Unveiling the full potential of telematics
How connected insurance brings value to insurers and consumers: An Italian case study
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Telematics is changing the motor insurance market and disrupting the traditional car insurance business model. Insurance companies worldwide are learning from the experience of first movers in order to develop their own telematics expertise.

This paper is focusing on the Italian market, which has the highest coverage of telematics-based motor policies globally. Therefore, experiences made in Italy could serve as a role model and be (partly) replicated in other markets. This paper outlines how insurers and consumers can profit from the value proposition of telematics, how telematics is changing the motor insurance landscape or even beyond by offering a broad overview of telematics and also a deep dive into latest evidence on a technical level.

This work has been a joint collaboration between Swiss Re, Matteo Carbone, Sergio Desantis and Gianni Giuli.

In collaboration with selected strategic partners, Swiss Re has built up comprehensive telematics capabilities and is developing additional expertise and technology to provide clients in selected markets with an end-to-end telematics solution in return for reinsurance.

We wish you an interesting, informative and exciting read.

Sebastiaan Bongers
Head Automotive Solutions – Swiss Re
Introduction

Digital disruption and innovative technology have prompted a fundamental shift in the automotive industry over the last decade, and change is continuing at a rapid pace. Traditional cars are being developed with semi-autonomous features and are likely to become fully autonomous vehicles in the future.

A key factor underpinning such innovation is the spread of telematics – the combination of computers and wireless telecommunication technologies to facilitate an efficient transfer of information over vast networks. In 1988, the European Economic Community launched initial programmes experimenting with vehicle telematics; ten years later, Progressive Insurance in the US issued the first telematics policies. Even so, telematics only started to achieve significant market penetration in the last few years and is now moving steadily from the learning phase to the transition phase.

In Italy today, with 4.8 million active telematics policies at the end of 2015 and more than 6.3 million policies or 15–16% of all motor insurance policies at the end of 2016, telematics potentially allows inter-vehicle communication and information exchange vehicle-to-infrastructure and vehicle-to-vehicle. This means that two vehicles could warn each other of obstacles or hazards on the road and cars can be re-routed by intelligent traffic signs. Next to telematics, the so-called semi-autonomous advanced driver assistance systems (ADAS) are accelerating the development towards autonomous vehicles. ADAS include safety enhancing features, such as emergency brake assist (EBA), side-view (blind spot) assistance, forward collision and lane departure warning systems. Among others, Daimler and Tesla are the two main car manufacturers driving these market developments. The Mercedes Model S is fitted with several sensors that read the road ahead to adjust steering, speed and brakes. Meanwhile, the software installed in Tesla’s Model S enables driving with an autopilot on US highways. Various other car manufacturers have built emergency auto-brake functionality into their cars. The next step will be fully autonomous vehicles that perform all driving functions by themselves and communicate independently with the surrounding environment.

The combination of ADAS and telematics has extensive consequences on road safety and thus on the insurance sector. According to the latest evidence, technology-assisted and autonomous driving will cut the frequency and costs of road accidents, which are mostly caused by human error (>90%).

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1 Source: http://omnim2m.com/history-and-evolution-of-telematics/
2 Source: http://www.migholding.com/content/it-insurance-test-driving-telematics
3 Source: Litman, T. 2016. Autonomous Vehicle Implementation Predictions
4 Source: Global Status Report on Road Safety. World Health Organization, 2015
5 Source: Carbone, M.
While telematics is all about data, the actual data registered by the connected car’s sensors is only raw material. The auto insurance sector has established the most successful use case for telematics data so far. It has done this by transforming the collected data into actionable knowledge affecting all components in the insurance value chain and bringing an unprecedented level of innovation to motor insurance. Until now, this part of the insurance industry has been mostly deemed very traditional and adverse to change. Telematics enables insurers to improve risk segmentation and pricing thanks to the data captured from the vehicles, which describes real-time driver behaviour. Moreover, telematics facilitates claims handling based on crash detection and reconstruction.

Telematics and ADAS influence the loss ratio of insurance companies (see chapter 5). Individual premiums will eventually decline, as semi-autonomous vehicles prevent accidents and telematics allows insurers to incentivise drivers to drive more carefully. However, putting this into a global perspective, we still expect the overall premium volume to rise, as growing populations and economies in emerging markets lead to an increasing number of cars and consequently insurance policies.

Telematics and all the data collected by telematics devices facilitate more adequate pricing of motor insurance for individuals. We expect customers to perceive usage-based insurance (UBI) as being fairer than the traditional motor tariff system, as they pay on the basis of how much risk they take. This may prompt people to adapt their driving behaviour and collect the reward for careful driving. Consequently, insurance companies and customers alike stand to benefit from telematics.

There is a wide range of services available to customers. These include such benefits such as emergency calls, efficient claims handling processes, weather alerts based on geo-localisation, highway and parking area tolling, anti-theft services if the installed telematics device registers an atypical driving style and the possibility to recover a stolen vehicle.

Beyond the benefits for insurers and their customers, telematics could potentially also help to solve social and environmental issues. Used to foster innovative mobility solutions, such as car sharing, it can help to improve traffic conditions and air quality in our cities and make more efficient use of resources. By accounting for individual risk taking, it improves horizontal equity among motorists.

One of the reasons for starting to adopt telematics in Italy in the 2000s was the high average premium for motor third-party liability to cover the high cost of first generation telematics technology. Insurance companies offering telematics-based insurance products responded to this problem with a strong value proposition touching the core of the clients’ pain points. Their message of rewarding drivers financially for using technology capable of preventing fraud and supporting them in case of accidents and car theft was tailored precisely to the needs and expectations of Italian customers. Telematics also proved to be extremely useful in risk selection, accident reconstruction and recovering stolen vehicles, which was to the benefit of the insurance companies. This has enabled the sector to grant larger discounts on telematics-based products and thus promote customer adoption. In Italy and abroad, insurance companies are developing and adapting various innovative solutions to make the adoption of such technologies more attractive to end users.

