



Inside Insurance Analytics

Ethical, Methodological, and
Risk Management Best Practices



THE EMERGING TECHNOLOGY SERIES



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Risk Management Best Practices

PROJECT TEAM

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About the Emerging Technologies Executive Task Force

In 2020, LL Global — in support of how our industry was pivoting to meet the time of crisis and the need for vast change — launched an initiative to engage and connect C-suite leaders in new ways. Core to this effort was the formation of several executive task forces focused on particularly pressing issues identified in the current environment — one of which is emerging technologies.

We created the Emerging Technologies Executive Task Force, with McKinsey & Company as a valued consultancy partner, to reflect a cross-section of industry perspectives. The group represents current and former LL Global Board members and is supported by LIMRA subject-matter experts. At a high level, the goal of this team is to gauge the different emerging and available technologies, as well as to assess which might provide the greatest opportunity for efficiency and/or disruption.

To begin, the task force created workstreams to prioritize three key areas:

- **Data and Analytics:**

This group's goal is to take a deeper view of artificial intelligence (AI), focusing on the foundational underpinnings of AI applications. Its work is intended to help surface deep insights on data strategy and data talent, as well as the core precursors needed to move AI projects forward.

- **Accelerated Digitization:**

This work addresses the move away from the traditional industry paradigm (where business is built around mortality, morbidity, and the functions of insurance) to pivot toward the human experience (HX). HX is the sum of customer experience and employee experience — building a digital experience where technology takes center stage in creating new models of success.

- **Platform Modernization:**

This team focuses on ways to tackle a pervasive, ongoing industry challenge. Whether companies decide to replace legacy systems or attempt to modernize them, it is critical to have industry best practices for executing on this monumental task.

For each of these workstreams, a dedicated subcommittee of financial services technology leaders is focusing on efforts that result in valuable insight and deliverables. Their research findings and additional outreach will help the industry benchmark the current landscape, identify and create new solutions, and formulate next steps.

We extend our sincere gratitude to the members of the task force and subcommittees. Without their dedication and commitment, this important work — by and for the industry — would not be possible.

Emerging Technologies Executive Task Force

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Introduction

As part of LIMRA's Emerging Technology Executive Task Force (ETF) initiative, a Data and Analytics subcommittee comprising member company analytics leaders launched a comprehensive research effort. This team fielded a survey asking a wider group of industry analytics leaders about their best practices for managing ethical issues, methodological challenges, and other analytics-related risks.

In this paper, we will examine their responses and discuss the following topics:

- The self-described maturity and level of investment in analytics organizations
- Common best practices that analytics leaders use to manage ethical issues, methodological challenges, and other risks
- Patterns observed in the survey responses and their implications for the industry
- Potential analytics-related industry utilities

Executive Summary

For this research project, the Data and Analytics subcommittee surveyed analytics leaders at 23 LIMRA member companies in the United States and Canada, asking each of them several questions covering various aspects of their analytics programs. Our main goal was to understand the best practices companies are using to mitigate the various risks inherent in deploying analytics solutions — and to examine the broader trends underpinning these practices. We also aimed to explore companies' levels of interest in setting up analytics-related industry utilities to address common challenges.

Key Findings and Insights

- **There is more opportunity for analytics functions to mature.**

Companies report that they have relatively advanced analytics functions, but the short length of time those teams have been in operation suggests there is more room to mature. Companies should invest more resources in analytics if they already have a program, or they should start one if they do not. As an industry, investing seriously in analytics programs now will result in tremendous returns in the future.

- **Companies prioritize tackling ethical issues over methodological issues.**

Analytics organizations at member companies tend to prioritize addressing ethical concerns (like data privacy and unintended biases) over methodological considerations (such as model explainability and performance degradation). This is a reasonable stance to take because ethical challenges pose a greater reputational and legal risk to companies, and it is vital that they be handled correctly. However, analytics teams also recognize the importance of addressing methodological issues to ensure they retain credibility with all stakeholders. Companies must balance their resources and efforts to ensure they handle both ethical and methodological issues appropriately.

- **Companies are wary about allowing fully automated decision-making.**

Companies tend to hedge against the risks of unsupervised automated decision-making. For example, some ensure that autonomous processes are allowed to make decisions only with human approval. Others allow them to make only less weighty decisions, while they reserve more important decisions for humans. This hesitancy against fully trusting autonomous processes will likely continue until artificial intelligence (AI) techniques and accuracy improve — and until regulators and other stakeholders become more comfortable with their role in company operations.

- **Robust internal “guardrails” ensure oversight and transparency.**

Analytics organizations tend to strongly prefer to handle ethical challenges internally, rather than seek advice from external organizations. This makes sense because these are sensitive issues, and companies are understandably wary of disclosure. However, analytics organizations do take their responsibilities very seriously, and they go to great lengths to maintain transparency and robust oversight in their programs. They seek internal review from legal and compliance teams, as well as peer review from fellow data scientists. They also make sure to fully document the decisions they make when selecting data, variables, and models for the sake of transparency.

- **There are potential opportunities for analytics-related industry utilities.**

Companies are interested in the possibility of sharing resources to tackle analytics-related challenges in the form of one or more industry utilities. Issues that could be addressed in this manner include ensuring compliance with data privacy restrictions, surmounting model explainability difficulties, addressing fairness concerns with regard to protected classes, and providing analytics literacy training for non-technical business partners.

Participating Company Characteristics

To understand the mix of survey respondents, our first questions focused on company characteristics. Specifically, we asked participants about the maturity, longevity, and structure of the analytics function at their respective companies. Our analysis of these company characteristics provides insight into the current state of the insurance analytics field. Looking forward, it will help focus LIMRA's efforts on the right analytics initiatives.

All of the 23 survey participants are life insurance carriers, retirement plan providers, or both. A few are reinsurance companies, and several are multi-line companies, selling property and casualty (P&C) or other insurance types in addition to life products. In these cases, we asked respondents to cite the practices of the life or retirement division, rather than of the company as a whole. No non-carrier distributors (banks, broker-dealers, financial advisors, or agents) are represented in the sample.

