

Insurance Telematics in Europe and North America

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Insurance Telematics in Europe and North America

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by Caspar Jansson



BERG INSIGHT RESEARCH TEAM

Casper Jansson, IoT Analyst
(caspar.jansson@berginsight.com)

Johan Fagerberg, Principal Analyst
(johan.fagerberg@berginsight.com)

OFFICE

Viktoriagatan 3
S-411 25 Gothenburg
Sweden

CUSTOMER SERVICE

Phone: (46) 31 711 30 91
Email: info@berginsight.com
Web: www.berginsight.com

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ABOUT THE AUTHOR

Casper Jansson is an IoT Analyst with a Master's degree in Industrial Engineering and Management from Chalmers University of Technology. He joined Berg Insight in 2021 and his areas of expertise include automotive telematics and EV charging technology.

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Summary

Executive summary

The integration of telematics technology constitutes the latest revolution for the automotive insurance industry. The concept of telematics is a portmanteau of telecommunications – long-distance communications – and informatics – the science of information. Telematics in general thus refers to the collection of information related to remote objects such as vehicles via telecommunications networks. The introduction of telematics technology in the context of automotive insurance is commonly referred to as usage-based insurance (UBI) or insurance telematics. Solutions of this type generally enable automotive insurers to improve pricing mechanisms based on actual driving data, gain better control of claims and differentiate their offerings to current and prospective policyholders. Variants of insurance telematics which have been popularised over the years include behaviour-based pricing models such as Pay-As-You-Drive (PAYD), Pay-How-You-Drive (PHYD) and Manage-How-You-Drive (MHYD).

The addressable market for insurance telematics is significant. A total of around 317 million vehicles were in use in the EU22+3 in 2019, including over 277 million passenger cars. In North America, an estimated total of around 293 million vehicles were in use in 2019, out of which passenger cars and light trucks are estimated to represent around 277 million vehicles. Some kind of basic automotive insurance is mandatory in most developed countries and there are in addition a number of subcategories of insurance that provide coverage for different types of unforeseen events involving motor vehicles. Motor gross written premiums in EU22+3 reached a total of over € 142.3 billion in 2019. The equivalent number for North America was US\$ 253.2 billion (€ 226.2 billion) in 2019.

The insurance telematics market is currently in a phase of strong growth which is expected to accelerate in the coming years. Europe and North America so far represent the vast majority of all insurance telematics programs and active policies from an international perspective, and the front-running national markets include the US, Italy, Canada, the UK and Germany. Berg Insight estimates that the total number of insurance telematics policies in force on the

European market reached 13.1 million at the end of 2020. Growing at a compound annual growth rate of 21.7 percent, the number of insurance telematics policies in force in Europe is estimated to reach 35.1 million by 2025. In North America, the total number of insurance telematics policies in force is forecasted to increase from an estimated 16.7 million policies at the end of 2020 to reach 49.0 million policies by 2025, representing a compound annual growth rate of 24.0 percent.

In the US, the top three insurers in terms of UBI policies have all introduced smartphone-based solutions to supplement or replace the previously used OBD dongles. Several US and Canadian insurers have during the recent year re-assessed and re-launched their telematics programs. The North American insurance carriers are also exploring claims-related insurance telematics and many are adding distracted driving parameters in their UBI. The European insurance telematics market is still dominated by insurers in Italy and the UK, with an estimated 9.7 million and 1.3 million policies respectively. The market in Germany has grown considerably during 2020 and reached about 0.7 million telematics policies. Uptake on all other markets is considerably lower, with between 120,000 and 440,000 policies in Spain, France, Benelux as well as Central and Eastern Europe.

The insurance telematics value chain spans multiple industries. Insurers with notable presence in the insurance telematics market include Progressive, UnipolSai, State Farm, Allstate, Generali, Allianz, HUK-Coburg, Admiral, AXA, Liberty Mutual, Intact and Insure The Box. Insurance players can either develop telematics programs independently or rely on partners to varying degrees. Smartphone-based telematics players have taken significant market shares during the past years. Leading vendors of smartphone-based insurance telematics solutions include Cambridge Mobile Telematics and Arity. Additional vendors include Telematics Technologies, Amodo and DriveQuant. Important telematics suppliers active in the insurance field include Octo Telematics, Vodafone Automotive, Viasat Group, Targa Telematics, Redtail Telematics, IMS (Trak Global Group) and The Floow. Other players on the insurance telematics market include Modus, Baseline Telematics, LexisNexis Risk Solutions, Verisk, CCC Information Services, OSeven and Sentiance. Automotive OEMs are increasingly taking an active part in the ecosystem. Examples include General Motors, Ford, PSA Group, Honda, Renault-Nissan-Mitsubishi, Toyota, Tesla, BMW, Daimler and Hyundai.

Chapter 1

The automotive market

The automotive industry is a major contributor to the global economy. The total annual sales of passenger cars, light trucks, light commercial vehicles, trucks and coaches is about € 1,600 billion worldwide. In 2020, total automotive production decreased 15.8 percent to 77.6 million vehicles worldwide. China is now by far the leading nation in terms of automotive production with about 25.2 million vehicles manufactured in 2020, followed by the US with almost 8.8 million, Japan with nearly 8.0 million and Germany with 3.7 million vehicles produced. At the end of 2019, there were an estimated 1.2 billion passenger cars and light trucks registered worldwide which corresponds to 160 vehicles per 1,000 inhabitants. Europe and North America represent the largest markets in terms of vehicles in use, each accounting for more than 40 percent of the total worldwide.

1.1 The automotive market in Europe

Europe has a strong automotive industry and is home to major manufacturing groups such as Volkswagen Group, PSA Group and Daimler Group. The automotive market declined 21.6 percent to almost 16.9 million vehicles in 2020 in terms of new registrations. The turnover generated from the automotive sector represents about 4 percent of the GDP in the EU, totalling approximately € 560 billion.

1.1.1 Vehicles in use and car density

A total of around 317 million vehicles including passenger cars and commercial vehicles were in use in EU22+3 in 2019. Passenger cars represent over 276 million vehicles. Commercial vehicles including LCVs and trucks as well as buses and coaches moreover account for approximately 40 million vehicles and has grown considerably during the past years. The largest market was Germany with almost 52 million vehicles, followed by Italy and France with about 45 million vehicles each, the UK with over 40 million vehicles, Spain with about 29 million and Poland with more than 28 million vehicles.

Figure 1.1: Vehicles in use (EU22+3 2019)

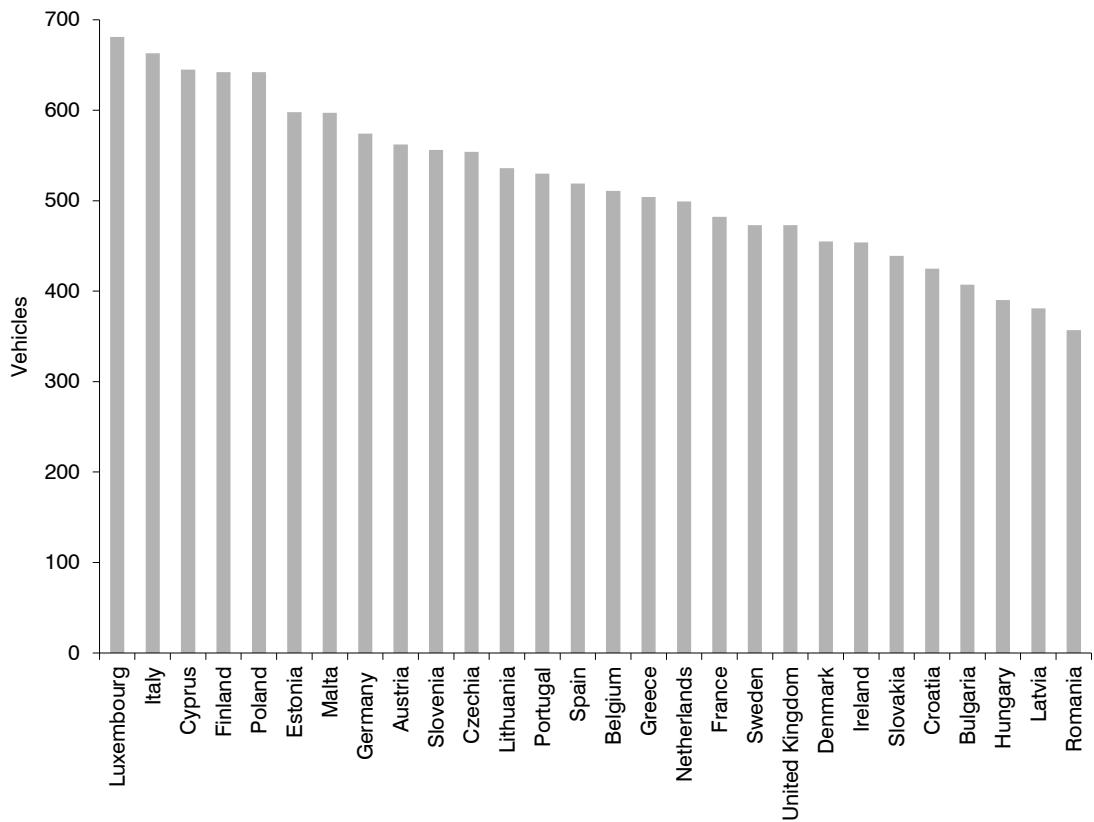
Country	Passenger cars	Commercial vehicles*	Total
Austria	5,040,000	520,000	5,560,000
Belgium	5,810,000	960,000	6,770,000
Czech Republic	5,990,000	800,000	6,790,000
Denmark	2,650,000	430,000	3,080,000
Estonia	790,000	140,000	930,000
Finland	2,720,000	440,000	3,160,000
France	38,220,000	6,720,000	44,940,000
Germany	47,720,000	3,890,000	51,610,000
Greece	5,250,000	1,160,000	6,410,000
Hungary	3,810,000	590,000	4,400,000
Ireland	2,170,000	450,000	2,620,000
Italy	39,550,000	5,220,000	44,770,000
Latvia	660,000	80,000	740,000
Lithuania	1,260,000	130,000	1,390,000
Luxembourg	430,000	50,000	480,000
Netherlands	8,940,000	1,200,000	10,140,000
Norway	2,770,000	620,000	3,390,000
Poland	24,360,000	4,010,000	28,370,000
Portugal	5,210,000	1,280,000	6,490,000
Slovakia	2,390,000	350,000	2,740,000
Slovenia	1,250,000	130,000	1,380,000
Spain	25,010,000	4,460,000	29,470,000
Sweden	4,890,000	680,000	5,570,000
Switzerland	4,570,000	460,000	5,030,000
United Kingdom	35,170,000	5,220,000	40,390,000
<i>EU22+3</i>	<i>276,630,000</i>	<i>39,990,000</i>	<i>316,620,000</i>

* Including LCVs (<3.5t), trucks (>3.5) and buses/coaches

Source: Berg Insight, ACEA

In terms of passenger car density per 1,000 inhabitants, the average across the European Union was 520 vehicles in 2019, up from 510 vehicles in 2018, 448 vehicles in 2005 and 380 vehicles in 1995. The highest levels are noted by Luxembourg and Italy at 681 vehicles and 663 vehicles respectively, closely followed by Cyprus with 645. Finland and Poland both had more than 600 registered vehicles per 1,000 inhabitants. Other European countries with levels exceeding 560 vehicles per 1,000 inhabitants include Estonia, Malta, Germany and Austria. The lowest passenger car density in the EU is noted by Romania at 357 vehicles per 1,000 inhabitants. Hungary, Latvia and Croatia all noted car density levels of less than 400 vehicles.

Figure 1.2: Passenger car density per 1,000 inhabitants (EU27+UK 2019)



Source: ACEA/Eurostat

Figure 1.3: Passenger car registrations by manufacturer (EU27+UK+EFTA 2020)

Group	Main brands	2019	2020	Change
Volkswagen Group	Volkswagen, Audi, Skoda	3,867,000	3,040,000	-21.4 %
<i>Volkswagen</i>		1,769,000	1,347,000	-23.9 %
<i>Audi</i>		762,000	643,000	-15.6 %
PSA Group	Peugeot, Citroën, Opel	2,467,000	1,719,000	-30.3 %
<i>Peugeot</i>		965,000	741,000	-23.2 %
<i>Citroën</i>		816,000	486,000	-40.4 %
<i>Opel/Vauxhall</i>		637,000	448,000	-29.7 %
Renault Group	Renault, Dacia	1,655,000	1,228,000	-25.8 %
<i>Renault</i>		1,064,000	819,000	-23.0 %
<i>Dacia</i>		582,000	405,000	-30.4 %
BMW Group	BMW, MINI, Rolls Royce	1,048,000	847,000	-19.2 %
<i>BMW</i>		831,000	675,000	-18.8 %
Daimler	Mercedes, Smart	1,017,000	765,000	-24.8 %
<i>Mercedes</i>		902,000	738,000	-18.2 %
FCA	Fiat, Alfa Romeo, Lancia	947,000	701,000	-26.0 %
Toyota Motor	Toyota, Lexus	797,000	695,000	-12.8 %
Ford Motor Comp.	Ford	965,000	655,000	-32.1 %
Hyundai		563,000	425,000	-24.5 %
Kia		503,000	417,000	-17.1 %
Nissan		394,000	290,000	-26.4 %
Volvo		343,000	287,000	-16.3 %
Jaguar Land Rover	Land Rover, Jaguar	229,000	159,000	-30.6 %
Mazda		257,000	149,000	-42.0 %
Honda		122,000	81,000	-33.6 %
Others	Mitsubishi, Suzuki, Tesla	632,000	502,000	-20.6 %
<i>Total</i>		15,806,000	11,960,000	-24.3 %

Source: ACEA & Berg Insight

1.1.2 New car registrations and leading manufacturers

New passenger car registrations in EU27+UK+EFTA reached 12.0 million vehicles in 2020, down 24.3 percent from the year before. The largest markets in Europe in terms of new registrations of passenger cars in 2020 were Germany, France and the UK which are all top-10 markets from a global perspective. Germany noted 2.9 million new registrations during the year followed by France at about 1.7 million and the UK at 1.6 million vehicles. The leading manufacturer on the European market is Volkswagen Group, reaching total new registrations of about 3.0 million passenger cars in EU27+EFTA+UK in 2020, down 21.4 percent from 2019. Volkswagen Group includes brands such as Volkswagen, Audi, SEAT, Porsche and Skoda. PSA Group was the second largest manufacturer in Europe with 1.7 million registrations. PSA Group acquired Opel from GM in 2017 and agreed to merge with FCA Group in Q4-2019 to create the new global automaker Stellantis. The merger was approved in late 2020. Renault Group was the third largest manufacturer with 1.2 million new registrations during 2020. BMW and Daimler were ranked fourth and fifth on the market and reached about 0.8 million registrations each during 2020. Hyundai Group comprising Hyundai and Kia also had about 0.8 million new registrations in the region in 2020. Other manufacturers with new passenger car registrations exceeding 600,000 vehicles in EU27+EFTA+UK in 2020 include FCA Group, Toyota and Ford.

1.2 The automotive market in North America

Production of passenger cars and commercial vehicles in North America decreased by 20.0 percent to 11.9 million vehicles in 2020. The US is the second largest nation in the world in terms of automotive production after China and 8.8 million vehicles were produced in the country during the year. World-leading manufacturers including General Motors and Ford Motor Company are both headquartered in the well-known Detroit region in the US which is established as a metonym for the American automobile industry.

1.2.1 Vehicles in use and car parc density

An estimated total of around 293 million vehicles including cars, trucks and commercial vehicles were in use in North America in 2019. Passenger cars and light trucks account for the lion's share of the vehicles in use. Commercial vehicles (GVW 3–8) moreover represent approximately 16.1 million vehicles out of which GVW 3 and GVW 8 represent the largest

shares. The US market alone has around 268 million vehicles in use, including an estimated 254 million passenger cars and light trucks. Canada moreover has over 26 million vehicles in use out of which passenger cars and light trucks account for close to 24 million.

Figure 1.4: Vehicles in use (North America 2019)

Country	Cars & light trucks ¹	Commercial vehicles ²	Total
US	253 800 000*	14 100 000	267 900 000
Canada	23 500 000	2 000 000	25 500 000
<i>Total</i>	<i>277 300 000</i>	<i>16 100 000</i>	<i>293 400 000</i>

¹Includes GVW 1–2; ²Includes GVW 3–8; *Estimate

Source: Berg Insight

North America had a car park density of 759 passenger cars and light trucks per 1,000 inhabitants at the end of 2019. The corresponding number for the US market specifically was 775 vehicles which places the country in a top position globally. Canada is also a top-5 country in the world in terms of car parc density. If only counting regular passenger cars, the US had a car parc density of 360 vehicles per 1,000 inhabitants in 2019, down from 454 vehicles in 2005 and 461 vehicles in 1995. A lot of vehicles that can be classified as light trucks are however in use by private individuals similarly to ordinary cars on the US market.

1.2.2 New car registrations and leading manufacturers

New passenger car and light truck registrations in North America reached more than 16.2 million in 2020, down 15.0 percent from the previous year. Both the US and Canada are on the top-10 list of countries in terms of the number of new registrations in 2020. The leading manufacturer on the North American market is General Motors, reaching total new registrations of more than 2.8 million vehicles in 2020. Group brands for example include Chevrolet, GMC and Buick. Toyota Motor Corporation including the brands Toyota and Lexus was the second largest manufacturer in the region, reaching new registrations of 2.3 million in 2020. Ford Motor Company and Fiat Chrysler Automobiles further reached 2.2 million and about 2.0 million registrations respectively during the year. Other manufacturers with new registrations in the range of 1.0–1.4 million vehicles in North America in 2020 include Honda Motor Company, Hyundai Motor Group and Nissan.

Figure 1.5: Passenger car registrations by manufacturer (North America 2020)

Group	Main brands	2019	2020	Change
General Motors	Chevrolet, GMC, Buick	3,144,000	2,766,000	-12.0 %
<i>Chevrolet</i>		2,100,000	1,852,000	-11.8 %
<i>GMC</i>		652,000	593,000	-9.0 %
Toyota Motor	Toyota, Lexus, Scion	2,621,000	2,305,000	-12.1 %
<i>Toyota</i>		2,297,000	2,009,000	-12.5 %
<i>Lexus</i>		324,000	296,000	-8.6 %
Ford Motor Comp.	Ford, Lincoln	2,701,000	2,284,000	-15.4 %
<i>Ford</i>		2,580,000	2,171,900	-15.8 %
<i>Lincoln</i>		121,000	112,100	-7.4 %
FCA	Dodge, Jeep, Ram, Chrysl.	2,427,000	2,000,000	-17.6 %
<i>Dodge</i>		487,000	299,000	-38.6 %
<i>Jeep</i>		993,000	850,000	-14.4 %
<i>Ram</i>		805,000	713,000	-11.4 %
<i>Chrysler</i>		133,000	113,000	-15.0 %
Honda Motor Comp.	Honda, Acura	1,797,000	1,487,000	-17.3 %
Hyundai Motor Gr.	Hyundai, Kia	1,494,000	1,393,000	-6.8 %
<i>Hyundai</i>		802,000	735,000	-8.4 %
<i>Kia</i>		692,000	658,000	-4.9 %
Nissan	Nissan, Infiniti	1,481,000	987,000	-33.4 %
Subaru		758,000	664,000	-12.4 %
Volkswagen Group	Volkswagen, Audi, Porsche	767,000	659,000	-14.1 %
BMW Group	BMW, MINI, Rolls Royce	419,000	338,000	-19.3 %
Daimler	Mercedes, Smart	367,000	292,000	-20.4 %
Mazda		345,000	337,000	-2.3 %
Others	Mitsub., JLR, Volvo, Tesla	690,000	640,000	-7.2 %
<i>Total</i>		19,011,000	16,152,000	-15.0 %

Source: Berg Insight

1.3 Automotive insurance

Insurance is a multi-trillion-dollar industry that has its very own terminology and a range of subsets. Worldwide premiums in 2020 are estimated to around US\$ 6.3 trillion (€ 5.5 trillion). In 2020, North America still had the largest insurance industry, representing around 43 percent of the total global insurance market, followed by Asia, and Europe (including Russia) accounting for 28 percent and 25 percent respectively. Latin America, Oceania and Africa moreover accounted for 2 percent, 1 percent and 1 percent respectively. The automotive segment forms a major part of the insurance industry and represents a significant share of the total premiums worldwide. Auto insurance can also be divided into subcategories of insurance that cover different types of unforeseen events involving motor vehicles. The rating mechanisms for motor insurance utilise a wide range of variables to arrive at specific price points for prospective and current policyholders. The rating and pricing procedures are likely set to be revolutionised by the emerging access to actual driving behaviour data linked to individual policyholders.

1.3.1 Basic insurance terminology and categorisations

Insurance is a risk transfer mechanism by which an insurer provides a guarantee to an individual or other entity to receive protection against losses caused by events beyond the control of the insured party. The concept generally refers to insurance providers' promise of financial compensation for future losses in return for payment of a periodic premium. In simple terms, an insurance provider generates profit if the difference between all incoming premium payments and all outgoing payments for insurance claims during a given time period is positive. As insurance companies accumulate vast amounts of cash from their clients, an additional revenue stream, aside from the collection of insurance premiums, comes from investing the share of the funds that is not used for day-to-day expenses or set aside as reserves. This source of income is important for the insurance industry as profitable investments can offset the impact of otherwise low-profit or unprofitable insurance operations.

The process of issuing insurance policies is commonly referred to as underwriting. The word stems from the historical practice of having risk takers – underwriters – write their names under the total amount or risk that they were willing to accept at a specified premium. The term underwriter can today be used to refer to both the insurance companies and the

employees that work as gatekeepers reviewing and deciding what insurance policies to grant to specific clients. A key role within the insurance field is further to determine risk levels and associated pricing for insurance coverage. This is handled by actuaries who work closely with underwriters. An actuary is in essence an insurance mathematician who carries out risk analyses and performs calculations to price the insurance products. The probability of events is mathematically evaluated and contingent outcomes are quantified in order to minimise the financial losses associated with uncertain and undesirable events. Actuaries rely heavily on statistical data and probability theory when performing risk assessments. Common concepts in the insurance field moreover include Bonus-Malus Systems (BMS) – Latin for Good-Bad – which adjust premiums paid by customers according to the individual claims history. Another relevant acronym is First Notice of Loss – FNOL – which initiates the claims process as the policyholder first reports an incident, e.g. theft, loss or damage.

The insurance market can generally be divided into two broad categories – life insurance and general insurance. The latter typically includes any insurance that is not a life insurance. General insurance is commonly referred to as property and casualty (P&C) insurance in North America and simply non-life insurance in continental Europe – both concepts have however spread across a range of markets. Insurance is subsequently often divided into personal lines and commercial lines insurance. The non-life insurance segment represents a major market, for example accounting for 41 percent of total premiums written in Europe in 2020, and even more than 50 percent in North America. Motor insurance represents the second largest sector within the non-life segment, after health insurance, accounting for about 22 percent in 2020.

1.3.2 The fundamentals of automotive insurance

In total, motor vehicle insurance is estimated to be a US\$ 700–800 billion market globally. Some kind of automotive insurance is mandatory in most developed countries and this is a highly competitive market often with low or even negative underwriting profitability. The industry can generally be divided into two segments – motor third party liability (MTPL) insurance and own damage insurance. The former covers damage caused by the policyholder to a third party's vehicle, property or health. MTPL is compulsory across the European Union and the same concept is used in a range of other markets as well, including non-European countries. Similar mandatory insurance is also present in North America to

protect third parties. Basic MTPL insurance is in general a relatively uniform and undifferentiated product across insurance providers whereby price competition is very strong. Additional voluntary MTPL insurance may offer extended protection beyond the amounts covered by the compulsory insurance for damage caused to third parties. Own damage insurance on the other hand covers damage to the own vehicle regardless of who is at fault. This is often referred to as Casco insurance which stems from an acronym for Casualty and Collision. This is a voluntary type of insurance available in a number of tiers that can cover events such as theft and robbery, fire, natural events, vandalism, glass damage, accidents, collisions with animals, loss of keys and travel interruption. Own damage insurance is along with MTPL often referred to as comprehensive insurance. Such insurance is more commonly purchased for valuable vehicles and these optional insurance offerings are more differentiated between providers at the same time as price competition is somewhat lower. The profitability is however in many cases limited and shrinking also for these types of insurance products in various markets. The fact that motor insurance – and especially MTPL – is a low-profit or unprofitable business from an underwriting perspective for many insurers means that profits from other insurance segments may have to be used to offset losses in the automotive segment. Motor insurance can on the other hand be seen as first point of entry in a customer acquisition which may subsequently see the addition of other types of insurance.

1.3.3 Traditional automotive insurance risk rating and pricing criteria

Automotive insurance is often sold as 6-month or 12-month policies though both shorter and longer durations may occur. The pricing procedure for automotive insurance traditionally includes the collection of a number of standard data points by the insurance provider from the individual customer. This data represents risk factors which are taken into consideration in the underwriting process and are used to calculate the price of the insurance premiums using specific algorithms. In the context of automotive insurance, key sets of variables that can be used by actuaries include:

- **Personal data** – Individual characteristics including demographics such as age, gender, marital status and address. As an example, the premium can be affected by the customer's place of residence. The risk varies between cities and the countryside and there are also general high-risk areas with elevated levels of car crime.

- **Vehicle-related data** – The vehicle's worth including new car values, repair costs and times, vehicle age, vehicle performance (e.g. acceleration and top speed), security features, etc.
- **Individual claims history** – The previous insurance claims made by prospective policyholders to its insurance providers over a time period, e.g. the past three to five years.
- **Driving convictions** – Insurance customers that have been convicted of driving felonies are rated differently than non-felons. Serious convictions may even disqualify individuals from specific levels of coverage.
- **Occupation** – Specific occupations may be classed as higher-risk than others. Using the vehicle for both private and business activities may furthermore affect the rate upwards.
- **Medical conditions** – The risk levels of drivers that hold restricted licenses due to medical conditions may be taken into account.
- **Drivers to be covered** – Additional drivers to be covered by the insurance policy can affect the rate. Safe drivers including experienced drivers with clean records have a different impact than young people and drivers with previous claims, convictions, etc.
- **Security and safety systems** – Policy pricing can be affected by the types of security and safety systems installed on a vehicle, e.g. alarms, immobilisers, airbags, electronic stability control systems, anti-lock brake systems (ABS) and tracking solutions.

In general, pricing of auto insurance further involves applying multivariate statistical techniques to large sets of historical data. Reference data sets commonly include thousands of vehicle years with associated claims history based on which individual customers are judged according to their specific characteristics. The different data points collected by the

insurance providers are used as proxies to estimate the actual risk level of each auto insurance policyholder. The policyholders are then placed in different risk classes with associated insurance pricing points. This procedure is however inherently plagued with defects as no proxies will be able to represent the underlying risk levels in full when different drivers with diverse behaviour are lumped together into categories. A plausible factor contributing to the unprofitability of auto insurance is in many cases the inability to accurately align premium pricing with individual risk using the abovementioned methods. The different categories of policyholders will indeed exhibit differences between specific individuals that are not reflected in the insurance premiums. This in effect leads to a situation where low-mileage and safe-driving policyholders undeniably subsidise their reckless and high-usage counterparts that expose themselves to greater risks. The comparably low product differentiation is positioning automotive insurance almost as a commodity and increasingly price-conscious consumers shop around for the best deals mainly based on the recurring premium cost of the insurance policy. The power of the prospective insurance customers has furthermore been compounded by the emergence of dedicated online comparison tools and policies are increasingly being quoted and purchased directly on the web.

1.3.4 Developments of the actuarial toolbox for motor insurers

Risk rating for motor insurance has in general not been an overly transforming field and the traditional methodologies have remained fairly the same for a long time. One of the larger developments within the domain is credit-based insurance scoring (CBIS) which emerged in the 1990s following assessments started already in the 1980s. Early applications to the automotive segment were for example introduced in the mid-1990s in the US. The concept introduces credit scores as a new type of variable to determine eligibility and price levels of insurance policies. Credit scores generally depend on factors such as payment history, amount owed and types of credit in use. Some stakeholders are characterising credit-based insurance scoring as a revolution, stressing that credit behaviour is strongly correlated with accident potential and thus the propensity to file insurance claims. Others are criticising the use of credit history data as unfair and discriminating against specific groups of people. Credit reports have moreover been shown to often contain errors of various kinds which can impact the accuracy of the scoring mechanisms. Nevertheless, data related to creditworthiness is today widely used in the insurance industry including automotive insurance risk rating procedures to set individual premiums.

Discounts on auto insurance are today commonly associated with bundling of insurance coverage for multiple vehicles or other types of insurance (e.g. home or personal property) with the same provider. In line with conventional bonus-malus systems (BMS), policyholders can further receive claims-free discounts from not filing any claims for an extended period of time, e.g. a number of consecutive years. Participating in specific driver training programs may also qualify policyholders to receive discounts. All of these efforts are aimed at fostering and rewarding the type of good behaviour that benefits insurance providers through reduced payments of compensation to policyholders as fewer and less severe claims are filed. These strategies are however not fail-safe. Driver training initiatives will for example not by definition result in safer driving among the policyholders as the actual driving behaviour is not evaluated. In light of such shortcomings of current methods, it has for some time been foreseen that telematics technology will bring about the next revolution in the automotive insurance sector.

Insurance has always been a data-driven industry and the collection of valuable data related to driver behaviour establishes auto insurance as a truly next-generation application area in the Big Data era. Similar to a credit rating, a driving score based on telematics data can be used as an indicator of individual risk. The fundamental difference is however the fact that such driving scores are developed specifically to be indicative of a person's ability to safely manoeuvre a vehicle, as opposed to credit scores which in essence were crafted as a way of determining if a person will be able to repay his or her debt on time. As such, telematics-based driving scores are likely to be superior as proxies for individual risk levels in the field of automotive insurance. This also opens up for increasing differentiation of motor insurance products which can be a positive development for the industry at large.

1.4 The European automotive insurance market

The European insurance market reached total premiums of around € 1.3 trillion in 2019. The largest individual markets in the European Union were the UK, France, Germany, Italy and Spain, combined representing some 76 percent of annual premiums. A total of more than 3,900 insurance companies were active on the European market in 2019, employing about 945,000 people. Automotive insurance represents a significant share of the total insurance premiums in Europe, contributing € 147 billion.

Figure 1.6: Motor insurance statistics (EU23+2 2019)

Country	Motor premiums (€ m)	Growth rate*	Average per vehicle (€)
Austria	3,591	4.1 %	585
Belgium	3,742	1.9 %	515
Czech Republic	1,874	9.4 %	236
Denmark	2,713	3.7 %	837
Estonia	228	2.2 %	236
Finland	1,584	3.5 %	461
France	22,772	3.0 %	477
Germany	28,550	2.2 %	509
Greece	1,090	2.0 %	136
Hungary	1,034	25.8 %	225
Ireland	1,873	0.8 %	704
Italy	16,326	0.9 %	316
Latvia	99	-0.2 %	129
Lithuania	421	4.2 %	294
Luxembourg	516	5.7 %	1026
Netherlands	4,625	7.4 %	427
Norway	2,390	6.5 %	666
Poland	5,490	0.5 %	183
Portugal	1,517	6.6 %	211
Slovakia	700	3.8 %	245
Slovenia	573	9.0 %	395
Spain	11,418	3.7 %	345
Sweden	2,996	3.1 %	510
Switzerland	5,301	-0.2 %	918
United Kingdom	20,873	0.7 %	501
<i>EU23+2</i>	<i>142,297</i>	<i>3.6 %</i>	<i>413</i>

*Nominal growth at constant exchange rates 2019/2018

Source: Insurance Europe & Berg Insight

Motor gross written premiums in EU23+2 reached a total of € 142.3 billion in 2019, up by 3.6 percent from the year before. The four largest markets represent about 62 percent of the total premiums. Germany is the single largest market with total premiums of € 28.6 billion in 2019. The second largest market was France at € 22.8 billion followed by the UK and Italy reaching total motor insurance premiums of € 20.9 billion and € 16.3 billion respectively during the year. The highest nominal growth rate between 2018 and 2019 was noted by Hungary, following the introduction of a tax on motor premiums in 2019. Both Latvia and Switzerland noted a slight decline in motor premiums. The average premium per vehicle based on the 2017 motor gross written premiums across all passenger cars, commercial vehicles and motorcycles in EU23+2 was € 413. High average premiums per vehicle are for example noted in Luxembourg, Switzerland, Denmark and Ireland, while the lowest average premiums can be found in Greece, Latvia and Poland. MTPL premiums are estimated to represent around 60 percent of total motor premiums in Europe. Total motor claims paid in EU28 increased 3.9 percent year-on-year to € 103.0 billion in 2019. The number of licensed insurance companies on the European motor insurance market is estimated to around 1,000 companies. Major motor insurers in Europe for example include Allianz, AXA, Generali, RBS, Aviva, Zurich, RSA, UnipolSai and MAPFRE.

1.5 The North American automotive insurance market

The North American insurance market reached total premiums of around US\$ 2.6 trillion (€ 2.3 trillion) in 2019, representing the largest regional insurance market in the world before Asia. The US is by far the largest national market with some US\$ 2.5 trillion in direct written premiums during 2019.

The US personal auto insurance industry reached total direct written premiums of US\$ 253.2 billion (€ 226.2 billion) in 2019. This corresponds to an average premium of around US\$ 998 (€ 891) per year. There are however considerable variations between different states. High average auto insurance expenditures are for example noted in Louisiana, Michigan, Florida and New York while North Dakota, Maine, Iowa and South Dakota have particularly low expenditures. Liability insurance represents around 60 percent of direct premiums written. The top-10 personal auto insurers together represented a combined market share of approximately 73 percent in 2019. State Farm was the leading provider with a market share of

16.1 percent followed by Berkshire Hathaway (GEICO) at 13.8 percent and Progressive at 12.2 percent. Allstate, USAA, Liberty Mutual and Farmers Insurance all reached market shares in the range of 4–9 percent in 2019. Other top providers include Nationwide, American Family Insurance Group and Travelers. US Commercial auto insurance furthermore represented annual direct premiums of around US\$ 45.1 billion (€ 40.3 billion) in 2019. The commercial auto segment is more fragmented with the leading 10 players comprising some 43 percent of direct premiums written. Key players in this segment include Progressive with a market share of 12.3 percent, followed by Travelers at 6.2 percent in 2019. Liberty Mutual reached a market share of 4.2 percent. Nationwide Old republic, Berkshire Hathaway (GEICO) and Zurich all had direct premiums written comprising between three and four percent of the segment.

The Canadian motor insurance market reached direct written premiums of around CAD 27.5 billion (€ 18.5 billion) in 2019. This corresponds to an average annual premium of around CAD 949 (€ 639) for private passenger vehicles. Key players on the Canadian auto insurance market include Intact, Desjardins, Aviva, RSA, TD Insurance, Wawanesa Insurance and The Co-operators.

Chapter 2

Insurance telematics solutions

2.1 Introduction to insurance telematics

The integration of telematics technology constitutes the latest revolution for the automotive insurance industry. The concept of telematics is a combination of telecommunications – long-distance communications – and informatics – the science of information. Telematics in general thus refers to the collection of information related to remote objects such as vehicles via telecommunications networks. The introduction of telematics technology in the context of automotive insurance is commonly referred to as insurance telematics or usage-based insurance (UBI). These two expressions are today most often used interchangeably though there are some nuances that separate the concepts. Solutions of this type generally enable automotive insurers to improve pricing mechanisms, improve claims management and differentiate their offerings to current and prospective policyholders.

2.1.1 The rationale for telematics-based insurance policy pricing

Usage-based insurance telematics is generally aimed at individualising automotive insurance. In simple terms, the idea is to make the pricing model more similar to that of utilities such as electricity or water – which is commonly related to monthly or quarterly use – rather than that of housing which similarly to traditional auto insurance generally has a flat cost regardless of the actual utilisation. The use of traditional proxies (e.g. age and address) which treat groups of policyholders as equals has undoubtedly led to a situation where low-risk drivers subsidise high-risk drivers. Insurance telematics enables improved customer segmentation – in the extreme case all the way down to the individual level. This is achieved by taking into account the risk levels exhibited by specific policyholders, as indicated by telematics data related to the way they drive. The fairness is improved as insurance customers increasingly are charged according to their individual risk profiles. Insurance underwriting has traditionally been considered to be as much an art as a science – predictive modelling leveraging new data streams such as telematics data however moves the dial closer to the science-end of the spectrum.

Figure 2.1: Distribution of fatal crashes by day of week and time of day (US 2019)

Time	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.	Total
00–03	1.1 %	0.9 %	1.0 %	1.0 %	1.4 %	2.4 %	2.8 %	10.7 %
03–06	1.0 %	1.0 %	1.0 %	1.0 %	1.1 %	1.6 %	1.6 %	8.3 %
06–09	1.6 %	1.5 %	1.5 %	1.6 %	1.6 %	1.2 %	1.0 %	10.1 %
09–12	1.4 %	1.4 %	1.4 %	1.3 %	1.4 %	1.4 %	1.2 %	9.4 %
12–15	1.9 %	1.9 %	1.7 %	1.8 %	2.0 %	1.9 %	1.8 %	13.0 %
15–18	2.2 %	2.2 %	2.1 %	2.2 %	2.5 %	2.3 %	2.2 %	15.7 %
18–21	2.0 %	2.2 %	2.2 %	2.3 %	2.8 %	2.9 %	2.5 %	16.9 %
21–00	1.8 %	1.7 %	1.8 %	2.1 %	2.8 %	3.0 %	2.0 %	15.2 %
Unknown	0.1 %	0.1 %	0.1 %	0.1 %	0.1 %	0.1 %	0.1 %	0.7 %
<i>Total</i>	<i>13.1 %</i>	<i>12.9 %</i>	<i>12.7 %</i>	<i>13.4 %</i>	<i>15.8 %</i>	<i>16.8 %</i>	<i>15.3 %</i>	<i>100.0 %</i>

Source: NHTSA's Fatality Analysis Reporting System

There are several arguments in favour of linking policy pricing with various driving characteristics. Extensive statistical data highlights the limitations in charging drivers based only on variables not related to actual driving habits. Aside from obvious influencers such as how much vehicles are driven (i.e. mileage), other aspects including when and how vehicles are driven also represent indicators of risk exposure. Accidents involving vehicles are for example not distributed uniformly across the hours of the day and the days of the week. According to 2018 statistics from the US National Highway Traffic Administration's (NHTSA) Fatality Analysis Reporting System (FARS), which details the factors behind traffic fatalities on US roads, certain time periods are overrepresented in terms of fatal crashes. The statistics are based on 33,244 fatal crashes during the year. A disproportionate share of crashes occur at nights and weekends in general and in particular within the time span 18–03 on nights between Fridays and Saturdays as well as between Saturdays and Sundays. Accident rates also vary by road type. Statistics from the UK have for example indicated that urban roads have several times higher relative accident rates compared with motorways, with rural roads being in between. These types of statistics can motivate the differentiation of insurance pricing between policyholders that mainly drive at low-risk times and road types compared to

their high-risk counterparts. Even more accurate risk profiles for individual policyholders can be determined by additionally introducing variables related to individual driving behaviour. Studies have shown that the best and worst drivers of a population can be separated by a factor of as much as 10 in terms of loss costs – insurance telematics helps insurance underwriters and actuaries make sure that these types of discrepancies are reflected in premium prices.

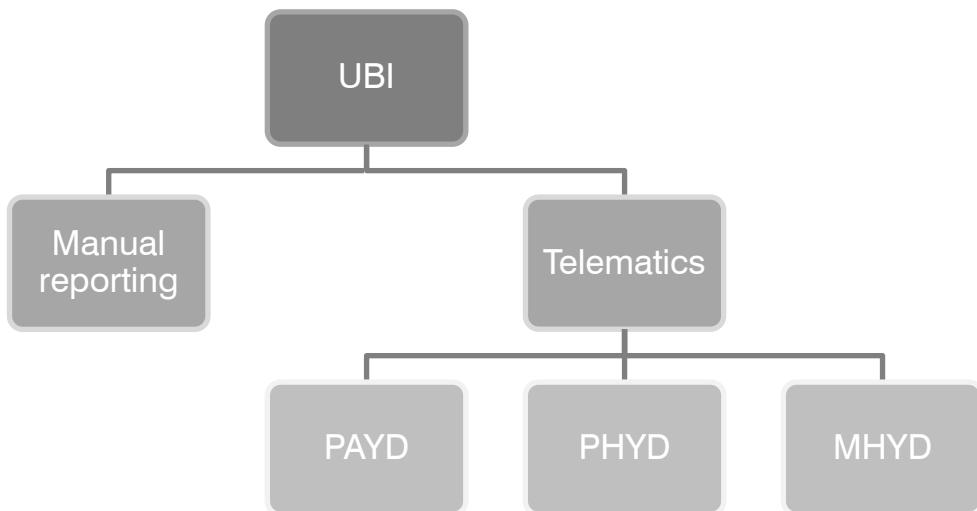
2.1.2 Brief history of insurance telematics offerings

Early attempts at insurance telematics solutions first emerged almost two decades ago. Front-runners include the pioneering provider Progressive in the US which has performed field tests related to insurance telematics and secured a number of relevant patents since the mid-1990s. Real insurance telematics offerings then started emerging in the 2000s, including a product from Progressive launched in 2004. On the European market, Aviva in the UK was an early mover launching insurance telematics for fleets and individuals in 2004–2005. UnipolSai in Italy also entered the telematics field at an early stage, working with Octo Telematics, however mainly focusing on combating fraud and theft. Early usage-based implementations were primarily focused on using the distance travelled to influence insurance pricing. The time of driving was sometimes also taken into account. These programs first mainly attracted drivers exhibiting behaviour deviating positively from average drivers, i.e. safe and low-mileage drivers – particularly within traditionally high-risk groups – who could reduce their premium substantially with a telematics policy. Implementation issues and Big Brother-type privacy concerns however slowed mass adoption of telematics-based insurance. Technological developments have since then gradually refined the insurance telematics concepts. An increasing range of behaviour-related driving attributes have been added to the policy pricing equations. Privacy concerns have started to soften as well, for example due to the increasing adoption of various location-based services following the wide adoption of smartphones. In the 2010s, continuing developments have even enabled data collection from OEM telematics platforms and smartphones alongside conventional aftermarket on-board devices. Telematics in general and insurance telematics in particular have now been established as key applications following the Big Data revolution. Today, insurance telematics is a high-growth area of telematics technology which comprises a wide variety of concepts as well as a constantly developing range of infrastructural components. A number of alternative business models for players entering the industry have also appeared.

2.2 Usage-based insurance and related concepts and applications

The concept of usage-based insurance (UBI) defined in a broad sense includes all types of insurance policies where the usage of the insurance customer influences the price of the policy. Consequently, UBI must not by definition leverage telematics technology even though, the concept usually is used to refer to these types of systems today. This report is mainly focused on telematics-enabled usage-based insurance – commonly referred to simply as insurance telematics – based on various types of technology platforms. Insurance telematics itself further includes a range of subcategories which represent different degrees of sophistication in terms of the telematics data collected and how it is used to influence policy pricing and customer driving behaviour. It is also possible to distinguish between usage-based pricing initiatives for underwriting purposes and claims-focused insurance telematics deployments focusing on claims management. Another important differentiation can be made between policies based on continuously recorded telematics data as opposed to limited review periods. There are also specific considerations for telematics programs targeted at individuals and companies respectively. Furthermore, there is a range of different value-added services that can be delivered on the same platforms as insurance telematics.

Figure 2.2: Subcategories of usage-based insurance and insurance telematics



Source: Berg Insight

2.2.1 Manual reporting

The simplest form of usage-based insurance only considers usage in the form of the distance driven by the insurance customer over a time period such as a policy period. This data point can easily be collected manually by the customer from the vehicle's odometer and declared to the insurance provider at decided-upon intervals such as when the policy is renewed, as well as in case of specific events – for example when filing an insurance claim. The price of the insurance policy is typically also dependent upon traditional rating variables, whereby the price per kilometre or mile can be based on for example demographics of the driver and attributes of the vehicle. The basic idea is nevertheless that the customer pays a price for the automotive insurance that is related to how much the vehicle is driven.

A predetermined number of kilometres or miles is generally included – as a monthly, quarterly, semi-annual or yearly allowance – based on the estimated driving needs when signing up for the policy. Exceeding the allowance results in a higher price whereas driving a shorter distance than anticipated can indicate that a policy including fewer kilometres or miles – and hence a lower price – would be more suitable when renewing for a new policy period. Being rewarded with reduced premiums for annual mileage that falls under a certain threshold is commonly referred to as low-mileage discounts.

A disadvantage with UBI policies based on self-reporting procedures relate to customer honesty. The ease of manipulating the data can make it hard for insurance providers to detect and manage fraudulent behaviour. Among the few applicable measures available to insurance providers seeking to foster honest data collection are random and targeted controls performed to check up on customers' actual odometer readings. Additional efforts aimed at alleviating the issue of inaccurate reports of driving distance include providers requiring documentation of the current odometer readings in the form of photos taken by the insurance customers. The manual reporting method is however still susceptible to fraud as also photos can convey inaccurate or outdated information.

2.2.2 Usage-based insurance telematics – PAYD, PHYD, MHYD, TBYB

Telematics-enabled UBI or insurance telematics includes various types of usage-based insurance policies where the customers' premiums are dependent on data collected through the use of telematics technology in the vehicles. Subsets of insurance telematics which have

been popularised over the years include Pay-As-You-Drive (PAYD) and Pay-How-You-Drive (PHYD) as well as the more recent Pay-Per-Mile and Manage-How-You-Drive (MHYD). These concepts represent varying levels of sophistication in terms of the application of telematics and there are also significant variations within the four categories. Along with the increased use of smartphone applications within insurance telematics, Try-Before-You-Buy (TBYB) has been established as an increasingly common concept.

PAYD – Pay-as-You-Drive

The first type of usage-based insurance telematics that was introduced on the market is Pay-As-You-Drive. PAYD is similar to UBI policies based on manual self-reporting of odometer readings in the sense that the key variable influencing the insurance premium in addition to conventional parameters is the distance driven during a time period. The main difference is that PAYD rationalises the data collection process by logging the mileage automatically through the use of telematics technology such as on-board devices. The data is most often transferred wirelessly and used by the insurance company to determine individual premiums based on driving distances. Early implementations did however not include wireless connectivity, thus demanding retrieval of the data from the devices at specific intervals.

Tiered plans with different levels of kilometres or miles are often offered also by the PAYD providers that use telematics. Evaluating actual mileage compared with the monthly or yearly allowance included in a customer's insurance policy is simplified compared with manual reporting procedures as the data is always readily available. The customer can be informed in near real-time of the current status of the remaining driving distance – for example through an online dashboard – and adjust the driving patterns accordingly. Exceeding the mileage allowance can result in additional charges and the policy may for example be topped-up with additional miles or kilometres when needed, whereas low mileage can be rewarded by a reduced insurance premium. PAYD policies however generally only take into account the distance driven whereas the driving behaviour has no bearing on the insurance premium.

Pay-Per-Mile

A pricing model in many ways similar to PAYD is the more recent pay-per-mile insurance offered by a number of insurers in both North America and Europe. Premiums are charged based on distance driven, but rather than using a top-up system where the customer buys a

few thousand additional miles at the time, drivers on a Pay-Per-Mile policy are charged a small fee per mile. This is usually done in addition to a fixed monthly or yearly fee which can include a low number of free miles. Typical rates for additional miles are a few cents per mile. Both the base rate and mileage rate are commonly determined based on traditional factors used for policy pricing such as age, type of vehicle, place of residence and driver history. Some insurers have furthermore placed a daily cap on the mileage charge to reduce the cost for long journeys.

PHYD – Pay-How-You-Drive

The second generation of usage-based insurance telematics, Pay-How-You-Drive, extends the PAYD concept by also taking into account driving style and behaviour in addition to mileage when determining insurance premiums. The behaviour-related parameters are similarly to the driving distance collected using telematics solutions in the vehicles that can incorporate functionality such as accelerometer and additional sensor capabilities. This enables the collection of driving behaviour data related to for example acceleration, braking, speeding, cornering and lane changing. Additional data points such as time of day, day of week, location, driving area (e.g. urban or rural), trip duration, road types, route choices, possible collision data, airbag deployments and other aspects related to where, when and how trips are performed can also be logged in a database. Rating of drivers is done by applying algorithms to the individual driving data sets to attach a risk profile to each driver, which affects the insurance premium. Aggressive behaviour like frequent rapid accelerations, harsh braking and fast lane changing is detrimental to the driver's rating whereas safe driving traits result in an improved score.

Insurance customers with PHYD policies are commonly rewarded with premium discounts in return for exhibiting safe driving behaviour. The behaviour is evaluated by the insurer which determines a percentage to be deducted from the premium. This adjustment can occur either at set points during the policy period (e.g. monthly or quarterly) or at renewal. Instead of premium discounts, insurers can opt to award safe drivers with non-monetary rewards such as an increase in the mileage allowance for policies with such limits. Better pricing conditions for top-up kilometres or miles is an additional model. The insurance provider often offers the possibility for drivers to track their ratings online, thereby encouraging policyholders to

improve the driving behaviour in order to achieve a larger discount or other rewards. Online dashboards or smartphone apps similar to the ones offering insight into the remaining mileage for PAYD customers can in the case of PHYD present significantly more detailed information like occurrences of frowned-upon behaviour including for example harsh braking events with associated time stamps. Insight into such data enables a degree of self-correction for the insurance customer, albeit only in a retrospective way requiring recollection of the events and the behaviour at the time.

MHYD – Manage-How-You-Drive

Next generation insurance telematics policies increasingly fall into the category of Manage-How-You-Drive. This represents an evolution from the previous models which mainly employ passive data collection systems: Both PAYD and PHYD systems enable little interaction with the driver beyond the web-based dashboards insurers can make available to their customers for follow-up of mileage consumption and effects on ratings stemming from unwanted behaviours. MHYD generally includes all the basic characteristics of these previous models in terms of monitoring of mileage (PAYD) and driving behaviour (PHYD), while at the same time incorporating a considerably richer component of driver feedback.

The systems aim to influence the driving style of the insurance customers in a more direct manner by leveraging additional technology such as in-vehicle interfaces to provide active feedback to the drivers. This crucial difference enables MHYD solutions to actually affect driving style to a far greater extent by serving constant reminders of undesired behaviour that help cement a safe driving style. Visual and audible alerts based on real-time data equip the drivers with immediate decision support to tweak behaviour in order to be better aligned with the safe driving characteristics that the insurance telematics systems seek to foster. Successful MHYD initiatives may even incorporate elements of gamification where drivers are rewarded points and awards when driving in a desirable way corresponding to low-risk behaviour, thus improving the insurance risk rating while at the same time introducing some entertainment as drivers compete to stay ahead of their peers. An important consideration for all types of MHYD solutions is to ensure that driver feedback is delivered in a non-distracting fashion, thus maintaining the driver's primary focus on the road.

TBYB – Try-Before-You-Buy

Try-Before-You-Buy is commonly used in a wide range of fields to denote the option for customers of trying out an offering before committing to the full investment associated with acquiring the product or service in question. In the insurance telematics setting, TBYB generally refers to initiatives enabling potential insurance customers to try out telematics-enabled insurance rating without first signing up for an actual policy.

TBYB is commonly enabled by scaled-back technology solutions – most often leveraging smartphone apps rather than dedicated on-board hardware – that log driving data in order to rate driving style similarly to full-featured insurance telematics systems. This ensures manageable costs for the insurer as well as low barriers for insurance customers due to the relative ease of providing and downloading an app compared with arranging the installation of an on-board system. Participating drivers' behaviour is subsequently mapped during a short period – for example defined by a number of kilometres to drive – whereby a preliminary scoring is determined. This offers both the insurer and the client a preview of the expected outcome insurance telematics would generate in a particular case. Depending on the result, this first driver behaviour rating may qualify the driver for an initial discount – which may later be extended – if signing up for a real insurance telematics policy with the provider. Insurers can also launch TBYB-type apps as a first effort in the insurance telematics space before (or even instead of) launching a full-blown program, thus enabling at least some degree of policy pricing differentiation. Some insurers have launched TBYB apps which customers can use to qualify for discounts on non-UBI policies.

Due to the low cost of enrolling additional users on a smartphone app, TBYB offers are not necessarily time restricted or even offered by an insurance company. Apps can be marketed as driving behaviour or driving improvement tools where the user can choose either to sign up for discounted auto insurance or to continue using the app without a connected policy.

2.2.3 Continuous and time-limited telematics data recording

While usage-based insurance can be divided into policies based on manual reporting on the one hand and insurance telematics on the other hand, it is further possible to categorise insurance telematics programs based on how telematics data is collected. Most often, vehicle

telematics in general refers to a range of different solutions enabling continuous monitoring of vehicle locations and other data in real-time. In many markets, the common perception of insurance telematics is similarly that the prerequisite vehicle usage and driver behaviour data is collected continuously over time. The data sets are evaluated at specific points in time to determine the risk ratings and associated premiums and discounts, but the data collection continues permanently – at least until the policy is cancelled – thus constantly enlarging the database of driving data for each insurance customer.

Telematics-based insurance offerings can however also be based on data collected only during a limited period of time such as a policy period of six months or even shorter. After the review period is completed, an individual insurance price is determined based on the behaviour and usage patterns exhibited during this particular time period. Arguments against this type of insurance telematics policies relate to the fact that a few months of data naturally is limited compared with the ever-increasing data sets collected from continuous data recording. There is also the chance that drivers alter their behaviour to appear low-risk during the review period. The benefits are instead related to reduced hardware costs as the same device can be reused for several insurance customers – this is sometimes referred to as a “roll-over model” – as well as lower costs of storing and managing the data. Additional counterarguments against critics include that fact that six months of behavioural data is infinitely more than what is leveraged in the case of traditional insurance policies that only calculate risk ratings based on proxies such as demographics and other non-individual factors. Risk rating algorithms can thus be used to extrapolate useful indications of future behaviour also based on data from a time-limited recording process. TBYB insurance telematics apps represent a special example of time-limited data recording alongside full UBI programs based on this principle.

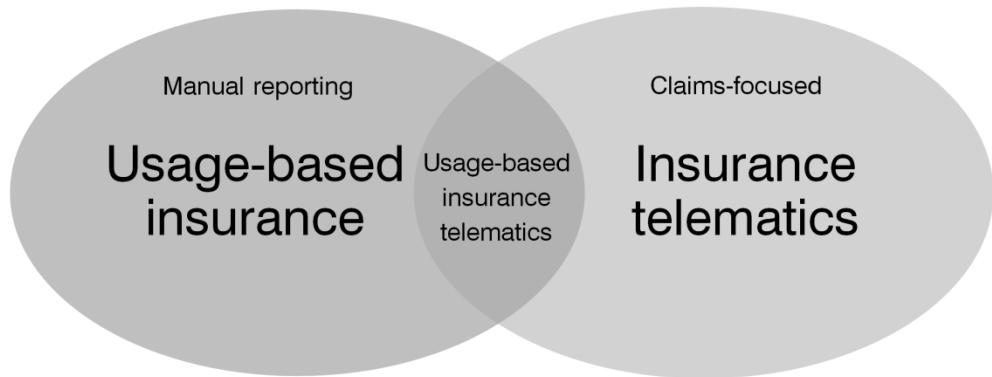
There are furthermore a few examples of smartphone-based programs where participating drivers are only required to use the mobile app for an evaluation period. In this case, advantages include a simpler customer experience where the customers do not need to use a smartphone application for the duration of the policy period.

2.2.4 Usage-based pricing vs. claims-related insurance telematics

Insurance telematics and usage-based insurance are commonly seen as synonymous. Similarly to how it is possible to take advantage of usage-based pricing without using telematics (e.g. by using manual mileage reporting methods), it is however furthermore possible to beneficially deploy telematics technology in an insurance setting without actually aiming to offer usage-based pricing to the policyholders. An important distinction can thus be made between usage-based and claims-focused insurance telematics. Usage-based insurance telematics includes the increasingly established subsets of PAYD, PHYD and MHYD that are directly related to policy pricing mechanisms from an underwriting perspective, whereas claims-focused insurance telematics initiatives generally have a different approach.

A common rationale for insurers to introduce telematics in certain markets is to use the data for claims management. While installing a telematics device in these cases can grant policyholders a discount on their premiums, this is commonly a flat discount that is equal for all eligible customers. This is thus not an example of usage-based pricing per se, as the driving behaviour is not generally linked to a variable premium rate. Claims-focused insurance telematics initiatives are instead for example launched in order to enable automated claims processing, enhance risk management and combat fraud. The telematics data can for example be used to validate incident reports in the claims management process and detect fraudulent behaviour, e.g. through simulation. It is also possible to leverage the data to detect events such as accidents when they occur and take relevant actions that improve the service level and efficiency of handling events. Next-generation proactive FNOL capabilities can be enabled through real-time analysis of telematics data, thus making it possible for insurers to deliver value-added services following an accident. The insurer can reach out to the driver immediately and emergency personnel and towing services can for example be contacted depending on the severity of the event, thus contributing to an improved customer experience. The telematics data can moreover be used to construct detailed crash reports without having to wait for the policyholders to report the incidents, whereby the insurer can improve response times and streamline the claims process.

Figure 2.3: Schematic classification of usage-based & claims-focused insurance telematics



Source: Berg Insight

Usage-based and claims-focused insurance telematics initiatives do not however need to be mutually exclusive. Once the telematics infrastructure is in place for either alternative it is generally possible to diversify into the other area by using the telematics data streams in new ways. One exception is usage-based pricing initiatives based on time-limited monitoring periods, as claims-related functionality generally would demand continuous access to telematics data over time in order to be able to investigate and monitor specific events. Otherwise, there are several examples of insurers with an initial focus on claims which have also launched usage-based pricing, whereas some UBI insurers have ventured into telematics-enabled claims and FNOL management functionality as well. Broadening the use of telematics data beyond the initial strategy can realise synergies including cost-related benefits and contribute to improved ROI for insurers.

2.2.5 Personal lines and commercial lines insurance telematics

The distinction between personal lines insurance for individuals and families on the one hand and commercial lines insurance for commercial businesses and professionals on the other hand is relevant to take into consideration also from the perspective of insurance telematics solutions. Insurance telematics is today more commonly associated with personal lines insurance, often targeting specific groups of people such as young drivers. Recruiting personal lines customers to sign up for insurance telematics policies will in most cases demand equipping vehicles with prerequisite telematics technology enabling driving data

collection. An educational process may also be needed to familiarise the customers with the telematics concept in general and insurance telematics in particular. Exceptions in terms of awareness as well as technology needs may include individuals owning vehicles with aftermarket car telematics systems already fitted or OEM systems like Subaru STARLINK and GM's OnStar. An increasing number of telematics programs are compatible with such telematics systems and can source the driving data directly without the need for additional installations.

In the case of commercial lines insurance, the potential clients for insurance telematics policies are in many cases more aware of the telematics concept and a fair share already have on-board systems installed for fleet management purposes. These systems may in some cases even be possible to leverage directly for insurance telematics data collection. This compatibility is fostered by the fact that a range of the traditional fleet management providers have diversified into the adjacent field of insurance telematics. Fleet insurance telematics still remains a relatively small market, however with promising potential given the success of conventional fleet management systems primarily aimed at improving efficiency, productivity and safety of drivers. The overlap with insurance telematics applications is significant and risk reduction is naturally also a desirable outcome among fleet managers. Key fleet management functionalities include remote monitoring of vehicle routes, driver behaviour logging and in-cab feedback to drivers, which are all akin to insurance telematics including PAYD, PHYD and MHYD. In most respects, driving in an optimal way from a fleet management perspective will also generate a low-risk insurance rating, whereby discounts resulting from signing up for a commercial lines insurance policy that takes into consideration telematics data can become an added bonus for a company using advanced telematics technology.

2.2.6 Value-added services related to insurance telematics

The technology used to enable usage-based policies such as PAYD, PHYD and MHYD is generally deployed with the primary purpose of enabling the data collection necessary to rate drivers in terms of vehicle usage and driving style. The telematics platforms associated with these initiatives as well as claims-focused insurance telematics deployments can however most often also be leveraged to deliver a wide range of value-added services (VAS) to the insurance clients. This type of related diversification has in many cases grown to become a

lucrative business for players active in the field as it can offer greater possibilities for differentiation than the actual insurance offerings. Increased customer loyalty and retention can thus be fostered alongside new revenue streams.

Examples of value-added telematics services that can be promising opportunities include:

- **Vehicle locator functionality** – Basic versions of such services enable the customer to more easily locate the vehicle, for example at a large mall parking lot. Additional features can include notifications if the vehicle is moved, e.g. without permission from the owner, as well as geofencing with associated alerts. Sensors can moreover detect if vehicles are subjected to strong impact while stationary and inform the owner.
- **Stolen vehicle tracking and recovery (SVT/SVR)** – These specific telematics services are related to detecting vehicle theft, often leveraging round-the-clock call centres. SVT services pinpoint the location of stolen vehicles and SVR service providers also engage in retrieving the vehicles and returning them to the owners independently using in-house personnel or in collaboration with law enforcement.
- **Remote vehicle diagnostics** – Telematics is leveraged to identify arising vehicle issues in real-time, thereby enabling preventive maintenance as well as requisite service in a timely manner. Value-added services can in addition to identification of for example engine malfunctions and fault codes also include assistance in resolving the issues through collaborations with preferred partners such as workshops.
- **Roadside assistance** – Customers can be offered assistance in case of emergencies or breakdowns. Examples of services that may be offered include towing, tyre changes, winching, jump-starts, fuel delivery and lockout entry assistance. The telematics platforms deployed for insurance purposes can be leveraged to accurately locate vehicles in need of help.
- **Driver behaviour monitoring** – Monitoring a driver's behaviour behind the wheel generates information that can be of interest beyond the mere insurance risk rating process. The same data sets can also be used to coach drivers in terms of

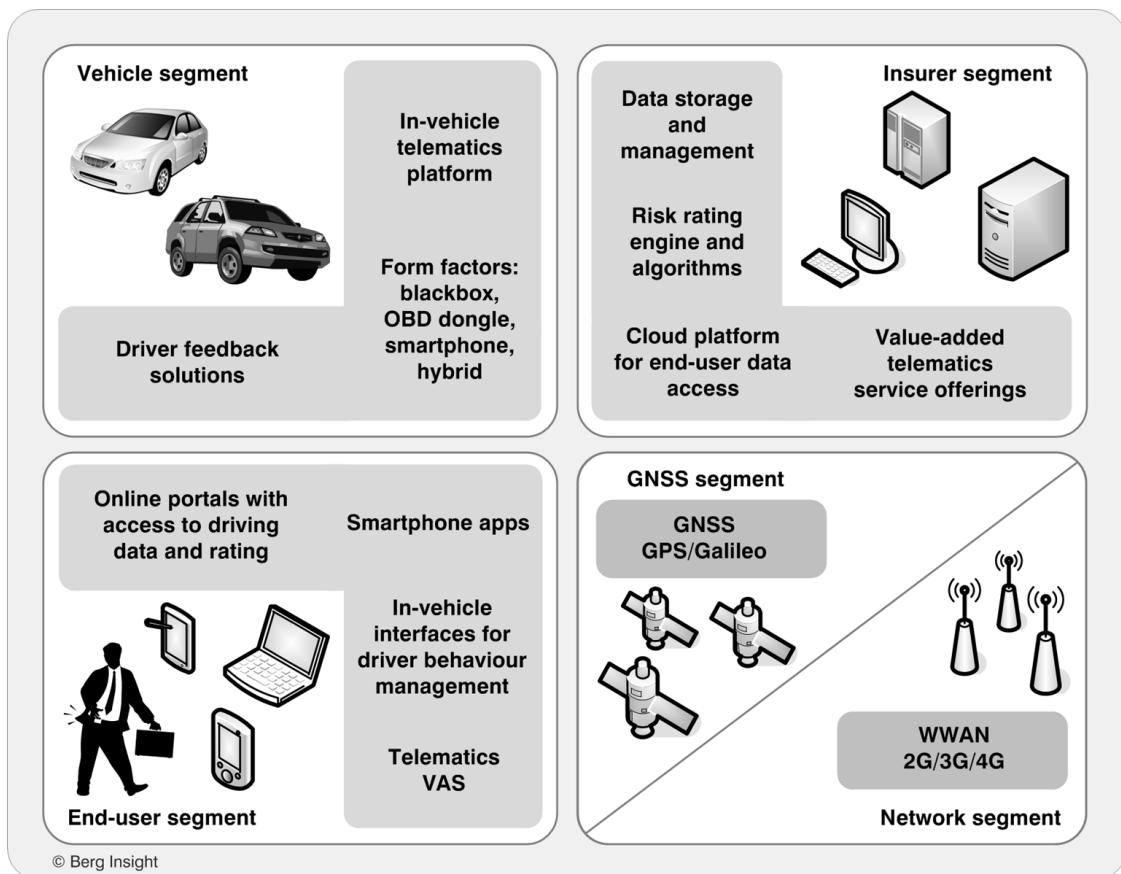
environmental impact, fuel economy and safety – and low-risk behaviour from an insurance telematics perspective generally corresponds to safe, economic and eco-friendly driving. Services related to driver behaviour monitoring can include direct in-vehicle speeding, idling and harsh braking alerts, MPG tracking and carbon footprint reports with associated training initiatives.

- **Parental reporting** – This refers to a specific application of driver behaviour monitoring where the driving habits of young drivers are mapped and reported to the parents. Such services can provide insights into mileage, speeds and even locations that have been visited, enabling corrective actions in case of unwanted behaviour.

These value-added services are primarily compatible with insurance telematics programs employing continuous monitoring as opposed to time-limited evaluation methods. Additional examples of services enabled by on-board technology and real-time tracking include concierge services, infotainment and location-based services such as travel tips, street sweeping alerts and real-time traffic information including road conditions. Many insurance providers offer various types of VAS to their clients opting for insurance telematics policies. Third parties with expertise in specific application areas can be leveraged by insurers choosing to focus more closely on the core competencies related to auto insurance. The commonalities with more traditional telematics applications are at the same time also attracting telematics experts to diversify into the field of insurance telematics, including both TSPs and OEMs that have experience from these types of VAS.

2.3 Insurance telematics infrastructure

A range of infrastructural components are demanded to deliver usage-based insurance policies that leverage driving distance and behaviour related telematics data from the policyholders' vehicles to enable individualised automotive insurance pricing. The same goes for initiatives focused on collecting telematics data for claims purposes.

Figure 2.4: Insurance telematics infrastructure overview

At a high level, the infrastructure for insurance telematics can be divided into five segments:

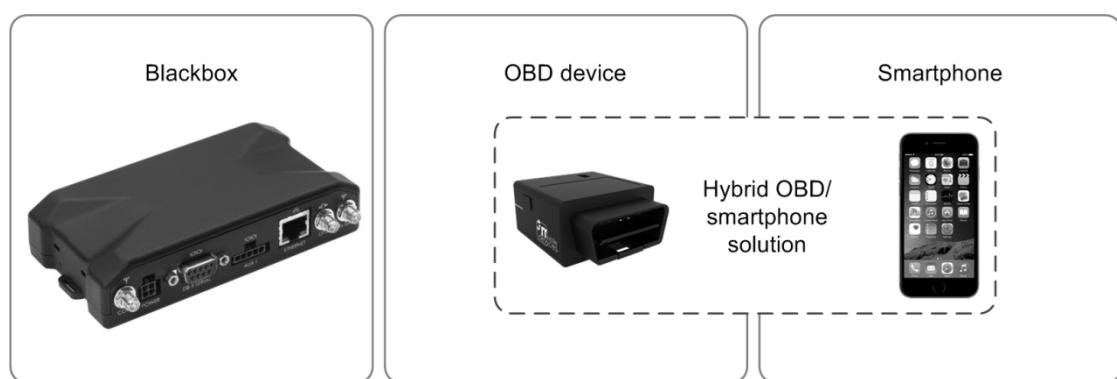
- **Vehicle segment** – The participating vehicles are equipped with telematics platforms featuring wireless communication capabilities and various sensors used to log driving behaviour data. A range of different form factors are available for insurance telematics applications.
- **Insurer segment** – The collected driving data is aggregated and stored in a database. The data sets are subsequently analysed to determine individual insurance policy pricing levels and can also be used for management of claims.

- **End-user segment** – The end-users can access driving data and ratings through web portals and mobile apps. In-vehicle interfaces can influence the drivers to adjust driving behaviour in real-time.
- **Network segment** – Wireless wide area networks are used by telematics solutions for data transmission. Cellular networks such as 2G/3G/4G/5G are most often used by insurance telematics systems.
- **GNSS segment** – Insurance telematics systems can if relevant rely on global navigation satellite systems such as GPS for accurate positioning of the policyholders' vehicles.

2.3.1 Vehicle segment

All insurance telematics solutions require some kind of on-board system deployed in the vehicle to log vehicle usage including mileage and often also driver behaviour data such as parameters related to acceleration or braking. There are many different form factors applicable for insurance telematics offering varying levels of functionality, data accuracy and driver feedback elements. It is not uncommon for insurance telematics providers to support multiple telematics platforms including different form factors as part of the same program.

Figure 2.5: Examples of principal insurance telematics form factors



Source: CalAmp, Mobile Devices and Apple

Black boxes

A traditional form factor for telematics applications in general is the hardwired black box which entails a ruggedised device that is permanently fitted at a concealed location inside the vehicle. Black boxes commonly feature integrated satellite positioning, data logging and wireless data communications. Accelerometers and various sensors can also be integrated. The devices can further be connected to various vehicle interfaces including CAN/FMS/J1939 enabling collection of operating data such as engine, brake and transmission data from the in-vehicle electronics systems. These types of parameters are especially interesting for fleet management purposes such as remote monitoring of truck performance. Many insurance telematics providers however also leverage black box solutions of various kinds for vehicles including passenger cars as well as commercial vehicles. Black boxes are offered by aftermarket providers for retrofitting as well as to vehicle OEMs enabling factory fitting of telematics devices either as standard or as an option. Both aftermarket and OEM-provided black boxes can be leveraged for insurance telematics purposes depending on the specific program.

OBD devices

Common insurance telematics devices moreover include OBD devices that are connected directly to the OBD-II port which is available in essentially all cars and light trucks in both Europe and North America, including also hybrids and electrical vehicles. The interface was developed for emission monitoring, but it is also possible to access a limited set of general parameters such as vehicle speed, engine RPM and run time since engine start. OBD devices generally enable easy self-installation as the port must be located in the driver's cabin within three feet of the steering wheel and be accessible without tools. The devices moreover have a very limited hardware footprint and rarely disturb the driver's environment – many are even fully concealed behind the flap or similar covering the port. From an insurance telematics perspective, OBD devices otherwise support much of the functionality enabled by black boxes even though some of the diagnostics features are restricted. Benefits include a significantly lower overall price point compared with black box alternatives. The plug-and-play nature of the installation process is easy for the consumer which means that professional installers need not be involved in the setup.

