Seeing Beyond Risk

Welcome to the new issue of Seeing Beyond Risk, the quarterly electronic publication from the Canadian Institute of Actuaries (CIA). Each issue presents the latest actuarial thinking from experts.

In this issue, Étienne Plante-Dubé, director of modelling and research at Desjardins General Insurance Group, provides an overview of big data, its impact on the insurance industry, and the role that actuaries can play in using big data. We are sure you will find this article informative and thought-provoking, and we encourage you to distribute it among your friends and colleagues.

Insurance in the Age of Big Data

By Étienne Plante-Dubé

With the new millennium came the dawn of the data age. Just as the carbon age at the heart of the industrial revolution gave way to the age of petroleum, the key driver of economic growth in the twentieth century, data has become a new raw material and the foundation on which new industries are building their business models. One need look no further than the GAFAM giants (Google, Amazon, Facebook, Apple, and Microsoft) and how they are fighting over our data, or the giants of the sharing economy (Airbnb, Uber, and Turo) defining new business models founded on innovative uses of data.

This data age is also turning the insurance industry upside down, so actuaries and policymakers would do well to pay heed. This article offers a snapshot of big data’s impacts, advantages, and risks for insurance in Canada.

MINI-HISTORY OF BIG DATA

“Big data” is generally described with the help of the “three v’s” principle introduced by Doug Laney in 2001:

- Increasingly large volume of data;
- Variety of data (data can be raw, unstructured, or semi-structured); and
- Velocity, which denotes the fact that these data are produced, harvested, and analyzed in real time.

These sets of data are becoming so voluminous that it has become difficult to harness them with traditional database/information management tools. The emergence of big data requires paradigm shifts in how to analyze them.

The term big data has also become a buzzword encompassing at once big data technologies for mass distribution of storage and processing on commodity hardware (e.g., Hadoop), as well as approaches and algorithms to extract their meaning and engage in forecasting. For the latter component, the term big data is similar in meaning to predictive modelling or other buzzwords such as machine learning, artificial intelligence, cognitive computing, deep learning, and data mining.

IMPACT OF BIG DATA ON INSURERS AND ACTUARIES

Since the profession’s earliest days, actuaries have tried to place as accurate a value as possible on uncertain future events. In a competitive insurance market, insurers rely on actuaries to precisely evaluate the cost of a risk, avoid anti-selection (e.g., the tendency of high-risk individuals to buy more life insurance than necessary), and remain solvent and high-performing. The emergence of big data has launched a race to innovate, which is picking up speed with each technological improvement and the explosion of available data sources.
Big data is revolutionizing the tools available to actuaries to predict risk with even greater accuracy. In the early 1990s, predictive models were introduced by a few innovative property and casualty (P&C) insurers in Europe. In the following years, they stood apart from their competitors by their robust growth and enviable profit levels. These practices quickly spread to North America, with similar effects for the insurers that were first to adopt them. These techniques have made possible not only a more accurate evaluation of the future risk relating to an individual risk, but also an explosion in the variables that can be considered by actuaries during the pricing process.

In P&C insurance, this data race first took the form of additional questions on insurance applications and a more granular processing of the information already collected (for example, the “driver class” was split into the individual use of each of the constituent variables, i.e., gender, civil status, age, and vehicle use). Subsequently, insurers took an interest in all sources of data external to their organization, such as those relating to geography, demographics, and weather.

TELEMATICS INSURANCE

It was the introduction of telematics insurance that truly ushered insurers into the big data age (all three v’s combined). The installation of a box capable of recording the vehicle’s GPS position second by second has allowed insurers to measure the vehicle’s use and the driving behaviours of their insured with a much higher degree of accuracy. In Canada, Industrial Alliance was the first company to launch a telematics insurance program in 2012. Desjardins Insurance followed suit in 2013 with Ajusto and then the Ajusto mobile application to tap into our smart phones’ data collection capacity, thus removing the need for a GPS device to be fitted to the vehicle.

Big data has several other applications within insurance companies. For example, combating fraud requires the use of predictive models or the detection of anomalies over a wide range of data sources and combining them. This is where the variety component really comes into the equation. For catastrophic claims such as earthquakes, floods, winds, and hail, catastrophe models are of great use. Building these models requires tens of thousands of simulations with very precise and voluminous geographic data. Here again, though, big data is up to the challenge.

In the internet of things, Fitbit-type bracelets and smart-home devices collect and transmit impressive amounts of data. It is no surprise, then, that insurers have taken notice. Lastly, social media and the sharing economy are revolutionizing the information available on individuals and their relationships, behaviours, and interests. Soon, marketing applications of big data may be limited only by advertisers’ imaginations.

