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Privacy: A Growing Risk in the Insurance Industry

By

Amit Mahapatra

A Creative Component submitted to the Graduate Faculty

in partial of the requirements for the degree of

Master of Science in Information Systems

Program of Study Committee

Dr. Anthony M. Townsend

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Iowa State University

Ames, Iowa

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Abstract

With the rapid development of technology-based products and services in recent years, information technology seeps into the pore of people's daily life by adding value-added services in products. Insurance has seen a rapid increase in technological advancements, which has led to an ever-growing risk of privacy, not just in this industry but across all the technology sector. Given this scenario, more data is collected, which increases the risk of data theft, and cyber risk and existing research shows that most organizations do not have sufficient resources to prevent data breaches, deal with notification responsibilities, and comply with privacy laws. Talesh, S. A. (2018) shows how insurance companies play a critical yet unrecognized role in assisting organizations in complying with privacy laws and dealing with cyber theft.

The scope of this research is to make insurance companies be on the front foot of the existing and upcoming privacy laws being incorporated and recommending efficient ways to comply with these laws internally and when exposed to an audit. Additionally, another goal of this paper is to identify and suggest ways to increase user adoption within the Telematics segment, which has been a talking point in the automobile segment of the insurance industry where it has been adopted by 20% of the consumer market as of 2016 but has a potential of taking over the entire section as more data is collected as the days pass by. With such changes, the terms and conditions of every privacy policy are becoming something more than just a fine print.

Keywords: Privacy, Insurance, Risk, Telematics, Cyber Risk, Data Breach

Chapter 1: Introduction

Insurance Industry

The insurance industry has been on the growing end of this ever-increasing technology. Since its inception in 1347, it has been one of the highest profit-making sectors in the country, and its contribution to the GDP growth rate is highly dominant. The companies in this sector are known to offer risk management services in the form of insurance contracts. The basic concept of insurance is one party (carrier) will guarantee payment for an uncertain future event. To get this benefit, the other party (insured) pays a premium, which keeps the party protected from the next occurrence.

The insurance industry serves both personal and commercial sectors through various competencies: Health, Property & Casualty, Life, and Reinsurance. The global insurance sector grew at a rate of 4% in 2017, which is the same level as the compounded annual growth rate from 2010 to 2016[1].

Technology has contributed a lot to this industry and is a part of the success of this industry. For many insurers, the path to digital transformation has been laid out. The goal of digital transformation is to replace the legacy systems with an all-cloud integrable chassis, which is evident with 7 out of 10 carriers. The goal here is simple: cost savings and pay-as-you-consume contracts are likely to continue to push usage. The next target for this transformation is to utilize the other benefits of the cloud platform, namely speed, flexibility, and scalability for the entire organization[2]. An example here is EMC Insurance Companies, headquartered in Des Moines and

[1] https://www.mckinsey.com/industries/financial-services/our-insights/2019-global-insurance-trends-and-forecasts
[2] https://www2.deloitte.com/us/en/pages/financial-services/articles/insurance-industry-outlook.html

known for its presence in the Property and Casualty segment, recently announced an entirely cloud-based insurance suite partnership with Guidewire Software to accelerate business transformation and growth. This multi-year projected will be delivered as a Software-as-a-Service (SaaS) solution, powered by Amazon Web Services, by Guidewire Partner Connect consulting member, PwC, who will be leading the implementation project[3].

Privacy Laws and its Impact

Insurance as a service is known to collect any Personally Identifiable Information (PII), and within this trend of digital transformation, there will be a lot of data collection and storage within a given organization. The privacy laws that exist across the globe will now enter the discussion. Pieters, Wolter. (2017) talks about the impact of privacy in our social culture by these information system technologies and how we should be narrowing our focus on how the IT-related development will impact social sustainability, which he terms as "information impact assessment."