This paper analyses and discusses the telematics value proposition of insurance companies, consumer perception, changes telematics bring to the motor insurance landscape and how telematics will potentially influence our daily lives beyond motor insurance.
Overview of the Italian market

Italy is the market with the highest coverage of telematics-based motor policies worldwide. With 4.8 million black box-equipped cars, Italy is ahead of the US (3.3 million) and the UK (0.6 million) (Figure 1).

Compared to the US, where dongles were the main data source at the end of 2015, the black box was the prevalent device used for data collection in combination with telematics-based motor policies in Italy and the UK.

Figure 2 also shows the difference between two different types of client. “Roll-over” clients try out a dongle and give it back to the insurer after a certain time, “leave-in” clients go beyond the trial phase and keep a telematics-based insurance policy.

In the short period of usually three months, “roll-over” clients are not able to take advantage of value-added services, such as claims handling. “Leave-in” clients who transfer completely into the new insurance model generate larger value for both the client and the insurer.

Several characteristics give an indication of which customers are increasingly opting for a telematics-based insurance policy.

The Italian National Association of Insurance Companies (ANIA) conducted a research project with insurance companies on the Italian market and discovered that the discounts offered with installed telematics attract customers of all ages. Even if young drivers between 18 and 23 years show the highest interest in telematics-based insurance policies in combination with a black box, the results show that all customer segments reached a material penetration and are increasingly opting for a telematics-based insurance product, regardless of their age (Figure 3).

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6 Source: Carbone, M., 2015
7 ANIA is the main insurance and reinsurance trade organization operating in Italy. Its main purpose is to build a sustainable development model which is recognized by both the general public and the institutions.
8 The analysis is relative to the auto insurance personal lines and represents 86.6% of the premiums written (2015 data) in motor liability in the Italian market. As the analysis considers the number of risks insured in the year, the penetration levels represented are lower than the year-end levels.
The discount is definitely a key incentive for Italian customers to purchase telematics insurance. Telematics penetration by district at the end of 2015 (Figure 5) clearly shows a relationship between the average cost of MTPL cover and telematics penetration.

The analysis at client level by the amount of premium paid also confirms this indication regarding the customer’s willingness to buy a telematics-based insurance policy (Figure 4). Almost 30% of the customers who pay high premiums (>EUR 900) opted for black box contracts, while the corresponding number drops to 13% for consumers who pay lower premiums (<EUR 400).

Source: ANIA

Istituto per la Vigilanza sulle Assicurazioni (IVASS). IVASS (in engl. Institute for the Supervision of Insurance) is the Italian insurance supervisory authority, an independent authority responsible for supervising and regulating all insurance business in Italy. The new governance of IVASS is integrated with that of Banca d’Italia.
Still, telematics-based insurance is not simply a product for customers who have to pay a high premium. A look at the volume of MTPL contracts reveals that policies priced below EUR 400 represent almost half of the Italian telematics portfolio. For customers with low premiums, the discount alone is not enough to explain why they purchase telematics-based policies (the up-front discount may reduce the yearly fee for telematics services by only a few euros or may not even offset the higher price of the service). As telematics penetration ranges from over 16% for new vehicles to 9% for vehicles over 22 years of age, black boxes are clearly more common with new vehicles. This is because their owners want to benefit from the stolen vehicle service and the discount on theft cover.

Based on different clusters of customers and geographical areas, insurance companies become better in developing specific use cases to target different customer segments, which effectively raises the telematics knowledge and awareness among both insurers and their customers. This not only boosts sales for telematics-based insurance products but also allows for lower premiums for drivers in southern Italy.

Today, the spread of telematics-based insurance policies is influenced by several factors and is linked to use cases based on potential insurance premium discounts. Although some patterns of typical customers of telematics-based insurance policies are visible, customers are expected to be more heterogeneous in the future.

While customers benefit from lower premiums and value-added services, telematics products also add value for insurers, as they achieve benefits on their profit and loss statements. A look at Italian best practices reveals a set of critical success factors.

The most important element is the capacity of telematics to improve the insurance bottom line: a significant self-selection effect exists with customer acquisition and material savings related to claims settlement, provided that adequate processes are in place and telematics data is used accordingly. The second aspect relates to the benefits arising from the introduction of value-added services offered to (and paid by) the driver and from the higher customer retention.

At this stage, UBI policies are mostly based on mileage. The first types of telematics products on the market did not have any variable component linked to usage (telematics information), only an up-front flat discount. At the next stage, insurers introduced UBI-related pay-as-you-drive (PAYD) policies in conjunction with the black box. Today, these products still represent around 25% of the 34 telematics solutions currently available on the Italian market. These solutions monitor mileage (distinguishing sometimes between driving during the day, the night, the weekend and/or itineraries) and provide a base premium adjustment to be applied in the following year. This confirms the current predominance of the up-front flat discount in the value proposition.

Looking forward, there is a visible trend towards UBI policies based on driving behaviour. Pay-how-you-drive (PHYD) policies are not yet as common on the Italian market as PAYD policies but are the next frontier in terms of advanced UBI products. The concept of PHYD and the interest for it appear to be increasing rapidly. PHYD policies integrate information gathered on mileage with an analysis of the client’s driving style based on the number and intensity of accelerations and stops, driving timetables, speed, location and other variables, such as weather conditions, the time of day / the weekday.

On a global scale, Italy clearly has the most advanced experience in combining car insurance contracts with hardware and using this data stream throughout the insurance value chain. In other countries, it is still a niche value proposition.

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13 Source: https://www.linkedin.com/pulse/telematics-insurance-risk-selection-matteo-carbone
Consumer perception and buying behaviour on telematics

In 2015, 5% of all motor insurance customers decided to switch from a traditional motor insurance to an insurance policy based on a black box. The overall retention of customers with a telematics-based insurance policy is also increasing over time.\textsuperscript{15}

Customers recognize that telematics offers many valuable benefits for consumers and society as a whole. For them, the key factors for choosing a telematics-based UBI are lower premiums, enhanced safety and improved claims experience.\textsuperscript{16} The perceived value of premium discounts and value-added services (VAS), such as theft protection, is higher than the perceived costs to install the black box and subscribe for VAS.

