Evolution of Insurance: A Telematics-Based Personal Auto Insurance Study

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Evolution of Insurance:
A Telematics-Based Personal Auto Insurance Study

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Abstract

Insurance has been constantly evolving since its inception; nowadays, insurance has become an indispensable part of people’s daily life. Nonetheless, very few individuals understand the mechanism behind their insurance coverage. This paper focuses on the evolution of personal auto insurances. The first part of the paper summarizes traditional pricing techniques for personal auto insurance and discusses their deficiencies. The second part of the paper introduces telematics insurance, an innovative form of auto insurance. This new kind of insurance integrates telematics as well as other technologies in the premium calculation process. The study proceeds to evaluate the pros and cons of telematics insurance for both the insurers and the insureds. The paper then explores the likely evolution of personal auto telematics insurance, including the devices used to capture and transmit relevant data, customers’ attitudes toward this product, potential insurer enhancements and possible new regulations. In my view, telematics insurance has a promising future, although increased regulation may be needed to address certain concerns. The research analyzes real data collected from credible agencies such as the National Highway Traffic Safety Administration (NHTSA) and Willis Towers Watson as well as interviews with insurance representatives from several insurance carriers who offer telematics insurance to reach its conclusion.

Chapter 1: Introduction to Auto Insurance

Insurance is a risk-transfer mechanism that enables the insured party to receive partial or full financial compensation for the loss or damage caused by events beyond their control. Insurance companies accept these risks in exchange for a predetermined amount of money paid by the insured in advance called premium (Macedo, 2009, 1). Insurance companies need to manage these risks appropriately, charging a fair premium for the risks assumed, in order to earn a reasonable profit. The premium cannot be so high that customers lose interest in the transfer and cannot be too low such that insurer profitability is in jeopardy.

The fundamental principle in such a risk management process is called “risk classification.” Insurance companies group people with similar traits to create a large pool and assume they all have the same expected costs. The actuary then calculates a price for the group; each member in the group gets the same premium regardless of individual risk characteristics (Finger, 2006). The traits that insurance companies use to group people together are called “rating variables” (Finger, 2006); in auto insurance industry, the insurers frequently consider driving related and non-driving related rating variables when pricing their policies (Garcia, 2015).

Driving related rating variables include years of driving experience, driving record, claims history, vehicle type, make, use, miles driven annually and location of the vehicle driven (Gusner, 2016). Drivers who have more years of driving experience are considered more proficient therefore would pose less risk than novice drivers. A 2014 traffic safety study in New Jersey found that regardless of age, people who had their licenses for the first
month caused the most accidents (Vallet, 2015). The data also showed that crash rates for teenagers “dropped 26 percent over the first six months they had their licenses and, by the end of the first year, fell 45 percent” (Vallet, 2015).

A clean driving record is another an important indicator to insurance companies regarding the driver’s driving behavior. In general, a traffic infraction like a speeding ticket will cause the rate to go up 20 to 40 percent and a significant violation like a DUI could double or even triple the driver’s auto premium (Gusher, 2016).

Insurance companies collect driver infractions from the local DMVs and claims information from the insureds. Typically, at-fault claims will likely to incur surcharges while not-at-fault claims may not incur surcharges. The number and the amount of claims also matter to the insurers. A driver who has had three claims in three years or a claim amount greater than $1,500 may be viewed as high risk to insurance companies (Gusher, 2016).

Moreover, vehicle type and make play a considerable role in ratemaking. According to a research study done by insure.com across six major car insurance companies, the Honda Odyssey LX is the least expensive car to insure while the Mercedes S65 AMG convertible is the most expensive car to insure. Repair costs, claim rates, and vehicle type are three main reasons behind such rate discrepancy. Luxury and sports cars have higher premiums because they always cost more to repair and tend to be faster on the road. The insurance companies also track claim rates by make and model; if the particular car model has a higher claim rate than others, policyholders are subject to higher premiums regardless of personal claim history (Vallet, 2017).

In addition, the insurers ask their clients to estimate annual miles driven, the location where the car is garaged and how the car is used (personal use, commuting, etc). “Most companies consider driving between 12,000 and 15,000 miles per year about average” (Autonow, 2013, para.1) and companies might discount the premium for low-mileage drivers or increase the premium for high-mileage drivers. Furthermore, people who live and drive in highly populated urban areas are exposed to higher risks than people who live in rural areas due to traffic congestion and higher crime rates in the city.