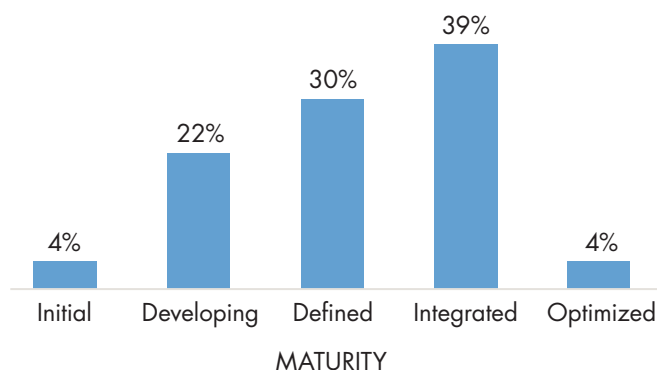
Analytics Function Maturity

We asked participants to self-evaluate the maturity of their analytics functions, using the following response options:

- **INITIAL**
(*Ad hoc* analytics efforts with little organization)
- **DEVELOPING**
(Organized analytics effort creating reports)
- **DEFINED**
(Established organization setting standards for data and reporting)
- **INTEGRATED**
(Well-established organization incorporating analytics into business processes)
- **OPTIMIZED**
(Fully built-out organization effectively promoting data-driven decisions)

Most companies report having a Defined (30 percent) or Integrated (39 percent) analytics organization, while a few others describe theirs as Developing (22 percent). Only one company each qualifies its program as Initial or Optimized (Figure 1).

FIGURE 1
Self-Described Maturity of Analytics Function



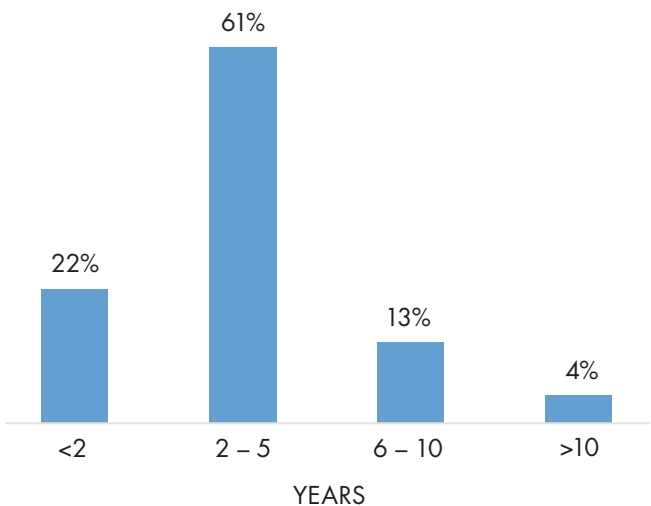
Both in this survey and in previous similar ones, larger companies and multi-line companies tend to have more mature analytics programs than smaller or life-only carriers do. For larger companies, this advantage is because they often have more resources to invest in new technologies. For multi-line companies, it is usually because they are reaping the benefits of P&C insurers historically being faster to adopt analytics than life-only carriers — starting with competition for auto insurance customers in the early 2000s.

Years as a Strategic Initiative

However, despite saying they have relatively established analytics programs, most companies also report that their analytics organizations have not been in operation for very long. In fact, a majority (83 percent) say analytics has been a strategic initiative at their company for less than five years (Figure 2).

FIGURE 2

Years Analytics Has Been a Strategic Initiative



Reviewed alongside the self-described maturity responses, this result implies that companies believe their analytics organizations are relatively mature, but — since they have not been in existence very long — there is likely more opportunity to advance them further with more years of experience. Not surprisingly, multi-line companies were most likely to have a long-standing analytics organization.

Analytics Organization Structure

Broadly speaking, most companies indicate their analytics teams are organized in one of three ways:

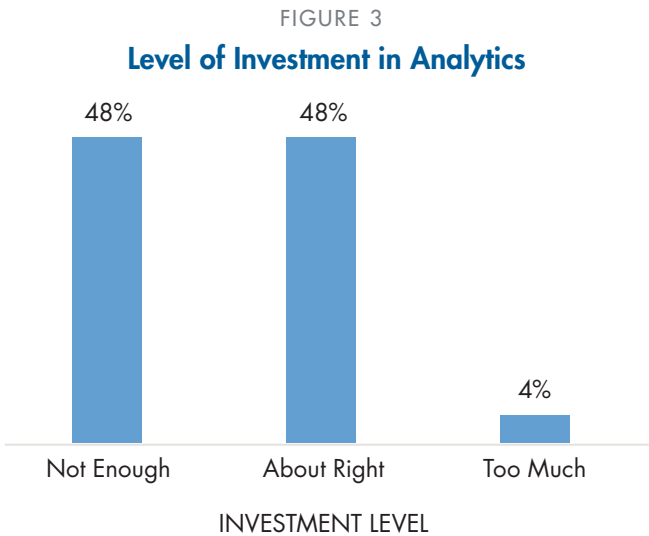
1. **A center of excellence model**, where the analytics function for the whole enterprise is centralized in one team
2. **A hub-and-spoke model**, where there is an enterprise team, but also embedded teams that are connected to the central hub
3. **A distributed model**, where multiple embedded teams combine to form the analytics function, without a central enterprise-level team

Most of the participating companies use a center of excellence model, with a smaller number using a hub-and-spoke model. Relatively few have a distributed model. Some analytics organizations blend elements of these models.

All of these approaches have their merits, and there is not one correct or incorrect way to structure an analytics organization. A company could achieve successful results with any of them. That said, the centralization of analytics functions is more common in our industry, as it allows resources to be allocated efficiently and reduces the risk of duplicating efforts. Also, an enterprise-wide scope for the centralized analytics team allows employees to gain well-rounded experience in many areas of the company. On the other hand, some companies choose to have distributed analytics teams to ensure they are closer to the business units and more responsive to their distinct needs than a centralized team would be.

Level of Investment

Respondents also described how they perceive their organizations' levels of investment in analytics (Figure 3). The same proportion of participants believe their companies could invest more as believe their investment is about right (both 48 percent). Only one participant thinks their company invests too much in analytics.