ADVANTAGES OF BIG DATA

Besides greater pricing precision and improved risk evaluation, insurers’ judicious use of big data can benefit their organizations and society at large in a number of ways.

By combating fraud more effectively, big data is making it possible to keep insurance costs affordable for everyone.
Currently in Canada, the introduction of catastrophe modelling to understand flood risks is a major contributor to the recent emergence of flood insurance policies.

As for telematics insurance, it is leading to more affordable insurance premiums for risks that had been perceived as too high back when there weren’t enough data to accurately assess them. For example, if they agree to share information on their driving habits, young drivers short on driving experience will receive premium reductions sooner than before, when they had to build up a good driving record over a period of years. Telematics insurance also has a positive effect on drivers who participate in these programs. Knowing that they can control their risk and reduce their insurance premiums through good driving habits, they may become better drivers and cause fewer road accidents and deaths. Some insurers are already observing this trend.2

We can also hope that greater use of mobile telematics insurance applications will help sensitize drivers to the harmful effects of distracted driving. According to the Société de l’assurance automobile du Québec (SAAQ), distracted driving is one of the causes most cited by police in accidents causing injury or death.3

While these examples are taken from P&C insurance, we can expect big data applications in the life insurance field to have similar effects. For example, applications or bracelets encouraging healthy lifestyles (physical activity, healthy eating) in life insurance could have beneficial effects on healthcare costs and mortality.

RISKS ASSOCIATED WITH BIG DATA

The main issue associated with big data is its perceived intrusion into our privacy. It is essential that insurers act transparently and that their clients be able to properly understand how their data will be used before agreeing or declining to participate in these programs. The evidence tends to show that clients are inclined to share their information if they see a benefit in it for them.

For insurers, big data poses a significant risk in that new and innovative players might suddenly change the business model. The emergence of price-comparison applications between 2005 and 2010 in the UK had a major impact on industry profitability. By offering simple tools designed to compare quotes from a number of insurers, these applications encouraged a lot of people to shop around for their insurance products. The largest of these comparison tools, MoneySuperMarket, is now valued at more than 1 billion pounds sterling.4

Some jurisdictions are trying to ban the use of certain pricing criteria, viewing them as unfair or discriminatory. For example, the use of gender in pricing has been prohibited in a number of European Union (EU) countries. These regulations are becoming far less effective in the age of big data. Indeed, since big data makes it possible to quickly identify hundreds of other variables that can be used in lieu of gender, this European initiative merely created a race among insurers as to which firm could find the best proxy to replace gender for use in pricing. And so, on average, men continue to pay more for their automobile insurance, in line with the higher risk that they pose.5

THE ACTUARY: A DATA SCIENTIST

The term data scientist was coined to denote professionals with expertise in harnessing big data. Ideally, data scientists combine the following three competencies:

- Skilled in math and statistics;
- Skilled at programming; and
- Knowledgeable about his/her field of business.

Combining these talents in a single person may seem like a pipe dream. Actuaries, however, with the solid foundation their education gives them to grasp statistical and mathematical models for analyzing big data, as well
as their sound understanding of business, are ideally positioned to play the role of data scientist in the insurance and risk management sectors. (This graphic illustrates the multiple skills data scientists require.)

That said, it is essential that actuaries surround themselves with specialists who have greater expertise than they in the various fields required to master big data: mathematics, statistics, informatics, programming, engineering, geomatics, etc.

**CHANGING BUSINESS AND SOCIETY**

Big data offers actuaries not only new tools, but also a tremendous opportunity to better exercise their role. But actuaries, for their part, need to approach this with curiosity and interest.

A number of the industries associated with actuaries have dived right into the data age. Insurers need to adapt and follow along. As this article shows, insurers can use big data in their pricing, marketing, underwriting, and claims operations. Those who are the first—or most adept—at using big data will be able to reap considerable rewards.

More importantly, policyholders and society as a whole will benefit from big data. More accurate premiums, more control over those premiums, fewer accidents, reduced fraud, and innovative new products are just a few examples of those benefits.

Endnotes:


Étienne Plante-Dubé, FCIA, FCAS, is an actuary with more than fifteen years of experience in property and casualty (P&C) insurance, mostly in pricing and research. He is one of the founding members and current Chair of the CIA’s P&C Research Subcommittee.

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Disclaimer: This article does not necessarily represent the views of all members of the CIA, or all members of the Canadian actuarial profession.