After evaluating all the driving related characteristics, the automobile insurers weigh in non-driving related rating variables as well when calculating premiums. Age, gender, marital status, educational level, and credit history are all non-driving related components employed by insurance companies to classify and group risks.

The insurers have demonstrated that age, educational level, and credit history have negative correlations with crashes and believe these factors should be considered in automobile insurance pricing. Brian C. Tefft, a senior research associate who is sponsored by AAA Foundation for Traffic Safety, confirms this theory in his research. According to the statistical data illustrated by the graph below, “Population-based crash involvement rates were highest for drivers ages 18-19 and decreased monotonically with increasing age thereafter. Driver-based crash rates were highest for drivers ages 16-17 and decreased until ages 60-69.” Although the crash rate goes up slightly after drivers reach 70 years

In addition to age, education level is also negatively correlated with car accidents which means the higher the degree people get, the lower the risk they would be in a car accident. This hypothesis is corroborated by Sam Harper, Thomas J. Charters, and Erin C. Strumpf, three researchers who published their work in the American Journal of Epidemiology. According to their findings, from 1995 to 2010, people who do not have high school diplomas are much more likely to be killed in car accidents than people who have completed high school or have college degrees. Moreover, the death numbers in the latter groups exhibit a decreasing trend while the death number of people who do not have high school diplomas almost doubles over the years.

Similarly, credit scores negatively correlate with car accidents which means the better credit people have, the less likely they are to be in car accidents. In 2003, University of Texas conducted a research based on 175,647 policies from five insurers in Texas and found that people who had the worst 10 percent of credit scores incurred a $918 loss on
average while people who had the best 10 percent of credit scores incurred a $558 loss on average; incurred losses steadily decline ranging from the worst to the best credit scores (Kellison and Brockett, 2003).

![Figure 1: Average Incurred Losses Within Each Group for Policies Grouped by Credit Score Decile](image)

Gender and marital status also have considerable impact on car accidents. According to NHTSA, men cause 6.1 million accidents per year while women only cause 4.4 million accidents per year. Marital status also matters to the insurance company because statistically, data has shown that married individuals are 50 percent less likely to be in an auto accident than single drivers (Gusher, 2016).

These traditional rating variables are widely used by insurance companies in the risk classification process because they are effective and easy to obtain. Nevertheless, these rating variables have raised concerns over the years and these problems will be discussed in details in the next chapter.

**Chapter Two: Issues with traditional rating variables**

A good rating variable must meet the following standards: it has to be fair to every one; it has to comply with the state regulation; and it has to be able to change with the policyholder’s driving behaviors. Some of the traditional rating variables fail to reach these criteria, and the need to change is imminent.

First of all, insurance company rates must be not excessive, not inadequate, and not unfairly discriminatory. In other words, each person needs to get a just premium from the insurer. However, many rating variables only capture a general trend but fail to distinguish special cases within the group. The premium becomes unjust for some policyholders. For instance, in Chapter 1, we saw that age has been proven to have a negative correlation with crashes; therefore, age is widely used by insurers to differentiate their customers in predicting their possibility of getting involved in accidents. Nonetheless, age only serves as a proxy for maturity and the real reason that contributes to crashes is the difference in maturity rather than the difference in age. As a result, many young matured drivers are forced to pay higher premiums while some older immature drivers pay less than their expected cost. Neither of the groups get a fair premium under the classification of age.
Legality has also become an issue for insurance companies. Many traditional rating variables are considered invasions of personal privacy and some states have already banned insurers from using certain personal information in determining their customers’ premiums. For example, California, Hawaii, and Massachusetts do not allow insurers to rate on age and credit history (Gusner, 2016); Hawaii, Massachusetts, Michigan, Montana, North Carolina, Pennsylvania do no allow insurers to rate on gender (Gusner, 2016). Massachusetts also bans insurers from rating drivers based on their marital status. Therefore, insurance companies must come up with alternative criteria that comply with the state law.

Lastly, most believe that drivers should be able to control the premium they are charged by changing their driving behaviors. Many traditional rating variables such as age, gender, educational level, occupation, and marital status are very difficult to change. People who believe these rating categories unfairly represent their driving risk cannot easily change the premium by changing their behaviors.

In conclusion, traditional rating variables have many problems in terms of fairness, legality, and the inability to change. Fortunately, insurance companies are actively seeking solutions to address these problems. The use of telematics in personal automobile insurance pricing provides one possible answer to the existing dilemma. The next chapter will discuss how telematics can help to solve some of these problems by improving traditional variables and adding new variables to the rating system.