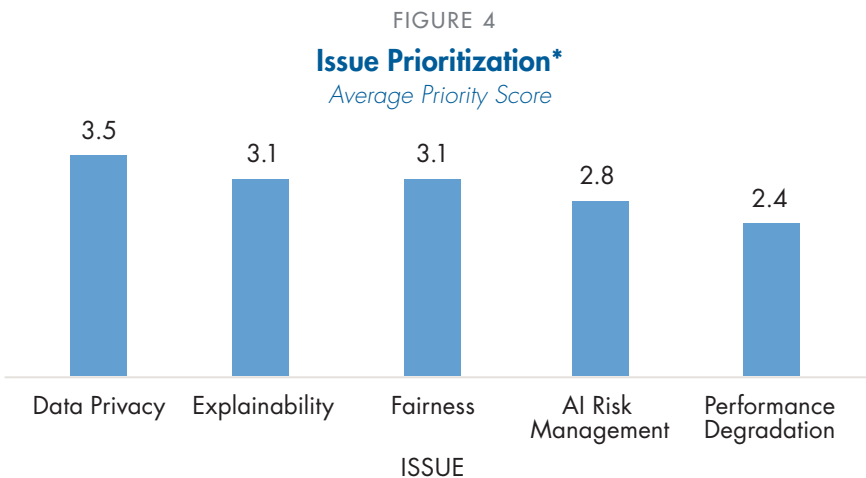
It could be dismissed as self-serving that many analytics professionals feel their companies should spend more on analytics, but our subcommittee concurs with their recommendation. As data becomes increasingly important to insurance company operations, insurers will need to invest more in analytics programs to maximize their potential. As an industry, there is much more value to gain by continuing to develop our analytics programs. We are not yet anywhere near the point of seeing diminishing returns on investment.

Relative Issue Prioritization

Survey participants ranked common ethical and methodological issues in analytics from the highest to lowest priority for their respective companies. The five options provided were:

- **AI risk management:** Caution about autonomous algorithmic decision-making
- **Explainability:** Difficulty explaining complex features and models to business partners, regulators, customers, and/or other stakeholders
- **Fairness:** Avoiding unintended biases or potential proxy discrimination from using variables highly correlated to protected classes
- **Performance degradation:** Concern about models losing accuracy and becoming obsolete over time, as new data comes in and underlying factors change
- **Data privacy:** Compliance with laws and regulations governing consumer data privacy

Overall, companies tend to prioritize ethical issues (such as privacy and fairness) over methodological ones (such as explainability and performance). From this list of analytics challenges, data privacy is cited as the highest priority on average, followed by fairness and explainability (Figure 4). AI risk management and performance degradation are still considered important, but are given relatively lower priority.

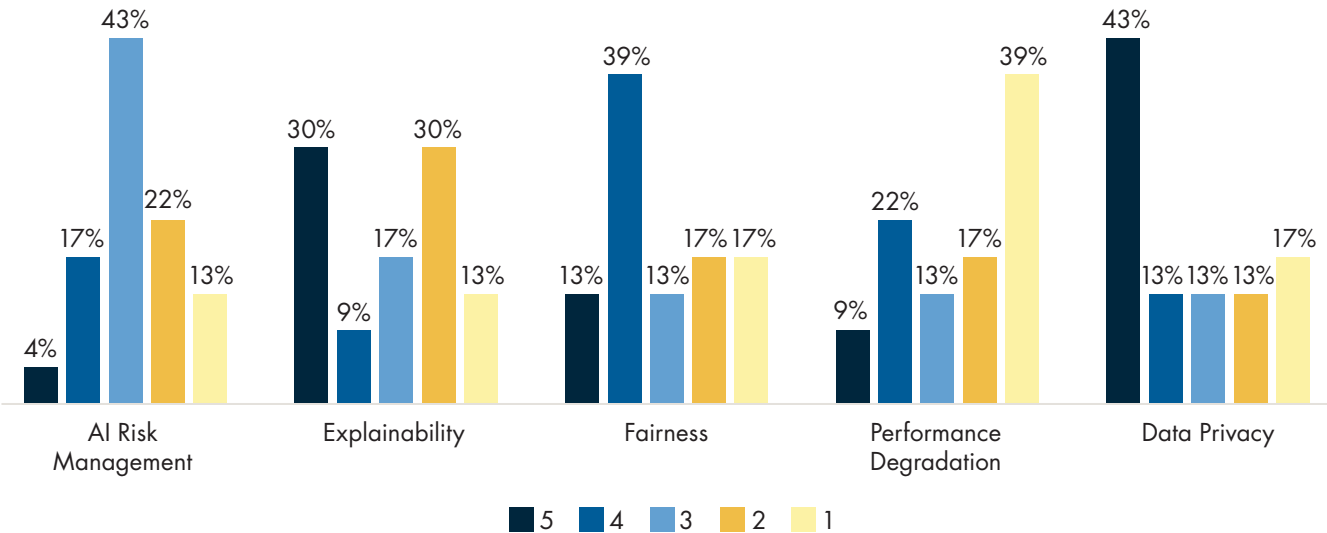


*This figure shows the average importance on a scale of 1 to 5 that companies assign to each of these issues, with higher numbers indicating higher importance

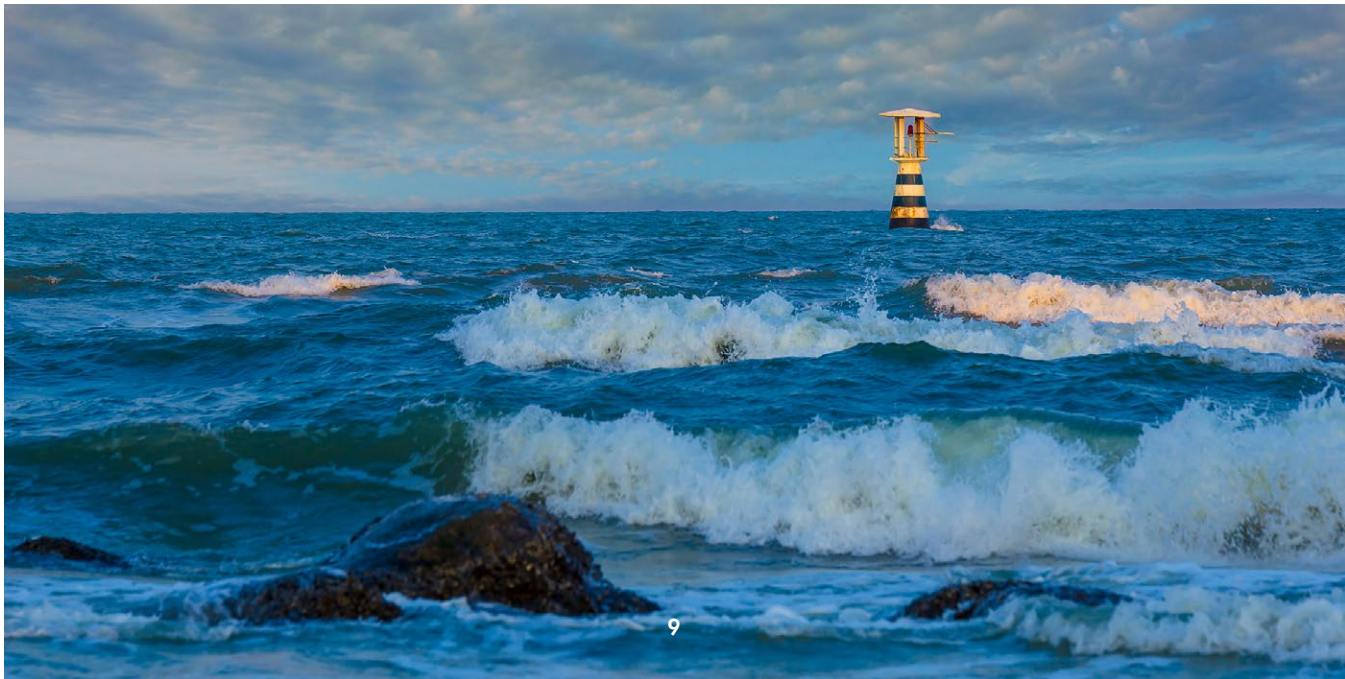
However, averages can conceal polarized responses. If we instead consider how participants ranked each option without averaging them, the picture changes slightly (Figure 5). Data privacy is ranked as the top concern by a large proportion of the sample, and fairness second, but opinions are split on explainability. The same number of companies list it as their top priority as list it fourth. Similarly, performance degradation is most commonly ranked lowest, but a notable number of companies identify it as their second priority.

