Auto Insurance Data and Analytics Strategy Technical Advisory Committee Report:

Fair Treatment of Consumers in Uses of Big Data Analytics in Auto Insurance

July 2022

Disclaimer

This report was developed by the Technical Advisory Committee for Auto Insurance Data and Analytics Strategy. The views expressed in this report are those of the Advisory Committee in accordance with its Mandate and do not necessarily reflect the views of FSRA.

Foreword

The Financial Services Regulatory Authority of Ontario's (FSRA) [Technical Advisory Committee for Auto Insurance Data and Analytics Strategy](#) (the Advisory Committee) comprises a group of experts in data, analytics, and technology from financial services providers, fintech companies, and consulting firms. The Advisory Committee was formed in November 2020 as a special-purpose committee with a focus on protecting consumer interests while promoting market innovation. Its mandate is to provide expert advice to FSRA on the consumer impacts and regulatory implications of the use of Artificial Intelligence (AI) and Big Data Analytics (BDA) in auto insurance.

The expert advice and recommendations from the Advisory Committee were compiled by FSRA on behalf of the committee to form the report on Fair Treatment of Consumers in Uses of Big Data Analytics in Auto Insurance and approved by the committee prior to finalizing the report. The report contains the views and recommendations of the committee members concerning model fairness, consumer transparency, and supporting vulnerable consumers in the application of BDA in auto insurance rating, underwriting, and claims.

The report would offer an opportunity to build trust and mutual understanding between consumers and the industry, particularly in areas of high complexity such as BDA. It is intended to:

1. contribute to public confidence in the insurance sectors
2. evaluate developments and trends in the insurance sectors
3. promote public education and knowledge about the insurance sectors
4. promote transparency and disclosure of information by the insurance sectors

FSRA would like to thank the Advisory Committee members for their active participation and generous support in developing this report.

The recommendations from this report will inform how FSRA sets and delivers on its priorities on reforming auto insurance rates and underwriting regulation. We also hope this report will help the industry implement BDA solutions in the auto insurance system.

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Director, Auto/Insurance Products, FSRA and Chair, Auto Insurance Data & Analytics Strategy Technical Advisory Committee

Executive Summary

Big data and analytics have emerged as critical issues in consumer protection. This report was developed by the Advisory Committee over the past year and explores how to treat consumers fairly in response to these issues. It also attempts to address how data is collected, treated, processed, communicated, and utilized to inform decision-making by all stakeholders in the Ontario auto insurance market.

The Advisory Committee attempted to provide a critical analysis of fairness from different perspectives or themes, without losing focus on consumer protection. The committee is pleased to present the following recommendations:

Theme 1 - Model Fairness: This theme discusses the key elements of rating models, including how data is treated and interpreted. It sets out to identify the critical issues and mitigate the risk of model bias leading to disparate impact in rating models for auto insurance. These are the committee's recommendations:

1. FSRA should conduct and publish research on key auto insurance issues.
2. The industry should continue to adopt best practices to promote public trust.

Theme 2 - Transparency: This theme discusses the impact that transparency in the use of data and analytics has on consumers, regulators, and intermediaries. It covers the "who, what, where, when, and how" of transparency. These are the committee's recommendations:

1. FSRA should survey consumers on disclosure practices.
2. FSRA should collaborate with industry to achieve transparency outcomes with a principles-based approach.
3. FSRA should ensure that its website has clear, easy-to-find information.

Theme 3 - Supporting Vulnerable Consumers: The committee explored the UK Financial Conduct Authority's (FCA) thoughts on how consumer vulnerabilities could be considered and accommodated in model-related decisions. We identified and explored challenges, including definitions, information gaps, and resourcing in relation to supporting vulnerable consumers. These are the committee's recommendations:

1. FSRA should further define vulnerable consumers and communities.
2. FSRA and industry should develop mechanisms to monitor treatment of vulnerable consumers.
3. Government and industry should explore mechanisms to support vulnerable consumers or communities.
4. FSRA should consider vulnerability in the underwriting and rate regulation reform strategy.
5. FSRA should collaborate with best practice setting or regulatory organizations.

The report also contains recommendations in the Focus Areas concerning Rating, Underwriting, Claims, and Data.

The Advisory Committee facilitated communication and open dialogue between FSRA and the industry. Implementing these recommendations will require continuing communication and collaboration.
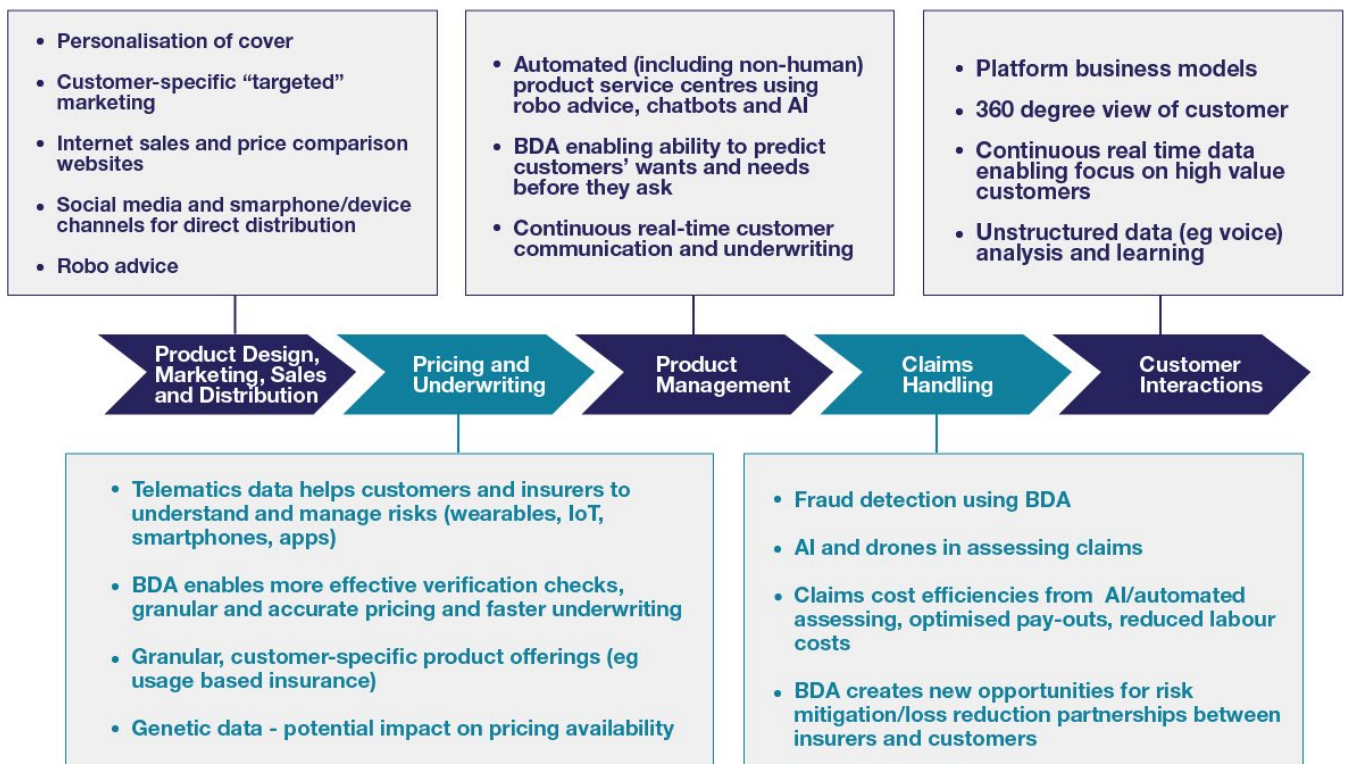
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Introduction

Big data analytics (BDA) refers to the use of algorithms and advanced analytics capabilities to make or inform decisions, based on patterns, trends, and linkages of new data sources.[1] BDA is becoming more prevalent in society, including property & casualty (P&C) insurance (see Figure 1 below).

Figure 1: The use of BDA across the insurance product lifecycle

- **Personalisation of cover**
- **Customer-specific "targeted" marketing**
- **Internet sales and price comparison websites**
- **Social media and smarphone/device channels for direct distribution**
- **Robo advice**

- **Automated (including non-human) product service centres using robo advice, chatbots and AI**
- **BDA enabling ability to predict customers' wants and needs before they ask**
- **Continuous real-time customer communication and underwriting**

- **Platform business models**
- **360 degree view of customer**
- **Continuous real time data enabling focus on high value customers**
- **Unstructured data (eg voice) analysis and learning**

Product Design, Marketing, Sales and Distribution → Pricing and Underwriting → Product Management → Claims Handling → Customer Interactions

- **Telematics data helps customers and insurers to understand and manage risks (wearables, IoT, smartphones, apps)**
- **BDA enables more effective verification checks, granular and accurate pricing and faster underwriting**
- **Granular, customer-specific product offerings (eg usage based insurance)**
- **Genetic data - potential impact on pricing availability**

- **Fraud detection using BDA**
- **AI and drones in assessing claims**
- **Claims cost efficiencies from AI/automated assessing, optimised pay-outs, reduced labour costs**
- **BDA creates new opportunities for risk mitigation/loss reduction partnerships between insurers and customers**

Source: Issues Paper on the Use of Big Data Analytics in Insurance, International Association of Insurance Supervisors, February 2020.

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[1] *Issues Paper on the Use of Big Data Analytics in Insurance*. (2020, February). International Association of Insurance Supervisors. Retrieved from https://www.iaisweb.org/uploads/2022/01/190902-Draft-Issues-Paper-on-Use-of-BDA-in-Insurance-For-Public-Consultation.pdf

In Canada, BDA is used across the auto insurance value chain.

