advanced radar	https://safedrivesystems.com/	x	x	x		x				
29	Brodmann17	https://brodmann17.com/aftermarket-passive-adas/	x				x				
30	MobilEye 6	https://www.mobileye.com/uk/fleets/products/mobileye-6-collision-avoidance-system/				x	x				
31	Geotab	https://www.geotab.com/	x	x	x	x	x	possible for integration	possible for integration	possible for integration	possible for integration
32	Lytx	https://www.lytx.com/en-us/	x	x			x	x	x (offline and remote coaching)		
33	Addsecure	https://www.addsecure.com/newsroom/#/?vehco	x	x	x						
34	Inthinc Technology Solutions	http://www.inthinc.com/	x	x	x		x	x	x	x	
35	Driver Profiler	https://www.driveprofiler.com/category/	x	x		x		x			

		industry-solutions									
36	Jaltest Telematics	https://www.jaltest-telematics.com/en/solutions/	x	x	x	x					
37	Plant-I /Pure Telematics	https://www.plant-i.co.uk/risk-management-report/	x			x	x	x			
38	Stratio Automotive	https://stratioautomotive.com/automated-maintenance	x	x	x		x (about the vehicle conditions)	x			
39	FuelSave	https://fuelsave-global.com/losungen/fs-vehicle/			x						
		Total in %	77%	72%	59%	69%	56%	54%	28%	33%	18%

Table 1 Overview of services offered by telematics solution companies (last update Dec 2020).

(Note: This is not an exhaustive list of all companies in the Telematics Solution Industry)

2.3 Competitive profile

To gain insights into the telematics solution market, six companies were selected based on their growth phase, availability of public information, and product segment. The chosen companies are Samsara, GreenRoad, Mobileye, Zonar Systems, D2go, and NEXTdriver. While most of these companies are privately held, Zonar Systems has been acquired, and Samsara and Mobileye have recently gone public. GreenRoad and NEXTdriver are still in the funding stage. Samsara, Mobileye, and Zonar Systems are developing their own branded telematics hardware, while NEXTdriver integrates with external hardware. On the other hand, GreenRoad can be operated without any specific telematics hardware, while D2go can be fully integrated into other platforms by utilizing the hardware resources available there. Later, i-DREAMS is compared with these companies based on the functionalities and features related to human driving safety.

2.3.1 Samsara

Company overview: Samsara (NYSE: IOT) was founded in 2015 by John Bicket and Sanjit Biswas in San Francisco. The company develops sensor systems, cloud-managed networking, and cloud-based analytics, serving customers across various industries, including Transportation & Logistics, Food & Beverage, Field Services, Construction, Government, K-12 Schools, Higher Education, Passenger Transit, and Utilities. Samsara focuses on digitalization to improve end-to-end supply chain visibility, from suppliers to end customers. Its sensor systems and cameras provide visibility across operations, covering equipment/facility and technician safety. Samsara's core applications for connected fleets include Video-Based Safety, Vehicle Telematics, Apps, and Driver Workflows.

Samsara has a total employee base of over 1,600 (Samara Inc., 2022). The company did an IPO in 2021 with a valuation of $11.5 Billion.

Strengths: Samsara is holding big IoT Data quantities with a high diversity of IoT data types, which are stored remotely on Connected Operations Cloud. In the fiscal year 2022, the Data Platform processed over 85 billion minutes of video footage and collected about 4.6 trillion data points. This immense amount of data powers their capacity for data analysis. Furthermore, Samsara owns an extensible technology platform that allows third-party applications to be integrated such as enterprise resource planning, payroll, and human capital management applications…

Customer segments: Target customers are customers that perform complex physical operations involving a high number of physical assets. Samsara reported it had more than 13,000 customers with subscriptions to its Connected Operations Cloud as of October 30, 2021.

Products - Value equation: The value equation is estimated as the ratio between the benefits which include products and services and cost via the perception of customers.

Samsara offers access to the Connected Operations Cloud on a subscription basis and prices each subscription on a per-asset, per-application basis. In each of the last three fiscal years, it generated approximately 98% of the revenue from subscriptions to the Connected Operations Cloud. According to Samsara's estimation, for the last three fiscal years, the calculated lifetime value of their customers has exceeded eight times the associated cost of acquiring them.
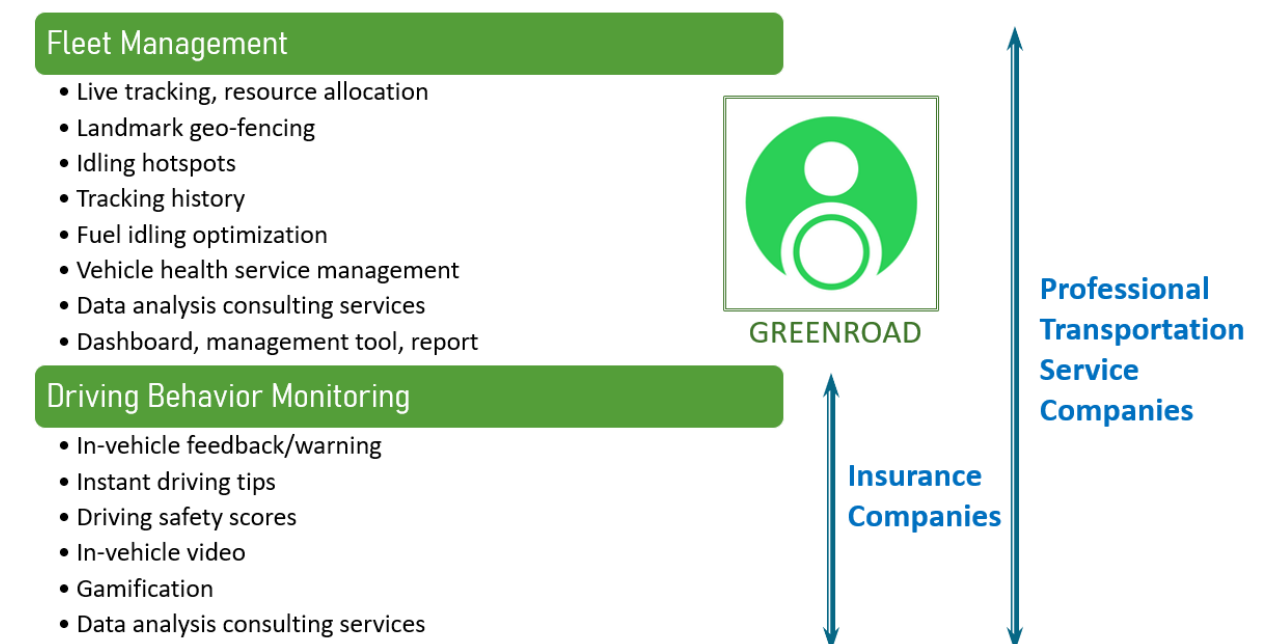
2.3.2 GreenRoad

Company overview: GreenRoad is a software company that provides telematics solutions for transportation sectors. The company was founded in 2004, based in the United Kingdom with around 120 000 driver users in all markets. It is currently privately held and had successfully raised $84.4 million in 10 years (2005-2015) (Start-up Nation Central, n.d.). From the last fundraising round G in 2015 onwards, the company is now focusing on introducing its products and expanding its markets. Currently, GreenRoad has offices in the United Kingdom and the United States and an R&D center in Israel. GreenRoad focuses on fleet management and on-vehicle and post-trip intervention via data-based predictive analytics (GreenRoad, 2020).

Strengths: GreenRoad strength lies in its innovative cloud-based solution that utilizes cloud computing and cellular network technology to transmit, store, and process data instantly, providing real-time analysis to both managers and drivers. This increases visibility and supports drivers in-vehicle. Another strength of GreenRoad is that its platform does not require any hardware, as it processes data collected by a smartphone such as location, speed, and acceleration, making it easy to implement with low investment from customers. They also own a patented algorithm that allows for monitoring and analyzing driving behaviors of more than 150 maneuvers and bad driving habits across five categories: acceleration, braking, lane handling, cornering, and speeding. The solution is available in both a smartphone app and a web-based system, therefore no local distribution is required.

Customer segments: The two main customer segments are transportation service companies (buses, trucks..) and insurance companies that are using the usage-based insurance (UBI) scheme or the Pay As You Drive scheme. Figure 2 shows the product features and customer segments for GreenRoad.

Products - **Value equation:** GreenRoad offers its value equation through its subscription-based business model where the price is varied with the number of services included. No hardware investment is required for customers since the input data are collected via smartphones, which are common devices nowadays. GreenRoad App is distributed widely via Google Play or App Store. The true 'products' are the solutions or service packets that can be accessed through a shared environment, combining access to shared physical environments like cloud storage and authorized access to and usage of systems and networks. However, the data that can be collected is limited to what can be gathered from a smartphone, which may limit the number of safety indicators that can be tracked and the accuracy of the data.

Fleet Management

- Live tracking, resource allocation
- Landmark geo-fencing
- Idling hotspots
- Tracking history
- Fuel idling optimization
- Vehicle health service management
- Data analysis consulting services
- Dashboard, management tool, report

GREENROAD

Driving Behavior Monitoring

- In-vehicle feedback/warning
- Instant driving tips
- Driving safety scores
- In-vehicle video
- Gamification
- Data analysis consulting services

Professional Transportation Service Companies

Insurance Companies

Figure 2 Product features and customer segments of GreenRoad

2.3.3 NEXTdriver

Company overview: NEXTdriver was founded in 2019 in Delft, Netherlands (NextDriver, 2023). NEXTdriver uses data collected from trucks and their surrounding environment to provide personalized online coaching for drivers. The coaching aims to improve road safety, reduce fuel consumption, lower CO2 emissions, and decrease costs associated with damage and maintenance. The coaching focuses on professional driving behaviors and is designed to help drivers improve their behavior in the short term and develop new habits for long-term results. NEXTdriver is currently active in Europe/Benelux market. NEXTdriver is still on private hold and in the funding stage.