**Chapter Three: Telematics**

Telematics, in a broad sense, refers to any integrated use of telecommunications with information and communication technology (Papp, n.d.) including information transporting, wireless communication and global navigation satellite (GNS). It is “the technology of sending, receiving and storing information relating to remote objects via telecommunication devices” (Papp, n.d.) for the purpose of making people’s life, work, and business easier. 

There are many applications of telematics. For example, a drone is an excellent example of telematics. It is equipped with a radio receiver that receives control signals sent from a hand-held radio control transmitter (Arnold, 2014). Another example of telematics is the intelligent house system that allows people to control the temperature, humidity, and circulation of their houses, even when they are not at home. Telematics is most widely used in automobile industry - car manufacturers use it to build onboard entertainment systems as well as develop pilotless automobiles; fleet owners use it to refine their fleet management process, enabling the fleet to be more organized and efficient.

Telematics is also used by auto insurance companies to improve their risk classification process. As discussed in the previous chapters, insurance companies are concerned with how many miles their clients drive a year because it is positive correlated with crash risks. Nevertheless, letting customers estimate their own annual mileage raises
issues with accuracy, verifiability, and potential fraud. In an attempt to improve this rating variable, Progressive and General Motors Assurance Company introduced PAYD programs along with telematics devices in the early 2000s (“PAYD and Usage-based Car Insurance,” n.d. para. 3). PAYD stands for pay as you drive; it comes with a telematics device on the vehicle which tracks miles driven by clients and sends the data back to Progressive and GMAC monthly. Customers who volunteer to install such mileage tracking devices get a 5 to 15% discount upon installation and a subsequent discount at the end of the term or for the next term if they drive below a certain mileage annually. Using GPS and cellular data to record the annual mileage improves the accuracy of the data, reduces the administrative cost of verifying the data, and reduces the possibility of fraud for insurance companies.

The PAYD program evolved over time and became diversified in type. Progressive found out that telematics could not only track miles driven per year, but also other data such as the time and locations of the vehicle driven. They modified their PAYD program and added new rating variables including the times of the day when the vehicle was driven. Before telematics, insurance companies had no way of telling what time of a day and when their policyholders were using their automobiles. However, with the installation of telematics, they can access these data and use these factors to improve their risk rating system. According to the data published by NHTSA, the highest average number of fatal crashes per hour is from 5:00 to 5:59 pm on weekdays (4.5 accidents/hour), and the highest average number of fatal crashes per hour is from 2:00 to 2:59 am on weekends (5.2 accidents/hour) as illustrated below in the graph.

Moreover, Saturdays and Sundays have the highest number of fatal crashes.
According to the NHTSA, in 2012 (the most recent data available), 5,632 fatal crashes
happened on Saturdays and 5,017 fatal crashes happened on Sundays. As a result, by monitoring what time and day the insured drives, insurance companies can classify people who like to drive at 3 a.m. on weekends as a high-risk group while classifying people who do not drive during peak times as a lower-risk group. By adding this new rating variable, it reduces discrimination raised by occupations, educational levels, and credit history.

The most sophisticated use of telematics incorporates specific driving behaviors of the individual to develop a more comprehensive risk profile. Insurers who have implemented such use of telematics include Allstate Drivewise, Esurance DriveSense, ProgressiveSnapshot, and Travelers IntelliDrive (Smith, 2015). In these programs, the insurance companies not only monitor the time and distance drivers drive but also the way their customers drive. The advanced telematics devices can capture drivers’ braking, acceleration, speeding, turning and cornering behaviors and send the data back to insurance companies for analysis.

Braking, acceleration, and speed indicate the aggressiveness in driving while turns and cornering indicate the level of proficiency in controlling the vehicle. Aggressive driving behaviors include speeding, tailgating, operating the vehicle in an erratic manner or suddenly changing speeds (“Facts + Statistics: Aggressive Driving,” 2015, para. 1). A study conducted by the American Automobile Association has shown that “aggressive driving played a role in 56 percent of fatal crashes from 2003 through 2007, with excessive speed being the number one factor” (“Facts + Statistics: Aggressive Driving,” 2015, para. 1). Moreover, according to NHTSA, in 2012, 52.9% of fatal crashes happen when driving at 55 mph or higher. Therefore, by monitoring drivers’ acceleration, braking, and speed data, insurance companies can know whether this driver belongs to the aggressive driving group and therefore adjusting the premium accordingly.