Overall, most participating companies have analytics programs that are past the initial stages of their development. However, many of these programs are relatively young compared to those at P&C carriers, and they are often underfunded. Carriers should continue to invest in their analytics programs to be prepared for a business environment in the not-too-distant future where using data and analytics to make important decisions is a must. They also need to make sure they provide support for their analytics programs to deal with and properly prioritize their most pressing risk management, ethical, and methodological challenges.

FIGURE 5
Issue Rankings*



*This figure shows the full breakdown of responses to this question, with 5 representing the highest priority from the options presented and 1 representing the lowest



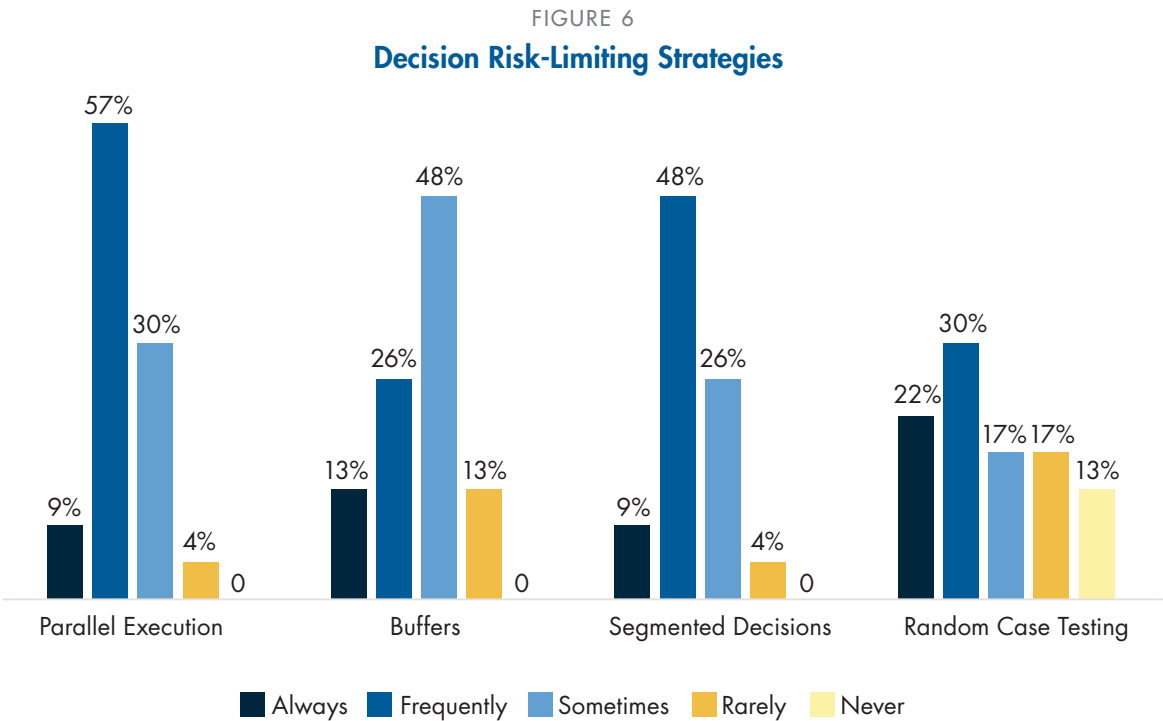
Automated Decision-Making Risks

As algorithms and AI processes become more prevalent in the industry, companies have found it necessary to take precautionary measures to ensure that these systems are making decisions as expected. If an automated system is making decisions that cannot be justified, cannot be explained, or even (in some cases) cannot be replicated, then that presents a serious problem for the company.

A common strategy companies use to mitigate these risks is to have humans review model decision-making and execution in parallel until they are comfortable with the results. Another similar practice is to segment cases, applying model results only for simpler decisions, while humans handle more complex cases. All companies in our sample report that they use the parallel execution strategy at least some of the time, and several use it frequently or always (65 percent). Similarly, 57 percent frequently or always use segmentation. Some companies also select random cases to do a closed file review to ensure that their models behave without bias. However,

opinions on this practice are more varied, as some companies say they do this rarely or not at all, possibly because it can be a time-intensive practice. Finally, analytics teams are less likely to consistently build buffers into their processes to account for false precision in model results, possibly because they might reasonably believe this adds more uncertainty or reduces the value of the model that is hedged in this way. Regardless, it is still a standard practice, with 48 percent of companies indicating that they add buffers some of the time — and none saying they do not use it at all (Figure 6).

Overall, companies are cautious about deploying automated decision-making in their high-value operational processes without human oversight. This arrangement is likely to continue until companies believe they can trust unsupervised AI processes to always make the same or better decisions than humans would in the same situation. Until then, the risk of autonomous algorithms engaging in unwise or unethical behavior is still too great.