A recent survey conducted by Survey Sampling International (SSI) – a global provider of data solutions and technology for consumer and business-to-business survey research – for the Connected Insurance Observatory in 2016, polled 3,525 customers in seven countries (Austria, France, Germany, Italy, Spain, UK, US). The survey provides interesting insights into how consumers perceive telematics, what their preferred telematics insurance product would look like and how they rate VAS attached to an insurance product.

Price is the most important factor for customers choosing a motor insurance product. Secondary factors include the services offered by the insurance company and its reliability. Consequently, possible discounts on an auto insurance premium could be key for customers to buy a telematics-based insurance product.

Figure 6 shows the likelihood of having a black box installed per country.\textsuperscript{17} In Italy, 66% of the auto insurance customers surveyed would have a black box fitted in their cars to receive VAS and a discount on their auto insurance premium. This result underlines that the propensity of Italian customers towards telematics is very strong. Even though the majority of the surveyed customers in the US and UK is more sceptical, only a low percentage shows any resistance to using telematics-based solutions in their cars. German, French and Austrian customers are less likely to buy an insurance product linked to a black box. However, the fact that technology is improving and becoming cheaper could make it attractive in the future to markets previously excluded.

The inclusion of additional variables in the analysis shows that the salary and the annual mileage of the survey participants influence the decision whether they would accept having a black box installed in their cars.\textsuperscript{18}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure6.png}
\caption{Tendency of subscribing a telematics offer by a customer in different countries.\textsuperscript{18}}
\end{figure}

\textsuperscript{15} Source: http://www.netpromotersystem.com/about/measuring-your-net-promoter-score.aspx
\textsuperscript{16} Source: Karapiperis, D. 2015. CIPR Study. Usage-based insurance and vehicle telematics: Insurance market and regulatory implications, p. 5
\textsuperscript{17} Source: Customers who are neutral are excluded from this illustration.
\textsuperscript{18} Source: Carbone, M., Bain & Company, SSI
In Italy, the acceptance of a black box increases in line with the salary of the potential customers (Figure 7). Only 55–56% of customers with a salary below EUR 20,000 would accept having a black box installed in their cars. With higher salaries, the willingness to use a black box increases to 82% for potential customers with an annual salary above EUR 100,000. The same trend is visible for all other countries in the survey.

A potential explanation could be that customers with higher salaries drive cars that are more expensive, pay more for their motor insurance and therefore are attracted by potential premium reductions in combination with a black box.

A look at the annual mileage among all surveyed countries reveals that the more the participants drive, the more willing they are to get a black box fitted in their cars.

There are different options to individualize premiums in order to reach price-sensitive customers. Premium reductions can be given in recognition of improved driving performance or voluntary reductions of mileage.20 With UBI programmes, fixed costs can turn into variable costs (associated with mileage) and can be attributed to existing classes and risk categories for premium calculation. Insurers have the opportunity to build value propositions for specific customer segments in order to increase acceptability of UBI products. For example, lower-income, urban and “multi-car” households, can benefit from flexible pricing and the option to pay more affordable premiums.22

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19 Source: SSI, Carbone, M.
21 Source: SSI, Carbone, M.
Customers in Italy prefer larger variable discounts based on distance driven each month rather than larger variable discounts linked to mileage or driving behaviour or smaller fixed discounts determined at the start of the policy (Figure 9).

Telematics-based insurance policies have the potential to make roads safer. Especially for young drivers, the tracking of rapid acceleration, speeding and sharp turns can have an educational effect. Once insurance companies have motivated their customers to improve their driving, the number of accidents and their severity could potentially decline, with the benefit of saving lives. Rewarding customers for safe driving in turn increases transparency, since the link between driving behaviour and the premium is much fairer than with traditional pricing schemes.

Another question was about what rewards were the best motivators for enhanced driving behaviour. The strongest incentive for all participants in all countries is the monthly discount. The runner-up differs from one country to the next, ranging from a discount at renewal to a refund for not having had an accident by year-end (see figure 10).

**Figure 9: Comparison of preferred discount models**

- Potentially larger variable discount based on distance driven each month, but in the worst case it can also be 0 discount
- Potentially larger variable discount based on driving behaviour each month, but in the worst case it can also be 0 discount
- Smaller fixed discount I can expect every month determined at the start of the policy

23 Source: SSI, Carbone, M.
Apart from the possibility of reduced premiums and easier claims handling processes, customers with a device or smartphone app installed are able to benefit from a variety of value-added services, such as roadside assistance, help in case of an emergency and recovery of stolen vehicles.

The survey participants ranked several value-added services based on their perceived attractiveness (Figure 11). Even though county-specific preferences differ, anti-theft services, easier claims handling and a car finder feature are highly appreciated across all surveyed countries. Parental control and personalized non-insurance offers are of the least interest among participants.

Figure 10: Motivating factors for safer driving

Figure 11: Perception of value-added services

Source: SSI, Carbone, M.
Source: There are four noteworthy approaches for data collection: Consumer devices (e.g. Smartphones), Third-party devices (e.g. 12V cigarette lighter plugs, black boxes), Third-party devices with CAN-Bus access, e.g. OBD dongles, direct access to the car’s OEM telemetry). Smartphone apps with telematics hardware give the insurer direct access to the policyholder, which is important for live scoring, driving feedback and value-adding services. (Source: Swiss Re, 2016. Telematics: Connecting the dots, p. 7)

Swiss Re
Unveiling the full potential of telematics

Case study: Services enabled by telematics enrich the entire journey of a car driver

The customer journey offers a variety of opportunities for insurance-related services as the three customer journey stages below illustrate (Figure 12):

**While driving.** Services include bad weather and speeding alerts, a dedicated concierge service and even an alert that is activated if the car leaves a pre-defined “safe area” (family control options for young or elderly family members). Discovery’s approach in South Africa in this field is highly relevant and includes an anti-theft service that alerts the client if the driver has an atypical driving style.