Strengths: NEXTdriver provides a light solution that is easy to implement and launch. The company's telematics system is designed to be user-friendly, making it simple for businesses to start using it right away. Additionally, NEXTdriver's telematics system can be easily integrated with several existing Fleet Management Systems, which allows businesses to continue using the tools they are already familiar with while also benefitting from the advanced features and capabilities offered by NEXTdriver's telematics system. This makes it a very attractive option for businesses looking to improve their fleet management and road safety.

Customer segments: NEXTdriver targets logistics companies, driver coaching companies, and freelance driving coaches and mentors. NEXTdriver's primary user is a driver, who receives weekly reports on their driving behavior and personalized advice. A secondary user of NEXTdriver is a fleet manager or a driving coach, who receives weekly statistics, summaries, and structured data on which further training can be based. Their main user segment is the professional truck drivers, with a focus on the 6.3 million trucks operating in the EU. However, they also target light commercial vehicles such as vans and small trucks (31.6 million) and buses (0.9 million) as these vehicles also have a high impact on safety and sustainability.

Products - **Value equation:** The company offers various packages with different pricing for their services, starting with a pilot package for free to introduce the features of the solution, a coaching toolbox (11€ monthly per driver) where all digital tools are provided such as informative insights about the driving behaviors, tips and compliments, gamification elements, scores, badges, rewards… and full coaching options (16€ monthly per driver) which provide a chat option for direct contact with a coach. According to NEXTdriver (Nextdriver, n.d.), their solution can result in up to a 10% reduction in fuel consumption and emissions and a 47% reduction in insurance claims.

2.3.4 Mobileye

Company overview: Mobileye, was founded in Israel in 1999, with the initial idea of developing a light and stand-alone device with its own processor which was capable of detecting vehicles using a camera (Mobileye, 2023). The company went public on the New York Stock Exchange in 2014, was acquired by Intel Corp in 2017, and went public again in 2022. Today, Mobileye specializes in developing hardware and mathematical models for safe self-driving cars. Their unique technology includes the EyeQ system-on-chip (SoC), which uses a single camera sensor for passive/active ADAS, and the Responsibility-Sensitive Safety Model, a mathematical model that digitizes safe driving rules for automated vehicles (AVs). Other technologies are including Mobileye's Road Experience Management (REM), True Redundancy, and Mobileye Drive, which allow up to the level 4 self-driving system by processing data from an array of sensors consisting of cameras, long-range and short-range LiDARs, and radars. The newly built product Mobileye connect platform allows Mobileye to penetrate further into telematics solution markets with features of fleet management, asset

tracking, safety reports… Mobileye's technology has been implemented in various car models of OEMs, including BMW, Tesla, and Volkswagen.

Strengths: Mobileye has a successful track record of developing highly innovative and reliable products for autonomous driving systems over the past 15 years, establishing them as a leader in computer vision for autonomous driving technology.

Customer segments: As telematics hardware and software providers, Mobileye targets a diverse customer segment, including OEMs, car manufacturers, telematics solution companies, autonomous vehicle product customers, small businesses, and individual customers who use their telematics hardware as ADAS sensors. In addition to these markets, Mobileye offers Autonomous Mobility-as-a-Service products for autonomous vehicle customers and provides fleet management services for truck and bus companies.

Products - **Value equation:** The company generates revenue from both hardware (ADAS systems) and service businesses, with the majority coming from the ADAS core business, which includes Mobileye SuperVision and EyeQ. In addition to ADAS, Mobileye's revenue is increasing from services in Autonomous Mobility-as-a-Service products. Fleet management represents today a small portion of the company's revenue.

2.3.5 Zonar system

Company overview: Zonar Systems was founded in 2001 in Seattle, USA (Zonar Systems, 2023). The company provides telematics hardware and software solutions that focus on road safety and inspection. In 2016, a majority stake in Zonar was acquired by the German automotive giant Continental AG. The company has a separate solution for the safety of drivers called Zonar Coach which specializes in in-vehicle coaching through real-time alerts. The app goes along with drivers to monitor the road ahead, capture footage of critical events, and gather vehicle data that show real-world performance. If the system detects specific unsafe behaviors, it alerts drivers to correct them before an accident occurs. The solutions include safety indicators such as hard braking, hard acceleration, lane drifting, tailgating, hard cornering, and posted speed limits. Key features of Zonar Coach include an AI-powered dual-facing dashcam, real-time in-cab alerts, HD video footage with a 110-degree view of the road and a 140-degree interior view, a fleet-wide visibility dashboard, an Incident Response Centre, an infrared camera for night driving, driver scorecards, streamlined incident reviews, on-demand recording, and real-time KPIs.

Strengths: Zonar places a strong emphasis on safety, compliance, and fuel efficiency. They have a patented Electronic Verified Inspection Report (EVIR®) system that can provide pre- and post-trip inspections for drivers. With over 100 strategic patents, Zonar has a proven track record of innovation in the industry.

Customer segments: Zonar's primary customers include pupil transportation bus providers, vocational fleet companies, transit fleet companies, and commercial truck companies. Their services aim to improve safety, efficiency, and on-time performance, such as ensuring compliance with regulatory standards, safeguarding passengers, optimizing asset utilization and efficiency, supporting fleet management, and green initiatives through digitizing paper-based processes.

Products - **Value equation:** Zonar's services and telematics hardware can be customized with various packages and options. Customers can choose the packages and options that best meet their needs, budget, and existing equipment. Packages range from basic solutions utilizing the Zonar app to more advanced systems with multiple sensors and cameras. Zonar also provides various use cases to help customers identify their specific needs.

2.3.6 D2go Solutions

Company overview: D2go Solutions is a Canadian company based in Quebec that focuses on driver scoring and gamification to improve driver engagement and performance (D2go, 2023). The company offers driver challenges and rankings to motivate users to adopt good driving habits. D2go solution is fully integrated with the platform of Geotab which is one of the largest fleet management companies in the world based on the number of subscribers.

Strengths: D2go Solutions' full integration with the Geotab platform enables the company to access the global market through its partnership with Geotab. This integration feature offers D2go a good opportunity to expand its reach and tap quickly into a wider customer base.

Customer segments: The primary target segment for D2go Solutions are current Geotab users who want to enhance their services with coaching and motivation features.

Products - Value equation: D2go Solutions adds value to the Geotab platform by offering a gamification solution that enhances employee engagement and motivation, complementing the existing capabilities of the Geotab platform.

2.3.7 Comparison

Due to limited publicly available information, i-DREAMS was compared to the aforementioned companies based on only four features. These four features focus on human driving safety behaviors: tracked safety indicators, real-time intervention (which includes all the real-time alerts which happen during the trip), post-trip intervention (which includes all the operations after the trip, such as data processing and analytics, driver's performance evaluation and following-up, coaching…), and the overall capacity of the ecosystem. To provide a more intuitive comparison, every company was assessed and ranked on each feature with a scale of 1 to 5 based on the level of complexity (1 being the simplest and 5 being the most complex). The score is only an indicator and is primarily based on the capability and functionality of the feature, rather than its effectiveness. For example, in the case of the feature of tracking safety metrics, the score is based on the number of indicators. The higher the number of indicators a company has, the higher its score. The same logic was applied to the other three features. Finally, all the features of each company and i-DREAMS were scored as shown in Table 2.

Safety indicators :

Companies	Offered safety indicators	Score
Samsara	Driver distractions (mobile usage) Speeding, tailgating, rolling stops, harsh braking, harsh acceleration, harsh turn	3
GreenRoad	Acceleration, braking, lane handling, cornering, speeding	2
Mobileye	harsh acceleration, harsh braking, steering, tailgating, lane discipline, overtaking, collision avoidance, vulnerable road user collision avoidance, speeding	4
Zonar System	Speed, tailgating, lane drifting, rolling stops, hard braking, hard cornering, hard acceleration, distracted driving	3
D2go	Harsh acceleration, harsh braking, harsh cornering, seatbelt, speeding, idling	3

NEXTdriver	Speed, braking idling	1
i-DREAMS	Fatigue, distraction, harsh acceleration, harsh braking, steering, tailgating, lane discipline, overtaking, collision avoidance, vulnerable road user collision avoidance, speeding	5

Real-time intervention:

Companies	Real-time intervention features	Score
Samsara	Real-time alerts with sound or a human voice, including safety alerts, device health alerts, location and movement alerts (geofence), maintenance alerts, driver alerts, routing alerts, security alerts, environment alerts…	5
GreenRoad	Real-time alert with text or text-to-voice messages, multi-stage warnings, including safety alerts and location and movement alert	4
Mobileye	Real-time alerts with audio, simple visual, and multi-stage warnings for safety alerts	3
Zonar System	Real-time alerts with human voice, including safety alerts, maintenance alerts	4
D2go	No real-time alerts on its own but depending on the Geotab platform	2
NEXTdriver	No real-time intervention	1
i-DREAMS	Real-time alert with sound, simple visual, multi-stage warnings for safety alerts	3

Post-trip interventions

Companies	Post-trip intervention features	Score
Samsara	Driver scores Video footages Automated sorting suggestions (need review, need coaching) on incidents/events Physical coach (follow up, give feedback/notes) Safety tips (for drivers to consult if they want)	5
GreenRoad	Driver scores, Gamification (ranking, rewards) Trip history with GPS locations	3
Mobileye	Driver score Trip history with GPS locations	1
Zonar System	Driver scores	2

	GPS locations, Video footage (with night vision)	
D2go	Driver scores GPS locations (depending on the available hardware) Driving trend Gamification (ranking, driving challenges, rewards)	3
NEXTdriver	Driver scores, Gamification (ranking, cups) Assign and able to set communication with a coach GPS locations	3
i-DREAMS	Driver scores GPS locations Video footages Gamification (reward, challenges, ranking) Safety tips that pushing actively to driver app	4