- Telematics have been increasingly used in pricing and risk classification.
- Machine learning models are used in detecting organized frauds.
- New innovative products are developed to meet personalized insurance needs such as short-term on-demand auto insurance policies.
- Data-driven customer-specific targeted marketing is common in sales and distribution.
- Automation of manual processes is widely adopted in underwriting and claims handling.

The prevalence of BDA can give insurers the ability to:

1. improve risk prediction and price accuracy by learning complex relationships from large volumes of data
2. serve customers better by automating underwriting and claims processes
3. develop innovative and new products that meet personalized insurance needs, e.g., usage-based insurance

However, such benefits may come with costs when risks are not managed properly. Concerns about BDA include:

1. new risks from data-driven automation (e.g., undetected data issues causing unintended harm and/or reinforcing existing societal disadvantages
2. the opacity of some BDA models (i.e., black box problem)
3. privacy and personal data protection (e.g., targeted marketing using personal behaviour data)
4. an increasing individualization of insurance (e.g., affordability issue for high-risk consumers and potential social concerns if the risk is correlated with low income and wealth)

5. market competition[2] (e.g., the high initial cost reduces the likelihood of investment in telematics programs from smaller insurers).

The Financial Services Regulatory Authority of Ontario (FSRA) seeks to understand current and potential BDA practices in the P&C insurance market. FSRA's aim is to ensure that consumers benefit from these new practices while also being treated fairly.

FSRA has adopted the Canadian Council of Insurance Regulators' (CCIR) and the Canadian Insurance Services Regulatory Organization's (CISRO) Guidance on *Conduct of Insurance Business* and *Fair Treatment of Customers* (FTC Guidance), which generally addresses the fair treatment of consumers. This report, however, focuses specifically on the fairness of BDA applications.

To gather insights, FSRA consulted the Auto Insurance Data & Analytics Strategy Technical Advisory Committee.

While FSRA set the general direction of discussions, the views and recommendations expressed in this report belong to the Advisory Committee members. The report was compiled by FSRA on the Advisory Committee's behalf and approved by the Committee prior to finalizing the report. For biographies of the contributing Advisory Committee members, please refer to Appendix 2.

Scope Determination Process

Prior to meeting with the Advisory Committee members in February 2021, FSRA solicited their opinions on how to define fairness.

To facilitate discussion on this topic, FSRA provided the Advisory Committee with research and insights from various organizations around the world on BDA governance and consumer fairness (see reference list in Appendix 1). FSRA also shared recommendations

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[2] *Big Data and Insurance: Implications for Innovation, Competition and Privacy*. (2018, March). The Geneva Association. Retrieved from https://www.genevaassociation.org/sites/default/files/research-topics-document-type/pdf_public/big_data_and_insurance_-_implications_for_innovation_competition_and_privacy.pdf

from the Residents' Reference Panel on Automotive Insurance in Ontario's (RRPAIO) report[3] to inform the Advisory Committee of consumers' perspectives.

From this exercise, FSRA proposes assessing fairness based on the following three pillars:

1. **Model fairness**: Models are statistically sound and minimize unjustified bias
2. **Transparency**: Stakeholders receive the information they need to make decisions based on their level of expertise and objectives
3. **Supporting Vulnerable Consumers**: Insurers take consumer vulnerabilities into account and, where possible, accommodate vulnerable consumers in their model-related decisions

These pillars were shared and discussed with the Advisory Committee at the February 2021 meeting. The roles to take by different stakeholders (e.g., insurers, government, third-party providers, etc.) in achieving these objectives were also discussed.

Based on those discussions and further research, it became clear that a comprehensive review of fairness would require insights from a broad group of fields.

The complexity of defining fairness extends into fields broader than auto insurance, including law, economics, and political science.

Given these complexities, an Advisory Committee working group met in April 2021 and agreed to the following scope for this report:

1. **Broader Themes**: This section explores the three pillars of assessing fairness, in the context of auto insurance BDA applications

2. **Focus Topics**: This section explores specific BDA applications, potential consumer benefits and harms in rating, underwriting, claims, and data

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[3] *Final* Report of the Resident's Reference Panel on Automotive Insurance in Ontario. (2021, January). Resident's Reference Panel of Automotive Insurance. Retrieved from https://www.fsrao.ca/media/2811/download

Broader Themes

This section discusses three pillars of assessing fairness, which include model fairness, transparency and supporting vulnerable consumers.

Theme 1: Model Fairness

Prior to discussing model fairness, it is important to have a high-level understanding of the model development process. The high-level process is as follows:

1. **Input**: The necessary data for model development is collected at point-of-sale with a customer and used to predict behavior or risk, as the customer's risk factors inform the premiums they pay.

2. **Computation**: A set of statistical techniques and tools are used to create a model that will be used to predict a customer's behaviour or risk. This includes using historical data to estimate trends that are expected to exist in the future.

3. **Output**: The results of a model are used to make a business decision.

The focus of this section is on providing assurances to consumers that the intermediate computation step in the model development process is done in a sound and fair manner with appropriate controls.

Monitoring data inputs and model outputs is also important to help detect model bias such as capturing false relationships or producing results that may cause unwarranted statistical bias against those in protected classes. This section discusses considerations around bias and what to do to mitigate it.

Discussion Item

A concern raised around models is that they may be exposed to bias against a certain group, e.g., against a protected class based on income or race. This relates to a discussion regarding disparate impact and disparate treatment, which can be roughly defined as follows:

- **Disparate impact:** When a negative effect is observed on protected classes, regardless of cause.[4] It refers to intentionally neutral models that nevertheless result in disproportionate negative outcomes for members of a protected class.

- **Disparate treatment:** When a negative effect is observed on protected classes, and it can be shown that it occurs deliberately. It refers to the intentional use of prohibited classes in models.

The difference between the two lies in the intentionality. Ontario's legal framework for rating applies the disparate treatment standard, i.e., there are prohibited variables[5] in rating like income or race, but it is less clear about disparate impact.

The Advisory Committee noted that insurers are not able to measure disparate impact on protected classes given that they do not collect data on this, due to legal or ethical reasons. On the other hand, for the data that can be collected and used in auto insurance models, the Advisory Committee has provided the following examples of measures to help assess model fairness and avoid bias that leads to disparate impact.

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[4] Disparate impact is a standard applied in employment law to prevent irrelevant factors from having a negative effect on members of protected classes. https://content.naic.org/sites/default/files/inline-files/JIR-ZA-39-04-EL.pdf

[5] R.R.O. 1990, Regulation 664: Automobile Insurance, prohibits insurers from using certain factors in a risk classification system including, but not limited to, income, employment history, credit history, and net worth. Retrieved from https://www.ontario.ca/laws/regulation/900664/v14

Table 1: Examples of Fairness Measures from the Advisory Committee Members

Areas	Examples of Measures/Metrics
Data input	• Credibility of input data, data reconciliation and validation • Ethical considerations and processes (by humans) in evaluating input data. In terms of metrics this represents a set of controls to be monitored

Model performance	• Goodness of fit/accuracy and robustness measures, examples:
	  ➢ Akaike's Information Criteria (AIC)
	  ➢ Actual vs. predicted plot
	  ➢ Root Mean Squared Error (RMSE)
	  ➢ Out-of-sample errors
	  ➢ Lift measures and Lift charts (simple quantile plots or double lift charts)
	  ➢ Gini index

Overall comparative ratios	• Compare premium change to income or CPI changes, when taking into account other potential drivers of change, such as vehicle technology change, driving behaviour change, or medical treatment changes, etc. • Percentage of uninsured change vs. population change

Unjustified disparity between groups	• Compare impacts to different consumer groups by demographic and social economic categories, e.g., age, gender, marital status, territory, vehicle ownership:
	  ➢ Underwriting fairness (e.g., % population insured, % change of DWP (Direct Written Premiums), New Business rate, Retention rate, Insurer-initiated cancellation rate)
	  ➢ Pricing fairness (e.g., average premium & loss cost, dislocation, performance metrics, loss ratio)
	  ➢ Equalized odds, predictive parity, disparate impact ratio

Model interpretability/ explainability	• SHapley Additive exPlanations(SHAP): SHAP value for each factor explains their contribution to the mode prediction • Permutation based variable importance • Partial Dependence Plot (PDP)

The next question is what to do if a particular disparate impact is found when assessing the fairness measures. Since insurers are working with a limited set of data, all models will have bias to some extent. However, the Advisory Committee believes it is important to **investigate the root causes** of any potential bias that manifests in disparate impacts.

Common causes of bias include:

- Selection bias where input historical data is not representative of all protected classes.

- Strong correlation between a model variable and a protected class, i.e., proxy variables that are not prohibited but enable a modeller to capture most of the effect of the prohibited variable. One example is territories, which are correlated with income or various demographic variables. Proxies will likely exist for any strongly predictive variable. As such, the committee noted that an expectation for models to have no unjustified bias would provide a stronger consumer protection than prohibiting the use of a certain variable.

Recommendations

To mitigate the risk of model bias leading to disparate impact, the modeller should follow the good model governance practices, including data accountability. The Advisory Committee made the following recommendations:

T1-1. FSRA should conduct and publish research on key auto insurance issues

As the regulator of auto insurance in Ontario, FSRA is best positioned to take a leadership role in the research of key issues in Ontario's auto insurance system. The Advisory Committee recommends that FSRA conduct research to develop data-driven insights for important public policy questions. The research can be done through partnerships with the

appropriate institutions (e.g., universities or research institutes). The industry representatives can also support the prioritization of the research topics and the execution of the research work.

Examples of research topics may include:

Correlation vs. Causality

Rating models are developed in accordance with Actuarial Standards of Practice (ASOP). However, the ASOPs explicitly state that it is enough to demonstrate that a variable is correlated with loss to use it in a rating model[6] (a modeller will seek a reasonable causal link if aiming to use it, but it is not required).