**In case of a crash.** The Italian market is often considered to be at the forefront in this respect because of how it has innovated the usage of telematics data to manage services. Many companies have invested in creating a valuable customer experience by involving partners such as assistance companies. The solutions provided in case of an incident start with proactively contacting the client and – depending on the gravity of the event – sending help directly to the place of the incident and handling all the logistics and case management issues that may arise. Innovation now focuses on simplifying the FNOL (first notice of loss) procedure in case of car accidents. One example announced by ANIA for this year involves the launch of a new app available throughout Italy which aims to dematerialize the FNOL.

**When parked.** Other than locating and recovering the car in case of theft, the black box can send alerts if the vehicle is moved or damaged in any way. This also allows to locate a parked vehicle. Many Italian companies recently launched innovative value propositions of this kind. One of the best practices in this respect is the street sweeping alert by Metromile, which was launched in Los Angeles and San Diego in 2015.

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Figure 12: Customer journey: Telematics-based services will be the way to stay relevant when the auto risk declines 29

1. “Live” Concierge supporting navigation
2. Alert in case speed limits are exceeded
3. Antitheft service if the box registers a different-than-usual driving style
4. Alert if the vehicle exits a “safe area” (or enters an “unsafe area”) of the city, defined by the customer (e.g. parental control options)
5. Weather alert based on geo-localization
6. Highway/parking area tolling
7. Fuel gas predictor
8. Road or medical assistance via dedicated button
9. Customer assistance and personalized case management in case of crash
10. Automatic assistance to the customer on the premises in case of severe accident
11. Simplified claim notification including automatic form fill-in based on telematics data
12. Claim certification at customer’s disposal
13. Street sweeping alerts
14. Short-time theft cover
15. Parking localization
16. Alert in case the vehicle is moved when the engine is off (e.g. tow-away)
17. Alert if the car is hit when parked
18. Alert if the device stops to send data
19. Antitheft service if the box is removed/uninstalled
20. Bodyguard for emergency outside the car when parked
21. Stolen vehicle recovery

29 Source: Carbone, M.
Telematics value proposition for insurers

One of the most relevant digital innovations, telematics will have a tremendous impact on the motor insurance landscape given the steady rise of UBI insurance policies.

We have identified three main benefits for the insurance sector coming from connected insurance:

1. **Frequency of interaction** enhancing proximity with the customer aimed at offering additional services.
2. **Benefits on the insurance bottom line** by increasing profitability through specialization. This includes the ability of a telematics-based offering to auto-select risks, influence driving behaviour and use collected data efficiently during the claims handlings process.
3. **Knowledge creation** on risks and customers, based on the combination of car data and contextual data. This will facilitate both the development of new risk models which can be integrated with economic models for decision making on specific insurance products and the identification of cross-selling opportunities.

These benefits are prompting insurance companies to innovate their traditional approach and come up with their own telematics strategies, from customer acquisition to customer retention and cross-selling, to improve the portfolio’s profitability.

Beyond the benefits for insurers, telematics are well-suited for such innovative solutions as car sharing and can thus contribute towards solving social and environmental issues, such as traffic conditions and air quality.

The Connected Insurance Observatory conducted a telematics survey among its insurance members, asking them about their opinions regarding the state of the Italian market, perceived barriers and advantages.

The respondents indicated that the main obstacles regarding connected insurance are not having a clear strategy (34%) and difficulties in data management (34%), followed by privacy management and implementation costs. None of the surveyed insurers sees any potential lack of demand.

The main expected advantage in motor telematics is risk-based pricing (66%), followed in joint second place by risk selection (11%), value-added services (11%) and eliciting low risk conducts and customer loyalty (11%). The respondents saw no special benefit from the control over losses.

Telematics has the potential to prevent a decrease in premium from necessarily translating into lower profitability. If telematics success factors as mentioned above are activated, we believe there is a clear value generation that will allow lower premiums to co-exist with profitability. The comparison between the traditional insurance bottom line and the telematics-based insurance bottom line reveals that risk self-selection, claims cost reduction and service fees paid by the customer generate more benefit than the loss resulting from discounts, premiums and costs for third-party suppliers (Figure 13). However, insurance companies have to make sure to develop business cases which achieve this profitable telematics-based bottom line.

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**Use of telematics brings relevant benefits to your bottom line**

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<table>
<thead>
<tr>
<th>Traditional bottom line</th>
<th>Risk self selection</th>
<th>Claims cost reduction</th>
<th>Service fees paid by the customer</th>
<th>Telematics costs</th>
<th>Benefits retrocession</th>
<th>Bottom line with telematics</th>
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<tr>
<td>1%</td>
<td>1.8%</td>
<td>2%</td>
<td></td>
<td>1.2%</td>
<td>~1.15%</td>
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<tr>
<td></td>
<td>Hardware</td>
<td>TPS</td>
<td>3% + 0.5% intermediary</td>
<td></td>
<td>Discount to customer</td>
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<tr>
<td></td>
<td>Intermediary</td>
<td>additional</td>
<td></td>
<td></td>
<td>1.8% + 0.6%</td>
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<td></td>
<td>additional</td>
<td>remuneration</td>
<td></td>
<td></td>
<td>0.6%</td>
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</tr>
</tbody>
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**Figure 13: The benefit of telematics on the insurer’s bottom line**

Source: Carbone, M., 2016
Looking at best practices across all countries in the survey, we identify five value creation levers:

**a) Risk selection**

Telematics can be directly or indirectly used to select risks at the underwriting stage.

This category comprises approaches that enable risk selection in the new client acquisition phase or when renewing a policy. On the one hand, these solutions take advantage of the auto-selection and dissuasion of risky behaviour propensity which typically characterize a product requiring the installation of a black box. On the other hand, they support the integration of static (traditionally used) variables with a set of telematics data collected for a limited period.

Products featuring ongoing telematics monitoring are generally not attractive to risky clients and thus tend to counteract adverse selection and fraudulent intents. Moreover, data collection limited to the underwriting phase can directly improve the overall quality of the underwriting process, thus facilitating price adjustments or agreements and options related to the monitored outcome.