The ecosystem on driving behavior and safety

Companies	Ecosystem	Score
Samsara	Driver App: Integrates all services: compliances, inspections, routing (tracking, logging, out-of-sequence arrivals), customized features Portals with cloud-based backend system; Allow customized multiple features in both app and driver ADAS systems Market place	5
GreenRoad	Driver apps with an open platform able to be embedded into other partner backend systems for data feed	2
Mobileye	For fleet management,: Eye watch to communicate with drivers, Portal for management ADAS systems, strong hardware, and analytical systems Autonomous Mobility-as-a-Service platform for AVs	4
Zonar System	Zonar ecosystem and Continent AG system (apps ZonarCoach, ZonarForm, ZonarAccess…) Portals with cloud-based backend system Market place	4

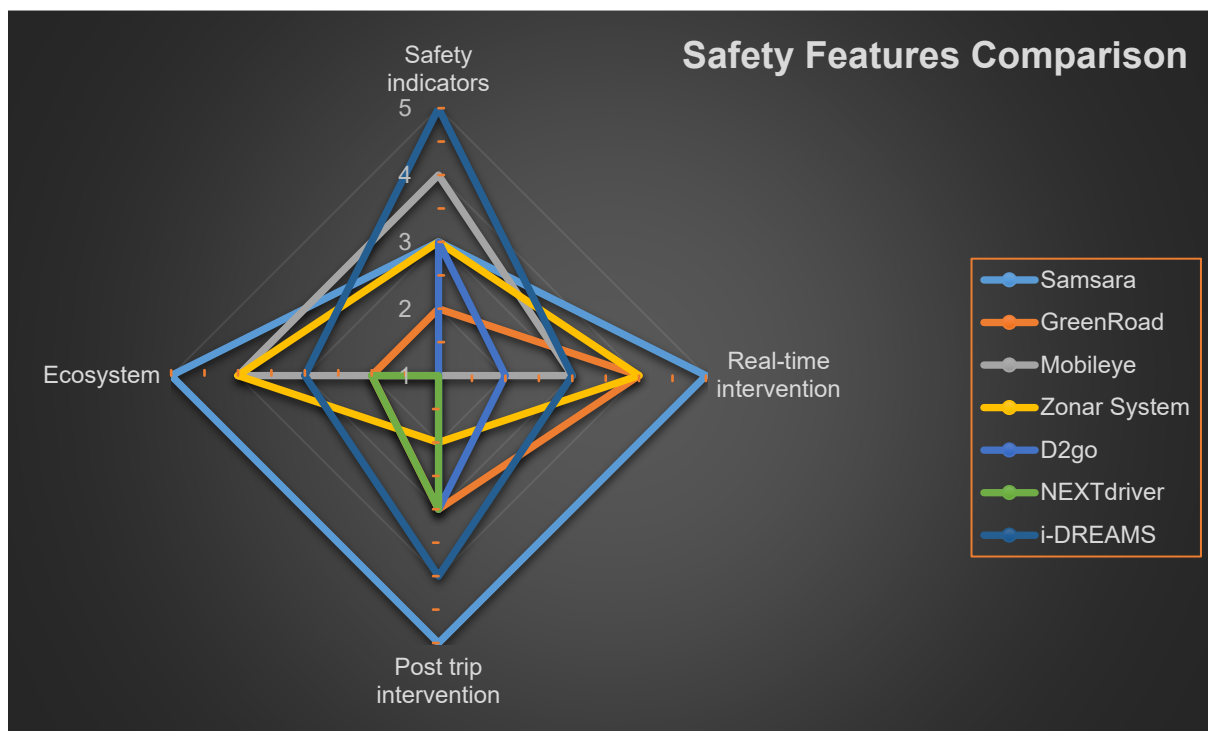|	ADAS systems	
D2go	An app that integrated into the Geotab platform	1
NEXTdriver	Driver app Portals for the coach and management	2
i-DREAMS	Driver App Portals for management with cloud-based backend system ADAS system	3

Table 2 Comparison table among the companies

Figure 3 Visualized comparison of safety features comparison between i-DREAMS and some other telematics solution companies

Figure 3 illustrates that each company has its own unique features which could become its competitive advantage depending on its target market segment. Some focus on the full telematics solution such as Samsara and Zonar systems. Some focus on a light solution such as D2go, Nextdriver, and GreenRoad. Mobileye focuses the business on hardware and real-time intervention rather than post-trip intervention. i-DREAMS scored highest in the number of safety indicators and ranked second in post-trip intervention by offering many features in driver evaluation and coaching. Its real-time intervention feature and the capacity of its ecosystem received an average score. Therefore i-DREAMS stands out with its comprehensive safety indicators and its full-spectrum knowledge-based approach that spans from real-time intervention to post-trip analysis, coaching with data-based footage, and motivating drivers via gamification. The i-DREAMS platform integrates various factors, including context, operator, vehicle, task complexity, and coping capacity, into a comprehensive framework to establish a safe driving tolerance zone. Empirical experiments have demonstrated that in-vehicle and post-trip interventions can effectively complement each other and maintain drivers in the safety

tolerance zone. All interventions come with footage as evidence, while post-trip interventions offer additional incentives, such as gamification challenges and rewards, to encourage safer driving practices. In-vehicle interventions are aimed at preventing immediate crashes, while post-trip interventions focus on long-term effectiveness and sustainable driving safety improvement.

To leverage its advantages, i-DREAMS could explore different strategies. One option is to provide complementary service package as an add-on to existing marketplace platforms like Samsara or Zonar systems. Another strategy could be offering its full-service package focusing on driver safety, which includes real-time intervention, post-trip analysis, and gamification with a comprehensive range of safety metrics. Additionally, a subscription-based business model is commonly used among telematics solution companies, with various product and service packages available. This allows customers to budget their fleet management costs on a recurring basis and provides a predictable revenue stream for the companies. Therefore, i-DREAMS could consider implementing this revenue stream as a starting point. However, these suggestions should be validated in conjunction with i-DREAMS' business model.

3 Identification of the business cases

3.1 Description of the i-DREAMS ecosystem

The i-DREAMS technological solution can be considered as a complex and integrated 'ecosystem' of hardware sensors, software and a set of methodologies for driver style monitoring, evaluation, scoring, triggering of interventions and gamification with the ultimate goal of reducing crashes through improvement of driving behavior, knowledge and safe driving attitudes. More details about the consolidated i-DREAMS technological solution can be found in Deliverable 8.1, and in Deliverables specifying different subcomponents of the solution, e.g., Deliverable 4.1, Deliverable 4.2, Deliverable 4.4, Deliverable 4.5 and Deliverable 4.6.

The monitoring and improvement of safe driving can be of interest in several uses cases or sectors ranging from e.g., goods transportation, personal transportation, preventive insurance, driver education, driver rehabilitation, etc. Below, three specific business cases are identified and described with great market potential using the instrument of the 'business model canvas'.

3.2 Description of business model canvas

The business model canvas is a strategic planning tool that can be used to quickly and effectively outline the key elements of a business idea or plan. It provides a structured way to think about and organize the key components of a business, and helps to ensure that all important aspects of the business are considered and addressed.

The business model canvas consists of nine key elements: problem, solution, value proposition, unfair advantage, customer segments, channels, key metrics, revenue streams, and cost structure. Each of these elements is important for understanding and evaluating the feasibility and potential success of a business idea. Therefore the business model canvas is often used as a starting point for developing a more detailed business plan. This can help businesses to focus on the most important aspects of their plan and ensure that they have a solid foundation to build on. The elements of a business model canvas typically include:

- **Problem:** This represents the specific challenge or needs that the business is addressing.
- **Solution:** This represents the product or service that the business offers to address the problem identified in the problem element. This could be a physical product, such as a new type of renewable energy technology, or a service, such as a platform for connecting patients with healthcare providers. Together, the problem and solution elements of a business model canvas provide a clear picture of the value proposition of the business or the unique value that the business offers to customers.
- **Value proposition:** This is the unique value that a business offers to its customers. It should be clear, compelling, and differentiated from the competition.
- **Unfair advantage**: This refers to any unique advantage that a business solution has over potential competitors. This advantage could take different forms, such as a patented technology, a strong network of partners, or a highly skilled team...
- **Customer segments:** This is the specific group of customers that a business targets. It should be well-defined and based on a thorough understanding of their needs, preferences, and behaviors.
- **Channels:** This is the way that a business reaches and communicates with its customers. It should be effective and efficient and tailored to the needs of the customer segments.
- **Key metrics:** This element is used to identify the specific metrics that the business will use to track its performance and evaluate its success. These metrics could include financial metrics, such as revenue or profit, or operational metrics, such as customer satisfaction or retention. The key metrics identified on a business model canvas are

often linked to the other elements of the canvas, such as the problem and solution, customer segments, and revenue streams.

- **Revenue streams:** This is the way that a business generates revenue. It should be sustainable and provide a solid foundation for growth.
- **Cost structure:** This is the overall cost structure of the business, including both variable and fixed costs. It should be well-understood and managed in order to support the business's profitability and sustainability.

Therefore we use the business model canvas tool to develop a high-level overview of how the i-DREAMS project could be valorized to offer our telematics solutions for different transportation types: truck, bus, and car.

3.3 Description of three business cases

3.3.1 The business model for truck

Figure 4 The business model canvas for Truck

- **Problem:** Truck accidents are a major cause of fatalities and injuries on roads, and can also lead to significant damage to property and cargo. However, there is a limited follow-up of professional drivers because, without proper tools, this can be time-consuming and costly, especially for such a low-margin sector as a truck business. Education for drivers is perceived as an out-of-pocket cost and therefore limited to what is legally required.

- **Solution:** i-DREAMS offers an innovative digital-based solution, which allows a continuous and individualized follow-up of drivers in real time. Drivers constantly

receive feedback in real-time and post-trip to improve their driving skills toward safety, eco-driving, and healthy functioning.