Ethical Issues

Companies go to great lengths to make sure their models and algorithms behave in an ethical way: acting fairly, making unbiased decisions, and protecting customers' privacy. This is partly because the consequences for not doing so can be severe. If discovered, biases against protected classes (such as race, religion, gender, or orientation) in company processes can become a tremendous reputational risk, even if they were unintended. For this reason, companies strive for transparency in their models, and they rigorously vet them to avert discriminatory outcomes.

Similarly, data breaches or disclosures of personally identifiable information can be a reputational risk, as well as a legal risk. No company wants to become known for a data breach and be liable for the fallout. Additionally,

data privacy laws and regulations in the jurisdictions where companies operate can restrict the data sources and features they are allowed to use in their models. Breaking these rules, even if it is done unintentionally, can be disastrous. As such, analytics organizations have developed best practices to help them mitigate these risks.

Companies tend to prefer to handle these ethical issues internally, rather than seek outside review of their methods. This is not surprising because these are sensitive topics, and companies reasonably want to limit their exposure. Another possible reason is that companies do not believe that review by external partners would provide value above and beyond their internal processes. However, in implementing these internal reviews, companies strive for transparency and robust oversight.

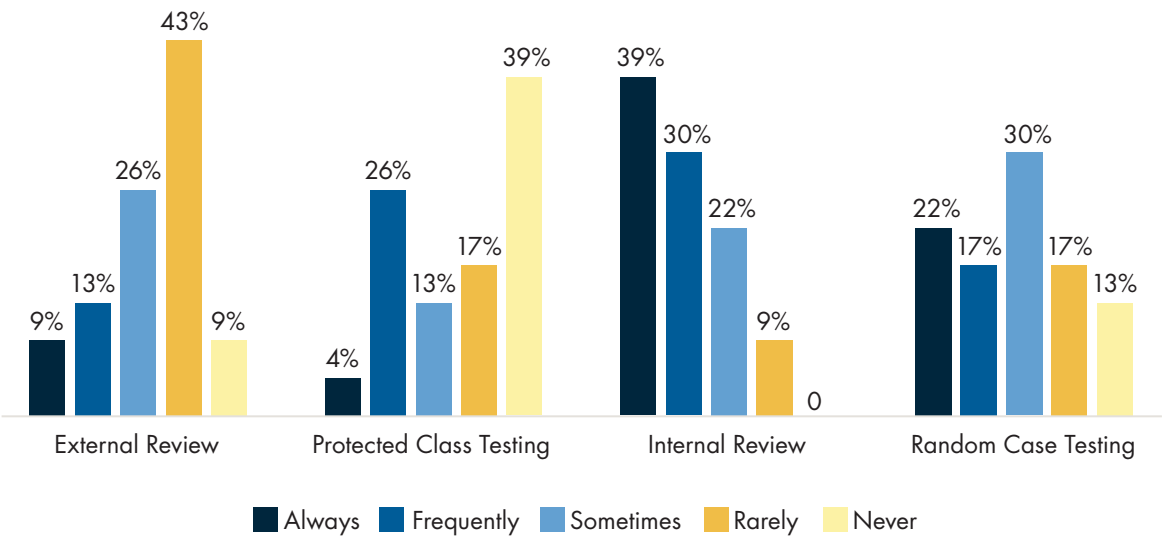


Fairness

The primary way that companies mitigate risks from unintended biases is to conduct internal reviews of models, usually by their legal or compliance teams (Figure 7). The majority of companies report that they always (39 percent) or frequently (30 percent) use internal reviews during model construction and implementation to check for fairness concerns. They are less likely to seek external reviews, with 43 percent of companies saying they rarely do this and only 9 percent saying they always do. Insurers clearly prefer to handle these issues internally, rather than risk the embarrassing disclosure of discriminatory behavior from insufficiently vetted models. Participants are also

less likely to say they use random case testing, possibly because it can be very time-intensive. However, opinions of this practice are split, with some saying they use it frequently, others saying they never do, and the most common response being “sometimes.” Companies are even more divided on whether they test their models using protected class data: 30 percent report doing so frequently or always, though 39 percent say they never do. Some companies that responded “never” indicate that it is because they do not collect protected class information from customers; therefore, there is no available data against which to test.

FIGURE 7
Fairness Strategies



Data Privacy

Similar to their approaches to fairness concerns, companies generally prefer to mitigate data privacy risks inhouse. We asked whether analytics teams vet their models and analyses using various internal and external reviewers (Figure 8). With few exceptions, participants frequently or always seek review from compliance, legal, and dedicated data privacy teams. They typically do not seek review from third-party experts, with “rarely” being the most common response (43 percent). As with the question on fairness reviews, it makes sense that companies would not want to risk disclosures that could bring legal or reputational consequences.

Overall, companies take the risks from these ethical issues very seriously, and they recognize the need to ensure that their analytics efforts align with the letter and spirit of the laws and regulations governing the industry. They strongly prefer to conduct these reviews internally in order to limit their reputational and legal risks, but this does not mean that companies are just going through the motions. Layers of internal reviews provide genuine transparency and oversight of their analytics efforts, and these safeguards ensure that their models behave fairly and adhere to data privacy standards. These reviews provide the added benefit of helping analytics teams improve their methodologies.