**b) Risk-based pricing / individual pricing**

One of the most prominent telematics benefits is the possibility to incorporate the information registered by a black box into the parameters of the MTPL tariff.

Telematics facilitates ongoing monitoring of the quantity and level of risk exposure throughout the coverage period. Accordingly, the risk can be calculated on the basis of the information gathered from the vehicle. This has a direct impact on pricing for individual customers.

There are many ways within three main categories to use this type of data in the tariff mechanism:

1. The commercial approach: telematics is considered as an option on the existing tariff or as a stand-alone product.

2. The value proposition for the customer can be “real individual pricing” — based on the calculation and charge of the fee corresponding to that particular customer, which is applied during the year — or a fixed discount level for the first year and the promise of a discount. The latter becomes a concrete proposal at renewal based on the customer’s registered driving behaviour in the previous 12 months.

3. The types of variables incorporated with the tariff — which may refer to the mileage only (PAYD) or may also take into consideration other data regarding driving behaviour (PHYD).

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31 Source: Carbone, M., 2014
Of course, an initial potential concern of such an approach would be the impact of an individual rating on the insurance principle of mutuality. However, especially for compulsory lines of business such as motor, mutuality will not be affected. Most likely, risks will simply be ranked based on a combination of telematics data and other criteria rather than on the standard parameters used in the past. Certain boundaries of “affordability” for the insureds will remain, as will the current mandatory regime to issue policies.

Telematics could actually improve the consumers’ position, as their premium will be based on their driving style, which they can strongly influence themselves. This would be in contrast to the previous set of static criteria that placed them into pre-determined risk categories.

c) Value-added services
Value-added services consist of policy-related services for customers based on telematics data. In practice, ancillary services are proposed to the insured clients in order to exploit relevant data detected and sent via telematics. These services must be provided directly by the insurance company or specialized partners.

On the one hand, these services represent a way of de-commoditizing car insurance policies and provide an additional source of income by identifying and developing new solutions based on client needs, which can now be measured and captured. In the medium to long term, this feature will become increasingly important because of the de-risking trend in MTPL business with technological progress related to security and connected cars. On the other hand, the delivery of these services is generating new opportunities for interaction and stronger ties between the client and the insurance company.

This change has great potential, as many customer satisfaction surveys confirm that there is a clear link between customer satisfaction and the level of interaction with the company. This is true both for Italy and other countries. A large part of the Italian telematics portfolio is based on products with an explicit yearly services fee paid by the customer.

d) Loss control – Loss ratio improvement
While underwriting has been the typical entry point for telematics programmes, the market is currently also addressing opportunities to generate additional value on the claims handling side, where insurance companies may substantially improve both customer experience and loss ratios.

Telematics-based insurance policies combined with black boxes also facilitate the use of data detected by sensors and thus enable the development of claims management processes that provide more rapid insurance intervention if an accident occurs.

Information gathered via telematics makes the entire claims process faster and more efficient with:

- rapid claim detection (anticipating the first notice of loss)
- better claim descriptions (via direct contact with the client)
- easy rerouting to own network of repair shops

The use of structured information coming from telematics sensors therefore enforces objectiveness and effectiveness of the claims management process. It optimizes the claims evaluation process by providing structured and objective information about the claim and giving the claims handler a better description of the crash dynamic (braking, speed, cornering etc.). The best practices in the Italian market accelerated claims settlement by 5% and reduced claims costs by almost 6% on the telematics portfolio.
Telematics also reduce the risk of customers reporting fraudulent claims. The collected data provides information about driving behaviour just before a crash which can be used in case of in-court processes. This will help to greatly improve fraud detection.

Finally, with the support of machine learning processes, insurance companies are able to analyse this huge volume of data and establish regular exchange with the client based on a predictive approach, which would take into account risk factors such as bad driving habits, car maintenance issues and dangerous weather conditions. Loss prevention could be the next area of innovation to lower loss expenses. Within an insurance telematics programme, redesigning claims management processes is one of the key aspects to maximizing the ROI of the initiative.

e) Loyalty and behaviour modification programmes

The current discussion on how telematics will evolve focuses on gamification and reward mechanisms: to manage client engagement and retrocession prizes other than insurance premium discounts. For example, Allstate in the US has adopted a score- and prize-based system related to driving behaviour. Clearly, international best practice is Vitalitydrive, the programme of South African company Discovery that has managed to create a motor-telematics policy based on driving behaviour, with a cash-back incentive for gasoline bought from selected partners replacing premium discount.

Looking into gamification use cases, insurers can retain an incremental quota of generated value through telematics solutions that provide rewards financed by partners instead of premium discounts. This approach requires the creation of an ecosystem where different partners provide tangible value for the customer.

Rewards can be effective ways to steer behaviour if they are built on mechanisms resulting in frequent interaction with the client. From this point of view, driving behaviour monitoring and reward-system mechanisms have a greater influence on behaviour than a tariff calculating the renewal premium based on the same variables. In this context, insurers should also keep in mind cultural variances, as different age groups and cultures react differently to the same value proposition.

The insurance sector thus faces a double challenge: first, to introduce a new, creative approach to product development and second, to acquire the skills to manage both gamification dynamics and partner ecosystems.

To ensure that the development of UBI and telematics take the right turn, insurance companies also need to make their pricing transparent and facilitate the alignment of interests with insureds.
Evidence of frequency decrease in Italy

The combination of ADAS and telematics has extensive consequences on road safety and therefore on the insurance sector. According to a joint whitepaper by Here and Swiss Re based on data from the World Health Organization (WHO), we expect basic, sophisticated and advanced ADAS to reduce claims frequency by 25–27% for such vehicles. Considering market penetration of such vehicles in 2020, the overall frequency will decline by 4.3%. These figures exclude any increase or decrease in mobile phone usage. 32

ANIA analysed a sample relative to 86.6% of motor liability premiums written in 2014 and discovered that the overall claims frequency is 4.77%.