Given the scenario with the privacy scare that involved the big tech giants, Facebook, the laws around this term has started to become stricter. Relevant to our research, the California Consumer Privacy Act (CCPA) has broadened privacy requirements with a compliance deadline of January 2020. The other known privacy act, the General Data Protection Regulation (GDPR), which is prominent in the EU, is similar in terms of CCPA and lays down rules relating to the to the protection of natural persons with regard to the processing of personal data and regulations relating to the free movement of personal data. . Companies serving or employing California residents need to focus on the following five requirements that may or may not impact their day-to-day businesses:

[3] https://www.guidewire.com/about-us/news-and-events/press-releases/20190909/emc-insurance-companies-selects-guidewire-cloud

1. Data inventory and mapping of in-scope personal data and instances of "selling" data
2. New individual rights to data access and erasure
3. New individual right to opt-out of data selling
4. Updating service level agreements with third party data processors
5. Remediation of information security gaps and system vulnerabilities

Reverting to the digital transformation example at EMC Insurance, Guidewire will be partnering up with a lot of third-party vendors to accommodate EMC's business needs, and when PII information is traded within the organization, it will be stored and used in some form or the other by these third-party vendors (tools). Any data breach with even one of the vendors could put the entire organizations' business in danger, given the ever-growing stricter privacy laws. Therefore, there is a need for managing and keeping track of all the PII information that comes under the CCPA Act, for the time a customer/agency/policyholder decides to act on it.

Use Case: Telematics

The scope of this paper is solely focused on a niche segment of the insurance industry, specifically the automobile segment, with applications spanning across the entire industry. With the introduction of Telematics into their ecosystem, this has undoubtedly been an upgrade from the traditional method which involved calculating insurance based on the policyholder's past claims. Telematics considers the parameters such as mileage, driving behavior, types of road driven, and much more into account for premium calculation. Further, this can also be used for additional services such as automatic emergency calls, stolen vehicle monitoring, and diagnostic functions of the vehicle which would incorporate economically more convenient and safer driving suggestions. Another use case: fraud detection in the claims handling process can be simplified using this

innovative technology. For example, a policyholder using the services of telematics would reap the benefits of it by having a good record of driving which would lead to a lesser premium as compared to another policyholder which would have a higher premium if the driving behavior is entirely opposite to the former. This technology has the scope of going into directions which involves gaining a competitive advantage by analyzing driving behavior but could also undergo losses because of the market prices on this technology and the consistency required in individual risk.

Despite various studies proving that telematics has improved the customer experience, the adoption rate for this technology does not reflect the growth of this industry. Today's adoption rate remains below 20%, which is pretty low given how mainstream insurance market is in the United States. There are some countries where regulators want to mandate the use of telematics devices in the automobiles to increase customer safety, but we are a long way away from that future given the scope of privacy environment we are exposed to at this given moment. There are various ways where carriers are implementing these devices into modern automobiles. These are a few examples:

1. Smartphone Application
2. Cigarette-Lighter Plug
3. Smart Tag
4. OBD Device
5. Battery Line
6. Windshield Mounted Device
7. Black Box

One of the driving reasons is concerns with privacy and how the insurance carriers might/might not share the information.