Research papers of journal quality, on the other hand, may seek to answer questions of causality. An example of a research topic could be the territorial rating variable. FSRA currently restricts insurers to no more than 55 territories, as per the legacy regulator's 2005 guidance.[7] Research may be conducted to understand items such as the root causes of territorial differences, whether the parameters of the current regulatory guidance (e.g., no more than 55 territories) effectively reflect the differences in losses across Ontario, and whether the restriction(s) may lead to any disparate impacts.

Assessment of disparate impact on protected classes

As mentioned above, the Advisory Committee noted that insurers are not able to measure disparate impact on protected classes since they do not collect this information.

Data on protected classes (e.g., income, education, race) is currently available from Statistics Canada at the Forward Sortation Area (FSA) level. Research may be conducted to understand the disparate impacts by using different insurance metrics (e.g., premium,

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[6] *Actuarial Standard of Practice No. 12, Risk Classification Standard of Practice, section 3.2.1.* Retrieved from https://www.actuarialstandardsboard.org/asops/risk-classification-practice-areas/
[7] *Automobile Insurance Territorial Rating – Update*. (2005). Financial Services Commission of Ontario. Retrieved from https://www.fsco.gov.on.ca/en/auto/autobulletins/2005/Pages/a-01_05.aspx

loss cost, loss ratio, underwriting declination rate, coverage availability) on different demographic profiles using data at an FSA level.

However, given that FSAs could have significant variations in consumer demographics and risk profiles, more granular data at the postal code or individual consumer level would be a more accurate way to assess disparate impacts.

In the future, some special mechanisms can be considered to collect customers' information on protected classes for research purposes that private insurers currently do not collect. For example, the role of the Facility Association (FA) was discussed for this purpose. As per section 7 of the *Compulsory Automobile Insurance Act*, the FA has a unique position as a non-profit association with a mission focused on auto insurance availability.

Consumers may take greater comfort in the FA (rather than private insurers) collecting sensitive data such as income to assess if insurers' underwriting rules result in disparate impacts or availability issues. However, the Advisory Committee noted the operational difficulties of collecting this information, potential issues with the FA's existing legal authority, and the privacy risk of managing this sensitive data. The committee also noted that as the FA only underwrites a small portion of Ontario's consumers whose risk characteristics could be different from non-FA consumers, its experience may not reflect the experience of most consumers in the market.

The Advisory Committee notes that publishing high-quality research will enable a more constructive conversation around important public policy issues. These insights can, where necessary, be reflected in the legal framework to ensure consumers are treated fairly, ultimately enabling trust in the system longer term.

T1-2. The industry should continue to adopt best practices to promote public trust

The Advisory Committee highlighted various controls in place to protect against adverse model results. The industry should continue to adopt best practices to promote public trust.

- **Current Ontario legal framework**:

  a) [Regulation 664 of the *Insurance Act*, (Automobile Insurance)](#) outlines the factors that insurers are prohibited from using in their risk classification models.

  b) [FSRA Unfair or Deceptive Acts or Practices (UDAP) Rule](#) outlines prohibited actions by an insurer; by an officer, employee, or agent of an insurer; or by a broker. On February 16, 2022, FSRA received approval from the Minister of Finance for its proposed UDAP Rule.[8] The rule came into effect on April 1, 2022, and replaced the [UDAP Regulation 7/00](#) under the *Insurance Act*. The UDAP rule strengthens the supervision of insurance industry conduct and enhances consumer protection by clearly defining outcomes that are unfair or otherwise harmful to consumers.

- **Regulatory guidance and discussion paper:**

  FSRA consulted the industry regarding an information guidance in Operational Risk Management Framework[9]. The guidance includes sound practices in governing the use of models in underwriting and rating activities for auto insurance.

  The Office of the Superintendent of Financial Institution's (OSFI)[10] [discussion paper on technology and related risk (Sept 2020)](#) identified the following core principles for advanced analytics:

  ➢ **Soundness:** An AI/ML Model is accurate, reliable, auditable, and fair by design.

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[8] *Unfair or Deceptive Act of Practices Rule*. (2022, February). Financial Services Regulatory Authority of Ontario. Retrieved from https://www.fsrao.ca/regulation/rules/unfair-or-deceptive-act-or-practices-rule
[9] *Proposed Operational Risk Management Framework in Rating and Underwriting of Automobile Insurance*. (2021). Financial Services Regulatory Authority of Ontario. Retrieved from https://www.fsrao.ca/industry/auto-insurance/regulatory-framework/guidance-auto-insurance/proposed-operational-risk-management-framework-rating-and-underwriting-automobile-insurance

[10] *Technology Risk Consultation*. (2021, May). Office of the Superintendent of Financial Institutions. Retrieved from https://www.osfi-bsif.gc.ca/Eng/fi-if/in-ai/Pages/tchrsk-sm.aspx

- **Explainability:** The ability to understand and describe the mechanics of the AI/ML model, tool, or system and meaningfully explain the results to pertinent parties.
- **Accountability:** Risk management frameworks integrate AI/ML and clear roles and responsibilities are assigned across the institution.

- **Professional standards**: Actuarial

  Pricing models need to comply with Actuarial Standards of Practice, including:

  - ASOP No.12 – Risk classification
  - ASOP No. 23 – Data Quality
  - ASOP No. 25 – Credibility
  - ASOP No. 38 – Using models outside the Actuary's area of expertise
  - ASOP No. 56 – Modeling

  These standards of practice intend to define good, responsible, professional use of data and analytics. They continue to apply in the context of BDA.

- **Insurer control practices**:

  An internal model governance framework, embedding appropriate accountability mechanisms, should be implemented according to best practices. Examples of good control practices include:

  - three lines of defence throughout the model lifecycle
  - internal compliance reviews and model validation reviews that consider bias and fairness in models
  - continuous monitoring of model performance with consideration of bias and fairness after implementation, etc.

There should be greater scrutiny for models that directly impact consumer outcomes. The Advisory Committee highlighted that for models where decisions have a greater impact on consumers (e.g., high probability and high severity of harm, low reversibility of harm), a Human-In-The-Loop decision-making approach should be chosen. Human-In-The-Loop

suggests that human oversight is active and involved, with the human retaining full control and the BDA models only providing recommendations or input. Decisions cannot be exercised without affirmative actions by the human, such as a human command to proceed with a given decision.[11]

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[11] *Model Artificial Intelligence Governance Framework, Second Edition.* (2020, January). Minister for Communications and Information, Singapore. Retrieved from https://www.pdpc.gov.sg/-/media/files/pdpc/pdf-files/resource-for-organisation/ai/sgmodelaigovframework2.pdf

Theme 2: Transparency

Consumers want to understand how decisions impacting them are made. Increasingly, decisions are being made by BDA applications, which makes transparency more complicated to provide. These implications have been recognized and have resulted in various developments.

In the Canadian context, examples include:

- the previously proposed federal government's Bill C-11 (also known as the *Digital Charter Implementation Act, 2020*[12]), which included specific provisions for AI transparency,[13]

- OSFI's discussion paper on technology and related risk, which explores how AI should be regulated.[14]

This section presents various perspectives raised by the Advisory Committee regarding transparency around BDA applications.

What information is necessary to make a decision?

The main point raised by the Advisory Committee is that the information disclosed should depend on the decision a stakeholder needs to make. Not all stakeholders need the same

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[12] *Canada's Digital Charter: Trust in a digital world.* (2020). Innovation, Science and Economic Development Canada. Retrieved from https://www.ic.gc.ca/eic/site/062.nsf/eng/h_00108.html

[13] Through the proposed Bill C-11, the Government of Canada intends to establish a new privacy law for the private sector, the *Consumer Privacy Protection Act* (CPPA). CPPA contains new **algorithmic transparency requirements** that apply to automated decision-making systems like algorithms and artificial intelligence. Businesses would have to be transparent about how they use such systems to make significant predictions, recommendations, or decisions about individuals. Individuals would also have the right to request that businesses explain how a prediction, recommendation, or decision was made by an automated decision-making system and explain how the information was obtained.

[14] "Explainability" was identified by OSFI as one of the core principles to manage heightened risks associated with advanced analytics. A robust approach to achieving model "explainability" included: quality data that are well managed; strong algorithmic interpretability; transparent processes at all stages of the model lifecycle (e.g., design, develop, validate, deploy, and operate), and identification and adherence to model limitations.

level of detail about a BDA application. Consider the available information, expertise, and objectives of the following stakeholders, who are ranked in order of their expected expertise to build a model:

1. **Modellers**: Modellers develop a model or BDA application, which is used to make business decisions such as the insurance premiums charged to customers. They have access to the raw, underlying data and they have the subject matter expertise and tools to develop the model or the BDA application.

2. **Reviewers**: Reviewers ensure that a model is sound. They will likely have the skill set to understand a modeller's work. But without significant knowledge transfer, they may not be able to explain the results in the same level of detail or as efficiently as a modeller. Note that reviewers could be model peer reviewers or the review control within the insurance company (e.g., model approval function, internal audits).

3. **Regulators**: A regulator's focus is on consumer outcomes. Therefore, they will have the expertise to understand the results of the models, the methodology, and the tools used. While an insurer may share certain data with the regulator, the regulator does not necessarily need the full toolset or data used by the insurer to achieve its objective.

4. **Brokers/agents**: Brokers and agents are best positioned to understand a customer's needs. They should have sufficient technical expertise to explain complex insurance matters to customers, including model-related decisions. However, they do not have the expertise to build a model, nor do they have access to the complete underlying dataset. They do not need these to adequately serve their customers.

5. **Customers**: A customer understands their own profile best and, if using a broker or agent, decides what to buy based on their advice. Most customers do not have training in model development and do not need it to buy an insurance product.

What to explain to consumers?

As explained in the Model Fairness section, the model development process includes input, computation, and output.

It is generally straightforward to explain the **inputs and outputs** of a model to a customer, as it is most relevant to a customer's interaction with an insurer/distributor (for example, when buying a policy).

