Life Insurers' Actuarial Transformation Journey and the Impact of Analytics

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AUTHORS Henry Chen, FSA, FCIA, MAAA

Mike Hughes, FSA, MAAA

Jasmine Lan, FSA, CERA, MAAA

Marshall Lin, FSA, MAAA, CFA

Nick Miller, FSA, CERA, FIAA

Tracy Zhang, FSA

Felishia, ASA candidate

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Executive Summary

This research assesses the evolution of life insurers' Actuarial Transformation efforts and the future outlook, with a focus on emerging Advanced Analytics techniques. For the purpose of this report:

- Actuarial Transformation (or Actuarial Modernization) is defined as a significant step change in an actuarial organization's productivity and decision support capabilities resulting from improvements to the operating model (people, processes and/or data and technology); and
- Advanced Analytics are defined as techniques based on large volumes of data and statistical methods such as predictive analytics, artificial intelligence and machine learning (AIML).

The research was conducted through literature reviews, interviews with actuarial organization leaders, and an industry survey.

SUMMARY OF KEY FINDINGS

The key findings include the following:

1. *Regulatory (solvency regulation) and accounting changes (e.g., principle-based reserving, GAAP Long Duration Targeted Improvements, and IFRS 17)* have been some of the most significant developments in the industry in recent years, and have been primary drivers for Actuarial Transformation efforts[1].

2. Many organizations have focused their Actuarial Transformation efforts on *actuarial modeling/valuation and associated data management solutions,* and advancements in this area are among their biggest successes to date.

3. Actuarial Transformation is not a one-and-done, since business needs and leading practices change over time; *organizations need to become good at managing change* as the pace of change and the level of competition continues to intensify in insurance and related industries.

4. Continued *senior management support* is a critical success factor, and cannot be taken as granted given the time and effort that may be needed to transform and the challenges associated with measuring the qualitative and quantitative *benefits* from Actuarial Transformation efforts.

5. *Talent and leadership development* are both highlighted as key focus areas and challenges for many actuarial organizations, with many actuarial leaders stressing the need to not limit actuaries

[1] These are not the only drivers, however. For example, companies would not have been able to offer, measure performance and manage risks on more complicated products with options and guarantees without Actuarial Transformation.

to traditional roles and to develop actuaries into *business leaders* who will drive business decisions and performance.

6. *Experience studies* and *underwriting* have been the most common uses of Advanced Analytics in the life insurance industry to date.

7. Many actuarial organization leaders are *not currently prioritizing Advanced Analytics* beyond experience studies and underwriting in their Actuarial Transformation efforts, as there is a need to complete their existing transformation priorities and the business opportunities/business cases for substantial investment in Advanced Analytics in the traditional actuarial domain have not been made.

8. Most actuarial organization leaders, however, agree that that Advanced Analytics *will likely play a larger role* in the insurance business and what actuaries do going forward, and are *closely monitoring industry trends and developments*.

9. The survey reflects the viewpoints of actuaries who are generally younger and have more experience and training with Advanced Analytics, and the results are *more bullish*: 40% of the participants already think Advanced Analytics should be one of the top priorities for Actuarial Transformation efforts, while another 40% expect it to become a larger focus in the next 5-10 years.

Through their Actuarial Transformation efforts, Life *actuaries have made significant progress* with meeting the needs of their organizations, the customers they serve and other key constituencies, such as regulators and investors. Looking forward – although it is impossible to know with certainty which innovations and capabilities will be the most important in the years ahead (and, hence, where to place "big bets") -- the need for change, as well as the increasing pace of change, will likely continue. *Actuarial teams should continue to prioritize a transformation agenda to help their teams and organizations stay nimble, relevant and responsive to changing conditions and customer needs.*

Section 1: Introduction

The insurance industry is competitive and continuously changing in response to market needs and conditions: one only needs to look back to see that the industry today is quite different compared to what it was in the past, and the pace of change has only increased in recent years.

Actuaries, like other professionals in the industry, have embraced these changes and adapted to continue adding value and driving the business. The adaption has been both consistent and incremental ("continuous improvement") and step changes in performance ("transformation").

This report will discuss how actuarial organizations approach transformation and where actuarial organizations are in their efforts to transform their operating model, process, and technologies, with added emphasis on Advanced Analytics because this has been a topic of great interest within the industry. The discussions focus on life and annuity insurers as this group already had a long history of working on Actuarial Transformation when this research was conducted, but the research team believes the insights summarized in this research can be applicable for all actuaries.

1.1 BACKGROUND

Actuarial Transformation can take many forms - from major systems upgrades and more sophisticated data management and analytics capabilities, to new operating models with increased offshoring and outsourcing – and continue to have a profound impact on actuarial work.

1.1.1 A FRAMEWORK FOR ACTUARIAL TRANSFORMATION

Actuarial Transformation is often linked to technology innovations or changes in the broader economy or the insurance/financial services industries. Actuaries and the companies they serve have responded to a wide array of significant changes over recent decades. Consider the following:

Figure 1
ILLUSTRATIVE DEVELOPMENTS BY DECADE

	1980s-1990s	2000s	2010s	2020s
Business & technology innovations	Personal computers Internet Mutual funds	Data management Business intelligence	Big Data, analytics, and AI/ML Smart phones and digitization Cloud, IoT Agile	Remote work TBD
Economic, regulatory, and other events / trends	Interest rate volatility Capital market volatility Baby boomer generation	Enron/SOX Dotcom bubble Financial crisis	Persistent low interest rates Offshoring and outsourcing	COVID-19 TBD
Life insurance industry changes	Interest sensitive products	Consolidation Globalization	De-risking and SIFIs Solvency II, PBR, IFRS 17, LDTI	TBD

	1980s-1990s	2000s	2010s	2020s
	FAS 97 and CRVM/CARVM Demutualization Independent distribution	VA living benefits Risk frameworks & economic capital	Customer centricity & innovation Cost reduction PE and other new entrants	
Transformative actuarial developments	Actuarial modeling software Asset/liability models and CFT End user computing Asset/liability management	Internal controls VA hedging Grid computing environment VA CARVM and C3 Phase II Early stage E2E transformations	Model upgrades & rationalization Actuarial data management End-to-end automation Centralization and standardization Location and talent sourcing	TBD

Actuarial Transformation is usually an ongoing journey, not a one-time event. Along the way, actuarial leaders reassess how their business needs are evolving and actuarial roles will change going forward. Leading practices and the definition of "what good looks like" going forward will be different than what it has been or is currently.

Change can be achieved in a variety of ways. Transformation programs are normally designed to achieve a step change in performance. Continuous improvement can supplement and help mitigate the need for periodic transformation. Waterfall, Agile, and various hybrid development approaches are used in practice.

While there are many ways to structure and execute a transformation program, key elements often include:

1. Assessment and roadmap
2. Current state and pain points
3. Future state needs and vision
4. Future state design, gap analysis and initiatives needed
5. Roadmap and business case
6. Detailed design and planning
7. Development and testing
8. Transition to business as usual

1.1.2 ADVANCED ANALYTICS FOR THE ACTUARIAL PROFESSION

Advanced Analytics refer to techniques based on large volumes of data and statistical methods such as predictive analytics, artificial intelligence, and machine learning.

Advanced Analytics are made possible by the rise of *big data*, which is defined as both structured and unstructured data that contains greater variety, arriving in increasing volumes, and with more velocity. Big data is larger, more complex data sets, especially from new data sources. These data sets are so large that traditional data processing software cannot manage them but, if harnessed, these massive volumes of data can be used to address business problems (via Advanced Analytics) that we would not have been able to tackle before.