The comparative analysis of the claims frequency of vehicles with and without black boxes showed that the raw difference of 5.4% is relatively low. However, this difference becomes more significant once the results are controlled for some key variables, such as the province of residence or the age of the driver.

The claims frequency 33 of vehicles with black boxes and drivers aged between 18 and 25 living in Naples is 6.08%. For vehicles without black boxes and drivers of the same age living in the same province, the claims frequency is 8.31%. These values are equivalent to a total raw difference of 26.8%. 34

Therefore, the most significant result of the analysis is that black boxes in vehicles reduce the claims frequency by an average of about 20%, all other factors being equal. 35 The geographical area appears to have the highest interaction level with black box absence/presence, as the average “standardized” claims frequency reduction results in 20%. 36 Additionally, there is a positive and significant correlation between “standardised” change and either the penetration of black boxes or the incidence of fraud. 37

To conclude, the results show that the use of a black box reduces risk. There are three possible explanations, none of which is mutually exclusive:

1. Best drivers signal “their type” by accepting the black box and/or insurers selectively improve their underwriting
2. Black boxes reduce fraud and/or inflated claims
3. Customers insured with a black box increase their attention and effort to drive safely 38

The following article by S. Desantis and G. Giuli (both from ANIA) provides further evidence regarding the impact of telematics in Italy. This article examines claims frequency. After focusing on the issue of driver self-selection of contracts with a black box, this chapter summarizes a recent technical note by M. Cosconati about the impact of black boxes on accident probability.

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32 Source: The Future of Motor Insurance, Here and Swiss Re, 2016
33 Caused claims frequency is the number of claims notified, divided by the number of insured vehicle years (or the number of insureds or number of policies) and differentiated by the cause of the claim. Insurers differentiate two types of auto insurance claims: property and liability. Property claims cover any type of physical damage to your own vehicle. Liability claims include property damage or personal injury caused by your vehicle to a different party. (Source: European Motor Insurance Markets, Insurance Europe, November 2015; http://www.swinglecollins.com/claims-frequency-when-is-it-wise-to-file-an-auto-claim/)
34 Source: ANIA
35 Source: ANIA
36 Source: ANIA
37 Source: ANIA
38 Source: ANIA
How telematics change the motor insurance landscape
by Sergio Desantis and Gianni Giuli (ANIA)

The penetration of telematics in the Italian automobile market
The spreading of black boxes in Italy has been closely linked to the general evolution of technology, which strongly influenced insurance products based on the use of telematics paired with MTPL insurance policies.

If at first (at the end of the 90s) the technological devices were mainly anti-theft devices allowing the geo-location of the vehicles, in the second step (started in mid-2000) the tools became increasingly sophisticated (including accelerometers and crash assistance services) and allowed to determine tariffs for term policies or “pay as you go” policies. But it was only at the beginning of this decade that black boxes started monitoring the driving style of drivers fostering the development of more and more sophisticated tariff determination techniques aimed at controlling the driving style of insureds and introducing the “pay how you drive” practice.

The development has been particularly fast and pronounced: if at the beginning of this decade (2010-2012) the incidence of insurance contracts with clauses referring to black boxes was below 5%, it is estimated that at the end of 2016 this incidence fluctuated between 16% and 17%. Thus, almost 5.0 million private cars out of more than 30 million insured opted for the installation of a telematics device in 2016 (they were slightly more than 1 million at the beginning of 2010). The annual average growth was higher than 45%.

Considering that the spreading of MTPL policies with telematics devices is not uniform throughout the insureds population, it is useful to provide an idea of the risk profiles:

a) Which profiles register the highest incidence
b) Which profiles have grown over time compared to the national average

The base characteristics of the insured (for example age and sex) clearly highlight that in Italy there is a higher incidence among very young people (18–23 years) and among young people (26–31 years) who are considered the most high risk profiles; in the period between 2012–2015 there was an increase (more pronounced compared to the general annual average), also for the central age section (46–51 years). This development shows how the interest towards this type of policies is progressively widening, affecting also those individuals with a lower risk profile.

The incidence in black boxes is equal between the two sexes, with a slightly higher increase over time for women compared to men.

Also with reference to a vehicle’s characteristics, those considered at higher risk have more telematics devices on board (in particular more powerful cars more involved in claims) even if, as recorded for the insured’s age, the penetration of such devices has grown transversely over time for lower-powered vehicles as well.
If we consider another parameter, such as the age of the vehicle, it appears that the highest incidence of black boxes is in cars less than 2 years old. This happens because these days such devices are often already installed before the car comes to market and because new cars, highly exposed to the risk of theft, are more likely to use black boxes to locate the vehicle when stolen. Interestingly, however, it emphasizes how the growth has been very pronounced also in older vehicles (between 6 and 10 years) and in more than 10 years old vehicles. This also shows how the appeal of innovative products is both transversal and growing across very different types of risks.

The effects of the black boxes on the claims experience of the insureds

By analysing past claims experience among the insured who have installed any type of telematics device (particularly those monitoring driving styles) and those who have not, it is interesting to compare the trends of the technical indicators that lay the basis for tariff construction of MTPL covers: claims frequency and the relative average cost.

This type of assessment has been made on a large number of data (over 3 million policies with a device installed and about 20 million policies without), relative to the Italian MTPL market for the period 2012–2015.

In this period, the results of the analysis show that:

1. the **caused claims frequency** for those vehicles equipped with black boxes (except for 2012) is always lower than those vehicles without black boxes (by between −2% and −5%); this is a clear sign of a more careful driving style by those who are aware of being monitored;

2. the reduction in claims experience (measured by the drop in claims frequency) between 2012 and 2015 was nearly double for vehicles with black boxes if compared to vehicles without (−14.3% vs −7.7%);

3. vice versa, the **average claims cost** is slightly higher for the vehicles equipped with black boxes than those without (up to +3%, except for 2012 when it was lower). This result may be explained by the fact that those who do not wish to be monitored while driving (and, therefore, at the moment of a possible claim) may be more inclined to report claims, also potentially fraudulent. The latter usually have a lower claims cost. Having a telematics device on board would trigger that virtuous circle under which moral hazard, which takes on the feature of fraud in its most extreme appearance, is reduced.
A “rough” comparison of the technical claims frequency indicators may affect the conclusions of the analysis, since the mix of risks at the base of the two “insured universes” (“those equipped with the black box” and “those who are not equipped with it”) might be very different. In other words, there is not a uniform distribution in the risk profile between those who accept the installation of the black box and those who do not. In general, the insured with the highest risk (or who inhabit areas with a higher accident rate) opt for a “pay how you drive” cover in order to pay a lower final premium.