- For inputs, insurers should make it clear to their customers which data they're using. It is important for insurers to clearly disclose to customers in plain language whether any third-party personal information is being used.

- For outputs, a customer will be provided the result, e.g., their premium. The Advisory Committee acknowledges opportunities to better present outputs to customers in the rating context.

Opportunities for inputs and outputs are discussed further in the "Recommendations" section.

Regarding the intermediate **computation** step, it is the Advisory Committee's view that trying to explain the intricacies of BDA applications will bring little value to consumers in their decision-making. Apart from intellectual property considerations, the Advisory Committee expressed that BDA applications are too complex for most customers to understand, and further noted that consumers have the option to escalate or ask more detailed questions, but that it is uncommon as technical details generally yield little value to them.

In addition, it was noted that developing an insurance product consists of many steps, and each one may use a different BDA tool. Attempting to attribute how the BDA applications from each step contribute to the final decision would be a highly burdensome task. It would be difficult to explain in a simple and efficient manner to any stakeholder, not just a customer.

Although it is not practical to explain all intricacies of BDA applications and models to customers, the committee agrees that customers should still receive an explanation of the main drivers in how a decision was made. The main drivers may include certain components of BDA applications.

The Advisory Committee understands the purpose of explaining BDA applications. However, it believes there should instead be adequate controls and communication to instill trust that models are developed in a fair manner. Ensuring adequate controls and other ideas are explored further in the "Model Fairness" section.

Recommendations

The Advisory Committee believes the focus should be on the point of disclosure (input) and point of outcome (output). As such, the committee identified the following **recommendations for FSRA:**

T2-1.   **FSRA should survey consumers on disclosure practices**: The committee noted how it may be beneficial for FSRA to survey Ontario consumers on insurer's disclosure practices (e.g., transparency of documentation, rate change clarity, accessibility of coverage, etc.). FSRA can then publish these outcomes to reward positive transparency innovations in the industry and draw insurers to innovations in a less prescriptive manner.

T2-2.   **FSRA should collaborate with industry to achieve transparency outcomes with a principles-based approach:** FSRA can provide principles-based disclosure expectations to insurers to align with the consumer transparency outcomes. For example, setting minimum disclosure requirements[15] for annual premium changes[16], while allowing insurers to determine the best approach for meeting these expectations. FSRA and insurers could proactively collaborate to

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[15] An example is the standardized APR interest rate explanation from U.S. https://www.federalreserve.gov/boarddocs/caletters/2008/0805/08-05_attachment1.pdf, page 17–19

[16] Examples include but are not limited to: reasons for changes to the annual premium, whether the changes are instituted by the carrier, or due to coverage changes initiated by either the customer or the carrier.

test the efficacy of the disclosure practices to determine if consumer transparency outcomes are achieved.

T2-3. FSRA should ensure that its website has clear, easy-to-find information: The committee noted that for FSRA to develop credibility and promote trust, it should have clear, objective information that consumers can easily find.

The committee also highlighted the following **areas of opportunity for the sector** to improve consumer transparency outcomes:

1. **Disclosing the use of third-party personal information:** If third-party personal information is used in decisions that impact customers (e.g., underwriting or claims declinations), proper disclosure should be provided to the customers to ensure data accuracy and fairness.

2. **Insurance Declaration Page**: The committee noted that the Insurance Declaration Page could offer an opportunity to explain to consumers the information used by the insurer to calculate the premium. This page could serve as a tool to communicate the use of third-party data and reason(s) for the annual rate change.

3. **Ensuring those interacting with customers are adequately informed:** The committee acknowledged that ensuring those on the "front line" have the information needed was an area for improvement (e.g., ability to explain premium changes).

Theme 3: Supporting Vulnerable Consumers

The purpose of insurance can be broadly expressed as reducing financial uncertainty and making accidental loss manageable. The Advisory Committee recognizes that certain groups of consumers may be exposed to more difficulties due to their personal circumstances. The appropriate level of care for vulnerable consumers may be different, and the Advisory Committee sought to understand how this group may be better served so they experience on par outcomes and receive fair treatment.

Reference: FCA Guidance

A starting point for this discussion was the [Financial Conduct Authority's (FCA) *Guidance for firms on the fair treatment of vulnerable customers* (FCA's Guidance)](#)[17] published in February 2021 in the United Kingdom.

The FCA's definition of a vulnerable customer is "someone who, due to their personal circumstances, is especially susceptible to harm, particularly when a firm is not acting with appropriate levels of care." The FCA separates vulnerability into four broad categories:[18]

1) **Health**: Health conditions of illnesses that affect ability to carry out day-to-day tasks.

2) **Life events**: Life events such as bereavement, job loss, or relationship breakdown.

3) **Resilience**: Low ability to withstand financial or emotional shocks.

4) **Capability**: Low knowledge of financial matters or low confidence in managing money (financial capability). Low capability in other relevant areas such as literacy or digital skills.

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[17] *Guidance for firms on the fair treatment of vulnerable customers.* (2021, February). Financial Conduct Authority. Retrieved from https://www.fca.org.uk/publications/finalised-guidance/guidance-firms-fair-treatment-vulnerable-customers

[18] See table 1 on page 10 of the FCA's guidance for further examples within each category.

The FCA views vulnerability as a spectrum of risk, where any customer can find themselves in vulnerable circumstances at any time. As such, the FCA expects insurers' products to be developed and operations to be structured such that the needs of vulnerable customers can be understood, recognized, and addressed.

The Advisory Committee acknowledged that all four categories of vulnerability may be relevant to BDA, but also noted that some aspects of vulnerability may exist regardless of whether BDA or traditional modelling techniques are used, e.g., serving a customer with lower cognitive abilities.

The Advisory Committee highlighted several ways BDA can be used to support vulnerable consumers; for example, BDA may be used to identify fraudulent or deceptive conduct that harms consumers with lower English language capabilities, triggering a claims process following identified crashes, or guiding consumers through the claims process.

The Advisory Committee cautions that, while the FCA's definitions are a good starting point, they are quite broad and may also be perceived as intrusive by many consumers. In addition, properly collecting and managing this information would be challenging, given that consumers' circumstances change.

Existing Challenges in Serving Vulnerable Consumers

The Advisory Committee identified various challenges in serving vulnerable consumers:

1. **Definition of vulnerable consumers**

   As noted earlier, the Advisory Committee believes that a more robust definition of vulnerability is required.

2. **Lack of information**

   The committee noted that the Ontario Application for Automobile Insurance standard policy form (OAF 1) is quite limiting in terms of information that can be collected. Most vulnerability conditions are either not collected at all, or, if shared with insurers,

not stored in structured fields in data repositories, making it difficult to extract insights.

Privacy laws prevent insurers from requiring consumers to disclose personal information that is not necessary to provide the service required, meaning that any OAF 1 fields requesting information connected to vulnerability conditions could not be mandatory; consumers would have to provide this information voluntarily. In addition, different product distribution models in the Ontario auto insurance market lead to different degrees of direct interaction between insurers and their customers.

The committee emphasized that factors such as these prevent insurers from doing meaningful tests, making the government and/or regulator better positioned to conduct such analyses.

3. **Current rate regulatory framework is not focused on vulnerable consumers**

In the context of rating and underwriting, Ontario's prior-approval rate regulatory regime requires insurers to submit filings for their entire books of business, and there is no requirement to pay special attention to vulnerable consumers. This means that insurers are unable to dedicate as many resources as needed to serve vulnerable consumers. In a market less focused on rate regulation like the UK, the regulator puts more emphasis on preventing vulnerable consumers from harms and require insurers to adopt proper practice.

Recommendations

T3-1. FSRA should further define vulnerable consumers and communities

FSRA should continue researching and collaborating with various stakeholders, including industry and consumers, to establish a rigorous definition of vulnerable consumers.

One recommended area for research is the definition of vulnerable communities (e.g., postal codes where resilience is below a certain threshold). The role of the regulator in this case is to establish a clear definition of vulnerable communities,

with inputs from insurers and consumers, that encompasses a certain percentage of the population. Once a definition has been established, vulnerable communities should be closely monitored, and the definition should be adjusted if necessary.

T3-2. FSRA and industry should develop mechanisms to monitor treatment of vulnerable consumers

Both FSRA and insurers could explore tools to better understand the state of vulnerable consumers.

Examples of tools FSRA could explore include:

- **Risk-based monitoring:** Monitoring of vulnerable communities as discussed above.

- **Surveys:** FSRA should conduct surveys regarding vulnerabilities to understand if any issues exist and, if so, raise awareness and collaboratively develop solutions with the industry.

- **Tools that identify bad actors in the system:** An example is individuals pretending to be licensed agents or brokers who take advantage of consumers.

- **Tools that address fraud and affordability issues:** For example, utilization of special policy terms that might restrict applicability of certain coverages; introducing preferred service providers or "delisting" service providers that are proven to have benefitted from illicit practices (e.g., falsified/exaggerated accident benefit treatment programs).

Examples of ways insurers could monitor vulnerabilities include:

- **In aggregate:** Insurers could conduct anonymous surveys to understand the proportion of consumers that face vulnerabilities.

- **By individual customer:** Another approach would be for customers to self-disclose vulnerabilities in a completely voluntary process.

Various conditions were raised by the Advisory Committee for such a process to function properly, including:

- assurance that it is a strictly voluntary, opt-in process
- a clearly defined process that focuses on supporting the vulnerable customer, ideally more specific than what is already set out in the *Accessibility for Ontarians with Disabilities Act, 2005*
- a clear explanation of these processes to the customer in plain language
- a process for strictly managing vulnerability data, only allowing it to be used for front-line servicing purposes

The Advisory Committee noted that, with data collection practices such as these, there would need to be adequate governance practices outlined through regulatory guidance and/or addressed in insurers' internal risk management practices in order to protect these self-declaration data and to ensure these data are used only as intended. The committee also noted that robust mechanisms would need to be in place to prevent abuse of the self-declaration process. Furthermore, eligibility requirements would need to be clearly established alongside an ethical verification process and periodical review to maintain integrity and prevent fraud.