- **Value proposition:** The telematics safety solution offers trucking companies and their drivers a way to improve safety on the roads, reduce the likelihood of accidents, and protect the value of their vehicles and cargo. It enables lower insurance fees by demonstrating good driving behaviors and improving their driver's driving skills (e.g Usage-Based Insurance - UBI). Continuous feedback could encourage good driving behaviors among drivers, and as a result, it will lower the operating cost (fuel, tires..) for truck companies. Furthermore, solutions offered by i-DREAMS could help to follow up on drivers' or trainees' performance and improvement over time, allowing coaches to track progress and adjust their coaching strategies accordingly.

- **Unfair advantage:** The i-DREAMS solution provides numerous tracked safety indicators and continuous automated feedback which is integrated with both real-time and post-trip feedback. The real-time feedback is calibrated specifically to the truck driving environment and is designed to operate within a safety tolerance zone.

- **Customer segments:** The primary customer segments for i-DREAMS intervention solutions are trucking companies where truck drivers are the direct users. Other potential customers are insurance companies who employ usage-based insurance (UBI). The i-DREAMS solution can help the insurance company to assess the risk associated with insuring a particular driver and to set premiums accordingly. Training companies might be interested in the i-DREAMS solution since it could help coaches identify areas where the driver may need to improve. The solution can provide detailed reports on a driver's performance over time, allowing coaches to track progress and adjust their coaching strategies accordingly. This can help coaches target their efforts more effectively and ultimately improve the overall safety and efficiency of a driver's performance.

- **Channels:** The solution could reach directly to trucking companies through a network of sales representatives. It could also go via insurance brokers who are between insurance companies and truck companies. The solutions and services can also be available on marketplaces as the add-on to other existing telematics solutions.

- **Key metrics**: The key metrics for the i-DREAMS solution include the number of drivers using the solution, the percentage of drivers with improved performance, and the overall improvement in safety on the roads by the number reduction in claims for insurance companies and the reduction in operational cost.

- **Revenue stream:** The revenue can come from equipment setup and subscriptions to the data and analytics services, depending on the amount of data and processing. The pricing has been internally calculated and reviewed, but it is not intended for public display.

- **Cost structure:** The cost includes the upfront cost of the software platform for development hosting and stored data, and other operational costs such as marketing, sales, legal, and customer support...

3.3.2 The business model for bus

The business model canvas   i-DREAMS - BUS   20-Feb-2023   Iteration #3

Problem	Solution	Value Proposition	Unfair advantage	Customer Segments
• Sector margins are very low • Focus on reducing costs, and mainly on fuel, but also on maintenance • Safety is not a priority • Follow up is not existent (mainly small/medium comp) • Educational tools are lacking effectiveness • Very difficult to stop Vehicles • Insurance Costs are increasing	• Continuous & personalized device for safety and eco-driving. • Combining in-vehicle with post-trip intervention. **Key Metrics** • % Reduction of vehicles incidents • % reduction of fuel/ operational costs • % improved driver performance	• Individual customizable in-vehicle & post-trip system • Reduce fuel consumption and operational cost (eco-driving) • Improve safety with in-vehicle intervention • Change driving behavior using post-trip intervention (every trip, aggregation over time) • Future connection with insurance • Possible customization for niche markets (student transportation/ etc.)	• Continuous automated feedback • Integration real-time (safety tolerance zone) and post trip feedback • The modularity / integrability of the system (possible use of WIFI- no data connection) **Channels** • Direct Sales • Specialized Fairs • Digital Campaign Ads on Specialized Magazines • Social Media	• Passenger Transport Operators (also specialized) • Fleet Managers • Bus drivers (also niche markets – danger materials/fuel/chemicals)

Costs	Revenue
• Devices • Specialized Resources • Hosting (Cloud Services) • Distribution • Communication/Marketing • Support	• Setup • Monthly subscription (dashboard, reports) • Channels (commission)

Figure 5 The business model canvas for Bus

- **Problem:** Similar to the truck sector, the bus business is also low-margin and cost-sensitive. Bus operators and drivers face challenges in managing the safety and efficiency of their fleet, including maintaining fuel economy, compliance with safety regulations, and managing increasing insurance costs.

- **Solution:** A continuous and personalized device that provides real-time feedback on safety and eco-driving to bus operators and drivers, combining in-vehicle monitoring with post-trip interventions. The solution is individually customizable, allowing bus operators to tailor the in-vehicle and post-trip systems to their specific needs.

- **Value proposition:** The i-DREAMS solution provides a range of benefits to bus operators, including reduced fuel consumption and operational costs through eco-driving and ongoing monitoring of driver performance. The solution improves driver's safety through in-vehicle interventions and promotes changes in driving behavior through post-trip interventions. The solution is flexible and could be customized to meet the unique needs of niche markets such as student transportation, where passenger safety and comfort are critical factors. Eventually, by improving driver safety performance, bus operators may potentially reduce their insurance costs.

- **Unfair advantage:** The i-DREAMS solution provides continuous automated feedback, with the integration of real-time (safety tolerance zone) and post-trip feedback. Additionally, the advanced system offered by i-DREAMS with modularity and integrability allows the use of both Wi-Fi and mobile data connection.

- **Customer segments**: i-DREAMS solution is targeted at bus passenger transport operators, both public and private, as well as fleet managers and bus drivers. The

solution can also be customized for niche markets such as student transportation or the transportation of dangerous materials.

- **Channels:** The telematics solution can be sold directly to bus operators through a sales team, or partnerships with bus manufacturers and fleet management companies. The solution can also be marketed through specialized fairs, digital campaigns, ads-on, specialized magazines, and social media.

- **Key metrics**: The key metrics include fuel savings, improved safety performance, and reduction of vehicle incidents.

- **Revenue stream:** The telematics solution can generate revenue through setup fees, monthly subscription fees for the dashboard and reports, and commissions from selling channels.

- **Cost structure:** The cost of the telematics solution will include the cost of the devices, specialized resources, hosting and cloud services, distribution, communication and marketing, and support and commission.

3.3.3 The business model for car

Figure 6 The business model canvas for Car

- **Problem:** Many people lack incentives to adopt safe and eco-friendly driving habits, and are unaware of the risks associated with their driving behaviors. Additionally, there is a lack of real-time feedback and coaching to help people improve their driving habits, and existing real-time intervention solutions usually evaluate a single vehicle-related parameter.

- **Solution:** i-DREAMS offers a solution that uses sensors and other technology to track a person's driving habits and provide them with real-time feedback and recommendations on how to improve. The solution includes gamification features to incentivize safe and eco-friendly driving, personalized training and coaching, real-time alerts for multiple parameters such as lane departure, fatigue, safe distance, and crash detection, and an assessment of a driver's suitability to drive.

- **Value proposition:** i-DREAMS comprehensive solution could provide multiple benefits to various segments, including private and professional drivers, insurers, corporate fleet companies, on-demand transportation providers, and driving schools, and promotes reduced road accidents. For drivers, the solution helps to enhance their safety and reduce costs associated with insurance, fuel consumption, and maintenance. Corporate fleet companies can also benefit from the solution by increasing road safety, reducing risk, and lowering costs, ultimately leading to higher profits and quality of service. Driving schools can use the solution to provide coaches with insights into individual driver performance, helping them create tailored strategies for each driver and ultimately improving their overall driving skills. The solution also has a positive societal impact by reducing road accidents and fatalities and lowering environmental impact through reduced CO_2 emissions (via eco-driving).

- **Unfair advantage**: By providing both post-trip and real-time feedback and interventions, the i-DREAMS solution could offer a more comprehensive and effective approach to improving driving behaviors. The solution uses multivariate analysis of driving, human, vehicle, and road conditions parameters to provide valuable insights to car owners, insurers, corporate fleet companies, on-demand transportation providers, and driving schools. In addition, the solution can be easily integrated with OEMs' infotainment systems for real-time interventions.

- **Customer segments:** The customers might be private car drivers, professional car drivers, insurance companies, corporate fleet companies, on-demand transportation providers (e.g. ride-hailing, taxi-hailing, car-pooling), and driving schools (including advanced driving institutes). The solution is flexible and could be tailored to address customer-specific needs and preferences.

- **Channels:** i-DREAMS solutions could reach its customers directly via approaching mobility services such as ride-hailing companies, car-pooling companies, corporate fleet companies…or indirectly via OEMs or telematics hardware provider companies.

- **Key metrics:** By offering the solution to different types of customers such as mobility services, insurance companies, corporate fleet companies, OEMs, and telecommunication companies, we can track the number of users or drivers who are using the solution and the improvement in their driving behaviors. We can also track the reduction in running costs, such as fuel and maintenance, as well as the safety score such as the reduction in road accidents, fatalities, and insurance claims. Additionally, we can track the reduction in environmental impacts, such as CO_2 emissions, to measure the overall impact of the i-DREAMS solution on society. These metrics can help us to understand the effectiveness of the solution and to make improvements where needed.

- **Revenue stream:** These are potential revenue streams such as setup fees, subscriptions for insurance, corporate fleet, or ridesharing. The subscription fee may vary depending on the specific needs of the company and the type of service. The pricing has been internally calculated and reviewed, but it is not intended for public display.

- **Cost structure:** These are potential costs associated with the i-DREAMS solution for cars. The sales and distribution costs may include the cost of marketing and selling the solution and services to potential customers, as well as any commissions or fees paid to partners or distributors. The software platform costs may include the cost of licensing our software and hosting it on the cloud. Furthermore, there are cost for the backend technical development and optimization including data storage, processing, and analysis… The development of training material costs may include the cost of content creating and updating instructional materials for customers and users. And the customer/user support costs may include the cost of providing technical support and assistance to customers and users of our solution.