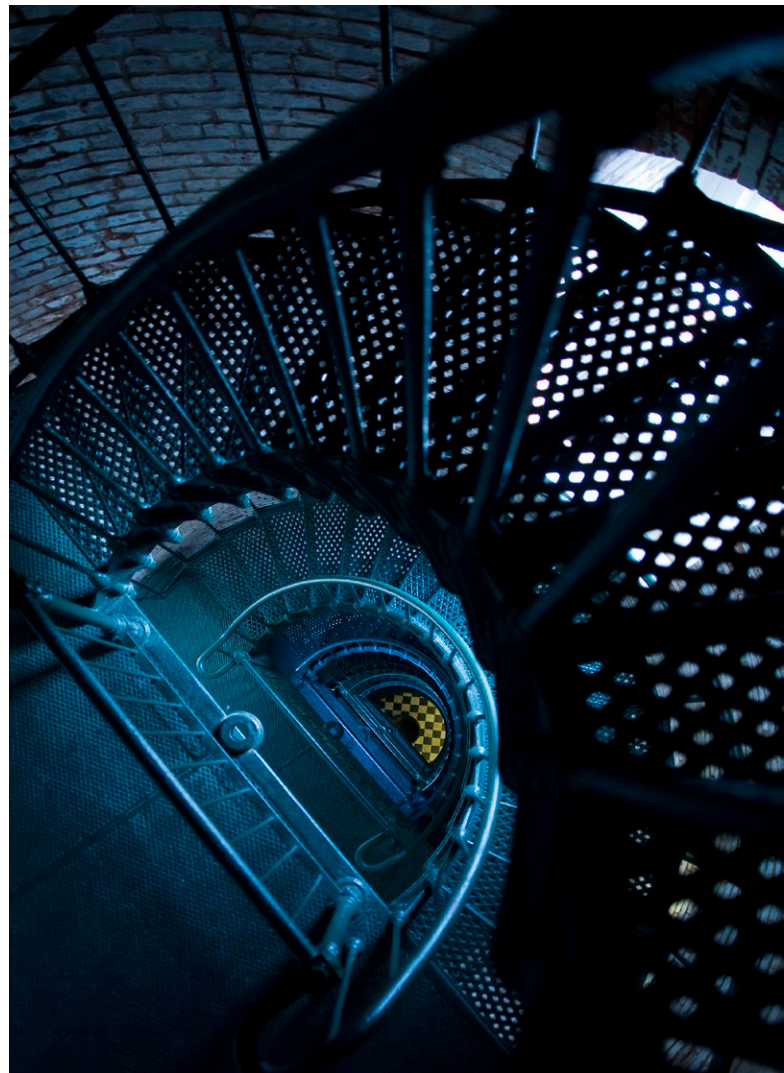
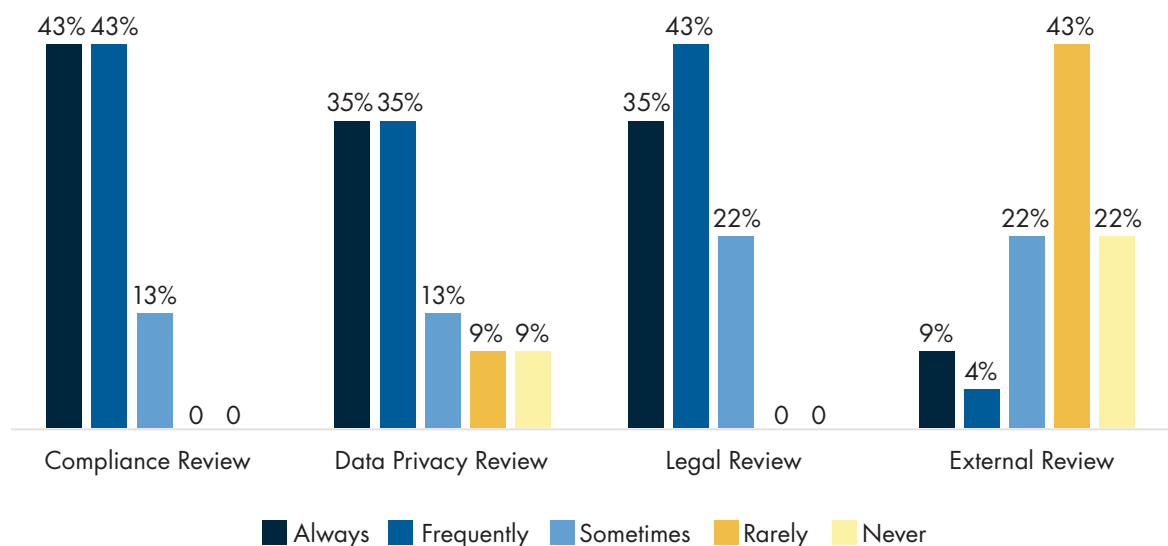


FIGURE 8

Data Privacy Strategies



Methodological Challenges

In addition to avoiding ethical pitfalls, analytics teams must also contend with and overcome several methodological challenges. They must be able to demonstrate to internal stakeholders, customers, and regulators that their statistical methods are sound, that their models continue to perform well long after implementation, and that their results are reasonable and explainable. If their models do not follow accepted methodologies, or their performance degrades over time, then business partners will not trust the results, and regulators may not allow their use. If they are not able to interpret the results and explain why the models make the decisions they do, then they will not be able to gain full business value from their insights.

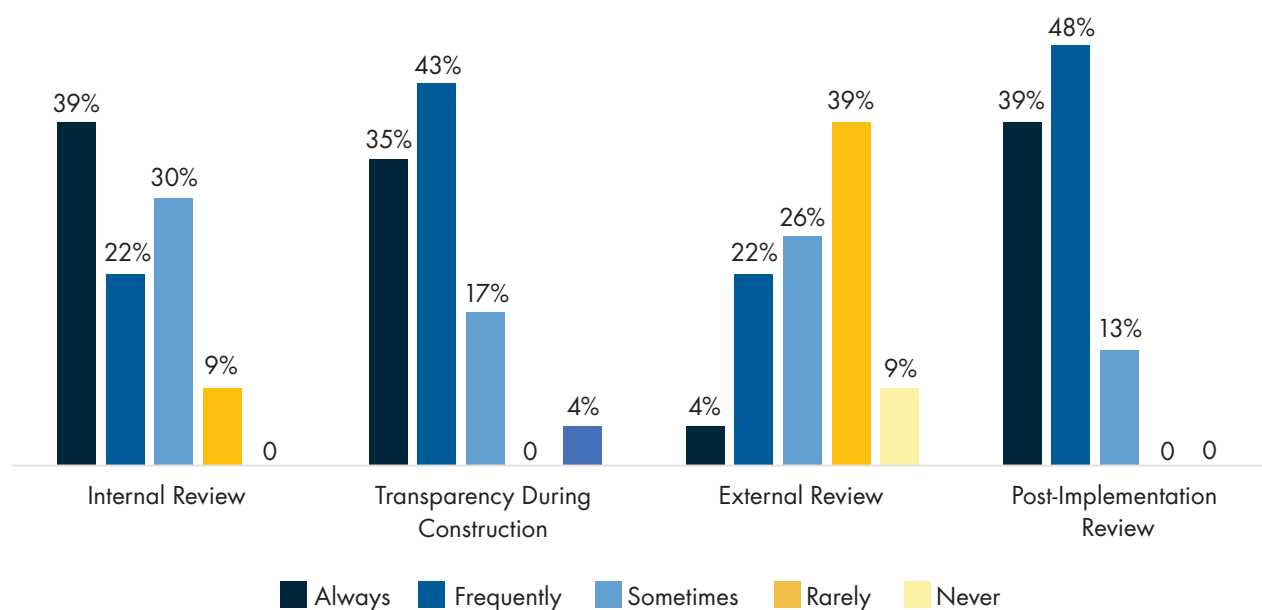
For these reasons, analytics teams need to ensure that their statistical methodologies stays up to date. They also need to update their models regularly and be able to explain any changes in the results. As with ethical issues, there is a clear pattern where companies prefer to handle

their methodological reviews internally, rather than seeking outside advice. This might be because companies want to protect their proprietary data and models, as well as due to concerns about confidentiality and data privacy. They may also justifiably believe that most external reviewers do not possess the insurance domain knowledge needed to properly evaluate their models.