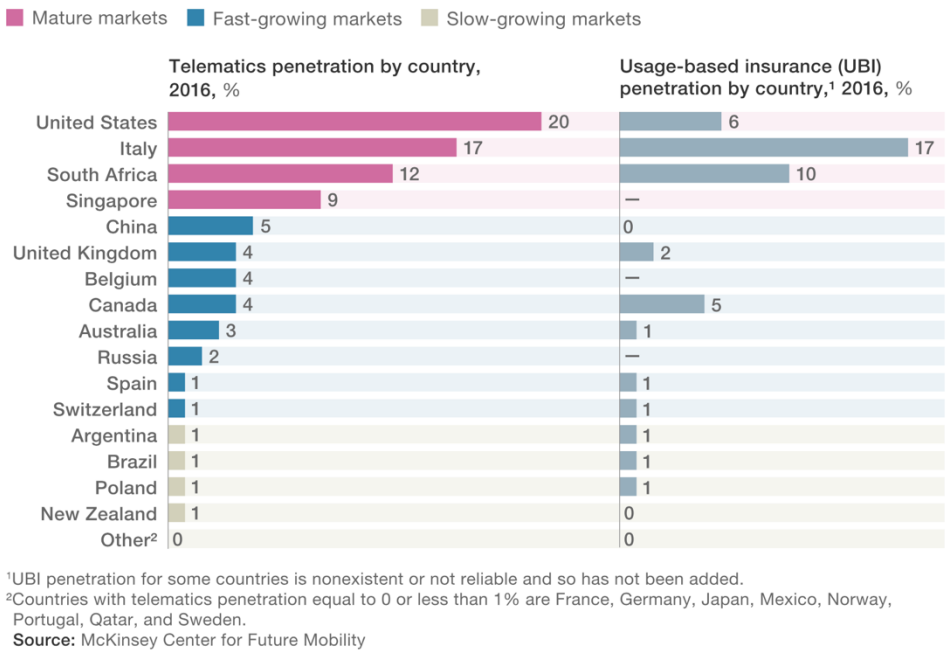

Figure 1 Adoption Rates across the Globe[4]

[4] https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/telematics-poised-for-strong-global-growth

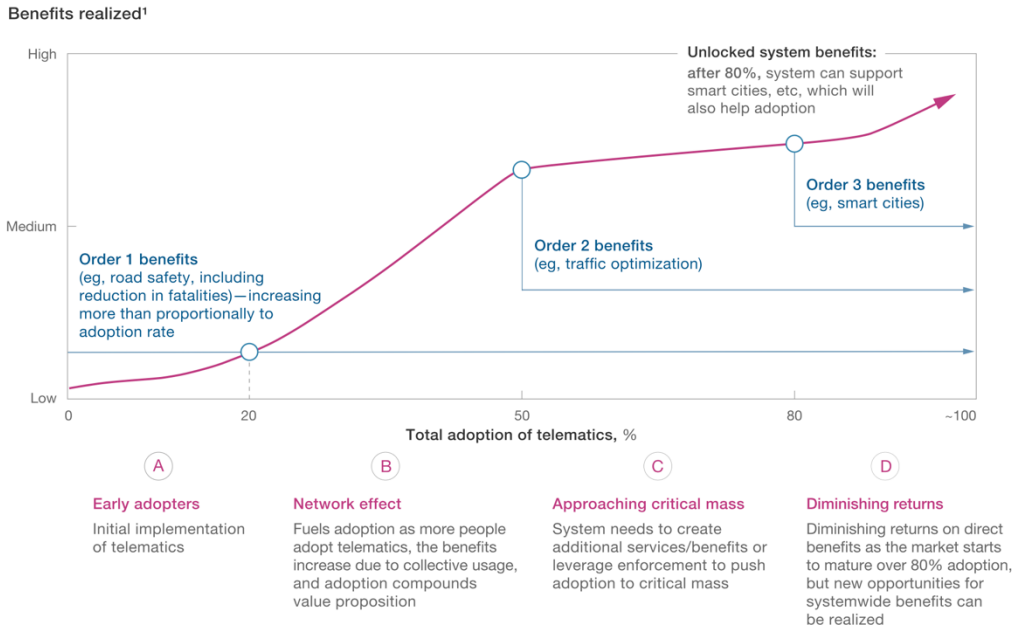

Figure 2 Adoption Cycle

The purpose of this research is to answer the following questions with existing application and methods in the academic and technology world:

1. *Identify and Recommend methods for adopting better telematics models into mainstream without any skepticism and showing concerns towards privacy and data breaches.*
2. *Identify methods to manage personally identifiable information (PII) within an organization to increase trust with the customers.*

Chapter 2: Literature Review of Possible Solutions

The insurance industry, at least when it comes to motor insurance, has reached its mature lifecycle stage especially when it comes to less developed markets, where Motor insurance is the most critical part of the product portfolio (Husnjak, S., Perakovic, D., Forenbacher, I., & Mumdziev, M., 2015). This study also proofs that 70% of the participants have indicated a positive response on their driving score which implies that telematics is a technology to start within the insurance industry.