Advanced Analytics have the potential to be transformative for the life and annuity insurance sector. These techniques can enable companies to better understand the complex causal relationships that affect the performance of the business in real time.

The actuarial profession has always used advanced mathematics and financial theories to analyze and understand the costs of insurance risks and insurance company profitability, but the rise of big data and Advanced Analytics represent even more opportunities for actuaries.

Advanced Analytics have the potential to significantly impact the actuarial profession, for example:

- Actuaries will likely need to utilize new sources of data, tools and processes.
- We will likely see increased collaboration and cross-functional teams of actuaries, data scientists, and other IT professionals, and the skillset of actuaries will continue to evolve.
- The actuarial profession needs to have a clear understanding of Advanced Analytics and how professionalism applies[2].

1.2 DEFINITIONS

The following summarizes how specific terms are defined in this report.

- Actuarial Transformation (or Actuarial Modernization): a significant step change in an actuarial organization's productivity and decision support capabilities resulting from improvements to the operating model (people, processes and/or data/technology).

- Advanced Analytics: techniques based on large volumes of data and statistical methods such as predictive analytics, artificial intelligence, and machine learning.

- Models: per Actuarial Standards of Practice (ASOP) No.56, a model is "a simplified representation of relationships among real world variables, entities, or events using statistical, financial, economic, mathematical, non-quantitative, or scientific concepts and equations. A model consists of three components: an information input component, which delivers data and assumptions to the model; a processing component, which transforms input into output; and a results component, which translates the output into useful business information."

[2] https://www.soa.org/globalassets/assets/files/resources/research-report/2019/ethics-ai.pdf

  - For this report we consider "actuarial models" and "models based on Advanced Analytics" distinct and mutually exclusive types of models.
  - Actuarial models in this report refer to models based on the traditional statistical and mathematical approaches, e.g., Monte Carlo simulation.
  - Actuarial models can be developed on different platforms, such as specialized vendor software packages with functionalities for all three components of a model (input, processing and results) or End User Computing (EUC) solutions.

- Proxy models: Advanced Analytics techniques used to provide approximations to the results that would be generated by actuarial models.

1.3 RESEARCH METHODOLOGY

Building on the research team's hands-on experience with Actuarial Transformation and the review of existing literature, we designed and conducted:

1. Interviews with leaders of actuarial organizations; and
2. Survey of a random sample of SOA members.

The research team believed this two-step approach would lead to a more complete understanding of Actuarial Transformation. The leaders focused on their organizations' vision and creating value for all stakeholders, while the survey allowed the research team to access the thinking and experience of actuaries across a wide range of roles and backgrounds.

Insights gathered from the interviews and the survey were then analyzed and presented in this report.

1.3.1 INTERVIEWS

The first part of our research focused on interviews with chief actuaries and leaders of Actuarial Transformation initiatives from mid- and large-size actuarial organizations in the US at different stages of their Actuarial Transformation journeys.

We asked for the organizations' leaders' views on the following:

- Environmental factors: the most significant developments and innovations impacting the actuarial functions at life insurance companies over the last few decades
- Actuarial Transformation to date: the primary focuses, main drivers, key successes, biggest challenges, and critical success factors for their transformation efforts to date
- Looking ahead: how the business focus and needs for actuaries might change
- Advanced Analytics: to what extent have Advanced Analytics been incorporated into the company's actuarial functions, how this might change, and what is needed for actuarial functions to leverage the potential of Advanced Analytics

The interview guide we used is included in the appendix.

1.3.2 SURVEY

The second part of our research was conducted through an online survey, distributed by the SOA to a random sample of members. The sample of members to whom the survey was distributed, and the demographics of the respondents, are summarized in the appendix.

1.4 LITERATURE REVIEWS

The following summarizes our review of relevant publications on Actuarial Transformation and Advanced Analytics, with the publications listed in the appendix.

Many insurance companies already saw the value in Actuarial Transformation by the early 2010s, if not earlier, for their organizations to maximize the full potential of actuarial functions[3]. A survey[4] completed in 2018 found the following key catalysts and focus areas for Actuarial Transformation programs:

- The most commonly reported drivers of Actuarial Transformation were:
    - Reporting efficiency
    - Regulatory changes
    - Data management
    - Generating business insights
- The most commonly reported current focus areas of Actuarial Transformation were foundational capabilities, such as:
    - Data infrastructure
    - Governance and control enhancement
    - Actuarial modeling platforms
    - Process efficiency
    - Target operating model
- The most commonly reported future areas of focus for Actuarial Transformation were:
    - AI and machine learning
    - Advanced Analytics
    - Management reporting

Looking forward, the insurance industry is expected to continue evolving. In the life and annuities space, the expectation is an ever-increasing focus on protecting the well-being of individuals, families, businesses, and communities, with investors and companies focusing on long-term value by expanding their valuation approaches to include more holistic, long-term metrics, rather than only short-term financial measures. Companies likely will need to continue investing in transformation to respond to future market changes, such as innovations in distribution driven by technology advancement, underwriting supported by Advanced Analytics, product and advice offerings based on customer needs, and continued regulatory and accounting changes[5].

Companies have been working on enhancing their data and data capabilities. With technology advancements in recent years, big data solutions have become more accessible and are now widely used by insurance companies[6]. This has enhanced insurance companies' abilities to obtain, store and analyze large volumes of data, a prerequisite for Advanced Analytics and more granular measurement and decision support using traditional actuarial approaches.

[3] https://www.actuaries.asn.au/Library/Events/GIS/2014/GIS2014StephanShawIndustryPaper.pdf
[4] https://www.pwc.com/us/en/industries/insurance/assets/pwc-actuarial-modernization-survey-2018.pdf
[5] https://assets.ey.com/content/dam/ey-sites/ey-com/en_gl/topics/insurance/insurance-pdfs/ey-nextwave-insurance-life-retirement.pdf
[6] https://www.wiley.com/en-us/Big+Data+in+Practice:+How+45+Successful+Companies+Used+Big+Data+Analytics+to+Deliver+Extraordinary+Results-p-9781119231387

A recent study published by the SOA indicated that, on average, actuaries have a reasonable understanding of Artificial Intelligence and machine learning (AI/ML), but are not confident enough to explain it to someone else[7]. The same study, which surveyed P&C and Life and Annuity companies, also suggested that:

1. P&C companies are further along in their AI/ML journey relative to life and annuity companies.
2. The companies surveyed have had difficulty extracting value from complex Advanced Analytics techniques because of the current lack of understanding by various stakeholders.
3. There have been a range of approaches in terms of leveraging data scientists vs. actuaries in their AI/ML implementations.
4. Roles outside of insurance companies have been demanding skillsets that are actuarial in nature.

The actuarial profession's interest in Advanced Analytics was highlighted in a number of publications, such as "Considerations for Predictive Modeling in Insurance Applications" where case studies were used to illustrate the key components of a predictive modeling function a company must address to have the best chance of gaining buy-in from stakeholders[8], or "Ethical Use of Artificial Intelligence for Actuaries" where the discussion focused on the ethical risks in the implementation of AI[9].

1.5 USE OF THIS REPORT

While this report offers commentary on a number of topics potentially impacting the actuarial profession, this report does not contain a prescriptive view on how the actuarial profession will unfold nor an exhaustive list of all the topics that will impact the profession, particularly given the scope of the research.