In addition, by recording drivers’ turning and cornering behaviors, insurance companies can predict the possibility of rollovers. Rollovers are dangerous accidents and “have a higher fatality rate than other kinds of crashes” (“Fatalities,” n.d., para. 1). In 2010, of nearly 9.1 million crashes happened in the United States, only 2.1% involved a rollover yet these crashes accounted for nearly 35% of deaths (“Fatalities,” n.d., para. 1). How a driver takes turns and corners significantly increases the probability of vehicle rollovers – when a driver turns sharply, he/she might experience untripped rollovers caused by the imbalance of the vehicle itself; when a driver corners badly, he/she might experience tripped rollovers caused by curbs or another vehicle.

To conclude, telematics helps the insurance company improve traditional rating variables such as miles driven annually; it also helps the insurers to modify their risk classification system by adding new rating variables such as time and driving behaviors to better predict the risk. What’s more, not only is telematics beneficial to the insurers, it is also beneficial to the insured, and these benefits will be addressed in the next chapter.

Chapter 4: The Benefits of Telematics for Policyholders
From a consumer’s perspective, telematics can bring flexible changes in premium, increase driver’s safety awareness, promote safer driving behaviors, reduce fuel consumptions and lead to a streamlined claim settlement process.

The foremost benefit of telematics for the policyholders is that it gives them greater control over their insurance premiums. Some of the risk factors in traditional auto premium calculation are difficult, and nearly impossible for the policyholders to change. As we discussed in Chapter 2, young male drivers are at a huge disadvantage in traditional insurance pricing, but the insureds cannot change their age or sex. They are forced to pay higher premiums because they are deemed riskier than other groups. In addition, some of the rating variables are correlated with each other; Jeremy B. Bernerth, director of the Management Department in Louisiana State University, pointed out in his article “Demographic Variables and Credit Scores” that marital status is negatively correlated with credit scores while education and age are positively correlated with credit scores. With installations of telematics, drivers are not limited by the proxies of driving behaviors but are rated based directly on their individual driving behaviors. If they want to lower their auto insurance premiums, they can earn discounts by improving their driving habits. Reducing-mileage, driving more carefully, and avoiding rush hours are all effective means to gain a lower premium for the renewal policy. Moreover, installation of telematics is completely voluntary; the policyholders can choose to opt out of the program at any time (Marabelli, Newell, Hansen, and Frigerio, 2017). Such flexibility in the program allows customers to try usage based insurance without any penalty (and usually with a significant discount).

Financial incentives are also effective in promoting driving safety. In a public opinion survey conducted by the Insurance Research Council (IRC), more than half of the participants of the 1,135 participating drivers admitted that they had made changes in their driving behaviors. 36 percent of the respondents said they made small changes and 18 percent said they made significant changes in how they drove following the installation of telematics devices (“Telematics Changing Drivers’ Behavior,” 2015). Moreover, 82 percent of the participants reported receiving driving reports from insurance companies after installing telematics. Of those who received the information, 81 percent of them reviewed the information. Of those who reviewed the information, 88 percent found the information to be helpful (“Telematics Changing Drivers’ Behavior,” 2015).

An additional benefit for customers relating to safer driving behavior is the reduction in fuel consumption expense. Speeding, hard breaking and rapid acceleration could increase fuel consumption by as much as 40% (“Fuel-efficient Driving,” n.d.). When people drive less aggressively under the monitor of telematics devices, they also reduce their fuel cost. Speed is another factor which impacts the fuel efficiency. The graph below demonstrates the relationship between speed and miles per gallon. When driving at 55 mph, the vehicle reaches maximum miles per gallon at the 33 mph mark. However, when drivers are driving over 65 mph the MPG drops sharply, increasing fuel consumption.
Telematics devices can also lead to faster claim settlement process for consumers. According to OCTO, one of the largest telematics device manufacturers in the United States, the average claim processing time for clients have been reduced by 50 to 60 percent. The reason that insurance companies can achieve such astonishing results is because the data collected by the telematics devices helps them to assign responsibility for crashes and better estimate the extent of crash damage. The graph below represents a crash pulse captured by telematics and sent to the insurance companies. From the graph, the insurance companies could determine how severe the accident is by calculating the vehicle’s delta-V. Delta-V is “the change in velocity over the period of time of the impact event occurs (Palmer, 2016).” It is a very accurate measure of impact energy and has been used by biomechanics specialists for decades.