T3-3. Government and industry should explore mechanisms to support vulnerable consumers or communities

Government and the industry can work together to explore mechanisms to help improve insurance accessibility and affordability for vulnerable consumers or communities. Advisory Committee members have discussed possible tactics to explore:

- **Creation of a subsidized market mechanism** to help vulnerable consumers, depending on needs. For example, discounts can be offered to

consumers in the lowest 2.5% (or some other threshold) of the provincial income level or Indigenous nations;

- **Relaxing current underwriting rules as they relate to cancellations for non-payment**, or other means of offering more flexibility and optionality in the insurance product;

- **The Ontario Risk Sharing Pool (RSP)[19] could take more of a role** in providing insurance to financially vulnerable consumers with payment issues; this should involve sharing costs among the industry to ensure that no individual insurer is disproportionately impacted;

- **An insurance tax credit provided by the government,** which could provide financial support for targeted groups of vulnerable consumers and would have the flexibility to adjust when the macro environment changes.

Each of the tactics has pros and cons.

Some members expressed that insurance premiums ought to remain aligned with the risk level of each policyholder as much as possible, or at least boundaries should be established on what can be absorbed by the insurance system, rather than introducing another level of subsidy into the system.

Others expressed that these mechanisms cannot be added to the existing regulatory environment without negatively affecting a sizable portion of the consumer base. As well, the Advisory Committee notes that any such measures taken are unlikely to impact all insurers equally, and care should be taken not to create additional economic costs for insurers who have a large presence in vulnerable communities, as doing so might serve to increase availability and affordability challenges. For the same reason, care should also be taken to

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[19] The Risk Sharing Pool is a mechanism for transferring risks that insurers must accept but do not wish to retain in their book of business. RSP risks are generally considered to be underpriced relative to the risk they present.

ensure that more sophisticated insurers do not purposely keep vulnerable consumers off their books.

T3-4. FSRA should consider vulnerability in the underwriting and rate regulation reform strategy

While maintaining a focus on ensuring consumers are treated fairly, FSRA should devote attention to addressing coverage availability and insurance price pressure in vulnerable communities, while also monitoring province-wide trends. This could dramatically improve outcomes for those in vulnerable communities.

Further research and consultation are needed on the usage of demographic-sensitive information in underwriting and rating variables, as these could be linked to vulnerable communities.

The Advisory Committee noted that various jurisdictions no longer permit the usage of demographic-sensitive variables such as gender or marital status. Insurers will not stop using these variables of their own accord as it would leave them susceptible to anti-selection (i.e., those that do stop using the variables will have models that are less predictive and will have less accurate premiums, leading to an outflow of good risks, which would lead to losses). This would instead require changes in rate regulation developed in collaboration and consultation with insurers.

Prohibiting the use of such variables outright will likely lead to price shocks; ideally, a principles-based approach to introducing new rating variables would be adopted, encouraging insurers to use more sophisticated ways to capture true underlying risk and move away from these demographic-sensitive rating variables.

T3-5. FSRA should collaborate with best practice setting or regulatory organizations

The Advisory Committee noted a few examples:

- **CCIR & CISRO's Fair Treatment of Customers Guidance:** This guidance is instrumental in promoting fairness in insurer practices. If FSRA finds gaps in the guidance following its research, it should work to ensure these gaps are closed in that guidance, as opposed to creating its own guidance. This will promote consistency and reduce complexity.

- **Professional standards:** FSRA should also engage professional organizations such as the Canadian Institute of Actuaries to ensure professional standards consider protections for vulnerable consumers.

- **Other jurisdictions**: FSRA should also continue working with organizations in other jurisdictions that have more developed frameworks concerning protection of vulnerable consumers, e.g., the FCA.

- **Front-line advisor education:** Given that front-line advisors are best positioned to support vulnerable consumers, FSRA should review conduct expectations to ensure vulnerability is considered and, consequently, that these considerations are also reflected in the advisor education process.

Focus Areas

The three themes discussed thus far help inform the four proceeding focus areas of BDA applications in rating, underwriting, claims and data.

Focus Area 1: Rating

Rating (i.e., pricing) of insurance products is a key application area for BDA. Insurers use complex models to categorize customers into risk profiles which, along with operational expenses and other costs/loadings,[20] dictate how much premium a customer should pay. BDA models allow insurers to create more refined risk profiles and, therefore, better predict a customer's propensity for loss.

This section discusses various applications in rating, potential consumer benefits and harms, and the Advisory Committee recommendations.

Model results are best-estimate, approximate averages and, in the context of rating, not perfect representations of an individual's inherent risk. Apart from modelling limitations, there are many reasons why a premium may not fully reflect the risk profile of a customer, including but not limited to:

- **Consumer behaviour**: Consumer driving behaviour or risk level may differ by day or time (discussed further in the "Highlighted Topic # 1: Telematics"), or impacted by environment, etc.

- **Business considerations**: examples include but are not limited to:

  - insurers may dampen price changes to limit price shocks
  - prices may be lowered to gain market share in target segments
  - insurers may not have sufficient data to accurately model a segment of interest

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[20] *Casualty Actuarial Society Statement of Principles #3: "A rate provides for the costs associated with an individual risk transfer".* (2021). Retrieved from

- ➤ insurers may use simpler models to simplify quoting and improve client experience

- **Regulatory considerations**: Prohibitions or limitations on certain variables prevent a more accurate representation of risk. Examples include credit score,[21] which is highly predictive of loss, or territories[22], whose restrictions are discussed in the "[Model Fairness]" section. Product reforms can be another contributor (e.g., medical/rehabilitation costs may change, and premiums may take time to properly adjust for the costs).

- **Market conditions**: One example is the cost of vehicle parts, which changes on a regular basis and may not be immediately reflected in premiums.

A key implication of these considerations is that statistical bias exists in every rating model.

Potential consequences of this are that consumers may pay more than they ought to, or cross-subsidization may occur between different customer groups, which introduces additional fairness considerations. As implied by the presence of regulatory restrictions, there is a public policy decision as to which biases we are willing to accept. The Advisory Committee noted that educating consumers on subsidization would be complex and may cause further distrust due to potential confusion.

Instead, the Advisory Committee recommended focusing on improving the disclosure of annual premium changes.

** a notable factor mentioned above is the dampening of price changes to limit price shocks. The complexity of BDA models creates volatility in the pricing process. The Advisory Committee noted the importance of compartmentalizing BDA applications to intermediate stages of the rating process to limit this volatility.

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[21] R.R.O. 1990, Reg. 664: Automobile Insurance, prohibits insurers from using certain factors in a risk classification system including, but not limited to, income, employment history, credit history, and net worth.
[22] *Automobile Insurance Territorial Rating – Update*. (2005). Financial Services Commission of Ontario. Retrieved from https://www.fsco.gov.on.ca/en/auto/autobulletins/2005/Pages/a-01_05.aspx

BDA Applications in Rating

- **Weather modeling**: Could include flood and hail mapping. Insurers may use weather models to determine areas that are susceptible to floods, hail, windstorms, and other weather-related events.

- **Internal vehicle rate groups**: Rate groups are used to estimate an insurer's expected loss for a specified vehicle type and coverage. For example, a newer vehicle may be correlated with lower medical rehabilitation costs due to better safety features but may also be more susceptible to theft.

- **Telematics and price optimization**: These will be discussed in more detail in later sub-sections.

Potential Consumer Benefits & Harms

BDA applications will improve the measurement of risk, which means the price can reflect individual risk more accurately.

BDA may also provide insurers with the ability to insure certain previously uninsurable risks at an affordable price. However, as model predictions become more precise, some high-risk customers may be priced out of the market altogether, creating accessibility and affordability issues for some customers.

Meanwhile, the volatility in prices mentioned above could cause unpredictability for customers if insurers do not use other components in their rating program to smooth the effects of annual price changes. BDA may lead to potential exploitation of customer inertia through price optimization, heightened in cases of vulnerable consumer groups.

Highlighted Topic #1: Telematics

Telematics is an auto insurance product in which the customer's price is adjusted based on a customer's driving patterns. Driving data is collected either through a device embedded in the vehicle or through a customer's cellular phone. Pricing solely using telematics data

could be a great contributor towards fairness in rating, as it would not rely on variables beyond a consumer's control.

While there are currently variables within consumer control (e.g., conviction history, at-fault claims, driving record, etc.), a material portion of a rating model's predictive power comes from variables beyond consumer control (e.g., age, gender, years licensed, territory, etc.). This section explores the viability of rating solely on telematics data.

The Advisory Committee highlighted examples in which driving behaviour is not the sole consideration for rating purposes, at least in the Ontario context:

- Accident benefit coverages[23] are awarded without regard to fault in an accident, and through court precedent, often extend beyond the realm of vehicle operation itself (e.g., a stolen vehicle may injure innocent third parties for which the insured's coverage must provide remedies).

- Comprehensive coverage includes perils that are not necessarily related to driving behaviour (e.g., fire, earthquake, explosion, vandalism, lightning, hail, and theft or attempted theft).

- Important secondary information typically not captured by telematics data (e.g., data on other drivers involved in an accident). The privacy and ethical implications as well as disclosure requirements related to collecting this information through telematics programs severely limit an insurer's ability to use this information for rating.

In addition, the Advisory Committee noted some difficulties in implementing telematics programs:

- **Operational:** If a consumer wanted to switch from telematics-only to non-telematics products, and vice versa, then this would potentially require defining a conversion standard.