In view of neutralising the different mix of risks between the two “insured universes” (caused by individuals with different ages, by the more or less high concentration in different geographical areas with very different claims experience, by different vehicle characteristics etc...), a multivariate analysis (multiple correlation) has been taken out, on the frequency of claims caused by private motor vehicles, in order to pinpoint “pure” riskiness of the vehicles equipped with a black box compared to those without a black box.

This study (based on 2015 data) shows that, once excluded the effects of all other parameters, claims frequency for vehicles equipped with black boxes is decisively better compared to claims frequency for vehicles not equipped.

In fact, if from the analysis of the “rough” claims frequency reported above, there seems to be a contained gap (an index of claims experience that is at best 5% lower for vehicles equipped with a black box), once all other factors are neutralized this difference results much higher. For the year 2015, the “odds” of causing damage were on average 20% lower among those who had accepted being monitored while driving, compared to those who had not.

Furthermore by analysing risk factors, for example age of the insured or engine power (typically those factors mostly linked to claims experience), it is interesting to observe that benefits, in terms of claims experience reduction, are transversally detected in all risk classes, but cause greater effects in profiles that notoriously report more claims (and for whom the higher penetration of black boxes is registered). For example:

1) young drivers whose cars are equipped with a black box (in particular those between 27 and 31 years of age, for whom a penetration of above 14% is registered) have a claims frequency (“eliminating” the effects of all other factors) on average 30% lower.

2) powerful motor vehicles equipped with telematics devices (in particular between 86 and 95 kw and for which a penetration of above 13% is registered) show a reduction in claims experience of above 22%.
Finally, the same analysis carried out on the risk factor inherent to the geographical area (represented in this analysis by 110 Italian provinces), demonstrates that greater benefits in terms of claims experience reduction are to be found mostly in high-risk areas (for example, Caserta, Catania and Naples, where there is a difference of more than 30% between those who have a black box installed and those who do not). These benefits taper off in certain large provinces with average claims experience (like Turin, Florence and Genoa) where the differences range between 10% and 20%, to less than 5% and 10% in provinces that are notoriously more virtuous (such as Bergamo, Verona and Trento). Data clearly highlight that the penetration of black boxes in various provinces is directly proportionate to the level of risk: the riskier the area, the stronger the spread of telematics devices.
The issue of self-selection

Most researchers anticipate that the inclusion of control variables, such as age and gender of the driver, black box presence or absence, geographical area etc., will adequately capture the policyholder’s intrinsic risk characteristics, thus allowing the impact of the black box on motor accident rates to be isolated. But what if there are additional relevant factors that cannot be observed? The omission of such regressors could bias the measured sensitivity of the claims frequency to the presence of the black box devices. In regression of continuous variables, the estimated coefficients are little affected by omitted variables, provided that these are orthogonal to the remaining regressors. The estimates are still consistent and unbiased, and the only inconvenience is an increase in the estimated standard deviations of the coefficients and therefore a reduction in their measured precision. Unfortunately in discrete models, even if the excluded unobservable regressors are not correlated with other explanatory variables, the estimated coefficients will be biased and inefficient. The bias will depend on the extent of the unobserved heterogeneity across individuals in the sample. We will now describe the contribution of Cosconati (2017), in which the selection problem is addressed explicitly.

Summary by M. Cosconati (2017)

Cosconati’s 2017 study focuses on the impact of black box-based motor insurance policies – which he labels BBP or black box product – on the probability of causing one or more accidents within a contractual year.

The author recognizes that the black box acts as a screening device to reduce asymmetric information: it is more likely that if a driver chooses the black box, he has good driving skills. At the same time, the black box changes driving behaviour by means of the incentives the company offers: “For instance, one would imagine that the lower the discounts on the number of kms driven, the higher the propensity to drive.” The author observes that the effect of BBPs on accident frequency is “conceptually different than the effect of other traditional variables, e.g. the vehicle’s characteristics. In the case of a BBP product, the researcher tries to assess the impact of a particular contractual arrangement, while in the case of the age/power of the vehicle, for example, he wishes to ascertain the impact of an observable characteristic of the driver/vehicle on the claims frequency”. Cosconati explains that presumably once the structure of the BBP changes, the “effect” of the black box varies too. In essence, what matters in determining the accident probability are the incentives rather than the hardware as such. He acknowledges that this distinction is not considered by many companies because they typically compare the realized average cost among adopters and non-adopters. While this exercise is prima facie an informative correlation, it has little to do with the “true” impact of the BBP on accident frequency.

To tackle this self-selection problem, Cosconati appeals to two pieces of information that might help to throw light on how far behavioural change induced by the BBP is relevant to claims frequency. Specifically, he suggests that:

- Different accident rates for the same consumer between year t and year t+1 are likely to reflect different effort levels towards driving safely when a black box is present.
- Different accident rates between two cars – one with a black box and one without – that are insured by the same driver may indicate that driving behaviour is affected by the presence of the telematics device.

M. Cosconati’s note concludes that insurance telematics are likely to enhance the market’s efficiency in the long run and under appropriate regulations will have positive effects for both consumers and insurers.

39 Source: ANIA
41 As he explains this dictation highlights the conceptual difference between the contract and the technological device per se, the so called “black box”.
Swiss Re conclusion and outlook

Swiss Re conclusion
ANIA analysed claims data of over 3 million telematics-based motor insurance policies and compared them with data of around 20 million traditional motor insurance policies. The claims frequency is lower for telematics-based policies paired with a black box than for traditional motor insurance policies. This indicates that drivers with a telematics-based motor policy may drive with greater care and therefore have fewer accidents. However, the average claims cost for vehicles equipped with black boxes is slightly higher than for those without black boxes. This might be a result of moral hazard or a stronger tendency to report claims.