Moreover, the seamless data transmission between the device and the insurance company allows insurance companies to get first notice of loss within minutes or seconds and permits them to notify critical departments such as the police, towing companies, and emergency medical assistance teams (Palmer, 2016).

At the same time, we have to realize that telematics is not perfect. There are still barriers and limitations for telematics devices that hinder the insurance companies from offering the devices and customers from opting to include them for insurance purposes.
These restraints will be discussed in the next two chapters.

Chapter 5: The Disadvantages of Telematics for Insurance Companies

Insurers have three major concerns with telematics devices – installation and administrative cost, data accuracy, and compatibility. Although there are four types of telematics devices on the market (the dongle, the black box, manufacturers’ embedded telematics equipment, smartphone), none of the device platforms are able to address all aspects of the insurers’ concerns - there is always a tradeoff between the cost, accuracy, and compatibility.

The dongle is a self-installed device purchased by the insurer and provided to its customers (usually free of charge). It has a relatively low installation and administrative cost and high data accuracy; however, it is not able to be used in older vehicles and has a relatively short life expectancy. In order for dongle to work, it needs to be plugged in to the OBD-II (on-board diagnostic) port on the vehicle. OBD-II operates like a computer; it is linked to the car sensors and reads the information gathered by the sensors including but not limited to emissions, mileage, and speed (Bolduc, 2014). When the dongle is connected to the OBD-II port, the dongle can also read this data and transport it back to insurance companies. Unfortunately, the OBD-II port only became universal in vehicles manufactured on or after 1996, the year when United States Federal Law mandated the installation of OBD-II port for all new vehicles. Dongle technology is therefore not usable in vehicles manufactured before 1996. This continues to be a huge market and should not be ignored by insurance companies. The graph below represents number of vehicles registered in the United States from 1990 to 2015.

From the graph one could see that there were over one billion cars registered from 1990 to 1995, even if there were only one percent of these cars running on the road today, the number would still be astonishing. In addition, the dongle has a relatively short life span – the average life expectancy is 12 to 18 months. Insurance companies need to replace the devices fairly regularly which may cause customers to run out of patience.
The black box collects the most accurate and comprehensive data for insurance companies, but it has the lowest cost effective ratio. It has the highest installation and administrative cost and cannot be transferred to a replacement vehicle. The black box is a telematics device equipped with its own sensors. This device can detect driving behaviors such as hard-braking, cornering, and turning all of which are directly tied to accident frequency and severity. In addition to the built-in sensors, it can also be wired-in to OBD ports and read data directly from vehicle’s sensors. However, due to its highly intelligent system, it needs to be installed by professionals. These two characteristics of the black box cause the manufacture and administrative cost of such device to be very high for insurance companies. Moreover, when policyholders decide to change their main vehicles for driving, the black box cannot be transferred to the new vehicle. The insurance companies then face a dilemma: install a new black box, at additional operational cost to the insurer or ask the customers to pay for the cost of the new device and risk losing these clients.

The third type of telematics device is embedded telematics equipment installed in the vehicle by manufacturers before the cars come out of the factory. As of the end of 2014, there are over 20 major car manufacturing companies including Audi, BMW, Fiat, Ford, General Motors, Honda, Kia, Lexus and etc. who sell car models with embedded telematics capabilities. When a customer decides to enroll in the telematics insurance program, they simply give the insurance companies the permission to access the data their embedded telematics collects. The advantage of this option from an insurer’s perspective is that there is no installation cost and the data collected is highly accurate and reliable. Nonetheless, the lack of standardization within the automobile manufacturing industry and the potential incompatibility with insurance company requirements become major issues for insurance companies who take this approach. Each car manufacturer wants to provide a unique embedded system to differentiate itself from its competitors and to attract potential buyers. However, the customization of embedded systems by the manufacturers raises technical difficulties for insurance companies as they need to adjust their data collection and management process to accommodate multiple systems. Moreover, this specific telematics insurance can only apply to vehicles with embedded telematics equipment which significantly narrows the market.