Hybrid OBD/smartphone solutions

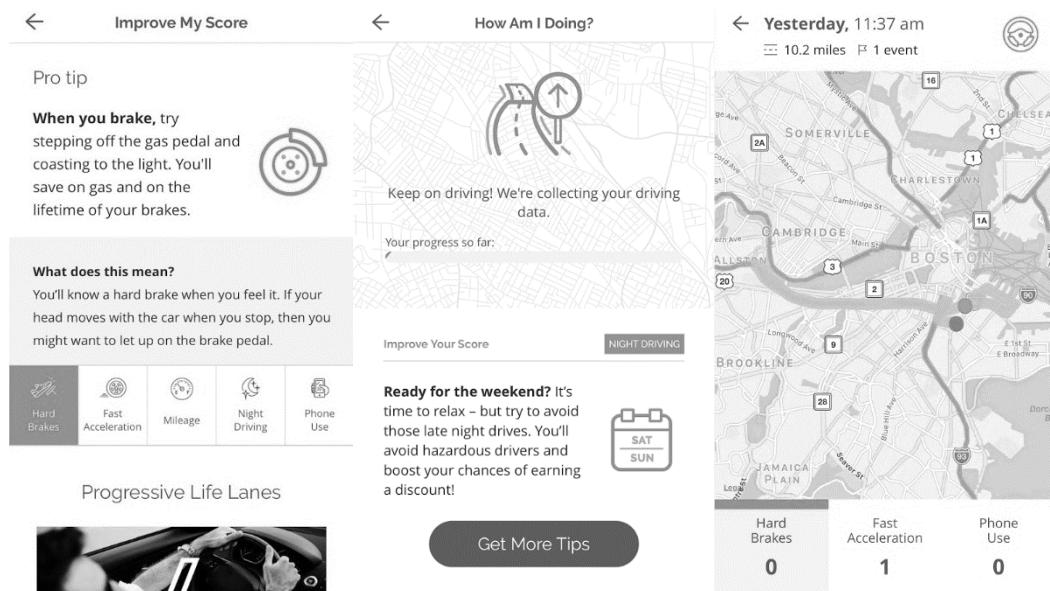
OBD devices are available in two broad categories in terms of communication capabilities – embedded or tethered connectivity – denoting the way telematics data is transferred from the vehicle to the back-office database. The former has a built-in modem with a dedicated SIM similarly to a black box while the latter lacks integrated communications capabilities. Tethered solutions are instead paired with existing mobile devices such as smartphones or potentially tablets – commonly via short-range technologies like Bluetooth and NFC or even Wi-Fi using hotspot modes – and leverage the communications networks of the mobile devices. This form factor – hybrid OBD/smartphone solutions – may be somewhat less robust than systems based on telematics devices with integrated wireless communications. Losing the pairing with the mobile device can cause data transfer to be delayed until a connection is once again established. On the other hand, usage-based insurance solutions will in many cases not be as dependent on near real-time data as other telematics applications since the actual risk rating is commonly only performed a few times per year at the most. Possible driver feedback solutions, claims-related applications and VAS offerings may however be more sensitive. A major benefit of the hybrid approach is that communications costs are reduced significantly when the insurance telematics solution can share the policyholder's existing smartphone data plan.

Smartphone-only solutions

During the past few years, mobile devices such as smartphones, have been increasingly integrated as part of the insurance telematics infrastructure, not only as communication enablers working in tandem with Bluetooth-enabled OBD dongles and similar, but also as independent solutions for driving data collection. Smartphone-only solutions have been available since 2010 and have become increasingly popular during the past years. Standard mid- to high-end smartphones are most often equipped with the key hardware elements of a telematics system such as GPS, data storage, gyroscope and accelerometer in addition to the mobile communications capabilities. The data generated through smartphone-only solutions is so far generally not as uniform as the equivalent collected by dedicated on-board telematics devices, though efforts are being made to enable collecting higher quality data through mobile apps. A major challenge is to record the characteristics of a car journey accurately and automatically while also avoiding significant battery consumption. Unless

driving trips are manually started and ended by the driver, the app needs to be constantly active and hence decrease the battery life leading to a negative customer experience. Another challenge is to distinguish between trips that should be recorded and trips that should not be taken into account – for example taxi-, bus- and passenger rides.

Figure 2.6: Examples of feedback from Progressive's smartphone app Snapshot



Source: Progressive

Additional disadvantages of initiatives based on mobile devices are related to customer discipline. While hardware-enabled systems are relatively fool proof in the sense that data is collected and transmitted automatically, mobile solutions demand that policyholders bring their phones and may require that associated app-based elements are activated. Incentive structures must consequently be designed to foster accurate procedures among users. The way multiple drivers are handled is yet another topic of interest. Taken together, smartphone-only solutions come with possible downsides such as the limitations on data collection and accuracy. If comparing with the status quo of traditional automotive insurance policies,

mobile devices will however indeed contribute with at least a certain level of actionable driving data that can be leveraged by rating algorithms in addition to mere non-UBI proxies. The cost structure is at the same time highly compelling and can motivate smartphone-based programs as a valid option, at least for situations where it is aligned with the overall strategy and for specific target customers.

One key area where smartphones play an important role is TBYB initiatives where insurers offer teaser versions of its insurance telematics offerings to prospective customers before they fully commit to joining a program. Smartphones have however also made a broader entry for full-fledged insurance telematics programs, collecting the data that serves as critical input for real risk rating of customers. In the latter case, this is often combined with TBYB opportunities, where an app is available to anyone to download for free. After downloading the app, users can choose to only use the app for driving feedback or to sign up for a telematics program and obtain a discount based on their previous driving. Smartphones also enable the insurers to interact with their customers on a more regular basis through gamification elements and monthly rewards based on driving behaviour.

Bluetooth beacon enhanced smartphone solutions

The use of Bluetooth Low Energy (BLE) beacons is one of the most recent additions in terms of hardware used for telematics-based auto insurance. Beacons are small, low-cost and low-power devices that use BLE to transmit a signal that identifies the device and in some cases also provides information about its remaining battery life. BLE has a broadcast range of up to 100 metres. An approximate distance between the beacon and a mobile phone can be determined from the strength of the signal when received by the smartphone. A beacon left in the insured vehicle for the duration of the policy solves the issue of detecting when journeys start and stop, and avoids recording for example taxi journeys. The app simply starts to record driving when the beacon is detected and the smartphone is moving simultaneously. Battery drainage is also avoided as scanning for beacons usually run at an OS level and apps can be designed to only switch on when a beacon is detected. The logistics of shipping and replacing beacons will still have to be handled similarly to other self-install devices. However, beacons are very small and light in comparison and can typically be shipped at a very low cost. Furthermore, none of the installation and security issues associated with OBD devices exist for beacons since the device is not connected to the car.

Several different types of beacons are available and used for UBI and insurance telematics. Standard, off-the-shelf devices not originally intended for the insurance industry are typically powered by a simple button cell battery which will last for more than a year due to the low power consumption. These beacons are very low cost at around US\$ 5–10. The size is very small, typically a few centimetres in diameter. Some TSPs have also developed more advanced, battery powered devices specifically intended for the insurance industry. These can for example contain accelerometers and an internal memory that can store driving data when the driver's smartphone is out of range. However, internal sensors and a larger amount of transmitted data lead to higher power consumption, meaning that a more advanced device needs a larger battery. Adding sensors and a lithium battery makes these devices significantly more expensive.

Figure 2.7: Example of a windscreen-mounted Bluetooth device from CMT



Source: Cambridge Mobile Telematics

Windscreen-mounted devices

Telematics devices can also be mounted on the inside of the windscreen, providing a good, visible position for speakers and buttons used for additional functionalities such as eCall and bCall services. These can be powered by an internal battery or be connected to a power supply – typically the fuse box since other connections such as the 12 V socket (cigarette lighter receptacle) usually lose power shortly after the engine is turned off. Constantly connected windscreen devices can feature a backup battery to guarantee functionality in case of an accident. Disadvantages include the visible position in the vehicle, although this

can act as a reminder for the driver to drive carefully. However, due to their high visibility, windscreen devices are less effective for stolen vehicle recovery. Anti-tampering functionality is sometimes provided, meaning that a warning is transmitted to the insurer if the device is removed from the windscreen.

12 V socket devices

Essentially all cars have a 12 V socket, commonly called a cigarette lighter receptacle, easily accessible from both the driver and passenger seat. Since most hardware used for telematics-based insurance only requires a power supply, the 12 V socket can be used to connect a telematics device. This can be in the form of a small 12 V plug with internal sensors or a telematics box that is placed elsewhere in the car and connected via a cable to the cigarette lighter receptacle. Both solutions are suitable for installation carried out by the policyholder. In order to further decrease the price, the 12 V plug usually connects via Bluetooth to the driver's smartphone and hence avoids the need for an additional data plan, but could also include cellular connectivity. Devices can contain a battery, either to provide eCall services in case of an accident or to eliminate the need for a constant power supply by using a rechargeable battery. Typically, the sensors in the device include accelerometers, a gyroscope and a GPS receiver.

Figure 2.8: GDV-Stecker 12 V device provided by Bosch



Source: GDV

Disadvantages associated with this type of device are that it can easily be unplugged and that it occupies the 12 V socket. Most plugs are therefore equipped with a USB port, making it possible for the driver to use for example a phone charger even when the telematics device is occupying the cigarette lighter receptacle.

Additional form factors, devices and interfaces

There are also additional device types that can enable collection of vehicle usage and driver behaviour data. Examples include dashboard cameras, connected PNDs and other types of nomadic devices. In addition to the various data collection solutions, the vehicle segment can also include in-car feedback equipment such as driver displays showing comprehensible information aimed at encouraging low-risk driving behaviour. Small standalone devices with indicators such as red/amber/green lights and audible alerts triggered in case of unwanted behaviour can be integrated to help coach the driver. Driver feedback is furthermore possible to deliver on the policyholder's existing mobile device using smartphone apps if the device is mounted in a non-obtrusive way. This option is available regardless of whether the behaviour data for risk rating is collected using dedicated hardware or mobile devices.

Figure 2.9: Nextbase's Dash Cam 522 GW and Rear Window Cam module.



Source: Nextbase

Devices without any wireless connection but with an internal memory can furthermore be used to record data for insurance purposes. An OBD-device in a roll-over program does not

necessarily need to transmit data to the insurer. Instead, the recorded data could be analysed after the OBD device has been sent back by post. Another solution is crash recorders which are based on a similar idea to black boxes in airplanes. This type of device has no wireless connection and usually overwrites data continuously so that in the event of a crash, only data from about 30 seconds before the crash and 10 seconds after the crash is stored. Recorded driving and crash data can then be used to settle any claims related to the accident.

2.3.2 Insurer segment

The insurer segment of a telematics-based insurance solution starts at a back-office data gateway where all communication from the vehicle telematics systems converges. Data collected from the individual vehicles such as mileage, driving times and events including speeding, harsh braking and cornering is collected, aggregated and stored in a database for further processing and analysis.

Figure 2.10: Schematic insurance telematics risk rating process



Source: Berg Insight

For underwriting purposes, the primary use of the collected telematics data is to refine the risk profiles of the drivers and determine associated policy pricing. The telematics data is used in combination with the traditional rating factors including proxies related to driver demographics and vehicle attributes. Insurance risk rating engines run the data points through rating algorithms incorporating predictive capabilities to determine optimal premiums for each policyholder. The models and constituent algorithms can be gradually refined to better represent true risk characteristics as the insurer accumulates a greater data set. Not

only individual data but also the driving data of other policyholders can be used to continuously improve the rating mechanisms. Each player can devise its own set of proprietary algorithms whereby the same driving behaviour may be rated slightly differently depending on which specific insurer's program a policyholder participates in. The telematics data available to most players may not yet fulfil the high standards in terms of quality and quantity of data that insurers usually have access to due to the relative newness of insurance telematics compared with the traditional rating variables. The data sets are however improving at an ever-increasing pace as more driving data is collected. Working with vendors offering off-the-shelf scoring solutions designed to quantify risk from behaviour data can enable insurers to run initiatives without first having to gather or model reference data internally. It is however important for insurers to develop an understanding of the scoring solutions that may eventually lead to the in-house development of tailor-made proprietary scoring algorithms. Pricing algorithms are moreover in some cases made available in the public domain whereby insurers can find useful structures to use as a starting point for new initiatives. Also, academic studies on the relationships between driving behaviour, accidents and policyholder characteristics can be useful inputs when developing pricing algorithms.

In the claims management process, telematics data can be used to streamline activities by eliminating manual tasks and automating the processing of insurance claims and consequently shortening the claims lifecycle. The telematics data can for example be used by the insurers' systems to investigate incidents in relation to policyholder reports, thus enabling detection of fraud associated with false claims. Simulations can be performed by combining the telematics inputs (e.g., related to a crash) with other data sources to recreate scenarios and evaluate likely outcomes. It is also possible to initiate actions based on the data in real-time, including immediate FNOL based on crash notifications as well as initiation of emergency-related services if deemed necessary. Having access to richer data about events such as accidents also enables insurers to employ better triage of claims which can contribute to improved efficiencies and resource prioritisation.

In addition to underwriting and claims processes such as risk rating and management of incidents, the insurer segment of the insurance telematics infrastructure also includes cloud platforms and various interfaces enabling the provision of end-user access to relevant

information. Policyholders are often granted access to a range of key performance indicators (KPIs) via web-based portals and similar. This can have CRM-related benefits as most policyholders otherwise rarely interact with their insurers on a regular basis, unless filing a claim or renewing the policy. The back-office elements of the various value-added services associated with many insurance telematics programs can also be part of the insurer infrastructure segment. The management of such VAS offerings is however commonly outsourced to specialised third-party partners while insurers focus on the automotive insurance aspects.

2.3.3 End-user segment

Many usage-based insurance telematics programs are targeted to specific subsets of policyholders such as young drivers. Well-performing drivers in general high-risk groups often have the potential to realise considerable savings. The individual insurance telematics policyholders themselves have come to represent an increasingly important segment of telematics enabled UBI offerings. Interaction with the drivers has become significantly more sophisticated as insurance telematics solutions increasingly have progressed from pure PAYD policies based on driving distance, to PHYD which also leverages driving behaviour, followed by MHYD initiatives aimed at positively influencing the drivers through direct feedback. Various value-added telematics services offered to policyholders alongside mere automotive insurance have moreover started to become important differentiators.

In the early days of UBI, the toolbox for driver interaction or feedback was essentially limited to communication by mail of the latest rating and associated policy pricing based on how much the policyholder had driven the vehicle. Subsequent additions include web portals granting policyholders access to select data such as logs of driving distances and data on risky manoeuvres, thus increasing the transparency and customer insight into the rating mechanisms and encouraging self-correction. There are also web-based tools for driving training, sometimes launched as part of programs targeted towards teens and other drivers with less experience in handling common high-risk situations.

Figure 2.11: Web- and smartphone-based interfaces and dashboards for end-users



Source: Hastings Direct & Ingenie

A lot of innovation is taking place in the area of mobile app-based feedback where information on driving behaviour and associated corrective measures are delivered through applications for the leading smartphone and tablet platforms such as Android and iOS. State-of-the-art insurance telematics programs take the driver interaction element to a new level by introducing in-vehicle feedback solutions based on hardware and software solutions incorporating sounds and visual components to influence driving style in real-time.

2.3.4 Network segment

Wireless cellular technologies were initially designed to carry voice traffic, but with the rapid adoption of the Internet, wireless networks became an interface also for accessing data services for users on the move. Today, the leading standards include GSM/HSPA/LTE maintained and developed by the Third Generation Partnership Project (3GPP) collaboration group, as well as CDMA/EVDO which is maintained by the Third Generation Partnership Project 2 (3GPP2). CDMA/EVDO networks are primarily available in the Asia-Pacific region and North America, whereas GSM/HSPA networks are available globally. LTE has become the principal 4G mobile network technology, with coverage expanding rapidly worldwide. Moreover, LTE specifications are being developed to better support M2M/IoT and connected car applications where low cost, low latency and enhanced coverage are more important than peak data throughput.

2G mobile networks

2G mobile networks still provide coverage of most densely populated parts of the world's landmass, though network operators in an increasing number of countries have shut down or started to phase out 2G services to reallocate spectrum for 4G LTE and 5G services. At the end of 2020, 2G still accounted for 17 percent of the global mobile subscriber base of 7.9 billion. GSM/GPRS is the completely dominant platform, while CDMA only accounted for a few tens of millions of mobile subscribers, mostly concentrated to Asia-Pacific and North America. 2G has an even stronger position in the cellular IoT segment. At the end of 2020, there were an estimated 1.0 billion 2G cellular IoT connections worldwide, corresponding to a market share of about 56 percent. GSM/GPRS has regional market shares of 50–70 percent in the greater part of the world. The main exceptions are the US, Japan, South Korea and Australia where the transition to 3G and 4G LTE is either underway or complete. CDMA 450

MHz networks are deployed in some European countries as a dedicated platform for mobile data communications.

3G/4G mobile networks

3G/4G mobile networks are available in virtually all major population centres in almost 200 countries worldwide. The combined market share amounted to 79 percent at the end of 2020 and has increased steadily in line with global smartphone adoption. In the cellular IoT segment, 3G and 4G LTE connections accounted for an estimated 8 percent and 25 percent respectively. Since the mid-2010s, there has been an accelerating uptake of 4G LTE at the expense of 3G as prices of 4G LTE modules and communications services have become more competitive. Demand is primarily driven by the global automotive industry and uptake in non-2G markets. Apart from the high-speed variants of 4G LTE, 4G LTE Cat-1 comprises an attractive replacement for sunsetting 2G and 3G services next to LTE-M. The leading US operators early promoted the technology. In China, LTE Cat-1 uptake is expected to increase significantly as the major domestic mobile operators have opted for LTE Cat-1 as a complement to NB-IoT.

5G mobile networks

5G services are commercially available in large parts of the world and 140 networks had been deployed in close to 60 countries and territories at the end of 2020. The first deployments of 5G mobile networks are focused on enhanced mobile broadband services. These deployments are based on the non-standalone (NSA) configuration that rely on the 4G LTE core network. Advanced network operators started to deploy 5G standalone (SA) networks in 2020. At the end of the year, 5G had a market share of close to 3 percent of all mobile subscriptions. The technology accounted for less than 1 percent of all cellular IoT connections. The main factor delaying the adoption of 5G in the IoT market is the lack of devices. Following the commercial availability of 5G modules supporting eMBB use cases in mid-2020, only a few IoT device vendors have introduced 5G devices in the marketplace to date. These include IoT gateway vendors, as well as a number of car makers in China. A wider range of IoT devices based on 5G chipsets and modules are expected to reach the market in 2022.

2.3.5 GNSS segment

One of the key elements of telematics applications in general is satellite positioning based on Global Navigation Satellite Systems (GNSS) such as GPS. Logging of GPS data is however not a prerequisite for insurance telematics and several providers of telematics-enabled usage-based insurance have even actively stressed that they have chosen not to collect vehicle location data in an effort to circumvent customer privacy concerns. As the main focus is on driver behaviour such as braking and acceleration patterns, data from sensors such as accelerometers is often of more importance than the actual physical position of the policyholder's vehicle. There are however also numerous examples of insurers that leverage GPS data in insurance telematics contexts. A basic example is to simply leverage logs of GPS locations to determine mileage for insurance premium calculations, i.e. the key UBI variable used in PAYD programs. The location data can in addition for example be used to determine the road types a policyholder is driving on as well as the proportion of driving taking place in rural and city environments respectively. These aspects can all be indicative of risk and there may even be specific locations flagged as particularly high-risk from an insurance perspective. GPS locations can also be matched with traffic reports to provide an understanding of certain contextual factors which might explain certain driving behaviour.

There are four global navigation satellite systems (GNSS) in operation or development. They are GPS operated by the US military, GLONASS operated by the Russian military, Galileo developed by the European Union as a civil project and Beidou deployed by China. Today, GPS is used for the vast majority of all civil applications worldwide. All four systems are designed to provide global coverage separately or in conjunction. The availability of multiple satellite navigation systems has many benefits for end-users. More satellites will be visible from more locations at any given time to ensure accurate positions. Service availability increases as more independent systems become available.

All global navigation satellite systems have similar system architectures. The Space Segment consists of the satellites placed in several orbital planes about 20,000 km above the ground, circling the earth in roughly 12 hours. Between 21 and 27 operational satellites are used to ensure that at least 5 satellites are visible from almost any location on earth at all times. The Control Segment consists of a Master Control Station, several Monitoring Stations and Ground Antennas. The GPS master control station in Colorado Springs in the US and is

responsible for the overall management of the GPS system, using information from the six monitoring stations around the world that oversee the exact positions, velocities and health status of the satellites. Ground antennas track the satellites from horizon to horizon and transmit correction information to satellites. Finally, the User Segment includes military and civilian receivers used for position and time determination in diverse applications ranging from navigation, surveying and geology to telecommunications.

2.4 Business models

Insurance providers seeking to offer telematics-enabled UBI policies and related offerings can apply a number of different routes to market. Three stylised alternatives can be identified which represent highly different levels of involvement and investment in the insurance telematics space. The alternatives vary significantly in terms of the commitment to telematics-based insurance, the share of outsourcing and in-house development respectively, as well as the exposure and brand recognition established among the actual insurance telematics clients. One must bear in mind that the real-world strategies of insurance providers can include elements of more than one of the strategies, which define a gradual scale in terms of strategic intent for the insurance telematics space.

Figure 2.12: Telematics strategies for insurance providers



2.4.1 In-house development

At one extreme end of the spectrum are fully in-house developed insurance telematics solutions. This corresponds to the most comprehensive involvement and insurance companies choosing the in-house strategy indeed have to make considerable investments in terms of time and resources. Benefits include deep understanding of the market and strong relationships with clients as the insurance provider is the only point of contact for the policyholder. The insurance company develops and runs the insurance telematics initiative in-house including the risk rating algorithm and the telematics data collection process that feeds into the rating.

Fully in-house developed solutions are for obvious reasons uncommon – or even non-existent – as even the most involved insurance providers leverage suppliers to varying extents. It is for example naturally commonplace for insurance players to source telematics hardware from established device manufacturers. Also, various back office components such as databases and cloud technology are normally acquired from specialised software players that generally serve multiple industries with standardised and customised solutions.

2.4.2 Leveraging telematics partners

Aside from insurers working with partners that supply constituent elements such as telematics devices and back office components, there is a wide range of insurance providers opting to collaborate more closely with telematics service providers (TSPs). Various TSPs are active on the market including players offering general purpose telematics solutions that can be leveraged for telematics-based insurance initiatives, as well as specialised niche players working specifically with clients on the automotive insurance market. These types of players can offer partial and full outsourcing of telematics-enabled initiatives such as UBI to insurance providers.

Some TSPs have been established as the go-to providers that can handle the entire technical and operational side of insurance telematics policies as a fully managed service. The offering can include everything from telematics hardware devices, data management systems and risk rating engines with associated algorithms to smartphone apps, gamification elements, in-vehicle solutions for driver feedback and cloud portals offering customers access to current

ratings. The insurance provider and the TSP can choose to jointly share the customer-facing elements of the insurance telematics initiative from a marketing perspective. It is for example common that the brands are positioned in a way that shows that the policy is offered by an insurance provider and is powered by a TSP. There are also true white-label agreements where the TSP works solely in the background and the end-user is only exposed to the insurance provider's brand.

2.4.3 Underwriting without direct client interaction

At the other extreme end of the spectrum of telematics strategies for insurance providers is the alternative that requires the lowest level of commitment and investment. Instead of launching an insurance telematics product of its own, an insurance company can provide only the underwriting capacity for another company that offers policies directly to end-users. While being a comparably simple and low-stakes way of entering this marketspace, it also comes with the general downside of involving no direct client relationships and thus limiting brand exposure and associated awareness that may be highly valuable from a loyalty and customer retention perspective. One can however argue that the strategy of providing underwriting capacity to another player can be a fruitful way for incumbents to try out insurance telematics, potentially as a first investigative step before fully committing to launch their own programs featuring telematics-based policies.

Chapter 3

The European insurance telematics market

3.1 Regional market characteristics

Europe was during 2015 surpassed by North America in terms of the number of active telematics-based insurance policies. Pioneering markets in Europe include Italy and the UK, but countries such as Germany, Spain and France have in recent years started to see a significant uptake. Italy has by far the highest market penetration in the world and is the second largest market in terms of number of policies, after the US. By the end of 2020, there were an estimated 9.7 million active telematics-based policies in Italy and 1.3 million in the UK. The growth in Italy and the UK have been driven by relatively different market forces. The uptake of insurance telematics on other markets in Europe is increasing but from low levels.

3.1.1 Italy

Italy has the highest market penetration of telematics-based auto insurance policies in the world and is the largest national market in Europe, with an estimated total of 9.7 million insurance telematics policies at year-end 2020. A major share is represented by the Italian insurer UnipolSai which has reached an installed base of over 4.5 million insurance telematics black boxes after working with Octo Telematics since the early 2000s. Another major player is Generali with over 2.0 million telematics-based mobility insurance policies in Italy, Spain, Germany and Slovakia. The vast majority of Generali's insurance telematics business is in Italy, where the installed base is estimated to be around 1.6 million. Octo Telematics has established a strong position on the Italian market, working also with for example AXA, Intesa Assicura, Groupama and Zurich in the country. Additional notable telematics service providers in Italy include FairConnect (Infomobility), Targa Telematics, Viasat Group and Vodafone Automotive. Allianz which has its own telematics subsidiary is furthermore a notable insurance player in Italy with some 500,000 active policyholders. Groupama is estimated to

have about 450,000 active black boxes in Italy, on level with 2019 but growing from 400,000 in 2018, 350,000 in 2017 and 200,000 in 2016. Other insurers with large telematics programs include HDI, Cattolica, Verti Assicurazioni, Nobis Compagnia di Assicurazioni, ITAS, Admiral Group (Conte.it) and Sara. There has been a trend of insourcing telematics services among the Italian insurers in the past years. UniPolSai has for several years insourced telematics via UnipolTech. Generali insources IoT data and service management through its subsidiary Generali Jeniot and Allianz uses its subsidiary Allianz Technology.

The Italian market has to a large extent been driven by high levels of fraud and theft motivating the installation of on-board telematics devices enabling vehicle tracking capabilities. The insurance telematics market in Italy has to a significant degree been focused on claims management and various services rather than usage-based insurance pricing, but both types of programs are now available in the country. Italy is dominated by black box enabled insurance telematics offerings in terms of form factors, though also other alternatives have emerged over time. The Italian government proposed to make telematics or similar alternatives mandatory to all motor insurance policies in August 2017. Following the Monti Law in 2012, the insurance companies that offer telematics services must bear the cost of installation as well as offer discounts to policyholders that agree on having black boxes installed in the vehicles. It is not likely that the government recognizes smartphone-only solutions as sufficient telematics products as the technology does not answer the requirements on crash reconstruction and fraud management.

OEMs have also entered the insurance field and offer branded insurance services. One example is Toyota, which offers a general pay-how-you-drive policy to customers of eligible vehicles and a pay-per-mile (PPM) policy for buyers of the new Toyota Aygo X. The PPM policy has a € 25 stationary portion and a € 0.04 per kilometre price and a maximum per month cost of € 75.

3.1.2 United Kingdom

The UK is the second largest insurance telematics market in Europe and is estimated to have reached an adoption level of approximately 1.3 million telematics-enabled insurance policies at year-end 2020. Key players include Admiral Group that reached an estimated 285,000

active telematics-enabled policies and the telematics-focused insurance provider Insure The Box which has an estimated active customer base of between 100,000 and 150,000 black box-based policies in force. A large number of major insurance players offer telematics-based insurance policies including Direct Line, Hastings Direct, Aviva, The Co-Operative, RSA (More Th>n), RAC, Autosaint, AA, WiseDriving (iGo4), Adrian Flux, LV=, Hughes, Markerstudy, MyPolicy, Motor Ichiban (Aioi Nissay Dowa Insurance UK) and AbbeyAutoline (Prestige). Direct Line's telematics programs have together less than 100,000 active telematics policies, remaining at a steady level since 2016. Hastings Direct had an installed base of 75,000 active black boxes in 2019 and launched a smartphone-only solution powered by CMT in 2020. Furthermore, the UK has seen a larger number of companies and brands focusing solely or primarily on telematics-based auto insurance. Examples in addition to Insure The Box are ByMiles, Marmalade, Ingenie, Only Young Drivers (Autonet), MyPolicy, Drive Wiser and Carrot as well as Girls Drive Better, which is a telematics-enabled offering from Policywise targeting women specifically. Several of the insurers active within UBI use white-label arrangements, including Tesco Bank marketing a black box insurance plan managed by Insure The Box. RSA offers telematics-based insurance through its More Th>n brand and is also an underwriter for Ingenie and Carrot in the UK.

The UK insurance telematics market is traditionally highly skewed towards usage-based offerings for young drivers that otherwise face very high insurance premiums. The main hardware used in the UK has since the introduction of telematics-based insurance been professionally installed black box devices. Due to the high cost of this solution, telematics policies have generally not been profitable if offered to policyholders with a premium lower than around £ 850 per year. Many insurance companies have not been able make telematics-based insurance economically viable for broader segments. However, there have been signs in recent years of projects targeting other segments than young drivers such as SmartDriverClub (Markerstudy), Be Wiser and Admiral. Targeting drivers with lower premiums requires solutions that are cost-efficient such as smartphone-only solutions or OBD-devices. The adoption patterns are in the future expected to continue to broaden in line with decreasing costs of implementing UBI. A number of insurers have introduced smartphone-based telematics policies and OBD-based offerings have also emerged. However, the black box still remains an important form factor for telematics programs in the UK due to data reliability.

Despite only having reached a small segment of the overall motor insurance market, telematics-based insurance in the UK is reasonably mature. Close to all programs offer discounts based on driving behaviour and use a range of parameters in most cases. A lot of focus has been put on improving driving behaviour. A number of policies in the UK used to apply curfews or surcharges for driving during the night due to the larger risk for accidents mainly between 11pm and 5am. However, most programs have removed the curfews to improve customer satisfaction and remove the feeling of being watched the entire time. Claims management and FNOL are also important parts of several telematics initiatives.

A number of insurers have furthermore worked with OEMs to install aftermarket telematics devices in new vehicles. Direct Line provides telematics-based insurance for young drivers to PSA Finance UK and its two offerings Peugeot Just Add Fuel and Citroën SimplyDrive. Ingenie has partnered with Vauxhall in a deal where the two companies now offer new Vauxhall Corsa cars with black box devices and Carrot Insurance has worked with Fiat to market its Fiat 500 together with an insurance telematics policy. In late May 2016, Trak Global Group, the telematics company which until recently controlled Carrot Insurance, announced a partnership agreement with Volkswagen Financial Services UK (VWFS) through which telematics-based insurance would be offered to 18–24-year-olds after purchasing a new Volkswagen Polo. So far, insurance telematics using factory fitted telematics devices have been limited in the UK. In 2019, By Miles began to write policies based on OEM telematics data generated by Tesla vehicles in addition to offering EV-specific insurance products. By Miles is one of the few insurance telematics providers offering telematics policies based on OEM telematics systems.

Several insurers, including RAC, HDI Global, Admiral and Direct Line offer telematics-based insurance for fleets. Insurance can either be offered with a new fleet management package, or in some cases be added to an existing fleet management package leveraging the same telematics device already installed in the vehicle. A new example is the insurance agent Flock offering the Jaguar Land Rover subsidiary The Out usage-based fleet insurance. Fleet insurance telematics has not yet reached a significant scale in the UK. However, large insurance companies such as Zurich, Aviva and RSA collaborate with telematics service providers to offer discounts for fleets. The commercial insurer Zego, which acquired the

Portuguese telematics service provider Drivit in December 2020, offers app-based usage-based fleet or driver insurance. Video telematics is an emerging trend on the insurance telematics market for commercial fleets. Players such as SureCam and VisionTrack offer FNOL solutions which can send footage directly to the insurer, broker or claims management company in the event of an incident. The use of video can further mitigate fraud in claims cases as well as provide clarity for estimating damage. The use of video telematics in the personal lines space is so far limited, but one example includes Theo founded by ThingCo, a telematics company based in the UK.

3.1.3 Iberia

Top-5 national markets in Europe by the number of vehicles in use moreover include Spain. Uptake of telematics-based insurance has been considerably lower in Spain than in Italy and the UK for example, with an estimated 200,000 active policies at year-end 2020. On the Spanish market, notable initiatives have been launched by MAPFRE, Generali, Allianz and Zurich. MAPFRE is a major auto insurance company in Spain, with a market share in terms of collected premiums of around 20 percent. MAPFRE launched a pilot already in 2007 together with Octo Telematics that eventually developed into the YCAR usage-based insurance product. YCAR uses a professionally installed black box. In 2021, MAPFRE launched its latest telematics offering in Spain through the subsidiary Verti, a TBYB mobile based program called Verti DRIVER. In addition to Octo Telematics, MAPFRE also works with Grupo Detector in Spain and other TSPs. Furthermore, Octo Telematics is the telematics service provider for Zurich in Spain, which launched a PAYD program using a black box device mounted on top of the car battery in 2014. Discounts were rewarded to drivers based on yearly mileage and percentage of distance driven on motorways. SVR and eCall/bCall services were also included. In addition, Admiral Group's subsidiary Balumba offered a black box-based insurance telematics offer – MyBox – powered by Octo Telematics. Notably, several of the programs powered by Octo Telematics in Spain are roll-over models where the policyholder has the telematics device installed during a limited time period.

In 2018, Generali Seguros began developing new products surrounding digitalisation and telematics-based insurance products in Spain. After an initial pilot phase with Vodafone Automotive, the new offering is now based on Generali Jeniot's Global Mobility Platform that powers other telematics programs within the Generali Group.

The major Spanish operator Telefónica has previously been involved in the insurance telematics segment as a TSP. Telefónica has left the hardware-based telematics service provider model and moved towards smartphone solutions. A project based on a smartphone solution was carried out in Spain together with Generali during 2015. Telefónica has also launched another pilot project branded Drivies. Drivies is a smartphone app developed by Telefónica I+D as part of a collaboration with Telefónica Insurance. In 2017, Telefónica spun off Drivies to a separate company.

Grupo Next is a technology company and broker that launched a telematics-based insurance policy in 2015. Grupo Next's business model is today based on a B2B2C model. The company white labels its platform and solutions to telecom companies, banks and insurance companies. The company uses a SaaS delivery model. By year-end 2021, the company managed about 50,000 active telematics devices in total. A smaller portion of these devices were tied to an insurance telematics policy in Spain but this business segment was divested in 2020 to enable the company to focus on its connected car offering.

Drive&Win is an insurance company founded in 2017 that aims to redesign the motor insurance business in Spain. The company uses a smartphone-app that pairs with the car's Bluetooth as a part of a larger customer centric strategy aiming to digitalise the entire insurance value chain. Telematics services are sourced from the UK-based company IMS (Trak Global) and safe driving is rewarded with cashback bonuses each week, similar to IMS' project with Carrot Insurance in the UK.

Fidelidade is a major player on the Portuguese insurance telematics market. In 2017, the company launched a pilot powered by The Floow that comprised 3,000 users. The offering was based on a smartphone-only solution. Fidelidade has also partnered with Brisa, the largest road operator in Portugal to launch a joint venture which specialises in telematics based insurance products, starting with a product branded Smart Drive. Subject to a 20 trip, 300-mile trial period, Smart Drive users are eligible for discounts of up to 15 percent on car insurance through Fidelidade. Opt-in drivers also benefit from Via Verde (a Brisa Company) toll credits worth 10 percent of their insurance premium. Smart Drive is powered by A-to-Be's MoveBeyond platform as well as The Floow's SDK. The subsidiary of Spanish oil and gas

company PETROPRIX – Hello Insurance Group – has launched both a PHYD and PPM model in Spain, based on its Hello Auto Connect dash cam device.

3.1.4 Austria

About 60,000 customers were enrolled in telematics-enabled auto insurance policies in Austria by year end-2020. The main player is Uniqa with its SafeLine offering which has around 40,000 active black box devices supplied by the local insurance telematics service provider Dolphin Technologies. Uniqa has moreover launched a smartphone-only solution also developed by Dolphin Technologies which detects phone usage and includes it as a parameter on which a discount is calculated. Additional initiatives on the Austrian market includes Generali and Allianz Austria. Generali runs an emergency service app branded Notfall. Allianz Austria announced the introduction of eCall services combined with crash recordings from a 12 V device with an internal SIM-card and data plan in 2016. The device and associated services come at a monthly fee of € 9.90 but is not coupled to an insurance contract. Crash data is owned by the customer that can choose whether to use the data to support a claim or not. The platform has been developed by Kapsch that also participated in the development of the 12 V plug manufactured by Telic. In 2018, Allianz introduced the smartphone-only program BonusDrive in Austria. The solution is developed by Allianz Technology and uses similar technology as the BonusDrive offering in Belgium.

3.1.5 France

The uptake of insurance telematics in France has not yet taken off on a mass scale. Privacy concerns are among significant factors affecting the telematics market in France. Still, the insurance telematics market in the country is expected to grow significantly from an estimated 170,000 active insurance telematics policies at year-end 2020. As many insurers are testing their way to find viable options, the number of telematics-enabled policies is anticipated to grow in the upcoming years.

The Groupama brand Amaguiz launched its own PHYD offering in 2016, targeting young drivers. In 2020, Amaguiz was incorporated into Groupama's product portfolio and the UBI program moved to Groupama. Groupama currently has no active telematics policies in France. Allianz launched its full scale PHYD offer Allianz Conduite Connectée in October 2015 and has about 30,000 telematics subscribers. In 2019, Allianz re-launched the telematics

program as a smartphone-only solution. Direct Assurance is a subsidiary of AXA and offers a PHYD policy based on OBD-devices through its telematics division YouDrive. The hardware is supplied by Meta System and telematics services are sourced internally through the AXA Data Innovation Lab. The YouDrive offer was first introduced as a test in March 2015 with 500 participants, and later in November 2015 launched as a full-scale offer. Additional start-ups in the insurance market include Otherwise, that offers a collaborative insurance product, covering auto, health and animal insurance and Wilov that offers a PAYD insurance product. Wilov uses a BLE beacon that connects to the user's smartphone. The policies are underwritten by Suravenir Assurances, a subsidiary of Crédit Mutuel Arkéa. In September 2021, insurance company Wakam and YEET-Assurances launched a PHYD insurance product based on a Bluetooth beacon and app and analysis from DriveQuant. The product targets the gig economy and is intended to be integrated in driver platforms. A similar launch in September 2021, was the launch of the product BlablaCar Coach and BlaBlaCar Assurance par L'olivier, a collaboration between Swiss Re, L'olivier Assurance (Admiral Group) and the carpooling company BlablaCar. The offer is a PHYD insurance for BlablaCar drivers and non-members alike.

Early initiatives on the French market included Easy Drive's partnership with Cobra (now Vodafone Automotive) and Bouygues Telecom from 2008 that resulted in a PAYD policy called Easy Drive. Recent initiatives on the French market include a smartphone-only offer from MAPA Assurances which was developed by the start-up Extra Drive and Société Générale's TBYB and driving behaviour app Star Drive which now also includes a PHYD policy powered by Baseline Telematics. Moreover, Société Générale offers a pay-per-mile insurance offering branded Carapass through its online banking subsidiary Boursorama. Carapass is aimed at infrequent drivers. Partners for the Carapass program include Meta System that provides OBD devices and Baseline Telematics that offers related telematics and data analytics services. Moreover, the Garantie Mutuelle des Fonctionnaires (GMF) launched the pay-per-mile insurance offering "petit rouleur" in 2018. The MAIF subsidiary Altima launched a smartphone-based solution that utilises a BLE beacon in collaboration with DriveQuant later in 2018. Matmut Group has signed a partnership with Michelin to offer UBI in France. Matmut Connect Auto was first launched in 2018 and comprised a pilot of 2,000 drivers. In 2020, the pilot was extended to 10,000 drivers. The solution is based on a telematics box and dedicated mobile app developed by Michelin.

ALD Automotive launched a connected insurance program in October 2019. The company is one of the largest leasing companies in the world. In France, the company has a partnership with Sogessur which is a subsidiary of Société Générale. It leverages telematics in the My ALD Driver and My ALD Manager programs to reduce claims expenses and educate drivers. Drivers can benefit by achieving a discount on their insurance premiums. PSA Assurance (Stellantis) has launched PHYD proposals on the French market. The latest iteration is called Drive and Connect and was launched in December 2021.

3.1.6 Benelux

The insurance telematics market in the Benelux region is estimated to have reached around 120,000 active policies at year-end 2020. On the Belgian market, AXA Belgium started testing a usage-based offering for young drivers based on the G-Box on-board device in late 2008. Today, AXA Belgium offers the mobile based AXA driveXperience program, previously using an OBD-II dongle connecting to the driver's smartphone. An initial premium discount of 20 percent is offered, which can rise to 50 percent based on the driving behaviour. AXA driveXperience mainly targets young drivers. The insurer P&V Group started working with Octo Telematics in 2009 to launch telematics offerings for the P&V and Vivium brands. In 2018, P&V launched a connected mobility platform comprising UBI and other services in partnership with the Volkswagen dealer D'leteren and Amodo. The platform is branded weCover and offers car insurance targeting young drivers under the age of 26. weCover uses an OBD dongle that is provided free-of-charge. As of January 2020, about 8,000 vehicles were equipped with the weCover box and about 90 percent of these were linked to drivers under the age of 26. Participating drivers benefit from an immediate reduction of 40 percent on their civil liability premium. The young driver program P&V Auto Junior previously used a telematics black box powered by Octo Telematics but is now using the weCover box and services. P&V has approximately 10,000 policyholders for its young driver program P&V Auto Junior which gives participants a 25 percent flat rate discount. Vivium's telematics policy is branded S2 Pack and offers VAS including eCall services and SVR. The S2 Pack telematics-based insurance policy is powered by Octo Telematics and based on a self-installed black box device that mounts on top of the car battery. AG Insurance has launched a driving behaviour pilot in collaboration with Touring and Proximus. The pilot is branded Safety and More and comprises 1,000 drivers that install a ConnectMy OBD dongle which is developed by Touring and Proximus.

Daimler Financial Services and Mercedes-Benz Bank offers a PHYD insurance in Belgium for Mercedes-Benz E-Class. The program uses factory-fitted telematics and the policies are underwritten by AXA Belgium, which also provides telematics services and scoring through the AXA Data Innovation Lab. Bâloise Assurances in Belgium launched the start-up Mobly. The company offers a mobility platform that is powered by Croatia-based Amodo. The platform powers various business models including breakdown coverage, peer to peer carsharing and usage-based insurance. Today, Mobly offers a pay-per-kilometre insurance that leverages an OBD-device powered by Munic to accurately measure the distance driven. Mobly charges a monthly fixed fee to cover the car when it is not used and variable fee that is determined by the kilometres driven. The factor used to determine the kilometre fee is traditional actuarial variables such as age, postal code, type of car and accident history. Mobly has launched a mobility insurance to cover car insurance as well as other means of transport including bus and shared mobility services. The Mobly Go app is the main interface for the new insurance product, offering a claims portal, roadside assistance, policy management services and customer service interaction tools.

Insurance telematics offerings in the Netherlands include the Risk brands Fairzekering and VOOROP which use OBD solutions from Chipin. Risk additionally supplies the Dutch insurer FBTO with a mobile based PHYD insurance offering. These brands accounted for an estimated 15,000 end users together in December 2020. Aegon Insurance launched the insurance telematics company Kroodle in 2013. Kroodle first offered telematics-based insurance products via Aegon. Today, the company is an independent insurance telematics technology provider. The Royal Dutch Touring Club (ANWB) and its insurance subsidiary Unigarant offers both a TBYB and PHYD offering in the Netherlands. The PHYD is branded ANWB Veilig Rijden and measures driving behaviour using an OBD-device to be plugged in to the vehicle. Ingenie Business and Redtail Telematics provide telematics services and hardware to the program that was launched in 2016. At the end of 2020, ANWB had an estimated 45,000 customers enrolled in the PHYD program. Ansvar Bewust is a UBI program offered by Ansvar Idea. Swiss Re (Movingdots) is powering the UBI program using its Coloride platform.

Bâloise Assurances Luxembourg launched GoodDrive in March 2017, a smartphone-only telematics-based insurance solution. Drivers were eligible to opt-in for the GoodDrive program and could be awarded with up to 30 percent discount on their insurance premiums. The GoodDrive product was later discontinued in 2020.

3.1.7 Switzerland

Telematics products in Switzerland are available from insurers such as AXA and Allianz. Both AXA and Allianz in Switzerland offer policies based on a type of device that the companies have chosen to call a “crash recorder”. The crash recorder has no wireless connectivity and hence cannot transmit data. Instead, the sole purpose of the device is to record data from a short period of time in close proximity to a crash. AXA reached over 40,000 active users of its crash recorder since its launch in March 2008. The device was battery powered and not connected to the policyholder’s vehicle. AXA also launched a PHYD program, called Drive Recorder, targeting drivers in ages between 18 and 25, but discontinued the program in December 2016. AXA Switzerland has partnered with the Germany-based start-up ThinxNet and founded a new connected car company called ryd Suisse. In 2019, AXA Switzerland launched new insurance telematics products based on ryd Suisse. The Crash Recorder program using professionally installed black boxes was replaced with an OBD dongle with similar features with the addition of eCall functionality. The current PHYD program from AXA Switzerland, branded DrivePartner, also uses the telematics solution from ryd Suisse. Ryd also has a partnership with Basler Versicherungen to run a UBI pilot encompassing 1,000 OBD dongles.

Apart from its crash recorder program, Allianz offers Helpbox which in addition to PHYD pricing and the services included in the crash recorder also includes eCall, bCall and SVR services. The device is professionally installed and records acceleration, position, date, time and velocity. The total number of telematics policies excluding crash recorder devices in Switzerland is estimated to be around 40,000 at year-end 2020.

AutoSense is a connected car company based in Switzerland. The company was founded by the Volkswagen dealer Amag and Swisscom. The company uses technology from Sweden-based Springworks International. In 2019, Zurich acquired a minority stake in the company.

The AutoSense offers an ecosystem of connected car services, including insurance telematics. A further UBI venture in the Swiss market is Simpego FlexDrive, formerly Dextra FlexDrive. It is a pay-per-kilometre offering based on AutoSense offered by Simpego Versicherungen, a young insurance company based in Zurich that has been offering car insurance in Switzerland since 2018.

3.1.8 The Nordics

The insurance telematics markets in the Nordic countries are still small in terms of number of policies. The insurance telematics market in the region is estimated at approximately 43,000 policies at year-end 2020. The Danish market has been the most developed so far, where the insurance company Alka Forsikring marketed a black box policy called Alka Boksen between 2007–2018. The initial box was offered to customers at a 40 percent premium discount, but at a DKK 5,000 (€ 670) installation cost covered by the customer. Still, it reached 3,000 customers before being discontinued in 2011. Alka reintroduced the box 18 months later, now using Octo Telematics as the telematics service provider and with the price for installation lowered to DKK 1,000 (€ 130). At the same time, the flat discount on the premium was also decreased to 25 percent. In October 2018, Alka stopped selling the Alka Box to new customers. The behaviour of the policyholders was not as Alka expected and the black box was not a sustainable business case considering the number of claims and risk in general. Alka had 9,000 active policyholders enrolled in the Alka Boksen at year-end 2018. As of Q2-2020, there were no active policyholders enrolled in the Alka Boksen program.

Additional telematics policies on the Danish market include Topdanmark and its subsidiary Danske Forsikring, which both launched a black box insurance offering to drivers under 28 in late August 2015. A smartphone app was added to the offering in 2017 which provides an overview of the current driving behaviour. The model was very similar to Alka Boksen and gives a 25 percent flat-rate discount, but at no extra charge for the telematics device. The telematics provider, supplying both the box and related telematics services is Octo Telematics. In 2019, the Topdanmark insurance telematics solution was discontinued but existing policies are supported still. Tryg Forsikring demands that high-risk cars are equipped with GPS tracking devices intended for SVR. Tryg has also launched the PHYD solution – Tryg Drive – that targets drivers under 30 years old and offers discounts based on driving behaviour. The

program was launched in 2017 and uses the Swedish firm Greater Than's connected car platform Enerfy. The digital only insurance broker Undo has launched a mobile based PHYD insurance product in Denmark where drivers are evaluated during one to three weeks at the beginning of each policy period and the driving score can then result in up to 20 percent discount on the premium.

A number of UBI pilots have been carried out in Sweden, but without any live products of significant scale. The insurance company If P&C in Sweden performed a smartphone-based UBI pilot powered by Movelio in 2013 which did not lead to a market launch. Hardware-based options have also been tested, but no product was introduced due to issues with reliability. Another Swedish insurer, Folksam participated in a research project under the name "Grönt Ljus" in 2011, which collected data from a hardware device. Folksam re-entered the telematics segment and launched the UBI initiative Folksam Körä Säkert available for Telia Sense customers in March 2017. In July 2021, the program was discontinued after the platform was closed down by the supplier. Moderna Försäkringar, a subsidiary of Tryg Forsikring, launched Moderna Smart in November 2015, a UBI policy based on a smartphone-only solution. In 2017, Moderna Smart Flex was launched, a UBI solution based on an OBD-II device and a smartphone app powered by Greater Than. Moderna Smart is estimated to have reached more than 15,000 policyholders and Moderna Smart Flex a few thousand policyholders. Since February 2020, Moderna no longer offers the UBI policies to new customers. The Swedish start-up Greater Than furthermore offers a connected-car solution based on an OBD-II device. In 2017, Greater Than and Moderna Försäkringar entered a joint venture, to launch a UBI offer in Sweden. The Swedish insurer Dina Försäkringar launched an insurance telematics pilot in 2017. The pilot was based on a smartphone-solution connected to a Bluetooth device. In August 2018, Länsförsäkringar launched the RideSafe program that aims to reduce distracted driving for commercial fleets. The product built on a pilot that commenced in Q3-2017 that used a BLE beacon to detect driving and blocked the signal from the phone. The solution that was powered by Safe Drive Pod based in the Netherlands has now been discontinued. Only the specialised insurance broker Paydrive, which recently went public, currently offers telematics based UBI policies in Sweden. Paydrive covers approximately 10,000 active policyholders and the underwriting partner is the Norwegian insurer Protector Forsikring. The telematics solution is mainly OBD-

based and delivered by various technology partners. The company also offers to use connected car data from Tesla vehicles via a partnership with SmartCar and recently partnered with Cambridge Mobile Telematics (CMT) for a mobile based solution.

Tryg Norway has launched a telematics pilot with 1,000 participating drivers powered by Telemotix and used an OBD-device to log the data and an app to provide driver feedback. In August 2018, Tryg Norway launched the full-scale product Sidekick, a hybrid OBD and smartphone solution, targeting young drivers under the age of 30. Tryg Norway has co-developed the solution together with Greater Than. After each drive, the policyholder receives instant feedback on the driving style in the form of a score between 1–100 in a mobile app. The driving score is translated into money that at the end of the policy period is paid to the policyholder's bank account. In 2019, about 1,300 clients were enrolled in Sidekick. Tryg Norway also offered an electronic logging device used by commercial clients called Tryg i Bil. The solution was delivered by the Norwegian-based company Sagasystem. As of Q2-2020, Tryg i Bil was no longer sold via Tryg's channels. An additional initiative on the Norwegian market is Sparebank1, which launched an OBD-based insurance telematics program powered by Webfleet Solutions in 2017. Sparebank1 replaced the OBD-based solution with a smartphone-only proposition branded Smartbil in 2019.

The telematics company Helpten pioneers insurance telematics in Finland. The company cooperates with many large insurance carriers in Finland that pilots Helpten's flexible multi-service model that enables PAYD and PHYD. In 2020, Finnish automotive importer Bassadone Automotive Nordic launched the app based PHYD insurance policy in Finland branded SmartDrive and underwritten by Fennia insurance. In the Baltics, the Estonia-based company Holon Technologies works with telematics service providers, OEMs and insurance companies to launch UBI. The project has now been put on hold due to financing issues. Icelandic drivers were presented with the first telematics UBI policy proposition in March 2021 offered by VÍS, building on CMT's Drivewell solution.

3.1.9 Germany

Germany is Europe's largest market in terms of vehicles in use and therefore has considerable untapped potential. Auto insurance premiums are however relatively low in the country at the same time as insurance fraud and vehicle theft are not major issues. Installation

of telematics systems for UBI purposes or fraud detection can therefore be difficult to motivate both in terms of the cost for the insurer and incentives in terms of discounts for the policyholder. The number of active telematics-based auto insurance policies in the country has still accelerated and is estimated to have reached close to 700,000 at year-end 2020. Insurance telematics initiatives have been launched by players such as Signal Iduna, Allianz, AllSecur, HUK-Coburg, VHV and AXA, as well as DEVK, CosmosDirekt, Sparkassen Finanzgruppe subsidiaries ÖSA, Sparkassen Versicherung and Sparkassen DirektVersicherung. Additionally, several insurers offer eCall services, either as a part of an insurance telematics offer or as the main service. This includes the GDV-Stecker project with 46 participating insurers connected to the German Insurance Association (GDV). GDV-Stecker was announced in March 2016 and uses telematics devices plugged in to the 12 V socket. Data is transmitted via a Bluetooth connection to the driver's smartphone.

The start-up company ThinxNet has launched the connected car solution Ryd, which consists of an OBD-II dongle connected to a smartphone app, which records vehicle diagnostics and driving behaviour. Rewards from partners such as gas stations are used to encourage safe driving. Ryd is offered by BGV, which sells the devices as a value-added service. The major insurer HDI has historically partnered with ThinxNet to offer bonuses based on good behaviour rather than discounts on the insurance. HDI launched a smartphone-only telematics solution branded DiamondDrive and powered by The Floow in 2018, offering UBI policies. The Floow has also partnered with Ergo to launch the UBI program branded Safe Drive. With Safe Drive, Ergo has developed a proposition aimed at young drivers under the age of 25. Safe Drive is powered by The Floow's FloowDrive solution.

In 2018, the start-up EMIL launched the first pay-per-mile telematics-based insurance program in Germany. The company targets drivers that drive less than 6,000 kilometres per year and uses an OBD device featuring a SIM card to record the mileage driven. The insurance policies offered by EMIL were developed in cooperation with the reinsurer General Reinsurance and the German insurer Gothaer Allgemeine Versicherung. Various VAS such as locating the cheapest petrol station were available and additional features such as eCall and vehicle diagnostics alerts. EMIL is today selling its platform to external companies and pivots its business model to focus on B2B. Friday is an insurance start-up on the German market that is backed by Bâloise Group and offers pay-per-mile (PPM) insurance products. The pay-

per-mile products were initially based on telematics data from ryd devises as well as consumer aftermarket telematics services or OEM telematics systems for drivers that own BMW vehicles. Friday has however reverted back to manual reporting for its PPM program.

Signal Iduna's UBI product was launched in late 2014 and is still offered through its subsidiary Sijox. The UBI product is now based on a smartphone-only solution, replacing a previous OBD-II device developed by Webfleet Solutions. AXA launched a mobile-only solution targeted at drivers under 25 in late 2015 and was followed by Allianz and the Allianz subsidiary AllSecur. AXA has however cancelled its smartphone-only program. Allianz Bonus Drive and AllSecur Bonus Drive have reached a customer base of 320,000 active policyholders in November 2020, increasing from an estimated level of 100,000 at year-end 2019. Simultaneously, Allianz is also participating in the GDV-Stecker project as well as most of the largest German insurers. HUK-Coburg launched a telematics offer in mid-2016 branded Smart Driver using black boxes developed by Bosch. HUK-Coburg's PHYD program had reached over 400,000 active policyholders by the end of 2020. In 2019, HUK-Coburg re-launched its telematics product with a windscreen device that connects to the driver's smartphone powered by CMT. This enables the company to write telematics policies to broader customer segments. In 2017, Württembergische launched a smartphone-based solution in collaboration with Vodafone Automotive, that uses CMT's SDK. DEVK launched a smartphone based PHYD program in January 2021, which had been adopted by 30,000 customers nine months later.

The market has grown rapidly because of the largest insurers' entrance on the telematics market. The technological landscape was first dominated by black boxes. Now smartphone-only solutions and to some extent also devices that plug into the 12 V socket have become popular. Both of these solutions have the advantage of being low-cost on a market where motor premiums are cheaper. Berg Insight expects rapid growth in the German market during the next few years as the wide-range of programs from large insurers such as HUK-Coburg and Allianz and smaller competitors become more prolific. The German OEMs are moreover front-running in terms of connected car technology, whereby telematics data streams applicable for insurance purposes can be available if the interfaces are opened up, for example through white-label agreements or other collaborations with insurers. BMW for

instance presented BMW CarData in mid-2017, offering third party vendors to utilise connected car data in order to be able to offer value-added services such as insurance telematics and UBI. In addition, Mercedes-Benz Bank launched a telematics policy based on factory-fitted devices in September 2017 and Opel has a small-scale PHYD program in collaboration with Allianz.

3.1.10 Central and Eastern Europe

The Eastern European market is still less mature in terms of insurance telematics offerings, though some initiatives have been launched in for example Hungary, Poland, the Czech Republic, Romania, Slovakia and Slovenia. Insurance players active in the region include UNIQA, Allianz, Generali, Groupama, VIG and Zavarovalnica Triglav. In 2015, Generali launched a new telematics product branded SOS Partner in Slovakia, which combines PHYD with eCall services. Triglav has reached 145,000 downloads of its free DRAJV app in Slovenia, developed by Amodo. The second largest domestic insurance company DDOR Novi Sad offers the telematics-based insurance offering TERA. TERA uses a professionally installed black box which provides SVR, vehicle location and eCall services to participating policyholders. TERA is also available as a fleet management system for enterprise customers through the brand TERA logistics. In March 2016, AXA announced a PHYD pilot project in Ukraine using OBD-hybrid devices supplied by Raxel Telematics and the program is now launched full-scale across Ukraine. AXA divested its Ukrainian business to Fairfax Financial Holdings in 2019 and the offer is now marketed by the subsidiary ARX. Allianz has telematics-based offerings in the Czech Republic, using a professionally installed black box and include eCall and bCall services. Allianz moreover offers insurance telematics programs in Poland, Russia and other regions in Eastern Europe. UNIQA in the Czech Republic reported over 15,000 active policyholders enrolled in the telematics-based program SafeLine.

In Poland, Link4 announced plans to introduce telematics-based insurance for both fleets and individuals in 2015. The fleet UBI offer was intended to use black boxes to record driving behaviour, but the project was later cancelled. The telematics product for personal lines customers has since then been launched in a collaboration with Telematics Technologies (NaviExpert). NaviExpert is a navigation system with an annual subscription fee of PLN 100 (€ 23). Link4's owner PZU Group powers a UBI product branded PZU Go in Poland. Yanosik offers the YU! PHYD product in Poland in collaboration with Ergo. Italy-based Viasat Group

has expanded its portfolio to Eastern Europe and is powering telematics-based programs in Romania, Bulgaria and Serbia. In Romania, Groupama has partnered with Viasat to offer the Autocontrol PHYD product.

3.2 Insurance telematics case studies

A wide range of insurance telematics products are available on the European market, offered by both traditional auto insurers and specialised telematics-focused insurance providers. Examples include UnipolSai, Generali, AXA, Allianz and Groupama in Italy; Admiral Group, Insure the Box, Direct Line, Hastings, Aviva, Coverbox, Ingenie, Carrot, RSA and Marmalade in the UK; UNIQA in Austria; Groupama and Direct Assurance in France; MAPFRE in Spain; Autoline and RSA in Ireland; HUK-Coburg, Allianz, VHV, HDI Global and EML in Germany; Mobly, Allianz, P&V and AXA in Belgium; and ANWB, FBTO, Fairzekering, VOOROP and Chipwise in the Netherlands. Some markets such as Italy, the UK, Spain, Germany and France have numerous well-established insurance telematics offerings which have been offered for many years, whereas other countries are still mainly at the trial stage in terms of market development.

3.2.1 More than 40 percent of the vehicles insured by UnipolSai feature a black box

UnipolSai Assicurazioni is an insurance company and part of the Italian Unipol Gruppo Finanziario. In January 2012, Unipol Gruppo Finanziario took over indirect control of the Fondiaria-Sai Group. In January 2014, the companies Unipol Assicurazioni, Milano Assicurazioni and Premafin merged by incorporation in Fondiaria-Sai which subsequently assumed the name UnipolSai Assicurazioni. UnipolSai reached a direct insurance income of € 12.2 billion in 2020, down 12.9 percent from the previous year. Total direct premiums from the land motor vehicle sector were € 3.7 billion for UnipolSai during 2020, down 4.9 percent from the year before.

In light of a high occurrence of fraud and vehicle theft on the Italian market, Unipol approached Octo Telematics in 2003 to set up a pilot program based on telematics devices. A total of 2,500 customers agreed to participate. The two-year pilot was successful, and the customers participating in the pilot noted a 20–30 percent reduction of crashes and a 30–50

percent reduction of auto thefts. A specific insurance policy for telematics users was subsequently launched in 2005 under the brand Unibox, offering a 10 percent discount on accident damage coverage and 50 percent discount on theft coverage. This represented an early example of telematics-based insurance on the European market. The company has since then introduced the KM Sicuri usage-based policy and the new identity SICURCITY. Additional products including UniPol KM & Servizi. UniPolSai also offers telematics services for two-wheelers. The KM & Servizi 2Route based on the telematics device Unibox 2Route offers hardwired black boxes for motorcycles and scooters. Policyholders that enrol in the program pay for the miles driven and receive 20 percent discount on the insurance policy. Based on the driving behaviour, an additional discount of 30 percent can be achieved upon renewal. The telematics device enables impact alarm, fall alarm, speed limit activation, geolocation of the vehicle, geofencing, SVT and SVR as well as control of the immobilizer. UniPolSai's online branch Linear Assicurazioni offers the telematics solution Linear AutoBox. UniPolSai also operates in Serbia through the second largest domestic insurance company DDOR Novi Sad. DDOR offers the telematics-based insurance offering TERA. TERA uses a professionally installed black box which provides SVR, vehicle location and eCall services to participating policyholders. TERA is also available as a fleet management system for enterprise customers through the brand TERA logistics.

In 2019, UniPolSai partnered with TrueMotion (acquired by Cambridge Mobile Telematics) to launch smartphone telematics programs, starting with Linear's BestDriver program in Italy. The BestDriver program is a smartphone-only program allowing drivers to monitor their trips, driving styles and levels of distractions in the BestDriver app. Safe drivers can win Amazon gift cards, earning up to € 20 every week. Linear's BestDriver app is the result of the collaboration between Linear and Leithà, the Unipol Group's competence centre for Big Data and Artificial Intelligence. In 2019, the app was downloaded by more than 50,000 drivers. In July 2021, Linear launched a TBYB program called Linear Drive&Save, a mobile only solution developed in conjunction with CMT. Drivers can receive up to 15 percent discount on a new Linear car policy.

UniPolSai mainly uses black boxes which provide sustainable and accurate crash reconstruction and claims management data. During the past years, the company has developed a smartphone app to enable behaviour modification and user interaction. The

black box is however still the main form factor for data collection used by the company. In 2019, the company enhanced its claims process based on data from black boxes. This led to a reduction of 1.9 percent in claims cost during 2019. UnipolSai had around 4.5 million active black boxes installed in Q3-2021. Thus, approximately 50 percent of the company's auto insurance customers have a black box in use. The number of telematics policies has grown significantly and has increased from an estimated 2.0 million telematics customers in 2014, to 2.6 million active devices in December 2015, 3.1 million in 2016, 3.5 million in 2017, 3.9 million installed at year-end 2018 and 4.4 million at year-end 2019. Policyholders with an installed black box are given a 20 percent discount on the auto insurance. A range of other policy options are available, ranging from mileage-based insurance premiums to telematics-enabled VAS such as assistance services and theft tracking. Data is used mainly for SVR and claims management. UBI variables such as mileage and driving behaviour as well as time of day and location are also recorded. However, discounts are not directly related to the given driver score, but the information is passed on to brokers and can be used when negotiating premiums at renewal. In April 2021, the Unibox Safe was introduced, which comprises a professionally installed Unibox and a Bluetooth hands-free device to be fastened on the windscreen. The Bluetooth device is fitted with solar panels to reduce the need for recharging with cable and contains a button for eCall services and also a button for a so-called Bodyguard service.

UniPolSai has launched a smartphone-app giving customers an overview of their insurance policies and data from the telematics devices. The smartphone app is used as a means to influence the driving behaviour and the risk profile. Moreover, UniPolSai offers the feature "Alert Meteo" that notifies drivers in five municipalities across Italy of extreme weather conditions to lower the probability for a policyholder to experience a claim. The app is the main communication channel with the customer. Drivers can request a claim in case of an accident directly in the app as well as view the current status of the policy. UniPolSai focuses on claims and crash reconstruction and since the black box is superior to the mobile phone in regard to crash detection, the smartphone app will mainly be used to interact with the customers to influence the driving behaviour.

UnipolSai has had a long-lasting business relationship with Octo Telematics which previously provided a complete end-to-end solution for UnipolSai's telematics program. However,

UnipolSai handles an end-to-end telematics solution internally from the subsidiary UnipolTech. UnipolTech was founded as Alfaevolution Technology in 2016 and rebranded in 2021. Today, it manages more than 75 percent of UniPolSai's new black box activation. Octo Telematics still provides installation services for select offerings, such as Linear AutoBox as well as TSP services on legacy black boxes. UniPolSai will mainly power the telematics offering internally through UnipolTech going forward. UnipolTech sources black boxes from three partners. Today, the company is expanding its services to external insurance customers. UnipolTech approaches customers with UniPolSai as a re-insurer to ensure that actuary services and claims handling align with the provided technology.

UnipolTech acts as a centre of excellence in order to expand telematics technology to other insurance verticals such as home, mHealth, motorcycles, bicycles and pets. In mid-2017, UnipolSai launched a telematics-based home insurance product branded Unibox C@sa. The company has moreover developed a telematics device for animals, which is included in the UniPolSai's telematics strategy. The product is branded Unibox C@ne & G@atto and enables users to trace the movements of the pets as well as offers 24/7 veterinarian assistance.

3.2.2 Generali offers a wide portfolio of insurance telematics products

The Generali Group is one of the largest insurance providers in the world with a total premium income of € 70.7 billion in 2020 employing about 72,600 people and operating in 50 countries. Key markets include Italy, France, Germany and Central & Eastern Europe. Generali is headquartered in Italy where it holds a leading position with an overall market share exceeding 15 percent. Generali announced the completion of its acquisition of AXA Greece in May 2021. In November 2021, Generali sealed its takeover of the smaller Italian insurer Cattolica. Cattolica achieved €1.8 billion in gross written premiums in 2020. Generali now owns 84.5 percent and plans a delisting and integration of Cattolica into Generali.

Generali has long experience in the telematics field, with telematics projects in Italy dating back to 2010. The company uses telematics technology for a variety of reasons, including revenue generation as well as cost control. Telematics for example plays an important role in stolen vehicle recovery and the claims management process by improving fraud prevention and contributing to a better overall performance. The technology is also used as a risk

selection tool, enabling the company to identify well-performing customers in otherwise traditionally high-risk segments. Generali had a total of around 2.0 million connected mobility insurance policies in force at the end of 2020. Berg Insight estimates that the Italian market accounts for more than 1.5 million of these, where the prevalent form factor is hardwired black boxes. Generali has successfully developed telematics and behavioural pricing projects in the motor business across seven countries in Europe.

In July 2015, the Generali Group announced the acquisition of MyDrive Solutions, a start-up founded in 2010 with focus on data analysis and software engineering aimed at providing driver profiling. In September 2016, Generali Group signed a R&D partnership with the UBI pioneer Progressive in the US to enhance the companies' data analytics capabilities and telematics-based product portfolio. Moreover, Generali Italia launched Jeniot at the end of 2018, a company developing services in the IoT and connected insurance that are tied to mobility, home and health insurance products. Generali Jeniot has developed the backend platform that powers Generali's telematics programs across Europe. The product portfolio targeting automotive IoT comprises personal lines insurance solutions, commercial lines insurance solutions and products utilising OEM telematics data. MyDrive's technology and operations have been consolidated into Generali Jeniot, the brand is however still in use for digital only products. Generali Jeniot has developed a smartphone-based solution using the platform from MyDrive. It also offers hardware-based telematics services using a range of aftermarket telematics products working together with various hardware partners. The insurance telematics platform enables real-time coaching of driver behaviour and services such as eCall, geofencing, car finder and crash report. The driver behaviour algorithms are applicable in the fleet management use case and Generali Jeniot works with fleet management companies as well as shared mobility operators. The company enables effective insurance pricing by leveraging telematics data and enhances existing fleet management systems with behavioural data monitoring. The company moreover has deep expertise in black box testing and performs Advanced Driver Assistance systems (ADAS) testing to analyse the effective impact of ADAS on risk mitigation and claims reduction. In 2019, Generali and FCA Group (Stellantis) signed a partnership aimed at developing connected insurance solutions in Italy, Germany, France and Poland. Generali Jeniot enables insurance telematics services for FCA vehicles, leveraging aftermarket black box technology

as well as embedded OEM telematics systems. The partnership will also be extended to the insurance plans for the cars of Leasys' fleet. Leasys is a Stellantis company that specializes in short-, medium- and long-term rental and carsharing.