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[23] *Ontario Automobile Policy (OAP 1) Owner's Policy*. (2019, April). Financial Services Regulatory Authority of Ontario. Retrieved from http://www.fsco.gov.on.ca/en/auto/forms/Documents/OAP-1-Application-and-Endorsement-Forms/1215E.3.pdf

- **Technology differences:** Some products (e.g. cell phone applications) may not produce data with the quality that others do. More reliable data-collecting devices tend to be more expensive, which would tend to increase consumers' premiums.

- **Customer Adoption:** Telematics programs that work on a customer's cell phone rely on that customer being diligent in turning on the relevant applications.

- **Cost and effort:** From an insurer standpoint, there is a significant "time zero" investment as telematics programs require a complex data infrastructure to manage high volumes of data and for the product to be delivered and maintained and often involve third-party vendors. The high initial cost reduces the likelihood of investments in telematics programs from smaller insurers.

Despite these challenges, it should be emphasized that many insurers have successfully implemented telematics programs in Ontario. The programs are implemented as supplements to existing rating models, i.e., as additional rating variables based on driving habits to either offer discounts or apply surcharges, rather than standalone rating plans.

The Advisory Committee noted that, thanks to telematics, it is possible to offer discounts up to 25% (varying by insurer) based on safe driving habits.

Products priced exclusively on the telematics data already exist in other markets such as the United States and eventually will come to Ontario. For example:

- companies like Metromile are offering pay-per-mile policies
- companies like Root Insurance price auto insurance policies based primarily on a driver's telematics data
- original equipment manufacturers (OEMs) like Tesla and General Motors (GM) are leveraging their vehicles' embedded telematics systems to help underwrite insurance policies, which are offered to customers through OEM-led agencies with the insurance rate primarily based on embedded telematics data

Ultimately, telematics growth and innovation should be encouraged.

Consumer interest in usage-based insurance (UBI) has increased significantly, especially during the COVID-19 pandemic. FSRA removed Usage Based Insurance (UBI) Guidance[24] to allow more competition and innovation in the auto insurance market in 2020. This aims to encourage innovative products that benefit consumers, such as pay-as-you-go or pay-per-mile options.

Highlighted Topic #2: Price Optimization

Rating models should be consistent with ASOP. However, this is generally an initial step to developing a final price, where business considerations may require adjusting a rate proposed by a model (e.g., to limit price shocks to a consumer on renewal).

These adjustments are still made within a range of reasonable prices proposed by a model. While the complexity of adjustments for business considerations may vary, such practices can be broadly classified as "optimization."

Traditional Modeling vs. Price Optimization

To estimate a price using a traditional approach, a modeller would first estimate loss for a prospective customer using a "loss cost" model, after which other loadings would be added (e.g., operational expenses and profit). Business considerations would likely be applied in a manual manner or based on qualitative assessment.

Price optimized models, on the other hand, provide a more automated means of incorporating business considerations. For example, more advanced approaches may include several types of models[25]:

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[24] *FSRA has Removed UBI Guidance to Allow More Competition and Innovation in the Auto Insurance Market.* (2020, November). Financial Services Regulatory Authority of Ontario. Retrieved from https://www.fsrao.ca/newsroom/fsra-has-removed-ubi-guidance-allow-more-competition-and-innovation-auto-insurance-market

[25] *Price Optimization White Paper.* (2015, November). Casualty Actuarial and Statistical Task Force. Retrieved from https://www.naic.org/documents/committees_c_catf_related_price_optimization_white_paper.pdf

1. **Loss cost**: The underlying expected cost for a customer used in a traditional approach.

2. **Demand**: These models determine how competitive a price will be for various segments of business. These models can account for price elasticity, which measures how sensitive a consumer is to a price change.

3. **Retention**: These models help an insurer understand what proportion of business they can anticipate keeping in future years, allowing them to plan their prices on a multi-year basis.

Pros/Cons

While price optimization can have a negative connotation, it is an economic reality not considered under the ASOP. This raises the question of what degree of optimization is reasonable.

In the United Kingdom, the FCA recently acted[26] to prevent what is referred to as "price walking," which is when new insurance customers receive more competitive premiums compared to renewing customers.[27]

Insurers' price-optimized algorithms determined that in order to make up for losses incurred on providing new business discounts (to attract more new business), they could charge customers more who were loyal or did not shop around as much (e.g., due to language difficulties or being older). If consumers shop around frequently, then they should be able to find deals in a frictionless marketplace. For those that do not shop around, there is a risk they may be penalized, as discussed in the UK example.

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[26] *PS21/11: General insurance pricing practices – amendments.* (2021, August). Financial Conduct Authority. Retrieved from https://www.fca.org.uk/publications/policy-statements/ps21-11-general-insurance-pricing-practices-amendments
[27] *General insurance pricing practices market study.* (2021, May). Financial Conduct Authority. Retrieved from https://www.fca.org.uk/publication/policy/ps21-5.pdf

The FCA market study[28] also found that there is some evidence that consumers who display characteristics of vulnerability pay higher prices relative to their risk for home insurance. Accordingly, rules were established stating that an insurer's renewal price could be no greater than the equivalent new business price. This example raises concerns about the use of certain price optimization practices.

Final Thoughts

Price optimization is being used in the insurance industry, and in fact is necessary to some extent for insurers to remain solvent. Regulators need to ensure that it doesn't lead to customers being treated unfairly.

There are some mitigants in the legal/regulatory framework that somewhat reduce the risk to consumers being charged unfair rates from price optimization. For example, CCIR/CISRO FTC Guidance has expectations on controls in place for product design and FSRA's UDAP Rule includes prohibitions that apply broadly to unfair discrimination in insurance.

Ontario's rate regulation requires that insurers use only rates and classifications approved by the regulator for individually rated automobile insurance policies, and that policyholders' renewal premiums cannot be greater than the equivalent new business premiums. This will be an area of continuous study for the regulator and the sector.

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[28] *General insurance pricing practices - Final Report.* (2020, September). Financial Conduct Authority. Retrieved from https://www.fca.org.uk/publication/market-studies/ms18-1-3.pdf

Focus Area 2: Underwriting

Underwriting rules specify the criteria an insurer uses to accept or reject a risk, coverage, or endorsement. Therefore, like rating, underwriting is also a key application area for BDA.

BDA Applications in Underwriting

- **Defining underwriting appetite and underwriting rules**: A BDA model may be used to designate new explanatory characteristics as underwriting criteria, help identify customers likely to commit fraud or unlikely to pay their premiums, and decide which tier or company a risk belongs in or when to cede a risk to FA RSP. Different strategies, like whether to order a Motor Vehicle Record (MVR) report, can then be employed based on the risk group assignment.

- **Automation of manual processes**: Examples include and are not limited to: information being pre-populated by third-party data sources (with an opportunity for insurers to confirm the data is accurate), simplifying the underwriting process especially when switching insurance providers to make shopping for insurance less burdensome.

- **Fraud detection and prevention:** Point of sale (POS) fraud, also known as premium or underwriting fraud, takes place when the applicant purposely hides or distorts facts/information when obtaining insurance coverage. A BDA model can be used to capture the precise identity of the applicant, discover the links of the applicant to frauds, and detect abnormal behaviour patterns.[29]

- **Other operational examples**: BDA can help predict the success of marketing campaigns, set operational metrics like the optimal number of underwriters available to answer calls or how to pair underwriters with brokers, and provide on-demand insurance such as trip-by-trip basis insurance.

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[29] *Insurance Fraud Detection and Prevention in the Era of Big Data – Curbing Fraud by Application of Advanced Analytics Across Policy Lifecycle.* (2015). WNS Decision Point. Retrieved from https://www.wnsdecisionpoint.com/Portals/1/Documents/Reports/PDFFiles/5283/38/WNS%20DecisionPoint_Report_Fighting%20Insurance%20Fraud%20with%20Big%20Data%20Analytics.pdf

Potential Consumer Benefits & Harms

BDA applications will aid in the development of an insurance company's underwriting guidelines and accelerate the underwriting process for consumers. Permitting auto insurance product innovation could encourage insurers to provide coverage for higher risk individuals at a more affordable price.

BDA applications can also help to tackle fraud at point of sale, saving cost for insurers and customers. However, customers without access to digital devices or those who do not want to provide personal data may become marginalized.

Also, BDA may increase the risk of creating an uninsurable subset of customers (e.g., those predicted to be less likely to pay their premiums).

Recommendations

FA2-1. BDA should not be used by the insurer to target poor service for a group of customers during the underwriting process (e.g., an insurer purposely creating an unjustified delay in providing a quote, even though a risk falls within its underwriting rules, to the point where the consumer is forced to purchase insurance elsewhere).

FA2-2. FSRA should adopt a principles-based approach for underwriting rules regulation, which allows insurers to select business based on their risk appetite while ensuring compliance with the "Take All Comers Rule."[30]

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[30] *Interpretation of Sections 237 & 238 of the Insurance Act and Section 1(1) and 2(1)(5) to 2(1)(8) of Regulation 7/00 Unfair or Deceptive Acts or Practices and Approach to Supervision [Take All Comers Rule].* (2022, April). Financial Services Regulatory Authority of Ontario. Retrieved from https://www.fsrao.ca/industry/auto-insurance/regulatory-framework/guidance-auto-insurance/interpretation-sections-237-238-insurance-act-and-sections-11-and-215-218-regulation-700-unfair-or-deceptive-acts-or-practices-and-approach-supervision-take-all-comers-rule

Focus Area 3: Claims

Claims resolution, from the moment a claim is reported until the moment a claim is fully paid and closed, includes investigation, valuation, reserving, and settlement. Insurers must examine claims diligently, settle them fairly and pay all reasonable and necessary claim expenses within prescribed timelines.

The claims process is yet another key area where BDA can be a useful tool.

BDA Applications in Claims Resolution

- **First notice of loss**: Telematics devices can help identify loss events and proactively provide services to vulnerable consumers who need help.