Statistical Soundness

To maintain statistical soundness in their analytics practice, companies generally rely on peer reviews by their internal analytics team, both during and after model construction and implementation. They strive to maintain transparency into the data sources and statistical methods they use during construction. Most participating companies report that they frequently or always take these steps (Figure 9). However, while some companies seek external reviews of their models from trusted partners (in fact, LIMRA has provided this type of review for some survey respondents), this is much less common.

FIGURE 9
Statistical Soundness Strategies

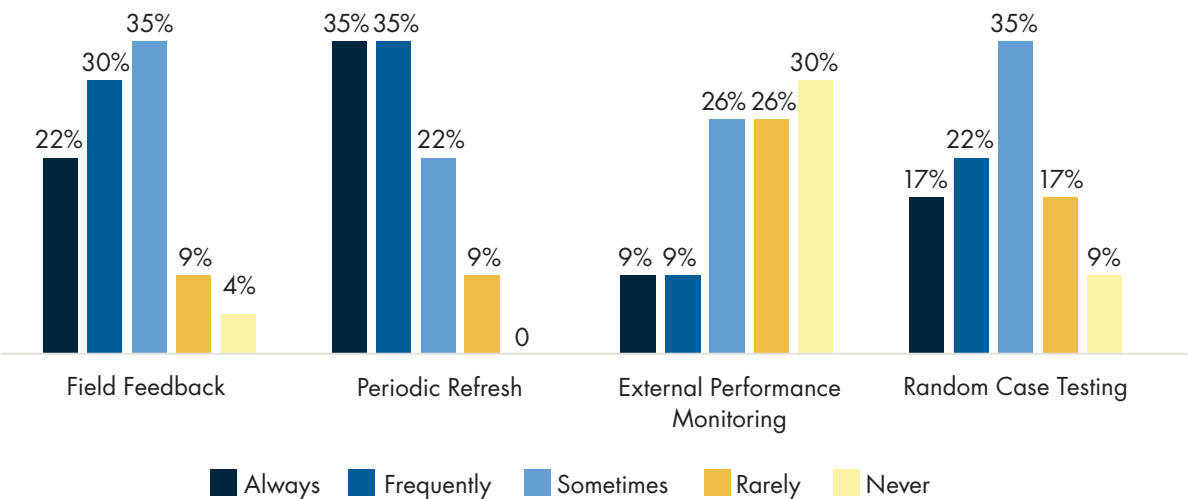


Performance Degradation

Analytics teams need to ensure that their models do not degrade in performance over time. Several factors cause models to become less accurate as more time passes from their initial implementation. For example, the underlying data might not update regularly, making it impossible for a model to keep up with subsequent changes in the phenomenon it is trying to describe. Another troublesome possibility is that new data coming into a model can look different from the data used to train it, with some variables measured differently or missing entirely. This can break a model and generate misleading results.

To maintain model performance, analytics teams use a number of strategies (Figure 10). For instance, 52 percent frequently or always solicit feedback from their business partners that use the model. Seventy percent say the same about periodically refreshing models on a regular schedule to ensure they are still using the best available data and code logic. Thirty-five percent say they sometimes measure model performance using random case testing for important metrics. Less common is external review by a third party using commercially available monitoring software.

FIGURE 10
Performance Maintenance Strategies



Explainability

Analytics teams have a strong interest in being able to explain the results of their models. Even the most sophisticated model does not have any value unless the analyst can explain to business partners how it should be applied. An unexplainable model may also cause regulatory problems or ultimately become less likely to be adopted.

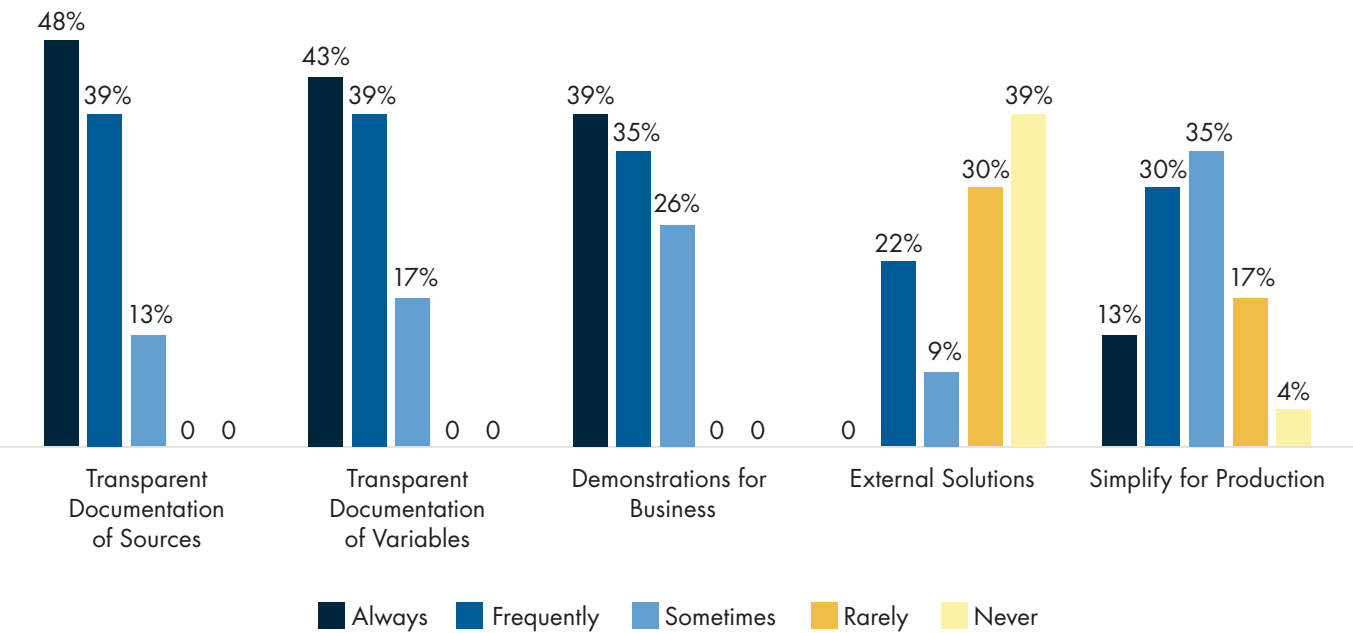
To improve explainability, analytics teams tend to rely on documenting their data sources and variables thoroughly (Figure 11). Eighty-seven percent and 83 percent, respectively, say they frequently or always generate these types of documentation. Another common strategy is to offer a demonstration of new models and applications for business partners, with 74 percent frequently or always doing so. This helps facilitate adoption and ensures that the business interprets and applies the model results correctly. A less common — but still valid — strategy is to simplify complex models to make them easier to implement in production. Thirty-five percent of