On the domestic market, Generali uses both professionally installed black boxes as well as self-installed devices to provide both basic and premium services, to be paid through a dedicated fee. The telematics policy is a PHYD product with a range of VAS, including an emergency call system and vehicle tracking in case of theft. The premium at renewal varies based on mileage, driving environment (e.g. city or highway) and the time of driving (e.g. day or night). Mobile and web-based access to driving data and scores is enabled. In 2020, Generali also launched a telematics-based fleet offering in Italy as well as a consumer facing mobile only solution in 2021 in the form of a TBYB offering. Generali's direct insurance subsidiary Genertel which sells insurance over the phone and online further introduced the Quality Driver insurance telematics offering in 2011. Quality Driver enables discounts of up to 25 percent and is a PHYD offering based on three factors related to speeding, road types and driving hours as well as acceleration and braking behaviour respectively. Roadside assistance and stolen vehicle recovery are also parts of the Quality Driver product. The driver's score can be viewed in a smartphone app or online. In 2018, Genertel launched a smartphone-based offering developed by Generali Jeniot branded GoDifferent. The GoDifferent app linked with a device placed on the windshield of the car. The device monitored the driving patterns and transmitted data to the app via a Bluetooth connection. The client received personalized feedback and advice on how to improve the driving style. Drivers who recorded a minimum of 500 kilometres and at least 10 trips and got a score of at least 50 points out of 100 were eligible for a discount on their insurance premium upon renewal. The score was determined based on braking, acceleration, cornering and speeding parameters. In 2021 Generali Jeniot released a new version of MyDrive aimed at providing an enhanced and more engaging customer experience. The new version of the mobile app has a new user interface, a new feedback engine and new capabilities such as an anti-distraction feature, which detects any potential smartphone usage while driving. The user can access a dedicated dashboard to monitor the driving performance through an aggregated report about the overall driving style, the number of trips made, total distance covered, number of smartphone distractions and number or type of negative events recorded, like harsh

acceleration or braking, behaviour at intersections, and speeding. The solution's coaching feature provides a score and feedback for each trip, offering personalized advice to the user on the driving behaviors to be improved. In April 2021, Generali and the Italian provider of electronic road toll collection systems Telepass announced a partnership where Generali clients, initially, are able to receive automated reimbursement on their road tolls in case of traffic delays. The partnership is planned to generate further value to customers of Telepass and Generali in the future.

Additional telematics initiatives have also been launched by the group in markets outside Italy. Generali Seguros in Spain launched the PHYD offering Pago como Conduzco – which translates into Pay as I Drive – that enabled discounts of up to 40 percent on the basis of driving data collected by on-board telematics devices. Value-added services such as emergency alerts and stolen vehicle tracking services were offered as well as individualised insurance premiums. In July 2021, Generali Seguros launched Generali Auto Connect & Go, a telematics-based solution in cooperation with Vodafone Automotive and Generali JenioT based on Windscreen "Live" device technology, aimed at providing primarily road safety and mobility-related extra services, such as pay-per-use cashback programmes. Furthermore, Generali has launched a telematics product in Slovakia branded "SOS Partner". SOS Partner was released in 2015 as an addition to Casco coverage in the form of an emergency call system with both automatic accident notification including GPS coordinates in case of a crash, and a manual SOS button connecting to Europ Assistance. Data collected through SOS Partner is also used for PHYD pricing. Customers enrolling in the program were eligible for an initial discount of 5–10 percent, which could increase to 10–20 percent based on the driving score upon renewal. The Greek market is offered a MyDrive branded mobile based solution, in which drivers are offered a participation discount of 10 percent and safe drivers can earn additional discounts.

Generali moreover launched a smartphone-only telematics program in Germany in 2016, targeting drivers of all ages where participants were rewarded for safe driving. Generali's subsidiary MyDrive Solutions has developed the app and performs data analytics and scoring for the program. One-second GPS data from the driver's smartphone is analysed and results in a driving score based on speeding, acceleration and braking. The driving behaviour is

compared to an optimal behaviour on the specific route provided by the Royal Society for the Prevention of Accident (RoSPA) which later determines a risk profile and the final driving score. An initial discount is offered based on the first journeys, which can rise to 30 percent upon renewal. The app furthermore offers suggestions on how to improve the driving. Generali Germany currently has a commercial fleet UBI offer for personal company cars, rewarding safe drivers. MyDrive Solutions additionally powers the Generali MyDrive smartphone only telematics solution in Greece that was introduced on the market in November 2018. A high safety score awards drivers points in Generali's loyalty program and gives the option of premium discounts or vouchers and discounts by partner firms. Generali Germany is developing a new value proposition aimed at replacing the purely digital solution based on behavioural score launched in 2016. The next generation solution will offer more than telematics services and additionally include VAS products like assistance services and reward programmes aimed at motivating users to adopt a more sustainable and preventive driving behaviour. Generali is also launching a device-based commercial telematics program for fleet managers in Germany, providing services such as real time vehicle monitoring and reporting parameters like fuel consumption. The hardware device will be installed on each fleet vehicle.

Generali aims to expand its connected insurance business also outside of motor insurance. This includes areas such as home and health telematics, and a partner agreement has been made with the South African insurer Discovery to provide a health-focused offering branded Vitality. Generali Group offered the first connected home policies in 2017, hence expanding its telematics portfolio to other lines of insurance. Generali Jeniot now offers services related to connected homes and pets. As a paradigm of this new approach, the new AirSafe product, an advanced air quality monitor and smart light device, coupled with proactive smart assistance services, was introduced in 2020.

3.2.3 Smartphone-only solutions – a growth engine for Allianz's telematics offerings

Germany-based Allianz Group is a major financial services company active in the insurance and asset management sectors. The company is a leading property and casualty insurer with a total client base of more than 100 million private and corporate customers. Allianz has about 150,000 employees in over 70 countries and achieved total revenues of € 140.5 billion

in 2020, down 1.3 percent year-on-year. Gross written premiums from property and casualty insurance reached € 59.0 billion in 2020. The company's largest market in the property-casualty operation is Germany with more than € 10.9 billion in gross premiums written. Other important markets are France, Italy and the US. Insurance segments served include health, car & motorbike, house & home as well as various types of business insurance.

Allianz created its own telematics business unit around 2006–2007 and the company Allianz Telematics was later established in 2011. The company has a total of more than 50 employees and is based in Trieste in Italy with staff located also in Munich where the Allianz Group is headquartered. Allianz Telematics was started with the aim to explore telematics products and services using a broad approach focused not only on insurance-related applications such as PAYD but also various services (VAS) and assistance. Allianz Telematics is today operating as part of Allianz Technology. Allianz Technology is the global IT service provider for Allianz and delivers IT solutions that drive the digitalisation of the group. The company has more than 10,000 employees located in 36 countries. The company delivers telematics solutions to Allianz group companies in a number of countries. The company sources hardware devices from partners such as Meta System. The software is further generally developed in-house by Allianz Technology. In January 2015, it was announced that Allianz was to collaborate with Telit and Telenor Connexion to optimise mobile network usage in line with GSMA guidelines for improved IoT performance. The company started out using black boxes, but the product portfolio broadened to OBD-devices in 2015 and smartphone-only solutions in 2016.

Telematics offerings have been launched in a number of markets including Italy, Germany, France, Spain, Greece, Switzerland, Austria, Belgium, the Netherlands and the Czech Republic. Allianz has also developed small-scale pilots in Poland, Russia, Brazil, Turkey, Australia, the Philippines, Thailand, Malaysia and the UAE and is simultaneously developing new products in Italy, Austria, Ireland, Greece, Germany and France. Target segments include personal as well as commercial customers. Examples of offerings range from fleet management solutions to service solutions such as emergency services and SVR for consumers. The consumer offerings may impact insurance premiums in different ways, either through flat discounts if signing up for specific services, or through actual usage-based discounts.

In total, Allianz had around 830,000 active policyholders within insurance telematics at year-end 2020. This includes solutions provided by both Allianz Technology and external partners such as IMS. The vast majority of the business is concentrated to Italy reaching an estimated 460,000 active policyholders by the end of 2020. Germany is the second largest market within telematics with an active customer base of over 220,000 at the end of 2020. France reached an estimated 33,000 policyholders and Spain an estimated 12,000. More than 99 percent of the total active units are represented by personal lines customers. A significant share of the units have connections to different types of potential insurance discounts and about 75–80 percent of the total installed base is estimated to be associated with usage-based insurance pricing.

Figure 3.1: Allianz's top telematics markets (Q4-2020)

Country	Size	Telematics partner
Italy	460,000	Allianz
Germany	220,000	IMS / Allianz
France	33,000	Allianz
Spain	12,000	Allianz

Source: Allianz and Berg Insight estimates

On the Italian market, Allianz introduced a pay per use offering alongside a range of safety and security focused telematics-based services already in 2009. The offerings were originally branded Service Pack and Pay Per Use and have over time evolved into the SestoSenso 2.0 and SestoSenso KM offerings available from Allianz today. The former is a telematics service enabling functionality such as automatic emergency calls, speeding notifications and theft tracking. SestoSenso 2.0 costs € 110 per year and Allianz car insurance policyholders can benefit from flat discounts of 20–36 percent on different policies if signing up for the service. SestoSenso 2.0 services can be accessed through the smartphone app AllianzNOW. The SestoSenso 2.0 is a solution comprising a new telematics device, replacing the legacy SestoSenso solution. SestoSenso KM is furthermore a mileage based PAYD policy leveraging telematics data to determine individual premiums.

Allianz Technology furthermore offered the Allie consumer telematics service based on OBD-II devices and smartphone apps in Italy. The initiative started out in 2012 as a test of this type of telematics form factor as opposed to the black boxes traditionally used by Allianz Technology. Customers can access telematics data and services through apps for iOS and Android devices as well as a web portal. Allie is offered in a number of packages enabling various VAS. In addition to the core service offering, users of Allie can also qualify for flat premium discounts of 10–15 percent on select insurance offerings from Allianz.

In 2016, Allianz introduced the programs called Bonus Drive in both Italy and Germany, although the technology used is different. In Italy, Bonus Drive is based on a self-installed black box that is mounted directly on top of the car battery. eCall services are included and a discount of up to 30 percent can be achieved at renewal. Bonus Drive users in Italy have access to information about driving behaviour and driving tips in the Allianz Bonus Drive smartphone app. In Germany, Bonus Drive was introduced in May 2016 and uses IMS' DriveSync platform to run an enhanced mobile solution where the user's smartphone is connected via Bluetooth to a device that plugs into the 12V socket or the recently developed battery powered Bluetooth beacon, DriveDot. The smartphone is connected to a 12 V Bluetooth car adapter, Bluetooth beacon or directly to the car via Bluetooth for vehicle identification, with the mobile app providing driver behaviour monitoring and driver coaching. Allianz offers the 12V device free of charge. The German program includes an initial cashback of 10 percent and an additional cashback of up to 30 percent based on the driving score at the end of the policy period. The DriveDot device enables Allianz to automate FNOL and enhance impact assessments and claims handling processes. Emergency services from Allianz Germany is handled through the GDV eCall project, which it is an active part of, and such services are offered separately as an additional module. AllSecur, a subsidiary of Allianz Germany, announced a smartphone only PHYD program also called Bonus Drive in October 2016. The technology in that program is however developed in-house by Allianz. Allianz Bonus Drive was also marketed in Belgium and Austria but as smartphone-only solutions developed in-house by Allianz. In Belgium, drivers could use the Bonus Drive for a free trial period of two months to determine a driving score. Following the trial, drivers who enlisted to the Bonus Drive scheme immediately achieved a discount corresponding to the achieved driving score during the trial period. The offered discount ranges between 0–50 percent. The score was reviewed on an annual basis and policyholders were required to register all

journeys with the insured vehicle and cover at least 2,000 kilometres per year. Currently Allianz Belgium offers a flat 10 percent discount to drivers whose cars are fitted with ADAS systems like adaptive cruise control and blind spot monitoring. Bonus Drive in Austria was similar to the solution in Belgium, but the trial period was 90 days and the maximum discount offered was 40 percent.

Allianz has a subsidiary called Allianz Automotive that works with several OEMs on how to utilise the data from connected cars. The first step was a partnership with BMW which has resulted in the introduction of the FlexiMile telematics-based insurance solutions for BMW electric vehicles in the UK and the Netherlands. The FlexiMile solution is no longer active on the market. Allianz Automotive explores OEM-based initiatives with multiple automotive OEMs in Germany. Moreover, Allianz signed an agreement with Scania CV Financial Services in 2017 in order to develop Scania-branded motor insurance solutions. The agreement is based on the long-term strategic cooperation between Allianz Automotive and Volkswagen Group. The two companies deepen their collaboration by designing additional services, such as telematics-based insurance for commercial vehicles.

The activities on other markets include various initiatives. In Switzerland, Allianz Suisse launched the Crash Recorder accident data recording product Helpbox in 2011, which could give customers younger than 30 years discounted insurance premiums following the installation of a small on-board event recording device. Similarly to SestoSenso 2.0 in Italy, the Allianz Helpbox telematics offering in Switzerland further enabled additional safety-related services such as automatic emergency calls, manual breakdown calls and theft tracking. In 2014, Allianz France introduced the consumer offer Conduite Connectée which is powered by Webfleet Solutions. The solution was first based on a self-installed OBD device paired with an application for iOS and Android handsets enabling wireless communications. The hybrid OBD/smartphone system also enabled roadside assistance functionality provided by Allianz Assistance and emergency alerts in case of an accident. Discounts of up to 30 percent were offered to safe drivers. Partners to the initiative include Webfleet solutions. The discount is applied at renewal of the policy if the app has been used during at least a 30-day observation period, no later than 3 months before the renewal month.

Allianz also has activities related to insurance telematics on the UK market, however using a different approach. In 2013, Allianz teamed up with Marmalade to launch a telematics product aimed at young drivers on the UK market. Marmalade is a UBI-focused insurer offering the New Driver Insurance policy which is underwritten by Allianz. Allianz extended the partnership with Marmalade in December 2017. As part of the new deal, Marmalade will be able to use Allianz's global connected car platform and telematics services and products from Allianz Technology. Several partnerships related to fleet insurance in the UK have also been announced. Discounted SVR products are available from TRACKER Network and a partnership with FMG was announced in June 2015. Following this partnership, Allianz customers will have discounted access to FMG's telematics software service Ingenium Dynamics. In 2016, Allianz UK entered a partnership with Lightfoot for fleet insurance. The Lightfoot device provides real-time audio, visual feedback and coaching for drivers in motor fleet vehicles.

3.2.4 AXA offers its insurance telematics portfolio in multiple European countries

AXA Group is a French finance company within insurance and asset management. The group operates in 54 countries employing around 115,000 people and reached € 93.9 billion in income from gross written premiums in 2020. AXA mainly operates in Western Europe, where it generates around 60 percent of its revenues, but is also present in Asia, the Middle East, Africa and Latin America. AXA reached a total of € 14.2 billion in gross written premiums for personal and commercial lines motor insurance in 2020, comprising 29 percent of the gross P&C revenues of € 48.7 billion. In the P&C vertical, France is an important market accounting for 14 percent of gross revenues. Germany contributed nine percent of gross P&C revenues while the UK/Ireland and Switzerland contributed seven percent each. In 2019, AXA divested its Ukrainian operations to Fairfax Financial Holdings and the Central and Eastern European operations were in October 2020 divested to UNIQA. In May 2021, operations in Greece were divested to Generali.

AXA offers telematics-based insurance across Europe and has also expanded its telematics portfolio to Asia, with the launch of insurance telematics propositions in Malaysia and Singapore. AXA uses insurance telematics for three different purposes: pricing, claims management and VAS. Pricing includes discounted premiums for safe drivers, claims

management includes crash notifications and accident reconstruction and VAS represents services such as geolocation of a car and rewards for safe driving in terms of bonuses and goodies. Depending on the characteristics of each local market, AXA strives to leverage the three pillars aligned with local market demands. The largest proportion of AXA's telematics policies are installed in Italy, followed by France, Belgium, Ireland and Switzerland.

The group's total installed base of active telematics policies is estimated at approximately 500,000 at year-end 2021, out of which the Italian market comprises a large part. AXA has also launched a TBYB smartphone app, AXA Drive, that offers trip assessment based on acceleration, cornering, braking and speeding. The app is used to increase the awareness of AXA's telematics programs and encourage safe driving across Europe. A new version of AXA Drive – AXA Drive 2 – offers more advanced scoring capabilities. Each AXA country can customise the AXA Drive app to match the local market demands. AXA has a dedicated subsidiary – AXA Data Innovation Lab – responsible for data analytics, scoring and telematics services for several of AXA's telematics-based propositions across Europe. The subsidiary was created to further AXA Group's overall digital strategy, including insurance telematics and UBI offerings. AXA has differentiated strategies on each local market and leverages different partnerships, either for scoring capabilities, telematics services or hardware sourcing. The AXA Group is no longer centralising the insurance telematics strategy and lets each local subsidiary handle the offering to cater to the demands in each local market.

In Italy, AXA offers a black box-based solution powered by Octo Telematics branded AXA Drive Box. Customers who install the AXA Drive Box get access to SVR and assistance services. The box can be paired with a hands-free button that connects the driver with AXA Central Emergency if an accident occurs. Discounts on the annual car insurance are awarded to customers who install the AXA Drive Box. In addition, a new proposition has been launched which focuses more on VAS to improve the customer experience on the Italian market. AXA Italy's online branch Quixa has launched the insurance telematics offering QuixaBox. Quixa has partnered with Vodafone Automotive, which provides telematics services and hardware to the QuixaBox scheme. The solution comprises a GSM/GPS black box as well as an emergency button and integrated handsfree system. Vodafone Automotive provides services such as SVR, roadside assistance, telephone support including information about weather

and traffic as well as direct contact with medical staff in case of an emergency. QuixaBox offers a bonus of € 30 upon renewal to safe drivers. A smartphone app enables users to locate the car, receive feedback on driving behaviour, set up a geofence zone and set a speed alert that notifies if a speed limit has been exceeded.

In France, AXA's subsidiary Direct Assurance has since 2015 offered a PHYD telematics offering branded YouDrive. The PHYD program uses an OBD-device, branded DriveBox, supplied by Meta System and Direct Assurance previously worked with Baseline for telematics services, however analytics services are now handled by AXA Data Innovation Lab. Moreover, a TBYB scheme branded YouDriveLite was offered between 2015–2018. In January 2021, a new app based TBYB offer was launched with a YouDrive branded app. The app also enables drivers to connect to the DriveBox directly and view their score in the app. Based on the provided driving score, drivers can achieve as much as 50 percent discount on their premium each month. The driving score is determined by acceleration, braking, high speed cornering, speed in relation to contextual data such as traffic and map data sourced from third-party companies as well as the covered distance. Customers that reach a driving score of 90 and drive less than 500 km per month are eligible for the maximum discount. YouDrive PHYD had an estimated customer base of around 60,000 active policyholders at the end of 2021.

AXA Belgium offered started to offer the AXA driveXperience in 2016, a PHYD insurance targeting young drivers starting in 2016. Driving data was gathered from an OBD-II dongle sourced from Meta System that connected with the driver's smartphone. Depending on the score provided by AXA Data Innovation Lab, discounts of up to 50 percent were offered to the safest drivers. An initial discount of 20 percent was offered by joining the program and driving tips was provided on a daily basis. In January 2021, AXA launched a replacement product branded AXA DriveCoach based on technology from Cambridge Mobile Telematics. The new product is an app-only solution and adds phone distraction to the scoring parameters as well as gamification features. AXA Belgium also underwrites the policies for Mercedes-Benz Financial Services' (formerly Daimler Financial Services) PHYD offering in Belgium and AXA Data Innovation Lab provides the scoring and related services to Mercedes-Benz Financial Services. Moreover, AXA provides a PHYD offer branded Drive & Save for PSA Assurances in

Belgium. The programs enable owners of eligible Peugeot, Citroën and DS vehicles to benefit from discounts on their insurance premiums. Data is collected from an embedded telematics system with the customers consent and processed by the AXA Data Innovation Lab.

After a successful pilot, AXA Switzerland and the German start-up ThinxNet founded a new connected car company called Ryd Suisse. Ryd Suisse offers aftermarket car telematics products targeting a wide range of customer segments including consumers, dealerships and insurance carriers based on an OBD-II device. AXA Switzerland offers two different telematics programs. The programs are branded Crash Recorder and DrivePartner. Crash Recorder was first introduced in 2008 using a device only for reconstruction of crash events that did not transmit data. Instead, data from 30 seconds before a crash to 10 seconds after was stored in the device for later retrieval. The first version of Crash Recorder used a standalone device supplied by Blacktrack and installation services were provided by Carglass. In 2019, AXA Switzerland launched a new version of Crash Recorder, using an OBD device provided by Ryd Suisse. The Crash Recorder works in a similar way as the previous version and only records data in connection with an accident. In addition to the crash recording capability, the device has new features such as eCall. An estimated 4,000 clients used the new Crash Recorder device and around 35,000 vehicles were equipped with the old hardware sourced from BlackTrack at the end of 2021. In addition, a new telematics product branded DrivePartner was launched in 2019. DrivePartner is based on an OBD dongle provided by Ryd Suisse and offers a range of connected car services as well as an upfront discount of 15 percent on the insurance premium for drivers between 18 and 25. Older drivers get the service free of charge and can benefit from various vouchers based on their driving behaviour. Examples of connected car features offered via the DrivePartner program include automatic emergency call, crash recorder, roadside assistance, real-time GPS location, information about fuel consumption and battery level status, driver behaviour statistics as well as location sharing and GPS alarm services with stolen vehicle tracking services. An estimated 1,500 AXA policyholders had enrolled in the DrivePartner program at year-end 2021.

In the UK, AXA underwrites policies for the pay-per-mile insurance broker By Miles. Furthermore, AXA UK offers a discount to drivers that have installed dashcams. Dashcams are commonly used to record a driver's eye-view of the road ahead on every journey and can

provide evidence of what happened in an accident. In Ireland, AXA offered a PHYD smartphone-only offering – AXA DriveSave – powered by MyDrive Solutions. AXA DriveSave targeted drivers under the age of 25 with an initial discount of 20 percent offered when enrolling in the program. A five percent cashback could also be earned during the year depending on the driving behaviour. The overall driving score ranged 1–100 and a score above 70 resulted in a 5 percent cashback. The score was calculated using a 72-point matrix measuring all driving behaviours. To be eligible for the AXA DriveSave program, drivers had to record all trips through the app, drive a minimum of 400 km over a 90-day period and at least record 90 trips during the same assessment period. Moreover, AXA Ireland offered a 10 percent discount on its insurance policy for drivers installing a Nextbase dash cam. The telematics offers are currently not available to new customers.

3.2.5 Admiral Group has multiple insurance telematics programs in Europe

Admiral Group is one of the largest car insurance providers in the UK and has grown rapidly through a multi-brand strategy since the launch in 1993. The company offers insurance solutions in the UK through its brands Admiral, Bell, Diamond and Elephant. Admiral Group is also present in Spain, Italy, the US and France. The company reached over 7.7 million customers and a £ 3.55 billion turnover in 2020. The UK motor insurance segment generated a £ 2.67 billion turnover and had about 4.75 million vehicles insured.

Admiral Group currently offers insurance telematics policies in the UK and Italy. The UK market is covered by the programs Admiral LittleBox and Bell Plug & Drive black box car insurance. The Italian market is covered by the ConTe.it+SAT program. Admiral LittleBox is a black box insurance solution that targets young and first-time drivers but is available for drivers of all ages. Black boxes and telematics services are supplied by Vodafone Automotive. In November 2017, it was announced that Vodafone Automotive will be the exclusive telematics partner for Admiral Insurance and its LittleBox telematics program. Parameters such as acceleration, braking, speed and what time of day the car is driven are recorded and analysed. These parameters determine the upcoming discount on the insurance premium. Only installing the black box makes the driver eligible for an upfront discount and a good driving behaviour can further increase the discount at the renewal of the policy. Approximately 80 percent of the LittleBox users are offered a discounted price at renewal. Admiral offers LittleBox customers the possibility to review the driving statistics

through an online portal. The portal displays information about the latest journey, total mileage and overall score, including driving tips to improve the driving behaviour. Value-added services such as theft tracking are also available as long as the LittleBox is active. In addition, following the announcement of the partnership between Vodafone Automotive and Admiral Insurance, Vodafone will provide information on crash situations and help Admiral to digitalise the overall claims process. In Spain, Admiral's subsidiary Balumba worked with Octo Telematics using professionally fitted devices for insurance telematics, a service which is no longer marketed.

In 2018, Admiral launched Admiral LittleBox for Van that offers black box insurance for fleet owners. Admiral LittleBox for Van offers telematics-based insurance to small, transit and larger vans up to 3.5 tonnes. Eligible vehicles must be less than 14 years old, worth more than £ 750 and cover over 1,900 miles a year. A driving score is calculated for the customer, which determines the discount on the insurance premium at renewal. The telematics device in the Admiral LittleBox for Van offering features a theft tracking functionality, which is offered as a free value-added service to policyholders.

Bell's insurance telematics offering differs from Admiral's LittleBox. The solution is based on a device that is plugged into the 12V socket. Complex installation is thereby avoided, but the device is more visible for the driver. Hardware and telematics services were previously supplied by DriveFactor, but the collaboration ended in 2016 and has been replaced by Redtail Telematics. The device records speeding, acceleration, braking and harsh manoeuvres to determine the driving score. Bell sends feedback to the driver via email and offers suggestions on how to improve the driving behaviour. Policyholders are offered discounts on the policy or cashback based on their driving score. Redtail Telematics supplies crash analysis and accident reconstruction, thus enabling an analysis of what happened before the crash to ease the claims handling process. Drivers can continuously use the device for up to 6 months, similar to roll-over models that are popular in North America.

ConTe.it+SAT is an insurance telematics offering from Admiral's Italian subsidiary ConTe. The black box is supplied by Octo Telematics and installation is free of charge. The black boxes offered are either professionally installed devices which have to be fitted by a certified technician or light devices, which can be fitted manually by attaching the box to the car

battery following instructions provided by ConTe. The offering provides security, protection and a discount on the policy. Further services such as crash detection and roadside assistance are included. If the black box detects a crash, a signal is sent to the emergency services which will attempt to get in contact with the driver.

At year-end 2016, Admiral Group announced that it had over 200,000 active insurance telematics policies in the UK and has not released any official update since. Berg Insight estimates that the installed base for Admiral Group reached about 285,000 at the end of 2020, which is equivalent to about 6 percent of all cars insured by Admiral Group. The LittleBox and LittleBox Van programs accounted for more than 150,000 connected black boxes in Q2-2020. Admiral has furthermore partnered with Cambridge Mobile Telematics to offer a smartphone-based solution. Today, the smartphone-based solution is on trial and has no live policies connected to it.

3.2.6 Insure The Box has sold more than 1.0 million black box-based policies

Insure The Box is a major provider of telematics-based car insurance on the UK market commonly using the insurethebox brand. The company is incorporated in Gibraltar and is a wholly owned subsidiary of Box Innovation Group (BIG) which has a total of around 450 employees. Caitlin Group was the majority shareholder and the authorised insurer of Insure The Box until early 2015. In December 2014, Aioi Nissay Dowa Insurance Japan (ADI) through its European subsidiary Aioi Nissay Dowa Insurance Europe (ANDIE) announced an agreement to acquire the majority shareholding in BIG from Catlin Group and other shareholders for £ 105 million (€ 134 million), receiving regulatory approval in February 2015. ADI and ANDIE are both part of MS&AD Insurance Group which is a leading Japanese insurer. ANDIE acquired just over 75 percent of BIG while the remainder was retained by the management of BIG. The existing brands have been kept, but the policies are now underwritten by ANDIE. In Q1-2018, ANDIE announced its intention to purchase the remaining 25 percent shares in BIG, which includes the brands insurethebox and drive like a girl. The business is today integrated within the ANDIE Group.

The insurethebox offering was launched in 2010 and includes the installation of a black box telematics device which features GPS, accelerometer and an integrated SIM card. The device is professionally installed at no charge and records data including the time of day of driving,

speed across different types of roads, sharp braking and acceleration, whether breaks are taken on long journeys, total mileage, motorway mileage and the number of journeys. The customer chooses a number of Policy Miles – 6,000, 8,000 or 10,000 miles – based on the expected yearly mileage. Additional miles can be bought as top-ups and are transferable to the next year. Safe driving can moreover generate rewards of up to 100 Bonus Miles per month. Since its launch insurethebox has rewarded over 370 million Bonus Miles to its drivers for their safe driving. At renewal, the Bonus Miles scores from the preceding year are used to calculate the price of the next premium. The average customer saving is up to 38 percent on renewal. The criteria used to calculate Bonus Miles scores are speed, smooth driving, taking breaks, time of day and motorway miles. Policyholders can log onto an online dashboard called Your Portal to check monthly, remaining and bonus miles, buy top-up miles and see how safe the driving has been. The company also offers free value-added services such as Accident Alert which is included as standard with all insurethebox policies. If a strong impact on the vehicle is recorded, an alarm is set off at the company's Service Centre in Newcastle. The data is analysed and the driver is contacted to assess the situation. Emergency services can be contacted if a serious accident is suspected. Telematics is also used for FNOL and to prevent fraud, where Insure The Box has had some significant wins during the past years with several favourable court-ruling based on telematics data. The black box can moreover be used as a theft tracking system. The company has a theft recovery rate of more than 90 percent.

Following the success of the initial insurethebox offering, the company introduced the Drive Like a Girl product in 2013. This brand mainly targets women aged 17–25. Men can however also get a policy and the premiums are gender-neutral in line with EU regulations. Drive Like a Girl previously offered cash back rewards every three months based on the driving behaviour. Insurethebox however noticed that the customer interaction was significantly lower than with the insurethebox brand where bonus miles were offered on a monthly basis. Hence, a re-launch of Drive Like a Girl focusing on reward points and bonus miles took place in mid-2016. Policyholders that drive safely – “like a girl” – can earn up to 100 reward points per month. The points can be used to buy top up miles and receive other goods and services. Insurethebox has worked with Tesco Bank as a white-label partner since 2013. During this time insurethebox has arranged and administered Tesco Bank Box Insurance, targeting young drivers aged 17–25.

Figure 3.2: Overview of the Your Portal interface for insurethebox policyholders

Welcome to Your Portal

This page gives an overview of your driving, showing how many miles you've driven and how many are still available. The graph below shows the total miles you have driven for each month of your policy. You can also view details of individual journeys by clicking on the relevant month.

Miles Available	Miles Driven
2325	4483

This is the number of miles you have remaining, including Policy Miles, Top Up Miles, Bonus Miles and Reward Miles.

This is the number of miles you have driven so far this policy year.

Miles Driven Each Month

Bar chart showing Miles Driven (Y-axis, 0 to 900) vs Month (X-axis: Jul, Aug, Sep, Oct, Nov, Dec, Jan, Feb, Mar, Apr, May, Jun). The chart shows a peak in driving during the winter months (Dec-Mar).

Bonus Miles

You can use this page to see how many Bonus Miles you have earned, as well as how they are calculated. Click on the icons below to find out how you could earn more.

Time of day	Speed	Alerts	Breaks	Motorway
[Icon]	[Icon]	[Icon]	[Icon]	[Icon]

Your Bonus Miles

55
08 Feb - 07 Mar

How do you compare? ▶

Time of Day

Our records show accidents are much more likely to happen at certain times of day. The best drivers tend to drive is between 1pm and 4pm. Try to avoid this as much as possible. More accidents also occur during the evening rush hour (5-6pm) and after 10pm. If you can avoid these times you will reduce your risk of an accident and earn more Bonus Miles.

08 Jan 2012 - 07 Mar 2012

Top Up Miles

If you need more miles you can buy Top Up Miles here at any time.

Top Up Miles can be bought in bundles of 250, 500, 1000 or 2000 miles. The price is based on your premium and is shown below.

250 miles	500 miles	1000 miles	2000 miles
£45.42	£90.84	£181.68	£363.37
Select	Select	Select	Select

Buy

You can buy online now with a credit or debit card, or you can call us on 0333 123 1308.

Please note: If you don't use all your Top Up Miles this year you can roll them over to next year when you renew. Unused Top Up Miles cannot be refunded if you don't renew. You must pay for Top Up Miles in full at the time of purchase. For full details please see the Frequently Asked Questions (FAQs).

Your Insurance

You can find your insurance policy details and any saved quotes here. If any of your policy details change please call us on 0333 123 1308.

Your Policy

Vehicle Registration XXXX XXX
Name Test
Car Ford Focus
Policy Number ITB/00000000
Product 6,000 miles
Start Date XXXXXXXX
End Date XXXXXXXX
Cover Type Comprehensive
Policy Extras Road Rescue: No
Keys Protect: No
Legal Protect: No
View Details

About You

Name Test
Date of Birth XXXXXXXXX
Occupation Test
Marital Status Test
Address 1 The Street
City XXX XXX
Mobile Number 0000000000
Alternative Number 0000000000
test@test.com
Change your Email
Change your Password

Saved Quotes

There are no quotes to view.

Helpful Information

Change in circumstances?

Source: Insure the Box

The company further in early 2013 introduced its own new telematics platform branded BIG Telematics, including new hardware. Technology partners for BIG Telematics among others include EE, PTV, RS Fleet Installations, 4D Data Centres and Meta System. Insurethebox has moreover had a longstanding partnership with Octo Telematics which has supplied more than 300,000 black boxes since 2010.

Launched in 2010, the company sold more than 65,000 insurethebox policies in the first year and reached the 100,000 mark in August 2012. The 200,000 mark was subsequently surpassed in 2013. The company has now sold more than 1.0 million policies and collected more than 5.0 billion miles of driving data. The number of active policies has remained steady for many years at an estimated level of 100,000–150,000. All vehicles are equipped with black boxes and the installed base includes no OBD devices or app-based solutions.

3.2.7 Direct Line Group uses a variety of sensors for gathering of telematics data

Direct Line Group is a British insurer active in personal lines motor insurance, home insurance and commercial insurance for small- and medium-sized enterprises. Products are also available for life, pet and travel insurance. At year-end 2020, Direct Line Group insured around 4.1 million cars, reaching £ 1.62 billion in gross written premiums in the motor segment. The company uses a multi-brand and multi-distribution channel approach including the subsidiaries Direct Line, Churchill and Privilege in the UK. The group operates through a number of locations in the UK, having over 10,000 employees. UK Insurance underwrites the insurance policies of Direct Line.

The company has launched a range of telematics activities in the UK. A year-long pilot was initiated in 2012 which in 2013 led to the launch of insurance telematics offerings from Direct Line. The group offers telematics solutions from Direct Line (DrivePlus) and group companies Churchill (DriveSure) and Privilege (DriveXpert) targeting drivers under 26. Telematics devices used were originally professionally installed black boxes, but these were in 2014 replaced by OBD devices installed by the driver. The DrivePlus Plug-in offering today enables discounts of 25 percent for drivers under 21 years and at least 15 percent for drivers aged 21–25. A mobile application branded DrivePlus App was moreover launched in 2013. This entails a TBYB offering and customers can download the app and drive 200 miles before receiving a quote. It also contains VAS including the possibility to locate a parked car via GPS and monitor the condition of the battery. Direct Line leverages various telematics devices to support its insurance telematics programs. The hardware ranges two types of OBDs, hardwired black boxes and OEM telematics devices. Direct Line sees an increasing interest in smartphone-only telematics solutions. In May 2021, DrivePlus was launched as a mobile only version with The Floow as telematics service provider. Drivers under the age of 26 are eligible and offered potential savings of up to 20 percent on a new policy.

Direct Line Group works with The Floow for mobile app-based solutions and data analytics. Direct Line holds a 15 percent equity share in The Floow since 2014. Trakm8 is moreover a supplier of the self-install devices and the T10 hardware following an extension of the supplier contract in 2017. Direct Line and The Floow had an exclusive agreement in the UK until mid-2018. The companies are still working together. Direct Line leverages The Floow's telematics services as well as supports The Floow's scoring algorithms by sharing relevant claims data and customer information. In February 2019, Direct Line and The Floow announced that the companies had analysed more than 2 billion miles of driving data as well as saved young drivers more than £ 50 million in premiums.

Around 50 percent of the Direct Line's new business sales to customers under the age of 21 years include telematics. The company is estimated to have a total of less than 100,000 telematics-based policies in force in December 2020. The number has been steady over the past years. Direct Line group has also signed a partnership with PSA Finance UK. The partnership covers the use of insurance telematics for young or inexperienced drivers in the Peugeot Just Add Fuel and Citroën Simplydrive programs.

3.2.8 Aviva chooses device-based telematics in the UK

Aviva is a multinational insurance company with 33 million customers in the UK, Europe, Asia and Canada. In the UK, Aviva was an early mover within insurance telematics and launched a fleet telematics product as well as a telematics policy for private lines customers in 2004 and 2005. The name of the company was at the time Norwich Union and the IP for the insurance telematics solution was licensed from Progressive. Traffimaster, now Teletrac Navman, was the telematics service provider and supplied the black boxes. The offer reached 45,000 cumulative users before being cancelled in 2007. Aviva has a strong distribution network and relationships with independent financial advisors, brokers and banks. In the telematics market for example, Aviva partners and underwrites policies for the specialised telematics-brokers Carrot and BeWiser.

Aviva offered the Aviva Drive app in the UK in addition to black box and windscreen devices in Italy until it exited the Italian market as part of its new strategy to focus on the core markets – UK, Ireland and Canada. The Aviva Drive app was first introduced in November 2012 and

had by year-end 2019 accumulated more than 700,000 downloads in the UK. The app was free and could be downloaded from App Store or Google Play. After 200 miles of driving, the user was scored on a scale from 0 to 10 and received a discounted quote on insurance based on that score. The app was developed in-house by Aviva and automatically detected journeys. The score could be used when drivers applied for traditional insurance policies in order to qualify for the discount. However, the policy is a traditional insurance product and does not use telematics data actively. No discounts were available to drivers with a premium below £ 200. Car owners with a premium above £ 400 was typically quoted a discount of 28 percent if achieving a score of 7.1 or higher. No drivers were penalised for a low score. In 2018, Aviva added a free dashcam feature to its Aviva Drive app in the UK. The drivers were required to set the phone in a cradle with the camera viewing the road ahead. The dashcam feature was thereafter activated when a collision was detected by a motion reading from sensors on the smartphone. The app recorded short loops and used automatic collision detection algorithms to only keep footage showing the 30 seconds before and 30 seconds after a crash. Users could also manually save footage, with the ability to play recordings or share them with their insurers. Drivers benefitted from the dashcam technology via the Aviva Drive app, regardless of whether they held an Aviva policy or not. Although the solution could be used by everyone, Aviva policyholders had the additional option to be put straight through to Aviva's claims team and send footage directly from the app. Currently Aviva customers in the UK are offered device-based telematics insurance through the Aviva brand General Accident. The product is aimed at 17- to 24-year-old drivers and collects data either through an OBD-II device or professionally installed black box, depending on the insured vehicle. Drivers are scored between 0 and 100 and get an initial discount for signing up and if the overall score is high enough, a discount is offered at renewal as well. In Q4-2021, Aviva Canada launched the Aviva Journey app to allow drivers to record their driving style to reduce their premium.

3.2.9 Ingenie targets drivers in the 17- to 44-year-old age bracket

Ingenie is a UK-based company founded in 2011 which offers black box insurance primarily targeted at learners and young drivers. The company sells both direct to customers and via price comparison websites. Ingenie has two business lines – Ingenie Retail and a service organisation providing B2B services under the brand Ingenie Business. Ingenie Retail is an

insurance brokerage business and was one of the first to offer telematics-based insurance on a PHYD basis in the UK. The company was gradually acquired by the software and outsourcing provider Watchstone Group, formerly known as Quindell, which used its option to buy the remaining 51 percent of Ingenie in July 2014. In November 2020, Ingenie was acquired by A-Plan Group, a subsidiary of Howden Broking Group.

Ingenie's panel of underwriters include Ageas, Covéa, Highway, Action 365, Marketstudy and Royal & Sun Alliance. Ingenie's core telematics program uses professionally installed black box telematics devices. The focus is on helping its customers become better and safer drivers so they can earn an additional 21 percent discount for driving well. A driving score is rated on a scale of 0 up to 100 based on speed, acceleration, braking and cornering behaviour. The score is updated every 10 days or 40 miles (64 km) and the customer is informed about what savings the driver is on track to receive at the next billing review. Through a smartphone app, the drivers can receive feedback on how to improve their driving score based on a colour scheme which ranges from green to black. Ingenie states that around 70 percent of the customers receive a good driving discount. Ingenie furthermore offers VAS such as free stolen vehicle recovery. Since 2012, Ingenie has partnered with Vauxhall to provide a telematics-based insurance product for 17- to 25-year-olds available for both new and used Vauxhall vehicles. Redtail Telematics and Trakm8 are important hardware partners and Avian provides the installation of black boxes. Ingenie is powered by its own cloud based microservices platform called "Multi" which allows any device, connected car or smartphone sensor application to be deployed into the market. The driver scoring and feedback is based on analysis of the telematics data which has been continually calibrated and updated over ten years and two billion miles worth of driving data. In addition to the core annual telematics insurance policy, the brokerage has launched a number of new insurance products including learner driver insurance and a mileage-based proposition that also utilises behavioural analytics.

3.2.10 IMS expands Carrot Insurance's platform to North America

Carrot Insurance is an insurance brokerage that is specialised in telematics-based auto insurance and is estimated to have approximately 55,000 active policyholders. The UK-based company was founded by the British telematics service provider Trak Global. Founded in

2009, Trak Global is now one of the largest insurance telematics service providers in the UK and serves both its internal customer Carrot Insurance as well as external customers such as RSA's programs More Than Smart Wheels and 123GO as well as the Spanish insurance start-up Drive & Win. In Q4-2018, Trak Global acquired IMS and now uses IMS brand name as the insurance telematics technology arm of Trak Global Group. Trak Global is no longer operating as a brand and all Trak Global software, hardware and services are now delivered under the IMS brand. In November 2021, Granite Group acquired Carrot Insurance.

Carrot launched its first insurance product in 2012 and provides two different types of telematics-based insurance with Zurich, Ageas and Aviva as underwriting partners. Carrot has since launch seen a 42 percent reduction in the number of accidents among its customer base. In addition, the company has returned £ 4 million (€ 4.5 million) to customers during the past seven years and the rewards program offers a built-in incentive for consumers to check their status and driving feedback. Due to the relatively high hardware and installation cost for black boxes, these types of policies are in the UK mainly aimed at high-premium customers such as young drivers. However, black boxes have several advantages over smartphone apps, being considerably more reliable and considerably more difficult to tamper with. Carrot offers black box insurances to new drivers with less than two years driving experience. Drivers with more than two years of experience, called "better drivers" by Carrot, are instead of the black box offered a smartphone app. The app requires the car to be equipped with Bluetooth, as it connects with the car in order to avoid bus rides and passenger trips in other people's cars to be monitored and scored. Cars which are not equipped with Bluetooth technology can be fitted with a Bluetooth windscreens-tag called the Carrot Wingman. The premium as decided at renewal is based on the scoring from the previous year for both "new" and "better" drivers. The scoring is divided in three categories: speed, smoothness and usage. A negative score for speed is given if the driver exceeds the speed limit or the average speed. Smoothness includes acceleration and deceleration in all directions, including vertical, for example when hitting a pothole. Negative scoring is given in the usage category for driving between 11 pm and 5 am, more than seven journeys during a 24-hour period or trips lasting more than an hour. The driving score is categorised as red, yellow and green and is determined on a weekly basis. Policyholders ending the week with a green weekly driving score receive various bonuses and rewards. The rewards differ depending on the policy. New drivers that have a black box policy receive so-called Carrot

Points, which can be converted to e-gift cards. Policyholders enrolled in the “better driver” program can claim treats in the smartphone app that is used to track the driving behaviour. Moreover, Carrot has introduced chatbot technology based on SmarTek21’s SmartBotHub Conversational AI to support its end-to-end digital customer experience. SmarTek21 has signed also a partnership with IMS in 2020 to roll out the SmartBotHub technology as an available module to IMS’ existing UBI customers and other interested insurers.

In 2018, Trak Global Group launched a Carrot-branded young driver product in Canada. The smartphone app-based product is branded “Drive with Carrot” and is being exclusively distributed via the Canadian insurance broker InsureMy. The Drive with Carrot product utilises a smartphone app that pairs with a Bluetooth source in the vehicle, similar to the “Better Driver” program in the UK. Rewards for safe driving are issued quarterly and safe drivers can receive cashback of up to CAD 50 per quarter.

In 2015, Fiat launched a marketing scheme for its Fiat 500 together with an insurance telematics policy provided by Carrot Insurance. The offer targeted young drivers in the UK and included £ 800 split over three years towards the insurance premium. The black box was installed prior to delivery and the cost for the device was included in the policy. This offer is no longer marketed. In May 2016, Trak Global announced a partnership with Volkswagen Financial Services UK through which telematics-based insurance was offered at no additional cost for a period of one year to customers buying a new Volkswagen Polo. The offer was available to young drivers between the age of 18 and 24, but is no longer marketed. Carrot Insurance handled the insurance administration and Trak Global was responsible for data analysis and scoring using driving data collected from the car’s on-board telematics system. Between October 2017 and March 2018, Trak Global and BMW Financial Services UK jointly offered a telematics-based insurance for young MINI One customers, which was administered by Carrot.

3.2.11 Marmalade targets young drivers

Marmalade is a UK-based company offering telematics-based new driver insurance, learner insurance and cars for young drivers aged under 34. The company was founded in 2006 and is headquartered in Peterborough. The sister brands Young Marmalade, Provisional

Marmalade and Intelligent Marmalade were in 2013 combined under the common brand Marmalade. The offering includes the New Driver Insurance product which entails a telematics-based insurance scheme for young drivers aged between 17 and 30. Driving data collected includes vehicle location, the distance travelled, speed, braking frequency and force, acceleration smoothness and time spent stationary. Every journey is assigned a risk rating categorised as red, amber or green corresponding to driving behaviour scores of less than 55 percent, 55–75 percent and over 75 percent respectively on a scale of 0–100. The drivers are from the beginning offered the full discount. If the behaviour is not within the acceptance criteria, this can result in an increase of the annual premium by £ 125 and subsequently an additional £ 250 increase or even policy cancellation if unacceptable behaviour is maintained. The insurance offer is only available for newer cars up to 9 years old with engine sizes of up to 1.4 litres which are deemed safer. In April 2021, the acquisition of Marmalade by Atlanta Group (a subsidiary of the independent insurance broker Ardonagh Group) was announced.

Marmalade has also expanded its New Driver Insurance product to include young drivers who drive their parents' cars. This offering is an alternative to parents adding a young driver as a named driver in their own policy. New Driver policies are underwritten by Allianz and Ageas. In 2020, Marmalade partnered with Cambridge Mobile Telematics (CMT) to develop a smartphone-based solution based on a BLE tag paired with a telematics app. The app records driving data and offers coaching and feedback on driving behaviours. The technology will be used by Marmalade's Named Young Driver Insurance, which allows brand new drivers to use their parents' cars alongside an already existing insurance policy.

Marmalade has partnered with multiple car dealers to offer new cars and telematics-based insurance to young and new drivers. Two options are available: "Cars for Young Drivers" and "Fuel & Go". Cars for Young Drivers combines the telematics technology with deals on new cars, including 12 months free black box insurance or a discounted black box insurance premium on select models. Cars for Young Drivers offers vehicle financing to drivers over the age of 18, or for parents and guardians. The Cars for Young Drivers and Fuel & Go insurance policies are underwritten by Highway Insurance (part of the Liverpool Victoria Group). The covers are offered for Audi, Citroën, DS, Fiat, Ford, Hyundai, Kia, Mazda, Nissan, Peugeot,

Renault, SEAT, Škoda, Vauxhall and Volkswagen cars. The Fuel & Go package offers young drivers a new car with 12 months of telematics-based insurance included from £ 159 per month.

Figure 3.3: Marmalade Young Driver app and tag developed by CMT



Source: CMT

Recently, Marmalade has transitioned to using CMT's app and tag solution in all its insurance telematics solutions. Previously, policyholders logged onto a web portal to access information on journeys and driving scores as well as measures to improve the behaviour. In February 2015, it was announced that Marmalade had awarded a contract to the UK-based telematics provider Trakm8. The contract was valued at £ 1 million and includes the supply of Trakm8's T10 hardware and associated telematics data services. Marmalade has worked with the incident management provider FMG offering the Ingenium Dynamics telematics system and associated dashboard. If a driver records a red journey, Marmalade's customer service reaches out to the driver to discuss the cause of the dangerous driving and how to prevent it from happening again.

Marmalade has also announced a collaboration with the British Insurance Brokers' Association (BIBA) providing access to Marmalade's telematics solution for young drivers. The collaboration was renewed in July 2020. BIBA brokers will have access to Marmalade's Broker Dashboard and Support team. The collaboration strives to further promote the benefits of the black box solution on the UK market. Marmalade also offers non-telematics short term insurance solutions to learner drivers and students who are home for the holidays. Marmalade's Learner Driver and Student Driver policies are underwritten by Zenith Marque Insurance.

3.2.12 RSA offers UBI via MORE TH>N SM>RT WHEELS and 123GO

RSA Insurance Group, previously known as Royal & Sun Alliance (RSA) Insurance Group, is a British general insurance company with headquarters in London. The group had over 12,000 employees and is active in over 100 countries with a total of £ 6.2 billion in net written premiums in 2020. The main regions of operation are Scandinavia, Canada and UK & International. In June 2021, the acquisition of RSA Insurance Group by Danish insurer Tryg and Canadian Insurer Intact Financial Corporation was concluded, after which Tryg is the owner of the Scandinavian operations and Intact the owner of the Canadian and UK & International business. RSA has active UBI programs through More Than in the UK and 123GO in Ireland. The company has also been involved in UBI in Norway and Canada.

More Than was launched in 2001 and is an insurer offering car, home, life, pet and travel insurance in the UK. The brand is stylised as MORE TH>N and the company offers the More Than Smart Wheels (SM>RT WHEELS) insurance product to young drivers. By the end of 2021, More Than Smart Wheels had an estimated customer base of approximately 85,000 telematics policies in force. The telematics insurance policies use professionally installed black boxes. The Smart Wheels product was launched in November 2014 and has been developed in partnership with the telematics provider IMS (Trak Global). The variables used for scoring are identical between Carrot Young Drivers and More Than Smart Wheels. This means that scoring is measured in three categories: smoothness, speed and usage. Smoothness measures acceleration and deceleration, both horizontally and vertically. Speed is measured both in relation to the speed limit and the average velocity amongst other cars on the same road. The usage category penalises long distance driving, driving during the night and large number of trips per day. More Than Smart Wheels insures the policyholder for

the number of miles selected when signing up for the scheme. The number of driven miles is tracked using the Smart Wheels box. Policyholders that exceed the allowed number of miles during a policy term are required to buy top up miles or park the vehicle in a safe location. The driving score is considered to determine the price of the top up miles. Similar to Carrot, More Than also has a cash back system and the score is taken into account at the next policy renewal. If the overall score is good during more than 3 months in a row, drivers are eligible for the cashback system. In May 2021, More Than launched a milage based insurance product, based on an OBD-II device from IMS. The policy is available to drivers who expect to drive fewer than 7,000 miles annually. If the milage allowance is exceeded, top-up miles can be purchased. In Ireland, 123GO is a black box insurance telematics program targeting young drivers. The product is also a combined PPM and PHYD policy. The telematics device calculates a driving score based on speed, smoothness and usage with technology from IMS (Trak Global Group), which in turn is used to calculate the renewal premium.

RSA moreover offered RSA Smart Fleet, which is a telematics solution for commercial lines insurance brokers. The solution targeted policyholders interested in accessing telematics, but not wanting to install black boxes. RSA Smart Fleet used a smartphone app connecting to vehicles via Bluetooth to record data. Smart Fleet was targeted at SMEs with fleets of up to 15 vehicles and was designed and operated in conjunction with Autonet Insurance and Trak Global. The data from the solution was uploaded to a web-based dashboard where the business owner could see vehicle usage, location, historical journeys and driver behaviour. The program achieved limited market success over the past few years and is no longer marketed.

3.2.13 Be Wiser offers Drive Wiser PHYD insurance in the UK based on Coverbox

Coverbox started as a pay-how-you-drive offering launched by Wunelli in 2009 and was later divested to the UK-based insurance broker DriveStyle Insure, which from 2015 changed its name to Coverbox Insure and was a specialist motor telematics broker. In July 2019, the company went into administration. The insurance broker Be Wiser acquired all 10,000 Coverbox policy customers and moved them into its Drive Wiser Brand as part of its telematics strategy. The change does not impact insurance policies as they are underwritten by separate insurance providers. The policies are underwritten predominantly by Aviva. Be Wiser is an insurance broker offering a range of insurance products from a panel of UK

insurers covering car, bike, van, domestic, business and commercial insurance. The telematics firm Drive Wiser is today a division of the Be Wiser Insurance Group. In May 2021, the insurance broker Atlanta group, a subsidiary of Ardonagh group, completed the acquisition of Be Wiser.

The main product is currently a PHYD policy including both claims management and driver scoring. The driver score is based on a calculated risk profile. Analysing the risk profile enables Drive Wiser to encourage customers to modify behaviour likely to result in an accident. Scores are reviewed at the annual renewal of each policy, at which point the insurance premium can be adjusted up or down depending on driving behaviour as well as claims and accidents. Drive Wiser's main purposes of using telematics are crash detection, FNOL and claims management including fraud prevention. Feedback on the risk profile is provided by text, email and an online dashboard, which is smartphone compatible. The number of telematics policies was in the range of approximately 20,000 policies in Q4-2021. Insurer partners associated with the company's panel of underwriters include The Co-op, AXA, Aviva, Midas Underwriting, Ageas and LV=. Policyholders' vehicles are equipped with professionally installed black boxes. The telematics service provider Insure Telematics Solutions (ITS) was founded by Coverbox and provides data analytics and hardware to Be Wiser's various insurance telematics programs.

3.2.14 AbbeyAutoline (Prestige) offers ChilliDrive powered by Inzura

AbbeyAutoline is an insurance broker providing personal line, business and commercial insurance. The company is a merger between two insurance brokers based in Northern Ireland, Autoline Insurance and Abbey Insurance. In 2019, the provider of insurance brokerage, underwriting, insurance software and claims management Prestige Insurance Holdings acquired Autoline. In September 2020, Autoline was merged with Abbey Insurance, also a subsidiary of Prestige. The combined entity is called AbbeyAutoline. Autoline made a first entry into the insurance telematics space through the launch of a solution based on a black box together with MyDrive in 2012. Autoline however over time realised that it was difficult to motivate the cost of the black boxes. The company thus sought an alternative option and subsequently released a smartphone-based solution together with MyDrive later in 2012. Autoline released a new app developed by Inzura in September 2015. The app is

combined with a BLE beacon that is used to detect when the driver is in the car and hence eliminating the need to manually start the app. The company shipped about 4,000 beacons across the UK in 2019. In 2019, Autoline partnered with the dashcam manufacturer MiTAC Digital Technology and Inzura to add new options to its ChilliDrive young driver telematics product. ChilliDrive customers can now integrate an optional dashcam to an updated smartphone app. The dashcam automatically starts recording in the event of an accident while driving, capturing the moment of impact in a collision. The data is sent to the driver's smartphone which monitors location, speed, dates and times of the journey to match with the recorded data. Combined with the dashcam, the ChilliDrive app can automatically provide FNOL and driver assistance features such as lane departure warnings, forward collision warning and fatigue alerts.

3.2.15 By Miles offers PAYD using aftermarket OBD devices and OEM telematics

By Miles was founded in 2017 and the company is backed by Jaguar Land Rover's subsidiary InMotion Ventures that invests in the mobility, transportation and travel sector. In 2020, the company closed a £ 15 million investment as part of its Series B round of funding led by CommerzVentures, along with existing investors Octopus Ventures, Insurtech Gateway and JamJar Investments. By Miles was officially authorised by the UK's Financial Conduct Authority in late 2017. By Miles' policies are underwritten by AXA and the company started selling policies in mid-2018. The offering is aimed at drivers who cover fewer than 7,000 miles a year. Policyholders pay a flat-rate annual fee to insure their cars against theft or damage when parked. In addition, By Miles charges a variable rate based on the distance driven. Mileages are mainly measured using an OBD-dongle provided by a range of suppliers including Redtail Telematics and Trakm8. The drivers can track their journeys and monthly charges using a smartphone app. The minimum flat-rate charge is £ 150 a year, while minimum distance-based charges are £ 0.03 per mile. By Miles offers value-added-services such as vehicle locator and SVT services. Moreover, tools for estimating insurance and fuel costs for a journey are offered so policyholders can compare car travel with other modes of transport. By Miles has partnered with Redtail Telematics that provides an end-to-end telematics solution comprising in-vehicle hardware, data warehouse, raw data analytics and software services including a smartphone app. As of 2021, the company had an estimated 15,000 telematics policies live and had sold about 25,000 policies since launch with its customers having driven over 100 million miles to date.

In 2019, By Miles began leveraging data from OEM telematics systems, beginning with Tesla. The new policy was created in partnership with the digital insurer La Parisienne Assurances (backed by Swiss Re) and offers lower mileage Tesla owners in the UK to sign up to a By Miles policy. To activate the pay-per-mile policy, drivers connect their Tesla to their By Miles account via the By Miles app. The cover for Tesla also covers EV-specific products including leased batteries and charging accessories. As of June 2021, Ford vehicles are also eligible for By Miles insurance using Ford's connected car telematics systems.

3.2.16 CalAmp invests in the insurance marketplace

CalAmp supplies telematics devices and has invested in the aftermarket connected car companies SmartDriverClub in the UK and Germany-based ThinxNet. The company also has a channel partner program supporting telematics service providers and integrators that offer CalAmp's services to a variety of vertical markets. In 2020, CalAmp merged the remaining assets of SmartDriverClub Group, including key team members, underlying solutions and intellectual property, into Tracker UK. The combination of SmartDriverClub assets with Tracker expands the offerings to serve a larger part of the subscriber-based connected car market with reach into insurance, dealership and leasing/rental markets. Examples of external clients leveraging SmartDriverClub's platform include the motor retailer Stoneacre and insurer Markerstudy. Through the Stoneacre staff management program, a telematics OBD device is given to each Stoneacre employee allowing Stoneacre to understand driving behaviour. In turn, this delivers insurance premium savings to Stoneacre.

SmartDriverClub Group was founded as a connected car club offering a wide range of connectivity solutions and services for new and used cars, before branching into insurance. SmartDriverClub as part of Tracker now offers end-to-end UBI services to motor insurers and brokers, including a white labelled app, driving behaviour and a suite of risk management reporting. VAS such as 24/7 crash assistance and theft tracking are also offered to participating policyholders. In July 2019, Markerstudy bought the telematics broker business SmartDriverClub Insurance, part of the SmartDriverClub Group. The telematics broker now operates under Markerstudy's retail and affinity division. Tracker continues to serve as a data services supplier for the business.

Tracker has installed more than 1 million SVR systems and contributed to the recovery of assets worth £ 561 million (€ 631 million) through a formal cooperation with all UK police forces. More than 2,000 police patrol cars and all police interceptor helicopters across the UK are fitted with Tracker's detection equipment. Tracker recently re-signed the contract to continue serving the UK police force for a further five years. The company has adopted CalAmp's global cloud-based SaaS platform and is pivoting its business model to focus on telematics data services to complement its SVR product. Driver behaviour data services and capabilities enable the company to support dealers and insurance companies beyond SVR services. The main sales channels are automotive dealerships and directly to insurance providers where Tracker delivers a comprehensive range of SVR and aftermarket telematics features. Tracker leverages a range of LoJack VHF or telematics devices as well as dual mode solutions that feature both technologies.

3.2.17 Stellantis' PSA Group offers UBI in the UK, Belgium and France

PSA Group was the second largest car manufacturer in Europe behind Volkswagen Group. In December 2019, PSA Group and FCA Group entered into a merger agreement. In January 2021, the merger was completed and the resulting entity was rebranded to Stellantis, an entity that owns and operates 16 automotive OEM brands. The PSA Group contributed the brands Peugeot, Citroën, DS, Opel and Vauxhall, which develop and manufacture passenger cars, light commercial vehicles, engines, as well as mopeds and scooters.

Stellantis also owns Banque PSA Finance, offering financial services for the former PSA Group brands and holds a majority stake in the automotive parts supplier Faurecia. PSA Finance UK is a UK subsidiary and offers two insurance telematics products: Peugeot Just Add Fuel and Citroën SimplyDrive. The programs are quite similar and provide a three-year deal where insurance, car tax, services, finance, warranty and roadside assistance are covered by one monthly payment. Direct Line underwrites the policies and for young drivers under the age of 21, a telematics device is used for monitoring of driving behaviour. Both professionally installed black boxes and self-installed OBD-II devices are offered in the programs. The Floow offers telematics services and scoring and supports the underwriting process for both Just Add Fuel and SimplyDrive.

The PSA brands explore UBI using embedded OEM telematics systems in Europe. A reduction of 10 to 25 percent on the insurance premium based on telematics data from Peugeot, Citroën, DS and Opel Connect Packs is for example offered. The UBI solution was first launched in France and Belgium and will be gradually extended to other countries in the coming years. The connected car insurance product is branded Mon Assurance Connectée and Drive & Save in France and Belgium respectively. The solution in Belgium is offered by PSA Assurances together with AXA Belgium. Data is collected directly from the OEM telematics system based on customer consent. An initial discount of 10 percent is offered to participating drivers, which can increase by an additional 15 percent upon renewal. The additional discount rate is determined by a driving score. In December 2021, PSA Assurance launched a new UBI product on the French market branded Drive & Connect. The program collects driving data during six weeks and then assesses the driver based on acceleration, braking speed, distance driven and duration of use. After the evaluation period the driver can earn up to 25 percent discount on the policy price. At renewal, driving behaviour from the last 12 months are taken into consideration.

The PSA group was an early adopter of embedded telematics systems and had about 6.5 million connected cars on the roads at the end of 2020. The insurance policies in France distributed by PSA Finance are offered to customers of new and used eligible cars from the Peugeot, Citroën and DS Automobiles brands. As of the end of 2020, over 86,000 customers had signed up for a policy and an estimated 15,000 of them had chosen the connected insurance option.

3.2.18 Mercedes-Benz offers UBI in four European countries

Mercedes-Benz Group is an automotive group which owns a number of car and motorcycle brands. It was previously part of Daimler AG, which also included bus and truck brands. In December 2021, Daimler Trucks was spun off and completed its IPO on the Frankfurt stock exchange and now operates as an independent entity. Mercedes-Benz accounted for 2.1 million out of the 2.8 million vehicles sold by the group in 2020. Daimler Trucks and Mercedes-Benz Vans made up most of the remainder with approximately 358,000 and 375,000 units sold respectively. Total revenues in 2020 reached € 154 billion. The group's insurance business is handled by Daimler Mobility (until July 2019 named Daimler Financial Services) that brokered around 2.3 million insurance policies in 2020, down 2.0 percent year-

on-year. In January 2022, Daimler Mobility rebranded to Mercedes-Benz Mobility following the spin-off of Daimler Trucks into a separate entity.

Mercedes-Benz Mobility and its subsidiary Mercedes-Benz Bank launched a new telematics-based PHYD insurance in Germany – InScore – in September 2017. The data is collected using a factory fitted telematics device developed in-house by Mercedes which is activated through the Mercedes Me portal. An aggregated score based on the driving behaviour, time of day and road type is calculated via a partnership with the German insurer HDI Global and a third-party scoring partner. The score ranges between 1 to 100 and can be shown through the Mercedes Me mobile app or the Mercedes Me online platform. Enrolling into the program makes the drivers instantaneously eligible for a 10 percent discount on the motor insurance, which can increase up to 10 percent based on the calculated driving score. The policies are underwritten by the insurance partner HDI Global. InScore is now available for all new Mercedes-Benz cars since 2018. There are also extra possibilities to increase the discount on the premium for InScore customers, for instance if they have an ADAS system installed. This will make drivers eligible for an extra discount of up to 15 percent. Mercedes-Benz Mobility furthermore offers telematics-based insurance for commercial lines. Policies are mediated by Mercedes-Benz Bank and underwritten by HDI. Premiums for the PHYD policies are recalculated every month and are individual to each vehicle. In August 2020, Mercedes-Benz Bank launched a campaign enabling customers to test the InScore product without commitment and those signing up for the UBI product within the second half of 2020 to reach up to 30 percent discount on renewal.

Mercedes-Benz Mobility has also launched two additional PHYD initiatives for Mercedes-Benz E-Class in Belgium and France. The major French insurer AXA is underwriting the policies in both countries and provides telematics services and driver scoring through its Data Innovation Lab. In Belgium, the PHYD initiative is branded Driver Score Insurance and in France Assurance Bonne Conduite. The basis of the offerings is the same as InScore, an initial 10 percent discount is offered, which can rise to up to 25 percent upon renewal. Cornering, braking and acceleration are the main factors influencing the driving score. Similarly to InScore, a factory fitted telematics device is used for both programs. The company also provides insurance telematics in the Netherlands under the brand Driver Score Insurance. The Driver Score Insurance offering in the Netherlands enables policyholders to

save up 25 percent on their insurance premium based on a score calculated from information such as time-of-day, kilometres driven, percentage of the driving spent on highways, acceleration and deceleration behaviour as well as GPS location. UK customers were previously also offered telematics-based insurance called Mercedes-Benz Intelligent Car Insurance.

3.2.19 HUK-Coburg relaunched Telematik Plus in 2019

Founded in 1933 and based in Germany, HUK-Coburg is one of the largest insurance companies in Germany. In 2020, the company employed over 10,000 people and insured about 13 million motor vehicles. HUK-Coburg is providing insurance across all verticals, including P&C, life and health insurance and other financial services such as VISA cards, which includes travel insurance. HUK-Coburg has founded the data analytics company HUK-Coburg Datenservice und Dienstleistungen (HDD).

HUK-Coburg launched a black box-based insurance telematics program branded Smart Driver in late 2016. Smart Driver was first launched in the Rhein-Main area but soon expanded to all provinces in Germany. The solution used a professionally fitted black box supplied by Bosch which was installed in the vehicle by a certified technician. The black box was equipped with crash detectors, which triggered an alarm in case of an accident in Germany. The Smart Driver app was also equipped with a crash notification button, which initiated a call to emergency services in case of an accident. Due to a very high demand, the Smart Driver product was sold out in November 2018. To meet the increasing demand in Germany, HUK-Coburg has developed a new solution together with Cambridge Mobile Telematics (CMT). The new product is based on a small hardware sensor that is fixed at the windscreen of the car and links to a smartphone app via BLE. The new product reached its first customers in 2019 under the new brand Telematik Plus. The solution is significantly less costly than the professionally installed black boxes used in the Smart Driver program, enabling HUK Coburg to target a wider audience.

Telematik Plus uses the DriveWell Tag developed by CMT in combination with a smartphone app branded Mein Auto. The app provides feedback on the driving behaviour and updates the discount. Initially, the driver is offered a 10 percent discount on the car insurance, which can increase to 30 percent upon renewal. The discount is calculated from a driving score,

which originates from the data given by the tag and smartphone app. In April 2021, a new Eco Drive feature was added to the solution whereby drivers are also provided with feedback on how eco-friendly their driving style is. HDD receives data from the policyholders' smartphones in an anonymized format. HUK-Coburg does not own the data which today is not used for other services than the intended purpose of assigning a driving score. CMT and HUK-Coburg are exploring how to use the telematics data in the claims process. In December 2020, more than 400,000 policyholders were enrolled in the Telematik Plus program.

3.2.20 VHV's Telematik Garant switched to a mobile based telematics solution

Germany-based Vereinigte Hannoversche Versicherung (VHV) is a large P&C insurer, especially focused on motor and liability insurance. VHV is in contact with over 14,000 brokers offering tailored insurance solutions to customers across Germany. The insurance telematics program Telematik Garant won its first active customers in January 2016, after being available through VHV's brokers since October 2015. Telematik Garant is available for drivers of all ages and not specifically young drivers. The technology was based on a hardware device, which was plugged into the 12 V socket and recorded the driving behaviour using built-in sensors. The device was also equipped with its own SIM card, thus offering full functionality to customers without connecting to a smartphone. The device was offered free of charge and there were no extra surcharges. Deutsche Telekom provided the connectivity services. From October 2021, new customers opting into the Telematik Garant program are supplied with an app and tag solution developed by the Swiss Re subsidiary Movingdots. The tag is fitted to the windscreen and paired with the phone over Bluetooth.

Based on the driving score, the driver can achieve up to 30 percent discount upon renewal of the yearly car insurance. Parameters affecting the driving score are speed, acceleration and braking as well as when and where the customer uses the car. An initial discount is granted in the first month a driver reaches a driving time of at least 25 hours, which is the minimum time needed to calculate a driving score. The offering also includes value-added services such as emergency assistance, which can be triggered manually by pushing a button on the 12 V device or automatically when the device detects a crash. Theft recovery and car tracking are further value-added services offered by VHV. However, since the device is visible and easily reachable in the car's cabin, its value in SVR applications is limited. Recent journey information such as speed, driving style, route and the time of the trip are available through

an online portal or a smartphone app. Rigid data security rules and a data protection agreement are in place to protect the driving data. Further features such as push notifications for parking information and theft are included in the smartphone app.

Figure 3.4: Windscreen device and app from VHV

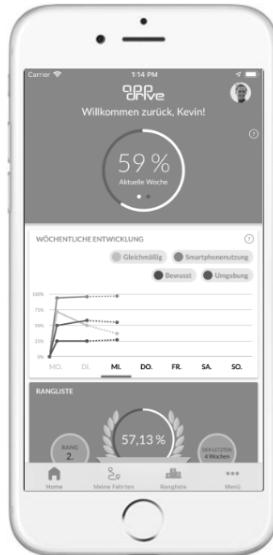


Source: VHV

3.2.21 German insurer Signal Iduna launches UBI based on a smartphone app

The German insurance provider Signal Iduna markets a telematics-based insurance policy through its Sijox brand, an offer that was initially launched in October 2014. The first solution leveraged a hybrid OBD-smartphone solution targeting young drivers. Telematics services were provided by Webfleet Solutions and drivers received a LINK 100 device which is a Bluetooth-enabled OBD-II dongle. Data collected included harsh braking, steering and acceleration, but the device is not monitoring vehicle GPS location. In 2019, Sijox launched a new smartphone-based solution called AppDrive. The app analyses the driving behaviour, integrated bonus systems, gamification modes, offers driving coaching tips and shows the weekly trends. The AppDrive score is calculated based on acceleration, braking, cornering and mileage. The app is developed by Signal Iduna's software development partners. Participating AppDrive insurance customers automatically qualify for a 15 percent discount on the My Mobility insurance package aimed at drivers between 17 and 30 years. The smartphone application can provide detailed driving style analysis and performance feedback aimed at fostering optimised driving behaviour and increasing road safety awareness. AppDrive also offers rewards such as Amazon vouchers for safe drivers.

Figure 3.5: User interface of Sijox's AppDrive



Source: Signal Iduna

3.2.22 EMIL powers pay-per-mile telematics products in Germany

EMIL is a software company from Berlin and offers a proprietary policy management platform for insurance companies. The EMIL Insurance Suite is a modular software platform that enables a wide range of insurance products and can for example integrate telematics data for motor-vehicle insurances. The EMIL Insurance Suite software supports motor insurances globally. The platform is device agnostic and supports a wide range of telematics data. It can be operated stand-alone or be integrated into the system of any risk carrier. The data can come from a variety of sources, such as apps, vehicle data platforms or OEM operated data streams. A range of VAS are offered, including tracking the vehicle's location, a driver's logbook and remote diagnostics.