Vehicle telematics technology, which has taken the automobile insurance industry by storm, involves the collection, transmission, and analysis of data collected from a device installed in a motor vehicle (Vaia, G., Carmel, E., & DeLone, W., 2012). The study involving the Italian automobile industry provided essential conclusions on the broad potential of the emerging information-intensive technology that would create benefits for the stakeholders involved in this business.

Telematics technology also provides data that are both more detailed and more reliable than conventional self-report driving data, and so help identify driving maneuvers associated with risky driving and overall trip safety objectively (Ayuso, M., Guillen, M., & Perez-Marin, A.M., 2014).

Nowadays, under the pressure of increasing competition, trying to achieve a cost reduction for both the insurer and the policyholder, some insurance companies have developed Usage-Based-Insurance models (Baecke, P., & Bocca, L., 2017).

But even with studies like, Desyllas, P., & Sako, M., 2012, that have come up with solutions that shines more knowledge on profiting from the Usage-Based-Insurance model, the significant concern still lies in predicting the exposure to the risk factor for the policyholder. The term exposure frequently appears in transportation research publications and can generally be defined as the quantified potential for loss that might occur because of some activity.

A study by Paefgen, J., Staake, T., & Fleisch, E., 2013 proposed a methodology for multivariate modeling of the exposure-accident relationship with the data collected from the In-Vehicle Data Recorders. This study also explained the differences between accident-involved and accident-free vehicles. Separate research by Wahlberg, A.E. (2003) used accidents as the dependent variable for predictions from behavior variables which resulted in various difficulties. However, this study managed to show some concrete results which involved a correlation between accidents and some necessary variables.

Another study by Segovia-Vargas, M.J., Camacho-Minano, M., & Pascual-Ezama, D. (2015) that encapsulated psychological factors might affect the driving behavior was carried out. However, concrete results weren't produced that could prove the argument as the participants in the study in Spain had to renew their drivers' license regularly.

The Ayuso, M., Guillen, M., & Perez-Marin, A.M., (2014) study concludes that fewer experience drivers have less time to the first crash which also involved gender differences, as it was a factor that was influencing the driving patterns on the risk of an accident. Because driving speed is one of the most critical factors contributing to automobile crashes and severe injuries, the research by Jun, J., Guensler, R., & Ogle, J. (2010) showed that accident involved drivers showed higher tendencies of non-compliance with the posted speed limit which leads to the conclusion on how

important it is to integrate the acceleration and braking variables into the telematics scenario to better understand the speed patterns of the drivers and creating a real-risk profile of the policyholder. Further, a study to be considered by Litmann, T. (2005) where mileage is also viewed as a significant risk factor which has been identified by insurance actuaries. The study highlights the fact that even drivers who never violate traffic rules face risks beyond their control with the possibility of an animal running in front of the vehicle or a catastrophic mechanical failure have a minor chance in contributing to the crash. This study emphasizes the importance of the variables that are missing from the current telematics research in the risk selection process.

The other issue that can be addressed in this context is that of privacy. We are in a generation where despite consumers appear to trust SNSs to protect their private information; they are reluctant to believe advertising or brands on these sites (Louise, K., Gayle, K., Judy, D., 2017).

With these privacy concerns in mind, there must be an action needed in the direction of securing users' information and not being embezzled by a third party. C. Troncoso, G. Danezis, E. Kosta, J. Balasch and B. Preneel (2011) took an approach which would store the information of the users locally and transmit only the result back to the insurance company. However, this would result in a bulky device which would end up taking a lot of space in the vehicle making it less likely for policyholders to adopt this technology and embed this into their lifestyle.

These existing studies and findings can be connected with our research questions which help us identify possible solutions for a better telematics model which can encapsulate better privacy rules which would possibly result in a higher adoption rate for the device. An ideal approach here is to move forward with a limited number of solutions that connect with both our questions and do a deeper dive on how these solutions can be incorporated with the existing solutions in the industry

and increase the adoption rate and produce better results with the telematics model without raising too many privacy concerns.

