WirelessCar

Autoliv

Saving More Lives

Saving lives through connected cars

Autoliv is the world leader in safety for mobility and society with sales to all major car manufacturers and 65 years of expertise within the domain of traffic safety. WirelessCar is a leading provider of digital services for connected cars. Through this collaboration, WirelessCar's expertise in turning car data into digital services, combined with Autoliv's expertise in safety from studying traffic, sensor and various environmental data will be used to create solutions that save lives, reduce the number of crashes, and minimize the cars' environmental impact.

In 2017, the shared mobility market was valued at **104.95 billion USD** (Grand View Research, 2019) with a projected increase in growth in the coming years.

With shared mobility being such a large market and becoming a key player for mobility in the future, there are many technological advancements and developments to increase our understanding of how a vehicle is driven, primarily focusing on safety, maintenance, and ecology.

The management consulting firm McKinsey & Company forecasts that improvements in driving behavior could reduce preventable crashes by as much as **20-30%** for fleet vehicles (Cordes, 2017). This white paper presents the approach Autoliv and WirelessCar are taking to improve road traffic safety, and associated costs for fleet.

Definition of the area

The main focus when surveying driving behavior in fleet management is to find out how people drive a car, how they can be encouraged to adopt a safer driving behavior, and how the fleet manager can make use of this knowledge while respecting the integrity of the driver.

Understanding the driver's behavior in a driving context requires different data layers. The behavior can be partially inferred from signals collected through an app in the smartphone, but combining this data with relevant signals obtained from the car enhances the accuracy and granularity. Such a deep dive

into driver behavior is essential to create user profiles which can, as an end goal, be used for individually tailored coaching for safer driving behavior.

In this context, safe driving is defined by five main parameters: speed, focused driving, smooth driving, turns, and utilization of existing safety mechanisms.

Speed

Traffic violations increase the risk of crashes and fatalities (Zhang, Yau, & Chen, 2013; Factor, 2014). Speeding is estimated to be a key factor in nearly **30%** of fatal road crashes in the EU (European Commission, 2019).

Similarly, in the United States, speeding was a factor in **27%** of all traffic fatalities in 2016, with an estimated death toll of 10,111 (National Center for Statistics and Analysis, 2017).

Globally, speed management is required as a key step to reach the WHO target of reduced number of traffic related injuries and fatalities (World Health Organization, 2017).

Focused Driving

In the EU, driver distraction is estimated to contribute to approximately **10-30%** of road crashes (Netherlands Organisation for Applied Scientific Research, Transport Research Laboratory, Rapp Trans, 2015). In the United States, car crashes related to driver distraction accounted for **9% (**or 3,450) of all road traffic fatalities in 2016 (National Center for Statistics and Analysis, 2017).

Amongst other reasons for being distracted, the use of mobile phones during driving is expected to have negative consequences in terms of safety, the extent of these negative consequences is still a matter of debate (Jeanne Breen Consulting, 2009).

Smooth

"The basic assumption is that drivers prefer to travel in comfort and generally will not expose themselves to kinematically drastic events unless necessary. Thus abrupt velocity and direction changes in the vehicle (e.g. hard accelerations/decelerations and/or rapid steering) are thus considered to be out of the ordinary, indicating an unplanned and urgent response to an unexpected situation (FOT-Net, CARTRE, 2018, p. 60)".

Jerky driving has been associated with aggressive driver behavior (Feng, et al., 2017) and increased crash risk (Bagdadi & Várhelyi, 2011). But rapid steering or braking can also be the natural response in preventing a crash (Guo, Klauer, McGill, & Dingus, 2010). Hence it is important to have contextual information related to driver behavior.

Turns

Intersections, or road crossings of any kind are complex situations. Drivers are more likely to make mistakes when turning left, compared to turning right. Consider the example of turning related crashes in Germany in 2017, where **71%** were due to left turns and **29%** from right turns. (Statistisches Bundesamt, 2019) Left turns constitute a risk factor for elderly drivers in particular (Mayhew, Simpson, & Ferguson, 2006).

Utilization of existent safety mechanisms

Modern cars come with advanced safety technology to prevent crashes from happening and to protect drivers better, should a crash occur. Anything as critical as wearing a seatbelt to using the adaptive cruise control (ACC) indicates how well the driver adheres to new safety settings within the vehicle, and thereby helping to minimize the risk of crashes occurring.

> **It takes approximately 66 days to change a habit.**

Visions and trends

The future transport system, well developed in accordance to the UN Sustainable Development Goals, will in part depend on transportation as a service.

Disruption of car ownership

Car subscriptions, car sharing, ride sharing, flexible access to a carpool, car sharing with family and friends, mobility as a service, ride hailing (Deloitte, 2017) - these are some of the services that have disrupted the traditional meaning of car ownership, and, one could argue, has caused almost every single private car becoming a member of a fleet.

As the sole owner of a car, you have access to a digital key, and when you let a family member or friend use the car, you in fact become the fleet owner of one car with N number of users.

You may want to settle the payment for road fees, fuel & charging, parking, etc. As a fleet owner, you want to receive all the information you need to manage this in a smooth and reliable way.

Evolution of connectivity

Fleet strategy starts with the connected vehicle. Connected devices are everywhere, changing the way companies track and manage inventory, and how consumers make purchasing decisions. With a focus on reducing costs and driving productivity, fleets will become increasingly data-oriented, striving for an optimized overall performance (Dharani, Isherwood, Mattone, & Moretti, 2018).