- **Fraud detection:** Fraud detection solutions (e.g., Shift, FRISS) can identify claim circumstances that warrant additional investigation for fraud or misstatement of claim amounts. BDA can also enable network analyses, which are reviewed by fraud specialists, to help disclose hidden links among claims (identifying "fraud rings"). This would be used to supplement the insurer's existing fraud investigation process.

- **Claim management**: BDA can be used for segmentation of claims by type and complexity, enabling more efficient management of claims, including the reserving process. For example, BDA can be used for the assignment of claims to adjusters based on expertise and/or capacity, the setting of appropriate reserves (amounts anticipated to cover future claim outcomes), or the prediction of claim exposures that may emerge in the future (e.g., potential future bodily injury claims).

- **Loss assessment**: Natural language processing (NLP), which is one application of BDA, can be used to support claims digitization. BDA can also enable damage value estimation based on picture/video/invoice recognition and validation of cost estimates by third parties in the claims process.

- **Automation of payment process**: BDA can enable the fast-tracking (or even full approval/"straight-through") of claim payments.

Potential Consumer Benefits & Harms

Telematics devices with safety warning push notifications and consumer behaviour coaching can help customers reduce the likelihood of collisions by improving driving habits and taking preventative measures in poor weather.

From a claim standpoint, BDA can automate approvals to enable a faster and easier claim process and can be particularly helpful in fraud detection. On the other hand, fraud detection algorithms with high false positive rates may increase the risk of unjustified rejection of claims or unfairly targeting a group of consumers for slow payment. Moreover, claim optimization with BDA may be used to target poor service or substandard outcomes for a group of customers (e.g., identify claimants, especially vulnerable customers, who are likely to accept cash settlement amounts below the true value of their claims). Meanwhile, there is increased concern regarding data privacy (e.g., data used for fraud detection may be inappropriately used for other purposes, access to personal health claim data).

Recommendations

FA3-1. Insurers should monitor false positives from their fraud detection models very closely and continuously strive to improve model performance over time.

FA3-2. BDA should not be used by the insurer to target poor service or substandard outcomes for a group of customers due to claims optimization (e.g., insufficient or unfair settlement based on the insured's profile).

FA3-3. As with rating and underwriting, the standard of due diligence should be commensurate to the impact on the consumer. Accordingly, any model that denies claim payments would impose a severe outcome and the tests necessary for applicability should be extremely rigorous. A human-in-the-loop model, with a human retaining full control, should be used by the insurer for such decision-making models. A human-out-of-the-loop model might be considered for smaller transaction types, provided human-oriented appeals processes are in place. A human-out-of-the-loop might also be considered once model accuracy has been confirmed and when there are appropriate controls in place to ensure that the accuracy is maintained over time.

Focus Area 4: Data

In line with the recent proliferation of devices and applications that generate data, consumers are now more conscious about what data is collected, how it is used, and by whom,

Figure 2: Jurisdictional Comparison of Privacy Protections

	European Union GDPR	United Kingdom	New Zealand	Australia	California	Canada (Bill C-11)
Coming into force / last major update	2018	2018	2020	2018	2020	2020 (introduced)
Defining privacy as a human right	✓	✓	✓	✓	✕	✕
Individual knowledge and understanding	✓	✓	✓	✓	✓	✕
Accountability: compliance with the law as objective standard	✓	✓	✓	✓	N/A	✕
Audit: proactive to verify compliance	✓	✓	✕	✓	✓	✕
Administrative monetary penalties: borad list of violations	✓	✓	N/A	✓	✓	✕
Absence of appeal before privacy- specific tribunal	✓	✓	✓	✓	✓	✕
Broad discretion to decline/discontinue complaints	✓	✓	✓	✓	✓	✕
Full discretion for public education and guidance	✓	✕	✓	✓	✓	✕
Codes approval: under OPA procedures	✓	✓	✓	✓	N/A	✕
Trans-border: specific provisions	✓	✓	✓	✓	✕	✕

This figure is an adaption of "Jurisdictional Comparisoin: Privacy Protections" by the Office of the Privacy Commissioner of Canada. The figure is modified with the permission of the Office of the Privacy Commissioner of Canada.

Source: https://www.priv.gc.ca/media/5434/jurisdictionalcomparison-eng.pdf

Canada's privacy regime is falling behind the laws of many of its global trading partners (see Figure 2 above). The current *Personal Information Protection and Electronic Documents Act* (PIPEDA) was enacted more than 20 years ago in 2000. The European Union passed the *General Data Protection Regulation (GDPR)* in 2018 to provide consumers with greater protections and rights around their data. Other jurisdictions are following suit, including Canada.

In Canada, the provinces have already stepped in to fill gaps in order to modernize the privacy regime. Ontario and Quebec have put forward proposals towards responsible digital innovation. Quebec passed Bill 64, and Ontario is in the midst of serious consultations about its own law[31].

In 2020, the government of Canada introduced Bill C-11 to update Canada's federal private-sector privacy law. The proposed Bill C-11[32] has the following implications for consumers in various areas:

- **Meaningful consent:** Individuals need to be able to make meaningful choices about the use of their personal information. Modernized consent rules would ensure that they have the plain-language information they need to make these choices.

- **Data mobility:** To further improve their control, individuals would be allowed to direct the transfer of their personal information between organizations. For example, individuals could direct their bank to share their personal information with another financial institution.

- **Disposal of personal information and withdrawal of consent:** The accessibility of information online makes it difficult for individuals to control their online identity.

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[31] *Leave no Ontarian Behind: Why Ontario should move ahead with its own private sector privacy law with or without federal reform.* (2021, September). Information and Privacy Commissioner of Ontario. Retrieved from https://www.ipc.on.ca/newsrelease/leave-no-ontarian-behind-why-ontario-should-move-ahead-with-its-own-private-sector-privacy-law-with-or-without-federal-reform/
[32] *Canada's Digital Charter: Trust in a digital world.* (2020). Innovation, Science and Economic Development Canada. Retrieved from https://www.ic.gc.ca/eic/site/062.nsf/eng/h_00108.html

The legislation would allow individuals to request that organizations dispose of personal information. In most cases, it would also permit individuals to withdraw consent for the use of their information.

- **Algorithmic transparency:** The CPPA (*Consumer Privacy Protection Act*) contains new transparency requirements that apply to automated decision-making systems like algorithms and artificial intelligence. Businesses would have to be transparent about how they use such systems to make decisions about individual customers. Individuals would also have the right to request that businesses explain how a decision was made by such a system and how the information used in the decision was obtained.

- **De-identified information:** The practice of removing direct identifiers (such as a name) from personal information is becoming more common. However, the rules that govern how this information is then used are not clear. The legislation will clarify that this information can only be used without an individual's consent under certain circumstances.

The following section summarizes the committee's discussions of the above areas[33]. Note that meaningful consent and algorithmic transparency were discussed in the Transparency section and the Rating/Telematics section.

Disposal of Personal Information and Withdrawal of Consent

Preamble: The Insurance Contract

Insurance contracts start with the principle of "utmost good faith." This principle requires both parties to commit to be transparent regarding the risk presented. The exchange of information and confirmation of same plays a critical role in insurance availability.

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[33] These discussions were carried out during Feb - June 2021. Bill C-11 was later struck down on the order paper with the federal election call in August. However, the proposed Bill C-11 will still likely influence privacy law reform and legislation in Canada.

Since confidential information is provided, the insurer owes a duty of care to ensure they protect the insured's information. This responsibility extends to include a "right of deletion" of an insured's information except in specific circumstances:

- A contractual exposure exists for which the information is necessary to monitor, evaluate, and adjudicate the exposure.

- An insured has violated the principle of good faith. As well, the potential for future violations introduces a risk of subsidy from other "good faith" actors to the detriment of the collective good.

Insurance Challenges

The Advisory Committee cautioned that withdrawal of information or opt-in provision of data would be difficult. This is because insurers need data from consumers to assess risk. The committee noted the following challenges:

Operational challenges

- Most operational systems are not configured for the withdrawal of information or opt-in provision of data. Also, the downstream impact is not well understood right now. This creates a significant burden for insurers.

- Claims may be re-opened after a period, and it would be challenging if records were deleted. A retention and destruction schedule to mitigate the impact would be required.

Analytics challenges

- Withdrawal of information or opt-in provision of data may limit the ability to replace models over time. This is because certain data will no longer be available. It would also limit the credibility of the data, leading to less accurate models.

- If consumers withdraw consent non-uniformly (e.g., greater usage by a specific client segment), it could create bias in the data. The bias in the data would translate into biased models. Moreover, high-risk consumers are more likely to withdraw consent. This may lead to cross-subsidization (i.e., lower risk drivers pay higher rates to cover the losses of higher risk drivers).

Market challenges

- Withdrawal of information or opt-in provision of data may lead to availability & affordability issues. There might be low appetite to operate in areas where data is scarce and the risk is high.

- Some third-party data collectors of information support the availability of insurance. Examples include CGI AutoPlus, the FA Underwriting Information Plan (UIP), and the GISA Automobile Statistical Plan (ASP). If insurers delete their data as the insured withdraws consent, how does that impact the third-party data collectors? Insurers/third parties need to enhance or update current procedures or operating models to manage this.

De-identified Information

The Advisory Committee also questioned whether insurers could keep de-identified claim/premium data when customers request the disposal of their personal information. There is a need to further clarify these matters in future privacy legislation reform.

Data Mobility

The Advisory Committee also discussed the concept of data mobility and its application in banking. Open banking[34] allows consumers to share their financial data between financial institutions and accredited third-party service providers. It provides consumers greater

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[34] *Final Report – Advisory Committee on Open Banking.* (2021, April). Government of Canada, Department of Finance. Retrieved from https://www.canada.ca/en/department-finance/programs/consultations/2021/final-report-advisory-committee-open-banking.html

control over their data, enabling them to securely use new data-driven financial services. These services analyze information from all accounts in one place and recommend personalized financial products or services (e.g., product comparison tools).[35]

For its application in insurance, the committee suggested there would need to be a common data format. There would also need to be some agreed-upon protocol that would enable data portability. Meanwhile, there could be potential challenges for the sharing of telematics data. Examples of challenges include Original Equipment Manufacturer (OEM) telematics data vs. insurer telematics data, cyber risk, consent transfer and consent withdrawal, and Intellectual Property laws.