Chapter 3: Recommendations

Given our literature, there are many possible solutions, some of which are still being developed and proofed out. We will be focusing on some of the existing studies that are within our scope of research.

Telematics based solution

Troncoso, G. Danezis, E. Kosta, J. Balasch and B. Preneel (2011) present a solution that covers both our concerns, privacy and better results. The key difference between PriPAYD and the 'Current Model' is that all computations transforming the GPS data into billing data are performed in the vehicle black box. The data involved in the calculation of the final premium are the number of kilometers traveled, the hour of the day, the road the user has chosen, and the rate per kilometer (hour and road type) given by the insurer. To perform the conversion, maps have to be available to the device, and calculations have to be performed to match the coordinates with road types. These are no more complex than the operations already supported by any off-the-shelf commercial GPS navigation system. The solution focuses on three key security properties (Authenticity, Confidentiality, and Privacy), this results in a detailed log of all the vehicle movements, and other audit information which is only accessible to the policyholder. This is made possible by a symmetric key which is shared by the black box and the policyholder, which is similar to an Authenticator Application used to sign on for Multi-Factor Authorization. Despite protecting the user's data, this device is unable to maintain its sophisticated model when it comes to Billing information as it is handled by the insurance carrier. Since no solution is ideal, therein lies one of the drawbacks of this solution. PriPAYD is a system that can support the deployment of very fine granularity of insurance policies while also providing strong privacy guarantees, it misses the mark

when it comes to accounting as it hands over the control back to the insurance carrier. Bobby D. Gerardo, Jaewan Lee (2009) use a mobile aggregation agent (AA) and intelligent data-mining agent (IDMA) which can be used by the policyholders to reduce the cost of motoring. The authors are able to formulate framework for data aggregation and Insurance service in vehicle telematics using multi-agents and perceived it to have promising applications ranging from academic, business and industrial use. A combination of these two resources is a great recommendation to present a practical solution to solve the privacy and model issues within this niche market of the insurance industry.

Johannes Paefgen, Thorsten Staake, Elgar Fleisch (2014) proposed a methodology for multivariate modeling of the exposure–accident relationship with IVDR data. Based on location trajectories from 1600 vehicles obtained from a PAYD insurance provider, they have developed and validated several models that explain differences between accident-involved and accident-free vehicles in a case-control study. The discussed models combine mileage as a measure of the ‘‘extent’’ of exposure with several groups of situational variables that represent the ‘‘degree’’ of exposure, such as daytime, weekday, road type, and velocity. Within those model coefficients, they were able to infer a ranking of situational variables with respect to their contribution to the risk of accident involvement. This can be extremely useful for prediction modeling for policyholders which would provide a better incentive to adopt this technology as it would give them recommendations for better driving behavior and avoid accidents. Given the research with in-vehicle data recorders (IVDR), this model can be improved once deployed and more data is collected to improve the accuracy of the results.

Philippe Baecke, Lorenzo Bocca (2017) showed that with the advent of the IoT paradigm, an increasing number of sensors are available that enable insurers to collect detailed data of customers' driving behavior. This study has investigated the impact of these data on the risk selection process. More specifically, it is the first study that proves in detail the added predictive value of telematics data in addition to traditionally used variables such as customer specific, car specific and historical claims variables. A predictive model that is only based on this data source is already able to assess the accident risk better than traditional models. However, most value lies in combining both data sources because they capture different underlying elements of the risk. Insurance companies should stimulate their clients to install In-Vehicle Data Recorders. This can generate advantages for both insurers and customers. While this clearly improves an insurer's risk selection process, customers can benefit from a lower premium if their driving behavior is analyzed as safe, but also from additional services, such as automatic emergency calls, stolen vehicle tracking and diagnostic services.

Privacy Based Solution

As mentioned earlier, EMC Insurance is undergoing digital transformation where Guidewire Software will overtake the Insurance Suite of the organization for a better and efficient business management. One of the existing concerns in this multi-year project is to comply with CCPA which has an upcoming deadline (January 1st, 2020). The goal here is to able to identify all the PII information stored with the organization to avoid penalties, if issued.