The IoT technology in cars and the new software-based car produce massive amounts of data – data that can turn into valuable insights and features through continuous over-the-air-updates. The power of real-time, secure, private car data and status, combined with user-centric services, is simply ground-breaking and transformational.

With minimal effort, new business models are made possible by providing the right set of vehicle information to the owner, user, service manager, and/or mobility provider. Being able to turn every car into a fleet member through retrofit devices, cloud-to-cloud integration, TCU-integration and in-car connectivity integration provides your business with exciting, new opportunities.

The role of a fleet manager is changing

Fleet managers need to be more analytical and strategic than ever before. Using the wealth of data provided by connected vehicles to predict and solve problems before they happen is becoming standard. This is especially true when it comes to driver behavior and safety. Fleet managers study driver behavior data to look for safety features that can prevent crashes and reduce injuries, both to invest in their drivers' safety and to reduce costs over time.

Performance metrics are increasingly linked to companies' strategic objectives and are critical to their core missions. The fleet management system can create Key Performance Indicators (KPI's) for the fleet (International Organization for Standardization, 2012). The measurements are evolving rapidly with the company objectives and the connected solutions that weren't available in the past.

Challenges

The issue of safety risks related to driver behavior is difficult to solve. Many reasons factor in when a crash happens, everything from vehicle malfunction to recognition mistakes, to the environment and to decisions made in the moment by a driver (Singh, 2015).

In spite of improved safety features in most cars, these features still do not contribute enough in reducing crashes and fatalities. Stricter regulations, new technology, and automated driving systems will decrease road traffic injuries and fatalities. In parallel, influencing driver behavior by implementing best practices can contribute to this reduction, both long-term and short-term.

In order to do this efficiently, one must have access to the right data, the right amount of data, and be able to interpret it correctly. Data from the cars combined with insights from smartphones, lead to new insights and provide a number of contextual data points. Herein lies the challenge and the opportunity.

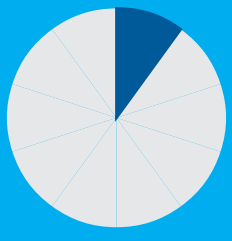
Left turns, a risk factor

71% Drivers tend to make mistakes far more often when turning left, compared to turning right. Consider for example turning accidents in Germany in 2017, with 71% percent being due to left turns and 29% from right turns.

Reduced cost of claims

Up to 30% Improvements in driving behavior may reduce preventable crashes by 20-30% for a fleet.

Fatalities related to distraction



9% In the United States, car crashes related to driver distraction accounted for 9% of all road traffic fatalities in 2016.

Autoliv's and WirelessCar's contribution

WirelessCar has 20+ years of experience working with connected vehicles. Autoliv has 65+ years of experience working with traffic safety. Together, the two companies can create unique benefits for users of a new solution for improved driver behavior. By combining car data and smartphone data to create new insights, Autoliv's and WirelessCar's collaboration will consist of the following:

- Reading, interpreting, and analyzing smartphone sensor signals
- Structuring car telematics journeys, data, and insights
- Matching the structure and analysis from the smartphone with the structure and analysis from the telematics unit in the car
- Using this data to properly coach and change driver behavior

Reading, interpreting, and analyzing smartphone sensor signals

Data from an accelerometer, a gyroscope, and GPS waypoints can tell you a lot about driver behavior. In order to understand this analysis, the sensor data first needs to be collected, filtered and cleaned, and then interpreted. Autoliv's Connected Safety Cloud, based on efficient processes and deep learning practices and models, delivers this by default. Many of the models used to transform data to safety insights are governed through Autoliv's extensive years of safety knowledge.

Structuring car telematics journeys, data, and insights

Collecting data from different car brands and different models within the car market requires accuracy. Each data unit has its specific characteristics. The car data must then be harmonized to be used together with data from other car models. The data comes from the car's Telematics Control Unit (TCU) – either a retrofit unit in the car, or a backend system.

Collecting, analyzing, optimizing and distributing the right car data to the right stakeholder at the right time unlocks numerous and significant user values. At WirelessCar, services are created that enable these benefits to emerge; services that are flexible, reliable, secure, globally available and customizable.

These services handle important issues of security, stability and privacy. The landscape for connectivity is changing and the applications that rely on connectivity are becoming increasingly critical to the overall user experience.

Matching the structure and analysis from the smartphone with the structure and analysis from the telematics unit in the car

With each trip registered both on the smartphone and by the telematics unit in the car, Autoliv's Connected Safety Cloud and WirelessCar's telematics platform will be able to match these trips, ensuring a 100% coverage of trips taken. Time, geolocation and waypoints are synchronized to create this match.

This is a vital process, as it is not until the perfect match exists that the value and analysis can be provided

to a fleet manager. With this match, the data from the smartphone and the data from the car can be proactively used by a fleet manager, while maintaining privacy for the individual driver.

Using this data to properly coach and change behavior

Changing behavior is difficult. Most of the time, drivers simply want to get from point A to point B as quickly as possible. Some drivers will do so in a manner that is respectful toward pedestrians, cyclists and other drivers, whereas some will be reckless and take risks.

It has been estimated that it takes approximately *66 days to change a habit* (Lally, Van Jaarsveld, Potts, & Wardle, 2010). Applying this theory to driving, coaching becomes a long-term endeavor. It cannot be accomplished in a day or two.

Coaching for change is one way to save more lives. This will require data. Through application of Autoliv's safety knowledge, understanding different types of drivers in traffic today, and realizing the changing technology enabling more data, this can be achieved. This enablement and data insight, is what the collaboration between Autoliv and WirelessCar generates.

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