The fourth and also the newest type of telematics device is the smartphone. Smartphones can be used with almost no incremental cost for either the insured or the insurers. They possess all kinds of sensors such as accelerometers and gyroscopes which can be used to collect the data; they have large storage capacity to store the data; they also have access to the high-speed internet allowing instantaneous transmission of data to the insurance company. However, the reliability and availability of the data still remain the most significant problem for smartphones. Reliability refers to the accuracy of the data and whether insurance companies will be permitted to make decisions based on the data collected (Handel, Skog, Welch, and Ohlsson, 2014). While dongle, the black box, and embedded telematics equipment all read the data directly from the vehicle’s sensors, the smartphone captures data from the GNSS-receiver (Global Navigation Satellite System).
The data “is accurate, but subject to quite frequent occurrences of undetected outliers as well as irregularities in the data acquisition rate” (Handel, Skog, Welch, and Ohlsson, 2014). For example, the speed detected by smartphones may not be accurate due to outside interferences. Availability refers to the geographical coverage for which the sensor information is available. Due to the signal restrictions, when people drive in areas with fewer mobile base stations, the cellphone might not be able to send data to the insurance companies on time. Another problem with smartphones is potential fraud. When an insured knows that their driving behavior might be considered dangerous (such as drag racing or driving in the early morning hours), they might simply leave the cell phone at home.

In conclusion, there are still many technical shortcomings for telematics devices. No device on the market today can offer accuracy, portability, and cost at the same time. These limitations are also the primary reasons that why not all insurance companies are adopting this technology.

Chapter 6: The Disadvantages of Telematics for Consumers

Auto insurers are not the only group that has concerns with telematics. Even with sizeable discounts offered for first-time users, some customers are still reluctant to adopt telematics for their insurance coverage. This chapter will discuss the concerns that consumers have with telematics devices for insurance pricing.

The first concern about telematics insurance is the insurance premiums do not always go down. While it is true that almost all auto insurance companies offer an upfront discount for new customers who sign up for their UBI programs, it is possible for the rates to go up. According to Progressive, a North America leading auto insurance company, two out of ten participants of its UBI program see an increase in their premiums after the discount period ends (Stauffer, 2017). Apart from reckless driving behaviors, a few circumstances that are outside the control of the drivers can also contribute to the premium increases. For instance, some of the telematics insurance charges a higher premium for driving in rush hours but it is hard for drivers to avoid rush hours if they needed to work during the rush hour time frame. Moreover, people who have night shifts and need to drive at night regularly will likewise incur an increase in their premiums, compared to the average driver.

The second concern about telematics insurance is the privacy and safety of the data captured. Telematics devices, especially the black boxes, smartphones and imbedded telematics equipment, record very detailed data on the driver and the vehicle. They are equipped with Global Position System which allows insurance companies to have access to every location the individual has been to and every route they take to get to those places. Although the insurance companies claim they will not access this information unless an accident happens, an emergency road assistance is needed, or a vehicle theft is reported, many customers have privacy concerns regarding such personal data. Further, telematics devices introduce a new risk from hacking. No matter how secure the vehicle is, “it is only as secure as the least secure internet-connected gadget you plug into it” (Greenberg, 2016), says Jose Carlos, a Spanish security researcher who works at Optiv Inc. He wrote in his
blog that he used the scanning software Shodan and found thousands of publicly exposed “telematics gateway units” (Greenberg, 2016). These units were at minimum security level and he could easily hack into these devices to read the information such as location, speed, and MPG. What’s more, the United States does not have any centralized and formal legislation on data protection. As a result, the security of the electronic transmission of personal data relies on the insurance company’s security protocols and discretion. Many of them do not have sufficient protocols in place to protect their clients’ data. In fact, Jose Carlos found a telematics device model called C4Max which had no password protection and was open to anyone who scanned it (Greenberg, 2016).

The third concern about telematics insurance is the unintended consequences associated with the installation of the device; namely, people might adapt their driving behaviors in unreasonable ways to avoid possible premium penalties. While education is one of the objectives of telematics from an insurer perspective, misuse of this information could lead to inappropriate behavior changes and serious consequences. Just as Peter Rodger, chief driving examiner at the Institute of Advanced Motorists, comments: “A black box only tells you what a vehicle is doing, not what a driver is doing.” For example, some people might change their hard braking habits to gradual braking even when a hard braking is needed in case of an emergency. In addition, some telematics devices would punish the drivers for hard braking but not for driving through a yellow light. As a result, the driver might speed up to pass the yellow light rather than brake abruptly. Running a yellow light is a risky behavior. According to the NHTSA’s data shown below, there were 4,668 fatal accidents relating to traffic signals during 2013 and a total of 2,593,000 crashes relating to traffic signals happened in the same year.