There are over 350 applications that are associated with the legacy system and not all of them can be considered to be on a single platform, since some of them are web-based and others are on-premises. As a part of the Digital Services team, I was involved in maintaining the Application Inventory along with its components which store possible PII information. The tools used here

were Power BI, SharePoint, and Flow by Microsoft. The data is stored as a list within SharePoint which reflects the information in the form of a report within Power BI. This report is consumed by the users in order to avoid manipulation of the source file. If there are any changes/edits, they are processed by a Form which follows a series of rules within Flow (Power Automate) and sent to approval by the owner of the application/report/data source.

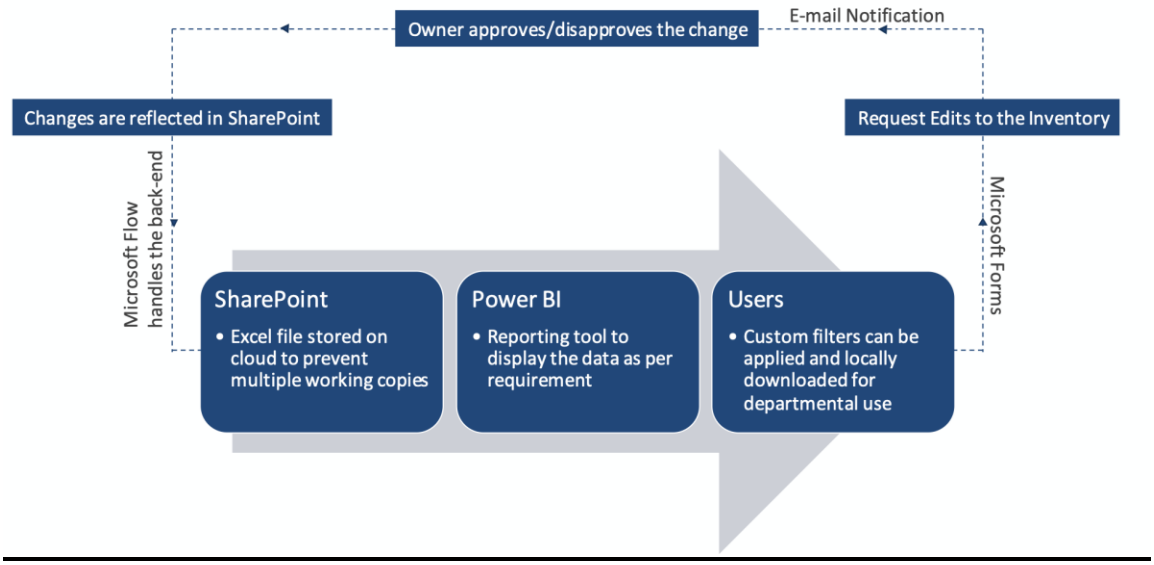

Figure 3 Business Process for Maintaining Application Inventory

This methodology has been in-use to manage the application inventory for the organization in order to comply with CCPA rules until a better solution is presented within the Guidewire ecosystem.

Chapter 4: Results, Future Scope & Other Applications

Results

During this comprehensive study for the search of the best telematics model that would follow suit with privacy concerns, the PriPAYD model by C. Troncoso, G. Danezis, E. Kosta, J. Balasch and B. Preneel (2011) comes closest to the perfect solution but falls short at the billing problem which includes the insurance carrier. Combining this with Johannes Paefgen, Thorsten Staake, Elgar Fleisch (2014) methodology for multivariate data modeling could yield best possible results for our problem statement and would cover all possible concerns of telematics model performance and privacy concerns. Philippe Baecke, Lorenzo Bocca (2017) present the best example of how important the value is for the best possible telematics model as it can be used for various purposes not just to have the best model but for better risk assessment which can benefit the insurance carrier as well as the policyholder.

Future Scope

Privacy is a growing risk and will be one given new legislation and court decisions at both the federal and state levels. Businesses will need to continuously revise their privacy policies to conform and keep up to date with changing regulations. As things progress

Other Applications

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