3.4 Description of potential markets

Based on the business canvasses described above, four potential markets (professional light vehicle insurance, heavy vehicle insurance, driver teaching & examination, and bus companies) were identified to further valorize the i-Dreams technology as shown in Figure 7.

Figure 7 Market identification for the valorization of the i-DREAMS technology

3.4.1 Professional light vehicle insurance

Insurance of professional light vehicles can be a good business case for the i-Dreams driver assistance technology because it can contribute to:

1. Improved safety: Driver assistance technology, such as lane departure warning, forward collision warning, and adaptive cruise control, can reduce the number and severity of accidents involving professional light vehicles. This can lead to lower claims and safer roads, making it attractive to insurance companies.
2. Better risk assessment: Insurance companies can use data collected by driver assistance technology to better assess the risk posed by individual drivers and vehicles. This can lead to more accurate pricing and underwriting, reducing the number of losses for the insurance company.

3. Improved compliance: Driver assistance technology can help enforce compliance with regulations, such as speed limits and hours of service, reducing the risk of non-compliance penalties and liability claims.

4. Increased efficiency: Driver assistance technology can also improve the efficiency of professional light vehicle operations, such as reducing fuel consumption, optimizing routes, and reducing wear and tear on vehicles. This can lower operating costs and increase profitability, making it a more attractive business opportunity for insurance companies.

3.4.2 Heavy vehicle insurance

Likewise the insurance of heavy trucks can be a good business case for the i-Dreams driver assistance technology since overall, the use of the i-Dreams driver assistance technology can lead to improved safety, better risk assessment, and increased compliance, making insurance of heavy trucks a more attractive business opportunity for insurance companies.

Although the business case for insurance of light heavy vehicles and heavy trucks show many similarities, they are also somewhat different due to differences in operating environments, regulations, costs, and insurance premiums. The specifics of the business case will depend on the specific circumstances of each type of vehicle and driver. For example, the data collected by driver assistance technology may need to be analyzed differently for heavy trucks and light heavy vehicles, depending on the specific risks faced by each type of vehicle and driver (e.g., the data may need to be analyzed differently for single drivers operating heavy trucks on long-haul trips, and for multi-driver fleets of light heavy vehicles operating in urban areas). These differences will lead to that different parts of the i-Dreams toolbox that will be used.

3.4.3 Driver teaching & examination

Driver assistance technology can improve driver training by providing real-time feedback and promoting safe driving habits. Novice drivers can receive immediate correction and reinforcement, allowing them to quickly develop the skills necessary to operate a vehicle safely. Additionally, data collected by the technology can be used to personalize training programs and track the progress of novice drivers, providing targeted instruction and feedback to improve specific areas where they may need additional help. More specifically, the i-Dreams technology allows to provide personalized tips and goals to the driver such that his driving behavior can be improved in a structural way. Furthermore, i-Dreams technology consists of several gamification features to allow that the novice driver can be motivated to further improve.

3.4.4 Bus companies

Bus companies prove to be an interesting business case to adopt the i-Dreams technology since this technology can be used to improve the training of bus drivers in different ways:

1. On-board training: Driver assistance technology can be used to provide real-time feedback to drivers during their training. For example, the technology can alert drivers when they make mistakes. This can help drivers learn from their mistakes and improve their driving skills.

2. Analytics and tracking: Driver assistance technology can also provide data on drivers' performance, such as speed, braking, and steering. This data can be analyzed to identify areas for improvement, and to track the progress of drivers over time.

3. Compliance training: Driver assistance technology can also be used to enforce compliance with regulations, such as speed limits, hours of service, and safe driving practices. By providing real-time feedback and analytics, the technology can help

drivers learn and maintain compliance with these regulations. This data can also be used to help drivers prepare for CPC assessments.

Given the modular nature of the i-Dreams technology several subcomponents of the i-DREAMS technology platform could be adopted in the selected markets as is shown in Figure 8.
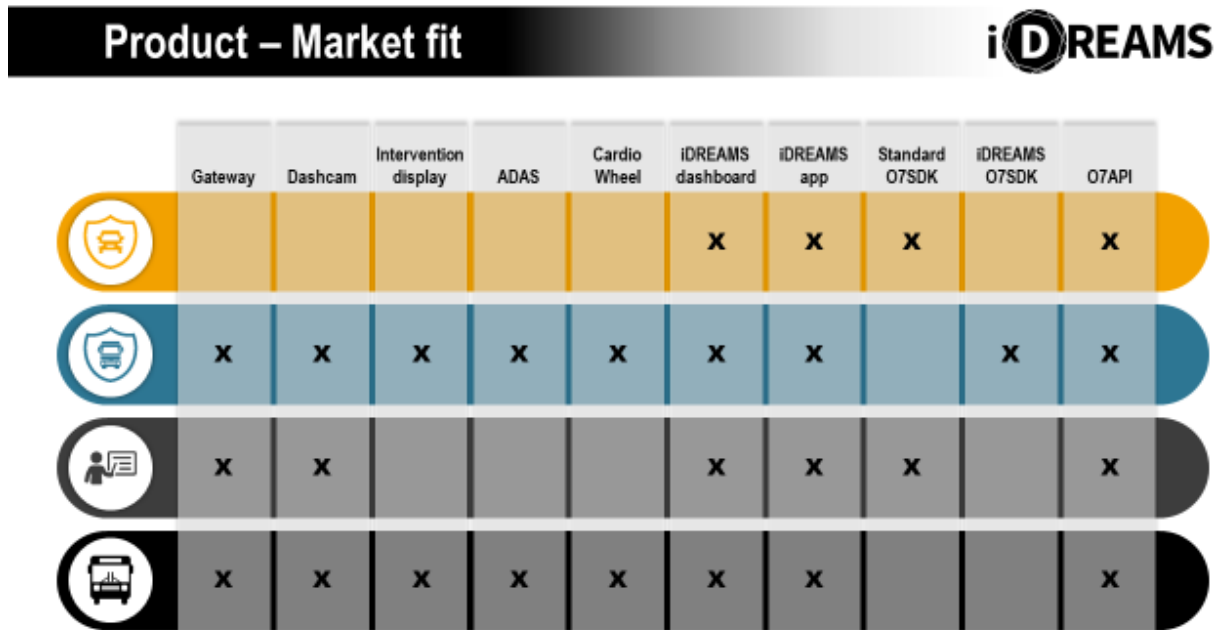

Figure 8 Product - Market fit

4 Operationalisation of the business cases

The operationalisation of the business cases originates from a set of agreements between the consortium partners that document in detail the rights and responsibilities of said consortium partners for the collaboration **within** the context of the i-DREAMS project, as well as **after** the completion of the project.

The **Grant Agreement (GA)** (number 814761) is the principal document for this. The GA is a contract between the European Commission and the grant recipients. It describes all the financial and legal conditions that must be met to realize the EU grant.

The **Consortium Agreement (CA)** is a mandatory agreement between the consortium partners and sets the framework for a successful collaboration in the project and it complements the GA (without any contradiction).

Since the project consortium (jointly) processes personal information, an **agreement concerning the (joint) processing of personal data** was compiled and signed by the consortium partners in accordance to the EU General Data Protection Regulation 2016/679 of 27/04/2016 (GDPR).

There is a significant valorisation potential for the i-DREAMS project results after the conclusion of the project. The **i-DREAMS Framework Agreement** with respect to the i-DREAMS platform documents the terms and conditions for a legal framework with respect to the academic and commercial use of the i-DREAMS platform. In a project where each consortium partner's contribution to a joint result cannot unambiguously be delineated, the i-DREAMS Framework Agreement avoids detailed and complex discussions regarding the particular contribution of each consortium partner when it comes to the academic or commercial use of the i-DREAMs platform, which consists of a combination of background intellectual property (IP) of several consortium partners, (exclusive) results and joint results.

Before detailing the contractual operationalisation of the aforementioned business cases, the following sections present a high-level overview of the current contractual relationships (rights and responsibilities).

4.1 Grant Agreement

The aim of the grant agreement is fourfold: 1) to gather legal, administrative and financial information from project participants and their linked third parties, 2) to make sure that the Description of the Action (DoA, Annex 1 to the grant agreement) and the estimated budget (Annex 2) match the proposal, and, if applicable, the ethics review report and the security scrutiny report, 3) establish the key points of the grant agreement (start date, reporting periods, amount of pre-financing, need for a consortium agreement, and, if applicable, ethical issues, third parties linked to the beneficiaries, in-kind contributions provided by third parties, subcontracting), and 4) verify the financial capacity of participants (in some cases)[1]

The GA outlines the basic terms and conditions that are also relevant for valorisation activities in *Section 3: Rights and Obligations Related to Background and Results*.

Each consortium partner contributes to the i-DREAMS project from their own expertise. At the start of the project, partners have to identify their ***Background***, i.e. any data, know-how or information including any intellectual property rights (IPR) that are required for the project and that are held by the partner before acceding to the GA. Articles 24 and 25 specify that **partners are required to provide access to their background** to other partners (i) on a royalty-free

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basis if said partner needs access to implement their own tasks in the project, and (ii) with fair and reasonable conditions (possibly including financial terms) if said partner needs access to exploit its own project results (valorisation). Unless agreed otherwise, access requests need to be honoured up to one year after the end of the project.

During the project, *Results* i.e. any output that is generated in the project such as data, knowledge or information and the IPR attached to them, are created. **Results are owned by the partner that generates them**. In case of joint ownership by multiple partners, i.e. when two or more partners jointly generated a result and it is not possible to establish the respective contribution of each partner or to separate the results for the purpose of protection, the joint owners must agree in writing on the allocation and terms of exercise of their joint ownership in a *Joint ownership agreement*. Unless agreed otherwise in such agreement, **each joint owner may grant non-exclusive licenses to third parties** to exploit the jointly-owned results on the condition that the other joint owners are given at least 45 days advance notice and a fair and reasonable compensation.