In 2018, EMIL launched a pay-per-mile insurance program in cooperation with the German insurer Gothaer Allgemeine Versicherung. The policy was built by the reinsurer General Re. The pay-per-mile insurance product targets drivers who drive less than 6,200 miles per year. Mileage is tracked via the EMIL app and an OBD-II dongle equipped with a SIM card. The

company has also signed a partnership with Vodafone in Germany to provide a TBYB product based on a smartphone app solution branded Vodafone Driving Academy. The driving style is assessed for 14 days for drivers that drive at least 25 kilometres per week and at least 4 trips. The driver then receives an insurance offer from EMIL based on the calculated driving score. Following an investment round in March 2020 EMIL refocused and now operates as a software developer for insurers.

3.2.23 DEVK implements Dolphin Technologies in its app-based telematics offering

Deutsche Eisenbahn-Versicherungskasse (DEVK) is a large German mutual insurance company founded in 1886 as a life insurance company for railroad workers. Today, the company offers insurance across the whole spectrum of life and general insurance as well as financial products, mainly to private customers. DEVK is headquartered in Cologne and employs around 3,400 people across 19 offices in Germany. In 2020, DEVK had about € 2.8 billion in gross premiums written and over 3 million active motor vehicle insurance policies.

DEVK began developing an insurance telematics product for its private car insurance customers in 2017. The telematics offering was initially tested on its own employees before being made available as a limited bonus system where customers could register and win coupons and other benefits for safe driving behaviour. In January 2021, DEVK launched the first PHYD insurance offering with telematics enabled behaviour-based pricing. The product gives customers an initial policy discount of 15 percent for the first year. In the subsequent years the overall driving behaviour is used as base to calculate the new annual premium. Driving behaviour is evaluated and scored by analysing four driving style characteristics as well as phone use while driving. The driving style is evaluated based on speed, cornering, acceleration and braking. Depending on the achieved driving score, drivers can be awarded a discount of up to 30 percent. The telematics product is based on a smartphone only telematics solution from Dolphin Technologies that connects to the cars infotainment system over Bluetooth. Cars that lack Bluetooth technology can instead be equipped with a self-powered Bluetooth dongle sourced from Chipolo. Additionally, DEVK has made a limited version of the app available to customers who do not have the UBI policy, where safe driving users may earn rewards like coupons or donate to a charitable cause.

DEVK offers the telematics policy to all private car insurance customers and had around 30,000 active telematics policies in Germany in September 2021. About 20 percent of the telematics policyholders have opted into the scheme as existing car insurance customers to DEVK, the remaining are new car insurance customers. Around five percent of all new car insurance customers have opted for the UBI offering since its launch in January 2021. At the moment, mainly younger drivers are targeted for the UBI policy.

3.2.24 UNIQA SafeLine powered by Dolphin Technologies focuses on safety

UNIQA Group is a major insurance group which includes around 40 companies in 18 countries and serves about 15.5 million customers. Core markets are Austria and Central & Eastern Europe and total premiums written in 2020 reached more than € 5.3 billion. Group brands include UNIQA and Raiffeisen Versicherung. In October 2020, UNIQA Group completed the acquisition of AXA's subsidiaries in Poland, the Czech Republic and Slovakia for a consideration of about € 1 billion. The acquisition adds 5.0 million new customers and € 800 million in premiums. Following two years of development and piloting, UNIQA introduced a kilometre based PAYD insurance product branded SafeLine on the Austrian market in November 2007. The policy is based on GPS positioning and a small covertly mounted telematics device is installed in the vehicles. UNIQA works with the telematics partner Dolphin Technologies which in turn sources the hardware from Meta System. The device installation is performed by an Austria-wide network of over 350 partner workshops.

SafeLine has a focus on safety and security functionality for situations such as emergencies, breakdowns, medical problems, accidents or theft. In addition to the hardware, a new smartphone app powered by Dolphin Technologies was launched in 2016 which includes a variety of intelligent services. The app recognises if the mobile phone is used during driving and a phone-free driving session is encouraged by rewards and discounts. The app furthermore includes VAS such as tracing the car, a driving logbook for a maximum 12 weeks and driving statistics. Alarms can be triggered automatically in case of a crash or by pressing a button or using the app, and the exact location is sent to the SafeLine control centre operated by the Austrian Automobile Club (ÖAMTC). Communication and relevant assistance are organised from there. The CarFinder feature further entails SVR functionality. Policyholders that drive more can still qualify for other discounts such as 10 percent on Casco insurance and 10 percent on accident insurance. In addition, UNIQA customers can

save up to 50 percent on liability insurance if they abstain from using their mobile phone when driving. SafeLine had an estimated 40,000 policyholders in Austria in Q4-2020, remaining at a constant level over the past few years. The product is no longer offered to new customers and the number of users is expected to decline in the next years.

UNIQA SafeLine is also available on the Czech market following a pilot started in 2010. The system is available in a number of versions differing in terms of features, payment options and associated insurance discounts. In the autumn of 2017, UNIQA Czechia offered a simplified mileage-based version of SafeLine that supplements the MTPL insurance. Drivers that do not exceed 8,000 kilometres per year achieve a 25 percent discount on the insurance premium, other discounts apply for mileage limits of 12,000 kilometres (20 percent reduction), 16,000 kilometres (15 percent reduction) and 20,000 kilometres (10 percent reduction). The Czech initiative is powered by Octo Telematics which was previously a sister company of Dolphin Technologies. At year-end 2020, SafeLine in Czechia had an estimated 15,000 active policyholders. In 2018, UNIQA and Dolphin Technologies launched a joint venture branded GoSmart Mobility. GoSmart Mobility is a mobility platform that aggregates various mobility services such as carsharing, public transport and other travel services as well as rewards drivers that do not use their smartphone while driving. The UNIQA Group now expands its telematics business in Eastern Europe. Examples include CHERRISK in Hungary and UNIQA Go in Poland which both are based on the GoSmart platform powered by Dolphin Technologies.

3.2.25 Groupama offers insurance telematics in multiple countries

Groupama – an abbreviation for Groupe des Assurances Mutuelles Agricoles which translates to Group of Mutual Agricultural Insurance – is a French insurance group with operations also in 10 markets outside France. Major international operations are found in markets such as Italy, Turkey, Hungary and Romania. Group premium income reached € 14.1 billion in 2020, down from € 14.4 billion in the year before. In mid-2008, Groupama launched Amaguiz.com, a brand of the group company Amaline Assurances, dedicated to direct insurance sales via the Internet. The company introduced a telematics based PAYD product in 2008 using professionally installed black box devices. In 2012, Amaline Assurances started using OBD dongles provided by Scope Technology. Through this deal, Amaline moved away from

professionally installed devices and also secured a larger ownership of the collected driving data. Telematics was also used to improve customer satisfaction and speed up the claims process. When a likely crash event was detected, customers were sent a text message with a phone number and information on how to file a claim. bCall services are also available through the app, as well as vehicle diagnostics and automated quotations from local workshops. Vehicle locator functionality was furthermore offered to the insurance telematics policyholders. Furthermore, Amaline delivers the website, brand, call centre and claims management for Renault Assurance. In March 2017, it was announced that Amaline and Scope Technology joined forces with Renault to provide an insurance telematics solution for the Renault Zoe. The program branded Renault Assurances Connectées enables policyholders to save up to 36 percent of the annual premium. The system leverages the embedded R-Link system for capturing driving data. In 2020, the insurance contracts of the Amaguiz brand were transferred into the Groupama brand and all telematics policyholders were transferred to Groupama's insurance offering Petit Rouleur, a traditional milage based insurance offer, or a regular Groupama auto insurance policy.

Additionally, Groupama offers telematics-based insurance in Italy where a flat rate discount is given for installing a telematics device. In Italy, Groupama has also formed the subsidiary G-Evolution. G-Evolution is based in Rome and provides telematics services to Groupama Assicurazioni. In July 2021, Groupama divested G-Evolution to FairConnect. Groupama Italy offers two telematics-based offerings that use hardwired telematics devices: Smart AutoBox and AutoBox PREMIUM. Smart AutoBox is a self-installed black box that mounts on top of the car battery and AutoBox PREMIUM uses professionally installed black boxes. Octo Telematics is also technology partner for the Autobox products. The mobile app My Angel enables a range of services including roadside assistance, tow truck information, connection with the agent and statistics dashboard. Discounts range 15–25 percent.

In Romania, Groupama launched a telematics UBI pilot in November 2017. The product offers eligible customers, with a premium of over 800 Romanian Leu (€ 165), a 20 precent initial discount and the potential to increase the discount to 40 percent on future instalments for safe drivers. The policy gathers data through a black box, sourced from Viasat Group, and drivers can monitor their performance on an app. In case the driver does not wish to use the

app, status updates may also be received periodically over email or SMS. Groupama Romania also offers commercial fleet insurance with included fleet management solution ViaTrackBase and telematics device for light vehicle fleets of up to 3.5 tons. Policy discounts of up to 40 percent are rewarded to fleets with safe drivers. Groupama has in addition launched a mobile app branded Kaskopilot in Turkey. The app is free of charge and rewards safe drivers with discounts and rewards via partners such as gas stations and various retailers. In total, Groupama had an estimated 500,000 active telematics-enabled policies at year-end 2020. The vast majority of the company's insurance telematics policies are in Italy.

3.2.26 Risk has launched several insurance telematics products in the Netherlands

Risk is a Dutch insurtech service provider and managing general agent (MGA) operating in the Netherlands. The company was founded in 2000 and currently employs around 140 people at the headquarters located in Utrecht. Risk offers turnkey solutions for web office and back office as well as API versions of the solutions. In addition, Risk also offers services to support with mortgage arrangements through its mortgage desk as well as a credit broker. The company is furthermore active as an incubator specialised in insurtech and has started subsidiaries to develop various insurance related technology. Risk is MGA for several major insurance companies including Allianz, Liberty Mutual Insurance, Maas Lloyd and Achmea.

Risk has launched several insurance telematics focused agencies over the years. The first example is Fairzekering that offers an OBD II based PHYD insurance where customers were rated on a scale from zero to 100 based their acceleration, braking and adherence to speed limits. A score above 69 results in a cashback of 35 percent of the insurance premium. Risk later launched the insurance broker – VOOROP – with an updated value proposition, also based on an OBD-II device but with an app for easier interaction and follow-up for the drivers. The policy pricing also followed a PHYD model. VOOROP added driving in the dark and in densely populated areas as scoring parameters. The scoring and OBD devices were sourced from Chipin, to which Novatel supplies the OBD devices. Risk provides the back-office solution to VOOROP and Nationale Nederlanden underwrites the risk. The latest product related to UBI launched by Risk is under the brand InsureApp. The solution is a smartphone app enabling a PHYD policy monitoring acceleration, braking, speeding and distracted driving. The app is built in-house and the driver evaluation is powered by SDKs form

Sentiance. InsureApp additionally supports customizing and up- or cross-selling based on knowledge gathered about the user's lifestyle and offers health monitoring, coaching and analysis.

Figure 3.6: The VOOROP dashboard on a desktop and smartphone



Source: VOOROP

Risk's main business model is to be MGA to its insurance partners and offers to bundle the UBI solutions with an insurance as an enhancement to the MGA proposition but also offers its platforms as pure SaaS solutions. While Fairzekering and VOOROP are B2C businesses, an increasing focus for Risk is its B2B2C proposition through the InsureApp proposition. Clients include the Achmea brand FBTO, which offers an app based PHYD solution to its motor insurance customers, where Risk is both MGA and technology partner. Berg Insight estimates that Risk has about 15,000 telematics-based insurance telematics policies active, of which the majority are OBD based.

3.2.27 MAPFRE provides insurance telematics products in Spain and the US

MAPFRE Group is an international insurer active in 44 countries on five continents. The company also offers insurance through its online brand, Verti, launched in January 2011. MAPFRE is the leading insurer on the domestic Spanish market and one of the major insurers in Europe. In May 2015, MAPFRE closed the acquisition of Direct Line in Germany and Italy. MAPFRE is also present in the US market through both its brands and is a leading insurer in Latin America in non-life insurance, where it also markets UBI. In July 2017, Direct Line Germany was rebranded to Verti and in March 2018 the Italian namesake followed suit. In 2020, the group had a total of around 29.4 million clients and close to 34,000 employees, generating total revenues of € 25.4 billion.

MAPFRE has been working with Octo Telematics on the Spanish market since 2007 where it was an early adopter of insurance telematics. The company first launched a pilot as part of the Generation Y project targeting young drivers aged 18–30, which later on developed into a full-scale offering branded YCAR. The YCAR UBI product is based on GPS-enabled telematics devices installed covertly in the vehicles with which savings of up to 40 percent are possible. VAS such as SVR and assistance services are further features. A smartphone app for iOS and Android offers access to driving data and enabled functionality like locating the vehicle. YCAR is no longer actively marketed. MAPFRE also works with Grupo Detector, a Spanish provider of security and telematics solutions and part of Viasat Group since September 2018, that is largely focused on SVR. In June 2019, MAPFRE launched its second UBI product in Spain – CaReward – a PHYD program offering participants incentives like discounts and gasoline checks as well as up to 15 percent discount on the premium at renewal. CaReward, unlike YCAR, is not offered exclusively to young drivers. Technology partner for the CaReward program is Spanish insurtech company Drive Smart. MAPFRE Middlesea furthermore has the UBI program MotorMax in Malta. In 2021, Verti launched both the smart phone-based TBYB program Verti DRIVER in Spain, with a gamification feature offering rewards and the potential of a € 180 discount on a renewed car insurance policy, as well as a smart phone-based pay how you drive program in Italy called Guido con Verti. In March 2022, MAPFRE signed a partnership agreement with Telefónica to offer better car insurance to Movistar Car users.

On the US market, MAPFRE USA has rolled out the DriveAdvisor program across a range of states in 2014. DriveAdvisor is a program that employs a mobile application for iOS and Android to record driving behaviour. Discounts can also be obtainable for customers agreeing to install a telematics device in their vehicle. Monitored parameters include acceleration, braking, speed and miles driven, and drivers can access feedback on the driving behaviour via personalised reports in the app that show the performance and progress. In October 2021, the Cambridge Mobile Telematics (CMT) powered program MotionSmart was launched in Massachusetts. The program will use CMT's scoring algorithms for rating policyholders who also earn a ten percent initial discount for signing up and are expected to record their first trip within 30 days from signing up. In Latin America MAPFRE launched the PHYD CaReward solution in Colombia during 2021.

3.2.28 ÖSA and Sparkassen Versicherung offer eCall services in Germany

ÖSA Versicherung and Sparkassen Versicherung are both part of Sparkassen Finanzgruppe, a group mainly consisting of savings banks, with a total of 620 member companies. Both ÖSA- and Sparkassen Versicherung offer telematics through its Copilot programs. ÖSA's Mein Copilot 2.0 and Sparkassen SV Copilot are eCall services using black box telematics devices provided by Octo Telematics. The device mounts on top of the car battery and is generally self-installed by simply connecting two cables to the car battery. Crashes are detected using an accelerometer and when an accident is detected, the accident information is transmitted to a call centre. Accidents where the acceleration is measured to more than 4 G are considered serious and help is dispatched immediately.

Deutsche Assistance Telematik is a fully owned subsidiary of Deutsche Assistance Service and handles the call centre for ÖSA- and Sparkassen Versicherung. Furthermore, Deutsche Assistance Telematik offers a similar eCall telematics program through a number of insurers. However, this is based on professionally installed devices provided by Bosch and is priced at € 9.90 a month for a three-year term, compared to € 2.50 a month for a 1-year term for the offer from ÖSA and Sparkassen.

3.2.29 GDV launches eCall service with 46 participating German insurers

The German insurance association GDV consists of 460 member companies with a total of 529,000 employees and almost 430 million written insurance contracts. Since April 2016, the association offers eCall services through 46 participating insurance companies. The program is called GDV-Stecker and is based on a small telematics device that plugs into the 12V socket. The telematics solution is provided by Bosch and IBM. The device is delivered by Bosch whilst IBM provides the IT infrastructure. The devices used for the project lack stand-alone network connection and is instead connected to the drivers' smartphones via Bluetooth. Data is only transmitted after a crash and information including vehicle location and crash data is then sent to GDV's call centre. The severity of the crash is measured using accelerometers in the device and a voice connection is established between the driver and an emergency call centre. Furthermore, the telematics device is also equipped with a USB-port so that for example a phone can be charged even though the cigarette-lighter socket is occupied. Over 900,000 units have been shipped to date and GDV had about 95,000 active devices at the end of 2020.

3.2.30 Zavarovalnica Triglav brings UBI to Slovenia

Zavarovalnica Triglav is a subsidiary of The Triglav Group, an insurance-financial group in Slovenia with approximately 5,200 employees spread over six countries in Eastern Europe. In 2020, the Triglav group reached € 1.2 billion in gross insurance, co-insurance and reinsurance premiums. In June 2015, Zavarovalnica Triglav presented a UBI solution, claiming it to be the first in Slovenia and the Adria region (Slovenia, Croatia, Bosnia and Herzegovina, Serbia, Montenegro and Macedonia). Branded DRAJV, it is a smartphone-only solution that measures acceleration, braking, turning and compliance with speed limits. Traffic conditions and context are also used for scoring and to understand driving behaviour. The driving score is presented on the user's phone on a scale from 1 to 100. If driving is deemed sufficiently good after 300 kilometres, the policyholder will receive a 5 percent discount on the car insurance. A further discount of 2 percent can then be added every month, until a 25 percent limit is reached. In April 2020, all drivers received a 2 percent discount without driving due to the COVID-19 pandemic and the lockdown implemented by local governments. Gamification elements have furthermore been added to DRAJV, enabling drivers to compare driving results. Safe drivers can have access to various perks such as driving a supercar or access to exclusive sports events. The goal of this program is to help all

drivers, particularly young ones, to improve their driving skills and save on their annual premiums. Scoring services were originally delivered and developed by Amodo, but in October 2020 a new version of DRAJV was launched together with the Slovak navigation company Sygic. The new app offers additional features to the scoring such as real time speed limit display, phone use monitoring, real time driving style feedback and dashcam integration as well as trip recording. The app also supports policy renewal and the purchase of additional insurance over the app. The DRAJV program is currently only available in Slovenia where the app had been downloaded more than 145,000 times in Q4-2021. Around 55,000 users were actively using the app in Q4-2021 and 95 percent of the active users were entitled to the discount upon renewal of the motor insurance policy. The app had then been used for travels totalling over 800 million kilometres.

3.2.31 PZU Group and Link4 offer telematics programs in Poland

Powszechny Zakład Ubezpieczeń Group (PZU Group) is a leading insurance company in Poland. The group traces its history back to 1803 as the first insurance company in Poland. Since 2010, PZU Group has been listed on the Warsaw Stock Exchange. The PZU Group provides financial and insurance services to more than 22 million customers in five countries including Poland, Latvia, Estonia, Lithuania and Ukraine. In January 2018, PZU launched a telematics solution on the Polish market branded PZU GO, based on a windscreen device that connects to the driver's smartphone. The device and app analyse speed and smoothness of the journey, driving time and distance travelled as well as harsh braking. PZU GO also offers eCall functionalities to drivers and sends crash notifications to a PZU call centre which contacts the driver or dispatches an emergency team to the last reported location. In June 2020, PZU started selling the solution on a broad scale and the project had over 20,000 customers signed up by the end of 2020. PZU Go is developed by the Poland-based insurance telematics provider Telematics Technologies, which also develops the NaviExpert mobile app.

In 2014, the PZU Group acquired the direct insurer LINK4 from the RSA Group. LINK4 offers an extensive range of non-life insurance products, including motor insurance, property insurance, personal insurance and third-party liability insurance. The company has been trialling telematics services since 2015, including telematics-based insurance for commercial lines. The commercial lines program was based on a black box but was later cancelled. The

telematics product for personal lines customers has since been launched in collaboration with Telematics Technologies. The telematics program is branded LINK4 Kasa Wraca that translates to LINK4 Cash Back. LINK4 offers a free NaviExpert navigation service that the company uses to analyse the driving style of the policyholder. The NaviExpert app analyses the driving behaviour based on speeding, acceleration, braking and average distance driven. Participating policyholders in LINK4 Kasa Wraca may have up to 30 percent of the premium refunded based on the driving behaviour. The program went live in April 2017 and more than 58,000 policyholders had participated in the program by December 2020. More than 146 million kilometres have been driven and 85 percent of the telematics customers have renewed their policies. Policyholders in the LINK4 Kasa Wraca program have generated more than PLN 3.0 million (€ 0.7 million) in refund on their insurance premiums. To be eligible for a refund in the Kasa Wraca program, policyholders must drive at least 200 kilometres per month with the NaviExpert app during at least 5 days and cover a minimum of 10 kilometres per day.

3.2.32 CHERRISK rewards safe driving

CHERRISK is an online insurance company in Hungary. The company was launched by UNIQA Group's Hungarian subsidiary in 2018. UNIQA has invested more than € 4 million in the establishment of CherryHub, which is a Budapest-based innovation company for the implementation of the CHERRISK model. UNIQA Hungary had more than 840,000 policies in force corresponding to about € 215 million in gross written premiums 2020. CHERRISK offers home, accident and travel insurance policies via an online interface. In July 2019, CHERRISK launched the CHERRISK GO mobile app. It allows users to collect cherries, acting as virtual currency, based on telematics data gathered by the user's smartphone. The cherries can be used to reduce insurance fees or exchanged for discounts at partner companies or charity donations. The application is built on Austria-based Dolphin Technologies' platform. The CHERRISK GO platform shares the same codebase as UNIQA Austria's telematics program goSmart and UNIQA Poland's solution UNIQA Go. CHERRISK GO measures mobile-free driving, walking, cycling and a healthy lifestyle. Coupons obtained with the help of points gathered can be exchanged at CHERRISK's partners. Five minutes of walking, running or driving without using the mobile phone rewards the user with a point. In June 2020 CHERRISK and CHERRISK GO was launched in Germany.

The CHERRISK ecosystem comprises more than 330,000 users and more than 100,000 have downloaded the CHERRISK GO mobile app. The number of daily users is more than 15,000. CHERRISK has sold more than 40,000 insurance policies since launch. As of Q1-2022, CHERRISK had sponsored 38 charitable projects in Hungary and seven in Germany.

3.2.33 HDI Global has launched DiamondDrive in Germany

HDI Global (formerly HDI-Gerling) is the industrial insurance business section of Talanx Group, a major insurance group with headquarters in Germany. Gross written premiums reached about € 41.1 billion for Talanx Group in 2020, up from € 39.5 billion in the year before. For motor vehicles, Talanx Group reached € 4.0 billion in gross written premiums, with HDI Global SE accounting for approximately 12 percent. HDI Global SE is involved in insurance telematics in the UK, Italy and its domestic German market.

In the UK, HDI Global offers a product branded Motor Fleet Insurance, which utilises telematics data to reduce fleet managers' motor fleet insurance spend and overall fleet running costs. The program was first available in 2013 and targets fleets of more than 250 vehicles. Through the fleet management platform, HDI aims to reduce claims and operating costs for its customers by encouraging its commercial customers to embrace vehicle telematics. Telematics data is used to monitor the driving behaviour and give the fleet manager a picture of the risks taken by their drivers each day. The insights provided by telematics data are used to reduce the fleet's accident rate and thus its claims expenses. HDI Global provides a telematics-based claims management solution including FNOL and accident detection. HDI also uses the telematics data to work with its clients to assess, support and manage continuous improvement of driving behaviour, aiming to achieve safe driving reducing the claims. An education program is also included in the Motor Fleet Insurance that includes the use of an eLearning and psychometric profiling facility.

HDI Global also provides a black box offering in Italy. In 2019, HDI Assicurazioni signed a partnership with Vodafone Automotive to launch a new insurance telematics program. Vodafone Automotive provides an end-to-end solution comprising aftermarket telematics devices, an insurance telematics platform and a mobile app enabling policyholders to remotely engage with the vehicle. Starting in September 2018, HDI launched the telematics

product DiamondDrive in Germany. HDI has developed the app using UK-based The Floow's SDK FloowKit. DiamondDrive offers an initial 5 percent discount on the premium for drivers under 30, who then can download the free app to monitor their driving. The app provides a score for each journey based on driving style, speed, daytime, attention and travel time. Drivers that achieve an overall score of between 70 and 100 across the full year are rewarded with a cashback of up to 30 percent on the premium. HDI DiamondDrive is also available as a TBYB model and can be used without any obligation for up to 90 days.

Figure 3.7: HDI's DiamondDrive app



Source: The Floow

3.2.34 Zurich invested in the UK telematics insurance provider MyPolicy in 2021

Zurich Insurance Group is an insurance company, headquartered in Zürich, Switzerland. The company is active in the insurance and asset management sectors. The group has about 56,000 employees and provides a wide range of property and casualty, and life insurance products and services in more than 210 countries and territories. Zurich operates three business segments: Property & Casualty, Life and Farmers Group. The Property & Casualty segment reached US\$ 40.1 billion in gross written premiums and the Life segment reached US\$ 28.4 billion in gross written premiums during 2021. Farmers Group provides certain non-claims related services to the mutual insurer Farmers Exchanges, which is a major insurer in the US.

In December 2017, Zurich acquired the connected car company Bright Box to strengthen the insurer's connected car portfolio. Bright Box still operates as a separate entity and the founders of the company continued to develop the business. The product portfolio was based on the Remoto platform, a cloud-based connected car platform for OEMs and dealerships. The product portfolio furthermore comprised in-vehicle hardware such as TCUs and OBD-dongles, mobile apps and back-end telematics services. Bright Box has added different layers of APIs to provide additional data monetization opportunities in new use cases such as carsharing and insurance telematics to the Remoto platform. Bright Box mainly targeted aftermarket solutions for importers and dealers and the customer base reached over 1,000 dealers across the globe. Bright Box also powered the Zurich Connected Cars product in the US. Zurich Connected Cars was an auto dealership inventory management solution and not directly linked to insurance products. In February 2021, Zurich invested in the British data analytics and telematics insurance broker MyPolicy Group. As part of the deal, Bright Box was incorporated into the MyPolicy Group and brand, giving MyPolicy access to Bright Box' partners and customers including Honda UK.

In 2019, Zurich acquired a 33 percent stake in the Swiss start-up AutoSense, a connected car company supplying connected car products in Switzerland. AutoSense was founded in 2018 as a joint venture between Swisscom and AMAG. AMAG (Automobil- und Motoren AG) operates as an automotive dealer for Volkswagen, Seat, Škoda and Audi brands in Switzerland. The Sweden-based start-up Springworks International is the telematics provider in addition to Munic, from which a connected OBD-II dongle is sourced. The product is also branded AutoSense and costs CHF 69 (€ 60) or CHF 99, where the latter service package includes Wi-Fi hotspot functionality including 3 GB of data. The company relies on partner companies for the development of services on the platform. AutoSense enables UBI via partnerships with both Zurich and other insurers, such as Simpego. Simpego offers the pay-per-kilometre FlexDrive solution using the AutoSense telematics device.

Zurich's insurance telematics portfolio is mainly represented by the Zurich BluDrive program in Italy. The solution is developed in collaboration with Octo Telematics. Zurich BluDrive offers protection to drivers, passengers and vehicles, and an anti-theft tracking system along with roadside services. The black box device from Octo Telematics is fitted on the car and tracks

the vehicle using GPS technology. It allows Zurich to measure how safely the car is driven and the mileage, factors which can be taken into account upon renewal.

3.2.35 If Insurance has long experience of telematics in the Nordics

If is a Nordic P&C insurer headquartered in Stockholm, Sweden and owned by Finnish Sampo Group. The company is one of the leading P&C insurers in the Nordics and provides insurance solutions in Denmark, Finland, Norway, Sweden and the Baltics. If divides its activities into four main business areas – Private, Commercial, Industrial and Baltic. The company reached € 4.6 billion in net written premiums during 2020, comprising 54.8 percent of Sampo Groups € 8.4 billion in net premiums written. In Q3-2021, If invested in the automotive technology company Aiden Automotive Technologies, which develops standardized communications between vehicles using the Android Automotive platform and third parties to broaden the scope of capabilities for connected vehicles.

If has piloted several UBI offerings in the past and launched a smartphone based UBI pilot, powered by Movelo and branded SafeDrive as early as 2013, which did not lead to a mass-market launch. Hardware-based options have also been tested, but no product was introduced due to issues with cost and low customer interest. If recently launched a pilot with a smartphone only PPM proposition called Smart Kjørelengde in Norway. The trial is available to drivers of Audi, BMW, Hyundai, Jaguar, KIA, Peugeot, Renault, Skoda, Tesla, Volkswagen and Volvo who have connected services active in their vehicle. The proposition lets drivers purchase covered miles in various sized packages and the miles that are not driven are rolled over to the next year. Significantly lower than expected milage results in a refund for miles not driven. Top-up miles can also be purchased at any time if the limit is reached. Technology partner for the pilot is Norwegian startup Enode, a developer of energy hardware APIs, founded in 2020.

3.2.36 Paydrive leverages aftermarket and OEM telematics for UBI

Paydrive is a Swedish insurance broker founded in 2013, specialised in telematics based UBI offerings. The Stockholm-based company employs about 10 people and achieved a turnover of SEK 11.5 million (€ 1.1 million) in 2020. Ålands Ömsesidiga Försäkringsbolag invested in Paydrive in 2015, as the first institutional investor, enabling pilot testing and further

development. In November 2017, a funding round including NFT Ventures, Ålands Ömsesidiga Försäkringsbolag and Norwegian insurer Gjensidige raised around SEK 30 million (€ 3 million) to Paydrive. An additional SEK 16 million (€ 1.5 million) was raised in December 2018. A further investment round was held in January 2021 to fund the continued growth ambitions. In May 2021, Paydrive acquired the Telia Sense from the Swedish telecom operator Telia Company, which became a shareholder in Paydrive as part of the deal. Initially, Gjensidige was also underwriter to Paydrive, but Norwegian B2B insurer Protector took over as underwriter in June 2021. This enables Gjensidige to focus on its role as investor, while Paydrive and Protector were able to benefit from synergies like shared analytics efforts. In December 2021, Paydrive was listed on the NGM Nordic SME stock exchange.

Paydrive offers a hybrid PPM and PHYD UBI model where the price per mile is affected by the driving style of the policy holder. The policy period was shortened from the usual 12 months to three months in 2020. Behaviour and mileage are measured using OEM telematics systems, Telia Sense devices or self-installed OBD-II devices provided by Scope Technology. The first aftermarket device includes a GPS receiver, gyroscope and accelerometer and the main parameters used to determine the driving score are speed, acceleration, braking and time of day the car is used. The driving style is scored on a scale from 0 to 100. Depending on the achieved score, drivers are segmented into four tiers of safe driving styles. Distance driven is considered to be more important than the driving score. The initial premium is determined using standard parameters such as type of car and the policyholder's age and home address. Depending on the tier in which the driver is placed, the price per kilometre can be significantly reduced at renewal after three months. The average cost for drivers in the safest tier was SEK 1 (€ 0.1) per 10 kilometres in November 2019, whereas the average price for drivers in the least safe tier was SEK 6 (€ 0.6) per 10 kilometres. VAS include stolen vehicle tracking and a digital driving journal. After the acquisition of Telia Sense, Paydrive also offers the product Paydrive Sense. Paydrive Sense comprises the connected car services previously offered by Telia Sense including for example a 20 GB Wi-Fi hotspot and vehicle tracking and diagnostics. Before the acquisition in 2019, Paydrive had already struck an exclusive partnership with Telia Sense, leading to the majority of Paydrive's existing customers transitioning to the Telia Sense product in 2019. Customers owning cars that are not compatible with the Telia Sense device can use the original OBD product sourced from

Scope Technologies. Paydrive also offers an insurance product targeting Tesla drivers in collaboration with Smartcar. Smartcar is based in the US and develops a connected car technology platform that enables developers to build applications that communicate with OEM telematics systems. Smartcar's APIs are compatible with a range of car brands, including for example Audi, BMW, GM, Tesla and Volkswagen. The Paydrive solution targeting Swedish Tesla drivers is a PHYD policy utilising connected car data, whereby Paydrive can access a range of data points, including mileage and EV charging status. In December 2021, Paydrive added the Cambridge Mobile Telematics mobile app and tag solution to its offering as well. Since March 2022, connected Porsche vehicles are also offered Paydrive's UBI solution through the Porsche Connect service.

Currently, Paydrive is active exclusively on the Swedish market but looks to expand to other markets in Northern Europe in the medium term. At the end of 2020, Paydrive had about 7,000 active policyholders, which have grown to around 10,000 active policyholders in Q4-2021. Additionally, Paydrive has taken over around 4,000 Telia Sense customers following the acquisition.

3.2.37 VÍS pioneers telematics insurance in Iceland

VÍS, formally Vátryggingafélag Íslands, is a leading insurer in Iceland with ISK 23.4 billion (€ 156 million) in written premiums. The company was founded in 1989 through the merger between the two insurance companies Samvinnutryggingar and Brunabótafélag Íslands. VÍS is listed on the Nasdaq Iceland stock exchange and employs about 190 people. The company offers both life and general insurance as well as commercial insurance in Iceland, general insurance comprising the core business. In March 2021, VÍS launched the first telematics PHYD insurance solution on Iceland branded Ökuvíðir, mainly targeting young drivers. The product is an app and tag solution based on Cambridge Mobile Telematics' (CMT) Drivewell SDK and tag solution and an app developed by OutSystems and Deloitte. Drivers are evaluated based on the five parameters speed, acceleration, braking, cornering and phone use while driving. The policy price is based on distance driven and the driving score provided by the app. Customers who drive fewer than 500 kilometers monthly or receive a score of at least 87 out of 100 are rewarded with reduced premiums. As a TBYB option, interested drivers may download and use the app for two weeks before they decide if they want to purchase the insurance.

Chapter 4

The North American insurance telematics market

4.1 Regional market characteristics

North America is currently estimated to be the largest region in the world in terms of the number of active insurance telematics policies after overtaking Europe during 2015. The US and Canadian insurance telematics markets are in many respects relatively similar, but Canada has previously been behind the pioneering neighbour in terms of uptake. Since 2016, the North American market has seen a shift in focus towards smartphone-only solutions. Canada has now passed the US in terms of market penetration. Both the US and Canada have notable variations between individual states and provinces, for example due to local regulatory influences.

4.1.1 United States

On a national level, the US market is the largest single market worldwide in terms of the number of telematics-based insurance policies in force. A majority of the top 20 insurers have live insurance telematics programs, and most have carried out telematics pilots. The insurance provider Progressive has been prominently active in the telematics field since the 1990s and had over around 4.5 million active telematics-enabled policies at year-end 2020. This means that Progressive's Snapshot today is the second largest usage-based insurance telematics program by insurance telematics policies in force. However, due to the roll-over model of the program, where devices are only left in the customer's vehicle for a short period of time as well as the increasing popularity of its smartphone-only solution, Progressive are estimated to be behind a number of European insurers in terms of installed devices. Major initiatives on the US market moreover include State Farm's Drive Safe & Save program and Allstate's Drivewise program, where the latter had more than 1.7 million active policies by the end of 2020.

A wide range of other insurance telematics offerings have also been launched in the country, including policies from most of the major auto insurers. National General Insurance – at the time known as GMAC (General Motors Acceptance Corporation) Insurance – performed early UBI tests and introduced a usage-based insurance program based on OnStar data already in the 2000s. National General was the insurance partner for Metromile offering OBD-based UBI. However, following Metromile's acquisition of Mosaic Insurance, Metromile is now handling underwriting and claims management internally. Liberty Mutual and the group company Safeco further offer Right Track powered by Octo Telematics. Liberty Mutual offers a smartphone solution that connects to a windscreen tag developed by Cambridge Mobile Telematics as well as a pay-per-mile offering and collaborates with GM to use OEM data for insurance telematics purposes. Telematics-based auto insurance is also available through other major insurers such as USAA, Nationwide, the Allstate subsidiary Esurance, Farmers, MAPFRE USA, Travelers, American Family Insurance, The Hartford, CSAA and National General. Notably, GEICO launched a UBI pilot in 2019, becoming the last of the top 15 US automotive insurers to launch a telematics program.

During the past years, several safety driving apps have emerged on the market. These apps gather driving data and reward safe drivers based on braking, acceleration, cornering, speed relative to the posted speed as well as phone usage. The driving data provided by the apps can potentially be used to offer discounted insurance premiums, either as a TBYB product or PAYD, PHYD and MHYD if the consumer gives consent to share driving data with insurance carriers. These types of apps have gathered vast amounts of driving data from millions of drivers, which can improve accuracy in the algorithms powering UBI products. Moreover, the solutions increase customer awareness of UBI programs in general as well as increase the general acceptance of driving behaviour tracking.

The US market has traditionally favoured the OBD form factor and often with a business model based on temporarily installed devices that record data only for a limited period of time before being returned to the insurer. Telematics data is usually used for pricing and underwriting rather than claims management or first notice of loss, partly due to the regulatory environment but also for traditional reasons where several insurers have chosen business models similar to Progressive's telematics program. Progressive has preferred the

roll-over model meaning that the vast majority of its UBI policyholders do not have a telematics device permanently installed in their vehicle. Other players such as State Farm and Allstate have both previously collected data continuously from permanently installed OBD devices. However, both State Farm and Allstate are now favouring smartphone solutions instead. Progressive launched a smartphone solution in December 2016 and the option is now the prevalent offer in a majority of states across the US. Overall, there is a major trend in the US market focusing on smartphone-only solutions following the major players' transition towards these solutions. This trend has affected the mobile operators such as Verizon and Sprint that are no longer pursuing insurance telematics due to the popularity of smartphone-only solutions. Important smartphone-only telematics solutions providers include Cambridge Mobile Telematics (CMT), which recently acquired the competitor TrueMotion, and the Allstate subsidiary Arity. Connected car data from OEM telematics systems are used in several UBI programs in the US. Automakers either partner directly with insurance carriers or work with third party telematics data exchanges that normalise data from a range of car brands. OnStar subscribers can since 2016 sign up for a driver feedback program branded Smart Driver. In November 2021, over 7.0 million customers had enrolled in Smart Driver since launch in May 2016. About 3.5 million of these have also enrolled in the optional insurance discounts program through OnStar's partners Progressive, Liberty Mutual and Nationwide. GM ended the discount eligibility program in 2021, replacing it with the newly launched insurance agency OnStar Insurance, which is now available in over 40 states.

4.1.2 Canada

Canada has seen healthy growth in the number of insurance telematics policies during the last year. The number of active telematics-based auto insurance policies in Canada is estimated at around 1.6 million at year-end 2020, up from 1.2 million in the previous year. The increase has been led by the two largest insurers in terms of the number of telematics policies: Intact including its subsidiary Belair, and Desjardins. Intact launched its insurance telematics program in 2013 and had reached 63,000 users in 2014. In April 2016 Intact and Belair had together achieved a cumulative total of 230,000 sold telematics policies, which increased to 435,000 in Q1-2018. As of Q2-2020, Intact had sold more than 700,000 telematics policies. Desjardins is estimated to manage around 325,000 UBI policies at year-end 2020. Desjardins furthermore offers UBI through its subsidiary The Personal. Other

significant insurers with a few tens of thousands of telematics-based insurance policies include TD's MyAdvantage and Allstate Canada. TD's MyAdvantage is a smartphone-only solution powered by CMT. Additional insurers and brokers with active telematics programs are CAA, National Bank Insurance (underwritten by Belair) and InsureMy. Allstate Canada has introduced a program on the Canadian market branded Drivewise similar to the US offering but powered by Modus and Arity.

On the Canadian market, there are insurance telematics programs relying on temporarily installed OBD devices or smartphone policies that monitor driving behaviour for a limited time period as is common in the US. The market leader, Intact, offered UBI based on a temporarily installed OBD device but has transformed to continuous monitoring using smartphone-based telematics solutions. Desjardins has re-launched its smartphone-only solution and moved from continuous recording of data to recording data during a limited time period of 100 days. Desjardins has integrated its UBI product in its general insurance app, generating attention and traffic to other digital insurance offerings. In 2017, there have been several introductions of smartphone-only programs in Canada, for instance TD Insurance that launched the offering branded MyAdvantage and Promutuel Assurance that launched the program Appi. Intact has enhanced its UBI product to increase customer interaction. The smartphone-only product also enables Intact to add parameters such as distracted driving to its driving score as well as ensure continuous monitoring of the driving behaviour compared to the roll-over model that was used before. Moreover, CAA launched in 2018 a pay-per-mile insurance product powered by Octo Telematics relying on permanently installed OBD dongles. Safe driving apps are emerging on the market, similar to the US. The online insurer Onlia that was founded as a joint venture between Achmea and Fairfax Financial has launched a safe driving challenge branded Onlia Sense. It is not linked to an insurance policy and enables drivers to earn gift cards and earn cashbacks based on safe driving behaviour recorded by a mobile app.

4.2 Insurance telematics case studies

The North American market is the home of several notable insurance telematics initiatives. Key insurance players active in the region for example include Progressive, Allstate, Liberty Mutual, Nationwide and State Farm in the US as well as Intact and Desjardins in Canada.

Most renowned telematics-based offerings in North America are focused on usage-based pricing and in some cases value-added services for policyholders. Some insurers use telematics data to facilitate the claims process. A few telematics-focused insurance providers such as Metromile and Root have emerged on the market offering specialised products alongside the telematics offerings from traditional auto insurers.

4.2.1 Progressive is the UBI telematics pioneer in the US

Progressive Insurance is a US-based insurance group offering auto insurance including personal and commercial car and truck insurance, as well as insurance products for motorcycles, boats and recreational vehicles. Home insurance is underwritten by select carriers, including American Strategic Insurance (ASI) and subsidiaries. Progressive was founded in 1937 and is today the third largest auto insurer in the US. The company had about 21.4 million personal lines policies and around 822,000 commercial lines policies in force at the end of 2020. Headquarters are located in Ohio and the company employs over 43,000 people throughout the US. Progressive had 16.5 million active auto insurance policies in force in 2020, increasing from 14.9 million in 2019.

Progressive has been a pioneer on the usage-based insurance telematics market. The company started researching UBI in 1992 and filed for a patent in 1996. Over the years, Progressive has secured a range of patents related to usage-based insurance and has been involved in a number of legal disputes over intellectual property matters. The company started licensing its IP to other US-based Insurance players through a licensing program launched in late 2012. Insurers including Aviva in Canada and the UK (Norwich Union) licensed the technology already in the early 2000s. Progressive's first telematics-based solution Autograph using professionally installed devices was piloted in Texas starting in 1998 and ended in 2001. The next-generation usage-based insurance program branded TripSense became available starting in Minnesota in 2004 followed by Michigan and Oregon in 2006. In 2008, Progressive rolled out MyRate which was the successor following TripSense, based on wireless cellular data transmission. MyRate was introduced in 18 states and was subsequently relaunched in a new version branded Snapshot Discount in 2010. The company began marketing the program nationally in March 2011. A pilot test of a smartphone-only application, developed by TrueMotion (now CMT) was carried out in 2015

among existing Snapshot customers and gathered data for research purposes. In December 2016, a full-scale offer based on the app was launched in four states. Certain customers are able to choose between the new smartphone application and the OBD-II based version. Feedback is provided after each completed journey, including driving tips and a map of the route. Following the introduction of the smartphone-only option, Progressive started researching distracted driving to assist Snapshot customers in driving as safely as possible. In late 2018, incentives for minimizing distracted driving were introduced. The company has also enhanced the mobile offering, enabling all policyholders with a smartphone of any kind to enrol in the smartphone-only program.

Snapshot is a usage-based insurance rating program based on a small OBD-II device sourced from the hardware provider Xirgo Technologies or a mobile app based on CMT technology. The device or app logs driving data including vehicle speed, time and in most cases GPS data. Parameters such as acceleration, braking behaviour and miles driven are derived from the measured vehicle speed and time. Harsh braking occurrences can cause Snapshot devices to beep, thus providing a degree of direct feedback. The personalised rate is calculated from these parameters such as harsh braking, distance driven and amount of time driven during high-risk hours, with the most dangerous hours being between midnight and 4 am. The driving data is transmitted to Progressive for processing to determine driving scores using in-house developed systems. Snapshot data is not used for claims unless requested by the customer. Policyholders can access information through web-based systems such as the Snapshot app and the general Progressive app to receive feedback on how to become a safer driver. Snapshot is mainly a roll-over program where telematics devices are installed only for a limited period of time. The OBD-II dongle is generally returned after a policy term of 6 or 12 months, after which a personalised rate for the policy renewal is determined. A minimum of 75 days of driving data needs to be collected in order to receive a personalised rate at renewal. A 10 percent discount is offered at the point of sale, with the possibility to obtain up to a total of 30 percent discount at renewal based on driving behaviour. Progressive's Snapshot program has handed out over US\$ 700 million in discounts, with individual drivers saving an average of US\$ 145 a year. Following the mass market introduction of a smartphone-only offering, Progressive has developed its scoring algorithms to account for smartphone usage. Drivers that avoid using the phone while driving

in select US states can achieve additional discounts on their insurance premiums. However, in the majority of states the driver might also experience an increased price if driving poorly. Progressive claims that nearly 20 percent of the drivers in such states experience increasing prices on their insurance premium. In July 2020, Progressive launched the Snapshot Road Test, which allows interested customers to try Snapshot for 30 days on a trial basis without switching insurance to gauge their potential premium savings. Progressive currently offers the Snapshot program across all US states except California, North Carolina and Virginia, after introducing Snapshot in Alaska, Hawaii and Indiana during 2015. The app-based version is available in 44 states and the District of Columbia. California, North Carolina and Virginia are excluded from the Snapshot products due to local regulations.

Progressive has recorded more than 33 billion miles of driving data and the database is growing with more than 10 billion miles per year. In 2016, Progressive saw a 20 percent growth in new participants and achieved the milestone of more than 2.0 million policies in force at year-end 2016. Snapshot policies reached about US\$ 5.0 billion in net written premiums in 2019. This represents the written premiums of a top insurer on the US market. Berg Insight estimates that Progressive had close to 4.5 million policies in force at year-end 2020. More than 1.0 million new customers enrolled in the Snapshot program during the year. More than a 40 percent of the company's new direct customers within automotive insurance enrol in the Snapshot program. The share is lower for the agent channel.

Figure 4.1: Progressive's Snapshot OBD-II telematics device supplied by Xirgo



Source: Progressive

Progressive additionally worked with GM OnStar, where participating drivers in the Smart Driver program could opt-in to share their OEM driving data with Progressive. After an evaluation period of 90 days, participating OnStar subscribers receive an email with driving feedback from OnStar. At this point, vehicle owners could also choose to share their data with Progressive in order to potentially receive discounted insurance offers. GM ended the discount eligibility program in 2021. Policies written from the OEM channel are included in the Snapshot program and Progressive uses the same proprietary algorithms used in the Snapshot device program to determine the driving discount. In 2019, Progressive partnered with Toyota Insurance Management Solutions to offer insurance discounts through the Snapshot program to eligible Toyota drivers in the US. Toyota owners who opt-in to share driving data from vehicles equipped with Toyota data communication modules (DCM) will have the opportunity to share their information with Progressive to receive a potential discount on their auto insurance. This offer is valid for any Toyota customer who purchases a 2018 or newer eligible Toyota vehicle model equipped with embedded OEM telematics technology.

4.2.2 State Farm works with CMT to enhance the Drive Safe & Save program

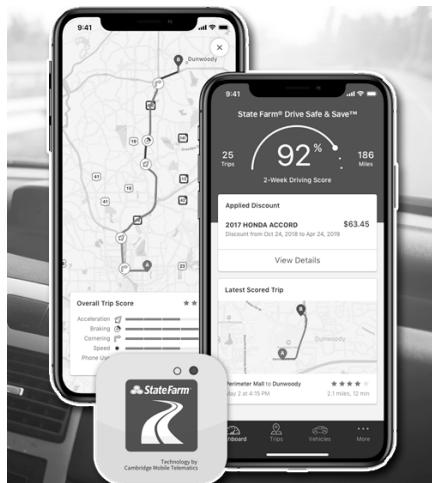
State Farm is a US-based insurance and financial services group active in property and casualty insurance, life and health insurance, annuities, mutual funds and banking products. The main business is State Farm Mutual Automobile Insurance Company. State Farm had a total of 84 million policies and accounts at the end of 2020, including around 44 million in the auto segment. The company generated revenues in the range of US\$ 78.9 billion in 2020.

State Farm offers a range of auto insurance products and associated discounts. Options include the Drive Safe & Save discount program, which is a telematics-enabled usage-based insurance offering launched in 2011. It offers a 5 percent discount just for enrolling which is applied to the first policy period. Policyholders can then be awarded discounts of up to 30 percent based on collected driving data, with exceptions for certain states including Maryland and North Carolina.

Different platforms are supported for data collection including data from OEM telematics services such as OnStar and a smartphone app paired with a Bluetooth beacon. An OnStar plan and enrolment in OnStar Vehicle Diagnostics (OVD) is required to participate in Drive

Safe & Save. New OnStar subscribers in the US get 10 years access to a range of connected car services, including OVD free of charge. State Farm will request odometer information from OnStar approximately 30 days after the policyholder sign up for Drive Safe & Save. Only mileage data is collected from the OEM systems, whereas the smartphone solution generally is used for a PHYD program. An aftermarket OBD-II device branded In-Drive was discontinued in February 2016, but existing customers were offered to continue using the service until November 2016. In-Drive was supplied through a partnership with Verizon Telematics. The OBD-II device has now been replaced by a mobile application and after November 2016, the customers using the OBD-II solution were given the option to enrol in the remaining Drive Safe & Save options, such as OnStar or Mobile. The Drive Safe & Save program is available for GM OnStar customers in all US states except Massachusetts, New York and Rhode Island.

Figure 4.2: State Farm's Bluetooth-beacon enhanced smartphone app



Source: State Farm

The smartphone application is combined with a Bluetooth beacon supplied by CMT. The latest version Drive Safe and Save 3.0 uses CMT's DriveWell platform to analyse data collected from smartphone sensors as well as the Bluetooth-based beacon device in the vehicle. The updated app has a revamped user experience with a focus on road safety.

Additional insights such as feedback to understand and improve driving behaviour have been added. The new system allows drivers to check their driver scores for any period, even for a particular trip. Factors that influence the overall driving score include acceleration, braking, cornering, speed, phone usage and time of day. Customers can see their current accrued discount at the Drive Safe and Save account page, through the State Farm mobile app and through the Drive Safe and Save app. Customers in California can furthermore participate in the Drive Safe & Save program by submitting manual odometer readings or enrol in Drive Safe & Save OnStar, provided they have a vehicle that supports OnStar. The premium is adjusted at each policy renewal period – typically every six months – and is based on the information collected from the previous 18 months. In 2020, State Farm saw an increase of 67 percent in customers enrolling in the Drive Safe and Save program.

State Farm has also ongoing in-house innovation efforts in the form of the subsidiaries Blue Owl and HiRoad. Blue Owl is a telematics service provider, developing an app-based telematics solution with HiRoad as first customer. HiRoad is a telematics insurer founded in 2016 offering mobile only telematics UBI in Arizona and Rhode Island. Safe drivers can earn up to 50 percent discount on their monthly premium instalments.

4.2.3 Allstate offers Drivewise and Milewise in the US

Allstate is a US-based personal lines insurer providing insurance products to around 16 million households. The main offerings include auto insurance, home insurance, life insurance and investment products including retirement planning, annuities and mutual funds. The Allstate Group includes the Esurance, Answer Financial and Encompass brands. As part of a transformative growth plan, Esurance will be integrated into the Allstate brand. Allstate is also active in certain Canadian provinces. Premiums written in the automotive business reached US\$ 24.1 billion in 2021. In total, the Allstate group had 25.9 million auto insurance policies in force at year-end 2021, up from 22.3 million in 2020. In January 2021, Allstate closed its US\$ 4 billion acquisition of National General Holdings, a deal that increased the number of auto insurance policies in force by 3.9 million policies. Allstate founded the dedicated technology company Arity in late 2016 as a spin off from the internal R&D department. Arity now also sells its software tools to other insurance carriers, OEMs and other companies in need of capabilities such as driver profiling. Allstate offers the UBI programs

Drivewise and Milewise under its own brand and Drivesense through Esurance. Discounts vary by state, but typically Drivewise enables policyholders to earn discounts of up to 25 percent based on driving behaviour and mileage. An initial discount of 10 percent is generally offered at enrolment and the premium is revised at renewal every six months based on driving performance from the previous year. Rates cannot increase due to participation in Drivewise.

Drivewise was launched in 3 states in 2011, following a pilot in Illinois during 2010. It has since then been gradually rolled out across the US market and is today available in 49 states and the District of Columbia. Simultaneously, the number of telematics policyholders has grown from 15,000 at year-end 2011 to more than 1.0 million in 2016. The number of policies grew by almost 400 percent annually during 2012 and 2013 before slowing down to a growth rate of 100 percent during 2014 and 59 percent during 2015 and 5 percent in 2016. The Drivewise customer base remained steady during 2017, grew almost 40 percent during 2018 and continued to grow to about 1.7 million customers at year-end 2019 and 1.8 million in Q3-2021.

Figure 4.3: Growth of Allstate's UBI offer Drivewise (2011–2020)

Year-end	States	Drivewise customers	Growth rate
2011	3	14,000	N/A
2012	10	65,000	364 %
2013	30	315,000	385 %
2014	46+DC	630,000	100 %
2015	48+DC	950,000	59 %
2016	49+DC	1,000,000	5 %
2017	49+DC	1,007,000	1 %
2018	49+DC	1,400,000	39 %
2019	49+DC	1,700,000	21 %
2020	50+DC	1,725,000	3 %

Source: Allstate and Berg Insight

The original Drivewise solution used an OBD device to gather telematics data. The in-vehicle device is being gradually replaced by a smartphone-only solution and new customers are enrolled in the mobile-only program. The mobile-only solution is currently the main platform of the Drivewise program. Allstate's mobile connections surpassed its device connection totals in May 2019. Today, Allstate writes new insurance policies in 2 states with the OBD device (AK and NY). Florida transitioned to the mobile-only program in 2019 and Arkansas launched a mobile telematics solution in April 2020.

Both the smartphone app and the in-vehicle device are used to gather telematics data including mileage, time of day and occurrences of harsh braking and speeding over 80 mph. The most important factor affecting the driving score is the mileage. Data is recorded continuously regardless of the type of hardware. The OBD-II devices are provided by Danlaw while AT&T provides wireless communications for the devices that are still active. Recorded data and performance ratings are available for customers online. The mobile app has been developed in-house and was first launched as a pilot in Montana during February 2014. Arity is handling scoring and data analytics as well as app development. Allstate today uses the general Allstate app for the Drivewise program and removes the need for an app dedicated for UBI. The Allstate app gives access to all policies and ID cards, lets policyholders pay their bills, report claims as well as get roadside assistance and gives accident support among other services.

In late 2015, Allstate added a reward system to the app available for Drivewise and Milewise customers. Examples of rewards include 200 points for 10 safe trips with no high speeds or sudden braking, 200 points for three consecutive days with no sudden braking and 200 points for three consecutive days with no high speeds. Clients can redeem their points for savings on merchandise, gift cards, local offers and more. Allstate has in collaboration with Arity added additional VAS such as the possibility for customers to track a tow truck's arrival on their phone in case of an accident. In December 2020, the Drivewise program was augmented with a crash detection feature in the US. The feature is available in the app-based solution and developed by Arity and uses phone sensors to detect major collisions when the vehicle travels at 25 miles per hour or faster. In November 2021, a trip categorization feature was added so that the mobile app can recognize what mode of transportation the user of the phone is in and automatically discern if the owner is the driver or a passenger.

In 2016, Allstate launched a pay-per-mile offering branded Milewise that uses an OBD device that records the mileage driven. The program has experienced a rapid growth during 2020 and 2021 and over 250,000 customers were enrolled in the program by Q3-2021, compared to about 26,000 at the end of 2019. Premiums are calculated daily by using a fixed daily rate and a flexible per-mile rate. Allstate sets the base rate and the per-mile rate based on traditional underwriting aspects including age, vehicle type and driver history. Driving behaviour parameters include speed, the time of day the car is used, hard braking and location. In 2019, Allstate began offering Milewise in Arizona with weekly price changes based on driving behaviour. This model is also available in Massachusetts. In Texas and Pennsylvania, Allstate has price changes based on driving behaviour, but those are done every six months as opposed to weekly. In Q4-2021, Milewise was available in 22 states. In 2020, a new agreement that enables 2020 model year Ford and Lincoln vehicles with embedded modems to connect with Allstate's Milewise program was announced.

On the Canadian market, Allstate Canada offers a different insurance telematics program which is operated by the telematics service provider Modus. The solution is also branded Drivewise and it has similarly to the US program historically offered participating drivers the possibility to achieve discounts of up to 30 percent by installing an OBD device. Drivewise in Canada is today a smartphone-only solution. Modus is responsible for the development of the Drivewise app and provides support to the program through data collection, data management, logistics and service support. Modus then shares the data with Arity that provides scoring services, as well as analyses the risk associated with driving behaviour to support future enhancements to the program. The UBI offer is now available to customers in Ontario, Nova Scotia and Alberta. A TBYB version of Drivewise – TestDrivewise – has been introduced in the form of a smartphone app which can be used to log a limited number of trips before signing up for Drivewise. Participants are eligible for an additional enrolment discount of 5 percent. In Canada, Drivewise analyses the driving behaviour for six months and awards eligible policyholders with a discount in the upcoming year. Drivers can however continue to use the app to monitor and improve their driving behaviour after the 6-month monitoring period.

Answer Financial is a member of the Allstate family of companies. The company, through its agencies Insurance Answer Center and Right Answer Insurance, is a personal lines agency operator in the US, providing auto and home insurance policies directly to consumers and through a network of marketing partners. In 2016, Answer Financial launched the free mobile app Streetwise Drivers Club that utilised smartphone-based insurance telematics technology and rewarded safe driving. The app was later discontinued in May 2019. The Encompass brand offers a safe driving app branded Route Report, available in 16 US states. Route Report is used to capture driving behaviours and reward customer participation. The company uses technology developed by Arity. National General launched an app-based telematics program in October 2017 with Arity as telematics and scoring partner. Currently, National General offers a pay-per-mile program for eligible GM OnStar vehicles.

4.2.4 Esurance offers DriveSense in 37 US states

The Allstate subsidiary Esurance provides auto insurance products directly to consumers. Esurance has so far offered three different insurance telematics programs: DriveSense, DriveSafe and Pay Per Mile. DriveSafe is no longer active and Pay Per Mile is currently being discontinued. As part of a transformative growth plan, Esurance will be integrated into the Allstate brand. This does not affect the UBI programs offered via Esurance and DriveSense will continue to be offered for new and existing customers. DriveSense is Esurance's discount program which was temporarily cancelled for new customers at the beginning of 2016. In June 2016, Esurance announced a new version of DriveSense based on a smartphone app available for both Android and iOS. At year-end 2015, DriveSense alone had 55,000 active policyholders and was available in 32 states, which decreased to 19,000 active policyholders at year-end 2016. The reason for the decrease was that Esurance temporarily cancelled its program to replace its device offering with a mobile offering and quickly aimed to replace its OBD-II customers' current product with a mobile app. DriveSense was available in 34 states in December 2017 and had about 18,000 policyholders, down 5 percent year-on-year. The mobile program gained a lot of traction in 2018 and Esurance had more than 170,000 customers enrolled in DriveSense in 37 states at the end of 2018, up more than 800 percent year-on-year. In 2020, there were an estimated 170,000 DriveSense customers in 37 states.

Figure 4.4: Growth of Esurance's UBI offer DriveSense (2011–2020)

Year-end	States	DriveSense customers	Growth rate
2011	2	1,000	N/A
2012	6	2,000	100 %
2013	16	10,000	400 %
2014	28	40,000	300 %
2015	32	55,000	38 %
2016	35	19,000	-65 %
2017	34	18,000	-5 %
2018	37	170,000	844 %
2019	37	200,000	18 %
2020	37	170,000	-15 %

Source: Allstate and Berg Insight

4.2.5 Allstate's subsidiary Arity expands its offering to external customers

Arity is a mobility data and analytics company founded in November 2016 by the major US insurer Allstate. The company started as an internal department at Allstate for collecting driving data and develop tools for assessing driver risk. Focusing on data analytics and software development, Arity offers a device agnostic solution supporting data from different sensors to clients including insurance companies, automobile manufacturers and sharing economy companies. Arity employs around 400 people at its headquarters in Chicago and additional offices in Northern Ireland and India.

Arity provides its technology through white-label apps, a software development kit (SDK), an OBD-II device or using data directly from a connected car. The company also has a Data-as-a-Service offering whereby clients can get access to its database of driving data. Hardware devices are supplied by Danlaw. At the centre of Arity's product offering is its sensor-agnostic mobility data platform, which helps customers process data at scale and predict risk and improve customer experiences. Data can be collected with Arity's proprietary app Routely or by embedding data generation functionality using the Arity SDK within existing apps.

Additional data sources such as OBD devices or OEM integration are also supported. Functionality like a smartphone-based crash detection algorithm built on a multi-sensor approach is offered as well. Arity can also assist its clients with scoring algorithms and risk profiling. The newest driving score – branded Drivesight 3.0 – is built on Arity's database comprising more than 38 billion miles of mobile driving data tied to insurance losses – and leverages both frequency and severity data to predict driving risk and future loss. The previous version Drivesight 2.0 factors in time of day, hard braking, speeding and distracted driving as variables. Drivesight 3.0 additionally takes contextual speeding, daily usage patterns (how often and how long someone typically drives), and the driving environment (roads/intersections travelled on) into account and allows for subscriber customizations. By Q4-2021, Drivesight 2.0 was approved in 47 states and Washington D.C and the new Drivesight 3.0 was approved in 36 states. Arity also has a Data-as-a-Service offering whereby clients can leverage its database of driving data, including vehicle miles travelled, real-time traffic and driving behaviour event reports.

In May 2021, Arity launched Arity IQ, a product which allows insurers to price auto insurance at quote based on existing individual driving scores from Arity's database. This database comprises more than 30 million drivers with associated scores from consumers that have agreed to share their driving data through third-party apps like Gas Buddy and Life360. Through an API call, insurance carriers can access driving data at time-of-quote, improving pricing accuracy. This enables insurers to offer a premium level at-quote that would normally require around six months of collecting data via a traditional telematics policy. Currently, the score available through Arity IQ is Drivesight 2.0, but Drivesight 3.0 will be available in the future as well as the option to request individual driving attributes for use with proprietary scores.

In addition to its insurance products, Arity offers a marketing platform and advertising network enabling companies, including insurance carriers, to find, connect and acquire consumers based on how they drive. Arity also offers solutions designed to help mobile app publishers integrate driving data to bring more personalized experiences to their users via Arity's SDK. The SDK is embedded into a variety of consumer apps such as GasBuddy, Life360 and WeatherBug to provide features like fuel consumption tips, crash detection and safe driving routes for commuters.

Arity also offers a Sharing Economy Solutions suite to ridesharing, carsharing and on-demand companies. Leveraging learnings from the insurance industry, Arity offers analysis of risk levels and driving habits to manage profitability for its sharing economy customers. The Sharing Economy Solutions suite uses predictive data models and machine learning to assess risk, driver behaviour and economic value by tracking miles driven, fuel consumption, car maintenance costs and daily travel habits.

Originally, Arity served Allstate Corporation's subsidiaries Allstate, Esurance, Encompass and Answer Financial. The company has since then expanded and currently provides services to about 10 insurance carriers in North America. Arity's platform powers the backend for Allstate's Milewise, which began utilising OEM telematics data from 2020 Ford and Lincoln vehicles for UBI in March 2020. The marketing platform has led to a notable increase of active devices reporting driving data to Arity's platform making the platform a means to improve the company's algorithms both for scoring and crash detection. During 2019, Arity's platform grew from 12 million connections to more than 23 million and went from having 85 billion miles of driving data to 295 billion miles of driving data analysed. In Q4-2021, the number of connections providing data to Arity is 28 million in direct connections through apps and SDK integrations and 140 million including third party sources. The combined connections account for over 60 percent of the drivers in the US. Driving data has been collected from over 630 billion recorded miles driven. The vast majority of the connections are to smartphone apps that are not linked to a UBI policy, such as Life360. Shared mobility use cases and other connected car verticals are also included in the reported figures. Berg Insight estimates that Arity powered around 2.5 million UBI policies at year-end 2021. Meanwhile the marketing platform was used by around 30 insurance carriers, including 4 of the top 10 in the US in terms of gross written premiums. The crash detection algorithm was used in more than 10 million smartphones by the end of 2020. Customers include National General Insurance, which entered a partnership with Arity in 2017. Other clients include Metromile, Southern Farm Bureau and March. National General which was recently acquired by Allstate has also used Arity for an app-based program. French tire company Michelin is a reference customer for the Data-as-a-Service offering.

4.2.6 Liberty Mutual has a broad portfolio of telematics products

Liberty Mutual Insurance Group is a US-based property and casualty (P&C) insurer. The company offers insurance products through two business units: Global Retail Markets and Global Risk Solutions. Liberty Mutual reached revenues of US\$ 43.8 billion in 2020. Private passenger auto is the largest line of business, which reached US\$ 13.9 billion in net written premiums in 2020. The company has a global reach with operations in 29 countries around the world. Liberty Mutual employs over 45,000 people in over 800 offices throughout the world. In July 2021, Liberty Mutual's acquisition of State Auto was announced.

Liberty Mutual is working in collaboration with Octo Telematics in a UBI program branded Right Track. Right Track is also available through Liberty Mutual's subsidiary Safeco Insurance. Right Track uses an OBD-II dongle that records braking, acceleration, time of day and miles driven. The driving behaviour is analysed after a 90-day period and results in a discount between 5 and 30 percent. Liberty Mutual has also launched the Right Track app powered by CMT. The app is connected to a windscreen tag via Bluetooth. The tag records the driving behaviour using built-in sensors based on the same parameters as the OBD-II device. Liberty Mutual also participated in the OnStar Smart Driver program before the discount eligibility program was discontinued by GM, offering participants the opportunity to share their Smart Driver data to achieve discounts of up to 30 percent. Liberty Mutual has also announced another OEM collaboration as discounts are rewarded to drivers with Volvo Cars' ADAS systems.

Following the launch of the Right Track app, Liberty Mutual presented a TBYB app including gamification elements such as leaderboards and rewards to promote safe driving branded HighwayHero. Liberty Mutual also announced a pay-per-mile offering branded ByMile in 2016. This program specifically targets low-mileage drivers. An OBD device is used to track the mileage and a monthly premium is calculated by using a base rate and then adding an extra factor multiplying the number of miles driven and a Per-Mile Rate. The ByMile program was cancelled due to component shortage for the OBD devices following the supply chain disruptions in the wake of the COVID-19 pandemic.

4.2.7 Desjardins offers a smartphone app for insurance telematics in Canada

Desjardins Group is a major Canadian cooperative financial group active in four main business segments, including wealth management and life and health insurance, property and casualty insurance, personal services and business services. Desjardins Insurance provides home and auto insurance to consumers across Canada and commercial insurance to businesses in Quebec, having achieved gross written premiums of CAD 10.6 billion in 2020. The company markets its products to the personal lines market under the eponymous Desjardins brand. Desjardins Group also includes the subsidiary The Personal which is a major home and auto group insurer on the Canadian market. State Farm's Canadian business has moreover been divested to Desjardins Group at the beginning of 2015, which further strengthened Desjardin's presence on the Canadian market. The integration of State Farm's Canadian operations was completed in 2018.

Desjardins General Insurance Group includes two subsidiaries active within UBI: Desjardins General Insurance and The Personal. Both market telematics-based insurance under the Ajusto brand. Previously an OBD-II dongle provided by the Canadian telematics provider IMETRIK Global was used to gather driving data. In 2017, the OBD-program was phased out and Desjardins is now running a 100 percent smartphone-only program developed in collaboration with Cambridge Mobile Telematics (CMT). The smartphone program offers discounts at renewal increasing linearly from 1 percent at a driving score of 61, to a maximum of 25 percent at a driving score of 97 or more, where the score is given on a 0 to 100 scale. Scoring is based on driving smoothness, speed, time of day and distance travelled. Premiums are not increased based on driving behaviour recorded by the Ajusto program. However, due to comments from clients on battery consumption and privacy concerns, Desjardins decided in 2017 to transition the Ajusto program from a continuous to a 100-day program instead. There is also a TBYB version of the app, which can be used for up to 90 days. The app is moreover compatible with Apple watch.

The UBI program is today offered as a module in Desjardin's general app. The app enables policyholders to manage home and auto insurance and view insurance policies, make changes and other services. Photo-based estimates and claims submission are also possible directly through the app. Berg Insight estimates that the company had about 350,000 clients enrolled in UBI as of Q4-2020. Policyholders can share and compare the driving performance

with their peers. Furthermore, the app offers rewards and badges to additionally promote safer driving.

4.2.8 Nationwide offers UBI based on OBD, smartphone and OEM telematics data

Nationwide is a US-based insurance and financial service company founded in 1926 and headquartered in Ohio. The company provides a full range of products including auto, commercial, home, farm and life insurance. In 2020, Nationwide reached US\$ 46.6 billion in total sales.

Nationwide launched its telematics-based insurance program branded SmartRide in 2010 following a collaboration with the Canadian connected car company IMS. The company has collaborated both with Octo Telematics and IMS (Trak Global) for the SmartRide program. However, Nationwide and IMS (Trak Global) joined forces in 2016 making IMS (Trak Global) an exclusive provider for new state entries. An OBD-II device records and transmits driving data which is used to calculate a discount. Nationwide uses four parameters to calculate a risk profile that determines the driving score: miles driven, harsh braking or acceleration, idle time during a trip and night-time driving. SmartRide uses a roll-over model similar to Progressive, which means that the OBD-device is mounted in the vehicle for a limited time period, in this case 4–6 months. In 2016, Nationwide announced a smartphone-only solution provided by LexisNexis. The mobile offering is used in select states as a complement to the OBD-based solution and new policyholders can decide which type of technology they prefer. In November 2017, it was announced that Nationwide will enhance its SmartRide Mobile program by also collecting data about distracted driving. The US-based company TrueMotion, now part of Cambridge Mobile Telematics (CMT), offers an SDK that applies to the existing SmartRide app and solely collects data regarding distracted driving. The SmartRide Mobile program was available in 43 US states at the end of 2021. In October 2020, Nationwide partnered with CMT to develop the SmartRide mobile only program, which has become the main offer. The device-based program is still available to interested customers. Today, telematics is used for underwriting and usage-based pricing. The program is available to Nationwide auto insurance customers and does not increase any premium based on the driving behaviour, thus solely rewards safe drivers with discounts on their annual auto premium. SmartRide offers new participants an introductory discount of 10 percent, which can rise up to 40 percent based on the driving behaviour. The estimated discount levels are

calculated on a weekly basis and at the end of the program, the final discount is calculated and applied at policy renewal. SmartRide had approximately 550,000 active policyholders in the US in Q4-2020. About one third of new customers today choose telematics insurance and Nationwide anticipates this percentage will rise to 70 percent in a few years.