This report is intended to inform and provide insights and, as a result, the authors (both individually and EY as an organization) and the SOA are not responsible for the consequences of using this report. No part of this report may be used or presented without reference to it.

Of note about this report:

- The preparers have assumed that the responses provided during the interviews and surveys were an accurate representation of the organizations' practices or understanding of their corresponding industry. The information presented in this study is based on what participants willingly shared and, in some instances, on what the participants estimated when they did not have an exact answer to a question.
- The research is subject to the below limitations; therefore, conclusions regarding actuarial applications should be drawn with caution.

[7] https://www.soa.org/globalassets/assets/files/resources/research-report/2021/2021-emerging-technologies-report.pdf
[8] https://www.soa.org/globalassets/assets/files/resources/research-report/2019/considerations-predictive-modeling.pdf
[9] https://www.soa.org/globalassets/assets/files/resources/research-report/2019/ethics-ai.pdf

1.5.1 LIMITATIONS OF THIS RESEARCH

- The scope was limited to analyzing the impact on the life and annuity industry in the US.
- The actuarial interviews were conducted on a limited sample of leaders at mid- and large-sized companies in the US. While a broad representation was targeted, the number of companies does not represent a statistically significant sample size. In addition, interviews did not explicitly cover actuaries who work outside of the life insurance industry (e.g., those who work at technology companies, marketing companies, etc.). The sample also skewed toward larger companies and, therefore, may not represent the experience of those working at smaller companies.
- Survey responses were received from a limited sample of respondents. While a broad representation by specialty and years of experience was targeted, the responses may not represent a broad industry consensus.
- The content coverage during actuarial interviews was limited by time constraints of the interviewees (generally an hour).
- Interviewees were considered to be an appropriate representative for their company to address these topics, but they may not have had the full view of their organization.
- The responses provided during both the interviews and surveys were subjective and intended to represent the views of the actuarial teams within their companies. They can also be influenced by the interviewees' personal experiences and understanding of the technology in question.

Section 2: Interviews

The researchers conducted 17 interviews with actuarial leaders from different life and annuity insurance companies to understand their views and perspectives on the cross impact between Actuarial Transformation and analytics. This section covers the interview approach and provides a detailed analysis of the responses received.

2.1 OVERVIEW

The researchers identified and interviewed actuarial leaders (including chief actuaries, head of Actuarial Transformation programs, etc.) from 17 different life and annuity insurance companies based in the US. These leaders are experienced in managing large actuarial organizations and/or delivering large Actuarial Transformation projects. Discussions included their views on Actuarial Transformation, successes and challenges encountered in their transformation journey, their perspectives on future Actuarial Transformation, the impact of Advanced Analytics on their actuarial functions, as well as their views on the developments and potential impacts of Advanced Analytics in the next 5-10 years. Please see the appendix for the interview guide used in the interview.

This section includes the responses received from the interviews. The insights gathered from these interviews are summarized below, including highlights from each individual company, but presented anonymously. Participating companies were allocated random reference numbers, which change from table to table to preserve anonymity. In some cases, the responses to certain interview questions were not available. In addition, potential implications are also discussed throughout the section.

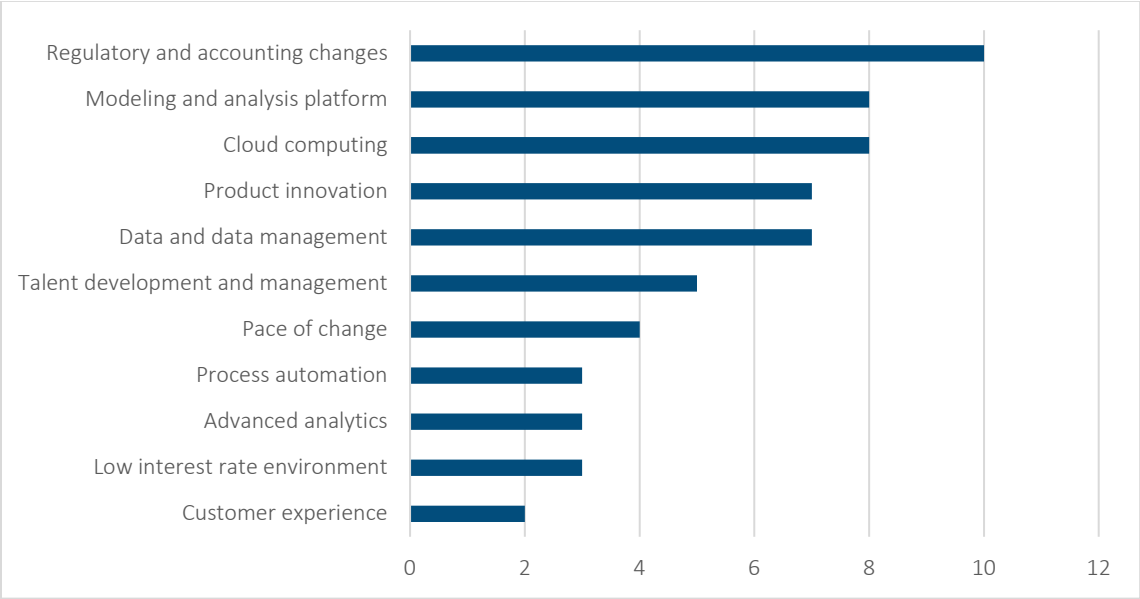
2.2 SIGNIFICANT DEVELOPMENTS OF ACTUARIAL TRANSFORMATION

This section aimed to understand actuarial leaders' views regarding the most significant developments and innovations that have impacted actuarial functions over the last few decades. The following question was asked of the interviewees and the responses were summarized and analyzed:

> *"In your view, what have been the two or three most significant developments and innovations that have impacted the actuarial functions at life insurers over the last few decades?"*

Figure 2A below shows the aggregated results of the interview responses of the 17 companies.

Figure 1A
MOST SIGNIFICANT DEVELOPMENTS AND INNOVATIONS



According to the interview responses, five developments and innovations rise to the top: regulatory and accounting changes, actuarial modeling and analysis platforms, cloud computing, product innovation, and data management (see figure 2A). Among all of these, the significance of technology development and innovation during the last few decades was frequently mentioned by actuarial leaders, as it has changed how actuaries work and allowed actuaries to develop more sophisticated processes with a much lower cost.

To complement the graph above, figure 2B below shows the highlights of all the interview responses collected from each of the companies interviewed.

Figure 2B
MOST SIGNIFICANT DEVELOPMENTS AND INNOVATIONS – INTERVIEW RESPONSES

Company	Interview Responses
Company #1	Product innovation, such as Variable Annuities, led to regulatory and accounting changes and evolution in actuarial models. As models become more complicated, keeping them consistent across the organization becomes imperative.
Company #2	There has been an increased number of actuarial programs and schools since the late 90s. Actuarial platform has gone through evolution from desktop solutions to network solutions to cloud based to managed cloud based. Tools such as Alteryx, R and Python have been opening doors for doing analytics in a much more powerful and user-friendly way.
Company #3	There have been significant enhancements to the data collection process, as well as managing data and turning data into something useful and understandable. There also have been a lot of improvements in modeling software and process automation.
Company #4	The pace of change in the life insurance industry and transformation have really picked up. There is now more data and at the same time more is asked of the actuaries – we need to have efficient data architecture, technology, and tools, and understand Advanced Analytics. The kind of talent we need today is different than what was needed 10-15 years ago. While technical skills will always be foundational, actuaries also now need to be business leaders, good communicators, and continuous learners.