companies sometimes do this, and another 30 percent do it frequently. However, some companies are hesitant to do this more often, because some nuance, accuracy, or value of the model can be lost by simplifying it, even if doing so facilitates adoption. Finally, as with several other challenges, analytics teams generally do not seek outside solutions to help them with explainability.

Overall, analytics teams go to great lengths to mitigate methodological challenges that might diminish the accuracy of their models or impede their adoption. Peer reviews, continuous performance monitoring, periodic refreshes, and transparent documentation ensure their models are statistically sound at deployment, stay effective as time passes, and are explainable to non-technical stakeholders. Companies prefer to tackle these challenges themselves in order to protect proprietary information. However, in some cases, they are open to the idea of having an external industry utility supplement and assist their internal efforts.

FIGURE 11

Explainability Strategies



Industry Utilities

To some extent, insurance carriers all face the same decision-making risks, ethical issues, and methodological challenges. Addressing these challenges can be costly and cut into already stretched analytics budgets, taking away from the ability to provide actionable business recommendations. Industry utilities are one way to spread the costs associated with these risks and decrease the budget impact to an individual company. Accordingly, we asked participants about their interest in various proposed analytics-related industry utilities, with LIMRA acting as a steward. Companies express interest in all of the following proposed utilities: data privacy standards, explainability standards, fairness guidelines, and analytics literacy training.

Data Privacy Standards

Data privacy is the top concern for many carriers. It can be difficult for analytics organizations to keep up with the complex mix of data privacy laws and regulations that they must follow. The rules are different among jurisdictions, can be exacting in their requirements and restrictions, and are constantly changing as more governments update their privacy laws. The most well-known rules are the General Data Protection Regulation (GDPR) in the European Union and the California Consumer Privacy Act (CCPA) in the United States. Both limit the use of personal information for business purposes, and they obligate companies to protect their customers' data privacy. More states and countries are expected to follow the lead of these regulatory early adopters in the future.

Explainability Standards

Analytics teams have an interest in making sure their models' decisions are explainable to regulators and business partners. If a model is a "black box," and no one can determine why it produces the results it does, then that model will be viewed with suspicion and become less likely to be adopted. Even if it is adopted, it may produce unintended outcomes in production.

Fairness Guidelines

Companies have an obligation to ensure that their business operations do not discriminate against protected classes, both for legal and reputational reasons. Even if the biases are unintentional, the backlash can still be severe. Prudent companies take steps to mitigate this risk.

Analytics Literacy Training

For business leaders at life insurance companies to best use the insights generated by their analytics teams, it is important that they have analytics literacy skills. Even the most accurate models are irrelevant unless the information they provide can be used to make correct decisions. Most of the responding analytics leaders indicate that they handle analytics literacy training for their business partners internally. However, many companies have expressed interest in an industry utility to standardize this training.



Taking Action with Training Resources

LIMRA and LOMA are working to develop analytics literacy training courses. LOMA already offers an insurance business concepts course for data scientists entering the industry with little-to-no background in insurance. Participants learn about the business context for their models and how they can best apply their skills as data scientists to add value. They are also taught how to develop actionable insights and communicate their findings to business partners in a way that will be understood.

An analytics literacy training utility would be essentially the other side of the same coin. We propose to teach insurance business leaders the analytics concepts they need to know in order to best use the insights that their data scientists produce. Participants would learn, among other things, the current and future capabilities and limits of analytics, how to interpret data and charts, how to demystify analytics jargon, and some of the statistical principles underpinning the field.

LOMA is also developing two analytics-related courses as part of its Learning Live series: one on data analytics and the other on artificial intelligence. As of this writing, these courses are going through a review process, and are expected to roll out in summer 2021. Other courses will follow.

About the Research

LIMRA's Emerging Technology Executive Task Force is working on white papers in multiple technology-related areas to provide value to our member companies. In addition to data analytics, other focus topics include digital acceleration and legacy modernization.

For this project, LIMRA and McKinsey & Company surveyed analytics leaders at 23 LIMRA member companies in the United States and Canada, asking several questions covering various aspects of their analytics programs. The respondents are either the leader of the analytics function at their company or report directly to that person. Only one survey response was requested and accepted from each company. The survey was fielded in September and October of 2020 and covered the following topics:

- Best practices to mitigate risks inherent in deploying analytics solutions
- The broader reasoning underpinning these practices
- Interest in analytics-related industry utilities

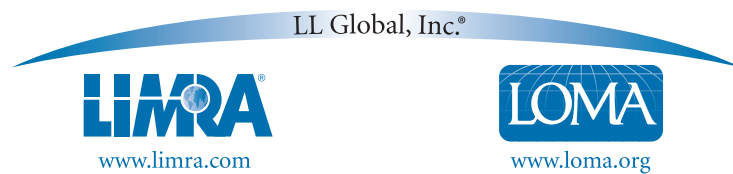
A Note on Survey Confidentiality: *To encourage candor about potentially sensitive topics such as data privacy and unintended biases, full anonymity was given to the survey participants and their companies. Therefore, this paper does not include a list of participating companies or any direct participant quotes.*

Acknowledgments

This paper would not have been possible without input and support from a number of partners. We specifically would like to acknowledge McKinsey's valuable partnership with us on the many efforts of the Emerging Technology Executive Task Force. We also would like to thank:

- The members of the Data and Analytics subcommittee for participating in survey design and offering advice on next steps for the industry utilities
- LIMRA colleagues Kartik Sakthivel, Patrick Leary, Karen Terry, and Martha Mitchell for helping to shape the survey and this paper, as well as for their outstanding work leading the other Emerging Technology ETF subcommittees
- The survey participants for their time and thoughtful responses





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