In 2019, Nationwide broadened its personal lines telematics portfolio by introducing a pay-per-mile insurance product branded SmartMiles. SmartMiles targets low mileage drivers that drive fewer than 8,000 miles per year such as frequent users of public transport, carpool, carsharing and ridesharing services as well as people who work from home or live near their workplace. SmartMiles uses an OBD dongle to track the miles driven. Users can keep tabs on their miles driven through the SmartMiles member portal or mobile app. Policyholders are charged a monthly rate that consists of two parts: a base rate and a variable rate that is determined by the miles driven. SmartMiles also takes driving behaviour factors into account and safe driving behaviour can lead to a 10 percent discount after the first renewal. SmartMiles is currently available in 42 states. In November 2020, a partnership between IMS and Nationwide to expand the SmartMiles program was announced.

In 2020, Nationwide and Toyota Insurance Management Solutions (TIMS) joined forces to launch TIMS BrightDrive. The program uses driving data collected from connected Toyota vehicles to provide a discount based on the customer's driving behaviour. Customers can earn up to a 40 percent final discount on the insurance premium after completing the collection of driving data for 90 days. In addition, Nationwide works with GM and Ford to offer UBI through the OnStar Smart Driver program and Ford Insure and Lincoln Motor Company. Policyholders enrolled in Ford Insure and Lincoln Motor Company consent to join Nationwide's SmartRide UBI program and will share their vehicle connectivity information with Nationwide for the initial six-month policy. Once customers purchase a policy, the connected vehicle will track and share distance driven, hard braking and accelerating, idle time and night driving to establish a policy rate for renewal.

4.2.9 Farmers offers mobile-based insurance telematics from Driveway Software

The Farmers Exchanges is a US-based mutual insurance company providing insurance and financial services. The Farmers Group is a subsidiary of the Swiss-based financial group Zurich Insurance Group providing certain services to the Farmers Exchanges. Incorporated in

1927, Farmers operates as a multiline insurer in the US with US\$ 24.2 billion in gross written premiums and ranks as a top 10 motor insurer in 2021 reaching around US\$ 9.9 billion in direct written premiums in the automotive segment. In its commercial lines vertical, Farmers partnered with Modus for an end-to-end commercial insurance telematics offering. The solution used GPS data from an embedded device to help clients monitor the locations and driving habits of the fleet. Modus provided telematics data and scoring, enabling an improved underwriting process for Farmers. New commercial policyholders were offered a free year of Modus' fleet management solution Zephyr to get additional insight on fleet performance.

In addition to the telematics-based commercial lines insurance product a new smartphone-only solution branded Signal was launched in 2017. The program is currently available in more than 30 states. The Signal app scores and monitors distracted driving and records behavioural patterns. Parameters used for scoring are phone usage, harsh braking, excessive speed, number of miles driven and time of day. At renewal of the car insurance policy, the policyholder is eligible for a discount ranging from 0.5 percent to 20 percent, depending on the driving score. The app is developed by the US-company Driveway Software and offers discounts to customers with a Farmers auto policy upon renewal based on the provided driving score. The app recently surpassed 1.0 billion miles of driving data.

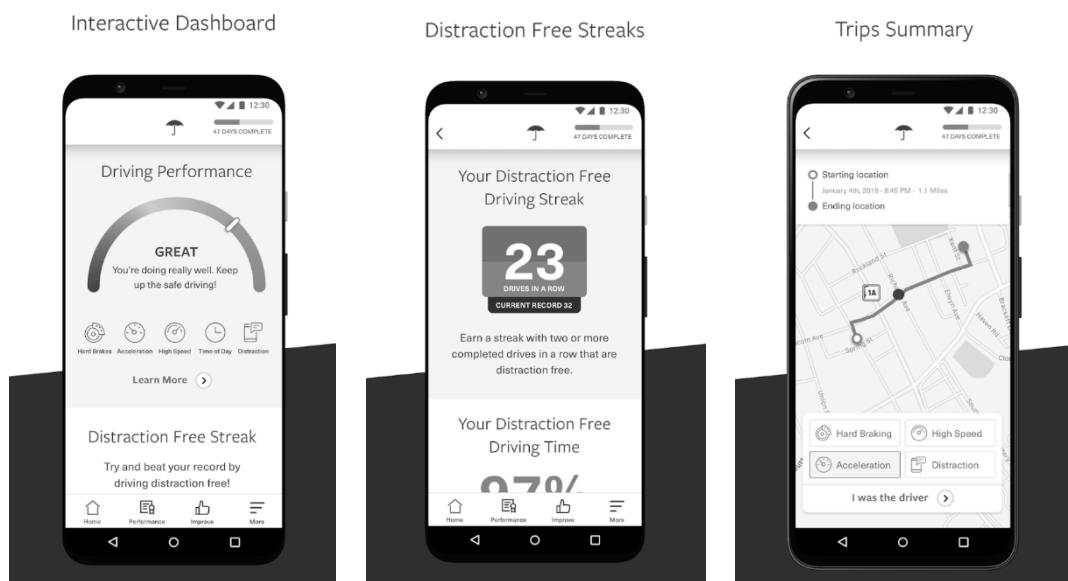
4.2.10 Travelers offers smartphone-based UBI

The Travelers Companies (Travelers) is a leading provider of property casualty insurance for auto, home and business. The company has approximately 30,000 employees and operations in the US and selected international markets. Travelers wrote about US\$ 32.0 billion in net written premiums during 2021, up from US\$ 29.7 billion in 2020. Net written premiums in the personal insurance space reached US\$ 12.5 billion in 2021 and automobile accounted for 47 percent of the premiums written in this segment.

Travelers introduced the smartphone-based insurance telematics program branded IntelliDrive in July 2017. IntelliDrive is developed in collaboration with TrueMotion (now Cambridge Mobile Telematics). New customers receive up to a 10 percent discount for enrolling in IntelliDrive. Participating policyholders receive a score based on the 90-day monitoring period. The score is determined by time of day, speed, acceleration and braking incidents as well as distracted driving. Travelers offer discounts of up to 30 percent, which are

applied at the next policy renewal. In some states (DC, MD, MT, PA and VA), drivers with a low score and dangerous driving behaviour may face higher premiums. In July 2020, the program was updated with larger savings potential for enrolment and at renewal as well as new features in the app such as detection of mobile use while driving, gamification features and a driver dashboard for monitoring the safe driving score. IntelliDrive is today available in 40 US states and the program grew by 50 percent in 2021. In January 2022, the continuous UBI program IntelliDrivePlus was launched. It offers an enrolment discount of up to 12 percent and potential savings upon renewal of up to 30 percent. The new program analyses the same driving characteristics as the IntelliDrive program but IntelliDrivePlus additionally takes milage into account and lower milage drivers can save further at each policy renewal. IntelliDrive was launched in Canada in January 2021 and is set up similarly to the US version.

Figure 4.5: Travelers IntelliDrive



Source: Travelers

4.2.11 GEICO offers a smartphone-based telematics program in select US states

The Government Employees Insurance Company (GEICO) is an insurance company primarily offering private passenger automobile insurance to individuals in the US. The company is headquartered in Maryland and a wholly owned subsidiary of Berkshire Hathaway. In 2019, GEICO wrote premiums in the range of US\$ 36 billion, making the company one of the largest auto insurance companies in the US. By the end of 2021, the company insured more than 30 million vehicles. In 2019, the company launched a smartphone-based insurance telematics program called DriveEasy. The smartphone app gives drivers feedback on their driving and assigns them a score. The DriveEasy app records a range of data points, including speeding, harsh braking, mileage using GPS, time of day and mobile phone usage. The app tracks two types of distracted driving, handheld phone calls and active phone use. Customers signing up to the service are eligible for a 20 percent discount on their monthly insurance bill for signing up to the service. Additional discounts are determined by the driving score generated by the DriveEasy app. In Q1-2022, DriveEasy was available to eligible GEICO policyholders in 27 states.

4.2.12 Toyota Insurance Management Solutions offers UBI in the US

Toyota and Aioi Nissay Dowa are both based in Japan and has had a longstanding strategic partnership through MS&AD, the holding company of Aioi Nissay Dowa. The companies have provided services within insurance and finance together since the 1990s. Toyota Motor Corporation, Toyota Financial Services and the Japanese insurer Aioi Nissay Dowa Insurance Company formed a jointly owned car insurance company under the name of Toyota Insurance Management Solutions USA (TIMS) in April 2016. Aioi Nissay Dowa owns a 50 percent share of the company, Toyota Financial Services a 45 percent share and Toyota Connected the remaining 5 percent.

TIMS offers both UBI and traditional auto insurance policies. The company partners with Travelers, Nationwide, Safeco Insurance and Liberty Mutual that underwrite its products. UBI is currently offered in 12 states. TIMS handles big data analysis and promote new insurance options and services in-house. Access to telematics data is available through the company's range of OEM telematics services and the development of insurance solutions includes PHYD telematics policies that are priced based on driving behaviour as well as mileage based PAYD programs. TIMS has launched a new UBI product created for Toyota owners branded

BrightDrive. TIMS powers the program in collaboration with its insurance partner Nationwide and the SmartRide UBI platform. Qualifying drivers receive a 10 percent discount immediately, which can increase to up to 40 percent upon renewal. The discounts are determined by a driving score generated by 90 days of driving data. The TIMS BrightDrive is available in Arizona, Ohio and Texas at participating dealers and online for most vehicles equipped with Toyota's Data Communication Module (DCM) from model year 2018. Customers who drive Toyota vehicles without DCM technology will be eligible for the same participation and earned discounts that are available through the Nationwide SmartRide mobile app or plug-in device program. Moreover, Progressive partnered with Toyota Insurance Management Solutions in 2019 to offer insurance discounts through the Snapshot program to eligible Toyota drivers in the US.

4.2.13 CAA offers MyPace and Connect powered by Octo Telematics

The Canadian Automobile Association (CAA) is one of the largest consumer-based organisations in Canada. CAA has more than 6 million members through eight automobile clubs and over 100 offices located across the country. CAA automobile clubs offer emergency roadside service, automotive and travel services, member savings and comprehensive insurance services. CAA has since 1974 provided auto and home insurance policies through its affiliate. CAA Insurance Company is an independent insurance company that underwrites home and auto insurance products distributed through CAA Clubs and select brokerages. CAA Insurance offers two telematics-based products: CAA MyPace and CAA Connect. Both products are powered by Octo Telematics. CAA Connect was launched in 2014. The program is available in Ontario and Manitoba. An OBD dongle is used to gather driving data. Policyholders achieve a 5 percent initial discount and an additional 15 percent discount can be achieved upon renewal after 1 year. The discount is based on a driving score accounting for annual mileage, driving speed and the time of day of trips. Users can trace their driving behaviour in an online portal or a mobile app. In 2018, CAA introduced a pay-as-you-drive insurance offering branded MyPace. MyPace allows motorists to have more control over their auto insurance and allows motorists to track how much they drive and the ability to pay for auto insurance based on that mileage. Motorists start with a base rate and are charged in 1,000-kilometre increments. The product targets drivers that drive less than 9,000 kilometres.

4.2.14 Root Insurance is a smartphone-based insurance company

Root Insurance is a start-up insurance company providing car, renters and homeowners insurance. The car insurance is a smartphone-only solution. The US-based insurer operates from Columbus Ohio and employs 800 people and has additional offices in Chicago, Phoenix and San Francisco. Root is reinsured by Odyssey Re and currently offers coverage in 32 states. The company is backed by venture capital and has raised more than US\$ 525 million in funding, including a recently completed Series E round led by DST Management and Coatue. In October 2020, Root held its IPO on the Nasdaq stock exchange in New York. Root had just over 322,000 auto insurance policies in force at the end of 2020, up 14.7 percent compared to 2019. This corresponded to US\$ 616.8 million (€ 540.0 million) in direct written premiums, of which US\$ 606.1 million (€ 530.6 million) were in the auto segment.

Root Insurance aims to only insure safe drivers and these are identified using a TBYB period of 2–3 weeks, where Root analyses driving behaviour through smartphone-based telematics. The company looks at more than 200 driving variables to assess a driver's risk level. Root utilises data from the GPS, accelerometers and gyroscopes in drivers' smartphones to calculate a risk score, which determines whether a driver is safe or not. Safe drivers are awarded with a quote on their car insurance from Root Insurance, while drivers not considered safe can receive quotes from other insurance carriers via the Root smartphone app. As of today, the company does not update the driving score at renewal, but there is a possibility to add such features in the future to ensure that customers keep driving safely. Root is handling scoring and risk analysis in-house and the initial purpose of the company was not to offer insurance services but rather offer telematics services, risk profiles and behaviour models for other insurance carriers. In order to provide discounts to safe drivers based on historical driving data from their vehicles, Root Insurance joined the Verisk Telematics Exchange. In August 2021, Root and Carvana entered a partnership that will result in that Root's insurance offering will be integrated into Carvana's online car buying platform.

4.2.15 USAA enhances insurance offering by acquiring UBI focused Noblr

Noblr is a car insurance company based in the US. The company is headquartered in San Francisco and has a service hub in Austin. The company has about 30 employees. Backed by venture capital, investors in the company include HSCM Bermuda Management Company,

White Mountains Insurance Group and Third Point Re. Noblr is a provider of insurance products intended to reward good drivers. In June 2021, US financial services company USAA announced its intention to acquire Noblr. USAA offers its services to current and former military personnel as well as their spouses and children and reported US\$ 25.4 billion net written premiums in 2020.

Noblr leverages telematics data to give feedback and real-time rates based on their driving behaviour. Noblr's monthly rate is composed of a fixed rate and a variable rate. The variable rate is based on how much and how well a person drives. Factors influencing the variable rate include smooth driving, distracted driving, road choice and time of day and are determined by using technology from Cambridge Mobile Telematics (CMT). Noblr estimates that good drivers could save up to 50 percent on their insurance premiums. Noblr launched in Colorado in 2019 and is currently available in Texas, Ohio Arizona, New Mexico, Louisiana, Pennsylvania and Maryland. The company expects to expand into six more states in the near future.

USAA launched its own PHYD program in 2019, branded SafePilot, which will continue to be offered alongside Noblrs product as an alternative without the milage-based premium costs. In September 2020, a feature was added that allows drivers to validate their claims by sharing their telematics data around the time of the incident with the claims adjuster at USAA. The product, available in 35 states, is an app only solution based on CMT's technology and offers a 10 percent enrolment discount and potentially up to 30 percent discount upon renewal. The SafePilot has grown significantly and had over 106,000 policies in force in December 2020. In September 2021, the number had grown by almost 75 percent.

4.2.16 Mobileye and Munich Re collaborate in Munich Re's Smart Mobility program

Founded in 1999, Mobileye is one of the leading companies within autonomous driving, computer vision and Advanced Driver Assistance Systems (ADAS). In 2017, the company was acquired by Intel in a US\$ 15.3 billion deal. Mobileye's products are integrated into car models from more than 25 global OEM partners and are also available in the aftermarket. More than 100 million vehicles worldwide are equipped with Mobileye technology. The US reinsurer Munich Reinsurance America has agreed to make Mobileye's aftermarket Advanced Collision Avoidance System available to its clients in the US.

Munich Re has a suite of telematics products, mainly targeting its clients in the commercial lines space. In the US, Munich Re offers the Smart Mobility product suite that comprises white-label telematics, collision avoidance and data analytics solutions. Munich Re also offers the Mentor program by eDriving, which is a smartphone app that educates drivers to manage their driving behaviour. The company also has a partnership with Geotab for fleet management as well as UK-based The Floow. The partnership with The Floow enables Munich Re's clients to provide The Floow's portfolio of solutions and capabilities to insurance clients around the world whilst also strengthening Munich Re's telematics consulting offering.

Figure 4.6: Mobileye Shield+ and Mobileye Connect 6 aftermarket ADAS systems



Source: Mobileye/Intel

The collaboration with Mobileye provides Munich Re's US clients with the option of retrofitting existing vehicles with Mobileye's aftermarket ADAS technology in the Smart Mobility product suite. Munich Re offers a range of Mobileye products including Mobileye 6 Series, Mobileye 8 Connect and Mobileye Shield+. Mobileye 6 is a windshield-mounted vision sensor and a visual display unit which warns drivers when a threat is detected with visual and audible alerts. Mobile 8 Connect has all the features of Mobileye 6 and has been enhanced to include a camera with a wider field of vision, driver alert configuration and GPS tracking. Mobileye Shield+ is a collision avoidance system designed for large municipal vehicles such as buses and garbage trucks and consists of sensors and visual display units to address blind spots. Commercial insurers and fleets that work with Munich Re US thus get the opportunity to mitigate the potential for collisions among their drivers and improve driver behaviour by using direct interaction through audio and visual warning signals. Utilising its experience in risk calculations and loss ratios, Munich Re also conducts a loss analysis to quantify the potential

impact of Mobileye's technology on an insurance client's portfolio of commercial fleet insurance premiums. Mobileye has moreover partnered with the Italian insurer Sara Assicurazioni to offer ADAS systems to insurance clients.

4.2.17 Progressive has launched a second commercial UBI product

Progressive is the leading insurance provider of commercial lines insurance in the US. The commercial lines business recorded net premiums written of US\$ 5.3 billion in 2020, an increase of 20 percent year-on-year. Progressive has been a pioneer in the usage-based insurance telematics market. The company started researching UBI in 1992 and filed for a patent in 1996. The personal lines offering Snapshot is today one of the leading insurance telematics initiatives in the US. In the commercial lines segment, Progressive launched the usage-based insurance product Smart Haul in 2018. Smart Haul gives eligible for-hire truckers using an electronic logging device (ELD) the option to save a minimum of 3 percent on their Progressive commercial truck policy in exchange for permission to access their driving data. ELDs automatically record driving data, including the hours of service in a day and were mandated in April 2018 for the vast majority of owner-operators and small fleets. ELDs have been widely used voluntarily by larger fleets since 2015. Progressive partners with the customer's ELD vendor and analyses the driving data to see if an additional discount can be achieved. The discount is determined by reviewing the driving data including information about the vehicles, driving behaviour, location and other diagnostics. The savings depends on how safe the driving is compared to truckers who do similar work. Both new and existing Progressive Commercial policyholders can participate in the Smart Haul program. Smart Haul was available in most states at the end of 2021. In December 2020, Progressive launched the commercial UBI program Snapshot ProView for commercial vehicles without a preinstalled ELD device. Vehicles are instead equipped with an OBD-II dongle and enables functions like vehicle tracking, geofencing, trip reporting and scoring to the fleet owner. The insured are offered a 5 percent enrolment discount and the possibility to save up to 18 percent on renewal depending on the driver scoring. Snapshot ProView is also available in most states.

4.2.18 Nationwide offers commercial lines insurance telematics solutions

Nationwide is an insurance company that offers a full range of insurance products including auto, commercial, homeowners, farm and life insurance. The company's commercial lines business generated annual direct premiums written in the range of US\$ 8.8 billion in 2020.

Nationwide offers a range of telematics solutions to its commercial lines customers, including a dashcam targeting long haul trucking, a smartphone-based telematics program as well as fleet management systems.

Vantage 360 Fleet is a free telematics offering for small businesses that provides a way to manage and monitor drivers' routes and driving activity. The solution is powered by DriveWell Fleet from Cambridge Mobile Telematics (CMT). The Vantage 360 Fleet technology is powered by CMT's windshield tag and phone sensor data collected by the driver's app in the background. Business owners have access to vehicle location tracking, driver performance and route insight. Vantage 360 Fleet launched in July 2019 and is currently available in Arkansas, Illinois, Indiana and South Carolina. There is no additional cost to participate in the Vantage 360 Fleet program. Nationwide provides the telematics program free of charge for its policyholders. A policy renewal discount of five percent on select business auto coverage is available to clients who enrol more than two thirds of the fleet in the program, install the tag within 30 days and actively collect data during the policy period. In Q1-2020, Nationwide launched the enhanced product Vantage 360 Premium Partner Program, offering fleet management services to human services organizations for a subsidised cost. Nationwide partnered with the telematics solution providers, Azuga and Zubie, to offer customers telematics systems with fleet management and GPS tracking capabilities. The Vantage 360 Premium Partner Program was available in New York, New Jersey and Texas. Human service organisations can track fleet vehicles in real time, find the closest driver to respond to client needs, monitor vehicle health, measure mileage, monitor driver performance and verify arrival and departure from client sites. In 2018, Nationwide signed a partnership with Lytx to offer the Lytx DriveCam safety program for fleet managers of long-haul trucking fleets. In August 2020, Nationwide started a partnership with Samsara. Through the partnership, Nationwide's eligible commercial auto customers who install telematics solutions from Samsara and meet the safety related demands are offered a subsidy.

4.2.19 Philadelphia Insurance Companies offers fleet insurance telematics

Philadelphia Insurance Companies, also known as PHLY, designs, markets and underwrites commercial P&C insurance and professional liability insurance products. The company is headquartered in Bala Cynwyd in the US. PHLY was founded in 1980 and was acquired by

Japan's leading P&C insurer Tokio Marine for US\$ 4.7 billion in 2008. The company specialises in 120 niche markets, including commercial auto insurance. In 2018, PHLY launched complimentary access to the fleet management solution PHLYTRAC in order to help businesses monitor their fleets and lower the risk of driver-related accidents. PHLYTRAC is developed by Azuga, a fleet management service provider headquartered in Silicon Valley, and the program is available in all 50 states in the US. PHLYTRAC is a white label product from Azuga that supports functionality such as real-time tracking, diagnostics, video safety, driver behaviour monitoring and driver coaching. The program includes live maps, driver scorecards and a fleet management dashboard that provides information of vehicle health and more.

Azuga had an installed base of more than 275,000 units worldwide by Q3-2021. More than 75,000 vehicles were enrolled in the PHLYTRAC program in mid-2020. About 400 million miles have been tracked and over 1,000 fleet policyholders are using the service. About 15 percent of the vehicles insured by PHLY have enrolled in PHLYTRAC. The program has resulted in a 19 percent reduction in claims.

4.2.20 Trov offers mobility insurance solutions built on Sentiance's platform

Trov develops an insurance technology platform powering digital insurance solutions in the finance, mobility and retail sectors. The company was founded in 2012 and is backed by leading VCs and strategic partners. In 2017, it closed US\$ 45 million in Series D financing led by Munich Re, bringing its total funding to over US\$ 85 million. In addition to the investment, Munich Re strengthened its strategic alliance to include underwriting for Trov throughout Europe, Asia and South Africa. The company is based in San Francisco and maintains offices in New York, London and Tokyo. In February 2022, Trov announced that its assets and team had been acquired by the insurance company Travelers. Trov provides on-demand insurance solutions via its enterprise and mobility insurance platforms. The Trov mobility insurance platform offers bespoke insurance products to solve risk management facing companies in shared mobility services and gig work.

The Trov mobility insurance platform relies on a device and format agnostic solution, ingesting data from any system that aggregates and manages telematics data. The data can be summarized in three categories including real-time vehicle data, risk data and

environmental data. The company partners with a range of companies that utilise both smartphones and vehicle hardware to collect data. Trov has partnered with Sentinance to enhance its understanding of end-users' real-time driving behaviour and risk context. Sentinance is a software company developing AI solutions that turns smartphone and wearable sensor data into driving behaviour intelligence. Trov's customers include global enterprises such as Waymo, Groupe PSA (Free2Move) and Zerology.

4.2.21 True Mileage uses NFC and works with Ohio Mutual Insurance Group

True Mileage was founded in 2012 and is a small provider of technology and analytics services for Usage Based Auto Insurance (UBI). The company has 5 employees and is currently active in the US, Canada and Europe.

In March 2017, True Mileage unveiled its new patent protected OBD device for data gathering. The device can be used either for a send-back program or as part of a hybrid solution where data is transmitted via the driver's smartphone using NFC technology. In the first case, driving data is gathered and stored in the device for a period of typically 3 to 6 months, before being returned for data analysis and scoring. In the second case, driving data is transmitted to the user's smartphone using NFC. The driver taps the device with an NFC-enabled smartphone whereby the data is transmitted to True Mileage's servers without having an embedded modem in the vehicle unit. The NFC connection can also be used by the driver to access driving and vehicle data, including error codes, safety data, measures on driving efficiency and mileage reporting. Historically, True Mileage was more focused on using the send-back model but increased adoption of NFC across phone manufacturers has made the hybrid approach viable. Following Apple's release of iOS 11, all iPhones 7 and newer models are compatible. The vast majority of Android phones are also compatible. When OBD-II devices are sold separately, the price is around US\$ 30 and there are no data transfer fees. The devices are compatible with nearly all model year 2008 and newer vehicles.

True Mileage also offers device-agnostic analytics services for UBI for a variety of data sources such as OnStar, Carfax, traditional OBD, UBI Apps and others. The company offers custom modelling and off-the-shelf customizable products for acceleration, braking, mileage, daytime and relative speed. Ohio Mutual Insurance Group is an analytics client since late 2014, where True Mileage provides discount analytics based on mileage in six states.

4.2.22 State Auto has a broad telematics portfolio focusing on both UBI and claims

State Automobile Mutual Insurance Company (State Auto) is a US-based insurance company founded in 1921. State Auto is a subsidiary of the property and casualty insurance holding company State Auto Financial Company that is traded on NASDAQ. State Auto Financial includes State Automobile Mutual, State Auto Property & Casualty, State Auto Ohio, State Auto Wisconsin, Milbank, Meridian Security, Patrons Mutual, Rockhill Insurance, Plaza Insurance, American Compensation and Bloomington Compensation. State Auto Financial Corporation and Subsidiaries reached US\$ 1.5 billion (€ 1.3 billion) in net written premiums in 2020, up 15.4 percent year-on-year. A pooling arrangement exists between all the insurance subsidiaries in the State Auto Group by which premiums, losses and underwriting expenses are shared by the pool participants. The State Auto Group markets its insurance products throughout the US, through independent insurance agencies which include retail agencies and wholesale brokers. In July 2021, Liberty Mutual Insurance agreed to acquire State Auto in a deal expected to be approved in 2022. Mutual members of State Auto will then become mutual members in Liberty Mutual.

State Auto is investing heavily in telematics, not just for underwriting and customer intelligence, but also for an improved claims experience. In 2015, State Auto embarked on a project to build a new technology platform for agents and policyholders. This led to the launch of telematics-based insurance in the fall of 2016 offering a broader range of insurance products. State Auto has a sensor-agnostic approach to telematics and targets a wide range of telematics products. The first telematics product was developed by Octo Telematics and branded Safety 360. Safety 360 uses an OBD-dongle that records driving data during the entire policy period. Hardware is sourced from Danlaw and scoring is performed by Octo Telematics' Drive Ability score. The program is discount-based and an introductory discount of 10 percent is offered to new policyholders, which can increase to 50 percent upon renewal based on the driving score. State Auto is also exploring surcharging in some states. About 21 percent of the new personal lines policyholders opted-in for Safety 360 in 2019. Telematics-based insurance today accounts for more than 8 percent of State Auto's total book of automotive policies. Moreover, State Auto announced in 2017 a partnership with CMT to develop a smartphone and BLE tag telematics program. The product launched in February 2020.

The project to develop a new technology platform led to the launch of its State Auto Connect digital technology platform in Q3-2018. State Auto Connect for personal lines features a new digital platform and a suite of products including Connect Auto, Home, Dwelling Fire and Umbrella. The company is also looking at using sensor technology on the property side with its membership in Roost's Home Telematics Consortium. Connect Auto also includes the State Auto Safety 360 telematics program. Following the COVID-19 pandemic, State Auto offers a 5 percent reduction on all their policies at renewal. Customers with State Auto Connect personal auto policies are encouraged to enroll in the State Auto Safety 360 program. The company is thus pushing its telematics polices to increase telematics enrolments. State Auto additionally offers State Auto Fleet Safety 360, a telematics-based program offering fleet owners a way to monitor their fleets. Target customers include small and medium sized businesses having light commercial vehicle fleets.

In April 2018, State Auto began utilising data from the Safety 360 program for claims-related telematics and rolled out its Quick Care enhancement for customers of the UBI program Safety360. Quick Care integrates data from OBD dongles powered by Octo Telematics, with CCC's crash-detection algorithms using the CCC X data exchange platform. Moreover, Quick Care enables new features such as SVR and vehicle diagnostics to help the policyholder identify non-drivable cars earlier. State Auto also announced in December 2018 that the company is using CCC X to connect with CCC ecosystem partners including a major OEM to deliver UBI and telematics-enabled claims. Within the OEM program offered by CCC, State Auto will use actual driving behaviour to identify attractive customers and offer discounted insurance policies. State Auto is also participating in Octo Telematics Drive Ability Marketplace and LexisNexis Telematics Data Exchange. Both exchanges enable State Auto to offer premiums to policyholders with a safe driving style. Today, the marketplace and data exchange are in early stages and State Auto has written few premiums through this channel.

4.2.23 Ford, Hyundai, Honda, and GM join Verisk Telematics Data Exchange

Verisk is an information services firm providing risk assessment and analytics for a number of fields including the P&C insurance vertical. The company has been active in insurance telematics providing scoring and claims algorithms for over ten years. Verisk launched the Verisk Telematics Data Exchange program in September 2016. Mainly OEMs, but also TSPs,

telecom companies and connected home and monitored security providers can participate and share data with insurers through the data exchange. Verisk acts as an intermediary that normalises data and provides predictive analytics. The objective is that auto insurers shall receive standardised data, which can easily be used without the need of developing a UBI scoring model of their own. Insurers will also avoid the cost and logistics associated with installing, maintaining and removing aftermarket devices. A critical benefit to auto insurers is that they are able to use insurance-ready data in a standardised format. Insurers are able to reduce the time and effort in pursuing each automaker and TSP on their own to obtain driving data and build an infrastructure to ingest, store and normalise the data. Insurers will also avoid the cost and logistics associated with installing, maintaining and removing aftermarket devices.

GM OnStar announced its participation in the data exchange in September 2015 and started reporting data in September 2016. The second carmaker that joined Verisk Data Exchange was American Honda Motor Company, which announced its participation in the program in late 2017. The agreement enables Honda customers to access a driving score provided by Verisk. In April 2018, Hyundai Motor America announced that it would be the third OEM to join the Verisk Data Exchange. This enables Hyundai Blue Link customers to share their driving data with Verisk to receive a driving score and the possibility to opt-in to a UBI program that theoretically results in lower car insurance premiums. The Blue Link solution uses embedded 4G connectivity and features emergency, safety, diagnostics, remote control and navigation services, offered as three service packages. The Blue Link connected car services are available on the entire Hyundai and Genesis line-up from model year 2018 in the US and Canada. Genesis models come with a five-year connected services trial whilst Hyundai models have a three-year free trial of Blue Link services. In March 2021, the Verisk Data Exchange became the exclusive provider of vehicle data from Hyundai and Genesis vehicles in the US. Ford Motor Company joined the Verisk Data Exchange in October 2020. Mobile telematics companies TrueMotion (now CMT) and Root Insurance joined the exchange in 2019. The agreement with CMT enables insurers to offer integrated telematics solutions that combines mobile data with Verisk driving behaviour analytics. Root Insurance benefits from the Data Exchange by getting access to historical driving data of their clients.

Model-ready data can also be provided to insurers allowing them to run their own scoring algorithms, which applies to insurers with existing UBI programs and scoring algorithms developed in-house. Verisk also continues to expand the data exchange platform to commercial lines and fleet insurance. In mid-2017, a partnership with Webfleet Solutions was announced for commercial vehicles connected to the WEBFLEET platform to opt-in for an insurance through the Verisk Data Exchange. In June 2018, Omnitracs and Verisk announced a strategic alliance. Omnitracs customers can opt-in to transfer fleet driving data into the Verisk Data Exchange, enabling access to fleet insurance services and operational safety feedback. At the end of 2020, the installed base of active fleet management systems based on telematics devices installed in commercial vehicles (not including trailers) in the Americas is estimated to over 800,000 units. The North American market represented the vast majority of these.

Insurers access the Verisk Driving Score through the Verisk Data Exchange. The Verisk Driving Score is device agnostic and enables consistency across data collection techniques such as smartphones, OBD dongles and OEM telematics systems. Rate filings for the Verisk Driving Score powering the Data Exchange have been filed and approved in 43 states. The exchange is gathering data from more than 8.5 million vehicles with an accumulated over 260 billion miles of driving data by the end of Q2-2021.

4.2.24 CMT powers multiple safe driving contests in the US

Cambridge Mobile Telematics (CMT) is a US-based company providing a smartphone-based telematics platform – DriveWell – that includes a white-labelled app, telematics processing and behavioural analytics. The company is a leading vendor of smartphone-based telematics services and works with a range of leading insurance carriers in Europe and North America including State Farm, Liberty Mutual, Nationwide, Desjardins, State Auto, HUK Coburg, Admiral and Hastings Direct. The company has more than 6.5 million active users in various insurance telematics programs. In addition to powering UBI programs, CMT offers a platform that enables cities, insurers, NGOs or mobility providers to run safe driving contests to improve driver behaviour and raise awareness of the DriveWell platform. In 2019, the platform ran five safe driving contests in partnership with municipalities and insurers to specifically address driver distraction. The company powered safe driving contests in Boston, San

Antonio, Los Angeles, Seattle and Rhode Island. Partners include Liberty Mutual, Amica, USAA, PEMCO, Progressive, Uber, Vision Zero Network and participating cities' public transport organisations. Each competition offers eligible participants the chance to win prizes for monitoring and changing their driver behaviour. The platform includes the Safest Driving app enabling phone distraction scoring, engagement mechanisms, behaviour change and corporate challenges. In 2019, the contests powered by CMT involved more than 35,000 drivers and 16 companies who ran corporate challenges. The contest that ran in Boston saw a 48 percent decrease in phone distraction, 63 percent decrease in harsh acceleration, 57 percent decrease in harsh braking, a 58 percent reduction in cornering and a 35 percent reduction in speeding. The pandemic has put a pause on new safe driving contests.

4.2.25 Intact discontinues its device-based program in favour of mobile solutions

Canadian property and casualty insurance provider Intact Financial Corporation achieved revenues of CAD 12.3 billion (€ 8.0 billion) during 2020 and employs over 16,000 people. Direct premiums written in the personal auto segment amounted to CAD 4.3 billion (€ 2.8 billion), making Intact the largest auto insurer in Canada. Products and services are marketed and distributed through its subsidiaries Intact Insurance, Belairdirect, BrokerLink and OneBeacon. Telematics-based insurance is offered mainly through the brands Intact Insurance and Belairdirect. In July 2021, Intact closed the acquisition of RSA Insurance Group's assets in Canada, Ireland and UK, increasing its annual premium base in Canada by approximately 30 percent and entering the UK and Irish markets. Together with RSA operations, Intact now employs over 26,000 people and reached close to CAD 18.0 billion (€ 11.8 billion) in direct premiums written in 2021.

As a part of the company's overall mobile strategy, a smartphone-only offering was rolled out in 2018. The mobile telematics offer is now available across Canada. Intact has consolidated its app strategy and offers UBI in its general insurance app. The app can be used to connect with brokers, view property and vehicle policies, check status of claims, access the proof of insurance and get notifications and tips. Self-installed OBD-II devices were previously used both by Intact Insurance and Belairdirect. Until March 2020, Intact and Belairdirect wrote new premiums based on the device-based program due to regulatory aspects in Alberta. The company had active OBD-II dongles reporting to its system until October 2020 when the

monitoring period of the last written policies expired. As of April 2020, all new UBI policies offered by Intact Insurance and Belairdirect are based on the smartphone-only offering.

The software technology for the OBD-II program was provided by Octo Telematics. Intact has chosen to work with TrueMotion (now CMT) to power the smartphone-only program. As part of the partnership, Intact will leverage insights powered by CMT's platform to create more personalized services to enhance the driving experience for its customers in Canada. In Q3-2018, Intact launched its UBI 2.0 product which improves the way that customers track their progress in the UBI program. Almost half of the UBI customers log in daily to check the progress of their driving behaviour. Driver scoring was previously based on what time of day the car is used, as well as harsh braking and rapid acceleration events. The new telematics offering includes new parameters of risk scoring including speed, turns, time of day and week, road type and kilometres driven. The smartphone-based solution moreover introduced mobile distracted driving features such as active phone handling, in-hand phone call and Bluetooth phone call as parameters. The company collects driving data continuously in the mobile app, thus moving away from the roll-over model that was used previously in the OBD-based program.

The mobile offering enables discounts of up to 25 percent as well as personalised messages to enable behavioural change. Policyholders enrolling in Intact my Drive get a one-time 10 percent discount when enrolling in the program and drivers can save up to 25 percent every six months. Belairdirect's Automerit program offers a 10 percent enrolment discount just for signing up and drivers can save 15 percent by driving safely as well as an additional 15 percent discount for driving less than 10,000 kilometres per year. The apps use the CMT SDK embedded in general insurance apps to measure distracted driving, harsh braking, rapid acceleration, risky hours and speeding. Intact handles scoring and data analytics in house and captures raw data from smartphones to build its own scoring algorithms. Moreover, contextual aspects such as road type and weather are researched to define a more accurate score. One of the most important parameters of scoring is to predict claims frequency in real-time, determined by the company's in-house AI capabilities.

In the commercial lines space, Intact Insurance offers a fleet management solution branded my Fleet Solution based on the TELUS Fleet Tracker program. Intact does not sell the system but subsidises the use of it as well as offers a discount on the insurance policy. By signing up for my Fleet Solution, fleet customers can take advantage of the fleet tracking and operational improvement and efficiency offered through the TELUS Fleet Tracker program. Clients can also benefit from Intact Insurance's loss prevention services. Intact offers an online personalised dashboard that provides metrics to drive improvements and efficiencies for fleet operations. The data is collected by the fleet management solution provider Fleet Complete which powers the TELUS Fleet Tracker program. The uptake of this service has been limited. Intact is also running a pilot based on connected dashcams for its long-haul trucking customers.

The telematics products are offered across all provinces in Canada through both direct sales and brokers. The take rate varies between sales channel and between 25–40 percent of new auto insurance clients enrol in UBI programs. Intact has so far collected about one trillion data points and the database grows with about 45 billion data points every month. The integration of UBI in its general insurance app has generated more traffic to the company's digital offerings as more than 25 percent of its customers use the app. During 2020, monthly UBI logged-in users increased by 118 percent. As of Q4-2021, Intact and Belair had sold an estimated 1 million telematics policies, up from about 700,000 at year-end 2019.

4.2.26 Lemonade acquires Metromile

Metromile is a US-based pay-per-mile auto insurer, with offices in San Francisco, Tempe and Boston. The company employs around 250 people and offers telematics-enabled insurance in Arizona, California, Illinois, New Jersey, Oregon, Pennsylvania, Virginia and Washington. In February 2016, the Canadian P&C insurer Intact Financial Corporation made a strategic investment in Metromile. This was followed by investment rounds of US\$ 192 million, announced in September 2016 to further increase the company's capabilities to become a full-service car insurance company. In addition, Mosaic Insurance was acquired by Metromile, which included Mosaic's licences in 50 US states in 2016. Metromile is now a licenced insurance company and handles both underwriting and claims management processes in-house. Some older policies were underwritten by insurers in the National General Insurance Group. By mid-2018, all policies were underwritten by Metromile Insurance Company. In July

2018, Metromile secured a US\$ 93 million Series E financing round. The company has raised more than US\$ 293 million in private funding to date and generates annual recurring revenues in the range of US\$ 100 million. Metromile had a base of about 95,000 policies in force in Q3-2021. The hardware is sourced from Munic. Metromile has also secured reinsurance partnerships with HSCM Bermuda and MAPFRE Re among others.

In November 2020, Metromile announced the intention to go public through a merger with special purpose acquisition company. In February 2021 the merger was finalized and Metromile began trading on the Nasdaq stock exchange in New York. The same year in November, it was announced that Lemonade would acquire Metromile. Lemonade is a personal lines insurer. Lemonade is listed on the New York Stock Exchange and headquartered in New York. The company reached US\$ 214 million (€ 187 million) in gross written premiums in 2020, up 84 percent year-on-year.

Lemonade announced the launch of its first car insurance coverage in Illinois the week before the acquisition of Metromile was announced in November 2021. The offer is an app only pay-per-mile product with additional discount to drivers of EVs and Hybrid vehicles. Metromile's premium pricing is determined using a pay-per-mile model and OBD-II devices branded Pulse are used to measure mileage. The policyholder is charged a fixed fee plus a small fee per mile driven. The fixed fee and the per-mile fee are determined by factors such as driver age, credit history, type of vehicle, driver history and length of prior insurance. Metromile began using new rating factors including driving behaviour in the summer of 2019. CMT powers the driving behaviour analytics platform. Average speed, time of day and the day of the week are used to help determine the quality of miles driven and price monthly base rates and per-mile rates more accurately. Metromile uses driving behaviour factors to rate select policies in Arizona, Illinois and Oregon. Other services available through Metromile's app include vehicle diagnostics, trip planning and the possibility to locate a parked vehicle. Customers can also access data related to insurance savings as well as other driving data such as fuel costs. A range of value-added services are offered such as car diagnostics, commute optimisation and street sweeping notifications in certain cities. The OBD-II devices include cellular connectivity and can record GPS location as well as accelerometer and gyroscope data. Insurance customers can choose to turn off location tracking. Metromile's

stolen car recovery rate is today 94 percent. In October 2020, the TBYB offering Ride Along was introduced, whereby interested drivers can download the Metromile app and use it for 17 days to get an insurance quote.

In mid-2017, Metromile launched its automated claims service branded AVA that is based on machine learning and artificial intelligence. AVA handles an end-to-end experience for single vehicle/no injury claims. For more complex claims, the system works alongside human adjusters by handling activities including payments, car rental assistance and auto repair shop recommendations. AVA uses claims details such as photos from the accident and data filed by the policyholder through the Metromile app to guide the policyholder in the claims process. AVA can also use opt-in data from the OBD-device in the claims analysis to reconstruct the accident. Metromile has invested to develop its claims handling platform to distinguish between crash types. Especially low-speed crashes and door dents have been researched and integrated in the AVA platform.

Metromile Enterprise is the SaaS business group of Metromile that began licensing its AI and SaaS platform to external insurance companies in 2018. Insurance carriers can licence Metromile Enterprise's platform to automate claims to help them operate with greater efficiency and provide an enhanced customer experience. In August 2018, Tokio Marine Holdings, the largest P&C insurance group in Japan, was the first insurance carrier to publicly announce that it will be adopting the company's fraud detection tool branded Metromile DIRECT.

Metromile also offers a new type of insurance called fractional insurance. The first product launched in partnership with the peer-to-peer carsharing provider Turo. Drivers who share their cars on carsharing marketplaces such as Turo will pay a monthly base rate and a pay-per mile fee for the miles they drive which are calculated by data derived from the Metromile Pulse device. When their cars are shared with other drivers, they will not pay for any of the miles driven by anyone else. At the same time, Turo Insurance Agency, which is backed by Liberty Mutual Insurance, ensures coverage for their cars while booked on the Turo carsharing marketplace. In September 2020, an agreement between Ford Motor Company and Metromile was announced, whereby drivers of eligible Ford vehicles could use OEM telematics to report their driven distance to Metromile.

4.2.27 American Family Insurance

American Family Insurance is a US Mutual insurance company founded 1927 in Madison as Farmers Mutual Automobile Insurance Company. In 1963, the company had grown into a group of companies and the name American Family Mutual Insurance Company was adopted for the parent company. Today, the group is among the top 20 P&C insurers in the US and is active within all major fields of insurance including life insurance as well as private and commercial P&C insurance. In 2020, the total revenues of American Family Insurance Group reached US\$ 12.9 billion (€ 11.3 billion) of which P&C premiums comprised US\$ 11.4 billion (€ 10.0 billion). The company employs over 13,000 people and has an additional 1,400 self-employed affiliate agents.

American Family Insurance offers three UBI programs to its customers. The oldest, branded KnowYourDrive, was introduced in 2017 and is currently the flagship UBI discount program. KnowYourDrive is a smartphone only PHYD program available in 19 states where drivers opting in receive an initial 10 percent premium discount. Based on data from the last 12 months of program participation, customers can increase the discount to 20 percent at the next annual renewal if they score well based on data on braking, acceleration, speeding and distracted driving. Initially the program used an OBD-II dongle from Automatic Labs to collect data in combination with an app and software from TrueMotion (now CMT), but has since developed the product into an app only solution. The program has been a success and enrolment has recently grown 150 percent year-on-year and comprises nearly half of the new business written in 2021. A Teen Safe Driver program was introduced in 2017 where the driving style of teens is monitored and can award a 10 percent discount to the annual premium up to the age of 18 and five percent for young adults (ages 19 to 21). The discount is contingent on the teen driving more than 3,000 miles or partaking in the program for one year and not committing major violations or multiple minor violations with respect to safe driving parameters. Teen Safe Driver is an app only solution and can be combined with the KnowYourDrive program.

American Family Insurance additionally launched a point-of-sale telematics program in 2020, where owners of suitable vehicles can be given a quote based on telematics data they have previously supplied to a third-party data exchange. The program is currently available in 18

states. In December 2020, American Family Insurance launched the PAYD insurance program MilesMyWay. The program is offered to clients driving less than 10,000 miles per year and the premium discount starts at 8,000 annual miles. The discount is calculated monthly based on the miles driven during the previous month and can reduce the base premium by up to 25 percent. No penalty is charged for exceeding 8,000 annual miles. The program is app-based with a Bluetooth sensor tag for the vehicle. Technology partner in the program is CMT, supplying the DriveWell telematics platform as well as its Bluetooth windshield tag. The MilesMyWay program is currently available in Arizona and Oregon.

4.2.28 HDVI pioneers telematics UBI for fleets of semi trailer trucks

High Definition Vehicle Insurance (HDVI) is a managing general agent for commercial auto insurance in the US, focusing on telematics-based insurance for small to medium size fleets. The company was founded in 2018 and currently employs around 50 people. The headquarters are located in Chicago and additional offices in South Carolina, Texas and California. In August 2020, HDVI closed a series A funding round, raising US\$ 16 million (€ 14 million) from 8VC, Munich Re Ventures, Qualcomm Ventures and AutoTech Ventures. A series B funding round of US\$ 32.5 million (€ 28.5 million) was closed in August 2021, headed by Weatherford Capital and including new investors Daimler Trucks North America and McVestCo as well as all participants of the series A round. HDVI offers auto liability coverage as well as physical damage and motor truck cargo coverage to fleets with up to 250 power units. Supplemental coverage such as trucker general liability coverage is also offered. The main underwriting partner is Spinnaker Insurance Company together with Munich Re, with HDVI bearing five percent of the assumed risk. In the short term, the core client group comprises fleet operators of semi-trailer-trucks (18-wheelers) and in the longer term the aim is to offer coverage to all types of commercial vehicle operations. HDVI currently offers coverage in ten states including Alabama, Illinois, Indiana, Michigan, Minnesota, Ohio, Tennessee, Georgia, Texas and Wisconsin. The goal is to launch services in more than twice the number of states over the course of 2022.

The main insurance product from HDVI is called HDVI Shift and is a fleet insurance coverage that leverages data from onboard telematics to aid in risk analysis. Electronic logging devices (ELD) and cameras as well as required software, installation and services are included in the

premium. The HDVI Shift insurance product was launched in May 2021 and is priced dynamically depending on the driving style, time of day and the routes taken. Fleets are able to reduce their monthly premiums by up to 12 percent based on safety information collected through the telematics data. HDVI also offers support to help customers increase their understanding of the telematics data and what is needed to achieve higher scores and thereby lower their insurance rates. HDVI is integrated with all major telematics service providers servicing the trucking industry and partners include Geotab, Keep Truckin, Lytx, Netradyne, Samsara and SmartDrive. Software tools are developed in-house and include functionality like driver safety and risk analysis, Federal Motor Carrier Safety Administration (FMCSA) inspection monitoring and insurance policy management modules as well as a telematics-based driver safety bonus program. Drivers can monitor their own safety score through the Driver+ smartphone app. Incentives for drivers to achieve high scores include gift cards to various stores, online retailers, restaurants and service stations.

4.2.29 Tesla launches its own telematics insurance brokerage in Texas and Illinois

Tesla develops and manufactures electric cars and electric drivetrain components. The company is headquartered in Palo Alto, California and was founded in 2003. Tesla uses proprietary technology, design and manufacturing processes to create a new generation of electric cars. The company has also provided development services and powertrain components to Daimler and Toyota. Tesla currently operates one factory in California and an assembly plant in the Netherlands, producing the Tesla Model S, Model X, Model Y and Model 3. The company has also constructed a Gigafactory in Shanghai and a new factory near Berlin was ready for production in 2022. The company has also announced that a new factory is under construction in Texas. Tesla uses a distribution model based on company-owned sales and service centres in order to ensure the best customer experience and benefit from short customer feedback loops. In 2020, Tesla's revenues grew 28 percent to US\$ 31.5 billion.

Tesla began working actively with insurance in 2016, when it launched the InsureMyTesla program in Australia and Hon Kong. The program was a partnership between Tesla and insurance companies, underwriting custom insurance plans for Tesla vehicles in an effort to reduce the costs of insuring a Tesla vehicle. It was also step towards offering the car, its maintenance and insurance at a single price, making the cost of ownership more transparent.

The program was expanded to more markets and introduced in North America in 2017 with Liberty Mutual and Aviva as insurance partners in the US and Canada respectively. In the InsureMyTesla program, Tesla only referred its customers to its insurance partners to offer quotes. The company first launched its own insurance brokerage for customers in the state of California in 2019. In October 2021, Tesla launched its first PHYD offering as an insurance broker in Texas, in which it leverages the built-in telematics sensors in Tesla vehicles to collect real-time driving data on the driving style for each vehicle. The scoring algorithm, called Safety Score Beta, evaluates data from ADAS sensors as well as more traditional telematics data like acceleration. The evaluated parameters include the number of forward collision warnings per 1,000 miles, time spent following a vehicle unsafely in terms of speed, relative speed of both vehicles and distance to the vehicle ahead, harsh braking and acceleration as well as forced disengagements of the autopilot function due to inattentiveness from the driver. The scoring is unique to a single vehicle and owner and is not carried forward to a new owner or Tesla car and the algorithm ignores any event that occurs during the time that the autopilot function is engaged. Tesla makes it a point to address privacy concerns and states that it will not use location-based data unless a serious safety concern is observed. The PHYD offering is currently available in Illinois and Texas. Underwriting partners to Tesla's insurance brokerage are the Markel subsidiary State National Insurance Company in California, Redpoint County Mutual Insurance in Texas and the American Family Insurance affiliate Midvale Indemnity in Illinois.

4.2.30 Pouch and Mojio partner to offer fleet insurance to small businesses

Pouch is an insurtech start-up focusing on small commercial auto insurance for companies with fewer than 20 employees. The company was founded in 2020 and is headquartered in Dallas, Texas in the US. Business owners with trucks, trailers, vans and other commercially used vehicles can get fleet insurance from Pouch with Stonegate Insurance as underwriter. In May 2021, Pouch partnered with the connected car services provider Mojio to offer the fleet management product – Force by Mojio – free of charge to its insurance clients. Force by Mojio is a commercial fleet management solution targeted at small businesses and based on 4G connected OBD-II devices. The device feeds data on driving behaviour, location and vehicle data to Mojio's web portal and app. Other functions include geofencing, location sharing to customers, predictive maintenance alerts, driver safety scoring, vehicle disturbance alerts and reports on vehicles and drivers.

Chapter 5

Market forecasts and trends

Vehicle telematics has made a broad entrance on the insurance market in several countries. Insurance telematics products can be launched by insurers for a wide range of reasons. There are players that mainly seek to drive revenues while others are looking to reduce costs. Some insurers aim to capture the early adopters, whereas other players rather work to keep up with competitors. Insurance telematics including UBI is often characterised as a useful tool to boost customer interaction and retention, but also customer selection in terms of attracting safe drivers. The different drivers to introduce telematics are far from mutually exclusive and multiple forces are often at play at the same time. The different scenarios are highly correlated with the specific insurer in question, including the current position – and certainly the desired position – on the automotive insurance market. Small insurers and newcomers can for example choose to enter the insurance telematics space for other reasons than incumbent providers. Nevertheless, UBI and other telematics-based applications can undoubtedly be a way to get access to new customer segments as well as renew the offerings for existing target customers.

5.1 Market analysis

The nascent insurance telematics market is currently in a phase of strong growth which is expected to accelerate in the coming years. Berg Insight expects that the number of telematics-based policies in force will grow significantly in the medium-term. Europe and North America currently represent most of all insurance telematics programs and active policies from an international perspective. These two regions are expected to continue to dominate the global market also in the upcoming years, though activities have taken off also in other geographies across the globe. In terms of form factors used to enable insurance telematics offerings, the US market in particular transitions to solutions based on smartphones. Although the European telematics market to a larger extent focuses on stolen vehicle recovery, claims management and fraud prevention, Berg Insight still expects smartphone solutions to grow on the European market. OBD devices are expected to

continue to lose market shares in the US in favour for less costly options. Embedded OEM telematics systems are expected to grow in all markets. In addition, other low-cost form factors such as Bluetooth-enabled windscreen tags are estimated to grow. Berg Insight anticipates that insurance companies will invest even more in insurance telematics products following the COVID-19 pandemic. Insurers that have started their digital transformation journey with telematics are already at an advantage by understanding the risk level associated to mobility patterns. The COVID-19 pandemic has further changed the way consumers look at auto insurance as many insurance companies have offered credits on premiums to respond to the decline in vehicle use that followed government-issued lockdowns.

5.1.1 Insurance telematics policies and penetration in Europe and North America

Both Europe and North America are forecasted to be high-growth markets for insurance telematics adoption in 2020–2025. The COVID-19 pandemic and its effects on the world economy are believed to drive demand of digital insurance business models, including insurance telematics. Berg Insight estimates that the North American market is larger than the European in terms of the number of active insurance telematics policies. The European market is more fragmented in terms of insurance telematics maturity and European insurers cannot scale telematics products in the same way as North American insurance carriers. Europe has a considerably larger installed base of active insurance telematics hardware units than North America. This is largely due to the difference in preferred solution between the regions, where North American insurers have mostly opted for roll over models and lately smartphone-based solutions instead of hardwired black boxes, which dominate the large Italian market.

Europe

Berg Insight estimates that the total number of insurance telematics policies in force on the European market reached around 13.1 million at the end of 2020. Growing at a compound annual growth rate of 21.7 percent, the number of insurance telematics policies in force is estimated to reach around 35.1 million by 2025. The insurance telematics penetration rate in the total population of registered vehicles in Europe is at the same time forecasted to increase from around 4.1 percent in 2020 to 10.5 percent in 2025.

Figure 5.1: Insurance telematics policies and penetration (Europe 2020–2025)

Telematics policies (Thousands)	2020	2021	2022	2023	2024	2025
The Mediterranean	10,136	12,164	14,596	17,516	21,019	24,172
Penetration rate	11.5 %	13.8 %	16.4 %	19.6 %	23.3 %	26.6 %
UK & Ireland	1,346	1,683	2,019	2,423	2,908	3,490
Penetration rate	2.8 %	3.6 %	4.2 %	5.0 %	6.0 %	7.2 %
Benelux and France	291	392	510	637	797	996
Penetration rate	0.5 %	0.7 %	0.9 %	1.1 %	1.3 %	1.6 %
Germany, Switzerland, Austria	866	1,255	1,758	2,461	3,445	4,651
Penetration rate	1.3 %	1.9 %	2.7 %	3.8 %	5.3 %	7.1 %
The Nordics	43	49	59	68	78	86
Penetration rate	0.3 %	0.3 %	0.4 %	0.4 %	0.5 %	0.6 %
Central and Eastern Europe	436	589	795	1,034	1,344	1,680
Penetration rate	0.9 %	1.3 %	1.7 %	2.1 %	2.6 %	3.2 %
<i>Total Europe</i>	<i>13,118</i>	<i>16,132</i>	<i>19,738</i>	<i>24,139</i>	<i>29,590</i>	<i>35,073</i>
<i>Penetration rate</i>	<i>4.1 %</i>	<i>5.0 %</i>	<i>6.1 %</i>	<i>7.4 %</i>	<i>8.9 %</i>	<i>10.5 %</i>

Source: Berg Insight

The largest market in Europe, both in terms of penetration and number of units, is Italy which is estimated to have reached 9.7 million active telematics-based policies at year-end 2020, up 24 percent year-on-year. The Mediterranean region reached an estimated combined number

of telematics policies of 10.1 million active insurance telematics policies. The growth in the Mediterranean is expected to continue during the next five years and reach 24.2 million policies and a penetration rate of 27 percent in 2025. The number of telematics-based policies in the UK and Ireland was approximately 1.3 million in 2020 and is expected to grow to 3.5 million in 2025. The vast majority of the installed base is in the UK. The German speaking market has picked up pace after years of slow developments, especially in Germany, due to the introduction of smartphone-based services addressing a wider target audience. Berg Insight estimates that there were close to 0.9 million active telematics policies in the DACH in 2020. With close to 50 million vehicles on the roads and a positive reception of the launched insurance telematics programs, the uptake of telematics-based insurance in Germany is expected to continue its rapid growth during the next five years. All other European markets are so far considerably less developed. The markets in Austria and Switzerland are expected to grow from low levels. There are around 291,000 active telematics policies in France and the Benelux. The Benelux region is expected to continue its growth trajectory in the upcoming years following many major insurers' entrance on the telematics market. France is expected to follow suit as insurers begin to find solutions that work for them in the market. For a long time, Denmark was the Nordic country with the largest uptake of insurance telematics. Sweden experienced a growth period a little later but most programs have since been discontinued. Many leading Danish insurers have also discontinued their telematics programs. In Finland and Norway, most initiatives so far have been small scale pilots. There have been many projects on the Central and Eastern European markets as insurance carriers explore digital business models. In 2020, there were close to 0.44 million insurance telematics policies in Central and Eastern Europe. Most insurance telematics policies can be found in Poland, the Czech Republic, Romania and Hungary as well as in the Balkans.

North America

In North America, the total number of insurance telematics policies in force is forecasted to increase from around 16.7 million policies at the end of 2020 to reach 49.0 million policies by 2025, representing a compound annual growth rate of 24.0 percent. This corresponds to an increase of the insurance telematics penetration from approximately 5.7 percent in 2020 to 15.7 percent in 2025 across the total population of registered vehicles on the North American market.

The number of UBI policies in Canada increased significantly in 2020 to an estimated 1.6 million policies. The Canadian UBI market is expected to continue to grow and is forecasted to reach 5.0 million active policyholders in 2025, corresponding to a CAGR of 25.0 percent. Considering that many of the largest insurers have re-structured and re-launched their UBI programs, the US market will grow rapidly in the upcoming years. Smartphone-based and OEM telematics programs are believed to achieve high market shares. Berg Insight forecasts that the US market will grow at a CAGR of 23.9 percent to reach around 44.1 million telematics-based auto insurance policies in 2025.

Figure 5.2: Insurance telematics policies by country (North America 2020–2025)

Telematics policies (Thousands)	2020	2021	2022	2023	2024	2025
US	15,063	19,582	24,477	30,596	36,715	44,058
Penetration rate	5.6 %	7.2 %	8.9 %	11.0 %	13.0 %	15.5 %
Canada	1,631	2,121	2,651	3,314	3,976	4,970
Penetration rate	6.4 %	8.3 %	10.2 %	12.7 %	15.1 %	18.6 %
<i>Total North America</i>	<i>16,694</i>	<i>21,702</i>	<i>27,128</i>	<i>33,910</i>	<i>40,692</i>	<i>49,029</i>
<i>Penetration rate</i>	<i>5.7 %</i>	<i>7.3 %</i>	<i>9.0 %</i>	<i>11.1 %</i>	<i>13.2 %</i>	<i>15.7 %</i>

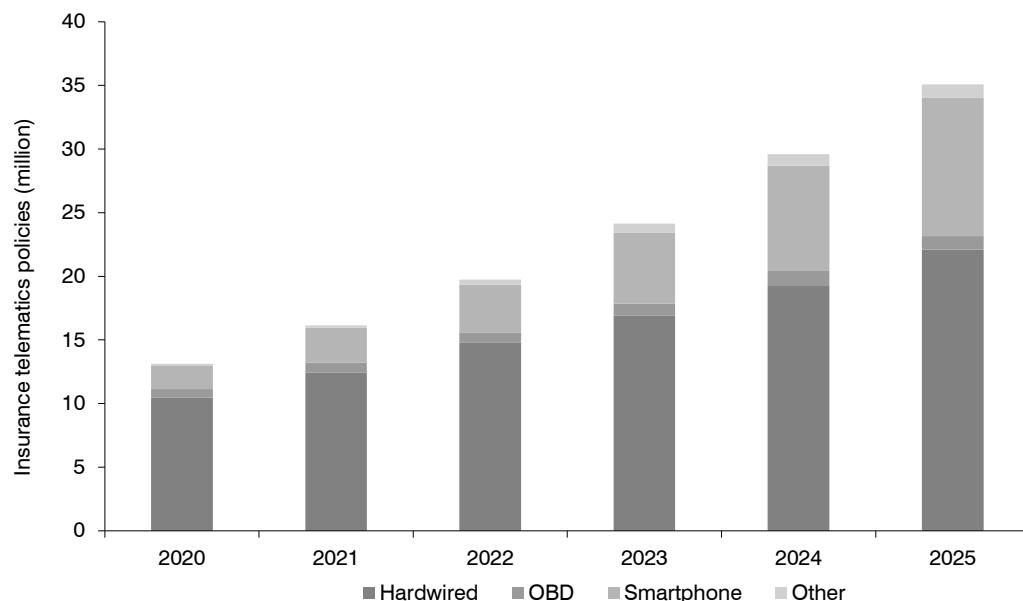
Source: Berg Insight

5.1.2 Form factor developments in Europe and North America

There are a number of alternative aftermarket telematics form factors that can be used to power insurance telematics offerings such as black boxes, OBD devices and smartphones. The European and North American markets differ significantly in terms of the historically preferred aftermarket device types. OEM-based alternatives as well as smartphone-enabled insurance telematics offerings increased their shares of the market during the past year. The uptake of smartphone insurance telematics policies have been further motivated by the COVID-19 pandemic. Insurers that had already started their digital transformation journey

were at an advantage and could deploy UBI policies without needing to consider the logistics around professionally installed telematics devices and the human contact necessary to carry out the installations. Car OEMs are also expected to increase their efforts to use the data collected from new connected vehicles. As insurance telematics is one of the most mature use cases for OEM telematics data, insurance products using OEM sensor data are expected to become more ubiquitous in the upcoming years.

Figure 5.3: Distribution of insurance telematics form factors (Europe 2020–2025)



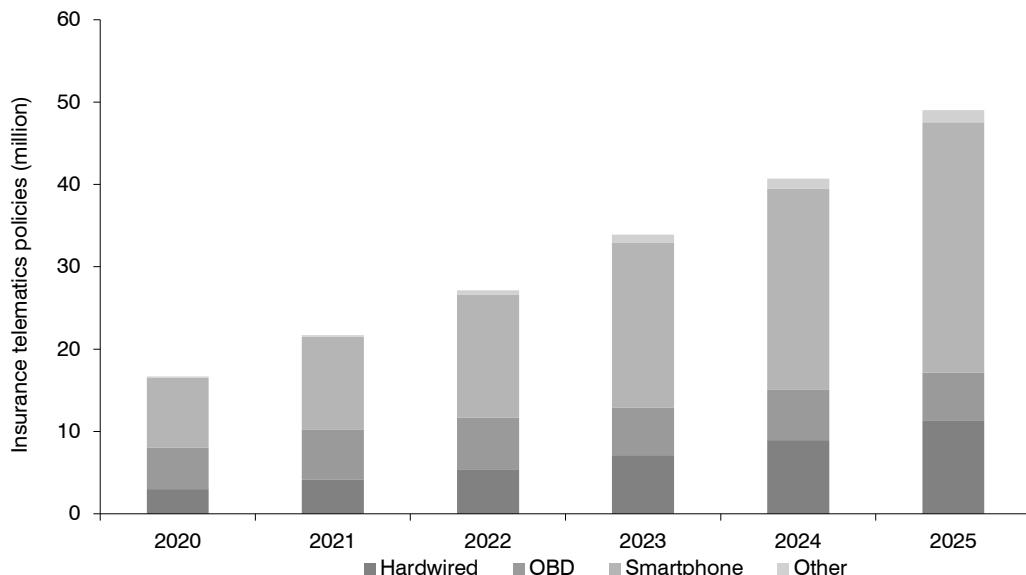
Source: Berg Insight

Europe

The European insurance telematics market is so far largely dominated by aftermarket hardwired in-vehicle telematics devices. Aftermarket hardwired devices are expected to continue to represent a majority share of the insurance telematics policies in Europe in the upcoming years. Strong growth is expected for smartphone solutions while OBD devices are expected to retain a small market share, although possibly experience some growth from the very low numbers today. App-based solutions have taken off in several markets, both in the

form of TBYB offers and full-fledged policies logging data continuously. Hybrid solutions where a smartphone is used together with a standalone battery powered BLE unit are also showing promising growth potential. Other low-cost alternatives such as 12V devices are present on the European market. Insurance telematics projects using OEM telematics data have emerged during the past years and their uptake is expected to grow in the coming years.

Figure 5.4: Distribution of insurance telematics form factors (North America 2020–2025)



Source: Berg Insight

North America

In North America, the smartphone form factor has recently overtaken OBD-based insurance telematics policies. The self-installed OBD devices are used either for continuous data recording throughout the duration of the policy, or in roll-over models where data is collected for a short period of time only. During the past year, most major US insurers with significant telematics programs including Progressive, Allstate and State Farm have launched smartphone-based solutions which increasingly phase out the use of OBD devices. State Farm has chosen a hybrid solution with a Bluetooth beacon that solves the issues of

automatic recording of journeys as well as recording trips when the smartphone is not in the car. Both standalone smartphone applications and enhanced smartphone solutions are expected to increase rapidly in terms of the number of users in the next few years. The North American market hosts several data exchanges utilising connected car data, which is expected to grow to become a significant form factor for insurance telematics purposes in the upcoming years. OEM telematics systems have increasingly been used for UBI in the region, either via connected car data exchanges or direct relationships between OEMs and insurance carriers.

5.2 Value chain analysis

The insurance telematics value chain spans multiple industries. A wide range of insurance players are active in the field, offering insurance products that leverage telematics data in various ways. The programs can to various extent be developed in-house, ranging from a very large involvement from the insurer to underwriting only. White-labelled solutions are common, where a TSP provides hardware, data analytics and sometimes also logistics.

Figure 5.5: Key players in the insurance telematics value chain



Source: Berg Insight

The telematics companies targeting the insurance market include insurance-focused specialists dedicated particularly to telematics applications such as UBI, as well as general telematics players that serve other verticals as well. Automotive OEMs are also increasingly taking an active part in the ecosystem and the data streams from line-fitted telematics systems can be used for insurance purposes. Furthermore, several mobile operators have extended their end-to-end M2M solution portfolios with telematics-based offerings for insurers, commonly through collaborations with specialised partners. IT industry players moreover play an important role in the insurance telematics value chain, providing infrastructure and software-based components needed to manage and take advantage of the massive amounts of data generated by telematics systems deployed in insurance settings. Figure 5.5 highlights a number of leading players from different parts of the insurance telematics value chain.

5.2.1 Insurance industry players

Telematics-related offerings have been introduced by a large number of insurance players in the world, including specialised insurers and brokers as well as traditional insurance companies mainly active in conventional auto insurance. The rationale for entering the insurance telematics field varies among insurers. Some mainly seek to leverage the telematics data to improve claims management whereas others focus on enabling usage-based premiums taking into account the driving behaviour of the policyholders. In mature markets, for example Italy and the UK, insurers tend to do both – price premiums depending on driving behaviour, but also use telematics data recorded in crash events to settle claims and in some cases also provide VAS such as eCall. Other ways of differentiating the insurance product portfolio are to offer telematics-enabled value-added services. Telematics can support CRM activities and enable insurers to retain and attract the best clients on markets where auto insurance to a large extent is commoditised and purchase decisions based primarily on price. In general, telematics-based offerings tend to be more common on markets having high premium levels or experiencing issues related to fraudulent claims. A significant share of insurance telematics initiatives is geared towards the personal lines market including subsegments such as young drivers. There are also a growing number of offerings targeted at fleet customers, which is an attractive use case since many fleets have already installed telematics systems.

Insurance players can either develop telematics programs independently or rely on partners to varying degrees. Insurers having large customer bases of policyholders opting for telematics-based insurance offerings include UnipolSai in Italy and Progressive in the US, counting over 4.1 million and 4.5 million active telematics-enabled policies respectively at year-end 2020. Progressive has performed pioneering development in-house, while UnipolSai has a long-standing collaboration with Octo Telematics. However, UnipolSai has since 2015 moved towards handling a larger share of its telematics program in-house through the subsidiary AlfaEvolution. Today, Octo Telematics manages legacy hardware. AlfaEvolution in turn manages about 75 percent of new installations. Progressive has on the other hand started working with the US-based start-up TrueMotion (acquired by Cambridge Mobile Telematics in June 2021) to develop its smartphone-only offering. Other insurers running large-scale telematics initiatives include State Farm, Liberty Mutual, Nationwide and Allstate in the US. In late-2016, Allstate decided to expand its internal telematics R&D department to an independent subsidiary – Arity – that also started serving external customers in 2017. State Farm has historically handled most of its telematics program in-house and sourced Bluetooth beacons from CMT. CMT is however gradually powering a larger share of State Farm's Drive Safe & Save program. In 2019, State Farm introduced a new version of its UBI program, branded Drive Safe and Save 3.0. The program is built on CMT's DriveWell platform and has a revamped user experience with a focus on road safety and provides additional insights to understand and improve driving behaviour. Liberty Mutual has a history of working with Octo Telematics in the US, but also works with other vendors in the telematics space including CMT. Nationwide works with Octo Telematics, IMS (Trak Global), TrueMotion and LexisNexis for different parts of its insurance telematics program. The company also leverages OEM telematics data from Toyota, Ford and Lexus as well as is an insurance partner of GM's Smart Driver program.