Company	Interview Responses
Company #5	There have been a lot of product innovations, which led to new regulations and model enhancements such as stochastic computations.
Company #6	The industry itself has been in a continual evolution. For example, in the early 90s when cashflow testing was introduced it led to new models and software. The more sophisticated models in turn have allowed us to analyze and think through the risk of more complicated products, which then led to more complicated products and even newer regulations.
Company #7	The overall business environment has led companies to developing more complicated products and risk management capabilities. This resulted in more regulations, and higher demands in computing time and higher requirements in the ability to manage and analyze data.
Company #8	Grid/cloud computing has been an important innovation as it unlocked a vast amount of potential, such as stochastic modeling. This enabled companies to develop sophisticated models to understand and manage complex products, which also led to complex regulations. Actuarial modeling has evolved from something a few people worked on to an industrial-strength process.
Company #9	Changes in the environment such as faster and cheaper technology has increased the importance to have competitive products and stay one step ahead. How data are used and managed have changed a lot.
Company #10	We have invested in partnerships with data scientists to develop accelerated underwriting and risk selection strategies. Cloud computing has been important, and regulatory and accounting changes such as PBR have led to how we manage our models.
Company #11	Interactions with customers are moving towards automated processes, digital and minimum human intervention. Other technology innovations, such as cloud computing and the ability to manage a large amount of data, have also led to changes in customer experience.
Company #12	Regulatory and accounting changes have been the key drivers which impacted actuarial functions. Cloud computing has been an important innovation, and end-user tools (e.g., Alteryx) have enabled actuaries to change the way we work.
Company #13	Big data and the underlying technology have enhanced companies' ability to manage and utilize data, and freed up resources to focus more on analysis. Remote working has eliminated geographical location limitations in terms of talent acquisition.
Company #14	There has been an increase in consumer needs for protection, but the market has become even more competitive. As a result, insurers have become more disciplined in risk taking and more efficient in distribution and operations. With the more complex products, regulations have become more complex and there has been consolidations and end-to-end transformation of the financial analysis platform: data, assumptions, actuarial models, governance, accounting, forecasting, etc..
Company #15	The pace of changes in the industry, which are interrelated and feed off each other (e.g., technology, expectations of regulators), has really accelerated. Companies need to become really good at transforming themselves and adapting changes quickly to stay ahead as part of the continuous evolution.
Company #16	Customer expectations have changed, and companies need new business processes. The persistent low interest rate environment has put a lot of cost pressure on companies. The following have been the most significant development impact actuarial functions: regulatory requirements, computing power, certification of actuarial profession, low interest rate environment, complex to manage costs and customer expectation which leads to new business process.
Company #17	Regulatory and accounting changes and technology innovation such as cloud computing have completely changed how actuarial functions operate. Companies have also looked at how they acquire and manage actuarial talent, driven at least partially by cost pressures.

2.3 ACTUARIAL TRANSFORMATION JOURNEY

This section aimed to understand the work done by respondents with their companies' Actuarial Transformation initiatives, including their primary focuses and objectives, major successes and obstacles, and critical success factors. Responses to the following three (3) questions are summarized and analyzed in this section:

1. *"What has been the primary focus of your organization's recent (last few years) and current Actuarial Transformation related initiatives? What are the main drivers for and objectives of your transformation initiatives to date?*
2. *"What has been your biggest successes to date? What has been your biggest challenges to date?"*
3. *"What are the critical success factors for Actuarial Transformation initiatives?"*

Figures 3A and 3B below show the aggregated results of the interview responses from the 17 companies for the first question:

Figure 3A

PRIMARY FOCUS OF ACTUARIAL TRANSFORMATION INITIATIVES

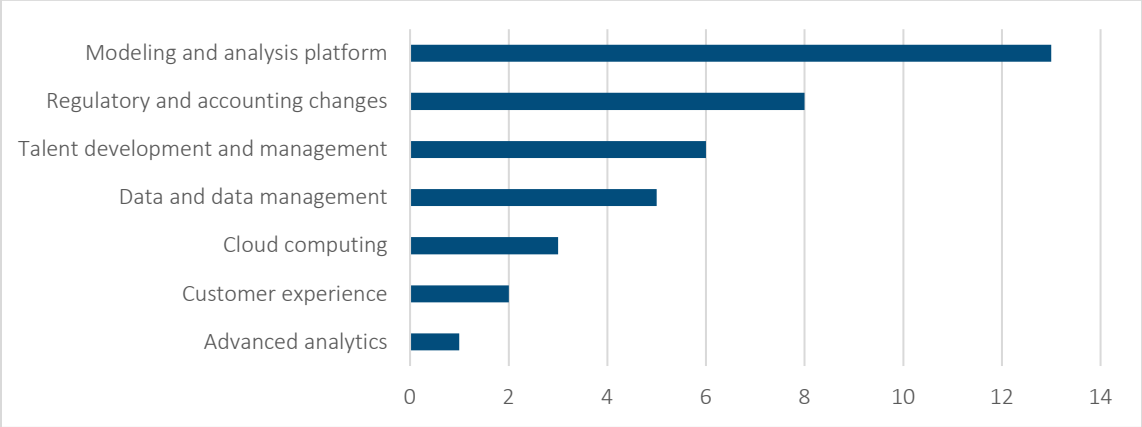
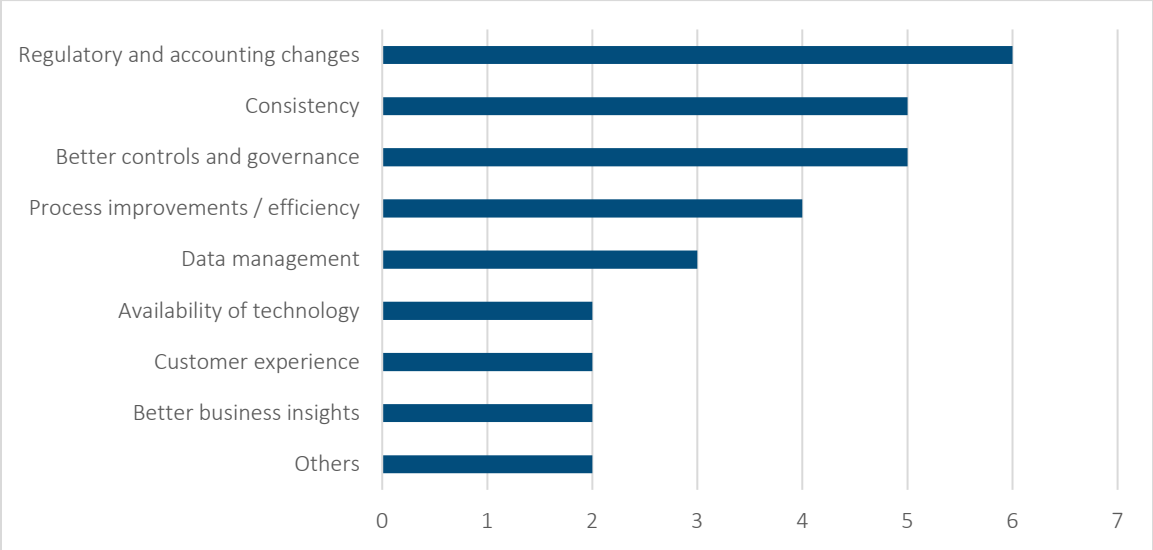


Figure 3B
MAIN OBJECTIVES OF ACTUARIAL TRANSFORMATION INITIATIVES



The top three primary focuses based on the interview responses are actuarial modeling and analysis platforms, regulatory and accounting changes, and talent development and management (figure 3A). Many companies mentioned the talent development and management as a key focus area. Many actuarial leaders mentioned that they want their actuaries to be able to work on cross-functional teams and in non-traditional roles, and they value a diverse set of skills. In addition, the recent impacts of COVID-19 on talent management and retention is likely another driver for their primary focus on talent management.