Furthermore, in the Great Britain, two teenagers were killed in a car accident because the driver tried to avoid the penalty of the insurance company’s curfew policy. The driver was
insured with telematics insurance which had a 11p.m. to 5 a.m. restriction; breaking the curfew could impose a 100 pound fine on the next bill. The driver and his friend left the party at 10:30 p.m. and he was speeding to get home before 11p.m. to beat the curfew. However, the car lost control and they both got killed (Bond and Duell, 2013).

The fourth concern about telematics is its inability to distinguish between drivers. The telematics devices are tied to the vehicle but do not currently recognize that there may be different drivers using the car. Consider the situation where the teenage children of policyholders use the family vehicle when learning to driver or as new drivers. Their immature driving habits will be captured by the telematics devices and reported to the insurance companies as their parents’ driving styles. As a result, their parents will face a much higher premium for the next billing cycle.

The fifth concern about telematics is the ownership of the data. Especially for devices that have been installed by the insurer at no cost to the insured, the insurance companies believe that they own the data, not the policyholder. Should a policyholder attempt to switch carriers and maintain the discounts that they have been receiving based on the telematics information, this information will not be accessible to the new insurer and they likely will need to “start over” with the new insurer.

In conclusion, many customers are reluctant to install telematics devices and allow access to their driving data by insurance companies because of privacy concerns, cyber risk and the unintended consequences after installation.

So far, the paper has discussed the pros and cons of telematics insurances for both the insurers and the insured. The final chapter will explore the future of this new technology and its application in auto insurance pricing. How is the technology likely to develop in response to the current known deficiencies? Will customers be more willing to share this data in anticipation of cost-savings? What are potential additional services that insurers can provide with telematics? What are the things that the regulators need to watch out for when telematics insurance becomes prevalent?

Chapter 7: The Future of Telematics Insurances

Telematics insurance is growing worldwide. In 2013, Usage-Based Insurance market penetration was less than 1% globally, three years later, in 2016, UBI had over 14 million subscribers accounting for a 32% market growth (“Usage Based Insurance,” 2017). North America is the leading region in the use of telematics insurance with over 7.1 million active policies (Hallauer, 2017). The final chapter will explore the future of telematics insurances, including the customers’ attitudes and acceptance, future devices for telematics insurance, additional insurance services that might be offered in conjunction with telematics and the potential new regulations for this market in the United States.

Consumer acceptance

Public awareness and acceptance of UBI are increasing steadily, especially among millennials. LexisNexis Risk Solutions is a data aggregation company which provides
consulting services to the government and private corporations. It started to study the U.S. UBI market in 2010 and continued its study every year. The researchers surveyed over 2,000 individuals in 2010, and found there were only 10% of the respondents who were aware of UBI programs. In 2016, the researchers sampled over 4,000 individuals and found that 43% of the respondents were aware of the programs. The percentage of people who are aware of the programs has increased more than 300% over the past six years.

![U.S. consumer awareness of UBI programs]

Furthermore, according to a survey conducted by Willis Towers Watson in 2015, younger generations had more interest in UBI programs than any other age groups. They were also more willing to change their behaviors in response to feedback received from the program. As the graph below illustrates, 71% of millennials were willing to consider purchasing a UBI policy when they knew their premiums would not increase while only 52% of all others were willing to try a UBI program. Even with the possibility of premium increases, 62% of millennials were still willing to try a UBI policy, while the percentage of interest dropped to 42% for all other respondents.

![Figure 1. Consumer interest in UBI policies with and without premium increases]

Moreover, millennials were more likely to change their driving behaviors in exchange for
a discount. Towers Watson’s research showed that of the millennials who were open to UBI, 84% would change their driving behaviors by driving within the speed limit (42%) and keeping a safe distance from other vehicles (35%). Only 53% of other groups were willing to consider changes to their driving habits as a result of feedback received from the UBI system.

Even as customers are becoming more aware and open to the UBI policies, they still have concerns of the program. According to Willis Towers Watson’s survey of 1,005 U.S. drivers in February, 2017 50% of the respondents were concerned with the potential for premium increases and 38% were concerned with data safety. Insurers need to take these concerns seriously when promoting their UBI insurance programs.