On the Italian market, Generali is another example of an insurer with a significant telematics program. The company has a total of around 2.0 million active telematics-enabled policies, primarily in Italy, and works with multiple telematics partners, including Vodafone Automotive, Octo Telematics and Viasat Group. Generali furthermore acquired UK-based MyDrive Solutions in 2015, initiating its own telematics hub in London. Generali Italia has founded the subsidiary Jeniot that focuses on developing strategies in various IoT verticals including car

telematics, connected care, smart homes and people tracking. MyDrive's technology and operations have been consolidated into Generali Jeniot, the brand is however still in use for digital only products. Generali Jeniot has developed a smartphone-based solution using the platform from MyDrive. Generali has made the strategic decision to insource all the IoT data and service management. The company still purchases hardware as well as logistics and installation services from telematics partners. Insurance telematics insourcing is a clear strategy among Italian insurers. The most prominent examples include the abovementioned Generali and Generali Jeniot as well as UniPolSai and UniPolTech, previously Alfaevolution Technology. Another example is Allianz that manages a dedicated telematics subsidiary.

Allianz has a customer base of around 835,000 telematics policies mainly in Italy and has its own dedicated telematics subsidiary providing end-to-end telematics solutions to several operations across Europe. The German market has also been successful, where it increased its telematics customer base from around 100,000 in 2019 to about 320,000 by the end of 2021. Allianz leverages external partnerships with telematics service providers in certain regions. Due to diverse market conditions in Europe, the company cannot employ a unified telematics strategy across the region. AXA is also a notable player across Europe and has an installed base of around 500,000 telematics policies in Italy, France, Belgium and Switzerland. AXA leverages its internal Data Innovation Lab for telematics services and scoring capabilities, but also works with external telematics partners such as Baseline Telematics and Octo Telematics on certain markets. Admiral Group is the largest telematics-based insurer in the UK with over 200,000 active telematics policies and leverages services from various telematics partners such as Vodafone Automotive and Redtail Telematics. The company pilots a smartphone-based telematics solution in collaboration with CMT. CMT embeds its SDK in Admiral's general insurance app to provide a driver behaviour score that is not yet used for telematics policies. Other notable telematics programs in the UK include for instance Direct Line Group that had less than 100,000 active telematics-enabled policies at year-end 2020. Direct Line Group has a close partnership with the telematics service provider The Floow, which the company held a minority equity stake in until recently when it was acquired by Otonomo. In addition to the abovementioned players, prominent insurance companies such as RSA Group, Zurich, AIG, Aviva and Aegas are all underwriting policies for insurance telematics for insurance brokers in Europe and especially the UK.

Progressive, AXA, Admiral, Liberty Mutual, UnipolSai, State Farm, Nationwide, Allstate, Generali and Allianz are all examples of traditional insurance companies which have diversified into telematics-based offerings. On the UK market, Insure The Box is an example of a company focusing solely on insurance telematics, having in the range of 100,000–150,000 policies in force in 2020. Other examples of insurance players concentrated on telematics-based products include By Miles, Carrot, Marmalade and Ingenie in the UK, and Metromile, Noblr and Root in the US as well as Paydrive in Sweden. Insure The Box and Ingenie have created their own subsidiaries which are handling scoring and telematics. Carrot was launched by the telematics company Trak Global Group, which also owns the telematics service provider IMS. IMS seeks to licence the platform powering now divested Carrot's insurance telematics product in the UK in other markets, beginning with North America. Metromile works with CMT to develop a driving behaviour score and sources telematics technology from Munic. The company has developed an insurance platform and an automated claims management solution in-house. Notably, both ByMiles and Paydrive have launched insurance telematics products based on OEM telematics data from Tesla vehicles during the past year. In general, pure-play providers focusing on insurance telematics have been more common in Europe – especially in the UK – while the front-runners in North America have been traditional US insurers adding usage-based insurance programs to their portfolios. However, in recent years there have been significant initiatives from traditional UK insurers as well. US-based auto insurers have furthermore to a great extent relied on in-house development in the first stage, while a new wave of offerings powered by telematics service providers has followed in North America in more recent time.

Insurers' telematics initiatives are most often initially launched as comparably small-scale trials and pilot programs across a few hundreds or thousands of policyholders. Notably, numerous such attempts have not led to the subsequent launch of full-scale commercial insurance telematics programs offered to the general public. Reasons not to move forward with an initiative can include lower-than-expected interest and negative attitudes across the customer base as well as ROI issues related to the cost of deploying and managing telematics. The Danish insurance companies Alka and Topdanmark were previously active in insurance telematics, but later discontinued their products due to ROI issues. Additional examples include Canada-based iA Financial Group (Industrial Alliance) that closed its

Mobiliz UBI program in 2018 and AXA in Germany that discontinued its UBI pilot in 2019. AXA Ireland has also stopped using telematics. Aviva in the UK was one of the pioneers launching black box-based policies already in the mid-2000s. The company's PAYD service was however withdrawn in 2008. Aviva then later returned with a smartphone-based offering in 2012. The company today offers the Aviva Drive app which can grant drivers discounts of up to 20 percent based on the first 200 miles of driving data recorded by the app. This thus entails more of a TBYB-type strategy without continuous usage-based pricing. Other players in Europe which have switched from hardware-based to app-based telematics strategies include for example Autoline. More recent examples include HUK Coburg in Germany and Marmalade in the UK, both using a hybrid smartphone and device solution powered by CMT. In North America, most major insurers with large telematics programs including Progressive, Allstate, Liberty Mutual and State Farm have already switched or are about to switch to smartphone solutions. However, all of the major insurance UBI providers, except State Farm, still offer an OBD dongle for their insurance telematics programs in some states.

Major players in risk transfer and reinsurance have taken up an interest in telematics to create new insurance products related to the disrupting trends of the automotive industry such as connectivity, autonomous driving, electrification and shared mobility. Swiss Re is one of the leading providers of reinsurance services globally and has developed telematics capabilities in-house as well as acquired the German telematics company Akquinet. Swiss Re offers a modular end-to-end telematics solution comprising a device-agnostic telematics platform, mobile apps, claims management solutions, scoring and actuarial support, go-to-market support and reinsurance by sharing the risk and helping insurers deploy telematics solutions. Another major player on the reinsurance market is Munich Re that has partnered with a range of companies in the telematics industry including Geotab, The Floow and Mobileye. The partnership with The Floow enables Munich Re's clients to provide The Floow's portfolio of solutions and capabilities to insurance clients around the world whilst also strengthening its telematics consulting offering. Munich Re has a suite of telematics products, mainly targeting its clients in the commercial lines space. In the US, Munich Re offers the Smart Mobility product suite that comprises white-label telematics, collision avoidance and data analytics solutions to clients. Munich Re also offers the Mentor program by eDriving, which is a smartphone app that helps drivers manage their behaviour and drive safely.

5.2.2 Telematics industry players

Telematics players active on the insurance market can on a high level be categorised into two broad groups. One is insurance telematics specialists which are only – or mainly – active in the insurance space, offering solutions for UBI and other insurance-related applications. The other category comprises the general telematics players, often primarily focused on applications such as stolen vehicle recovery and fleet management, but also serving the insurance market with software and hardware directly or through partnerships. In reality, there is rather a continuous spectrum of providers between these stylised endpoints. This is due to the fact that several of the insurance-focused telematics players are today also offering solutions for other adjacent applications, while some of the general telematics industry players have established strong positions in the insurance telematics market specifically.

Octo Telematics is a market leading telematics service provider on the insurance telematics market and offers end-to-end solutions for data analytics, claims management, usage-based pricing and various VAS. The company has served over 100 insurance customers to date and has an active subscriber base of 5.5 million telematics units in the insurance space. The Italian market represents the vast majority of Octo Telematics' business and the company has been working with the key insurance customer UnipolSai in Italy since 2003. Other important markets include the UK and North America. In 2017, Octo Telematics announced an acquisition of the UBI assets of Willis Towers Watson, including the DriveAbility program and marketplace. This has further enhanced Octo's position in North America and improved its data analytics capabilities. Today, Octo Telematics has integrated the DriveAbility score that uses Willis Towers Watson's large database that began collecting driving data in 2010 in combination with Octo Telematics crash and claims database. The DriveAbility solution is applicable globally but has achieved most success in North America due to Willis Towers Watson's strong position on the market. The DriveAbility Marketplace is a telematics platform that normalizes, aggregates and scores data from third party data suppliers. Octo Telematics is also active in a range of aftermarket car telematics applications offering telematics services to leasing companies, car rental companies and a range of shared mobility service providers.

Additional solution providers for insurance telematics include Vodafone Automotive, Viasat Group, Trak Global Group, Baseline Telematics, The Floow, Modus and Scope Technology. LexisNexis is focused on delivering its global telematics platform to insurance carriers and

automotive OEMs. The company has also launched a post-collision management solution and an ADAS risk score to aids insurance carriers and automotive OEMs in digital product offerings. The connected car company IMS offers turnkey UBI solutions and works with 20 insurance customers, including Nationwide and Farm Bureau Financial Services in North America as well as Allianz and RSA Group in Europe. The portfolio also includes fleet intelligence and road charging solutions. Baseline Telematics is focused on insurance telematics specifically and has ongoing projects with around 20 insurers. The company has re-launched its telematics proposition and is now focusing on smartphone only UBI solutions through a SaaS platform. Baseline Telematics is estimated to have around 500,000 active telematics policies on its platforms on various markets, mainly in Brazil, France and Canada. Former Cobra Automotive Technologies, now Vodafone Automotive, is a wholly owned subsidiary of Vodafone Group, offering telematics services for the automotive and insurance industries including SVR, vehicle tracking and UBI solutions. The main insurance client is today Generali Group in Italy. The insurance segment represents a major part of the company's total customer base, with approximately 1.7 million insurance telematics subscribers. Viasat Group's portfolio within insurance telematics is spanning across the entire value chain, from hardware production via driver analytics and telematics services to customer interaction. The company has an installed base of over 500,000 units within insurance telematics, mainly in its domestic market, but also in Eastern Europe. The Floow collects data from more than 1.0 million vehicles in the UK, the US, Germany, Portugal, Italy and Ireland and serves notable insurance customers such as Direct Line and Aviva in the UK and has a global partnership with Munich Re. Scope Technology offers insurance telematics solutions in Europe, North America, Asia and Latin America. Customers include insurers such as Groupama in France and AIG. Other notable companies serving the insurance telematics market with various solutions include players such as Dolphin Technologies and Redtail Telematics.

Cambridge Mobile Telematics, Arity, Amodo, Inzura, Zendrive and Driveway Software are significant players that mainly or exclusively focus on smartphone UBI solutions. However, most other TSPs also offer mobile solutions to their customers in addition to dedicated hardware options. Cambridge Mobile Telematics is a leading player in the insurance telematics market and strengthened its position further in 2021 with the acquisition of TrueMotion, another prominent actor. The company has shipped more than 21.0 million BLE

tags used in insurance telematics programs since 2012. CMT's smartphone-based solution currently has more than 6.5 million active users, including drivers that do not have telematics policies but use apps developed by CMT for distracted driving and safe driving awareness programs as well as TBYB scenarios. Berg Insight estimates that the company powers more than 6.0 million UBI policies in Q4-2021. The vast majority of the active users are located in North America. The enhanced Bluetooth beacons are now supplied to for instance State Farm and Liberty Mutual in the US. In 2019, State Farm and CMT announced version 3.0 of the Drive Safe & Save Mobile app. Drive Safe & Save 3.0 uses CMT's platform to analyse data collected from smartphone sensors as well as the Bluetooth-based beacon device affixed in the vehicles. Additional clients include HUK Coburg in Germany, Admiral, Marmalade and Hastings Direct in the UK. Through TrueMotion, CMT has developed Progressive's smartphone application for UBI that launched in December 2016 and is specialised in detecting distracted driving. Arity is a subsidiary of Allstate and powers a range of telematics solutions for the Allstate Group and external customers. Arity also delivers to consumer applications like the WeatherBug and Life360 in the US. This allows the company to offer its customers telematics-based scoring at point of quote for over 10 million potential customers in Arity's database. At year-end 2020, the company is estimated to power around 2.0 million telematics policies. Amodo serves the telematics application Triglav DRAJV in Slovenia which reached over 52,000 active customers achieving discounts at the end of 2020. Inzura offers a digital platform and has customers in Europe and Asia. The company focuses on launching insurance telematics propositions in emerging markets. Driveway Software has partnered with Verisk Analytics and has also developed Farmers' smartphone-only solution – Signal. Following the rise of smartphone-only solutions to become a mainstream form factor, TSPs specialising in smartphone UBI solutions have experienced a significant growth in recent years. Other players developing smartphone-based telematics solutions include Sentiance, OSeven Telematics and DriveQuant. Moreover, the major reinsurer Swiss Re has developed a smartphone-based telematics solution branded Coloride. The solution is developed in collaboration with its subsidiary Movingdots.

Many of the traditional fleet management and telematics players have entered the insurance telematics space. The insurance market presents opportunities to realise economies of scale, not the least for hardware-centric players which can ship the same types of devices as for

other telematics applications such as SVT/SVR and FM. In the case of consumer UBI applications, the systems oftentimes have to be relatively affordable in terms of telematics hardware as well as subscription fees unless the costs can be offset by VAS sales, whereas fleet insurance telematics generally is a less price sensitive market as the systems most often also are used for a range of other applications.

Examples of companies present on the insurance market include the European FM players Webfleet Solutions, Masternaut and Quartix. Webfleet Solutions has been active in the space since 2012 and offers PAYD/PHYD insurance for both personal lines and commercial lines. Historically, Quartix exclusively served the insurance space through a partnership with LexisNexis, but recently also added some smaller partners. Quartix sold 17,000 hardware devices to the insurance sector during 2020. UK-based Trakm8 serves both the fleet management industry as well as the insurance telematics market. The company serves for instance Direct Line and Marmalade and had approximately 184,000 active telematics units within its insurance vertical at the end of 2020. The global telematics service provider Teletrac Navman has been involved in several insurance telematics projects on the UK market. In a two-year pilot that started in 2013, Teletrac Navman worked with Citroën and Direct Line to provide telematics-based auto insurance to young drivers by fitting telematics devices in new Citroën C1 cars. Teletrac Navman is today not directly involved in insurance telematics projects in Europe. The division Teletrac Navman Automotive, provides a diverse range of connected vehicle services to a global network of vehicle manufacturers, vehicle owners and retailers. At the end of 2020, the Teletrac Navman Automotive's technology was used to track more than 250,000 vehicles. In North America, the fleet management and vehicle tracking TSP, Spireon, launched its first telematics product for the insurance market in late 2015. The company sought to leverage its existing connected car products Kahu and GoldStar for UBI. A pilot ran during 2019 and the company also explored FNOL for its connected car products but Spireon has since then shifted its focus away from UBI products. Other players on the North American FM market active in the insurance telematics space include Geotab, Fleet Complete and Azuga.

A wide range of companies provide hardware used for insurance telematics applications. Examples include Meta System, Danlaw, Xirgo Technologies and Queclink. For several players that also offer software solutions for other telematics applications, the insurance

segment has mainly been a hardware-oriented business. Insurance telematics software providers and insurers are at the same time increasingly adopting a device-agnostic stance, thus supporting hardware from an increasing range of third parties. In line with developments also seen in other verticals, telematics hardware has become increasingly commoditised, while the differentiating factors between different deployments are rather found on the software side, for example in rating algorithms, claims management functionality and various VAS. Most hardware-oriented players are expanding into the software space and aspire to become end-to-end service providers to insurance carriers, rather than simply providing components to their end product. CalAmp for instance, which previously offered exclusively hardware in the insurance vertical has diversified into insurance telematics software applications. In April 2015, CalAmp acquired the early-stage technology company Crashboxx focused on insurance telematics applications. In 2016, CalAmp further acquired LoJack, a supplier of aftermarket SVR systems. Following the acquisitions and internal development, CalAmp now offers services such as instant crash notifications and diagnostics of vehicle error codes. Additionally, CalAmp has since acquired Tracker UK and LoJack Mexico, further expanding its UBI solutions portfolio. Tracker UK is investing heavily in insurance telematics and has merged its telematics product offering with SmartDriverClub in the UK.

Figure 5.6: Examples of telematics hardware providers serving the insurance space

Companies		
Aplicom	Gosafe	Queclink
ATrack	Meta System	Redtail Telematics
Viasat Group	Munic (Mobile Devices)	Sinocastel
CalAmp	Inseego	Trakm8
Danlaw	Pointer Telocation	Xirgo Technologies
ERM	Quartix	Gosuncn

Source: Berg Insight

Redtail Telematics has also broadened its portfolio and offers SaaS such as scoring algorithms and data processing, but can also assume the role as a designated hardware provider. Munic (formerly known as Mobile Devices) offers a solution comprising telematics devices and a platform to various aftermarket telematics verticals including insurance telematics, fleet management and dealership management. In 2020, Munic introduced a Data as a Service (DaaS) solution branded EKKO. EKKO enables insurance carriers and other stakeholders to leverage all data needed for connected insurance products or actuarial research programs at a licencing cost. Autoliv, the Swedish vehicle safety technology company, introduced its own driver safety score in 2019.

5.2.3 Automotive industry players

Automotive OEMs show a growing interest in insurance applications based on telematics data. Industry players across both Europe and North America have launched initiatives related to insurance telematics in various ways. Some OEMs work with telematics partners that have competences within telematics hardware and software applications. Others work directly with insurance companies that can be granted access to specific data streams from existing OEM telematics systems to be used for insurance rating. Several vehicle manufacturers further offer auto insurance under their own brands and some have also diversified into insurance telematics applications such as usage-based pricing.

Insurance telematics such as UBI can be beneficial for OEMs from a marketing perspective by enabling differentiation of the offering. Telematics can further through FNOL functionality help OEMs ensure that cars to a greater extent are repaired in affiliated garages using original parts. The growing trend of connected cars is expected to increase the involvement of OEMs in the insurance value chain as the prerequisite hardware for telematics-based insurance products increasingly will be factory-fitted in the long term. Some automotive OEMs have indicated that they will close the access to the OBD port in the future, which will have an impact on the current form factors in the insurance telematics industry. As the automotive industry players have extensive knowledge of telematics and data analytics, it is safe to say that their involvement will increase in the insurance telematics industry.

Insurance telematics products from OEMs in Europe are so far commonly based on installation of aftermarket devices only intended for insurance telematics rather than leveraging the capabilities of OEM telematics solutions. Some small-scale solutions utilising OEM connected car data have been active for some time, with limited market success. The French insurer Amaline, a subsidiary of Groupama, provides insurance under the brand Renault Assurance and is also responsible for managing the call centre and claims. Renault has a partnership with Groupama and Amaline to provide UBI for its electric car brand, ZOE. The South African telematics service provider Scope Technology provides telematics services and scoring to Renault's R-link System. Renault-Nissan Alliance has moreover partnered with The Floow on a data exchange program where The Floow will act as a data analysis partner. This solution is mainly intended for smaller insurers or insurers that do not have a telematics program of their own. The program is today limited due to issues with data reliability. Daimler has furthermore through Mercedes-Benz Bank and HDI-Global introduced usage-based truck insurance in Germany based on driving data from the FleetBoard systems. Daimler Financial Services has also introduced a PHYD program in France, Belgium, the UK, the Netherlands and Germany. Factory fitted telematics devices in all new Mercedes-Benz vehicles since 2018 are used in combination with telematics services from external third-party scoring companies to give the driving score used for PHYD discounts. The factory-fitted telematics device transmits time and GPS location every two minutes. Insurance partners include HDI Global in Germany and AXA in Belgium and France. The policies are activated through the Mercedes Me portal. PSA Group offers telematics-based insurance in France and Belgium, using connected car data directly from the car. PSA Group also offers insurance telematics based on aftermarket devices in the UK. In December 2021, Stellantis, the result of the merger between PSA and FCA, announced that it intends to launch its own UBI programs in Europe and North America in 2022 through the respective captive finance arms in the regions.

In mid-2017, the German automotive manufacturer BMW launched BMW CarData, which enables customised service options for BMW drivers based on data from the vehicle. The initiative enables third-party providers to utilise connected car data to customise services for BMW customers. As the vehicle generates data such as mileage driven, fuel consumption and event data like crash notifications, third party vendors can with the consent of the customers access the generated data to provide services such as UBI programs. Similar

initiatives are expected to be launched in Europe in the upcoming years from other automotive OEMs. In parallel to OEM-branded data exchanges, several marketplaces that offer connected car data have emerged on the market. Examples include Wejo, IBM, Caruso and Otonomo. LexisNexis Risk Solution has launched its Telematics Exchange in Europe. In 2019, the company signed a partnership with FCA Italy to develop new insurance services based on FCA's new connected car platform developed by Harman. Starting from 2020, LexisNexis offers normalised data, or a ready-to-use insurance telematics score based on telematics data from FCA connected vehicles. A further step would be to completely by-pass the OEM and bring the data directly from the vehicle to a neutral server, without passing through the OEM server. The neutral server operator would ensure data distribution to service providers who request access to the data. Some European OEMs have proposed to create an ISO standard for data transmission between cars and service providers via a central server, under the label "Extended Vehicle Standard". In accordance with the European Union's Regulation (EU) 2018/858, OEMs must be ready to share connected car data with third parties by September 2020. More specifically, this regulation establishes a requirement for automakers to provide technical information captured by telematics devices and other vehicle components to independent vehicle repair operators, so they have an equal ability to compete with authorized dealers.

Vehicle OEMs with activities in the insurance telematics space on the North American market for example include General Motors, Toyota, Hyundai, Nissan, FCA and Ford Motor Company. GM's OnStar is taking part in Verisk Telematics Data Exchange and was joined by Honda's HondaLink and Hyundai's Blue Link in 2017 and 2018 respectively. Verisk Data Exchange collected data from over 8 million Ford, GM, Honda and Hyundai vehicles in Q4-2021. OnStar subscribers can since 2016 sign up for a driver feedback program branded Smart Driver. Participating drivers receive a score and feedback on their driving, including a record of late night driving, speeding, harsh braking and hard acceleration events. Information on distance driven, fuel consumption, speed and total idle time is also available. As of November 2021, more than 7.0 million customers have enrolled in Smart Driver since launch in May 2016. About 3.5 million of these have also enrolled in the optional insurance discounts program through OnStar's partners Progressive, Liberty Mutual and Nationwide. To be eligible for usage-based insurance discounts through the telematics data exchange, a

customer first needed to opt-in to the OnStar Smart Driver program. OnStar data was then used by the insurers in the US for PAYD policies. OnStar customers have been able to share mileage data with State Farm since the launch of the Drive Safe & Save program in 2011. The Discount Eligibility program was ended during 2021 and to replace it GM launched its own insurance agency, OnStar Insurance Services, offering OnStar customers PHYD insurance underwritten by Homesite Group. Similarly, Ford Motor Company has been involved in the insurance telematics field for many years. In February 2020, Ford launched the PHYD product Ford Insure, with Nationwide as underwriting partner. The product requires the FordPass Connect and FordPass app and offers potential premium reductions of up to 40 percent for the highest safe driving scores. The Ford affiliate American Road Services Company is the licenced insurance agent for Ford Insure. Ford reached insurance incomes of US\$ 128 million (€ 112 million) in 2020. During 2020 and 2021 Ford has also struck deals with Allstate, Nationwide, State Farm, Allstate, Liberty mutual, Metromile, the Verisk Data Exchange and the LexisNexis Telematics Exchange to share OEM telematics data from 2020 and newer Ford and Lincoln vehicles in the US.

Further initiatives in North America include for instance Mitsubishi Motors becoming the first automotive OEM to join the LexisNexis Telematics Exchange. LexisNexis provides scoring and data analytics capabilities enabling Mitsubishi drivers who opt-in to the program the opportunity to enrol in UBI programs or simply receive information on their driving behaviour and pointers on how to drive more safely. Nissan, FCA Italy, Ford and GM have also joined the LexisNexis telematics exchange.

Automotive OEMs have during the past few years launched new insurance propositions, seeking to leverage telematics data to improve the user experience for its drivers. Toyota Motor Corporation, Toyota Financial Services and the Japanese insurer Aioi Nissay Dowa Insurance Company formed a jointly owned insurance agency under the name of Toyota Insurance Management Solutions USA (TIMS) in April 2016. TIMS offers UBI based on embedded OEM telematics devices in the US and its policies are underwritten by a range of insurance companies including Travelers, Nationwide, Safeco Insurance and Liberty Mutual. The company has partnered with Nationwide on the UBI program BrightDrive, which leverages Nationwide's SmartRide UBI platform. The TIMS BrightDrive is available in 12 states

including Arizona, Ohio, Virginia, Washington and Texas for most vehicles built after 2020 and some of model years 2018 and 2019 equipped with Toyota's Data Communication Module (DCM). Customers who drive Toyota vehicles without DCM technology will be eligible for the same participation and earned discounts that are available through the Nationwide SmartRide mobile app program or plug-in device. Moreover, Progressive partnered with Toyota Insurance Management Solutions to offer insurance discounts through the Snapshot program to eligible Toyota drivers in the US. In this relationship, TIMS acts as a marketing conduit, not as the Toyota insurance agency affiliate that represents a panel of carriers. Customers who opt in become Progressive customers, enrolling in the Snapshot program. In December 2021, Toyota introduced its first branded insurance product – Toyota Auto Insurance – underwritten by the Farmers Insurance brand Toggle. The product is not currently a UBI offering but the aim is to offer UBI in the future.

In 2017, Tesla partnered with Liberty Mutual to offer InsureMyTesla, intended to deliver cheaper policies to drivers. The program is available in international markets such as Europe and Asia. In 2019, Tesla launched Tesla insurance in California. The insurance offering is designed to provide Tesla owners with up to 20 percent lower premiums. Tesla Insurance offers comprehensive coverage and claims management through a partnership with State National Insurance Company. It is able to leverage knowledge in telematics, automated driving systems and serviceability of its vehicles to provide insurance at a lower cost. Moreover, the pricing is intended to reflect the ADAS features that come standard on all new Tesla vehicles. As of 2019, the company only used telematics data in an anonymised format to help set the price in California as the state imposes more restrictions on insurance carriers than other states. In October 2021, Tesla launched a PHYD offering as an insurance broker in Texas, leveraging the built-in telematics sensors in their vehicles. The PHYD offering is currently available in Illinois and Texas. Tesla partners with different underwriters, depending on the state.

The young battery electric vehicle (BEV) company Rivian, that delivered its first vehicles in December 2021, has also started a licenced insurance agency to simplify ownership of the cars. The agency, called Rivian Insurance Services, offers discounts to drivers who frequently engage the Highway Assist functionality equipped in Rivian vehicles. Discounts at renewal

can reach up to 15 percent for drivers who use the Highway Assist frequently. Rivian has partnered with several insurance underwriters including Nationwide and The Cincinnati Insurance Company.

5.2.4 Telecom industry players

Mobile operators have during the past years diversified from offering connectivity to providing end-to-end solutions for vertical IoT markets. A number of operators across Europe and North America have been active within the insurance telematics space, most commonly working together with one or several technology providers from the telematics ecosystem as well as other types of players offering relevant capabilities for insurance customers. Examples of operators that have been offering insurance telematics solutions include major players such as Vodafone, Sprint and Verizon.

The Spanish mobile operator Telefónica has been involved in a number of insurance telematics projects testing different products and business models for some time. The IoT division of the company has multiple times worked with Generali in Spain, including the launch of Pago como Conduzco, which translates into Pay as I Drive. It started as a pilot based on an on-board telematics device and was launched commercially in 2013. The product is still available, but Telefónica is no longer involved in the project. Telefónica is now focusing on smartphone solutions instead. In 2015, Generali and Telefónica worked together on a smartphone project branded Generali Driver. An additional smartphone pilot project is Drivies, a driving coaching app targeted directly to end-users. The application is developed internally by Telefónica I+D and automatically detects and records car journeys. In 2017, Telefónica spun off the Drivies app to a separate company. Telefónica's UK subsidiary, O2 UK, has launched a telematics-based insurance in partnership with BGL Group's subsidiary Junction. The telematics-based insurance started with a smartphone-only solution branded O2 Drive that used GPS data from the smartphone to determine driving behaviour. In 2017, O2 Drive Box on Board targeting young drivers was launched. O2 Drive Box on Board used a black box with built-in connectivity. Telefónica moreover explores the possibility to monetize connected car data from its aftermarket consumer telematics product Movistar Car, powered by Net4Things. In March 2022, MAPFRE signed a partnership agreement with Telefónica to offer better car insurance to Movistar Car users. As of Q1-2022, the Movistar Car product had more than 65,000 active customers.

In 2014, Vodafone acquired the Italian telematics solution provider Cobra Automotive Technologies (now Vodafone Automotive) for € 145 million in an effort to expand its range of end-to-end services for the automotive sector further beyond connectivity. Vodafone Automotive's portfolio includes telematics solutions that are for example used by the Italian insurer Generali which is the main insurance customer. The company also works with Admiral, which was announced in November 2017. Vodafone can offer end-to-end PAYD/PHYD usage-based insurance services as well as a range of VAS such as automatic crash and breakdown notifications and security services including theft alerting and tracking. Vodafone Automotive has also launched a driver reward platform to increase customer retention and engagement. The company has also expanded its insurance telematics portfolio by including smartphone-only solutions. The acquisition of Cobra Automotive Technologies has provided Vodafone with a unique advantage among the telecom industry players within insurance telematics in Europe. The insurance segment represents a major part of Vodafone Automotive's total customer base and the company has reached an estimated installed base of 1.7 million insurance telematics subscribers at year-end 2021. In November 2017, Vodafone announced a new concept for connecting consumer IoT devices called V by Vodafone. The portfolio includes a connected car dongle providing eCall, remote tracking and driving safety analysis branded V-Auto.

There are also a number of other initiatives on the European market. Deutsche Telekom, Orange and A1 have previously been active on the insurance telematics market, commonly working with telematics partners. A1 Telekom Austria Group has partnered with ThinxNet promoting the connected car service ryd in Austria. In Sweden, Telia Company launched Telia Sense in partnership with Springworks in 2016. Now acquired by the insurance broker PayDrive, the solution offers an ecosystem of partners such as insurance companies, parking providers and roadside assistance companies. Telia Sense is also available in Denmark since 2017. Springworks also powers AutoSense, a connected car initiative founded by Swisscom and AMAG Group. Zurich bought a stake in AutoSense in 2019. AutoSense enables an ecosystem of connected car services, including insurance telematics from Dextra. Additionally, Deutsche Telekom offers a range of connected car services powered by Mojio in Europe. Examples include Telekom CarConnect in Germany, T-Mobile Czechia Chyré auto and T-Mobile Polska Smart Car. The Belgium-based mobile operator Proximus trials a UBI

pilot with AG Insurance and Touring based on an OBD dongle solution. The trial comprises 1,000 participating drivers born 1993 or later.

On the US market, Verizon has expanded its presence in the telematics space as an end-to-end solution provider. In March 2018, Verizon announced the launch of Verizon Connect which combines the brands within Verizon's connected vehicle portfolio (Verizon Telematics, Fleetmatics and Telogis). In 2016, Verizon launched the product HUM by Verizon, which is an aftermarket connected car system that offers features such as a safety score based on driving behaviour, vehicle diagnostics, emergency assistance and 4G LTE Wi-Fi Hotspot. Verizon aims to add insurance partners to the HUM solution, offering its customers to utilise the safety score to opt-in to different UBI programs. The safety score is determined by cornering, speeding, phone usage, braking and acceleration. Additional features added to the HUM app include for instance a safety score leader board to further encourage safe driving by adding gamification features.

Several other mobile operators in North America have historically been active within insurance telematics. AT&T offers an M2M solution for insurance telematics, which enables insurers to identify, retain and connect with safe drivers. In-vehicle OBD-II devices are connected to a web-based monitoring platform and can log data such as location, speed, acceleration and braking behaviour. The AT&T Insurance company portal includes integrated scoring software to analyse driving information and a policyholder portal is available for access to driver data. The solution enables targeted premiums and can help reduce fraudulent claims by using the data to validate incident reports. Moreover, AT&T has relationships with more than 25 car brands and added about 9.9 million wholesale connected cars during 2020. AT&T has also launched an aftermarket OBD dongle – HARMAN SPARK – in collaboration with Harman Connected Services which potentially can be leveraged for UBI in the future. T-Mobile offers a connected car solution branded SyncUp Drive that is powered by Mojio. The service comprises Wi-Fi hotspot, maintenance reminders, driving behaviour analysis as well as in-app roadside assistance powered by Allstate. Sprint (now T-Mobile) entered the usage-based insurance market in 2012 and worked with an ecosystem of companies active in the insurance telematics field including IMS and Modus. Sprint also offered consumer telematics services powered by Harman. There have also been limited telematics-related activities with operator involvement on the Canadian market. In September

2014, it was for example announced that the insurance telematics solution provider Modus partnered with the operator Bell. Bell currently offers the Bell Connected Car Plug-in service, using an OBD-II dongle from Mojo. The service offers functionality like geofencing, vehicle location, driving style monitoring, engine diagnostics and trip tracking.

5.2.5 IT industry players

A wide range of players active in IT, system integration, data management and analytics, consulting and professional services are involved in the insurance telematics value chain. Verisk Analytics is for example an information services company which has formed the Verisk Telematics division offering solutions for telematics-based UBI initiatives including risk scoring. Verisk Analytics has a long history of serving the insurance industry, especially related to claims data and risk profiling through its subsidiary Insurance Services Office. The professional services company Willis Towers Watson was also active in the UBI space, working together with partners such as Vodafone, IMS (Trak Global) and Cambridge Mobile Telematics. The company provided advisory services and data analytics within insurance telematics in addition to its DriveAbility scoring and marketplace which leverages new sources of data from automotive OEMs, telecom companies and consumer brands. Following Octo Telematics' acquisition of the Willis Towers Watson's UBI assets in 2017, the DriveAbility scoring and marketplace are today run by Octo Telematics. Willis Towers Watson is still active in the UBI space by offering consulting and advisory services to insurers and reinsurers. SAS Institute which provides analytics software and services for business intelligence among other things offers data management, visual analytics and server solutions applicable to telematics initiatives for insurers. The company is moreover working together with Octo Telematics on solutions for insurance companies following an agreement announced in 2015. Guidewire is a company that delivers software to P&C insurers and serves more than 380 customers. The company has strategic alliances with CMT, Octo Telematics and IMS (Trak Global).

Companies such as Accenture and IBM are also involved in the insurance telematics market. The latter offers a portfolio of solutions that can help insurance companies integrate big data and analytics capabilities into the telematics strategy. An early UBI project for IBM was the Norwich Union (now Aviva) pilot in 2004. A more recent IBM project within the insurance telematics segment is BMW's CarData program that offers third-party service providers access to data from the embedded telematics systems in BMW vehicles, with the customer's

consent. IBM is also developing a marketplace for connected car data. A range of solutions for the insurance telematics segment is available, including software that enables scoring, weather alerts, customer engagement, customer insight and additional value-added services. Several marketplaces and developer platforms utilising connected car data have emerged on the market. Examples include Wejo, Otonomo, High Mobility and Smartcar. Data platform players offer open APIs supported by automotive OEMs enabling data access and SDKs for application development and access to driving data of individual drivers as well as aggregated driving data. Insurance telematics, including usage-based insurance, as well as fleet management are major use cases for utilisation of vehicle data.

Additional IT industry players active within insurance telematics include Microsoft, Amazon Web Services (AWS) and Google. These major cloud service providers are keen on working with car OEMs. Microsoft committed to a US\$ 5 billion investment in its IoT and intelligent edge solutions over four years in mid-2018. Its rapid development of horizontal IoT capabilities has led many of Microsoft's partners to utilise the Azure IoT services rather than building their own IoT platform on top of Azure. In the automotive market, the company has introduced the Microsoft Connected Vehicle Platform (MCVP), composed of about 40 different Azure services tailored for automotive scenarios. The platform enables automotive OEMs to build solutions for in-vehicle experiences, autonomous driving, advanced navigation, customer engagement, telematics and prediction services, and connectivity and over-the-air updates. Microsoft has assisted several insurance companies and telematics service providers in developing machine learning algorithms for claims handling and FNOL utilising telematics data. Microsoft also provides a scalable cloud solution through Microsoft Azure for insurance telematics industry players. AWS is for instance powering Modus' cloud-based infrastructure that is used for driver scoring and telematics services. In addition, the major IT company Google is seen as a threat to many insurance companies due to its large database of customer data, which in theory could be used for insurance purposes. Google is moreover a significant player in providing cloud computing services which for instance is used by Austria-based Dolphin Technologies. Also, Google Maps is used by telematics industry players such as Scope Technology in accident reconstruction platforms.

Accenture has launched the telematics platform Yasmine that equips insurers with a dashboard of statistics on both drivers and cars. Yasmine is based on an ecosystem of connected devices, a mobile app and embedded software based on AI and analytics. Enterprise Resource Planning (ERP) software providers furthermore offer functionality tailored to the needs of insurance companies in general, including core financial systems. The ERP giant SAP – which has in-house capabilities relevant to insurance telematics in areas such as Big Data, analytics and web technologies – is in addition working with the insurance telematics providers IMS (Trak Global) and Octo Telematics. Additional IT industry players which power many device agnostic platforms among the major telematics service providers are Salesforce, Software AG and Oracle Java.

5.2.6 Mergers and acquisitions in the insurance telematics space

Numerous mergers and acquisitions have taken place in the insurance telematics value chain. Recent years have seen deals involving players from many parts of the ecosystem including insurance companies, mobile operators, insurance telematics specialists, equity investment companies, telematics technology providers and large corporations active in areas such as insurance-related software, risk management as well as more diverse operations. Year 2021 showed to be a particularly active year when it comes to M&A activity – 18 new transactions were done during the year.

The Italian Meta System group has been involved in a number of deals over the years. The group has included Octo Telematics as well as Dolphin Technologies. Dolphin became majority-owned by the group in 2007. The Meta System group's holding company Meta-Fin has owned 85 percent of Dolphin Technologies. Meta System has shipped over 8 million telematics units to the insurance telematics market to date. In March 2015, China-based Shenzhen Deren Electronic signed an agreement to acquire a 60 percent stake in Meta System for € 57 million. In 2019, Meta System raised € 76.3 million and landed new shareholders including Sichuan Gloport Investment group, CMAF and China Alliance. Meta System specialises in safety and security systems mainly for the automotive sector and the portfolio among other things includes telematics devices which are supplied to insurers such as UNIQA through Dolphin, as well as for example AXA, Insure The Box and Allianz. The Meta System group has previously also owned Octo Telematics which still sources hardware from the former parent company. A number of private equity funds acquired shares in Octo in

2010. Octo Telematics was further in February 2014 acquired by the Russian Renova Group, and Pamplona Capital Management subsequently purchased a minority stake in September 2014. In 2018, Octo Telematics top executives agreed to buy a 20 percent share from the controlling shareholder Renova Group. The deal reduces Renova's shareholding in the company to 49 percent. In 2019, Octo Telematics acquired the entire share capital of Nebula Systems to enhance its vehicle diagnostics capabilities.

Many recent transactions have involved UK companies. The insurance telematics player Wunelli launched the Coverbox pay-as-you-drive offering in the UK in 2009 which was later divested to DriveStyle in 2011. Wunelli was itself subsequently acquired by LexisNexis Risk Solutions in May 2014. UK-based Watchstone (formerly known as Quindell) acquired in July 2014 the insurance provider Ingenie active in the UK. Ingenie is an insurance broker that works with underwriters to offer black box insurance primarily for young drivers and was itself acquired by A-Plan Group in November 2020. Furthermore, UK-based Enigma Telematics in June 2014 merged with the major Italian telematics provider Viasat which among other things serves the insurance market. The UK-based telematics company Trak Global Group announced the acquisition of IMS in late 2018. In Q3-2019, Three Hills Capital Partners acquired a minority stake in Trak Global Group, following an investment of over £ 40 million in the business. More recently, the long-established telematics broker Coverbox went into administration in August 2019. Subsequently, Be Wiser acquired all 10,000 customers on Coverbox policies and moved these to its Drive Wiser brand. The insurtech company Zego acquired telematics company Drivit in December 2020. The insurance broker Atlanta Group acquired both Marmalade and Be Wiser in 2021.

A noteworthy transaction during 2015 was Generali Group's acquisition of the UK-based start-up MyDrive Solutions in July 2015. MyDrive's operations are in the process of being consolidated into Generali Jeniot, which is Generali's telematics and IoT business based in Italy. Additional noteworthy transactions in 2017 include for instance Intel's acquisition of Mobileye. Mobileye has developed an aftermarket ADAS system that includes in-cabin interaction with the driver and has announced a collaboration with Munich Re's US operation. Moreover, Zurich acquired Bright Box to strengthen capabilities in connected cars in late 2017. Bright Box is mainly targeting aftermarket solutions for importers and dealers and the customer base today comprises over 1,000 dealers across the globe. In 2019, Zurich

acquired a minority stake in the connected car company AutoSense. Paramon Capital Partners acquired a majority stake in FairConnect in September 2018. The investor and its financing partners invested more than € 100 million in the company. FairConnect has since acquired both the French mobile based TSP DriveQuant and the Groupama subsidiary G-Evolution. Moreover, Italy-based Viasat Group acquired the Spanish company Grupo Detector to strengthen its position in Spain. Grupo Detector is one of the telematics service providers that powers MAPFRE's YCar telematics program in Spain.

In late 2014, Aioi Nissay Dowa Insurance Europe (ANDIE) which is part of the Japanese MS&AD Insurance Group agreed to acquire the majority shareholding in Box Innovation Group (BIG) including the major telematics-based car insurance player Insure The Box in the UK. The deal enables ANDIE to reinforce the automotive business in Europe while MS&AD can exploit the technology in new markets. MS&AD has previously developed various telematics-based solutions in Japan. Today, MS&AD powers telematics-based insurance for connected Toyota vehicles in Japan using OEM embedded telematics systems. ANDIE also has strong links with Toyota in Europe and acts as a partner for automotive insurance. In Q1-2018, ANDIE announced its intention to purchase the remaining 25 percent of the shares in the Box Innovation Group, which includes the brands insurethebox and drive like a girl. The business is today fully integrated withing the ANDIE Group. CalAmp acquired Crashboxx in April 2015 in a bid to expand beyond hardware in the insurance telematics space. In the same month, it was moreover announced that DriveFactor was acquired by CCC Information Services. DriveFactor is now fully incorporated in CCC operating as part of its telematics portfolio. CalAmp has furthermore acquired the aftermarket SVR specialist LoJack in 2016. In 2017, CalAmp acquired a minority stake of the German-based start-up ThinxNet that offers a connected car service branded ryd. In 2019, CalAmp acquired UK-based Tracker for US\$ 13 million from Tantalum. Tracker was previously owned by Direct Line Group. The acquisition is a move to help drive CalAmp's European expansion. Tracker is a LoJack licensee and a leading company in the SVR market across the UK. In 2020, CalAmp merged the remaining assets of SmartDriverClub Group into Tracker UK. The combination of SmartDriverClub assets with Tracker expands the capabilities of Tracker to serve a larger part of the connected car market such as insurance and dealership markets. The brokerage business of SmartDriverClub was acquired by Markerstudy in July 2019. In March 2021, CalAmp divested LoJack US to Spireon.

Figure 5.7: M&As in the insurance telematics space (2014–2022)

Buyer	Acquisition target	Date
Vodafone	Cobra Automotive Technologies	August 2014
Pamplona Capital Management	Octo Telematics (minority stake)	September 2014
ANDIE (MS&AD)	Insure The Box (BIG)	December 2014
Shenzhen Deren Electronic	Meta System	March 2015
CalAmp	Crashboxx	April 2015
CCC Information Services	DriveFactor	April 2015
Generali Group	MyDrive Solutions	July 2015
Novatel Wireless (Inseego)	DigiCore (CTrack)	October 2015
Willis Group	Towers Watson (Merger)	January 2016
Metromile	Mosaic Insurance	September 2016
Octo Telematics	DriveAbility	December 2017
Zurich	Bright Box	December 2017
Viasat Group	Grupo Detector	September 2018
Paramon Capital Partners	FairConnect	September 2018
Trak Global Group	IMS	December 2018
General Motors	Wejo(minority stake)	February 2019
CalAmp	TRACKER	February 2019
CalAmp	Car Track (LoJack Mexico)	February 2019
Bridgestone	TomTom Telematics	April 2019
Sichuan Gloport	Meta System (minority stake)	June 2019
Continental	Drust	June 2019
Markerstudy	SmartDriverClub (broker)	July 2019
Be Wiser	Coverbox	July 2019
Zurich	AutoSense	July 2019
Three Hills Capital Partners	Trak Global Group (minority stake)	August 2019
Octo Telematics	Nebula Systems	December 2019
UNIQA	AXA Czechia, Slovakia & Poland	October 2020

Buyer	Acquisition target	Date
A-Plan Group (Howden)	Ingenie	November 2020
FairConnect	DriveQuant	November 2020
Zego	Drivit	December 2020
Allstate	National General Holdings	January 2021
Zurich	MyPolicy (Investment)	February 2021
Azuga	Mobikit	March 2021
Spireon	LoJack U.S.	March 2021
Atlanta Group	Marmalade	April 2021
Generali Group	AXA Greece	May 2021
Paydrive	Telia Sense	May 2021
Radius	Modus	May 2021
Atlanta Group	Be Wiser	May 2021
Cambridge Mobile Telematics	TrueMotion	June 2021
USAA	Noblir	June 2021
Earnix	Driveway Software	July 2021
FairConnect	G-Evolution	July 2021
Liberty Mutual	State Auto	July 2021
Intact	RSA Canada, Ireland & UK	July 2021
Bridgestone Americas	Azuga	August 2021
Granite Group	Carrot Insurance	November 2021
Lemonade	Metromile	November 2021
Travelers	Trov	February 2022
Otonomo	The Floow	February 2022

Source: Berg Insight

In 2016, the major insurance broker Willis Group merged with the US-based professional services firm Towers Watson in a US\$ 18 billion deal. The merger led to the formation of Willis Towers Watson, which now has over 40,000 employees and is serving more than 140

countries. Willis Towers Watson is a provider of risk management, insurance brokerage and consulting services. This includes insurance industry consulting, where Willis Towers Watson has helped more than 50 insurers on five continents to launch UBI programs. The company furthermore has launched its telematics-enabled scoring model branded DriveAbility scoring, which is utilising a large database of risk ratios, telematics data and claims data. In Q4-2017, Octo Telematics acquired the UBI assets of Willis Towers Watson, including the DriveAbility solution and marketplace.

Metromile is an insurance company which offers telematics-based insurance policies in 7 states in the US. Metromile acquired the US based insurer Mosaic Insurance in September 2016, including its licences in 50 states. This enabled Metromile to become a regulatory approved insurance company able to handle both underwriting and claims management in-house. In February 2021, Metromile became a publicly listed company through a merger with a special purpose acquisition company (SPAC) and in November the same year, the digital focused homeowners and renters' insurer Lemonade announced the intention to acquire Metromile. The deal, valued at about US\$ 500 million, was approved by Metromile stockholders in February 2022.

Automotive OEMs and Tier 1s are showing an increasing interest in the connected car market. In 2019, General Motors acquired a minority stake in Wejo. Wejo is developing a data marketplace which enables a global mobility data ecosystem. Wejo has identified and collaborates with companies in 10 key industries that benefit from connected vehicle data. These include mapping & navigation, GIS and location data services, car dealers, financial services, and entertainment and retail. In 2019, Continental acquired Drust, a connected car service provider based in France. Azuga acquired mobility data company Mobikit in March 2021 and was subsequently acquired itself by Bridgestone Americas in August 2021.

The acquisition pace in the insurance telematics ecosystem is expected to continue to be high in 2022-2023. Though the awareness of telematics-based insurance applications such as usage-based pricing has started to be established, the market remains highly immature in many regards and the uptake is still limited among insurance providers as well as policyholders. As the insurance telematics penetration grows across Europe and North America as well as other regions, a likely scenario is that a smaller number of solution

providers will dominate the market, driven by unparalleled databases of accrued driving behaviour data as well as unique experience in telematics program deployment. There is a continuous inflow of start-ups offering new innovative solutions leveraging telematics data that are targeted at the insurance market. Successful solutions showing growth potential and scalability are in many cases likely to be absorbed by larger players that have the financial and operational strength to serve the insurance market on a large scale. The consolidation trend is expected to bring additional M&As between players offering complementing solutions, thus enabling the resulting entities to increasingly serve end-to-end customer needs.

5.3 Market drivers and barriers

There are a range of drivers and barriers that influence the developments on the market for insurance telematics. Macroeconomic factors such as the general economic climate and the overall price points for motor insurance in different countries can have an impact on insurers' propensity to offer telematics-based insurance, as well as policyholders' willingness to adopt such policies. The evolving regulatory environment on regional, national and local level as well as the competitive situation on the insurance market can also have an effect on the uptake of telematics-enabled policies. Technological development is yet another factor with important influence on the insurance telematics market.

5.3.1 Macroeconomic environment

Vehicle-related costs in general and motor insurance in particular commonly represent a significant share of the disposable income for many car-owning households. Macroeconomic factors such as the general economic climate can thus have an effect on the relative affordability of motor premiums, and times of crisis can make it harder to bear the cost of vehicle insurance in addition to the car itself. Plausible scenarios include switching to a less comprehensive insurance coverage, for example only the bare minimum mandated to operate the vehicle in traffic. A flourishing economy can on the other hand allow vehicle owners to opt for fully comprehensive coverage. However, the insurance markets in many ways differ considerably between countries and the price for motor insurance can vary significantly between national markets as well as between different customer segments within countries.

It is more straight-forward to rationally motivate telematics deployments in markets where insurance premiums are high in general or for specific segments of policyholders, such as young drivers. Another sweet spot is represented by markets plagued by high levels of fraud or theft, where telematics can be profitably leveraged for claims-related functionality and to enable vehicle retrieval services. Markets with above-average crash propensity can also more easily motivate telematics initiatives, as crashes similarly to fraudulent behaviour contribute to increased costs for insurers which can gain crucial insights and achieve associated benefits by analysing telematics data. It is harder to present a compelling business case for markets that do not fulfil the abovementioned types of characteristics and where motor insurance is comparably inexpensive in relation to other products and services. Many markets have thus experienced mediocre uptake and hesitant customers when insurance telematics solutions have been introduced. If car insurance policies are already fairly cheap, it can naturally be tough to convince a potential customer to agree to have the driving behaviour tracked and monitored. The key to attracting customer interest can be to bundle the offering with popular value-added services such as safety and security features that policyholders are willing to pay for, while at the same time also boosting ROI by potentially leveraging low-cost telematics setups such as smartphone-based data collection or existing OEM data streams.

5.3.2 Regulatory environment

The regulatory environment affects the insurance telematics market in many ways and contributes to notable differences between different regions, national markets and even parts of countries due to varying local regulatory frameworks. Regulations for example define what types of variables can be used to segment policyholders into risk classes. On a general level, the regulatory landscape is to an extent more fragmented in North America where there are local variations between specific states and provinces, whereas in Europe regulations tend to be homogenous across national markets and sometimes also uniform on EU level.

Applicable laws and rules related to insurance telematics tend to underline the importance of customer consent and stress that data collection must meet privacy norms in terms of what personal data can be logged and for how long. Telematics systems that collect data which can be linked to individuals are in general a sensitive issue from a privacy perspective. There is for example rigorous general data protection legislation on EU level which is designed to

ensure that everyone has the right to the protection of personal data, meaning that such data can only be gathered legally under strict conditions and for a legitimate purpose. In April 2016, a new General Data Protection Regulation (GDPR) was approved by the EU Parliament. The new GDPR replaced the existing Data Protection Directive in May of 2018 and is aimed to further empower all EU citizens' data privacy. Key pieces of legislation on national level further include the French data protection authority CNIL's data privacy law in France. Insurance-related fleet applications have generally been accepted before corresponding initiatives targeting the consumer market. The privacy regulations can limit the collection of certain types of data. Location data is commonly seen as more sensitive than other data. In March 2021, the European Data Protection Board (EDPB) adopted the Guidelines 1/2020 document, relating to the GDPR and specifically processing of personal data in connected vehicle applications. The document includes guidelines for processing personal data for telematics UBI applications. Guidelines with potentially noticeable implications include the assertion that a policyholder must have the option to subscribe to a non-UBI insurance policy, which could affect insurers specializing on these types of policies. The guidelines states that a minimal amount of data should be collected to provide the service and raw data should preferably be processed locally where the sensor data is collected to strengthen the users control over the data. In cases where this is not feasible, the guidelines recommend that a third party, mainly the TSP, analyses anonymised sensor data and provides only the scoring results to the insurer to minimize the ability to profile the individual.

There are further limits on what telematics data can be used for in insurance settings. In some markets, the data can for example solely be used for price setting while disqualifying other use cases such as leveraging the data for claims-related purposes. The latter is not the case on the Italian market where claims-related insurance telematics applications are particularly commonplace. In Italy, the most discussed law related to insurance telematics is law 27/2012, commonly called the Monti Law. The decree was introduced by former Italian Prime Minister Mario Monti in order to reduce fraudulent claims for minor personal injuries in car collisions. It requires insurers to provide premium discounts for policyholders that have agreed to install a telematics device. The initiative has contributed to a flourishing insurance telematics market in Italy, partly by driving awareness among policyholders which have adopted such policies on a broad scale. Moreover, a new decree that changes the insurance telematics market in Italy

was introduced in August 2017. The legislative decree number 124 article 132 recommends telematics solutions for insurance to combat fraud and complements the so-called Monti Law. The proposal to make telematics mandatory was approved in August 2017 by the Italian parliament and are currently followed through by the government. The government further emphasised that the insurance carriers are required to apply a discount if the policyholder agrees to vehicle inspection or if the policyholder agrees on the insurer installing a black box, or a portable black box is already installed in the vehicle, as per the Monti law. The cost of installing, removing, maintaining, replacing and transferring the black box shall moreover be borne by the insurer.

Another key regulatory development is the so-called Test-Achats ruling – commonly known as the gender ruling – by the European Court of Justice. This forbids all European insurers to use gender as a rating factor as it is determined to violate discrimination law related to gender equality. The case originated in Belgium and was pushed by the Belgian consumer association, the Association Belge des Consommateurs Test-Achats ASBL. An exemption in the Gender Directive previously allowing insurers to use gender-related factors when determining premiums was made invalid starting in December 2012. This has a significant effect on insurers in Europe which have used gender as a risk factor for premium pricing. In the case of automotive insurance, young male drivers for example tend to exhibit considerably higher accident risk than young females and have been priced accordingly. These developments can naturally be a problem for traditional underwriters that have to exclude the gender variable. Telematics insurers are not affected to the same extent due to the ability to better price insurance premiums on individual level based on gender-neutral criteria related to actual driving behaviour. A possible scenario is that also other traditional rating factors are disqualified in the future, thus contributing to make the business case for telematics-based risk rating even more attractive as a means to accurately segment policyholders. In the UK, the Financial Conduct Authority (FCA) implemented new regulation coming into effect in 2022, intended to prohibit the practice known as “price walking” in automotive and home insurance – the practise of continually increasing the price at renewal for customers resulting in loyal customers paying more for their insurance than customers willing to change insurance provider. The new rules require insurers to price renewals at the level or below what the same person would pay as a new customer and to submit annual reports to the FCA regarding customer outcomes.

In the US, insurance is regulated at the state level. Insurance companies thus in essence need to file to get approval from each individual state in order to roll out a product nationally. Insurance providers offering UBI products have for example run into regulatory hurdles in markets such as California and North Carolina hampering the development. In California, annual mileage is a required rating factor, all insurers must use it, but it is not allowed to use driving behaviour as a rating factor today. Also in Canada, the regulations are varying across provinces and some are more liberal including Quebec. This province for example allows surcharging as part of UBI programs whereas other jurisdictions mainly allow discounts. Surcharging is otherwise in general not commonly implemented in any markets so far, but it has during the past year been more common. The US based insurer Progressive surcharges dangerous driving behaviour in the majority of the US states and 20 percent of all the drivers in such states experience increased insurance premium prices. Other insurers such as State Auto are also exploring surcharging in select states.

The eCall mandate in the EU stipulates telematics equipment as mandatory in new models from April 2018. This is not telematics used for insurance purposes, but it requires telematics devices to be installed on a large scale and potentially push OEM involvement in the insurance telematics segment. Similarly, a federal mandate in the US requires all trucking operations currently maintaining hours of service logs to equip their vehicles with electronic logging devices (ELDs), again increasing the number of telematics devices in use. Progressive launched for example a UBI program using ELDs for commercial lines insurance in September 2018 following the increasing number of telematics devices in this market.

5.3.3 Competitive environment

The traditional auto insurance market is in general highly competitive and characterised by intense price competition and relatively low differentiation between different offerings. Convenient web-based price comparison tools – offered by players such as Confused.com and comparethemarket.com as well as Google – have contributed to increasing empowerment of the consumers.

Telematics represents one of relatively few ways in which insurers can truly differentiate the customer offerings. Usage-based pricing as well as various value-added services can contribute to improved customer satisfaction and willingness to pay in a market where motor

vehicle insurance otherwise often is looked upon as an additional tax on vehicle ownership. Telematics can thus improve underwriting profitability at the same time as boosting claims efficiency by leveraging the data streams. Adoption of telematics can also help incumbent insurers signal innovativeness and establish a high-tech profile in an otherwise traditional and slow-moving industry.

There are first-mover advantages associated with early introduction of telematics offerings, as the early adopters of such products among policyholders are likely to include well-performing and thus low-risk drivers that want to be rewarded for this. Insurers are therefore equipped with the ability to attract low-risk drivers – without having to compete based purely on list prices – in an otherwise mature market. Another advantage is that insurers can gain crucial experience and understanding as well as get a head start in terms of data collection, accumulating growing databases of telematics data that can be used to better rank policyholders. These positive selection mechanisms and experience gains come at the price of having to face the teething problems of new technology, while fast followers can learn from the initial mistakes of the front-runners and act accordingly. As telematics becomes increasingly mainstream, a plausible scenario is however that insurers which have chosen not to launch such products are left serving high-risk customers that are aware of their shortcomings as drivers and which may even have tried UBI only to realise that it is not a good deal for them. Late movers among insurers can also have a hard time attracting customers from other telematics programs. Switching UBI insurers would in most cases also mean having to prove one's driving behaviour level from scratch again as data portability largely is non-existent, thus compounding the lock-in effects. Smartphone applications offer a new opportunity for insurers that enter the insurance telematics market at a late stage. Through TBYB offers, the customer can share their driving data without having a live policy and receive a discount upfront when signing up for insurance. This enables niche-based insurers to focus solely on offering insurance to drivers that achieve a certain driving score and thus avoid the drivers with a high-risk profile.

The COVID-19 pandemic is expected to drive the digitalisation of insurance products. Some insurance carriers have already decided to offer discounts to policyholders due to the changed mobility habits following the lockdowns issued by governments in Europe and North America. Examples in the US include Allstate, Progressive, GEICO, Nationwide and Liberty

Mutual Admiral was the first major UK motor insurer to offer its customers partial refunds. The pandemic increases remote work and reduces commutes, consumer spending and leisure trips, which together make insurance telematics policies more appealing among consumers that change their mobility behaviour. As customers look for additional ways to save insurance premiums, insurance companies anticipate increased interest in UBI programs that allow customers to pay for what they use instead of a fixed price.

From a marketing perspective, it can be argued that telematics-based insurance could be a delicate product category to enter due to perceived privacy issues among potential adopters. Toning down inherent characteristics of the concept such as the fact that drivers will be tracked and have their behaviour data logged is however deemed counterproductive. Successful players with strong positions on the market have instead openly featured their telematics devices in advertising as part of strategies that are likely to contribute to improved customer awareness and product recognisability in key target segments. Most telematics devices, as well as well-designed smartphone apps, lend themselves nicely to be featured in campaigns across traditional print and broadcast media as well as online. Smartphone-based UBI apps can also themselves effectively double as marketing tools in a market where apps are on everyone's lips and uptake can be boosted by social gamification elements and viral effects. Several insurers have for instance launched competitions to find the best driver in a specific country or region. A smartphone application is then provided for free, with the option for users to sign up for a telematics-enabled insurance policy. These types of apps enable insurance companies and related service providers to improve scoring algorithms based on real-time data.

5.3.4 Technology environment

The technology environment for insurance telematics solutions has evolved significantly since the concept first emerged in the 1990s. Implementations in the early days of insurance telematics relied on professionally installed hardwired black box devices, making the deployments relatively costly. Telematics hardware price points have since then consistently decreased at the same time as new device alternatives have emerged. Notable examples include self-installed OBD devices that carry a lower sticker price and minimise installation costs. In rough terms, the general price points for applicable on-board hardware have moved from hundreds of dollars to one hundred dollars or even less. A plausible development is that

insurance telematics applications such as UBI increasingly are looked upon as value-added services to car telematics in general – rather than the other way around – as these services become part of bundled connected car offerings. A number of initiatives using aftermarket devices to provide connected car services including UBI have been launched, for example Telia Sense and Movistar Car. Many insurance companies seek to use OEM telematics data for insurance telematics programs and some platform players have specialised in normalising and standardising telematics data from OEM telematics systems. Examples include LexisNexis, Verisk and CCC that produce standardised formats across car OEM data and geographies.

Recent years have also seen the entry of smartphone solutions. Mobile applications – which initially mainly played the role of alternative access interfaces for policyholders alongside web-based portals – have increasingly started to be used as data collection probes enabling access to telematics data using only the policyholder's existing smartphone and data plan. This Bring-Your-Own-Device (BYOD) type method is naturally associated with lower costs and high scalability, however generally at the expense of inferior data accuracy and stability compared with hardware-based alternatives. Smartphone data can nevertheless be highly useful if ensuring that software algorithms take into account the fact that this data has its specific characteristics. Insurance telematics players are increasingly claiming to be device agnostic, making it even more crucial to adapt calculations according to the specific data collection methodologies as data sets from different sources are not directly comparable. Hybrid solutions using hardware devices without a separate data plan provide higher quality data and can also in many cases be used for eCall services and crash reconstruction. A range of such hybrid devices has become more common during the past years, including BLE beacons, windscreen mounted devices and devices that plugs into the 12 V socket. Next-generation smartphone-only solutions have furthermore already improved significantly compared to predecessors from a couple of years ago. In addition to improved data accuracy and related benefits, functionality such as automatic data recording without having to launch the app has emerged. The rapid hardware and software innovation in the smartphone ecosystem gives smartphone-only solutions a promising spot in the emerging market of driving analytics. Even though the data accuracy in smartphone-only solutions has improved significantly during the last couple of years, there is still a major deviation depending on the smartphone model and developer. Allianz in the UK performed extensive trials between all the

different smartphone-only telematics players and app developers and noticed that the driver scores varied widely between the different programs. While one app indicated that a driver was safe, another indicated a dangerous driving behaviour. However, continuous improvement by app developers and smartphone manufacturers will make the smartphone-as-a-sensor more and more compelling for insurers.

A recent development, following the refinement of mobile based solutions and service offerings where data has been collected on participating drivers beforehand by a third party TSP through various channels and that is later sold to an insurer, either as a finished score or as a dataset of parameters to be scored by the insurer at the point of quote. A more straightforward example is the ClearScore product, DriveScore, available in the UK, which offers to act as an intermediary between the driver to be scored and the insurer, only letting the insurer see the calculated safe driving score calculated by DriveScore. The solution aims to address the potential customer segment that accepts the recording of driving style so long as it is not done by the insurer. A different variation is the Verisk Data Exchange on the US market, which collects data from connected cars from several OEMs, currently having access to 8.5 million vehicles and the driver behaviour-related data from them. This data can be accessed by client insurers to offer an individual behaviour-based premium offer at the point of quote, bypassing the need for TBYB programs and long evaluation periods without the promised discount for safe drivers. The Allstate subsidiary Arity offers US insurers Arity IQ, a similar product, with data from smartphone sensors gathered from over 30 million drivers in the US. Arity currently offers insurers to get a driver score for any of the registered drivers as needed at the point of quotation and plans to expand the offer to delivering the driver specific parameters, allowing the insurer to score the drivers applying for coverage with their own algorithm. The three mentioned offerings have in common that they enable insurers to offer behaviour based UBI without the need to develop any larger scale infrastructure for it.

5.4 Future industry trends

While insurance telematics has increased significantly in adoption since the term was first coined, the fact remains that the penetration is still highly limited and that the market is far from having achieved mass adoption. Berg Insight nevertheless foresees an increasing

uptake of telematics technology for a broad range of insurance-related purposes in the coming years. Key influencers expected to boost the insurance telematics market include smartphone-based solutions and in the longer term also the connected car trend which is largely driven by the vehicle OEMs and related service providers. Additional developments are in the long term anticipated in the area of personal telematics data portability, while the industry also has to keep a close look on the emergence of autonomous vehicles which can disrupt the very foundations of the motor insurance market.

5.4.1 Continued broadening of the insurance telematics concept is expected

Insurance telematics has over the years evolved from relatively simple mileage-based PAYD programs to behaviour-based PHYD policies and offerings aimed at directly influencing the driving style of policyholders as part of MHYD initiatives. Continued innovation is expected to contribute to an ever-increasing range of new features within the insurance telematics concept. Differentiated offerings will increasingly be targeted towards not only for example young drivers and low-mileage drivers, but also other segments such as experienced and senior drivers, high-end vehicle owners and learner drivers. In markets where the main form factor is hardware devices, bundling of various value-added services enabled by continuous data collection is expected to contribute to an increasing uptake in policyholder segments which have otherwise been reluctant to sign up for telematics-based policies. Time-limited driving data collection methods are consequently expected to gradually decrease in favour of permanent monitoring which enables a far wider range of functionality. In many cases, UBI can be offered as a part of a broader offering such as aftermarket eCall services and various connected car solutions. In this case, the UBI concepts do not need to carry the complete cost of telematics deployments including devices, data plans, installation, support, logistics and replacement of damaged or lost devices. Costs can also be shared with other companies such as for example workshops paying a small commission for customers that are directed to that particular workshop for maintenance or repair. Insurers can also potentially leverage the data from insurance telematics to cross-sell non-connected insurance products. For example, drivers that frequently drive on unpaved roads can be offered an extra windshield insurance.

5.4.2 Insurers will embrace both UBI and claims-related insurance telematics

Insurers focused on hardware-based UBI are anticipated to increasingly capitalise on the systems to achieve efficiency gains in the claims processes, while insurance players launching initiatives mainly to benefit from claims-related functionality are likely to gradually start considering introducing usage-based pricing. UBI programs are at the same time expected to evolve. Surcharging is for example expected to become increasingly commonplace, as the current situation where programs aside from a few local exceptions almost exclusively award discounts is not perceived to be a viable business model in the long term. UK insurers have recently begun to focus more on claims management, FNOL and fraud detection. In the past years there have been several court cases where telematics data have been presented with favourable outcomes for the insurer. In Italy on the other hand, UBI is becoming an increasingly important part of telematics offers, even though driving behaviour in many cases has less direct impact on discounts. As the roll-over models have been common in North America, most insurers have solely been focused on UBI applications rather than claims related data. However, there has been a recent interest of adding claims-related telematics insurance in North America as well. Recent developments have moreover been made in scoring algorithms, where a number of telematics providers now have the ability to account for context and for example not penalise drivers that accelerate rapidly when entering a motorway. In addition to improvements in UBI algorithms and data collection, solutions for claims management including crash reconstruction are also expected to improve. Telematics data is expected to increasingly be used to determine the best course of action following an accident. Predictions made on both expected damages to the insured vehicle as well as the driver and individual passengers determine what aid the customer requires. For example, decisions on whether to tow the vehicle to a repair shop or directly to a scrap yard will to a larger extent be based on telematics data, resulting in decreased costs for insurers as well as improved customer experiences. In addition, the emerging technology of machine learning and artificial intelligence can be leveraged to automate the claims process based on telematics data. Metromile and CCC are two examples of pioneers that aim to automate the claims process with telematics data. Today, single vehicle and no injury claims can be resolved by analysing telematics data using AI. Industry representatives believe that more complex claims still will require manual handling in the foreseeable future.

5.4.3 Form factor shift to favour mobile devices

In spite of some industry representatives mainly considering app-based solutions as a method to attract new customers, smartphone solutions can constitute a pragmatic compromise between cost and quality of data. While the data accuracy is not on the same level as for hardware-based options, smartphones can undoubtedly contribute at least some highly useful data and may be the only option in cases where costs must be kept to a minimum. Berg Insight foresees strong growth of smartphone-enabled insurance telematics in the upcoming years. The transition to app-based UBI has come a long way in the US where the major insurers providing UBI have chosen to roll out smartphone solutions. As new customers enrol and old customers switch to a smartphone solution, the number of policyholders collecting data through a smartphone app grows rapidly. The larger uptake of smartphone-only solutions in North America is explained by a focus on UBI applications rather than claims-related insurance telematics. App-based UBI is expected to grow also on the European market, but at a slower pace. Both Allianz and HUK Coburg in Germany have introduced smartphone-based telematics solutions. Even in the UK and Italy, smartphone-based solutions have also emerged. Battery powered BLE devices windscreen-mounted devices or 12V devices connecting to the phone using Bluetooth are furthermore emerging as complements used to enhance mobile apps.

5.4.4 Connected cars pave the way for mass-marketisation of insurance telematics

In most markets, insurance telematics largely remains a niche application mainly applicable for specific segments. Factors such as the cost structure on many insurance markets can simply not motivate large-scale deployments of telematics across a major share of the policyholders. While declining aftermarket hardware prices and increased adoption of smartphone-based alternatives bring down implementation costs, the true mass-market adoption is expected to be driven by initiatives involving the vehicle OEMs. Auto manufacturers are already broadly equipping their vehicles with telematics systems used for various services and this development is predicted to accelerate in the next few years. The connected car trend will likely be a game changer for UBI and other types of telematics-based insurance offerings as the prerequisite infrastructure is increasingly made available as standard on new cars. The auto insurance market can potentially experience rapid adoption of telematics policies, if initiatives leveraging line-fitted OEM on-board technology become mainstream and actively marketed at the point of sale alongside other bundled services,

including telematics-enabled VAS. There are already several examples on the market where cars are sold bundled with connected services including telematics-based insurance. These types of initiatives are only expected to become increasingly common in the future.

5.4.5 New data exchanges expected to make OEM data available to small insurers

Some insurance telematics service providers and data analysis firms including Verisk, LexisNexis, Octo Telematics and CCC have during the past years set up programs which enable sharing of data between OEMs and insurers. The data analysis firm acts as an intermediary that adds value by for example standardising data, providing claims-related information and providing individual driving scores. The use of an intermediary is motivated by the large number of insurers and car manufacturers worldwide. It is challenging to arrange a simple exchange of data between small insurance carriers and multiple car manufacturers as insurers would have to analyse data from a range of different connected car solutions. OEMs would moreover have to contract a significant number of insurers. The data exchange programs can in addition to OEM data also use data from other sources, such as companies that install telematics devices for other purposes than insurance, for example connected car and stolen vehicle recovery services. These data exchange programs will primarily become common for small- and medium-sized insurance carriers to access data from OEMs. Berg Insight still expects major insurers and OEMs to cooperate without an intermediary and there are some good examples. AXA's Data Innovation Lab provides scoring for the Mercedes-Benz PHYD programs in Belgium and France for example. Progressive, Nationwide and Liberty Mutual utilise driving data directly from GM OnStar in the US. Nationwide works with Toyota and Ford whereas Allstate works with Ford directly to leverage OEM telematics data.