To complement the graph above, figure 3C below shows the highlights of all the interview responses collected from each of the companies interviewed.

Figure 3C
PRIMARY FOCUS AND MAIN OBJECTIVES OF ACTUARIAL TRANSFORMATION INITIATIVES – INTERVIEW RESPONSES

Company	Responses (Focus)	Responses (Objectives)
Company #1	• We focused on the following initiatives in recent years: re-platforming experience data using PowerBI, assumptions governance as part of PBR, combining models, processing model runs on the cloud, and accelerated underwriting.	• Process improvement / efficiency • Better controls and governance • Regulatory and accounting changes • Customer experience
Company #2	• Data has been the primary focus for most of our transformation related initiatives. We also converted legacy models to newer platform and consolidated redundant models. We are aiming to be more efficient at resourcing and better at making strategic business decisions.	• Availability of technology • Data and data management • Consistency
Company #3	• We have focused on training our actuaries and building a strong foundation. We make sure that we do not hire talented people and then task them with only repetitive, non-challenging work. We have built a culture that anyone can volunteer to work on something they are interested in, actuarial or non-actuarial.	• Better business insights
Company #4	• We have focused on GAAP LDTI and transforming our modeling and financial analysis platform.	• Customer value • Regulatory and accounting changes

Company	Responses (Focus)	Responses (Objectives)
Company #5	• We have been very focused on our "one model" vision in the better part of the past decade, but over the last few years have started shifting the focus more towards newer cloud computing technology and techniques such as AIML.	• Consistency
Company #6	• Our primary focus has been on transforming our data capabilities.	• Data and data management
Company #7	• We have focused on recent regulatory and accounting changes such as LDTI. Our legacy operating model is also not efficient, for example we have pricing, valuation, and CFT in different systems, and we have therefore been focusing on consolidating the platforms and simplifying calculations.	• Better controls and governance
Company #8	• We have focused on transforming the entire modeling environment: calculation engine, supporting processes and governance.	• Regulatory and accounting changes • Process improvement / efficiency • Better controls and governance
Company #9	• Our focus has been centered on making reserving and projection consistent, including conscious decisions on the modeling platforms the company wants to be on. We also focused on putting the right skills into the right role, in the right location.	• Availability of technology • Consistency
Company #10	• We have focused on consolidating actuarial models to a single model platform, improving the capabilities of this model, and implementing new accounting standards. We have also focused on developing end to end data processes – increasing data quality, automation, minimizing manual processes and improving decision making process.	• Regulatory and accounting changes
Company #11	• Our focus has been on moving from a home-grown system to a vendor environment, for actuarial modeling and valuation, and a more centralized operating model for modeling. We have also been moving calculation intensive activities to the cloud. Regulatory and accounting changes have accelerated this move.	• Regulatory and accounting changes • We need to improve efficiency by moving towards a much more aggressive reuse of cashflows like best estimate cashflows. We have reduced cost per unit by using cloud. Cloud has exceeded budget (early stages in receiving profits) are we really getting value from all the extra runs • There was also a desire of refining who can get access to what in terms of data management and controls. • Lastly, we would like to re-define the target operating model. Instead of using the usual one route in the model we added a second step to it. Primary model generates cashflow and secondary model takes input from primary model to do various downstream processes. Working towards a more centralized approach.
Company #12	• We have focused on putting all our reserving and projection models on the same platform.	• Consistency
Company #13	• We have spent a lot of time and effort on recent regulatory and accounting changes, which took away some of our focus on customers and customer experience.	• Regulatory and accounting changes • Process improvement / efficiency • Consistency
Company #14	• We have focused on modernizing our models, building one source of truth to feed the models, creating a conformed model output repository, and making actuarial solutions more robust.	• Customer value • Better controls and governance

Company	Responses (Focus)	Responses (Objectives)
Company #15	• Our focus has been on model rationalization, conversations and reducing the number of models. We also have focused on regulatory changes such as IFRS 17.	• Cost reduction • Better controls and governance • Better business insights
Company #16	• Our focus has been on transforming everything, i.e., people, process, technology. • Transformation is part of what our actuaries do – we may invest in initiatives here and there, but what we really want is for our actuaries to continuously transform instead of creating a one-time "Actuarial Transformation" program with finite timeline and budget.	
Company #17	• We carved out 20-25% of the team to focus on various regulatory and accounting changes in the last few years, but at the same time installed this mentality that it is everyone's responsibility to continuously improve what they do.	

Figures 4A and 4B below show the aggregated results of the interview responses from the 17 companies for the second question:

"What has been your biggest successes to date? What has been your biggest challenges to date?"

Figure 4A

BIGGEST SUCCESSES OF ACTUARIAL TRANSFORMATION INITIATIVES

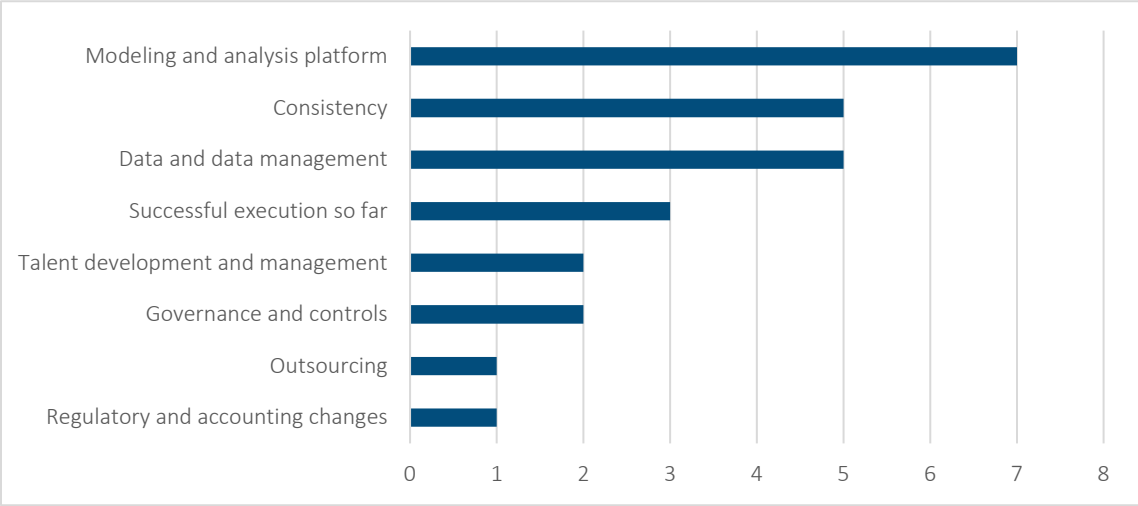
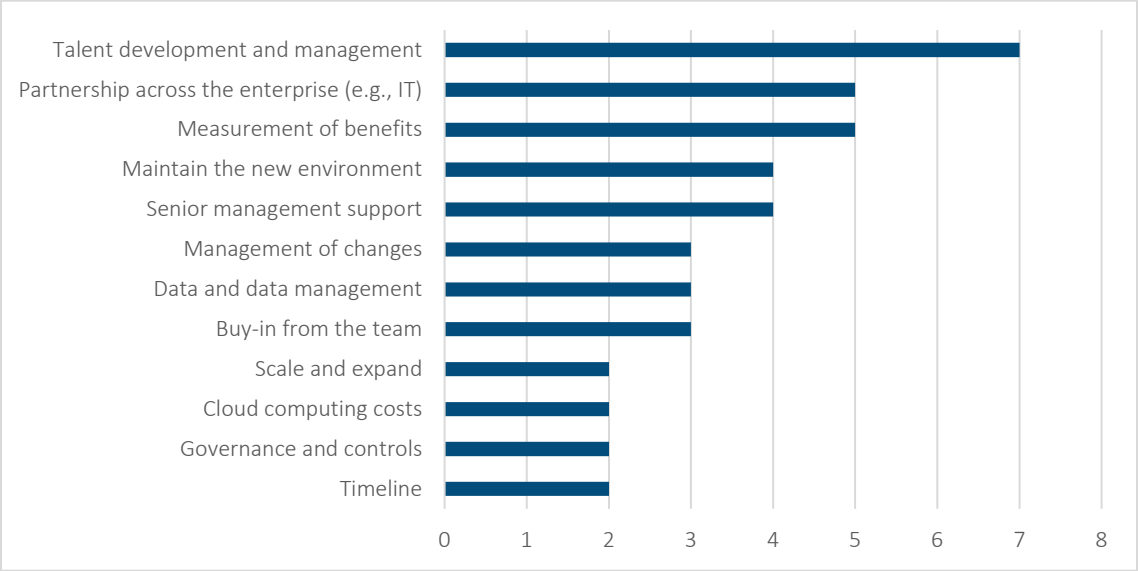