**Future Devices**

The dongle and the black box are still the main devices used by insurers on the market. Nonetheless, the smartphone is likely to gradually replace them and become the predominant device for monitoring drivers’ behaviors. Due to its prevalence among Americans, ease of installation, and relative low cost for insurance companies, insurers are likely to move to the smartphone as the preferred data capture instrument. In 2016, 77 percent of Americans owned a smartphone and the ownership was wide-spread regardless of age and income. 92 percent of young adults had smartphones and 74 percent of Americans aged 50-64 also had smartphones. In addition, 64 percent of low-income Americans whose household income were less than $30,000 per year owned a smartphone (Smith, 2017). The smartphone is becoming ubiquitous and it provides a large population base for insurers to promote their UBI programs. Furthermore, using smartphones to monitor drivers’ behaviors saves a huge amount of money for insurers because they no longer need to buy telematics devices, ship them to customers, or install the devices for them. Customers also enjoy the hassle-free participation of telematics insurance by simply downloading an app to their smartphones.

Smartphones also provide more sophisticated data protection than dongles and black boxes. Since dongles and black boxes are linked to the vehicle’s sensors, hackers could hack into the vehicle through these external devices. Smartphone utilizes its own sensors to monitor the drivers’ driving habits. These built-in sensors are not linked to the vehicle therefore reduce the possibility of hackers hacking into the vehicle. In addition, the data transmission of the smartphones could be protected through traditional encryptions and “geo-encryption.” Traditional encryptions convert electronic data into ciphertext so that unauthorized parties could not understand these text easily (Rouse, n.d.) and only authorized parties with the decryption key could read these encrypted data. The “geo-encryption” adds an additional protection to the location and time data, which encrypted these specific data again.

**Potential Insurer Enhancements**

With the development of the technology, smartphone-based insurance could bring
potential insurer enhancements to the customers. For instance, an android application has been developed at Technological Educational Institute of Crete. This application scores driving behaviors at the end of each trip and shows the score and the analysis to the drivers right away. This application provides the users with the most immediate feedback on their driving behaviors so that they could improve the behavior on their next trip rather than wait until the end of the month or policy period. Real-time feedback technology reduces the chance of premium increment caused by accumulated bad driving behaviors.

Meanwhile, this innovation also enables insurers to adjust premiums more frequently than at each policy renewal. Most policies on the market today have a 6-month policy term; premiums are fixed for a six-month period. Changes in the pricing are only reflected at policy renewal. Real-time feedback allows insurers to collect data right after each trip; the insurers will have more immediate information on their customers’ driving behaviors so that, with regulator approval, they could shorten the premium adjustment period. In fact, some insurers have already experimented with monthly premiums but the market needs more time to respond to this change.

There will likely be other value-added services in the future telematics insurance. For instance, the insurers could disable texting features on the phone while driving, provide driver coaching tools for teenage drivers, and keep journey logs on telematics devices for their customers.

Possible New Regulations

Insurance is a highly regulated environment yet the regulators have not responded to telematics insurance in terms of data protection and fair premium. As the telematics insurance continues to grow in market share, new regulations may be needed in order to ensure the privacy of customer data and their fair treatment. There are currently no standards of data collection in each state; it is up to the insurers to decide what kinds of data they want to collect and how they will collect it. The states should step in and specify what kinds of data could be collected, how detailed these data could be, and how long the storage period should be for these data. Furthermore, the states should clarify who owns the data and ask the insurance companies to specify how they will use the data.

The regulators also need to consider possible unfair premium discrimination for customers. In the future, telematics will most likely to be a default option for personal auto insurance; “customers will need to opt out of the program rather than opt in” says Tom Ellis, the editor of an insurance comparison website. It is almost certain that people who choose to opt out of the program will face a higher premium to insure their car. Although there will be customers who opt out of the program because they are bad drivers, some people will choose to opt out simply because they are unwilling to share their personal information with the insurers. This group of people will be grouped with the bad drivers and forced to pay a higher premium, which contradicts the principles of fair premium pricing.
Conclusion

Insurance has been constantly evolving and telematics-based auto insurance is one of the newest examples of this evolution. Despite its privacy concerns and other minor disadvantages, telematics insurance offers the customers a fairer way to pay their premiums and a more accurate way for insurers to calculate their expected costs. Foreseeably, in the near future, telematics insurance will become the dominant way of pricing personal auto insurance. Nonetheless, telematics insurance marks not the end of an era, but the beginning of an epoch in which the insurance companies keep absorbing new technologies to improve the insurance product. With the development of technology, the insurance industry has an unlimited potential for new changes. These changes will lead to a market that is beneficial to both insureds and insurers. What is yet to come? We shall all have to wait and see.
Reference:


http://www.naic.org/documents/committees_c_d_auto_insurance_study_group_151119_public_hearing_compilation_testimony.pdf