Article 27 obligates partners to **examine the possibility of protection of the results** if these can reasonably be expected to be commercially exploitable or if protection is possible, reasonable and justified given other circumstances. Importantly, article 28 **obligates partners to exploit the results up to four years after the completion of the project** by using the results in other research activities, converting them into a product, delivering services with them or using them in standardisation activities.

Partners have to disseminate the results as soon as possible unless this would obstruct other legitimate interests.

Partners may **transfer ownership** of their results, the new owner respecting the same principles of (joint) ownership, protection, exploitation, dissemination, transferring, licencing and access rights w.r.t. the results, as specified in the GA. Each partner may **grant licences** to their results as long as this does not impede the access rights of other partners to these results. **Partners have access rights to each other's results** (i) if they need these results to implement their own tasks during the project, **or (ii) if they need these results for the exploitation of their own results, and this up to one year after the completion of the project.** In the latter case, **fair and reasonable conditions** need to be agreed upon.

Partners should comply with **ethical principles**, and all applicable **(inter-)national and EU law**, including the EU and national law on the processing of personal data. Article 36 binds partners to **confidentiality** of confidential material (in any form) up to four years after the project's completion.

The amendment to the Grant Agreement extends the duration of the project from 36 to 48 months following 11/04/2019. The official end date has been fixed at 30/04/2023.

4.2 Consortium Agreement

The aim of the CA is set the framework for a successful project implementation (i.e. settle all issues that might hamper the smooth and seamless cooperation of the different actors for the different parts of the project). It is a private agreement between the beneficiaries, setting out the rights and obligations amongst themselves. It should complement the grant agreement and must NOT contain any provision contrary to it.[2]

DESCA (Development of a Simplified Consortium Agreement) is a comprehensive Model Consortium Agreement which offers a reliable frame of reference for project consortia. DESCA enjoys broad support within the EU framework programme community. A CA between the

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[2] https://ec.europa.eu/research/participants/data/ref/h2020/other/gm/h2020-guide-cons-a_en.pdf

partners of a research project is mandatory for most EU research projects. The European Commission offers general guidance for the drafting of consortium agreements, but rightfully does not endorse a specific model consortium agreement. Initiated by key FP7 stakeholder groups, and updated ever since for Horizon 2020 and now for Horizon Europe in consultation with the FP community, the DESCA initiative seeks to balance the interests of all participant categories: large and small firms, universities, public research institutes and RTOs, in the spirit of the Responsible Partnering Initiative.[3]

The i-DREAMS CA follows the DESCA model. The rights and obligations in the Consortium Agreement that are relevant for the valorisation of the i-DREAMs results **follow the GA**. Partners declared their **Background** (any data, know-how or information including any IPR that are required for the project and that are held by the partner before acceding to the GA) in Attachment 1 of the CA and have also, where relevant, indicated that access to specific background is subject to legal restrictions. Consortium partners give **access rights** to their background and results when it is needed for the implementation of another partner's tasks within the project. Such access rights shall be granted on a royalty-free basis unless otherwise agreed upon. Access rights with the purpose of exploitation of a partner's own results shall be granted by the consortium partners to that partner on the basis of fair and reasonable conditions. Access rights for academic purposes (i.e. internal research activities and education) shall be granted on a royalty-free basis.

When **access rights concern software**, they will only be provided in object code (in machine-readable, compiled and/or executable form) and compatible API if normal use requires it, and not in source code format (software in human readable form such that modifications could be made to it) unless the receiving partner can demonstrate that it is technically or legally impossible to implement or exploit its own results without it.

Confidential information disclosed between consortium partners may contain **personal information**. Partners need to comply with the relevant data protection regulations and need to agree in writing upon a **privacy policy**. In particular, the partners acknowledge to be "**joint controllers**" as defined in article 26 of GDPR, as they jointly determine the means and the purposes of the processing operation.

The Consortium Agreement shall continue in full force and effect from the start date of the i-DREAMS project until complete fulfilment of all obligations undertaken by the partners under the GA and under the CA.

4.3   Legal & ethical aspects

The development and use of the i-DREAMS platform involves the participation of human subjects, i.e. drivers of motor vehicles, and the processing of their personal data. This creates a need to reflect on the GDPR regulation and ethical aspects during the project execution, as well as the post-project valorisation activities.

4.3.1   Ethical advice

Given the involvement of human subjects and the processing of their personal information, ethical advice was sought and obtained from local ethical committees where a study was being conducted. In every case, the research protocol in dealing with driver participants and their personal data in the study was given a positive advice by the committees.

In the valorisation phase of the i-DREAMS platform by the industrial partners (see further), in general there is no obligation for further advice from an ethical committee.

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[3] https://www.desca-agreement.eu/

Generally, if the valorisation of the research results involves processing personal data, the industrial partners will be required to comply with data protection laws, such as the General Data Protection Regulation (GDPR) and ensure that the appropriate legal basis for processing is met.

If the valorisation of the research results involves activities that are similar to the research activities for which ethical approval was obtained, the industrial partners may be able to rely on the ethical approval that was already obtained. However, it is important to note that even if the activities are similar, the context and conditions may have changed.

4.3.2 i-DREAMS agreement on the processing of personal data

The i-DREAMS platform processes various data streams of personal information. An **agreement concerning the (joint) processing of personal data** was agreed upon between the consortium partners, in order to regulate all relevant aspects, in compliance with Article 26, resp. Article 28, paragraph 3 of the European Regulation of 6 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (GDPR).

The partners agree to record, at each processing and both in the capacity of controller and of processor, in their **processing register** (i) the purpose of the processing, (ii) the categories of personal data processed (of which categories of data subjects), (iii) the origin/destination of the personal data, (iv) the storage period for the personal data, (v) the legal basis for its processing, (vi) whether or not it is shared with third parties, and (vii) the technical and organizational security measures to be taken (irrespective of being controller, processor or joint controller).

Only personal data, which is **strictly necessary** for performing the processing activity within the project in which the partners are involved, may and can be processed.

Regardless of the capacity of processor or controller, the partners shall store personal data **no longer than necessary** for the purpose of the processing. If the personal data is no longer needed after the processor has performed the processing activity, the processor shall return the data to the controller and/or permanently remove it.

The processor shall follow closely the instructions which he receives from the controller, and shall use the personal data made available to him solely for the processing activity given by the controller.

The joint controllers are obliged to inform the data subjects of this joint processing. In particular, the joint controller(s) shall point out to data subjects the rights provided them by the GDPR. The joint controllers are each in turn responsible for their respective part in the processing activities for personal data. This shall be shown by (the) completed record(s) of processing.

The partners undertake to take appropriate measures to ensure the **confidentiality and security** of personal data and its processing. They shall ensure that access to data (to be) processed is limited to personnel who need the data in order to perform tasks for the purpose of the processing, and respectively, for performance of the processing activity in the context of the Project.

With all reasonable efforts, partners should respect all of the required measures listed in Article 32 of the GDPR, in the light of the security of processing, in particular, **appropriate technical and organizational measures to ensure a level of security appropriate to the risk**, including (i) pseudonymisation and encryption of personal data, (ii) the ability to ensure the ongoing confidentiality, integrity, availability and resilience of processing systems and services, (iii) the ability to restore the availability and access to personal data in a timely manner in the

event of a physical or technical incident, (iv) a procedure for regularly testing, assessing and evaluating the effectiveness of technical and organizational measures for ensuring the security of the processing.

Data subjects have a right to information regarding the purpose of the processing, the data being processed and the storage time, and the right to inspect, correct, rectify and erase their personal data, as well as the right to transfer this personal data to a different controller, and the right to object to processing.

No joint controller shall be liable for a default under this agreement which is caused by force majeure. Except in the case of fraud, deception or deliberate fault, in cases in which one of the partners can be held liable in respect of the other (others), one partner shall not be liable for indirect damage.

The current GDPR agreement remains into effect for the duration of the CA (and GA)

4.3.3 Processing personal information in the i-DREAMS framework

The General Data Protection Regulation (GDPR) lists six legal bases for processing personal data:

- Consent: the data subject has given clear consent for their personal data to be processed for a specific purpose.
- Contract: the processing is necessary for the performance of a contract to which the data subject is party or in order to take steps at the request of the data subject prior to entering into a contract.
- Legal obligation: the processing is necessary for compliance with a legal obligation to which the controller is subject.
- Vital interests: the processing is necessary in order to protect the vital interests of the data subject or of another natural person. It is unlikely that this legal basis can be applied outside of an emergency situation.
- Public task: the processing is necessary for the performance of a task carried out in the public interest or in the exercise of official authority vested in the controller.
- Legitimate interests: the processing is necessary for the legitimate interests pursued by the controller or by a third party, except where such interests are overridden by the interests or fundamental rights and freedoms of the data subject which require protection of personal data. Controllers who are assessing whether to process data under the legitimate interest legal basis should consider the three elements needed for this legal basis: i) identifying a legitimate interest which they or a third party pursue; ii) demonstrating that the intended processing of the data subject's personal data is necessary to achieve the legitimate interest; and iii) balancing the legitimate interest against the data subject's interests, rights, and freedoms.

The most applicable legal basis for the lawful processing of de personal information of an individual user of the i-DREAMS platform, i.e. a driver, is 'consent'. This is and should be the default legal basis of choice.

However, in certain situations, such as with employees, arguably it may be difficult to obtain valid consent due to the power imbalance in the employer-employee relationship. In these cases, it may be appropriate to rely on another legal basis for processing the personal data of employees, such as the performance of a contract or compliance with a legal obligation. In some other cases, consent for monitoring driving behaviour might already be agreed upon in the employment contract of a driver.

Corporate social responsibility (CSR) can be a factor to consider when determining the appropriate legal basis for processing personal data, but it is not a legal basis in and of itself

under the GDPR. CSR is a concept in which companies integrate social and environmental concerns in their business operations and interactions with their stakeholders. CSR is a self-regulating business model that helps a company be socially accountable to itself, its stakeholders, and the public. For the clients of the i-DREAMS platform, CSR could materialize as an increased level of awareness and level of innovation in road safety and ecodriving.