Figure 4B
BIGGEST CHALLENGES OF ACTUARIAL TRANSFORMATION INITIATIVES



Actuarial leaders responded that "modeling and analysis platforms," "consistency" and "data and data management" are the most common successes of their Actuarial Transformation efforts. Other popular areas mentioned by leaders are included in figure 4A above.

In terms of the biggest challenges, people-related topics were consistently brought up by actuarial leaders. This includes a focus on talent development and management, and partnership across different organizations within the enterprise such as IT and Finance. Many actuarial leaders clearly stated that they want to recruit people who are good at Actuarial Transformation and able to work on cross-functional teams, or those who already have a transformation mindset. Another challenge which actuarial leaders brought up was "how to measure the benefits gained from the transformation program." Several actuarial leaders mentioned it was very difficult to clearly quantify and articulate the benefits from these investments, which resulted in challenges to receive sustained support from senior executives. As organizations start to transition to harvesting benefits from their transformations executed in the last five to ten years, it will be important to clearly measure and communicate the benefits for the entire organization.

To complement the graph above, figure 4C below shows the highlights of all the interview responses collected from each of the companies interviewed.

Figure 4C

BIGGEST SUCCESSES AND CHALLENGES OF ACTUARIAL TRANSFORMATION INITIATIVES – INTERVIEW RESPONSES

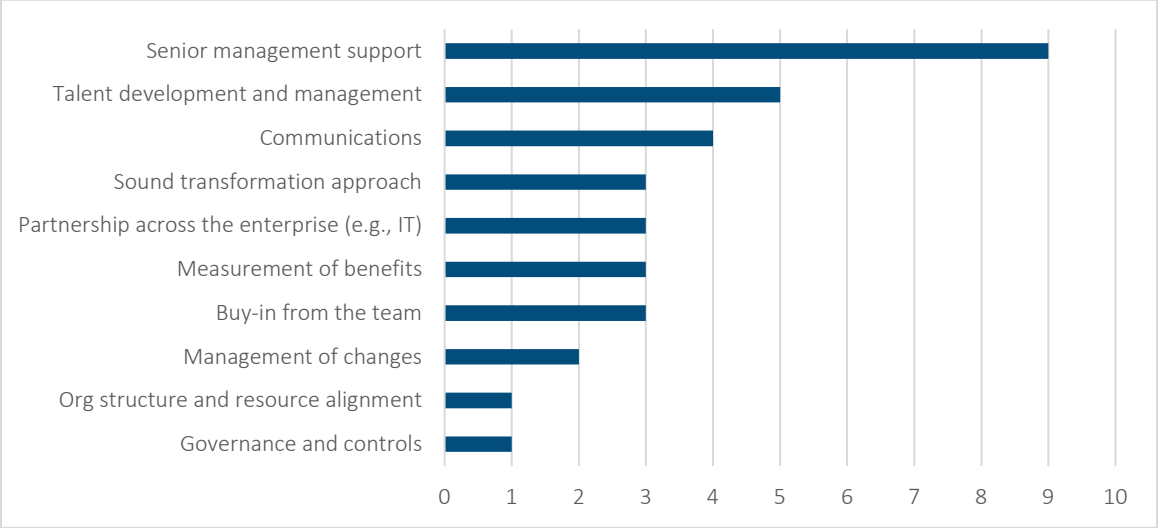
Company	Successes	Challenges
Company #1	• We have successfully consolidated all our annuity models into the actuarial modeling platform we chose. We've also built a single source of truth data mart to feed all the models.	• Quantification of efficiency gain.
Company #2	• Put everything we do onto one platform. Have consistency in what we do.	• Getting the resources with the right expertise and who can focus on transformation efforts. You also need to have realistic timelines, and there is a trade off since the longer your timeline is the more changes you will have to manage along your journey. We also lacked a good understanding of our data.
Company #3	• Technology implementation and self-service have empowered people to access new information.	• Partnership with IT. Have the proper guardrails in place to maintain governance and control.
Company #4	• We have been able to recruit talent from all over the world, and we have worked together effectively. • We established a central modeling team who owns, builds, and manages the model on behalf of other regions. This makes it efficient to run and build the models, and to build economies of scale across the whole organization.	• For a large company like us there can be disagreements at the executive level and therefore maintaining senior management buy-in has been challenging for our transformation efforts. • We sometimes find it challenging to find the right balance between giving people the freedom to utilize technology platforms while still having the proper governance and controls. • On the talent front, keeping people with decades of experience in the company has not been easy.
Company #5	• We are seeing returns from our focus on talent development: our people are being upskilled and the technology tools they need to succeed are being provided to them.	• It is sometimes challenging to make people understand why change is needed.
Company #6	• We have converted 90% of our balance sheet to our target platform, with improvements to our models.	• We have overall resource constraints, but even without that adopting new regulations like IFRS 17 while transforming has just been challenging. • Making sure executives understand the benefits of our transformation efforts and setting realistic expectations has also not been easy.
Company #7	• We have reorganized our modeling team in to separate development, test, and production groups, to provide an additional level of controls and focus on building a better controlled modeling environment.	• Measuring and quantifying the benefits of the Actuarial Transformation has been the biggest challenge, and this is important for continued support from senior management. When looking at traditional cost saving metrics, one might conclude there has not been tangible benefits from the transformation efforts. However, we have actually been reinvesting cost savings from transformation into doing more with the same team, generating additional insights, and continuing to expand the scope of our transformation. • Our actuarial team does not currently have an effective data quality tool – this will be a focus area going forward.