5.4.6 Fleet insurance telematics to disrupt the fleet tracking market

Insurance telematics in general and particularly the subsegment of UBI are today mainly associated with personal lines insurance as this is most widely marketed towards potential adopters. Similar telematics-based data collection has however been broadly used in the fleet sector for many years, in many cases with indirect or even direct effects on insurance premiums. Large fleets are often awarded insurance discounts as a result of implementing safety programs that use telematics to manage the behaviour of professional drivers. The actual effects on insurance costs are however oftentimes decided on a case-by-case basis and not as straightforwardly as in consumer UBI programs. For the small and medium sized

businesses (SMB) sector, a plausible scenario is that insurance products more similar to personal lines usage-based insurance will emerge on a broader scale. Similarly to individuals, small businesses commonly have tight budgets and generally shop around for new insurance policies more frequently than major enterprises that tend to develop closer relations to their insurance partners (or even rely on self-insurance). The necessary telematics data for risk rating is moreover in many cases already available through the fleet management systems used by the companies for other functionality.

Video telematics is also an area of interest for insurance companies. The use of video can further mitigate fraud in claims cases as well as provide clarity for estimating damage. Lytx has partnered with a range of insurance carriers offering its DriveCam safety program to long-haul trucking companies. The insurance software player Concirus and the video telematics provider SureCam work together to automate risk management and streamline the claims process for fleet operators. This enables Concirus to address larger and self-insured customers, while smaller fleets that are traditionally insured can benefit from cost savings passed on by insurers from leveraging this type of technology. Moreover, UK-based VisionTrack has introduced a FNOL solution which can send footage directly to the insurer, broker or claims management company in the event of an incident.

While fleet insurance telematics initiatives launched over the years in many cases have achieved limited success and uptake, the commercial auto insurance industry is still increasingly enthusiastic about telematics-driven insurance telematics programs. During the past few years, insurance carriers have launched new fleet telematics programs where the insurance carrier subsidise the use of fleet tracking. The fleet thus pays nothing to the telematics service provider which can focus its efforts on upselling additional services such as dashcams or premium fleet management services. The insurance company in turn sees this as a competitive advantage, reducing its losses due to a substantial reduction in claims frequency and severity of accidents. One of the most successful such examples is PHLYTRAC powered by Azuga. PHLYTRAC is offered by Philadelphia Insurance Companies (PHLY) in the US. The program has surpassed more than 75,000 connected vehicles among over 1,000 customers. Another example is Nationwide that offers the Vantage 360 and Vantage 360 Premium Partner programs in collaboration with CMT, Azuga and Zubie. A new

entrant to the market is High Definition Vehicle Insurance (HDVI), focusing on small and medium sized fleets of semi-trailer-trucks. HDVI recently launched a UBI that offers up to 12 percent discount to fleets with safe drivers.

5.4.7 Privacy concerns are softening across customer segments

Insurance telematics has historically oftentimes been criticised for having Big Brother connotations and invading the privacy of prospective policyholders. These issues have generally been less severe among young drivers which have for example opted for usage-based insurance to a greater extent in some markets. Other market segments have also increasingly come to accept the concept. Similarly, to developments seen for many other types of services such as location-based services (LBS) offered as smartphone applications, the privacy concerns are expected to continue to wane as insurance telematics becomes increasingly established on the market. Most industry representatives already today insist that privacy is not a major issue, as long as informed consent is obtained and policyholders appreciate the benefits they can achieve by contributing a specific set of personal driving data. As telematics services in general become a natural and integrated part of owning a car, insurance applications such as usage-based pricing are also expected to be widely accepted. Insurers can contribute to this development by ensuring transparency about what data is collected and how it is used.

5.4.8 Big Data: Ownership and portability of telematics data to be scrutinised

The insurance industry is in general a highly data-driven field and this is even more the case following the advent of telematics-enabled usage-based insurance and claims-related functionality. Continuous logging of telematics data for a large customer base of policyholders adds up to massive databases, and properly storing and analysing these data sets poses technical issues in itself. There are however also other less tangible considerations related to data ownership. While it can be argued that the individual data about a specific policyholder is personal data covered by privacy regulations, the more interesting question is whether an insurance customer can take this data to another insurance provider and use it to get personalised pricing. Berg Insight anticipates a long-term scenario where data portability is supported, enabling policyholders to bring their driving data – either in full or aggregated to a more portable level – and associated risk scores to a new provider,

similarly to a credit score. Such development would likely demand standardisation efforts – e.g. an industry-wide standard for telematics data overseen by an independent party – as well as adjustments of the regulatory environment related to telematics data ownership and transferability.

5.4.9 Insurance telematics aims to reduce distracted driving

Distracted driving is one of the major causes of traffic-related accidents. Following the rise of smartphones and social media, phone usage is the main reason behind distracted driving today. For example, 1 out of every 4 accidents in the US is caused by texting and driving. This has been identified by several insurers and campaigns against distracted driving from both insurance companies and other stakeholders such as NGOs and state departments are common. Smartphone-only solutions within insurance telematics can be used to reduce phone usage while driving. Several telematics service providers such as CMT, IMS, Dolphin Technologies and TrueMotion have all announced that they are taking action against distracted driving by involving phone usage as a parameter to determine a driving score in a PHYD program. Apple has moreover added a do not disturb while driving feature to iOS 11. The feature can either be started when the iPhone senses driving motion or when the iPhone is connected to the car's Bluetooth and keeps the phone silent and the screen dark during driving. As accidents related to phone usage are rising, more initiatives to reduce such behaviour are expected in the future. Other initiatives such as cameras and sensors in the cabin to reduce distracted driving are also piloted in North America but not available on the market today. The OEMs are also exploring in-vehicle cameras as a means to reduce distracted driving.

5.4.10 Mobility trends provide new opportunities for telematics-based insurance

Insurance telematics will play a central role in emerging mobility trends such as ridehailing and carsharing. Ridehailing services such as Uber and Lyft pose an interesting grey area between personal lines and commercial lines insurance. Ridehailing companies implement telematics platforms to monitor driving behaviour for safety, fraud and insurance purposes. Companies such as Sentiance, Amodo, OSeven and Zendrive provide driving analytics for ridehailing fleets. Mobile telematics solutions targeting ridehailing companies in most cases group together all drivers to produce a score for the overall fleet that can be used by an insurance company. Another mobility trend is carsharing – where companies offer a

decentralised car rental service focusing on short term rentals that supplements other modes of transportation. As carsharing aims to reduce the number of cars in use and still provide mobility to customers with the need of a car, the service will grow aligned with current macro-trends such as urbanisation and environmental awareness. Insurance telematics offers an opportunity to adjust the premiums based on a risk profile determined by the driving behaviour of an individual carsharing user. Additionally, new insurance telematics products targeting peer to peer carsharing have emerged. The pay-per-mile insurance company Metromile offers a new type of insurance called fractional insurance. The first product launched in partnership with the peer-to-peer carsharing provider Turo. Drivers who share their cars on carsharing marketplaces such as Turo will pay a monthly base rate and a pay-per mile fee for the miles they drive which are calculated by data derived from the Metromile Pulse device.

The COVID-19 pandemic has led to an increase of new products based on insurance telematics to meet the needs of businesses that engage independent contractors to make same-day deliveries during COVID-19. March and AXA XL launched a UBI auto policy branded deliveryPRO in the US. The deliveryPRO platform is powered by the mobile data analytics company Arity and the premiums are based on the number of miles driven.

5.4.11 Vehicle diagnostics data from connected cars can create value for insurers

The rise of connected cars gives insurance companies the possibility to use available data to create value through their insurance telematics programs. The aftermarket devices and smartphones that are common today are to some extent effective in terms of providing a driving scoring, offer gamification features to theoretically raise awareness for safe driving and provide crash notification and accident reconstruction to ease the claims management process. The rise of connected cars could give access to vehicle diagnostics data, which can provide ground-breaking possibilities for insurance companies for both underwriting and claims management purposes. BMW is pioneering sharing such vehicle diagnostics data through its CarData program and several OEMs are expected to follow. Value-added services such as driver behaviour prompted interaction through the built-in infotainment system rather than a mobile app and the possibility for claims automation are two new possible features.

5.4.12 Outlook: Insurance telematics is growing rapidly in other regions

Telematics-enabled insurance has increased significantly in Europe and North America since the concept was first coined in the mid-2000s. In recent years, there has also been rapid growth of telematics-enabled motor insurance policies outside of these regions from a low level. Larger programs first started to appear in for instance Australia, South Africa and Japan. Many of the well-established telematics service providers are looking at supporting insurance telematics in regions such as South-East Asia and Latin America. Some European telematics service providers argue that it is more attractive to launch a project in Asia rather than in North America due to the complex regulatory hurdles of granting approval for each US state or Canadian province. Berg Insight anticipates a significant growth in terms of telematics-enabled policies outside of Europe and North America. South America is a promising market that experiences issues with vehicle theft and insurance fraud. The rationales for insurance telematics in South America are similar to the ones in Italy. Examples of insurance telematics providers in South America include Sancor, Sura Brazil, Sura Argentina, Bolivar and El Aguila as well as Qualitas in Mexico that recently struck a deal with Octo Telematics. In the Middle East, Walaa Rides is a smartphone-based insurance telematics product offered by Walaa Cooperative Insurance Company based in Saudi Arabia and several other projects are active in the region.

The Asian insurance market is growing rapidly and accounts for more than 33 percent of all the direct premiums written in the non-life segment. Notable insurance carriers in Asia which have or are about to launch insurance telematics initiatives include AIG in Singapore, AXA in Malaysia and Singapore, Singapore-based Etiqa, Sompo in Japan and Thailand-based Bangkok Insurance (BKI). Due to the digital maturity in many Asian countries, smartphone-only solutions are often the preferred form factor. OBD-II solutions are also commonly used in Asia. Advanced Info Service (AIS) in Thailand partnered with Thai Vivat Insurance Company to launch a UBI service based on an NB-IoT device that has attracted more than 10,000 customers to join the program. An example of vehicle OEM involvement in an insurance telematics project in Asia is Toyota Motors that together with the MS&AD Insurance Group's Aioi Nissay Dowa Insurance have jointly developed a telematics-based insurance program in Japan which launched in 2018. As of November 2019, more than 25,000 vehicles were enrolled in the TOUGH Connected Car insurance program and the total number of telematics auto policies in the MS&AD Group reached 382,000 policies in force for 2019. In 2020, Toyota

and Aioi Nissay Dowa Insurance launched a new telematics Damage Service System, a new accident response service that uses driving data acquired from connected cars. At the end of 2020, MS&AD Group companies had 867,000 telematics-based auto insurance policies in force, a year-over-year growth of 127 percent.

During 2017–2018, insurance telematics products have also emerged in China. The CIRC (China Insurance Regulatory Commission) that regulates the digital insurance industry passed new regulations on premium pricing in 2017 which marked the government's will to encourage companies to develop insurance telematics offerings. Zhong An is China's largest online insurer and was launched in 2013 by Ping An, Tencent, and Alibaba. In November 2017, Zhong An established a big data alliance with Sinosafe Property Insurance and Urtrust Insurance. The alliance allows the insurers to work together on certain issues facing the industry, including better pricing of insurance policies and combating fraud using telematics data. As a result of the alliance, Zhong An collects data related to more than 3 million vehicles. Moreover, Zhong An is expanding to other markets and is for example launching a digital insurance product to ridehailing drivers in South-East Asia in collaboration with South-East Asia's leading ridehailing company Grab.

5.4.13 Pay-per-mile insurance programs are resurging

During the past years, pay-per-mile insurance have resurged as a significant option for insurers that are interested in telematics. Pay-per-mile insurance programs generally use OBD devices to accurately measure the mileage driven and in some cases offer claims-related services such as crash reconstruction data and FNOL. The solutions target low mileage drivers that drive less than 8,000 miles per year such as frequent users of public transport, carpools, carsharing and ridesharing services as well as people who work from home or live near their workplace. This aligns with emerging shared mobility trends. Metromile is a specialised pay-per-mile insurance company with 95,000 active policies in Q3-2021. Several large insurance carriers in the US have recently launched pay-per-mile insurance programs, including Liberty Mutual's ByMile, Allstate's MileWise and Nationwide's SmartMiles. In Europe, By Miles offers a pay-per-mile product in the UK and MAIF's subsidiary Altima offers pay-per-mile insurance in France. Telematics used for pay-per-mile insurance can be appealing for some consumers that don't want insurance carriers to

analyse and modify the insurance premiums based on their actual driving behaviour, but still reap the benefits in terms of lower insurance premiums based on how long they drive and a facilitated claims process. During the COVID-19 crisis, the total number of trips and distance travelled decreased during lockdowns in many countries. Insurers are now incentivised to adopt pay-per-mile insurance programs as consumers change the way they look at insurance after the COVID-19 pandemic.

5.4.14 Insurers to explore other IoT verticals

Some kind of automotive insurance is mandatory in most developed countries and this is a highly competitive market often with low or even negative underwriting profitability. Thus, making it a natural point of entry for insurance companies to explore new technologies such as telematics. Today, insurance companies are exploring other IoT verticals. One example is smart home solutions that can be used to analyse risk and add value to home and business insurance products. Insurance companies are for example offering connected sensors that can detect smoke, water leakage and gas leakage. In the US, StateFarm offers discounts for installing Canary connected devices and ADT security systems and American Family partnered with Nest to offer smart smoke/carbon monoxide detectors for Minnesota homeowners at no additional cost. UniPolSai, that pioneered insurance telematics in Italy, offers a home insurance product branded Unibox C@sa that includes for example smoke sensors and water sensors as well as connected security cameras. Generali offers a similar product in Italy using smart home products from FairConnect. Desjardins have also added smart home products to its digital insurance solution Ajusto in Canada. Additional IoT verticals that insurance companies find relevant include pet tracking, mHealth and people tracking. IoT related insurance products such as smart homes can be used as first point of entry in a customer acquisition which may subsequently see the addition of other types of insurance products.

5.4.15 The insurance telematics concept to be applicable for more vehicle types

Insurance telematics initiatives have mainly been focused on the passenger car personal lines market so far. The past years have seen the emergence of insurance telematics services to a range of other vehicles, including micromobility vehicles in different shape and forms such as e-bikes and scooters as well as other valuable assets such as recreational vehicles

and caravans. SVT solutions have been offered to these types of vehicles for a long time due to the theft frequency of such assets, but insurance companies have lately picked up an interest in using telematics-based policies. Bikes, scooters and motorcycles are more likely to be stolen than a passenger car whereas RVs are valuable and high-risk assets. Besides basic systems that notify the owner in case of theft, many advanced systems offered by insurers also include monitoring and recovery services. The recovery rate of stolen bicycles is very low in the majority of the European countries. Usage-based insurance services are most likely to emerge for motorcycles and micromobility vehicles whereas leisure vehicles mainly will have SVR solutions. Micromobility telematics specialist companies Comodule and Conneqtech offers integration with a range of partners such as insurance carriers, roadside assistance companies and security firms for stolen bike recovery services.

5.4.16 Autonomous cars alter the playing field for motor insurance

Connected cars are undoubtedly expected to act as a driver for telematics-based motor insurance in the upcoming years. Another major parallel trend in the vehicle industry is however anticipated to have an even greater effect on the motor insurance market altogether, namely the burgeoning development of autonomous or driverless cars. While so far being far from general commercial availability, self-driving cars are set to upend the insurance industry. Innovations within semi-autonomous advanced driver assistance systems (ADAS) including safety-enhancing features such as emergency brake assist (EBA) systems can already make policyholders eligible for sizeable discounts on traditional insurance. Both Liberty Mutual in the US and Allianz in France are two examples of insurance companies that offer discounts to vehicles with ADAS and EBA. Increasing the share of driving automation to the point where the driver's influence – at least in theory – eventually becomes virtually negligible certainly poses an interesting scenario from the auto insurance perspective. If the vehicles are truly autonomous, one can even argue that accident liability should be assumed by the OEMs and associated suppliers rather than the individual car owners. This scenario poses a range of complex regulatory challenges that can affect the insurance market profoundly. In reality, it will however most likely take decades before conventional cars are fully replaced by autonomous vehicles. Insurance telematics applications such as UBI thus certainly have a crucial role to fill in the foreseeable future.

5.4.17 Automotive OEMs bet on insurance telematics

Connectivity and various ADAS features give car OEMs new possibilities to keep in touch with their customers and to create new revenue streams. The data gathered live from vehicles can not only be used to monitor the health of vehicles and offer value added services such as over the air software updates but also enables OEMs to help its clients to reduce the total cost of ownership through offering competitively priced UBI policies.

An early example in Europe is Mercedes-Benz through Mercedes-Benz Mobility and its subsidiary Mercedes-Benz Bank, which launched a telematics-based PHYD insurance in Germany – InScore – in September 2017. The data is collected from the factory fitted telematics device which is activated through the Mercedes Me portal. The PSA Group (now part of Stellantis) also explores UBI concepts through a partnership between PSA Assurance and AssurOne Group. The product is available in France and Belgium and branded Mon Assurance Connectée and Drive & Save respectively with data being collected directly from the OEM telematics system. In December 2021, Stellantis announced the trial of a new PHYD offer Drive & Connect for the French market covering Citroën, DS and Peugeot vehicles.

A notable example from North America is Tesla. In 2016, Tesla partnered with various insurers to launch the InsureMyTesla program, starting in Hong Kong and Australia. A year later, the insurance product tailored to Tesla vehicles was launched in North America. In 2019, Tesla became an insurance broker in California, which was expanded to Texas and Illinois in 2021, offering PHYD insurance to Tesla owners. Another major OEM active within insurance telematics is Ford, which has launched a UBI offering together with its affiliate company, American Road Services Company, as licenced insurance agent. The offer is available to customers owning eligible Ford vehicles from 2020 or later and promises up to 40 percent policy discounts to safe drivers in 46 US states. GM launched its own insurance agency, OnStar Insurance Services, in late 2020 offering OnStar customers PHYD insurance underwritten by Homesite Group. The new electric vehicle manufacturer Rivian also launched its own insurance agency in Q2-2021. The service is available in 48 states and aims to improve the ownership experience and customers are rewarded with premium discounts for activating the vehicle's Highway Assist system. In North America, Toyota, Hyundai, Nissan and FCA have also developed their own insurance products. Toyota was early, introducing a

car insurance agency under the name of Toyota Insurance Management Solutions USA (TIMS) in April 2016. TIMS offers UBI based on embedded OEM telematics devices in the US and its policies are underwritten by a range of insurance companies.

Chapter 6

Company profiles and strategies

The insurance telematics market is served by a wide range of players. The ecosystem for example includes telematics players with significant business in the insurance sector such as Octo Telematics, Vodafone Automotive, Viasat Group, Trak Global, FairConnect, Cambridge Mobile Telematics, The Floow, Scope Technology and Modus. Several traditional fleet telematics players including Quartix and Trakm8 have also expanded into the insurance telematics field. The industry is in addition served by other types of companies providing various solutions and services such as LexisNexis, Verisk Analytics and CCC.

6.1 Agero

Agero is a North American company mainly known for its services within roadside assistance. The company also offers claims- and asset management and information services. Approximately 12 million requests for emergency assistance are handled each year and following partnerships with mainly OEMs and insurance companies, Agero is responsible for providing assistance to more than 115 million vehicle owners. Agero's business unit Agero Connected Vehicle Services was among the first providers of telematics solutions in the US, beginning in 1996 with the Lincoln RESCU program. In November 2013, Agero sold the division to SiriusXM for US\$ 530 million. Sirius XM Connected Vehicle Services is today one of the largest telematics service providers on the North American market working with for example Acura, Audi, Honda, Infiniti, Jaguar, Land Rover, Lexus, Subaru and Toyota.

Since 2014, white-label smartphone solutions have been offered to the insurance industry. In September 2018, Agero launched a holistic mobile solution that utilizes a smartphone's native sensors to provide automatic crash detection. The solution is based on a platform that is branded Driver360. The Driver360 mobile software development kit (SDK) can be integrated into existing insurance providers' and automotive OEM's mobile apps. The platform detects crashes and notifies Agero emergency contact centres instantly. Driver360 functionality also

includes driver scoring and coaching to help prevent crashes by helping drivers improve their driving behaviour. The platform's core trip capture engine tracks and reports information that can be used by insurers and automotive OEMs to deliver additional safety and convenience features for users. Driver360's solution combine data from in-lab crash testing with consumer driving data from Agero's MileUp mobile app research and development study. Launched as a crowdsourcing platform, MileUp has captured more than 3 billion miles of real-time driving data.

Agero has a strong relationship with many leading insurance carriers on the North American market. Driver360 crash detection can automatically trigger FNOL, providing an opportunity for insurers and their partners to improve the claims handling services. Agero's Accident Scene Management services, including primary tow, also helps expedite the claims cycle. The company has moreover announced partnerships with The Floow, Cambridge Mobile Telematics and Octo Telematics.

6.2 Amodo

Amodo is a data analytics company founded in 2013. The company has offices in Croatia, the US and Austria and employs about 50 people. Investors include Speed Invest, Lead Ventures, SGH Capital and Bee Next. In 2020, Amodo closed a Series A round of financing, adding US\$ 3.3 million in venture capital. The product offering is aimed at the insurance industry and is primarily based on driving behaviour analytics, driver engagement, behaviour-based customer segmentation, scoring framework, content management system and business consulting. Amodo enables hybrid solutions combining elements from TBYB, PAYD and PHYD. The company has a core focus on data analytics and app development. Data security is another focus for the company and it currently has three security related ISO certifications – ISO 27001, ISO 27701 and ISO 22301. Using a device-agnostic solution, the company can provide data analytics to insurance customers globally regardless of the data collection device. Amodo's device agnostic platform collects data from over 1.5 million drivers. The European market accounts for the vast majority of the insurance telematics policies powered by Amodo. Around 90 percent of the installed base consists of smartphone-only solutions and the rest are hardware-based solutions, comprising mainly solutions using OBD-II dongles. Amodo has also begun collecting mileage-data directly from OEM telematics

systems acting as a data broker by normalising and enhancing connected car data from a range of car brands.

A flagship project has been done for UNIQA Croatia. The UNIQA Smart Kasko product applies a TBYB model and after a 30-day trial period, a basic or extended insurance is offered. The basic package is an annual insurance contract with Casco coverage for the vehicle when it is parked. The Extended package offers casco coverage while driving, prepaid in batches of 100 km, 300 km or 1,200 km, which are only used when the driver chooses to have coverage. If the driver records the driving style using the app and achieves a score above 60 out of 100 points, free kilometres with casco coverage are added to the extended insurance.

Amodo targets three types of clients including traditional insurance companies, digital insurance brokers and players from adjacent industries such as car dealers or telecoms operators. In total, the company powers more than 20 insurance telematics programs. Major insurance customers are Croatia Osiguranje's new digital insurance brand LAQO, BNP Paribas Cardif, AIG, Porsche Bank, P&V, UNIQA, Tower Insurance and Zavarovalnica Triglav. Amodo has customers in Europe, the US, Latin America, Africa and Southeast Asia. Examples of additional customers include Mobly (Bâloise Insurance), Globe Telecom, Youse, Quanta and VIG. In conjunction with Zavarovalnica Triglav, Amodo is involved in a smartphone-only insurance product in Slovenia that went live in 2015. Amodo is also working with Uber to develop new insurance products. The company has a partnership with Munic, which supplies OBD-II dongles and the Munic.io platform. Additional hardware partners include Queclink, Ruptela and Teltonika. Amodo has also partnered with Daimler on a neutral server initiative and can access specific data from all connected Mercedes-Benz vehicles produced after January 2016 which are used within the European Union. In 2019, Amodo signed an agreement with BMW Group to access data from BMW and MINI cars in Europe. In Q2-2021, Amodo and SAP signed a partnership which enables Amodo to use SAP solutions in its solutions. Later, in Q3-2021 Amodo partnered with PI Labs and Bsurance to additionally enhance the product offering.

6.3 Autoliv

Autoliv develops automotive safety systems. The company is headquartered in Sweden and has more than 64 facilities in 27 countries along with its joint ventures. In addition, the company has several technical centres and 20 crash test tracks. The company's shares are listed on the New York Stock Exchange and the workforce comprises about 68,000 employees. In 2020, Autoliv's sales were US\$ 7.4 billion (€ 6.5 billion). The airbag and steering wheel products constitute 66 percent of revenues and seatbelt products 34 percent.

In 2019, the company introduced a product branded Safety Score. Safety Score is created to help insurance companies, ridehailing companies and OEMs to provide a framework for coaching and improving safe driving habits. The base product is Autoliv's app Driving Avatar, which is offered in different forms, from a lightly branded app to a white label or API and SDK solution. Autoliv has partnered with Sentiance which provides its motion intelligence SDK to monitor the movement of a driver's mobile device. The solution monitors real-time driver behaviour and compares it against Autoliv's proprietary data algorithms. Users are provided with a safe driver score between zero and 1,000. Drivers with higher scores exhibit behaviour connected to a safe driving style considering data on turning, acceleration, braking, speed and distraction. Added to this is a comprehensive coaching framework, branded D.A.R.C.Y. (short for Driving Avatar Road Coach Yoda), launched in January 2021 and intended to increase driver engagement and to coach individual drivers towards a safer driving style within each safety aspect of driving. The solution also includes a safe driving rewards module and a new crash detection algorithm leveraging Autoliv's test centres and tracks to improve crash detection for FNOL and crash reconstruction. The main tool for data collection is the drivers' smartphone, but the solution can also be combined with OEM telematics systems, enabling Autoliv to validate algorithms as well as future-proof the platform. The company has also developed a Connected Safety Cloud, which provides holistic insights and enriches the driving score with contextual data such as weather, type of roads driven and trip duration.

The solution can be used by ridehailing, taxi, limousine and other fleet and professional driving companies. Additionally, Autoliv targets insurance carriers in UBI projects. So far, the company has achieved some market traction with insurance carriers in Europe, working with a handful of companies on UBI pilots and other safe driving products, adding some more

insurance clients in 2020. Other target clients include telematics service providers, family safety apps and micromobility service providers. In May 2020, Autoliv signed an agreement with WirelessCar to enhance its Connected Safety Cloud. WirelessCar is a Sweden-based telematics service provider, majority owned by Volkswagen Group. The company provides OEM telematics services to a range of automakers. Examples of OEM clients include Volvo Cars, Jaguar Land Rover, Subaru and Volkswagen. The collaboration with WirelessCar enables Autoliv to combine smartphone and OEM telematics data to ensure accurate reading and interpretation of smartphone sensor signals as well as enhance the Safety Score.

6.4 Azuga

Azuga is a US-based company headquartered in Silicon Valley. Sumeru Equity Partners (SEP) acquired a majority stake in Azuga in 2018 and SEP made a significant strategic investment to accelerate the company's growth and product innovation strategy. The telematics and automotive electronics provider Danlaw has also held a significant equity interest in Azuga. In March 2021, Azuga acquired the insurance data science and analytics company Mobikit to expand the insurtech platform capabilities. In August 2021, Bridgestone Americas agreed to purchase Azuga from SEP, Danlaw and other shareholders for US\$ 391 million. The acquisition was completed in September 2021. More than 400 Azuga employees based in the US and India are now part of the Bridgestone Mobility Solutions team.

Azuga has developed a connected vehicle IoT platform – Azuga ONE – which is the basis for multiple product lines including Azuga Fleet, Azuga Road Usage Charging and Azuga Data Science. The Azuga Fleet product supports functionality such as real-time tracking, diagnostics, video safety, driver behaviour monitoring and driver coaching based on a variety of hardware. The back-office functionality is accessible across Internet-enabled PCs, tablets and smartphones. The fleet tracking solution is offered as a subscription including hardware, charged at US\$ 23 per month on a 2-year contract. Azuga launched its commercial auto UBI program in 2016 and has three insurance customers using this product to help insurers assess risk and price premiums more accurately. Examples of clients include Philadelphia Insurance Companies (PHLY) and Nationwide. The insurance companies subsidise the use of the fleet management platform and Azuga can upsell additional services (e.g. dashcam

functionality) to the end customer fleets. The most successful fleet insurance telematics program powered by Azuga is PLHYTRAC that surpassed 75,000 vehicles in Q3-2020. The insurance company pays the full price for fleet tracking which is offered for free to the end customers. Moreover, Azuga is one of the partners in Nationwide's commercial lines insurance telematics program branded Vantage 360 Premium Partner Program, offering telematics free of charge or at a reduced cost to human services organisations. In Q3-2021, the company reached a total installed base of more than 275,000 units.

6.5 Baseline Telematics

Baseline Telematics is a privately held Canadian company based in Montreal. The company has also an office in Brazil and has presence in Europe and other parts of the world such as India, Africa and Mexico. Baseline provides telematics solutions to over 20 insurers in 12 countries. The main markets are Canada and the US. Additional markets include Latin America, Eastern Europe and France. The company has historically focused on providing telematics services through a UBI platform enabling insurers to launch PAYD/PHYD programs with monthly variable rates. The company has however shifted focus from providing telematics services to offering a SaaS platform to insurance companies. Baseline Telematics' new strategy coincided with a launch of a new version of a smartphone-based cloud solution in September 2016.

The product portfolio comprises a SaaS platform – Command Centre – that manages smartphone-based insurance solutions. Additional products include the white label smartphone-based insurance telematics solution Basedrive, a rewards program designed for commercial fleets branded Drvn, the gamification and reward-based insurance app Behaev and an operations management tool for cities, municipalities and townships, branded Resident. Moreover, Baseline offers Bluetooth beacons that pairs with for example the Behaev app to offer more accurate vehicle usage measurements than smartphone only solutions and an OBD dongle to access vehicle diagnostic data which is commonly used in the commercial-line solutions Drvn and Resident. Baseline Telematics has various pricing packages. A 6-month Command Centre subscription includes workshops and a pilot project to ensure that the product is aligned with the insurer's needs. Basedrive is priced as a percentage of the connected premium per month. The percentage varies between 1.0–2.5

percent of the premium. Command Centre also comprises an API gateway free of charge that includes 2 requests per second, connecting to the insurer's existing systems. Baseline also offers an SDK branded Slingshot that detects, records and transmits the required behavioural and usage information needed to develop smartphone-based PAYD/PHYD programs.

Baseline Telematics works with a wide range of partners including EY, CGI and Amazon. EY helps Baseline Telematics' customers with business analysis, rate filings, business transformation and systems integration. CGI, a Canadian IT consulting and solutions company has worked with Baseline Telematics on a number of projects. Amazon and its AWS platform is providing cloud services to Baseline Telematics' new platform. Baseline Telematics' installed base is estimated to consist of approximately 67 percent smartphone-only and 33 percent smartphone-OBD hybrid solutions and are represented by three major customers, one in Brazil, one in France and one in Canada. Customers include for example Société Générale, Porto Seguro, The Guarantee, Sogessur and Promutuel.

6.6 Bosch Connected Devices and Solutions

Bosch Connected Devices and Solutions (BCDS) was founded in 2013 and is a wholly owned subsidiary of the major German conglomerate Bosch which generated sales of more than € 71.5 billion in 2020 and employed roughly 395,000 associates worldwide. Utilising the automotive and sensor knowledge of its parent company, BCDS developed and marketed connected devices and tailor-made solutions for IoT such as components for insurance telematics and industrial IoT. In mid-2021, the business activities of BCDS were discontinued. Portions of the products offered by the company were transferred to other Bosch companies, however, the 12V device for insurance use cases was discontinued.

BCDS was headquartered in Germany and had operations in China, the US, India, Hungary and Singapore. Within insurance telematics, BCDS has developed a telemetry e-call plug which is used in a project launched by German insurers through the German Insurance Association GDV. The project used a 12V device which connected to the driver's smartphone via Bluetooth and had a three-axis accelerometer embedded in the device. An estimated 900,000 devices had been shipped by the end of 2019 and around 200,000 of these are estimated to be active. The telematics eCall plug has also been used by customers in Japan,

the US, Singapore and China. In 2018, BCDS added a new functionality to the device which allows detection of driving events including acceleration, braking, turning, start and stop. BCDS worked with US-based Modus and Croatia-based Amodo, which utilised BCDS' hardware to power insurance telematics programs. BCDS has also introduced a consumer version of the telematics 12V device branded Vivatar in Germany. The solution leverages a 24/7 call centre available in 11 European countries. The main sales channels for Vivatar include supermarkets and repair shops.

6.7 CalAmp

CalAmp positions itself as a connected intelligence company that aims to help its client businesses make more informed decisions. The company provides a unified IoT ecosystem combining software applications, a scalable cloud platform, telematics services and intelligent edge computing products. The company has steadily grown its base of SaaS subscribers over the past years and continues to migrate from a hardware provider to a solutions provider. CalAmp's IoT services are sold worldwide to a broad array of market verticals including automotive, insurance, transportation and logistics, leasing and rent a car, construction, K-12 and government. The company is expanding its international market reach and currently serves customers in the US, Latin America, Western Europe, Asia-Pacific, the Middle East and Africa. Total revenues reached US\$ 309 million (€ 271 million) in the fiscal year ended in February 2021. Over 890 employees work for the company across the US, the EU and Latin America. As of December 2021, CalAmp has more than one million unique subscribers across all its recurring software and subscription services including over 500,000 subscribers in Europe comprised primarily of LoJack Italia, LoJack España and Tracker stolen vehicle recovery (SVR), rental fleet and insurance customers. The company also has a growing base of fleet and asset management, supply chain and CalAmp Telematics Cloud (CTC) subscribers. CTC is an enablement platform that connects customers to a wide range of applications and micro-services through APIs.

CalAmp has been active within the insurance segment since 2013 and offers UBI telematics services, claims management software, SVR and value-added services. The main devices offered are self-install devices (like OBD-II devices), hardwired black boxes, proprietary VHF

(LoJack) and dual-mode (cellular and VHF) devices. CalAmp acquired CrashBoxx in 2015 to expand its addressable market to insurance companies and commercial fleets. The CrashBoxx crash response system improves vehicle crash reporting, repair and recovery by automating functions associated with emergency response and accident reconstruction. CrashBoxx is integrated into CTC and provides instant crash alerts and collision severity reporting with a high degree of accuracy by distinguishing between crash and non-crash events. After receiving an instant crash alert, the LoJack Secure Operating Center provides immediate assistance to the driver. CrashBoxx capabilities will be embedded in all compatible CalAmp devices, enabling customers to receive automated push notifications and CrashBoxx Portal access to near real-time accident reconstruction reports. With these automated services, insurers can make vehicle repair more efficient, expedite the claims process and mitigate fraud.

CalAmp acquired LoJack in March 2016 securing the LoJack Stolen Vehicle Recovery System (SVR), LoJack Stolen Asset Recovery System to protect heavy equipment, and added enterprise solutions for fleet, asset and cargo tracking and supply chain visibility services that are complementary to the core CalAmp SaaS business. In March 2021, CalAmp sold the LoJack US and Canadian SVR business to Spireon to accelerate its pivot to enterprise SaaS-based services. CalAmp continues to expand LoJack International, which operates as a subscription-based SaaS business and retained ownership of the LoJack patents and trademarks.

LoJack Italia, the Italian subsidiary of CalAmp, offers scalable SVR and broader telematics solutions based on the core CalAmp technology stack. The main sales channels are leasing and rental companies, automotive dealers and OEMs. In 2019, LoJack Italia signed an agreement with Toyota to equip the entire range of Toyota vehicles in Italy with LoJack SVR systems. LoJack Italia leverages its 24/7 operations centre to offer SVR and customer assistance services to car theft victims across the Europ Assistance Group, an insurance solutions provider to insurers and assistance companies. LoJack Italia has developed a custom platform of Command Centre services for Europ Assistance Group customers dedicated to the tracking and recovery of stolen vehicles. The solution ingests data from OEM telematics systems, LoJack systems and other aftermarket telematics solutions. In 2021,

LoJack Italia launched CalAmp iOn to extend its market reach deeper into commercial, government and service fleets offering an integrated fleet and asset management solution that helps reduce costs, increase operational efficiency and improve fleet safety.

In 2019, CalAmp acquired LoJack Mexico and Tracker Network Limited in the UK (Tracker), enabling the company to support key enterprise customer opportunities on a pan-European and international basis. LoJack Mexico established itself as a leading company in SVR with more than 126,000 subscribers by working closely with local law enforcement agencies in major cities throughout Mexico. The company leverages CalAmp's full stack of telematics and SaaS solutions and by the end of February 2020, registered more than 13,000 additional subscribers by expanding product offerings to its subscriber base as well as serving auto dealers, OEMs, insurance providers and leasing companies throughout Mexico. Examples of LoJack Mexico clients include GNP in the insurance market as well as Hertz, Volkswagen and MAN Truck & Bus in the automotive OEM, leasing and rental space. The company also has a channel partner program supporting telematics service providers and integrators that offer CalAmp's services to a variety of vertical markets.

SmartDriverClub Group was founded as a connected car club offering a wide range of connectivity solutions and services for new and used cars as well as UBI solutions and received an investment from CalAmp in November 2015. In 2020, CalAmp merged the remaining assets of SmartDriverClub Group into Tracker, expanding Tracker's capabilities in the connected car market. Examples of dealer clients leveraging SmartDriverClub's platform include the motor retailer Stoneacre. Through the Stoneacre staff management program, a telematics on-board diagnostic (OBD) device is given to each Stoneacre employee allowing Stoneacre to understand driving behaviour. In turn, this delivers insurance premium savings to Stoneacre. Following the merger with Tracker, all products are marketed under the Tracker brand. End-to-end UBI services are offered to motor insurers and brokers, including a white labelled app, driving behaviour and a suite of risk management reporting. Customers include Be Wiser, Freedom Group and AbbeyAutoline. Value-added services such as 24/7 crash assistance and theft tracking are also offered to participating policyholders. In July 2019, Markerstudy bought the telematics broker business SmartDriverClub Insurance, part of the SmartDriverClub Group. The telematics broker now operates under Markerstudy's retail and affinity division. CalAmp and Tracker continue to provide UBI services to the business.

Tracker has installed more than 1 million SVR systems and contributed to the recovery of assets worth £ 557 million (€ 631 million) through a formal collaboration with all UK police forces. More than 2,000 police patrol cars and all the police interceptor helicopters across the UK are fitted with Tracker's detection equipment and Tracker recently re-signed the contract to continue serving the UK police force for a further five years. The company delivers a comprehensive range of SVR and aftermarket telematics services to its main sales channels including automotive dealerships, corporate fleets and insurance providers. Like other LoJack global entities, Tracker leverages a range of LoJack VHF or telematics devices as well as dual mode solutions that feature both technologies. The company has adopted CalAmp's global cloud-based SaaS platform and is pivoting its business model to focus on telematics data services to complement its SVR and insurance offerings. In October 2021, Tracker launched CalAmp iOn to penetrate deeper into the UK commercial and service fleet marketplace, enabling operators to track driver behaviour and vehicle usage, while also managing portable assets through one platform.

6.8 Cambridge Mobile Telematics

Cambridge Mobile Telematics (CMT) was founded in 2010, following an MIT research project starting in 2005 under the name CarTel. The US-based company has about 400 employees and powers 80 programs in over 20 countries with offices in the US, the UK, Hungary, Italy, India and Japan. In December 2018, CMT secured a US\$ 500 million investment from the SoftBank Vision Fund. CMT acquired the competing US-based smartphone-only telematics company TrueMotion in June 2021, making CMT a technology partner to 21 of North America's largest insurance carriers. CMT offers its services to insurers for both personal lines and commercial lines applications, mobile network operators, fleets, home security companies, as well as cities and municipalities.

TrueMotion's product portfolio is now part of CMT's offering including a reward engine. The reward programs have had a demonstrated positive impact on retention and on driving behaviour. CMT provides a smartphone-based telematics solution – DriveWell – that includes either a custom-built white-label app or a full SDK integration into any current app, complete telematics processing and behavioural analytics. DriveWell generates a calibrated driving

score and allows insurers to build enhanced statistical models for risk pricing and reward customers for improvements in driving behaviour through gifts or discounts. CMT moreover provides gamification features such as leader boards and social features to further promote safe driving and enhance the behavioural motivation of safe driving. CMT services include an actuarial score, behavioural scoring for the drivers, crash detection and forensics as well as claims management assistance. The CMT actuarial score is filed and approved in 48 US states for personal and commercial lines and can be used by CMT's customers to enhance their existing scoring capabilities. The company uses machine learning and AI to turn raw driving data into analytics. CMT has also developed a battery powered windscreen device – the DriveWell Tag. The device has built-in sensors to record acceleration, braking, cornering and impacts. Data is transmitted to the driver's smartphone using BLE, but an internal memory also makes it possible to record and store data for up to two weeks when the vehicle is driven without a smartphone connected to the windscreen device. The tag can also be used for crash detection, FNOL and impact alert. The battery life is expected to be around 4 years.

CMT entered the field of commercial fleets with the launch of DriveWell Fleet. The main sales channel for the fleet offering is insurers offering the solution as a value-added service to commercial lines clients. DriveWell Fleet is a comprehensive telematics solution that provides insights on driver behaviour risk as well as vehicle dynamics and location. The solution consists of a smartphone app, DriveWell tag, telematics processing and big data analytics engine and a web portal for viewing driver and vehicle scores, trips, locations and driving history. Fleet managers can motivate drivers with in-app gamification, rewards and feedback features as well as training and encouragement in the smartphone app. The cost of DriveWell Fleet consists of an on-boarding fee and monthly subscription fee based on the number of drivers. Nationwide is a client using the DriveWell Fleet solution in its commercial fleet insurance telematics solution Vantage 360 Fleet. A dash camera for mobility fleets was also launched which has been trialled by Uber in the US and Discovery Insure in South Africa.

CMT also offers the use of telematics for claims management in the US. Its Claims Studio range of services help insurance carriers improve Loss Adjusted Expenses (LAE). Claims Studio includes two products – Crash Detector and Claims Reporter – which both are

available as app-only and app and tag programs. Crash Detector is CMT's solution for immediate crash detection, enabling on-scene services or automated FNOL. Claims Reporter is a solution for claims analysis, using robust crash data to facilitate faster and more accurate claims reporting. CMT claims that the solution is now in use by multiple US carriers including Farmers, USAA and State Auto.

Clients include State Farm and Liberty Mutual, which both use CMT's app and tag for the Drive Safe & Save and Right Track programs. Additional clients include Geico, Progressive and Farmers who use the app-only option. In 2019, State Farm and CMT announced version 3.0 of the Drive Safe & Save program. The program uses CMT's platform as well as the app and tag solution for driver data collection. Further collaborations include clients like insurance carriers and cities launching safe driving contests to improve driver behaviour. In 2019, the company worked with insurance carriers and municipalities on safest driving contests in Boston, Seattle, San Antonio and Los Angeles. CMT serves 21 of the 25 largest auto insurers in the US. Other leading insurance clients include American Family Insurance, Nationwide, MetLife, Plymouth Rock and Travellers in the US, and Desjardins and Intact in Canada.

CMT is also present in Europe where customers include Admiral, Hastings and Marmalade in the UK and Germany's leading auto insurer HUK-Coburg. HUK-Coburg's telematics program, called Telematik Plus, is an app and tag solution with around 400,000 subscribers as of April 2021. In June 2021, CMT partnered with Unipol in Italy to launch a Try-Before-You-Buy (TBYB) program with the group's brand Linear called Drive&Save. The program is one of few smartphone-only insurance telematics programs in Italy. CMT developed the solution in collaboration with Leithà, the competence centre for Big Data and AI within the Unipol Group. Additional clients include Discovery in South Africa, AIOI in Japan and Insurance Australia Group in Australia.

Non-insurance partners have included ride hailing companies such as Grab, Uber and Lyft which use DriveWell to analyse driving behaviour and in some cases involve insurance companies. CMT is also collaborating with CCC, providing data to the telematics data exchange CCC X. In November 2019, CMT partnered with Duck Creek Technologies and Guidewire. Duck Creek Technologies is a global provider of P&C industry insurance software.

The main sales channels include selling white label solutions to insurance carriers and selling SDKs embedded in UBI apps. CMT has shipped more than 21 million DriveWell tags to date and collected billions of miles of driving data. Not all CMT programs use the tag however and for many the smartphone is the sole data collector. Combined, CMT's smartphone-based solution currently has more than 6.5 million active users, most of them have an insurance or a TBYB policy.

6.9 CCC Information Services

CCC Information Services is a US-based provider of cloud, mobile, AI, telematics and hyperscale technologies and apps for the automotive, insurance and collision repair industries. CCC is based in Chicago and employs today more than 2,000 people across the US. The company has over 3.0 million active devices connected to its ecosystem and has processed over 50 billion miles of driving data and more than 200 million automotive claims have been processed using CCC products and services. The company's solutions are in use by more than 350 insurance carriers, including most of the top 20 insurers in the US, 25,000 repair shops, numerous OEMs, and third-party data and service providers. CCC provides software and tools to manage the lifecycle of a vehicle, including everyday driving and collision-related experiences, including claims and repair processes. The company started to focus on insurance telematics in connection with its acquisition of DriveFactor. DriveFactor was acquired in 2015 and is one of several important acquisitions made by CCC. Previous acquisitions include Injury Sciences in 2013 and Auto Injury Solutions in 2014. Injury Sciences focused on predicting the expected severity following a crash using acceleration data, including likely injuries and severity of injuries such as whiplash. Auto Injury Solutions was a provider of auto injury medical review solutions.

DriveFactor has been absorbed into CCC's telematics exchange CCC X. Today, CCC X provides insurance telematics for UBI, behaviour analytics, scoring solutions and claims-related applications in the US. CCC can apply its own algorithms to score data or work with carriers to apply scoring algorithms. Telematics-based claims services include electronic crash detection, first notice of loss (FNOL) and predictive solutions, which support real-time

decisions including vehicle repair, preferred method of inspection and injury triage. When a crash is detected and verified, the pre-accident driving and impact data are sent to CCC's predictive analytics engine. Insurers and their FNOL representatives are provided with real-time data and can support the customer based on actual information. CCC has introduced the product branded CCC VIN Connect targeting UBI using OEM connected car data. VIN Connect provides vehicle and driving behaviour data, upon customer consent, to insurers at point of quote. CCC uses two-sided consent including one consent between the customer and the OEM and one consent between the customer and the insurance carrier. The solution reached the market in early 2020 and CCC is currently enrolling insurance carriers and automotive OEMs. It has also announced a service to bring ADAS into the insurance quoting process.

CCC X went live in December 2017 and remains a focus for CCC. The data exchange converts connected car data and makes it available for use across the CCC ecosystem. CCC X aggregates and normalizes connected car data from a rich variety of sources including beacons, dongles, mobile applications, fleet and professional devices and connected cars. One of the world's largest OEMs has recently started to provide data to CCC X in the US. The platform also connects to the CCC ONE platform to enrich connected car data with historical and other third-party data. The data exchange enables partners to use APIs to plug into a digital marketplace to share, consume and create new business models using telematics data. Examples of partners include telematics companies such as Danlaw, Octo Telematics and Cambridge Mobile Telematics as well as other companies that add value and enhance telematics data such as Baron. State Automobile Mutual Insurance Company (State Auto) is the first insurer to publicly announce its participation in the CCC X data exchange. State Auto uses CCC X to connect with CCC ecosystem partners, including a major OEM to deliver UBI and telematics-enabled claims. Several automakers are reporting data to CCC X. CCC X has processed more than 50 billion miles of driving data, out of which OEM telematics systems account for the majority of the data. The first automaker to publicly announce its partnership with CCC was Volkswagen. In August 2020, Volkswagen announced that CCC became the automaker's exclusive provider of insurance telematics services for the newest generation of VW Car-Net, included in most model year 2020 and 2021 vehicles. Upon customer consent, the CCC X data exchange utilises driving data from Volkswagen Car-Net, and powers personalized experiences through the opt-in UBI insurance telematics program DriveView.

CCC's telematics and mobile capabilities moreover power CCC Accident Advisor which is a mobile solution that assists drivers through the steps following an accident and connect them with insurers that participate in CCC X to digitally advance the claims and repair process. Accident Advisor is an end-to-end safety and post-collision management solution that provides real-time crash notifications for connected vehicles. The Smart Estimate product is part of the company's AI-powered suite of solutions that leverage telematics data to transform the claims experience for insurers and the consumers they serve. The Smart Claims suite is the power behind Accident Advisor. Volvo Cars USA is the first automaker to leverage CCC Accident Advisor. All connected Volvo car owners in the US can use accident advisor in the Volvo On Call app. In August 2021, Toyota Motor North America launched a post-collision guidance feature, powered by CCC and branded Mobile Collision Assistance Service, on its Owners App. The product offers Toyota and Lexus drivers guided instructions to help them navigate the post-collision procedures and lets them choose how they would like to handle the claim and repair process.

6.10 ClearScore

ClearScore is a UK-based fintech company and credit marketplace. The company was founded in 2015 and employs around 200 people in three markets – the UK, South Africa and Australia. The combined user base reached 15 million in Q4-2021, of which 12 million were in the UK. The main offering is credit scores and reports from the credit rating agency Equifax as well as informational material to help clients understand and improve their credit score. In addition to this, ClearScore also offers the dark web monitoring service ClearScore Protect, whereby ClearScore scans the dark web for stolen passwords related to the users registered email addresses. ClearScore offers consumers these services free of charge and instead earns revenues from matching users with financial products. Investors include QED Investors, Blenheim Chalcot and Lead Edge Capital. In June 2020, Invus Opportunities joined the group of investors through a US\$ 200 million investment in ClearScore to fund an accelerated growth effort with increased international focus.

In addition to its credit related products, ClearScore launched a UBI app branded DriveScore in September 2021. The app is used like a normal driving behaviour app and scores the driver based on cornering, acceleration, braking, speeding and distraction as well as time of

day. The DriveScore app is not tied to an insurance offering but is marketed as a learning tool for drivers in the UK. Drivers are encouraged to maintain a safer driving style through coaching and the option to participate in driving challenges where they can earn tickets to a monthly prize draw. If the driver wants to use the obtained score to get an insurance quote, the score and snapshots of the scoring metrics are shared with partnering insurers. Quotes can be requested directly through the app and in the future also through other channels. Current insurance partners to DriveScore include Admiral, Hastings and Covéa. ClearScore has partnered with Cambridge Mobile Telematics and uses its scoring and app SDKs in the DriveScore solution. DriveScore is marketed using a similar business model as the ClearScore products. The consumer can use the app and its functionality free of charge and revenues are instead generated from referrals. In the future, the data will additionally be used to enable targeted advertising.

6.11 Dolphin Technologies

Founded in 2001, Austria-based Dolphin Technologies is a telematics service provider in the German-speaking region that provides end-to-end solutions to insurers. Headquartered in Vienna, Dolphin Technologies has 35 employees and generated annual revenues of € 6.1 million in 2020. The company initially provided other automotive telematics applications and started working on insurance telematics in 2006. The target markets are Austria, Germany and Eastern European countries. A total of more than 100,000 hardwired units have been installed to date, but the company has changed strategy during the past years to focus on smartphone-based telematics and data analytics. Dolphin Technologies had more than 310,000 users of smartphone-only insurance applications in Q2-2021, however not all related to UBI. The main insurance customers today include the UNIQA group in Austria, Poland and Hungary as well as DEVK in Germany. Dolphin Technologies has powered UNIQA SafeLine which is a safety-focused black box- and app-based car insurance offering for many years. In total, Dolphin Technologies serves approximately 34,000 insurance telematics policyholders in Austria using the black box. The SafeLine product is now discontinued and the number of insurance telematics policyholders will drop in the coming years. Insurance companies are charged a fixed fee per month and policyholder.

The company's insurance solutions have historically been based on four main foundations: Security and Safety, UBI, Event-Based Interaction (EBI) and VAS. Dolphin Technologies has during the past years focused on preventing dangerous driving behaviour which for instance includes using a mobile phone while driving. Today, the company is pivoting its value proposition to analyse and predict risk based on driving behaviour and outside circumstances such as weather and traffic. The product portfolio is based on scoring feedback, customer interaction, prediction and reward platform. In November 2014, the EBI platform was launched, aiming to enhance propositions with CRM and marketing automation. The company is focused on expanding the EBI platform and has developed the smartphone app GoSmart. EBI includes real-time alerts based on data analytics and a holistic view, where drivers are alerted based on driving behaviour or third-party information, such as weather reports and traffic information. The platform powers digital insurance programs in Hungary (Cherrisk Go) and Poland (UNIQA Go). Dolphin and UNIQA have formed a joint venture branded GoSmart Mobility. The joint venture is based on the EBI platform that helps individuals personalize and plan their mobility as well as rewards good and safe driving behaviour. The company has also launched the reward engine called Mobilio. Mobilio rewards drivers that does not use their smartphone while driving with points that can be converted to cash. It was launched in Q3-2019 and the first insurance companies were onboarded in Q4-2019. Mobilio is offered as a consumer app as well as powers rewards engines for Dolphin's clients. The Move SDK is the most recent addition to the product portfolio. The platform enables clients to build UBI or insurance apps based on Dolphin's technology. Benefits of the system include automatic marketing based on driving profile, driver behaviour analysis and claims prediction.

Dolphin Technologies has developed a cloud-based and scalable platform powered by Google-Kubernetes. The technology assists insurance companies to segment their users based on driving behaviour and thereafter adjust campaigns to prevent dangerous driving behaviour. Dolphin Technologies was majority owned by Italian Meta System group between the years of 2007 and 2014. The group's holding company Meta-Fin owned an 85 percent share before Dolphin completed a management buyout in 2014. Meta System group however maintains a minority share in the company and hardware devices are still sourced from Meta System.

6.12 Earnix

Earnix is a fintech company that provides IT infrastructure for insurance companies and banks. The company was founded in 2001 and has presence in the US, UK, Germany, France, Italy, Israel and Australia. In February 2021, Earnix raised US\$ 75.0 million (€ 65.7 million) at a US\$ 1.0 billion (€ 0.9 billion) valuation. The round was led by Insight Partners and joined by the existing investors JVP, Vintage Partners and Israel Growth Partners. Earnix launched its first UBI offering in December 2020 and in July 2021 it acquired the assets of US based Driveway Software. Driveway Software is a software company based in the US and the company has R&D operations in Israel.

Earnix provides a cloud analytics platform and mobile apps that enable driver safety scoring and UBI solutions for insurance carriers and mobility companies globally. The product portfolio comprises scoring algorithms developed by its actuarial team, driving data to power insurance clients' in-house algorithms or deliver driving data scored by analytics partners as well as smartphone-based telematics solutions. The technology combines sensor fusion, machine learning and AI. In addition, the company offers tools that coach drivers towards safer driving and help insurers engage with their customers. The offer includes white-label apps for iOS and Android, SDK integration and a custom app for UBI, based on the client's design requirements and branding.

6.13 FairConnect (DriveQuant)

Fairconnect is a Switzerland-based TSP with significant operations in Italy. FairConnect is the owner of the Italy-based telematics company Infomobility since October 2018. FairConnect was itself acquired by Palamon Capital Partners in 2018. In November 2020, FairConnect took an equity stake in DriveQuant. DriveQuant provides connected services to be embedded into mobile apps by automotive and mobility professionals such as motor insurers, fleet managers, distribution and maintenance networks, manufacturers and shared mobility industries. The French company was founded in February 2017 after several years of research and development at IFP Energies Nouvelles (IFPEN), a French institutional player in research and training in the energy, transportation and environmental sectors. In August 2021, FairConnect acquired the subsidiary of Groupama Assicurazioni, G-Evolution, a TSP

with speciality in claims handling. DriveQuant is increasingly the brand associated with the companies' insurance telematics and mobility offering.

FairConnect offers a full range of services to insurance companies including data analytics, machine learning and the deployment of telematics devices. The company has developed a windscreen device branded Microbox that connects to the driver's smartphone via BLE for data transmission. It also has an internal memory that can save data when not connected to a smartphone. The company's devices enable assistance services in case of emergency and failure, analysis of driving behaviour in real time and contextual response. FairConnect is moreover developing smart home solutions, also targeting the insurance industry. In 2018, Generali launched Generali Sei a Casa – IN TOUCH that builds on FairConnect's homebox product. The smart home product portfolio comprises a control unit, water sensors, smoke detectors and alarms.

DriveQuant provides a platform that leverages various data inputs such as speed, acceleration, direction and rotational speed. These variables can be measured using a smartphone or a telematics device and are matched with third party data such as road traffic, road type or weather. The company develops proprietary algorithms that generate driving scores and key performance indicators. DriveQuant offers services to companies that have their own data collection mechanisms through APIs and can also develop end-to-end white label solutions. The company also sells its solutions to fleet management companies seeking to deepen their driver behaviour analytics and predictive maintenance capabilities. During the past year, DriveQuant has focused on building its SDK branded DriveKit, which is a library of driving analytics components for analysing vehicle trips and evaluating the influence of driving style on safety and energy consumption. The current focus is on developing the crash detection capabilities of the DriveKit platform.

DriveQuant works with the French insurer MAIF to develop a driving coach app for young drivers as well as with MAIF's subsidiary Altima. In 2018, Altima launched a pay per minute insurance program. The solution is based on a smartphone app developed by DriveQuant that syncs with a Bluetooth beacon sourced from third parties that is placed in the glove compartment of the vehicle. The company powers several UBI programs including Covea,

April Group, MAIF, Altima, Wakam and Club Identicar. DriveQuant targets a European expansion and has several pilots in Eastern Europe and Scandinavia, where it powers TietoEVRY's Insurance-In-A-Box platform. DriveQuant has also experienced traction with new clients in emerging markets such as Thailand and in Eastern Africa. By year-end 2021, tens of thousands of vehicles were connected to the company's platform across the entire customer base including fleet management providers, leasing and car rental companies, car dealerships and insurance carriers. TotalEnergies is an example of a client in the fleet management space, where it uses DriveQuant's Eco driving scores to coach drivers and help companies reduce their environmental footprint. The deal with Groupama also includes a partnership between Groupama and the FairConnect Group in which FairConnect Group will supply the connected insurance solutions to Groupama Assicurazioni as well as to other entities in the Groupama Group. In total, FairConnect supported about 800,000 connected vehicles from some of the largest connected insurance providers in Europe at the end of 2020. The company for example powers Genertel's telematics product GoDifferent in partnership with Generali's subsidiary Generali Jeniot. Additional customers include Cattolica's Active Auto program and TUA that launched Smart Drive in 2018.

6.14 Greater Than

Greater Than was founded in 2004 and is an end-to-end solution provider of connected insurance solutions, primarily to global insurance carriers, automotive OEMs and new mobility solution providers. The company is listed on Nasdaq First North Growth Market and generated revenues of SEK 11.6 million (€ 1.1 million) in 2020. Greater Than employs around 50 people at the headquarters in Sweden and additional offices in Singapore, Tokyo, London, Brussels and Palo Alto. In January 2021, the company raised SEK 136 million (€ 13.0 million) to fund further growth efforts.

Greater Than has developed an artificial intelligence analytics platform branded Enerfy. Enerfy matches the individual driving behaviour with the projected accident probability based on real-time analysis. Enerfy is device-agnostic and gathers data from various sensors including smartphones, OBD dongles, smartphone-dongle hybrids, black boxes, dash cams and factory-fitted telematics systems. The AI has been trained using 19.5 billion kilometres

driven on public roads in over 106 countries. The risk assessment platform encompasses more than 7 billion reference profiles, each with associated accident probability. In 2019, the company launched the Enerfy Global AI based platform, enabling clients to customise their offering based on 480 different white label solutions. The product portfolio comprises for example risk pricing, risk portfolio tracker, PAYD, PHYD, fleet UBI, loyalty programs and driver challenge. In April 2020, Greater Than unveiled its smartphone-based telematics solution branded App2car. In May 2020, a collaboration with a third-party data broker that grants Greater Than access to data generated by 250,000 cars in Germany and the US was initiated. The new collaboration enables Greater Than to offer insurers driver risk profiles that can be used for individual premium calculations. In August the same year, the different features in the Enerfy platform were offered through SDKs for integration in clients' existing apps.

In September 2016, Greater Than and Moderna, the Swedish subsidiary of Tryg Forsikring, entered a strategic joint venture to launch the insurance solution Enerfy – Försäkring med Moderna. The technology was supplied by Greater Than and the insurance underwritten by Moderna. Enerfy's offering was based on a hybrid solution based on an OBD-II dongle that worked in conjunction with a smartphone app. The data was analysed by the company's scoring algorithms and the driver got instant feedback on the status of the driving. The insurance premiums were based on a fixed cost per month determined by the type of car involved and partly based on a flexible premium influenced by the driving behaviour. The driving behaviour grading was on a scale from 1–15 and based on 15–20 different parameters. The joint venture ended in May 2020, enabling Greater Than to focus on the core business of providing insurers with AI reinforced risk insight.

Greater Than's platform supports both commercial lines and personal lines insurance. The product powers the Danish insurer Tryg Forsikring's UBI-solution Tryg Drive as well as Tryg Norway's UBI solution Sidekick that launched in mid-2018. Moderna Försäkringar's own UBI program in Sweden, Moderna Smart, was also powered by Greater Than. Additional clients include Zurich Ireland and UK and MS First Capital as well as FIA that develops a Smart Driving Challenge based on Enerfy. In September 2019, Greater Than signed a partnership with MS First Capital insurance and ComfortDelGro Insurance in Singapore with the intention to launch UBI products in Southeast Asia. The company in addition signed a partnership with

Microsoft and achieved a co-sell status as part of Microsoft's partner program, offering Enerfy on the Azure Marketplace. In October 2021, US insurer Aegis Security launched a UBI proposition, powered by the Enerfy platform, through the general agent Covercube in Arizona.

In 2019, the number of insurance telematics policies supported by the company's platform grew more than 200 percent. The growth trend continued in 2020 and the company currently supports several hundred thousand insurance telematics policies. The majority is in Asia Pacific and Europe. OBD-II devices account for around 30 percent of the connections. OEM telematics accounted for around 10 percent and smartphone-based connections constitute the remainder.

6.15 IMS (Trak Global Group)

IMS (Insurance and Mobility Solutions) is a vehicle and driving data business providing mobility insights and services to insurers, mobility operators, governments and drivers. IMS was founded in 2009 as Trak Global and became a leading TSP in the UK. In December 2018, Trak Global announced the acquisition of the Canadian TSP Intelligent Mechatronic Systems. Intelligent Mechatronic Systems was founded in 1999 and rolled out its first end-to-end UBI deployment in 2005. The company was subsumed into Trak Global which was subsequently rebranded to IMS and in 2020, Trak Global ceased to operate as a trading brand in Europe. Trak Global Group is now the international parent company to IMS. Trak Global Group has long-standing partnerships with global insurers, motor manufacturers, corporate fleets and daily rental companies. Insurance telematics services tailored for both commercial lines and personal lines are today offered to insurers worldwide. Trak Global Group has also started direct-to-consumer brands including Carrot and Appy Fleet. Carrot is an insurance broker specialised in insurance telematics introduced by Trak Global in 2012. Policies are underwritten by Zurich, Ageas and Aviva, which get full access to Carrot's raw data about the policyholders and can leverage telematics technology without developing their own telematics platform. Trak Global Group operates in a dozen countries including the UK, Ireland, Germany, China, Canada and the US and employs over 300 people. In May 2021, the division IMS Italia was launched to increase the market presence and to operate as a growth

platform into mainland Europe as well. In Q3-2019, Three Hills Capital Partners acquired a minority stake in Trak Global Group, following an investment of £ 40 million in the business. IMS generated revenues of £ 33.5 million (€ 39.0 million) in 2021. Trak Global Group divested Carrot Insurance to Granite Group in November 2021. Trak Global Group now operates in two main business verticals: insurance solutions and mobility solutions. Insurance solutions covers personal lines usage-based insurance, insurance telematics solutions utilising various data sources, commercial lines motor insurance telematics, insurance for learner drivers and pay-per-use insurance. Mobility solutions comprises asset tracking and driver risk management for car rental companies, carsharing operators, corporate fleets, P2P carsharing service platforms, leasing solutions as well as ride-hailing companies.

IMS has developed a portfolio of more than 200 connected car patents and patents pending across a diverse range of technologies worldwide. The product portfolio comprises end-to-end telematics services. Insurance telematics and connected car services are provided using a device-agnostic connected car platform branded DriveSync. The platform enables end-to-end insurance telematics and connected car solutions, offering full logistics, data storage with comprehensive end-to-end security and customer support. A range of VAS are available in areas such as roadside assistance, FNOL, geofencing, young driver coaching, behavioural feedback and vehicle health management. Features such as detection of smartphone usage and distracted driving have also been added to the platform. The smartphone usage can be integrated as a factor when determining the driving score, which has been developed to consider acceleration and speed in relation to contextual factors such as road type to improve the scoring model further. The platform also comprises additional VAS such as automated emission testing and estimated repair costs. DriveSync is device agnostic and supports data from for example Bluetooth beacons, 12V connectors, OBD-II devices, smartphones, black boxes and direct OEM integration. In November 2020, an engagement toolset was launched to enhance customer engagement for insurers and mobility operators. The toolset includes features like rewards, messaging, coaching and gamification. In December the same year, the app development framework OneApp was launched, which enables a high degree of configurability in the customer facing app for insurers and mobility providers. It includes SDKs for incorporating the functionality into customer's proprietary apps as well. In February 2021, IMS launched its Vehicle Data Exchange, a service providing real-

time vehicle data access in a standardised form from most available data sources, including vehicle OEM telematics data from over 12 car OEMs including BMW, Ford, Mercedes Benz and Stellantis.

IMS also enables its deployments with full analytics and scoring leveraging a customizable scoring model. IMS' approach to scoring and analytics enables customers to either leverage IMS' own scoring algorithms, the customer's existing actuarial models in collaboration with IMS, or leveraging one of the company's third-party scoring and rating partners. IMS offered access to the learnings from driver data via the Carrot Insurance brand that underpins customer and risk management. Carrot has since launch overseen a 42 percent reduction in the number of accidents among its customer base. In addition, the company has returned over £ 4 million (€ 4.5 million) to customers during the past eight years and the rewards program offers a built-in incentive for consumers to check their status and driving feedback. IMS moreover asserts that its claims data analytics, also used by Carrot, can reduce the combined operating ratios (CORs) by more than 7 percent. The engagement and rewards platform powering Carrot and other insurer clients such as More Than Smart Wheels can be offered as a plug-in to the DriveSync platform. The solution has also been rolled-out in North America.

IMS has also launched a Claims as a Service (CaaS) product offering. The CaaS solution reduces claims costs in three ways: claims liability including validation and analysis of technical data, FNOL and improved claims handling process by offering faster intervention and fraud detection. The last part includes easy to use portals for claims adjusters to ensure that the telematics data is used to refute fraudulent and incorrect claims. IMS technology experts can act as expert witnesses in court if regulations allow the use of telematics data in claims cases. The offering targets both insurers and mobility clients. Mobility clients benefit from risk reduction and lower insurance premiums. Both carsharing operators and car rental clients in the UK use the solution. IMS has designed and manufactured its own black boxes since the beginning and is today selling the seventh generation of its black box branded T7. The box comprises GPS receiver, cellular modem, accelerometer and gyroscope. OBD-II devices are sourced from third parties. In June 2020, IMS launched its first claims-focused telematics-based solution using the in-house developed windscreen device called Wedge.

The device can work independently but connects to the driver's smartphone via Bluetooth for data transmission.

More than 20 insurance customers are currently using IMS' services for active insurance telematics programs. Examples of IMS' customers include Nationwide, Amerisure, Farm Bureau Financial Services, Onlia and Berkshire Hathaway Guard in North America. RSA Group, ADAC, Allianz and Zurich in Europe. The company has also entered into a partnership with Ameisure to provide commercial UBI telematics services in the US. IMS provides Ameisure with commercial fleet telematics technology and delivers a driver behaviour-based score for analysis, provides recommendations for participant improvement and enables credits towards insurance premiums based on IMS's scoring model. IMS powers three commercial lines UBI programs. The products use either IMS' telematics technology sold via insurers or existing fleet management devices. The company works with a large European OEM to develop its connected car platform. It also has a long history of retrofitting its telematics devices for insurance telematics purposes for automotive OEMs in the UK. Strategic partners include Guidewire, Amazon and Microsoft. Guidewire is a software provider for the P&C insurance industry that serves more than 380 customers. The Guidewire partnership enables insurers to use IMS' accelerator to integrate with Guidewire's PolicyCenter, offering services throughout the customer lifecycle, including qualification, quotation and renewal. IMS also provides services to all legislated North American road charging programs, including two road usage charging programs in Oregon (OReGO OAM and OReGO CAM), and Utah's Road Usage Charge, in addition to successful pilots in Washington, California and other states. IMS has integrated with the toll-based mobility companies A-to-Be and Emovis working with Milestone Solutions and others to enable sustainable and fair transportation solutions. IMS has also partnered with a connected car data platform provider that offers access to OEM telematics data from 15 OEMs. The data is additionally utilised to validate smartphone-based offerings.

IMS connected more than 550,000 vehicles in various connected car applications by the end of 2021. The group connects over 400,000 vehicles in the insurance segment as of Q1-2021. About 40 percent of the connections are in North America and 60 percent in Europe. Black boxes account for just over 10 percent of the insurance connections. OBD devices with an

accompanying app account for 35 percent. Smartphone app only solutions using mobile apps/SDKs with or without a Bluetooth beacon or Wedge beacon account for around 50 percent and the remaining five percent comprise OEM telematics.

6.16 Ingenie Business

Ingenie Business is a telematics service provider that is affiliated to the insurance broker Ingenie based in the UK. Ingenie Business designs and develops telematics technologies for a range of clients, including insurers, brokers, financial institutions and OEMs both in the UK and overseas. The company offers a range of solutions to insurance clients from a comprehensive end-to-end white labelled solution to a Platform-as-a-Service offering, devices, installation management, mobile apps for driver scoring and feedback, data hosting, data cleansing, driver risk scoring, distracted driving, FNOL detection and crash reconstruction. During the past years, Ingenie has developed and invested in the cloud-based platform branded Multi. The platform is built on the combination of driving and claims data from Ingenie's broker business and allows for the personalisation of rules, events and scoring down to an individual level. Other insights from Ingenie used in the platform include customer profiling, acquisition, behavioural change outcomes, in life management, claims data and pricing.