CSR could be used as an argument to demonstrate that the processing is necessary for the legitimate interests of the controller or a third party, as long as the fundamental rights and freedoms of the data subject are not overridden by these interests.

For example, one could argue that the processing of personal data of drivers is necessary for the legitimate interests of the controller (the client) and third parties (such as other road users) in promoting safety on the roads, improving eco-driving and potentially reducing insurance costs. However, it is important to conduct a balancing test, taking into account the nature, scope, context and purposes of the processing, as well as the risks to the rights and freedoms of the data subjects, and to provide appropriate safeguards for protecting the privacy of the data subjects.

A thorough assessment of the specific use case should be conducted for every valorisation project. The legal basis for processing the personal data in question should be documented in order to demonstrate compliance with GDPR, in particular in case of opting for a legal basis other than 'consent'. It is also important to consult with legal counsel to ensure that the chosen legal basis is appropriate and lawful.

4.4 Road to market

In order to facilitate the exploitation of the i-DREAMS Results (an obligation as set forth in the GA), the consortium partners set forth straightforward terms and conditions with respect to the academic and commercial use of the i-DREAMS Platform in the "**i-DREAMS framework agreement**", given that it is impossible to establish the detailed contributions of each consortium partner to the i-DREAMS platform.

Up to three years after the completion of the i-DREAMS platform, **the industrial partners** will receive an **exclusive license** to jointly or individually exploit the i-DREAMS platform in any form whatsoever. The Industrial Partners shall conclude an additional agreement between them, setting forth the specific terms and conditions with respect to the (sole or joint) exploitation. The industrial partners commit to using all reasonable efforts for the purpose of exploiting the i-DREAMS platform in Europe. All partners (industrial partners, knowledge institutions, safety promoting organisations, end-users) are compensated by the industrial partners with a one-time financial compensation based on the industrial partner's revenue if a certain threshold has been reached three years after the completion of the i-DREAMS project. The industrial partners finance the data infrastructure, keep the safety promoting organisations informed of any new evidence-based insights and arguments in the field of safety policies, and consider the i-DREAMS end-user partner as a preferred user of the i-DREAMS platform.

If at the end of the three-year period the industrial partners failed to demonstrate any revenues, the exclusive nature of the exploitation license will be revoked.

With respect to the data in particular, the industrial partners explicitly acknowledge the **fundamental right of the knowledge institutions to use the data for academic purposes**, in compliance with the applicable legislation and in conformity with the commercial agreements signed by the industrial partners. In order to facilitate said academic use, the industrial partners agree to finance the infrastructure curation, maintenance, updating and storage of the analytical database for a duration of three years upon the termination of the i-DREAMS project.

The industrial partners obtain a right of first offer on any new IP generated by the knowledge institutions that are directly based on the i-DREAMS platform and for which the knowledge institutions want to grant commercial rights.

Given that the GA, CA and GDPR agreement are set to expire at the end of the i-DREAMS project, the i-DREAMS framework agreement remains the principal **required** agreement for further valorisation activities involving the i-DREAMS framework. However, this doesn't mean this agreement is **sufficient** when conducting valorisation activities under said agreement. In the given context, below is an indicative list of required agreements for exploitation within the next 3 years after completion of the i-DREAMS project:

Preparatory agreements between **consortium partners** *before* valorisation involving customers

- The **i-DREAMS framework agreement** remains in full force.
- An **agreement concerning the (joint) processing of personal data** between the consortium partners (all partners that will have access to the new data, not only the industrial partners). An addendum to the existing agreement could be added, or a new agreement could be agreed upon. The existing agreement expires upon completion of the i-DREAMS project (expiration of the GA and CA).
- As specified in the i-DREAMS framework agreement, the **industrial partners shall conclude an additional agreement** between them, setting forth the **specific terms and conditions with respect to the (sole or joint) exploitation**. The other consortium partners shall be informed of this agreement.
- The **industrial partners** that valorise the i-DREAMS platform should have an appropriate combination of **Civil liability and Bodily injury insurance** to offer protection from financial losses in the event that they are found liable for both damages caused to others' property and bodily injury caused to others. This type of insurance is usually required by law or by contract to cover a company in case of accidents or incidents that may happen in the scope of their activities.

Agreements to be signed with the **client** (businesses in a B2B relation)

- A **user agreement,** similar to the field trial agreements used within the i-DREAMS project, is needed, determining the conditions for clients for the use of the industrial partners' product offerings based on the i-DREAMS platform, setting the **rights, obligations, liabilities** that come with the installation and use of the i-DREAMS platform. The user agreement may, if not covered by itself, be complemented by
    - an agreement for the installation, respectively de-installation, of the i-DREAMS platform in the vehicle
    - a confirmation form for the correct installation of the i-DREAMS platform in the vehicle
    - a form to indicate damage as a result of the (de-)installation of the i-DREAMS platform in the vehicle
- The industrial partners will need to sign a **material transfer agreement** (MTA) with their clients of the product offerings based on the i-DREAMS platform for the company data and driver data that will be exchanged between them. Note that the access to the data by the consortium partners for academic use needs to be acknowledged, and agreed to by the client.

Agreements to be signed by each **individual** driver that produces and shares personal data within a valorisation project:

- Individual users of the industrial partners' product offerings based on the i-DREAMS platform (i.e. (professional) drivers) need to be **informed** about the processing of their

personal information in an easy to understand fashion, and they need to give **explicit consent for the processing of their personal information**. 'Consent' is the most appropriate legal basis for processing personal information of the drivers.

- Individual users of the app will have to agree to the **terms and conditions** for using this technology.

4.5 Demoproject

To narrow the gap between research and validation and facilitate commercialization, several demo projects were established during the i-DREAMS project to demonstrate a scalable prototype version of the i-DREAMS technology in a real-world, industrial case. While the i-DREAMS field trials demonstrated a technology with a Technology Readiness Level (TRL) of 6 (technology demonstrated in relevant environment), the purpose of these demo projects was to bring the i-DREAMS technology to TRL 7 (system prototype demonstration in operational environment). To achieve this, several changes and compromises had to be made to the technology used during the i-DREAMS field trials. These changes primarily involved replacing the custom edge computing hardware installed during the i-DREAMS field trials with cheaper third-party hardware that can be purchased in large quantities. The i-DREAMS platform, including the company dashboard and driver app, remained unchanged. This reduced the cost per installation and solved scalability issues caused by supply chain issues in the chip market. Moreover, quality assurance and conformance with market specific directives of hardware components is now guaranteed by the external supplier. Third-party hardware, on the other hand, provides less flexibility. Real-time interventions are no longer determined by the i-DREAMS Safety Tolerance Zone (STZ) or are not available at all, depending on the configuration. The processing power of the third-party hardware is also significantly lower than that of the Cardio gateway, resulting in significantly lower video data throughput. This, however, helped to reduce recurring costs by reducing cellular data usage.

4.5.1 Technology overview

After comparison of different suppliers of hardware devices, a setup featuring GPS-trackers and cameras from Teltonika was selected. The main reasons for this choice are the availability of hardware, the ability to collect data relevant to the existing i-DREAMS platform, a well-documented wiki system, and flexibility in data collection and data transfer. To meet the needs of various use cases, two versions of an i-DREAMS solution based on Teltonika hardware were developed. First, a "normal" version with a smart Mobileye-like "ADAS" camera capable of providing real-time interventions (not based on i-DREAMS Safety Tolerance Zone) and collecting road sharing data (vehicle following behavior, collision avoidance, pedestrian avoidance). Second, a less expensive "light" version in which the smart camera was replaced with a standard dashcam. Table 3 provides a comparison of the original i-DREAMS set of technologies and the "Teltonika"-version.

Because of the decreased throughput of video data, it was no longer possible to automatically upload video clips of every event; instead, a small change was made to the dashboard, and a button was added that allows company managers to manually request the uploading of a video clip for each event.

Drivers can still use the smartphone app to receive post-trip feedback and use all of the other i-DREAMS features.

Edge computing is no longer possible because the Teltonika hardware does not support custom software; instead, all processing is done in the backend. This has implications for driver identification and mobile phone detection. During the i-DREAMS field trials, driver identification

was performed through a custom HMI or automatically by retrieving driver identity from the Fleet Management System (FMS). The Teltonika hardware does not support the use of a custom HMI. Instead, a new driver identification method based on Bluetooth beacons was developed. The beacon signal is sent by a small keychain beacon carried by the driver, or by the i-DREAMS app on the driver's smartphone.

	i-DREAMS field trials	**"Teltonika normal" solution**	**"Teltonika light" solution**
Collection of vehicle control data (acceleration data)	Yes	Yes	Yes
Collection of road sharing data (tailgating, forward collision detection…)	Tailgating, lane discipline, collision avoidance, VRU collision avoidance, illegal overtaking	Tailgating, lane discipline, collision avoidance, VRU collision avoidance.	No
Detection of overspeeding	Yes	Yes	Yes
Detection of mobile phone usage	Yes	Yes	Yes
Real time interventions	Yes, based on i-DREAMS STZ	Yes, based on fixed thresholds	No
Event video	All events, automatic upload	On Request	On Request
Driver Identification	HMI, driver card	Bluetooth keychain beacon, driver card, Bluetooth app beacon	Bluetooth keychain beacon, Bluetooth app beacon