Company	Successes	Challenges
Company #8	• We have more than doubled our model run capacities and are more efficient. We have built a production environment using Alteryx with automated work flows to process and connect model output to other data.	• As our capacity for model runs increased the demand has also increased – people are now running more models and doing more analysis than before. This has really increased our cloud computing cost and led us back to the drawing board to rationalize all the model runs we are doing. • We have focused initially on accounting changes where we have introduced several new technologies and now need to scale the solution we built to other areas within our organization. It is not always easy to get people to change the way they have been working
Company #9	• The biggest success has been the implementation of US GAAP LDTI	• US GAAP LDTI has been the focal point for us, and as a result we have neglected other areas to the extent that there could be gaps by now. We need to scale what we have implemented and broaden the scope of the transformation.
Company #10	• We have moved most of our models into the platform we selected and is mostly a single-platform shop now.	• Cloud computing cost has been much more expensive than we thought. • It is hard to maintain one model while making sure all teams are supported.
Company #11	• We've delivered successfully to date. We have been able to have a flat head count whilst revenue, and amount of work actuarial performs, has grown significantly.	• Getting support from senior leadership can never be taken for granted, and it is important to be able to point to metrics showing improvement. • Once a structure is in place it is never easy to pivot from that. • We keep asking ourselves if there is anything else we can do to develop and manage our talent better, and to use our actuaries to the fullest potential.
Company #12	• We went through the post level term at the end of 2019 and had no earning issues around that because we knew what was going to happen for each treaty.	• Most of our biggest challenges have been data related.
Company #13	• We now have a corporate actuarial service center which drives consistency across the organization, and enables the company to do things and deliver results in a consistent way.	• It is challenging to measure the outcome from the spend on transformation or to clearly define and articulate what we are getting. • It is not easy finding effective relationship managers between business units, and to ensure the needs of different units are met.
Company #14	• We made a lot of progress on data, such as our processing capacity.	• The never-ending pace of change in technology – we have to keep marrying new technologies with the old. • Finding external resources has been challenging.
Company #15	• We probably had a later start compared to our peers, but we have been successfully executing our transformation plan so far and meet all the milestones we set.	• It is not easy finding people with the ability to plan and manage transformation efforts, timeline, or budget. • Effective collaboration between actuarial and other functions is also not easy, as it requires different ways of thinking and working.
Company #16	N/A	• We have a fully automated process, but it takes a lot of effort and care to maintain. Also the more automated the process is, the more it is difficult to understand. We have to use an outside model to validate results, and have separate modeling (people who understand the process) and testing (people who understand the business) teams. We also rotate people so that they get exposure to different aspects of the business, not just maintaining and executing the automated process.
Company #17	• We are now confident in completing all our planned model conversions.	• Maintaining partnership with IT has not always been easy, for example when IT lost their key people who knew both IT processes and the administration systems actuarial rely on.

Figure 5A below shows the aggregated results of the interview responses from the 17 companies for the last question:

"What are the critical success factors for Actuarial Transformation initiatives?"

Figure 5A
CRITICAL SUCCESS FACTORS FOR ACTUARIAL TRANSFORMATION INITIATIVES



Most actuarial leaders suggested that the three most critical success factors for Actuarial Transformation initiatives were senior management support, having the right people with the right skillsets and mindsets, and embedding transformations into the organizations through communications across the entire enterprise. Actuarial leaders mentioned that it is critical to obtain senior management commitment and, to earn their support, actuaries need to make the effort to engage them in continued conversations and demonstrate the value-add.

To complement the graph above, figure 5B below shows the highlights of all the interview responses collected from each of the companies interviewed.

Figure 5B
CRITICAL SUCCESS FACTORS FOR ACTUARIAL TRANSFORMATION INITIATIVES – INTERVIEW RESPONSES

Company	Interview Reponses
Company #1	• Technology-enabled actuarial talents are needed. It is also important to understand the trade-off between technology capital cost and human capital cost, and the overall efficiency gains at the organization level.
Company #2	N/A
Company #3	N/A
Company #4	• Close monitoring of progress and accountability against project plans.
Company #5	• Getting senior level buy in. • Getting a critical mass of people to buy in to ongoing transformation.
Company #6	• Transformation can still happen without large budgets. If transformation is embedded into your organization and you have employees who are driven and understand the company's strategy, transformation will happen from within.
Company #7	• Consistency of data across data sources and use cases. • Having people who can speak the language of both actuarial and data/IT.
Company #8	N/A

Company	Interview Reponses
Company #9	• We need to be as nimble as possible to adapt future changes. We need systems and processes that can change quickly, but more importantly our actuarial organization need to be good at transformation. • It is critical to have support from senior management for budget and resources. • We need to provide our people the training they need to understand the business, not just technology or processes. • We need to have integrated teams with technology talents and actuaries. • We need to have the right amount of governance and controls – sufficient but not so much that it actually hurts us.
Company #10	• We need to have the right people, with the right mindset and guide them with the right roadmap. • Senior management buy-in and support is important, but it is not always easy to quantify the benefits. This makes it even more important to have a sound transformation approach, for example celebrate successes and milestones.
Company #11	• Support from leadership is critical, as well as partnership between actuarial and IT.
Company #12	• We have had tremendous management support. The individual teams always want to build something that works best for them, and if left in silos then you would just be building another set of customized and inconsistent solutions. You have to make sure there is communication and the organization stay focused on achieving consistency.
Company #13	• Senior management commitment is critical, and to earn their support, actuaries need to make the effort to engage them in continued conversations and demonstrate the value-add. • It is critical to start small and plan proof points. There also needs to be a process of re-starting and continuing transformation efforts, as there will likely be unforeseen interruptions.
Company #14	• Senior leadership needs to agree with the vision. • It is critical for the different teams to have good working relationships.
Company #15	• Need to have buy-in from the top and have the resources and time to transform. • Need to have the right org structure and resource alignment to support your objectives.
Company #16	N/A
Company #17	• Senior management has been supportive, and we have buy-in from our team.

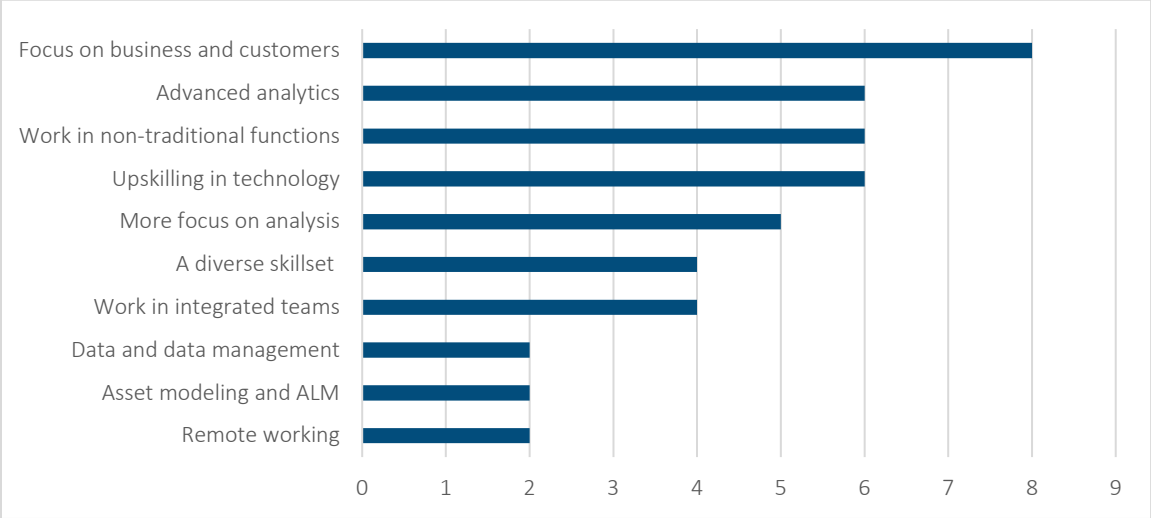
2.4 PROSPECT OF FUTURE CONTINUED ACTUARIAL TRANSFORMATION

This section aimed to understand actuarial leaders' views regarding to the future focus of their continued Actuarial Transformation and any additional opportunities for actuaries. The following question was asked of the interviewees and the responses were summarized and analyzed:

> *"Looking ahead, how will the business focus and needs for actuaries change over the next 5 – 10 years? What new opportunities do you see for actuaries?"*

Figure 6A below shows the aggregated results of the interview responses for the 17 companies.