Ingenie Business' first external customer is the Royal Dutch Touring Club (ANWB) which launched a mass market offering in 2016. Berg Insight estimates that ANWB had about 45,000 active telematics-based policies in Q4-2021 and ranks as one of the leading telematics-based insurance companies in the Netherlands. The device agnostic platform Multi went live in October 2018 and powers both Ingenie's retail business as well as ANWB's telematics proposition in the Netherlands and other external clients. The agreement with ANWB has been renewed and ANWB has also introduced an Ingenie-developed app-based telematics product. In July 2020, the A-Plan brand Endsleigh Insurance launched a telematics UBI product powered by Ingenie's platform Multi. Data is collected either using a self-installed OBD-II device or alternatively a professionally installed hardwired black box. Target customers are Endsleigh's core market – young drivers and university students. Ingenie Business aims to leverage the resources within the Howden Group to grow further and to expand the geographical footprint.

6.17 Insure Telematics Solutions

Insure Telematics Solutions (ITS) is a telematics service provider operating in the private car insurance sector. Founded in 2014, the company has expanded to around 35 employees in its office in Peterborough, UK. ITS supplies an end-to-end solution, including hardware and telematics services to Coverbox (Drive Wiser). The company was founded as a spin-off from Coverbox but is an independent company today. The insurance broker Be Wiser acquired the assets of Coverbox after it went into administration and is now a major client of ITS for its various telematics product offerings. Insure Telematics Solutions offers telematics services to tens of thousands of active policyholders in the UK. The company has focused on providing professionally installed black boxes, but the company also offers self-installed black boxes that mount on top of the car battery as well as OBD devices. In 2019, the company launched a new platform – the ITS Hub – focusing on data analytics.

ITS offers consultancy services, data analysis and a cloud-based platform to insurers in the UK and continental Europe. The modular platform is device agnostic and accommodates any model of insurance telematics including PHYD/PAYD as well as claims FNOL applications. Active risk management includes five pillars: FNOL, claims management, driver intervention, validation & fraud and risk scoring which all represent the foundation of the solution and platform provided by ITS. ITS furthermore develops crash notification services. The data analytics has moved from only processing data from G-force sensors to a partnership with Microsoft and the introduction of machine learning to analyse more complex crashes. This enables the insurer to get instant details and data from the crash. ITS moreover provides driver scoring based on a risk profile, which is calculated by analysing real-time data. Dangerous driving behaviour is detected by machine learning, thus enabling the insurer to actively manage the risk. A number of parameters such as speeding, acceleration and braking are used to determine the score both separately and in relation to each other. The ITS Hub is device agnostic and allows organisations to source hardware from multiple providers. The Hub is then capable of converting the resulting data into a single common data format making it universal and tailoring it to each business' specific needs.

The company offers both end-to-end solutions comprising hardware, installation services, data analytics and scoring as well as modular solutions tailored to the customers' needs. The company has adopted a Platform-as-a-Service (PaaS) business model for insurance

telematics based on the ITS Hub. The PaaS strategy enables insurers to control hardware and user engagement interfaces in-house. ITS can also supply its solution to car dealers and fleet managers that can leverage the company's platform for SVR, driver risk behaviour analysis and crash notifications. ITS has a data analytics partnership with Microsoft and is using the cloud-based machine learning solution Azure for analytics. ITS has moreover entered a partnership with the claims management companies WNS and DWF. Clients include Verex Group and Principal Insurance in the UK as well as XS Direct in Ireland.

6.18 Inzura

Inzura was founded in 2015 and is headquartered in the UK with additional offices in Thailand, Indonesia and Singapore. Inzura's main products include Inzura iApprove, an AI powered customer on-boarding app launched in June 2021, and Inzura Drive, an app-based telematics solution with optional integrated dashcam. In 2019, the company raised £ 1.0 million in a pre-A funding round. This follows a seed investment round in early 2018. The company's digital insurance platform supports multiple lines of insurance and includes app development, operational infrastructure, app-based telematics and UBI, a digital photo vault with photo recognition and data analytics. The target markets are Europe, Asia and Latin America. Inzura is serving multiple insurers and intermediates. Major customers include Prestige and MCE in the UK and Sompo, Muang Thai and SMK in Asia.

The telematics side of the digital insurance platform covers PAYD, PHYD, TBYB and on-demand insurance. In order to increase customer retention rate and engagement, gamification, rewards and driver engagement are additional features offered as part of Inzura's platform. The company's smartphone-only solution analyses one-second GPS data rather than accelerometer and gyroscope data from internal sensors in smartphones. Inzura has partnered with Mitac/Mio to integrate their dashcam products into the company's telematics app. Inzura launched its white-label dashcam and telematics solutions with automatic video FNOL. The white-label product includes a Mio733 camera and a branded app that manages the camera set-up and operation. As well as instant access to accident footage via the Inzura Insurer Portal, the new solution includes advanced driver assistance features (ADAS) such as lane departure and forward collision warning. Inzura has delivered

the new Dashcam solution to a number of brokers including its existing client Prestige/Autoline that launched a dashcam solution as part of its ChilliDrive young driver product. UK insurance agent One Answer Insurance is a customer using the iApprove app.

6.19 LexisNexis Risk Solutions

LexisNexis Risk Solutions is a part of RELX Group and provides assistance and analytics within prediction, assessment and management of risk. LexisNexis has served the insurance industry for more than 40 years. This includes solutions for insurance telematics. In 2014, the company acquired the UK-based telematics service provider Wunelli. Wunelli was founded in 2007 and is fully incorporated in the LexisNexis brand since 2017. The company today employs more than 500 people in Atlanta, Chicago, Dublin, Portsmouth, London, Mumbai, Sao Paulo, Melbourne, Shanghai and Beijing. LexisNexis provides end-to-end UBI programs across multiple data collection methodologies, including OEM data. The company's solutions comprise UBI program management, UBI smartphone application design and development, and third-party data delivery via the LexisNexis Telematics Exchange. Additionally, LexisNexis Risk Solutions offers advanced driver scoring and data analytics, consultancy and configurations for a rapid deployment of an end-to-end program creation.

LexisNexis has developed a global telematics platform which is the foundation of the company's modular telematics strategy. The global telematics platform underpins a series of consumer-facing insurance modules delivered from a consistent technology codebase. Built on a proprietary processing engine for data ingestion and real time decisioning, the platform is wholly designed, operated and exclusively created by LexisNexis Risk Solutions, accessible through the company's private cloud. The telematics platform powers UBI programs in Europe and North America allowing the company to offer the same suite of services across the regions. The company's platform filters, normalises, contextualises and analyses driving data, thus providing a consistent, rateable set of common attributes and scores across multiple data collection techniques. The scoring is based on a standard protocol for scoring that comprises more than 400 data points. Insurance carriers can use the score directly or utilise the driving data attributes available from LexisNexis to power their own scoring models. The technology can score multiple drivers using the same vehicle, as well as

a single driver using multiple vehicles and use data from multiple data sources. The data available from the platform and scoring algorithms are based on identified data. The proprietary platform securely stores and processes big data insurance applications, including the machine-to-machine integration via APIs and SDKs for building driving data products within the insurer's existing consumer applications. The common data framework within the platform is consistent across regions and product use cases. In April 2021, LexisNexis launched an updated version of its scoring product, called Drive Metrics, which will be compatible with carrier-specific rating plans and is claimed to deliver as much as 79 percent additional lift above standard rating factors.

The company leverages its history of handling telematics-related data in a safe and future-proof manner. Data transparency and consumer consent are main pillars for the offering. Moreover, LexisNexis provides data management, consent management and user integration solutions for automotive OEM telematics programs. The company has also developed a post-collision support platform for automotive OEMs and insurance carriers based on connected car data and consumer supplied accident details, launched in Q3-2020. The post-collision management solution assists drivers through the steps following an accident and connect them with insurance carriers. It has also developed an ADAS classification system, enabling insurance carriers to classify vehicle safety features related to risk.

The proprietary platform securely stores and processes big data insurance applications, including the machine-to-machine integration via APIs and SDKs for building driving data products within the insurer's existing consumer applications. The company's developer SDK was launched in 2018 and provides a suite of technologies that enable designers to rapidly build applications and services that connect to the LexisNexis Global Telematics Platform within a secure environment. The company also offers a white label design service for smartphone based UBI programs as well as dedicated apps designed for UBI.

In April 2017, LexisNexis launched its telematics exchange with three OEMs signed to deliver connected car data. It is a device agnostic end-to-end telematics solution focusing on improving UBI programs for insurance carriers and OEMs. The telematics exchange acts as an intermediate between the data source and the insurer. The LexisNexis Telematics

Exchange gathers and normalises telematics data from OEM telematics systems, black boxes, 12V devices, OBD-II dongles and smartphone apps. It also connects to existing sources of insurance information including claims history and a range of data used for traditional underwriting. LexisNexis offers options for insurance carriers to consume the data within their workflows, aligning it with carriers' business processes and strategic objectives. Data can be delivered in real-time, directly into the insurers' rating platforms or via batch. Insurance carriers already connected to the platform can utilise the data from the telematics data exchange as it is based on the same technological platform as single-source of data.

In July 2020, the company launched the new product – Telematics OnDemand – which enables insurance carriers to request driver-specific data from the LexisNexis Telematics Exchange. This removes all barriers of using telematics data at point of quote and underwriting as the telematics score generated by the exchange can be used as a rating variable similar to credit history and other traditional underwriting factors. Consent management is handled by LexisNexis user management tool, which has a long history of providing this service to all US insurers in the underwriting process. The telematics exchange reached Europe in November 2017. In 2018, LexisNexis announced the availability of its telematics solutions to Mitsubishi's Road Assist+ smartphone app, based on LexisNexis' SDK. The Mitsubishi Road Assist+ app delivers driving data to Mitsubishi drivers, who can opt in to make their data available to participating insurance carriers through the LexisNexis Telematics Exchange. In 2019, Nissan, GM and FCA Italy joined the LexisNexis Telematics Exchange. As GM joined LexisNexis Telematics Exchange, LexisNexis became GM's preferred portal for sharing consumer-approved connected car data with insurers. As of Q2-2020, more than 6 million connected vehicles were reporting data to the LexisNexis Telematics Exchange in the US, including both smartphone-based and OEM telematics solutions. Starting in 2020, FCA customers are able to share their telematics and vehicle data with LexisNexis and insurance companies to access customised policies offered by a Pan-European Insurance Panel linked to the LexisNexis Telematics Exchange. The integration of FCA vehicles is currently on the way as connected cars based on FCA's new connected car platform developed by Harman now reach the market in Europe. In September 2021, Ford Motor Company joined the Telematics Exchange, enabling US owners of eligible Ford and Lincoln vehicles to opt in to UBI programs. The main target markets for the Telematics Exchange include Italy and the UK in Europe as well as North America.

The most important insurance telematics customers include Nationwide in the US and the long-standing customer the Co-operative in the UK as well as SulAmérica in Brazil. LexisNexis powers Nationwide's SmartRide Mobile, a smartphone-only discount program. LexisNexis has been supplying telematics solutions for the Co-operative's Young Driver program for more than 10 years. LexisNexis is also active with insurance telematics solutions on a range of other markets including Brazil, China, France, Germany, Italy and Spain.

LexisNexis Risk Solutions continued to increase its coverage of policyholders and drivers in 2019, with significant growth coming from the onboarding of General Motors' connected car program. Overall, LexisNexis has significantly expanded its telematics exchange footprint, while still continuing to add to its smartphone, OBD and black box-based programs. The company has collected more than 6.5 billion miles of driving data to date, along with associated claims and collision data for more than 1 million events.

6.20 Meta System

Meta System was founded in 1973 and develops and produces electronic systems and devices for the automotive and energy markets. The company is a provider of telematics hardware and supplies security products, parking aids and battery charging systems for electrical and hybrid cars directly to OEMs including BMW, PSA Group, Daimler Group and Volkswagen Group. China-based Shenzhen Deren Electronic acquired a 61 percent stake in Meta System in June 2015 and announced intentions to acquire the remaining shares within the following 5 years. Sales reached € 128 million during 2014 and the 60 percent stake was bought for € 57 million. In 2019, Meta System received an investment of € 76.3 million and landed new shareholders including Sichuan Gloport Investment group, CMAF and China Alliance. The new deal reduced Deren Shenzhen Electronics' stake in the company to 35 percent.

In 2002, Meta System founded Octo Telematics and in 2005 the two companies started working with UnipolSai. The first milestone of 1.0 million shipped units was reached in 2008. At the end of June 2018, Meta System had shipped cumulative more than 8.0 million units to the insurance market, up from 7.5 million in September 2017. Meta System is a pure hardware provider to Octo Telematics, whereas a contract with Allianz also included firmware

and logistics in Italy and 5 additional countries. The company moreover supplies hardware to insurance customers and TSPs in France, Belgium, the UK, South Africa and Russia. Additional customers include Groupama, Baseline and Dolphin Technologies. Dolphin Technologies was also a part of the MetaSystem Group between 2007 and 2014. Meta System expanded its relationship with the major French insurer AXA and nowadays provides hardware to AXA Group in many markets. Meta System also develops vehicle charging solutions. The company has won contracts with BMW, Porsche and PSA Group to develop and manufacture the on-board charging device fitted in the car.

The product range includes black box, OBD and windscreen devices. Black boxes intended for installation in either the engine or passenger compartment account for approximately 80 percent of the production. An additional 15 percent are devices that connect to the OBD-II port, with an even split between Bluetooth hybrid devices and cellular dongles. The remaining 5 percent of the units are windscreen devices, typically including voice features, an emergency button and a backup battery. These devices are generally connected to the fuse box and have gained in popularity in Italy. In 2017, Meta System signed a MoU with Huawei. Huawei and Meta System will collaborate in different connected car verticals in the future, including UBI and insurance telematics.

6.21 Modus

Modus is a telematics service provider with headquarters in California with around 60 employees. The company was originally a software provider, mainly within the wireless technology sector with customers such as Verizon and Sprint. Since 2008, Modus has been focused on the IoT segment where the company provides solutions for insurance telematics and fleet tracking. In May 2021, the UK-based Radius Group acquired Modus and during 2022 Modus will be rebranded to Radius Telematics – North America. The first two insurance projects included an unsuccessful pilot with American Family and a successful project with Esurance. Esurance remains one of Modus' main customers within the insurance segment. Other customers include Allstate Canada, Farmers and Selective Insurance. Fleet customers include Bosch, Sprint, US Cellular and THL. Allstate Canada has pivoted its offering towards a smartphone-only solution. Modus develops the Drivewise app that is used for recording driving behaviour and collaborates with the Allstate company Arity, which provides scoring

and data analytics. Modus also offered an end-to-end commercial insurance telematics solution in collaboration with Farmers in the US. Selective Insurance is another US customer. Modus in addition powers insurance telematics projects in the Middle East and Southeast Asia and is also exploring the European insurance market. Modus has during the past years changed its strategy from a direct sales approach to an indirect strategy. The company collaborates with various partners to approach larger insurance customers.

Modus is active in around 20 countries on 6 continents and serves over 250,000 end users for its solutions, out of which the insurance segment accounts for an estimated 175,000. A total of around 120 billion GPS points have been collected from more than 120 million trips. The Modus platform is device-agnostic. The company offers turnkey telematics device and smartphone-only solutions including logistics and tech support to end users. The insurance product portfolio comprises smartphone apps, data collection & analysis, driver behaviour & education, third party integrations, access to vehicle health data and a claims module. Modus' claims module includes crash data for analysis, reconstruction and claim fact verification as well as FNOL services. Smartphone solutions may also include a Bluetooth beacon developed by the company.

The installed base consists of approximately 75,000 smartphone-based connections and the rest are various hardware-based connections, for example OBD or hardwired black box devices. OBD-II devices are sourced from a number of providers, such as Geometris, Xirgo, Queclink, Smart Witness, Gosuncn, CalAmp, Danlaw, Munic and Gosafe. Additional partners include AT&T, Bosch, Arity, Sprint, Siminn, Telkomsel, Maroc Telecom and Maxis. However, most of the partnerships with telecom companies cover other areas than insurance telematics such as vehicle tracking and fleet management. Modus furthermore uses Amazon Web Services (AWS) for its cloud infrastructure.

6.22 Motix Connected

Motix Connected (formerly MS&AD TX Connected) is a UK based telematics service provider. It is the new brand name of TX Connected and before that, ITB Telematics Solutions, the telematics arm formerly part of BIG Insurance Group, which includes brands such as insurethebox and drive like a girl. The company has been spun off as a connected mobility

technology provider and is a major supplier of telematics-based car insurance on the UK market. In December 2014, Aioi Nissay Japan (ADI) through its European subsidiary Aioi Nissay Dowa Insurance Europe (ANDIE) announced an agreement to acquire the majority shareholding in the company for £ 105 million, receiving regulatory approval in February 2015. ADI and ANDIE are both part of the MS&AD Insurance Group, which is a leading Japanese insurer. MS&AD and Toyota have a long-term partnership and the carmaker owns a minority share of MS&AD. Aioi Nissay Dowa Insurance leverages its partnership with the Toyota Group to develop the telematics business via the Toyota network throughout Europe, Oceania, China, Thailand and numerous other countries and regions. In April 2021, the new name Motix Connected was adopted after the main product, the MOTIX platform.

Motix Connected offers an end-to-end platform branded MOTIX. The MOTIX platform analyses driving data from black boxes, Toyota Data Communication Modules (DCMs) and smartphones as well as other data sources. Driving data points are matched with a vast database of driver behaviour data. The MOTIX platform is designed to deliver a wide range of mobility and connected insurance applications. It delivers all the services required for a connected insurance scheme including IoT device management, data collection, AI- & ML-based insight, driver behaviour scoring & coaching, accident alerts/FNOL, smart data for UBI insurance & risk pricing, fraud investigation, theft tracking, customer engagement, EV usage and fleet risk management. The company's scoring creates a driving style score and provides effective driver coaching and profiling, enabling the driver to drive more safely and the insurer to better assess their risk and price more accurately. Clients are able to track their ratings for their individual journeys and overall score as well as see how they improve over time. The company offers a range of telematics services including insurance telematics for personal lines and commercial lines, fleet management, OEM telematics and shared mobility services (carsharing, ridehailing and micromobility). In 2020, the company announced an AI FNOL product which intelligently detects crashes. Motix Connected also offers a smartphone telematics solution which does not require a black box and is integrated into the MOTIX Drive mobile app.

The insurethebox offering was launched in 2010 and includes the installation of a black box telematics device which features GPS, accelerometer and an integrated SIM card. The device is professionally installed at no charge and records data including the time of day of driving,

speed across different types of roads, sharp braking and acceleration, whether breaks are taken on long journeys, total mileage, motorway mileage and the number of journeys. Launched in 2010, the company sold more than 65,000 insurethebox policies in the first year and reached the 100,000-mark in August 2012. The 200,000-mark was subsequently surpassed in 2013. insurethebox has now sold more than 1.0 million policies and following the success of insurethebox, the company introduced the Drive Like a Girl product in 2013 and has since expanded throughout Europe with Toyota and Lexus Insurance. Since December 2020, Motix Connected provides the vehicle data service for European Toyota and Lexus vehicles that enables owners to sign up to be priced with SwissRe's ADAS risk score. The company has also integrated with Toyota Motors to enable connected car services.

6.23 Munic Car Data

Munic is a French vehicle data company founded in 2002. In 2020, the company held an IPO on Euronext Growth in Paris, raising € 18 million in capital and currently employs around 85 people. The company has additional offices in the US, Tunisia and China. The company also rebranded to Munic from Mobile Devices. The company offers a solution comprising telematics devices and an edge computing platform branded Munic.io that can be used in a broad range of telematics verticals, including for example insurance telematics and rental and leasing telematics.

Munic develops a complete range of telematics devices for service providers and insurers that combine 3 unique features: fully programmable and customizable thanks to the embedded OS (Morpheus, based on Linux and 5000+ telematics APIs), extensive vehicle protocol support and deep vehicle data collection with the Multitasks technology, as well as the availability of more than 300 third party applications in the Munic.io Appstore. The Munic.io platform enables companies to develop services and solutions that are core to the business, for example a driving score in the case of an insurance carrier. In addition, as the company saw a growing appetite for multiple services aggregation within the insurance telematics offering, additional tools were integrated in the Munic.io platform to enable automatic crash detection, crash reconstruction, roadside assistance and vehicle diagnostics. In 2020, Munic introduced a Data as a Service (DaaS) solution branded EKKO and is currently in the process of launching it commercially. EKKO enables insurance carriers and

other stakeholders to leverage data needed for connected insurance products or actuarial research programs at a licensing cost. EKKO distribution partners offer devices free-of-charge including a range of capabilities such as geolocation of the vehicle, remote diagnostics and driver behaviour analytics. An example of a distribution partner is Groupauto which offers the Munic solution to over 5,000 workshops in its various repair garage networks in Europe. The data, which is reported to the EKKO platform, can be used to support the service and repair of customer vehicles. Clients that use EKKO pay a subscription fee to access anonymised and GDPR secured data. The hardware range includes the Munic V6, V6+ and V7+ OBD dongles and the Munic Max black box family featuring integrated GPS, 2G/3G/4G/LTE connectivity, powerful CPU, multiple interfaces to light and heavy vehicles, BT 4 LE and Wi-Fi.

Munic addresses the insurance telematics market, selling either devices or licensing UBI data through its new EKKO program, through two different sales channels. The company either works with insurance carriers directly or through partners. Today, four insurance companies work directly with Munic, where the most notable example is Metromile in the US. Munic has partnered with five telematics service providers that use the company's Munic.io platform and telematics devices. Examples of insurers that use the company's products through third parties include AXA in Italy, Zurich in Switzerland and Bâloise Assurances (Mobly) in Belgium. Munic has shipped a cumulative of more than 575,000 devices to the insurance telematics market. In 2020, about 75,000 units were shipped. At year-end 2020, around 475,000 active devices were connected to Munic's servers in the insurance telematics segment. North America accounts for about 265,000 connections and Europe for 160,000 units and other markets account for the remaining 50,000 units.

6.24 Octo Telematics

Octo Telematics specialises in telematics services and systems for the insurance, automotive and mobility markets such as insurance telematics solutions, safety and security solutions (e-call, b-call and stolen vehicle tracking), fleet telematics and shared mobility services. The company was founded in 2002 as part of Meta System in Italy and is now active in a range of other markets worldwide. The company is currently owned by Russian conglomerate Renova Group, Italian Pamplona Capital Management and members of the top executives in Octo.

Octo Telematics is headquartered in Rome and has an additional office in London as well as its North American base in Boston. Approximately 400 employees are currently serving more than 100 partners and running more than 150 schemes in over 20 countries. At year-end 2021, Octo Telematics had over 5.5 million units connected to its servers. The number of end users has grown from 1.6 million in 2012 to its current level. Octo also holds one of the world's largest databases of insurance customer driving behaviour data, covering over 300 billion miles of driving data. Data related to 493,000 crashes and insurance events has been collected and analysed. The company also manages over 400,000 vehicle rentals per month.

Octo Telematics acquired the Italian mobility solutions provider Tecnologie nelle Reti e nei Sistemi (TRS) in December 2016, later incorporated into Octo Telematics. The company offers a product portfolio that includes end-user interfaces, a modular backend operations platform and telematics hardware including NFC-based vehicle entry technology. The end-to-end solution supports a variety of operational models, including station-based, free floating and corporate carsharing as well as car rental and leasing. In addition to its end-to-end shared mobility solution, Octo Telematics also offers its insurance telematics and fleet management capabilities such as crash notification and driver behaviour analysis to carsharing and scootersharing operators. Mobility operator customers include Toyota KINTO, Enjoy by ENI, LeasysGO! By FCA and Infomobility.

Octo Telematics offers end-to-end telematics solutions including both hardware and software components. The company has historically focused mainly on fixed black box-based systems and OBD-II devices. Octo is now device-agnostic and includes the use of sensors in smartphones and data directly from connected cars. The company mainly focuses on data analytics, including driver scoring and services related to easing the claims process. Octo Telematics's solutions for UBI can record driving behaviour parameters such as time, place and trip duration data as well as driving style data related to speeding, acceleration, braking and cornering. In addition to UBI, the solutions enable claims cost reduction and fraud detection, including crash reconstruction with calculated probabilities for vehicle damage and personal injuries such as soft tissue damage and whiplash. Additional services such as automatic crash alerts, breakdown and assistance services, theft prevention and recovery, traffic information, vehicle diagnostics as well as insight into driving behaviour to improve

safety and environment-related performance are also available. The Octo platform is device-agnostic and aligns with Octo's strategy of focusing on data analytics regardless of sensor type and facilitates further advanced analytics of driver scoring and claims handling. The platform delivers multi-dimensional analytics and real-time data services. Octo has delivered new risk scoring services that leverages its big data, IT infrastructure and external data to transform insurance business processes. The company offers a range of connected user services including vehicle diagnostics, fleet management, vehicle sharing and real-time monitoring of traffic and environmental conditions.

Octo also offers a white labelled digital engagement product that summarizes and records values suitable for analysing a driver's profile and combines them with other indicators, such as distance covered, time of day and road type. Through the collection of data, the aim is to increase customer engagement throughout the policy life cycle, bringing additional value in terms of overall portfolio risk reduction and supporting the insurer's pricing process. For fleet management companies, the telematics data also contributes to virtual driver coaching, which can help to optimize the fleet owner's portfolio through enhanced safety and cost efficiency. For the insurance customers, this digital engagement tool is offered through two different forms: the smartphone edition, which works as a stand-alone solution, and the smart tag, which works alongside the smartphone edition to offer an extra layer of safety through emergency service assistance. The core smartphone offering implements driver coaching functions, for instance by detecting distraction events.

Octo acquired the Usage Based Insurance (UBI) assets of Willis Towers Watson, including the DriveAbility Score and the DriveAbility Marketplace, to leverage collected driving data since 2010, and further enhance its capabilities in data analytics. The DriveAbility team has helped more than 50 insurers on five continents to launch UBI programs. The DriveAbility score uses granular telematics data with claims, policy and external contextual data to deliver a score. Factors that determine the score include distance driven, time, level of distraction, acceleration, cornering, braking, type of roads, junctions and weather. The score is used by more than 25 insurers on five continents and approved for use in 48 US states. Billions of miles of granular telematics data and claims data have been collected, pooled and analysed to enable scoring algorithms. Octo also offers the DriveAbility Marketplace, an analytics platform that normalizes, aggregates and scores data from third party data suppliers. The

DriveAbility Marketplace enables insurers to develop personalized insurance offers to pre-scored drivers. Octo Telematics provides both scoring and insurer integration. The third-party data suppliers are in charge of customer engagement, implementation of telematics services and management of consent, the DriveAbility Marketplace platform manages the interface between third party data providers and insurers, data processes and hosting, the data analysis and scoring, customer qualification, regulatory subjects and brokerage. Participating insurers manage the rating and quoting, binding and underwriting and service policy. DriveAbility Marketplace also facilitates relationships between stakeholders including automotive manufacturers, fleet and rental companies, telecommunications companies and insurers to present personalized insurance offers to customers using pre-analysed driving data. Octo Telematics has further expanded its analytics services by partnering and investing in the UK-based company Nebula Systems. Nebula Systems has roots in automotive diagnostics and data acquisition and is developing solutions that enable third parties to access deep level OEM data. In 2019, Octo acquired the entire share capital of Nebula Systems.

Octo's focus is on developed countries in Europe and North America where main markets are Italy, the UK and the US. The company provides its products in a B2B2C model and it covers all customers' needs and contexts: from complete turn-key solutions provided as Software as a Service model to SDKs and APIs allowing a flexible integration of Octo's technologies in the customers' apps. UnipolSai is one of Octo's main customers on the Italian market. Other key customers include AXA, Groupama, MAPFRE, Liberty Mutual, State Auto, CAA, Nationwide and Intact. In July 2021, Ford Motor Company and Octo entered a partnership where Ford customers with eligible vehicles could consent to have their driving style data analysed by the DriveAbility score through UBI policies with partnering insurance companies. Similar agreements have also been made with other car manufacturers including Renault, Nissan and Mitsubishi Alliance.

Octo Telematics collaborates with a range of solution partners. Since 2017, Willis Towers Watson and Octo have a strategic alliance to develop opportunities in insurance and other adjacent markets. Other partners include Guidewire, Salesforce and telecoms company TIM. Octo also has business agreements in place with OEMs to manage factory-fitted devices or the integration of third-party devices.

6.25 OSeven Telematics

OSeven Telematics is a mobile telematics service provider specialising in insurance telematics. The company was founded in 2015 and has headquarters in London with additional offices in Greece. The workforce comprises about 30 employees. OSeven is backed by investors and VCs and has recently completed a new funding round to scale-up across multiple geographies in the coming years. The product portfolio comprises a device-agnostic cloud-based platform. The platform mainly gathers data from smartphones but can integrate with telematics devices and connected vehicles. The product portfolio targets insurance companies and offers UBI solutions for personal lines, commercial lines and shared mobility service providers. The company also offers white-labelled mobile apps and SDKs to enable smartphone-based insurance products. OSeven leverages machine learning for analysis of driving behaviour and detection of severe crashes. The scoring algorithms utilise data collected from smartphone sensors including GPS, accelerometers and gyroscopes. The company has developed a loyalty program branded SafeMiles, enabling drivers to earn SafeMiles for each mile travelled safely that can be redeemed for discounts and goodies at various partners such as gas stations, retailers and merchants.

The company targets large insurance carriers, with focus on emerging markets including Latin America, the Middle East and Africa and Asia-Pacific. OSeven Telematics also explores new sales and distribution channels including banks and mobile operators. OSeven is active in more than 20 countries including Greece, Cyprus, Saudi Arabia, the UAE, Qatar, Kuwait, Oman and Brazil. Examples of insurance clients in Europe include Ergo, Interamerican (Achmea Group) and General Insurance of Cyprus in Cyprus.

6.26 Quartix

The UK-based vehicle tracking and telematics supplier Quartix was founded in 2001 and has over 20,000 customers across a wide-range of sectors. The company is publicly traded on London's AIM market since Q4-2014 and its installations can be found in the domestic market as well as in France, Germany, Ireland, Italy, Poland, Spain and the US. Quartix entered the insurance telematics field in late 2010 when securing a contract to supply approximately 15,000 vehicle tracking systems to Coverbox, which at the time was owned by Wunelli.

LexisNexis (Wunelli) is still an insurance telematics partner. The company has also added a range of smaller partners in addition to LexisNexis. Quartix currently supplies 6 insurance clients in the UK with telematics systems. In the insurance telematics sector, Quartix mainly provides its credit-card sized tracking devices and some associated services such as installation, data services and call centre services for theft recovery. Insurance telematics customers use Quartix's technology to monitor the driving style and habits of higher-risk drivers. In 2016, Quartix developed a new product platform, which handles insurance customers similar to its core business within fleet management. Improvements in the new platform includes the contextual speed scoring SafeSpeed database, which gathers 30 million data points per day from fleet vehicles and maps them to over two million road distributions. The SafeSpeed database assesses each data point against the speed distribution for that stretch of road. This is used to provide an improved way of measuring accident risk.

During 2020, the company installed 17,000 insurance telematics units, a decline of 53 percent year-on-year. In 2021, the corresponding number was a little over 5,000 insurance telematics units. Quartix has installed more than 700,000 black boxes since 2001 and currently tracks over 200,000 vehicles on its systems, out of which the insurance segment represents an estimated 39,000 units. These installations and connections are principally represented by personal lines insurance. Total revenues reached £ 25.5 million (€ 29.7 million) in 2021, a 1 percent decrease year-on-year. The insurance telematics segment accounted for £ 1.8 million (€ 2.0 million) in 2021, down 53 percent year-on-year. The decline in the insurance business is in line with the strategic decision made by Quartix in 2016 to focus on its core fleet management market.

6.27 Redtail Telematics

Redtail Telematics is a provider of wireless technology delivering vehicle intelligence to customers in the insurance, enterprise and fleet management sectors. The company offers telematics solutions to the usage-based insurance, fleet tracking and stolen vehicle recovery sectors globally. Redtail Telematics was founded in 2010 as a sister company of Plextek, a 100-employee strong designer and manufacturer of communications systems. Redtail

Telematics has offices in the US and the UK. Building on its relationship with Plextek, Redtail Telematics has an aggregated experience of over 25 years from vehicle tracking and communications technology and can also leverage access to Plextek's engineering expertise. Redtail Telematics and Plextek have shipped more than six million telematics devices to date.

Within the insurance vertical, Redtail Telematics provides telematics solutions tailored to specific customer needs. The company can also assume the role of a designated hardware provider and offers black boxes, OBD-II dongles and 12V devices including rugged IP67 and battery powered models. The company offers end-to-end solutions ranging from device and firmware to connectivity, data analysis, portals and B2B and B2C mobile apps. Redtail Telematics specialises in producing telematics devices that use a combination of GPS, accelerometer, gyroscope and cellular technology. The company has expanded beyond telematics device design and manufacture to offer a broad set of services including the capture, analysis and processing of telematics data. The product portfolio is gradually evolving and new features such as intelligent battery status monitoring have been added during 2020. Redtail Telematics also offers a smartphone-as-a-sensor solution that comprises driver scoring apps for Android and iOS. The company's sensor-agnostic insurance telematics platform includes scoring algorithms supporting UBI initiatives such as mileage-based PAYD and behaviour-based PHYD. The platform furthermore supports claims-related insurance telematics such as accident reconstruction and FNOL. The scoring algorithms uses 16 different parameters to calculate the driving score, including the industry-norm four parameters of harsh acceleration, speeding, braking and cornering. The scorecard adds environmental and contextual factors to determine a risk profile using machine learning which matches driving behaviour with an estimated claims frequency. Redtail Telematics has also added driver coaching capabilities to its portfolio of scoring features.

The core markets are Europe and the US but the company also works on expanding to other regions such as developed markets in Asia-Pacific. At year-end 2020, the Redtail Telematics team had delivered over 6 million devices into the automotive aftermarket in 33 countries and had an estimated installed base of approximately 450,000 active cellular devices of which about 270,000 are supporting active insurance and SVR policies. Customers in the insurance segment include Admiral Group, Ingenie, Unigarant, By Miles and Acorn (via Concirrus).

Redtail started working with the UK-based insurance broker Ingenie in 2011 to whom it supplies devices and high-resolution data for the young driver program. Ingenie launched a B2B vertical in 2016 to supply its scoring capabilities to external customers and started working with the insurer Unigarant based in the Netherlands utilising Redtail's OBD-devices and services. Redtail Telematics also works with Admiral Group and its Bell Plug and Drive telematics-based proposition. In this partnership, Redtail Telematics supplies the 12V black box and claims related data through its accident reconstruction platform. In addition, the company has taken over Plextek's 25 year-long design and supply relationship with TRACKER Network which has included SVR, Fleet tracking and UBI to customers such as Direct Line. Redtail is also the technical partner to the PAYD insurance broker By Miles that introduced pay-per-miles policies in 2018 and works with insurtech start-ups such as JLR-backed Synaptiv, customising its products to explore new business models in the Connected Driver space. Redtail Telematics also works with automotive OEMs and leading Tier-1 players offering insurance telematics programs based on automotive OEM telematics data. This enables OEM telematics data to be used by insurance carriers.

6.28 Sentiance

Sentiance is a data science company headquartered in Antwerp, Belgium. The company employs 70 people and has additional offices in Vilnius, Toronto, London and New York. Sentiance was founded in 2015 and has received funding from Mesh Holdings, Volta Ventures and the Samsung Strategy Innovation Center, among others. The company specialises in detailed motion analytics and driving behaviour insights.

The product portfolio comprises a platform used for driver scoring and driver behaviour analytics. The company has also invested in a behaviour change framework, enabling its clients to actively interact with their users to improve mobility behaviour and offer contextualised coaching. In Q2-2021, Sentiance launched a crash detection function, developed together with automotive safety company Autoliv. The main data collection source is an SDK that collects location and sensor data. Sentiance analyses eight mobility patterns including walking, running, biking, various forms of public transport and car ridership. The company uses reference profiles to accurately match driver behaviours with risk levels. The

company's insights can be used by insurance companies in UBI programs as well as fleet managers and shared mobility operators seeking to keep drivers safe and reduce accidents and claims expenses. The company's insurance solutions primarily use smartphone sensor data to build driver profiles. Trip analytics are determined by factors such as smooth driving, hard accelerations, hard braking, hard turns, phone handling, driving distance and trajectory. Contextual scoring of driving events is offered to customise the score based on the purpose of a trip, street type and location.

Sentiance applies a Platform-as-a-Service (PaaS) business model, offering a modular solution that can be customized by clients. Insurers can use raw data delivered by the platform or utilise a comprehensive driver score for UBI. Sentiance is active in the mobility, wellbeing and commerce industries. The target clients in the mobility industry include insurance companies, fleet managers, connected car service providers, shared mobility operators and MaaS application suppliers. Examples of clients using the company's platform include Trov, Autoliv and Uber. Autoliv uses the company's platform to power its Safety Score product. Trov uses the platform in its mobility insurance product. Sentiance has also partnered with Netherlands-based Risk to enhance Risk's UBI product by introducing behavioural and contextual insurance. Multiple ridehailing companies, including Uber and Careem, implement the Sentiance platform to monitor driving behaviour of their drivers. The company's solutions are used by multiple insurance companies in UBI programs. The company has client references in North America, Europe, Australia, Singapore, South Africa, Japan and the Middle East. North America is the largest market in terms of active users in the insurance segment.

6.29 Scope Technology

Scope Technology is a vendor of telematics solutions based in South Africa that was founded in 1999 with a focus on the needs of the fleet industry. The company has around 160 employees and is active in Europe as well as in Africa, Asia and Latin America. Scope Technology entered the insurance telematics sector in 2008 and created the joint venture DriveProfiler with Hollard Insurance in 2010. Solutions are provided to insurers, fleets as well as OEM and aftermarket. Today the insurance telematics offering is delivered directly by Scope Technology or via its global partner network. Scope Technology offers end-to-end

solutions including hardware, actuarial platform, campaign and gamification management, claims management, AI based damage assessment and value-added services. The company's geographical presence within insurance telematics is spread across Asia, Europe and Latin America.

The product portfolio includes a variety of trip data collection options ranging from app only/app beacon assisted to OBD and battery installed telematics devices. Leveraging Scope Technology's global partnership with Microsoft, all solutions run on Azure. Scope Technology has also developed its next generation eBeacon which incorporates a new sensor architecture as well as a panic call button that prompts an emergency call from the user's smartphone when pressed. While the portfolio includes a variety of data collection options, the solution is device agnostic and has supported third party devices as well as embedded OEM telematics. At the heart of the solution are the actuarial, analytics, claims and the client engagement platforms. The actuarial platform aggregates, converges and utilizes a wide array of data sources ranging from policy, GIS, traffic, weather and telemetry in constructing the building blocks of the actuarial modelling. The platform allows for the carriers' actuaries and data scientists to conduct the analytics, and construct the actuarial modelling and revenue modelling. Scope's claims management offering includes a claim reconstruction and notification platform as well as AI based automated damage assessment. The reconstruction platform receives the incident data from the mobile device and employs data modelling to reconstruct the minutes leading up to and the incident itself and establish the incident's probability, severity, likelihood and severity of physical injury, as well as the estimated vehicle damage in affected body panels. The claims offering is further complemented by an AI driven image analysis tool that provides an assessment of the damages to a given vehicle as well as the required repairs and their estimated cost.

At the centre of the company's client engagement solution is the client campaign management platform incorporating key elements of behavioural science and gamification. Designed for the carriers' marketing and behavioural scientists, the platform makes use of diverse data sources including policy, social, telemetry and risk analytics in constructing profiled base campaigns to the customer base of any program. The platform supports multiple concurrent campaigns, each with its own designated objectives such as active risk

reduction, loyalty and policy renewal and up-sale. The offering is supported by an automotive ecosystem providing the carrier using the platform with opportunity for provisioning and personalized up-selling of the carrier's own products, complemented by partner services and products, selected by the carrier. The platform provides a comprehensive solution encompassing marketplace management for multiple partners, onboarding of partners and related services and products, a blockchain backed transaction module for billing, payment, redemption and revenue sharing, as well as support for the utilization of the carrier's virtual points in the purchase of selected vouchers.

The fleet management solution is also leveraged for insurance telematics use cases. Insurers can offer the fleet management platform as part of an insurance policy and the drivers are incentivised to drive carefully by offering drivers achieving good scores gifts like vouchers. In Q2-2020, Scope Technology announced a new project working with an insurance carrier in Brazil that offers Scope Technology's fleet management platform. The insurance carrier pays the telematics provider the full price for the fleet management platform and offers it for free to end customers.

Scope Technology employs both a direct and indirect sales strategy. The company currently serves 30 insurance companies, financial services companies, vehicle OEMs, mobile carriers, and fleets with a variety of services including SVR, PAYD & PHYD programs for personal and commercial lines, connected car programs, fleet management and image recognition. The installed base is about 1.0 million across all segments, out of which half is insurance related. The company added about 70,000 vehicles in the insurance telematics space in 2019. The installed base of insurance telematics solutions consists of 60 percent smartphone solutions, 30 percent OBD-II and 10 percent hardwired devices. Insurance clients include Macif, Suravenir, and Groupama in France; Paydrive in Sweden and Sampo in the Nordics. Other clients include MSIG, Banorte, Sancor and Sura. The company offers solutions in the US, the UK, the Nordics, Indonesia, Malaysia, India and the Middle East and has also experienced a significant growth in Latin America during the past years. Additional customers of the company include companies like VWFS, LeasePlan, America Movil as well as OEM connected car solutions and insurance projects with Honda, Stellantis and JAC Motors.

6.30 Swiss Re

The Swiss Re Group is one of the world's leading providers of reinsurance, insurance and other forms of insurance-based risk transfer. Headquartered in Zurich, where it was founded in 1863, the company operates through a network of around 80 offices globally. At the end of FY-2021, Swiss Re achieved US\$ 47.0 billion (€ 39.7 billion) in gross premiums written and employed more than 14,000 people. In 2015, Swiss Re acquired the Germany-based telematics company Akquinet that now operates under the brand Movingdots and supports Swiss Re in its mobility and telematics propositions as well as other Insurtech services. The Automotive and Mobility Solutions team at Swiss Re employs a workforce of more than 80 people engaged in a range of product offerings at offices in Beijing, Milan, London, New York, Zurich and through Movingdots, Bremen.

The core product from Swiss Re – Coloride – is a modular end-to-end insurance telematics solution comprising a device-agnostic telematics platform, a white-labelled app or SDK, claims management solutions, scoring and actuarial support and go-to-market know-how. Coloride utilises smartphone sensors such as accelerometer, gyroscopes and GPS to identify risky manoeuvres, speeding habits and phone usage while driving and offers post-driving coaching. The solution also assigns a risk score to each driver which can be combined with the driver's historical claims data. In addition, Coloride can be enhanced with a battery powered windscreen device to complement the app-based product. The device connects to the driver's smartphone and enables more accurate trip recording. Two versions are offered – Coloride Drive Tag and Coloride Safety Tag which adds crash detection functionality. Swiss Re utilises its experience in risk assessments and works closely with insurers to leverage telematics data across the insurance value chain. Coloride is available worldwide and operates over 10 live solutions as well as over 20 active pilot projects. The company's telematics solution supports multiple insurance telematics programs and collects data from hundreds of thousands of customers. An example is the partnership between Swiss Re, the carpooling company BlaBlaCar in France and L'olivier Assurance, formed in September 2021 which resulted in a new digital motor product – BlaBlaCar Coach. The offer consists of an app powered by Coloride that offers drivers personalised coaching and tips for safer driving and is available with PHYD car insurance. Coloride is mainly targeted towards personal lines insurance but can also be deployed in commercial motor applications. The first

implementation was launched in January 2022 in partnership with the US based supply chain management company Overhaul Group, where Coloride will be used in an app-based product for the US trucking industry.

In addition to telematics solutions, Swiss Re has developed new products and solutions to address other needs in the automotive & mobility space arising from the production and ownership of electric vehicles (EVs) and autonomous vehicles. The company works together with car manufacturers to develop a vehicle-specific insurance rating that accounts for safety-relevant advanced driver assistance systems (ADAS). BMW was announced as the first carmaker working with the Zurich-based reinsurer on the Swiss Re ADAS Risk Score. In September 2020, Toyota Insurance Management Europe joined the ADAS risk platform, enabling scoring based on data from Toyota and Lexus vehicles. In April 2021, Swiss Re and Veoneer entered a partnership to further improve assessment and enhance development of ADAS technology. The Swiss Re ADAS Risk Score measures the impact of ADAS systems on frequency and severity of claims. Swiss Re also offers new tailor-made insurance products for EV owners and extensions of existing products, such as extended warranty for EV batteries, after a successful launch in China in 2019. Other client segments include leasing and rental companies as well as players in the shared mobility space such as ride-hailing operators.

6.31 Targa Telematics

Targa Telematics is an IT company which has been active in the sphere of IoT and connected vehicles for more than 20 years. The company has clients among leasing and car rental companies, large finance companies, car makers, insurance companies, mobility operators and large fleets and offers a variety of services including insurance telematics, asset and fleet management. It also offers remote diagnostics and telemetry for vehicles from professional and construction-site vehicles to the management of airport service vehicles. Headquartered in Italy, the company has additional offices in European capitals including London, Paris, Lisbon and Madrid. Targa Telematics reported revenues of € 49.0 million in 2021 and employs 140 people. The company has more than 950 customers and offers its solutions across Europe, the US, Asia and Oceania.

Targa Telematics powers insurance telematics programs in Italy and has begun branching out into other European markets. The company offers a range of services which include registering and analysing driving data, a 24/7 control room, SVT and SVR services, fraud prevention services, e-assistance as well as claims-related data such as crash detection and FNOL. The company's core capabilities in insurance telematics are related to crash detection and other claims-related telematics features. Targa Telematics leverages its hardware partners to deliver professionally installed black boxes and self-installed black boxes. Furthermore, Targa Telematics enables insurance companies to develop usage-based insurance products. Factors that are analysed for UBI include speed in relation to the speed limit, seatbelt usage, acceleration/deceleration and kilometres covered, permitting the co-creation of flexible insurance products based on pay-per-use and pay-as-you-drive frameworks.

Targa Telematics has extensive experience in managing large fleets of connected vehicles on its digital platform. The company applies both a direct and indirect sales strategy, though the company's sales team manages the majority of sales. The company reached a total installed base of over 2.0 million connected assets at the end of 2021. About 1.4 million devices of these were in insurance telematics programs. Targa Telematics works with around 10 insurance companies. The main insurance customers include UnipolTech, AON, Verti Assicurazioni and Nobis Compagnia di Assicurazioni. UnipolTech, a subsidiary of UnipolSai, is the market leader in telematics-based insurance in Italy in terms of active policies.

Moreover, leveraging its know-how in the mobility landscape and its technology, Targa Telematics can support its insurance clients in creating new revenue streams. A reference client is the insurance broker AON, which chose Targa Telematics as partner to develop its new pay-per-use long term renting service Flee, which companies can offer their employees.

6.32 Telematics Technologies

Telematics Technologies is a Poland-based company developing LBS and telematics services. The company is headquartered in Warsaw with an additional office in Poznan and has a workforce comprising about 90 employees. The company traces its history to the LBS company NaviExpert that was founded in 2005. NaviExpert remains a brand of Telematics

Technologies. Telematics Technologies generated revenues of PLN 21.6 million (€ 4.9 million) in 2020, a year-over-year growth of 20 percent.

The product portfolio comprises NaviExpert navigation services and NaviExpert Telematics services targeting fleet management and insurance telematics solutions. The product portfolio directed towards insurance telematics includes a device-agnostic IoT insurance platform, as well as mobile apps and SDKs for smartphone-based telematics products. The platform can analyse data from smartphones, OBD-II devices, BLE beacons and 12V devices. The platform provided by Telematics Technologies enables a wide range of features including assessment of driving behaviour, driver profiling and risk scoring, crash detection and reconstruction and FNOL. Telematics Technologies also provides mobile apps as VAS for drivers with a MHYD module, gamification as well as vehicle health monitoring. The company also offers business consulting services related to LBS, insurance telematics and fleet management.

The company powers a range of insurance telematics programs in Central and Eastern Europe and focuses on B2B sales. A prominent client is PZU, which first launched UBI in 2015 via its subsidiary LINK4. The NaviExpert app is used to analyse driving behaviour in the LINK4 "Cash Back" program where safe drivers can earn up to 30 percent cashback on their insurance premium. The program was launched in April 2017 and by the end of 2020 more than 68,000 policies had been activated. Telematics Technologies also powers PZU GO, an insurance telematics product offered by PZU in Poland. PZU GO is based on a small electronic device that connects via Bluetooth to the PZU GO app to cover dangerous situations on the road. In case of emergency – crash or collision – help is provided to the place of accident. At the beginning of June 2020, PZU started selling the solution on a large scale. In October 2021, PZU had nearly 70,000 customers actively using PZU GO. In 2021, Telematics Technologies started a UBI pilot aimed at fleets in cooperation with one of the largest insurers in Poland. The solution makes use of OBD devices, a fleet management panel, an app for drivers as well as reporting. The OBD devices are sourced from Teltonika. Insurance telematics solutions provided by Telematics Technologies are mainly based on smartphone-only or smartphone-hybrid solutions. The company supported over 130,000 insurance related telematics connections at the end of 2020. The NaviExpert navigation

service is offered as a separate app or as white label by a range of mobile operators including T-Mobile, Orange, Plus and Play in Poland. The NaviExpert navigation service has a monthly active user base of about 600,000 subscribers.

6.33 The Floow

The Floow is a telematics service provider based in the UK and founded in 2012. The company employs around 100 data and social scientists, engineers, designers and commercial support staff. The Floow opened an office in Detroit in 2017 to develop its presence on the North American market. The US office is currently located in Walnut Creek, California. In February 2022, it was announced that the automotive data and platform provider Otonomo had entered into an agreement to acquire The Floow. The Floow specialises in data collection, storage management and interpretation of driver performance data, thus enabling insurance companies, auto service organisations, fleet operators and OEMs to offer telematics products and services. Data is gathered from a wide variety of sensors in any device or smartphone and The Floow offers a device-agnostic platform for analytics of telematics data. Data is currently being collected from approximately 1.0 million vehicles in the UK, the US, Germany, Italy, Israel, Indonesia, Iceland, Portugal, South Africa, Brazil, Spain and Ireland. About 90 percent of the installed base are linked to an insurance policy of some sort. Almost 50 percent of these are OBD and black box devices. Smartphones account for the remaining share.

A platform branded FloowDrive was launched in 2018. FloowDrive targets personal lines insurers and is a customisable cloud-based telematics platform, comprising data gathering, scoring, a customer-facing app and an insurer-facing management information portal. FloowDrive can be optioned as a customised offering so that it includes the clients' branding and language localisation requirements. FloowDrive mainly gathers data from smartphones but can integrate with a variety of sensors. The Floow has developed scoring mechanisms that utilise sensor data such as GPS Location, GPS Speed, GPS Bearing, accelerometer, gyroscope and call state info in combination with contextual data such as map data, aggregated behavioural data and third-party transient data. The sensor data is aggregated in KPIs including acceleration, braking, cornering, speed on various road segments, start & end

locations, length of trip, making & receiving phone calls, day of the week, crash events and time of day. The KPIs are translated into a scoring system that comprises six categories: smooth driving, mobile distraction, speed, fatigue, road risk and time-of-day that affect the overall driving score. The Floow's approach offers client actuaries and underwriters flexibility to produce tailored scoring models by adding their own risk or claims data as well as tailored aggregate scores, components and elements to create insurance discounts to policyholders. The Floow has moreover developed a reward platform which combines a driver scoring app with the opportunity for end users to gain rewards in exchange for safer driving. Rewards are provided from local retailers and merchants to meet local market demands. The Floow furthermore offers white-labelled smartphone apps and SDKs for existing insurance apps to insurers interested in smartphone-only solutions. In April 2020, The Floow launched the Bluetooth product FloowTag. FloowTag is a stand-alone Bluetooth Low Energy device which can be self-installed to a vehicle's windscreen. The FloowTag solution is built to improve the capabilities of FloowDrive and validates the scores generated by smartphone only products developed by The Floow. In July the same year, a smartphone-based crash detection service was launched, which is offered to customers of the SDK solutions.

In 2018, The Floow launched FloowFleet, a commercial lines insurance telematics platform aimed at small fleets. FloowFleet utilises data from a broad range of sensors and hardware. These scores are accessed via management portals that allow the fleet manager and the commercial lines insurer to see how vehicles in the fleet are being driven. In August 2020, the traffic flow monitoring and forecasting tool MobilityIn was launched. It offers insights about traffic flows and driver behaviour on aggregate levels, leveraging various sensors to map vehicle movements in a specific area.

One of the early customers was Direct Line Group, a UK-based insurance company with more than 10 million customers. The Floow and Direct Line work on multiple telematics projects and leverage the device-agnostic platform developed by The Floow. Telematics data for Direct Line Group can be sourced from SVT boxes, black boxes, two types of OBD-dongles and smartphone-only solutions as well as OEM telematics devices. In September 2020, Direct Line and The Floow launched the first app-based telematics insurance product in the UK. In May 2021, a second smartphone-only version of a UBI policy was launched together with Direct Line. The Floow also participates in further driver-behaviour R&D projects

such as MOVE-UK, a £ 5.5 million project on automated driving led by Bosch, and with Jaguar Land Rover as a participant. More than 20 insurance brands globally use The Floow's technology and scoring algorithms to improve risk-based pricing. These include major insurers based in Europe and North America. Clients include Munich Re, Direct Line Group and Aviva in the UK; ACG, CSAA and Plymouth Rock in the US on personal lines as well as Progressive and Hartford on commercial lines; Liberty Short-term and Standard Bank in South Africa; HDI and Ergo in Germany as well as the Portuguese insurer Fidelidade. The Floow also works with Renault-Nissan Group on a project announced in 2015. Furthermore, following BMW's decision to open its data sources to data analytics companies in the BMW CarData program, The Floow entered a project on how to monetise the data from BMW in Germany by offering insurance telematics solutions. In the UK, The Floow provides telematics services to Direct Line's partnership with the PSA Group, further increasing its presence in the OEM segment. In addition, The Floow powers multiple safe driving contests in collaboration with cities using its B2C app TripMate.

6.34 Trakm8

Trakm8 designs, develops, manufactures, supplies and supports vehicle tracking, fleet tracking and GPRS/GPS tracking products and services. The company was founded in 2002 and is listed on the AIM stock exchange. Trakm8 has 175 employees today in the UK and the Czech Republic. Revenues in the fiscal year ending in March 2021 were £ 16.0 million (€ 18.6 million). Trakm8 has previously mainly focused on developing GPRS/GPS tracking hardware with associated embedded software for indirect distribution channels. Today, the company provides a range of fleet management and vehicle tracking solutions. Trakm8 had approximately 254,000 active units reporting to its servers at year-end 2020. About 184,000 of these are represented by the insurance and automotive telematics segment. The products offered to the insurance sector consist of telematics hardware such as self-install dongles and software including consumer apps and web portals. Insurance customers include By Miles, LexisNexis, Direct Line and Marmalade and in 2020, Trakm8 secured contracts with four additional insurance companies.

6.35 Verisk Analytics

Verisk Analytics is a data analytics provider serving customers in insurance, energy and specialized markets as well as financial services. Headquartered in the US, the company operates in 30 countries and has around 9,000 employees. Using advanced technologies to collect and analyse billions of records, Verisk draws on data assets and deep domain expertise to provide innovations integrated into customer workflows. The company offers predictive analytics and decision support solutions to customers in rating, underwriting, claims, catastrophe and weather risk, global risk analytics, natural resources intelligence, economic forecasting, and many other fields. The company was founded in 1971 as the Insurance Services Office (ISO). In 2009, Verisk Analytics became a publicly traded company following an IPO where the main shareholders were US insurers. In 2020, Verisk generated revenues of US\$ 2.8 billion, up 7 percent year-on-year. Revenues from insurance-related business accounted for 71 percent of the total.

Verisk Analytics has been involved in telematics for about 10 years and a designated business unit under the name of Verisk Telematics was formed in 2014. The company provides predictive analytics that insurers can integrate into their telematics-based UBI programs. The main focus in recent years has been the Verisk Telematics Data Exchange, where mainly OEMs but also TSPs and telecom companies as well as connected home and monitored security providers can participate to share data with multiple insurers to utilise the collected data in UBI programs. Verisk then acts as an intermediary that normalises and processes the data by applying predictive analytics. The Telematics Data Exchange provides underwriting analytics for UBI programs by offering scoring algorithms, driver feedback & monitoring and model-ready data for insurers with existing UBI programs. The program also offers claims analytics, including First Notice of Loss (FNOL), event detection, and accident reconstruction based on the gathered data. Verisk launched the service TrueVIN in January 2020, enabling insurers to gain more granular knowledge on an individual vehicle's technical specifications than what is available through the vehicles VIN number. In June 2021, Verisk launched an updated version of its driving score, branded DrivingDNA. The new score is based on data from 260 billion miles driven.

Verisk Telematics collaborates with various TSPs and other stakeholders including TrueMotion and Root Insurance Company. In February 2019, Verisk joined forces with

TrueMotion. The partnership enables the companies to offer integrated telematics solutions for insurers that combine TrueMotion's mobile data with Verisk's driving behaviour analytics. Root Insurance Company has also joined the exchange, enabling the company to provide discounts to safe drivers based on historical driving data. Other insurance customers include the major insurers Nationwide and Metromile. OEMs connected to the Verisk Data Exchange include GM, Honda, Ford and Hyundai. Verisk is the exclusive data exchange for Hyundai and Genesis connected vehicle data in the US. Since May 2020, the Verisk Data Exchange is available on the Geotab Marketplace.

6.36 Viasat Group

Italy-based Viasat Group is a provider of automotive telematics (mainly insurance telematics and fleet management), EMS circuit boards and high-end electronic systems. The privately held company was founded in 1974 and has around 850 employees. Viasat Group has offices in Italy, Spain, the UK, Poland, Portugal, Belgium, Germany, Bulgaria, Romania, China and Chile and operates in more than 60 countries across Europe, the Middle East, Africa and South America. The company generated revenues of € 70.4 million in 2020, a decrease of 14.5 percent year-on-year. Viasat Group is one of the largest players in the insurance telematics field and supplies telematics services and hardware to a number of major insurance companies. The company has delivered more than 2.0 million telematics devices to date and connects around 700,000 units including fleet, insurance and connected car services such as SVT. Insurance is the largest vertical in its connected car segment and the company installed over 31,000 insurance telematics devices in 2020 reaching a total of around 425,000 connected units. About 34 percent of the group revenues come from the insurance business unit. In September 2018, Viasat Group acquired Spain-based Grupo Detector which is a leading SVR company and a LoJack licensee. The acquisition strengthens Viasat Group's position on the Iberian Peninsula where Viasat Group has been active since the acquisition of the fleet management company MobileFleet in 2017.

Viasat offers a comprehensive end-to-end solution within insurance telematics which covers both personal lines and commercial lines. The insurance services can be divided in four main areas: Insurtech & Driving Style analysis, Security & Safety including crash management and SVT, Data Management and Value-Added Services. The company has control of the entire value chain from hardware R&D and production via data analytics and driver profiling to

customer engagement and interaction. Solutions within logistics, backend support and comprehensive control centres are also provided to insurance partners. Viasat's insurance telematics solution allows the customers to implement new structured and customised insurance models such as PAYD and PHYD. The company enables its customers to obtain information such as automatic recording of accident-related data, statistical analysis of vehicle usage and driving data including speed, acceleration and cornering. A large part of the installed base is based on black box devices, but Viasat Group offers OBD-II and smartphone-only solutions as well. An example of a telematics-based insurance product provided by Viasat is the Slimbox Autoinstaller, which is a satellite location system for the insurance market. The product can either be installed as a black box or in the OBD-II outlet directly by the driver. Viasat recently launched a new Insurtech offer for insurance brokers, agents as well as traditional installers and dealers branded "Sicuri & Protetti". Viasat has partnered with ANAPA Rete ImpresAgenzia to develop the solutions to insurance brokers across Italy. Sicuri & Protetti offers value-added services to customers such as driving data dashboards, SVT and SVR services and eCall services. In March 2021, Viasat and Mobito announced a collaboration to offer Viasat vehicle data on the Mobito Data Marketplace.

Viasat Group applies both a direct and indirect sales strategy. The insurance business unit offers services to insurers through fully owned and outsourced operations centres. The operations centres have been certified by the Italian CUR (Centrale Unica di Risposta) to offer eCall services according to the European standard. The business model for insurance companies is based on a B2B2C model, whereby the main customer is the insurance company which pays a yearly subscription including hardware, software, installation and related services. Viasat is mainly active in its domestic market Italy within insurance telematics but has small-scale operations in Romania and Bulgaria. The company aims to expand its presence within insurance telematics to the markets where it has existing offices and operations in other business areas. Major customers within the insurance segment include Generali, Reale Mutua, Sara Assicurazioni and Assimoco. The company has also active projects with Mapfre, Amissima, AXA, DDOR Novi Sad, Groupama Asigurari, Admiral, Helvetia, Italiana, Vittoria Assicurazioni, Zurich Italia and Conte.it.

6.37 Vodafone Automotive

Vodafone Automotive (formerly Cobra Automotive Technologies) is a provider of security and telematics services to the automotive industry and part of Vodafone Group. Founded in 1975, Cobra Automotive was acquired by Vodafone in August 2014, leading to the name change to Vodafone Automotive in April 2015. Italy-based Vodafone Automotive employs around 800 people and has two main business units – formerly known as Cobra Telematics and Cobra Electronic Systems – focused on telematics services and infrastructure, and electronic systems and components respectively. Vodafone Automotive provides customers such as automotive OEMs, dealerships and aftermarket customers with products and services including telematics, vehicle tracking, fleet management and usage-based insurance. Installation of the company's telematics devices can make customers eligible for insurance discounts. The offering within UBI moreover includes on-board hardware and back-office administration systems as well as web-based and mobile access interfaces to behaviour data for policyholders and insurers.

Vodafone Automotive develops various solutions for UBI applications and sees telematics as an operational tool for insurers to improve retention rate and add value to customers. The company manufactures its own hardware in Italy, but also has the capabilities to write firmware and software as microservices for third party devices. The end-to-end insurance telematics proposition includes risk and claims management, customer engagement, VAS such as stolen vehicle recovery and the opportunity to open new sales channels for insurance carriers. Vodafone Automotive provides data analysis for risk assessment and an operational platform providing claims efficiency and crash detection. To improve customer loyalty and engagement, the company offers a digitalization platform to encourage good driver behaviour through rewards. Vodafone Automotive has also expanded its product portfolio by including smartphone-only solutions. Scoring is also offered and is based on sensor data from for example accelerometers and GPS tied to KPIs on driver behaviour as well as contextual information like weather conditions, road type and traffic data. Capabilities in crash detection and reconstruction enables automated estimation of vehicle damage and repair costs. The suite also includes methods for encouraging behavioural change. Distracted driving and phone usage are also analysed by Vodafone Automotive's platform. The company partnered with Cambridge Mobile Telematics in 2017 and offers to embed the DriveWell SDK in its

smartphone-only solutions. Vodafone Automotive further emphasises the possibility to expand the ecosystem of insurance telematics to travel, home and personal insurance. Solutions enabling episodic and on-demand insurance used by shared mobility operators, leasing companies, car rental companies as well as automotive OEMs are also offered. In 2019, Vodafone Automotive partnered with Geotab to create Vodafone Business Fleet Analytics, which is now offered in all European markets currently served by Vodafone Automotive. Vodafone Automotive has changed its strategy away from a technology-based strategy to an outcome-based strategy focusing on individual insurer's needs. Vodafone Business Fleet Analytics increases the addressable market to enterprise fleets, enabling the company to offer commercial lines insurance telematics solutions on a wider scale. The already existing relationships between automotive OEMs and Vodafone Automotive additionally opens possibilities for insurers to access data directly from OEMs.

The main insurance customer today is Generali, which Vodafone Automotive is working with in Italy, Slovakia and Brazil as well as with Generali's online branch Genertel in Italy. Vodafone Automotive is the preferred telematics supplier of Generali. Additional customers in Italy include AXA's online branch Quixa that offers the Quixabox program as well as HDI. Vodafone Automotive is furthermore active within UBI in Germany, Spain and the UK including customers such as Admiral, MCL and Württembergische Versicherung. In 2017, Vodafone became telematics partner for Admiral Insurance's telematics program LittleBox. Vodafone Automotive provides Admiral with detailed information on crash situations, helping the company with the entire claims process. Vodafone Automotive has also reached an agreement to launch a telematics-based insurance proposition with Generali Spain. Examples of telematics customers among vehicle manufacturers include Aston Martin, Audi, Bentley, Ferrari, Lamborghini, Maserati, Mercedes-Benz, Nissan, Porsche, Renault, Škoda, Tesla, Volkswagen passenger cars and Volkswagen commercial vehicles. Berg Insight estimates that Vodafone Automotive has an installed base of around 1.7 million telematics units related to insurance telematics at year-end 2020, a growth rate exceeding 10 percent year-on-year. Black boxes account for more than 80 percent of the installed base in insurance telematics applications, whilst OBD devices account for most of the remainder.

6.38 Webfleet Solutions

Webfleet Solutions is the largest fleet management solution provider in Europe, headquartered in the Netherlands. The company was previously a business unit of the TomTom Group which divested TomTom Telematics to Bridgestone Europe for a purchase price of € 910 million. Bridgestone is the world's largest tyre and rubber company. The new company name Webfleet Solutions was subsequently launched in October 2019. Webfleet Solutions entered the insurance telematics market in 2012 together with UK-based Motaquote (Towergate). The company is today active in PAYD, PHYD and MHYD insurance for both personal lines and commercial lines insurance and the product portfolio can leverage traditional black box systems as well as OBD-based hybrid solutions that leverage smartphones. A smartphone app and terminals for live feedback to the driver is also part of the product range. The company provides telematics data as well as behaviour profiles and driving scores. Crash data and claims-related telematics solutions are in addition offered to insurance customers. The revenue streams include sales of hardware and subscription fees per policy for data handling, driver profiling and scoring.

Webfleet Solutions has also entered the field of analysing connected car data directly from OEMs. Apart from insurers, Webfleet Solutions also work with a Volkswagen importer in the Netherlands to equip new cars with telematics devices. The company is also active in the leasing and rental segment, working with companies such as LeasePlan and Arval. The leasing and rental product portfolio comprises driving behaviour analysis which can be leveraged for insurance purposes. An alliance between Webfleet Solutions and Verisk Insurance Solutions was announced in mid-2017. This provides Webfleet subscribers access to fleet insurance benefits and operational safety feedback. Webfleet Solutions also powers the Signal Iduna brand Sijox' mobile based PHYD solution AppDrive.

6.39 Zendrive

Zendrive is a US-based developer of driver safety solutions. The company was founded in 2013 and is backed by venture capital from First Round Capital, Thomvest Ventures, BMW I Ventures, NYCA Partners, Fontinalis Ventures and Sherpa Capital. Zendrive is headquartered in Silicon Valley and has an office in India. Zendrive offers solutions within UBI, claims

automation, lead generation and risk modelling. The products include a platform with driver apps, online dashboards and backend systems. The company has developed an automatic crash notification algorithm and a Safety Score. The Safety Score is a direct measurement of driving behaviour. It derives from a patented algorithm that Zendrive has created from its experience in analysing over 200 billion driving miles. The algorithm accounts for acceleration, braking, cornering, collisions and smartphone-based distraction like texting and handling the phone. Today, the safety score is mainly used by family members to compare and monitor driving habits. In commercial settings, Zendrive's score can be used by businesses for comparing employee efficiency and safety. For Fleet Management use cases, Zendrive groups together all drivers to come up with a score for the overall fleet. Zendrive offers its crash notification algorithms and driving scores through SDKs. Insurance companies can leverage the safety score for UBI and underwriting purposes or the crash notification for claim-related solutions such as FNOL. Zendrive works with insurance companies in the US, Europe, Africa and South America. In addition, Zendrive has partnered with Verizon to power the Verizon Hum smartphone-only program.

Appendix

Glossary

2G/3G/4G/5G	Second/Third/Fourth/Fifth Generation mobile telecommunications.
ADAS	Advanced Driver Assistance System.
API	Application Programming Interface.
BHPH	Buy Here Pay Here – type of car dealership which also handles vehicle financing for the buyer.
Blackbox unit	Integrated device for mobile communication, satellite positioning and vehicle data recording.
BLE	Bluetooth Low Energy.
BMS	Bonus-Malus System.
BYOD	Bring Your Own Device.
CAN-bus	Controller Area Network bus.
Casco	Casualty and Collision.
CDMA	Code Division Multiple Access.
CNIL	Commission Nationale de l'Informatique et des Libertés – French data protection authority.

CRM	Customer Relationship Management.
DOT	Department of Transportation.
EBA	Emergency Brake Assist.
ERP	Enterprise Resource Planning.
FM	Fleet Management.
FMS	Fleet Management System. European truck industry standard for CAN-bus connectivity.
FNOL	First Notice/Notification of Loss.
GDPR	General Data Protection Regulation.
GNSS	Global Navigation Satellite System.
GPRS	General Packet Radio Service.
GPS	Global Positioning System.
GVW	Gross Vehicle Weight.
HSPA	High Speed Packet Access.
IoT	Internet of Things.
LBS	Location-Based Services.
LCV	Light Commercial Vehicle.

LTE	Long Term Evolution.
M2M	Machine-to-Machine.
MGA	Managing General Agent.
MHYD	Manage-How-You-Drive.
MPG	Miles Per Gallon.
MRM	Mobile Resource Management.
MTPL	Motor Third Party Liability.
NFC	Near Field Communication.
OBD	On-Board Diagnostics.
OEM	Original Equipment Manufacturer.
P&C	Property & Casualty.
PaaS	Platform as a Service.
PAYD	Pay-As-You-Drive.
PHYD	Pay-How-You-Drive.
PND	Personal Navigation Device.
ROI	Return on Investment.

RPM	Revolutions Per Minute.
SaaS	Software as a Service.
SDK	Software Development Kit.
SMS	Short Message Service.
SVR	Stolen Vehicle Recovery.
SVT	Stolen Vehicle Tracking.
TBYB	Try-Before-You-Buy.
TSP	Telematics Service Provider.
UBI	Usage-Based Insurance.
VAS	Value-Added Service.
VAR	Value-Added Reseller.
Wi-Fi	Brand name for WLAN devices based on the IEEE 802.11 specifications certified for interoperability by the Wi-Fi Alliance.
WLAN	Wireless Local Area Network.
WWAN	Wireless Wide Area Network.

Berg Insight offers premier business intelligence to the telecom industry. We produce concise reports providing key facts and strategic insights about pivotal developments in our focus areas. Our vision is to be the most valuable source of intelligence for our customers.

Other products available from Berg Insight:

Aftermarket Car Telematics

www.berginsight.com/m2m

Public Transport ITS in Europe and North America

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