Recommendations

FA4-1. Insurers could leverage experience from companies that are compliant with the *GDPR Act* and build a roadmap following a modernized privacy regime. Examples include technological investment in well-established retention and destruction schedules, and the automation of data deletion.

FA4-2. Insurers should establish internal committees and policies to achieve optimal consumer outcomes and ensure the ethical handling of data. This includes managing consent, maintaining accurate and updated customer data, managing changes in data use, ensuring third-party confidentiality, escalating data issues, and establishing accountability.

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Appendix 2: Technical Advisory Committee Member Profiles

Aidan Chen

Vice President, Data & Analytics and Privacy Officer, Facility Association
Aidan is responsible for Facility Association's data asset management development, oversight of new products and associated processes, and Member Services.

He is a passionate insurance professional committed to continual learning and development, with over 18 years of experience in the Canadian and International Reinsurance, P&C and Life insurance industries.

Aidan's diverse background includes insurance pricing and portfolio management, valuation and financial reporting, system conversion and system development.

Achraf Louitri

Actuarial Vice President, Intact Personal Lines
Achraf started his career at Intact in 2008. During his first 8 years as an actuary, he held various actuarial pricing positions in personal and commercial lines insurance.

He joined the Intact Data Lab in 2016 where he led cutting-edge initiatives and helped the lab grow and become a centre of innovation at Intact. He then became the VP - Data Science at the end of 2019, where he managed multiple data science teams, developing AI solutions that contribute to the achievement of Intact's mission and objectives. In June 2021, he became the Actuarial VP for Intact Personal Lines.

Baiju Devani

Head of Artificial Intelligence, TD

Baiju has led data sciences and engineering teams for over a decade to bring algorithmic and data-driven business growth in FinTech and InsurTech space. Prior to his current role in TD, Baiju was SVP and Chief Data Officer at Aviva Canada, responsible for embedding the use of data and algorithms to drive business growth. He led a cross-functional team of actuaries, data scientists and data engineers to deliver innovative data-driven solutions including use of applied machine learning for product pricing and underwriting and other advanced algorithms for decision-making.

Before Aviva, Baiju led the analytics group at IIROC where he guided decision-making and algorithmic surveillance in trading markets that generate up to 600 million real-time data points daily. Baiju was also at OANDA, a FinTech start-up that disrupted retail foreign-exchange markets where he led data sciences and business growth, and was part of a team that scaled the organization from a start-up to a 400+ employee global business.

Christopher Cooney

Vice President, Insurance Data and Analytics, TD

Chris Cooney is currently the Vice President of Insurance Data and Analytics at TD. Given his current mandate, Chris is responsible for overseeing a variety of data and analytic projects impacting their customers and their business. His previous role was VP, Analytics and Modeling at TD Insurance (TDI), leading development, planning, and execution of TD Insurance's analytic strategy. Prior to joining TDI, Chris was employed with RBC Insurance in a similar capacity.

Today, Chris is the Chair of the Facility Association Board of Directors as well as a member of the Board of Directors at the General Insurance Statistical Agency ("GISA").

Danish Yusuf

Founder and CEO of Zensurance

Danish is a former leader in McKinsey & Company's Digital Insurance practice, supporting insurance clients globally on defining their digital strategy. He earned a bachelor's degree in Software Engineering from the University of Toronto and has an MBA from Harvard Business School. In 2018, he was named by Canadian Underwriter as one of the Top 10 Brokers Under 40 in the Property and Casualty industry.

Before McKinsey, Danish was a software architect and developer at IBM Canada, covering everything from mainframe development to web development.

Deb Upton

Vice President, Pricing & Actuarial Gore Mutual

Deb was the first in-house Actuary hired into the organization and has led the development of the Actuarial function and its integration into the company's processes.

Prior to joining Gore Mutual, Deb held various roles at larger insurers with pricing and reserving experience across many lines of business.

Don De La Paz

Vice President, Enterprise Client Data and Functions Data Management Office, Royal Bank of Canada

Don De la Paz, who was recently appointed to lead Enterprise Client Data as well as drive Data Management for a number of key functions within RBC, is a strategic leader and seasoned data professional well versed in Data Governance, Data Management, and Data Science practices.

Prior to his current role, Don led Information Management Risk, oversaw the bank's key risks regarding data and set the foundation for its overall data risk posture through appropriate data polices and framework, data risk appetite, and measurement. He also played a key leadership role in helping to stand-up RBC's Chief Data Office as well as spent most of his career within RBC's Insurance platform where he built and formalized analytics and data capabilities supporting all insurance lines of business. Prior to RBC, Don was part of ING Canada's Actuarial Data team as well as part of the Client Service US Group Pensions function within Manulife Financial.

Don holds a Specialist Degree in Statistics from the University of Toronto and volunteers in various programs such as the University's Backpack to Briefcase program helping graduates prepare for their professional careers.

François Godbout

Associate Vice-President, Research & Analytics Innovation, Co-operators General Insurance Company

François Godbout is a recognized leader in the Canadian insurance industry, with a proven track record following his leadership of many large-scale actuarial and data & analytics initiatives.

He has the responsibility of building and leading advanced analytics strategies for his organization, while guiding his team of multi-disciplinary experts from a wide range of fields including actuaries, statisticians, meteorologists, hydrologists, and geomatic engineers. He is an accomplished professional who is skilled at building relationships and consensus.

François is a Fellow of the Casualty Actuarial Society and of the Canadian Institute of Actuaries. He holds a Bachelor's degree in Actuarial Science from University of Laval.

Kai Huang

AVP, Modelling & Pricing Analytics, Economical Insurance Company

Kai Huang is a senior leader in the P&C industry with extensive experience in pricing and analytics of insurance products.

Throughout his career, Kai held various leadership positions heading analytics teams across a multitude of insurance functions, including product & pricing, claims and human resources. At Economical, Kai oversees a team of Data Scientists and Big Data Engineers in the Personal Lines insurance department.

Kai is a Fellow of the Casualty Actuarial Society and an advocate for Big Data Analytics.

Michael Lin

Chief Information Officer, Travelers Canada

Michael Lin is a seasoned executive with more than 25 years of experience leading information technology (IT) for large organizations. He is currently the Chief Information Officer (CIO) and a member of the Senior Leadership Team at Travelers Canada, a property & casualty insurance provider.

As CIO, Michael leads the IT function and works with businesses and international partners to develop and deliver technology strategies that support corporate long-term objectives, with a focus on deepening technology and innovation capabilities across the organization.

Previously, Michael was Senior Vice President and CIO for Morneau Shepell, a provider of human resources consulting and outsourcing services. He was responsible for software engineering, infrastructure, and technology strategy globally. His mandate encompassed product research and development, cybersecurity, and technology innovation, including an AI Center of Excellence.

Prior to joining Morneau Shepell, Michael held several senior leadership positions within the financial, insurance, and technology sectors. He holds a BsC in Computer Science from the University of Toronto.

Richard Boire

President, Data Science and Machine Learning, Boire

Beginning his predictive/data analytics career at such leading-edge organizations as American Express Canada and Loyalty One in the late 1980s, Richard launched his own consulting company in 1994, which then later became the Boire Filler Group. The Boire Filler Group was then sold to Environics Analytics 2016.

Richard's applied experience and expertise of over 30 years has been utilized across all industry sectors. Much of this experience has been focused on the property and auto insurance area where in 1999, he pioneered the development of predictive loss cost models for several insurance companies. This vast experience and expertise resulted in Richard publishing a book in 2014 entitled "Data Mining for Managers: How to use data (big and small) to solve business problems," which was published by Palgrave McMillian of New York City.

Santiago Villasis

Director, Advanced Analytics & AI, CGI

Santiago Villasis leads the Advanced Analytics practice for Insurance at CGI. His core expertise is in Big Data Analytics, Machine Learning and Business Intelligence design, development, and implementation on both the client and consulting sides. Santiago has over 20 years of progressive experience across different areas in the fields of banking, telecommunications, automotive, insurance, government, and credit data management industries.

His solutions and insights have brought innovative, significant, and sustainable returns and savings to his clients, including five Fortune 500 companies. He has consulted for Bank of Canada, Ministry of Transportation of Ontario, and deponed for the Office of the Privacy Commissioner of Canada on the value credit data for insurance.

Santiago holds a BSc. & MSc. in Economics from the University of Idaho, and an MA in Economics from McMaster University. He also has a Chartered Insurance Professional (CIP) designation from IIC, a certification in Artificial Intelligence from MIT, and a Certified Digital Marketing Professional certification from AMA.

Steve Gugler

Partner, 3Tree

Steve Gugler has been a leader of innovation within the Canadian P&C industry for over 20 years. Prior to co-founding the InsurTech 3Tree in 2016, Steve held several Executive leadership positions within the Canadian insurance industry. Steve has worked both in the start-up field, as well as industry institutions like the Insurance Bureau of Canada.

He has played a solution-focused leadership role on many industry-wide initiatives, with particular interest in enabling the industry to achieve better digital capabilities. Also included in his experiences has been the pioneering of insurance telematics in Canada and delivering automated insurance solutions in many other key areas including regulatory reporting, broker/carrier connectivity, automated underwriting, and foundational data transformations. Steve brings strong engagement management skills, proven delivery team management abilities, as well as deep telematics data, regulatory reporting data, and CSIO and ACORD insurance data standards expertise.

Steve is an ACORD certified ACE and has an Honours Bachelor's degree in Business Administration, Wilfrid Laurier University.