Further interesting evidence is the reduced claims experience, which is detected among all driver risk classes. This effect is more pronounced in areas with a higher penetration of black boxes and where more claims are reported, e.g. young drivers (aged between 27 and 31) equipped with a black box, for whom a penetration of above 14% is registered, have a claims frequency on average lower by almost 30%. In geographical terms, the same pattern of a more pronounced reduction in claims experience can be found predominantly in high-risk areas. The ANIA study shows that the spread of telematics-based insurance policies is increasing in line with the riskiness of a geographical area.

Structural interpretation
Even if the effect of an installed black box on accident rates can be isolated and measured accurately, it is not straightforward to attach a meaningful economic explanation to any empirical regularity. There are at least two structural explanations that could link measured claims incidence with the presence of the black box:

- **Adverse/advantageous selection**: drivers with a particular innate driving ability may choose a telematics-based policy. For example, safe drivers might be tempted to install black boxes in their cars if there is a financial incentive of lower insurance premiums.

- **Moral hazard**: drivers with a black box may increase their attention and drive more safely while those without may not change their driving behaviour. The average overall effect will depend on the balance in these behavioural effects in terms of the average/aggregate claims.

[Note: ANIA also notes that the presence of black boxes may reduce fraud and/or inflated claims. This can be thought of as another manifestation of the moral hazard explanation, especially if telematics devices provide additional information on vehicle location, damage incurred etc.]

If we could accurately detect and measure driver types, this could be an additional control variable in the regression analysis to help distinguish between competing explanations. But in practice this is one of the unobservable factors that could influence the claim incidence rate and contribute to the potential bias in the estimated regression coefficients. As a result, using only high-level data, it is difficult to separate the effects on safety of having telematics-based insurance from the effects of self-selection bias (i.e. the personal factors that motivate people to choose telematics policies).
However, M. Cosconati appeals to two pieces of information that might help to throw light on how far behavioural changes matter for claims frequency. Specifically, they suggest that:

- Different accident rates for the same consumer between year $t$ and year $t+1$ are likely to reflect different effort levels towards driving safely when a black box is present.
- Different accident rates between two cars – one with a black box and one without – that are insured by the same driver may indicate driving behaviour is affected by the presence of the telematics device.

Using this strategy, he finds evidence that the black box reduces accident probability via moral hazard; however, one has to be cautious in making any statements about the overall quantitative impact.

These hypotheses are not entirely watertight. In particular, two years of claims history may be too short a time period for material changes in driving traits to reveal themselves. Likewise, a policyholders’ multiple cars may be used for different purposes, at different times/locations, by different delegated drivers etc., all of which would materially impact on the claims experience, irrespective of the presence of the black box. Such considerations mean that any statistical analysis is unlikely to be entirely conclusive. Nonetheless, results from selected regressions that review different features of cross-section and time series variation in the data may be useful in drawing inference about how telematics may be changing the structure and dynamics of insurance markets.
Key Learnings and outlook
To summarize, the above findings show that telematics influence the motor insurance landscape significantly. This is reflected e.g. in the risk selection (which can enable insurers to select and price risks more accurately), in more efficient claims handling processes and in changing loss frequency and severity (reduction in expected losses for insurers and overall decrease of insurance premiums for drivers). All these factors lead to lower insurance claims, less severe injuries and significantly improved road safety. In particular, ADAS can reduce accidents by 25–27% on top of telematics reduction, and therefore these two trends change the nature of motor insurance.

Although there is not yet any strong statistical evidence about the changed or improved driving behaviour of customers with telematics-based insurance policies, the analysed data indicates a positive trend that this will be the case in the near future. However, we see this linked to the need for advanced schemes, such as PHYD.

We learned that consumers of motor insurance policies in Italy are willing to buy a telematics-based insurance policy because the advantages clearly outweigh the disadvantages. The key drivers prompting customers to opt for a telematics insurance policy are discounts on the insurance premium and lower premiums in the long term, enhanced safety and improved claims experience. Possible reductions in premiums and the perceived value of additional services have more weight than any privacy issue, as in our daily digital lives we are constantly experimenting with more convenience and social networking, spreading thousands of digital fingerprints throughout the web.

In the US and UK, gamification concepts are becoming more popular. Gamification elements attract young drivers in particular, as they enable drivers to compete against others at a national, regional or even personal league level, comparing driving style or mileage. Examples for international best practices can be found in South Africa (Vitalitydrive by Discovery, see chapter “Telematics value proposition for insurers”).

Telematics are expected to spread at an even faster pace in the next few years. Its popularity has increased rapidly in Europe, driven mainly by Italy, and UBI subscriptions are expected to take off in the UK, Germany and France within the next five years. More than 100 million telematics-based policies are expected to be in force by 2020, generating premiums in excess of EUR 250 billion.

Telematics can be seen as a starting point and a door opener to many new opportunities for both insurers and customers. Other areas, such as property and life and health will also change, as connected cars, connected homes and connected lives could merge into a connected world protected by connected insurance policies. This will not only bring benefits but also risks (for example cyber risks) to insurance companies and their consumers. Health wearables collect health data and could potentially revolutionize the health sector if data is sent automatically to a doctor or to an insurance company. Smart home devices could make houses and apartments more secure with the ability to monitor them in order to prevent fire or other types of damage, in this way preventing losses for insurance companies.

Consumers will continue to gain a better understanding of telematics and companies will find innovative ways to leverage the data collected by the corresponding devices far beyond the motor landscape.

Finally, telematics will pave the way towards autonomous driving, for which this technology is core. Looking at the statistical and behavioural analysis, which has already started in Italy, we believe that further in-depth examination should be carried out in order to anticipate customers’ driving behaviour and achieve the best customized products and services.

42 Source: The Future of Motor Insurance, Here and Swiss Re, 2016
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