Table 3 Comparison of different hardware solutions

4.5.2 Installation tools

To meet the requirement in terms of quality assurance when scaling up in combination with Teltonika hardware, various installation tools were developed based on lessons learnt during the i-DREAMS field trials. These tools should make it possible for third parties to install equipment in vehicles without requiring much assistance. Included are detailed installation

manuals, connection schemes, and a web application that allows installers to validate installations as well as create and link vehicles and drivers (see Figure 9).
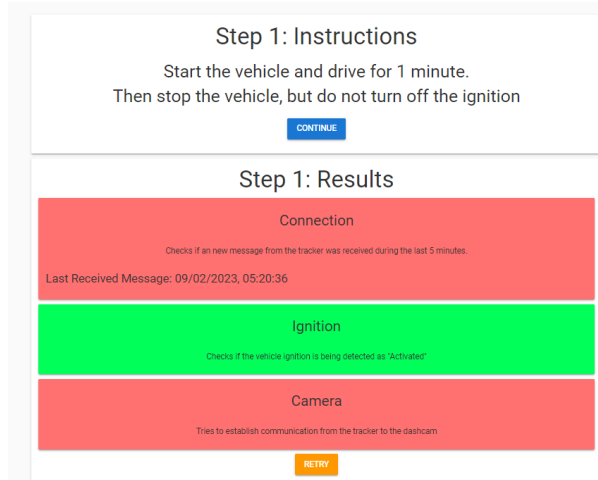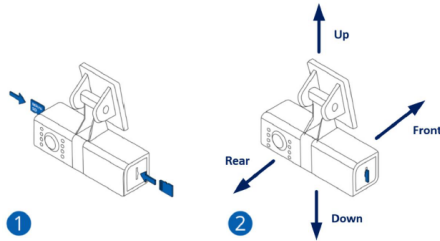

Figure 9 Screenshot of parts of an installation manual and web application for verification of the installation

4.5.3 Commercial partnership

Currently different potential commercial use cases of the i-DREAMS technology are explored. A first collaboration has been set up by DriveSimSolutions (i-DREAMS beneficiary) with the company SAFE.T Fleet and HR Prevention to test a use case for the fleet insurance sector in Belgium. The i-DREAMS technology is therefore currently demo-tested by clients of SAFE.T Fleet and HR Prevention. When successful, a tailored version of the i-DREAMS technology, adapted to the needs of the insurance sector, will be created and a license agreement set up with SAFE.T Fleet and HR Prevention. Thanks to the i-DREAMS technology, the concept of establishing a "safety culture" within businesses could be introduced. This includes vehicle insurance solutions linked to the i-DREAMS technology, as well as an e-learning app for professional drivers, which is currently being tested by the Belgian government in order to obtain the certificate of professional competence for professional drivers.

4.5.4 Projects overview

Four companies were selected to run demo projects with the i-DREAMS technology combined with Teltonika hardware. Each company featured a distinct type of road transportation. Table 4 provides an overview of the four demo projects. The provided overview represents the current status as of February 2023; demo projects are still in progress, with new updates and installations occurring on a regular basis.

	Vehicle type	Number of installations	Number of drivers	Logged distance (02/2023)
Company A	Truck - Construction	6 x Teltonika Light	6	129.000 km
Company B	Truck - Long Haul	3 x Teltonika Light 2 x Teltonika Normal	5	126.000 km

Company C	Truck – Cooled transport	8 x Teltonika Light	8	550.000 km
Company D	City Bus	5 x Teltonika Light	9	178.000 km

Table 4 Overview of demo projects using Teltonika technology

Because the "Teltonika light" solution – without real-time intervention and smart camera – has been available for a longer time, most installations were performed using this solution (see Figure 10). Currently, the "Teltonika Normal" solution – with real-time interventions and smart camera - is being rolled out in an increasing number of vehicles.

For the demo projects with companies A, B and C, only one driver was using each vehicle. However, at company D, drivers are working in shifts and vehicles are being shared amongst drivers. This created an additional challenge for driver identification, because a one-to-one relation between driver and vehicle is no longer sufficient. Hence, a driver identification method using Bluetooth beacons was developed. By implementing this approach, any driver carrying a Bluetooth beacon is able to drive any vehicle with Teltonika / i-DREAMS hardware installed, with the collected data being linked to the correct driver profile.

By request of the client companies, the option of adding a panic button to the installation was also provided. By using the panic button, a driver is able to manually trigger an event for which a video clip is automatically recorded and uploaded for replay in the smartphone app or web dashboard.

Figure 10 Overview of Teltonika hardware, installed during demo projects. GPS tracker installed in the fuse box compartment (top left). Interior view of a dashcam installed in a truck (top right) and exterior view of a dashcam installed in a bus (bottom).

4.5.5 Conclusions of the demo projects

The purpose of the demo projects was primarily to bridge the gap between research and commercialization. Based on lessons learnt during the i-DREAMS field trials, a new and scalable solution was developed where research hardware is replaced with industrial grade hardware. This exercise also has been a good example of the flexibility and modularity of the i-DREAMS platform, where data input can be provided by various sources with the main concepts of scoring and influencing driving behavior remaining unaffected. Similarly to the i-DREAMS field trials, the industrial hardware solution also required emphasis on flexibility and modularity to meet the requirements of different companies, vehicles and transportation types. Furthermore, the biggest challenge has been to create a scalable solution while also assuring the highest possible standards of quality and keeping cost-per-installation at a minimum. Therefore, clear installation procedures, documentation and tools for validation were developed. A comparison was made between different suppliers of telematics and GPS-tracking hardware, with Teltonika hardware being the first to be integrated into the i-DREAMS platform.

5 References

Bucsuházy, K., Matuchová, E., Zůvala, R., Moravcová, P., Kostíková, M., & Mikulec, R. (2020). Human factors contributing to the road traffic accident occurrence. *Transportation Research Procedia*, 555-561.

Costello, B., & Suarez, R. (2015). Truck driver shortage analysis 2015. Arlington, VA: The American Trucking Associations.

D2go. (2023, Jan). *Homepage*. Retrieved from D2go: https://d2go.io/

FMCSA. (2018, April 19). *General Information about the ELD Rule*. Retrieved from FMCSA: https://www.fmcsa.dot.gov/hours-service/elds/general-information-about-eld-rule

Global Newswire. (2018, March 29). *Global Boom Trucks Market 2017-2025: Shortage of Truck Drivers is One of the Biggest Concerns for the Market*. Retrieved December 20, 2020, from https://www.globenewswire.com/news-release/2018/03/29/1455301/0/en/Global-Boom-Trucks-Market-2017-2025-Shortage-of-Truck-Drivers-is-One-of-the-Biggest-Concerns-for-the-Market.html

GreenRoad. (2020, April 9). *GreenRoad Drive™ and Track Webinar April 7 2020 (COVID19 TIMES)*. Retrieved from https://www.youtube.com/watch?v=Yr3Bj9x5qyo

Greenroad. (n.d.). *Company Overview*. Retrieved from https://greenroad.com/uk/company-overview/

Market Research. (2021). *Vehicle Telematics Market Outlook and Forecasts 2021 – 2028*. Mind Commerce. Retrieved from https://www.marketresearch.com/Mind-Commerce-Publishing-v3122/Vehicle-Telematics-Outlook-Forecasts-14495666/

Mobileye. (2023, Jan). *Corporate Profile*. Retrieved from https://ir.mobileye.com/

Morgan Stanley. (2022, June 14). *Stronger for Longer in Global E-Commerce*. Retrieved from Morgan Stanley: https://www.morganstanley.com/ideas/global-ecommerce-growth-forecast-2022

Nextdriver. (n.d.). Retrieved 12 10, 2022, from Nextdriver: https://nextdriver.nl/en/

NextDriver. (2023, 3 30). *NEXTdriver*. Retrieved from LinkedIn: https://nl.linkedin.com/company/nextdriver?trk=public_profile_experience-group-header

Pakgohar, A., Tabrizi, R., Khalili, M., & Esmaeili, A. (2011). The role of human factor in incidence and severity of road crashes based on the CART and LR regression: A data mining approach. *Procedia CS, 3*, 764-769. doi:10.1016/j.procs.2010.12.126

Petridou E., M. M. (2000). Human factors in the causation of road traffic crashes. *European Journal of Epidemiology*, 819-826.

Research and Markets. (2020). *Usage-Based Insurance Market for Automotive by Package Type, Technology Type (OBD-II, Blackbox, Smartphone, Embedded, and Other Technologies), Vehicle Type, Vehicle Age, Device Offering, Electric & Hybrid Vehicles, and Region - Global Forecast to 2027*. Research and Markets.

Salzman, A. (2018, July 14). *Truck driver shortage is pressuring businesses*. Retrieved December 20, 2020, from https://www.barrons.com/articles/truck-driver-shortage-is-pressuring-businesses-1531526402

Samara Inc. (2022). *Samara annual report.* San Francisco: Samara. Retrieved Dec 20, 2022, from https://s29.q4cdn.com/853855404/files/doc_financials/2022/q4/Samsara-FY22-Annual-Report.pdf

Splitter, J. (2020). *COVID-19 And Truck Driver Shortage May Threaten Food Supply Chain*. Retrieved December 20, 2020, from https://www.forbes.com/sites/jennysplitter/2020/03/18/covid-19-and-truck-driver-shortage-may-threaten-food-supply-chain/

Start-up Nation Central. (n.d.). *Greenroad Funding History*. Retrieved December 20, 2020, from https://finder.startupnationcentral.org/company_page/greenroad

Stratistics Market Research Consulting Pvt Ltd. (2020). *Telematics Solutions - Global Market Outlook (2018-2027).* Research and Markets. Retrieved from https://www.strategymrc.com/report/telematics-solutions-market

TransUnion. (2022). *Personal Lines Insurance Shopping Report.* Chicago: TransUnion. Retrieved from TransUnion.com: https://content.transunion.com/v/2022-q2-insurance-shopping-report?utm_campaign=pr+ins+q2+shopping+report&utm_content=report&utm_medium=press-release&utm_source=press-release&utmsource=press-release

Zonar Systems. (2023, Jan). *About us*. Retrieved from zonarsystems: https://www.zonarsystems.com/company/