Figure 6A
OPPORTUNITIES FOR ACTUARIES OVER THE NEXT 5-10 YEARS



The interview indicated that actuarial leaders' views of where the top business needs and opportunities for actuaries will be in the next 5-10 years include:

- Focus on business and customers – Actuarial leaders indicated that transformation should result in actuaries spending time on higher value-added activities, support different functional areas of the company and work on cross-functional teams.
- Advanced Analytics – Actuaries need to think of new ways of getting data quickly and in a good format to handle unexpected situations. This includes managing data processes better and having more dynamic reporting capabilities, such as Advanced Analytics, data visualization and data engineering skills.
- Work in non-traditional functions – Actuaries need a lot of different skills and work within an integrated team to solve complicated business challenges, not just the traditional actuarial skillsets; hence, actuaries need to work with non-actuaries and diversify their skillsets.
- Upskilling in technology – Actuaries will be empowered with advances in technology, and will move more towards building tools instead of producing each analysis manually.
- More focus on analysis – Actuaries need to better explain results where Advanced Analytics and new technologies would be able to facilitate more efficient processes and activities.

Compared to their current focuses in Section 2.3, we noticed that the companies' future focus will shift from primarily concentrating on modeling and accounting change driven activities to other areas, including reporting and analysis, developing their actuaries' people and analytical skills, and upskilling on technology capabilities. This is consistent with the leaders' views that the people mindset and transformational skillsets are some of the most critical success factors for Actuarial Transformation initiatives.

Several actuarial leaders suggested that Advanced Analytics represents an area of opportunity for actuaries in the next 5-10 years. Section 2.5 and 2.6 go into greater detail on the prospects for Advanced Analytics in the actuarial industry.

To complement the graph above, figure 6B below shows the highlights of all the interview responses collected from each of the companies interviewed.

Figure 6B

OPPORTUNITIES FOR ACTUARIES OVER THE NEXT 5-10 YEARS ACTUARIAL TRANSFORMATION– INTERVIEW RESPONSES

Company	Opportunities for Actuaries
Company #1	• More time on higher value-add activities: increase time for analysis by reducing time spent on manual processes and reconciliations, and by optimizing model run time.
Company #2	• Actuaries are problem solvers, and the need for actuaries will continue to evolve. We need to be more business focused, work in integrated teams, and understand customer needs and behaviors. • We need to give actuaries the opportunity to rotate amongst cross-functional teams, and actuaries need to be able to shift to other areas.
Company #3	• We need to keep up with the changing technology and demographic environment. For example, there has been a major shift to digital such as automated underwriting and we have seen excess mortality that is not related to COVID. • Actuaries will support a variety of areas within the company, and an actuarial college degree is not a requirement anymore. People with a lot of different skill sets will be more valuable. • We now allow full-time remote for all jobs.
Company #4	• Actuaries will be further empowered with advances in technology, and we will move more towards building tools instead of producing each analysis manually. • We will have a more commercial focus and be involved more in the business.
Company #5	• Actuaries are being equipped with more computing power and IT-based solutions, and we need to get actuaries away from purely theoretical exercises and into applying our analysis to the business. • Actuaries will have a role in data science – big data and machine learning – even if we do not yet know what the role is.
Company #6	• Technical skills will always be important for actuaries, but these are foundational and actuaries who can also work in cross-functional, agile teams will have a lot more opportunities. • Most business issues need to be solved with an integrated team today and we need a lot of different skills – not just the traditional actuarial skillsets. Actuaries need to work with non-actuaries and a diverse skillset is important.
Company #7	• As part of the accounting changes more information is being exposed, which will push the analytics agenda. Actuaries need to better explain results, where the Advanced Analytics and new technologies would be able to facilitate more efficient processes and activities.
Company #8	• We operate in a very competitive environment and need actuaries to help us win in the space we compete in. Actuaries need to provide more transparent information on opportunities and risks.
Company #9	• We need to develop actuaries into strong business leaders. There are plenty of opportunities for actuaries, not just inside actuarial.
Company #10	• There are new opportunities for someone who understand both actuarial requirements and data. We need to manage data processes better and have more dynamic reporting capabilities: data visualization and data engineering skills are important. • As we move towards a remote working environment, we need to build a different culture and quality actuarial leadership is even more important.
Company #11	• There are opportunities for actuaries to move away from manual, repetitive work and focus more on understand and use results. There is still a ton of opportunities to be more creative in product design and management.
Company #12	• For our company, as we move to the next phase of our transformation our actuaries will likely focus more on cloud computing and Advanced Analytics.
Company #13	• For our actuarial organization, beyond the continued need to focus on regulatory changes and model-based valuation we also want to expand our use of Advanced Analytics.

Company	Opportunities for Actuaries
Company #14	• As the insurance industry focuses even more on customers, actuaries will need to have a stronger partnership with the front office to help their company keep their customer value strong, through better insights in not only trends in mortality and morbidity, but also consumer behavior like purchasing decisions and persistency. • With all the regulatory and accounting changes and additional financial reporting requirements, it will become even more important for companies to clearly understand and communicate their economic and risk adjusted valuation. Actuaries will need to have a stronger voice in this area. • There are lots of opportunities for actuaries willing to integrate more with other business areas to solve business problems and help the company find its value. In a sense, actuaries are "programmed" to solve "actuarial problems", but there needs to be recognition in that actuaries need to grow beyond that artificial limit we set for ourselves. We need to gain exposure to a broader perspective and build relationships with other business partners, otherwise top jobs at insurance companies will continue to not go to actuaries. • A partnership between actuaries and data scientists will very likely provide better solutions.
Company #15	• Actuaries' ability to model assets needs to be more sophisticated. • We also need to focus more on value creation.
Company #16	• Data scientists do not know the business, and if no-code / low-code Advanced Analytics tools are available actuaries can really help drive the business. • There are opportunities for actuaries to drive advancements in forecasting, ALM and data management. • We tend to develop versatile resources with our rotation program, but then it is difficult to develop talents with in-depth skills in a certain area. These can be two different career paths and we need to figure out how to fit them together.
Company #17	• We need to think of new ways of getting data quickly and in a good format to handle unexpected situations such as the pandemic. We also need to think of new ways of using data – underwriting, risk management, etc..

2.5 USE OF ADVANCED ANALYTICS

This section aimed to understand actuarial leaders' views regarding the use of Advanced Analytics in their current organizations, as well as their expected degree of focus on Advanced Analytics in the next 5-10 years. The following questions were asked of the interviewees and the responses were summarized and analyzed:

> *"To what extent have Big Data, predictive analytics, and Artificial Intelligence / Machine Learning (AI/ML) been incorporated into your current actuarial function and key activities/processes? Do you expect this will change materially in the next 5-10 years, and if so, how??"*

Figures 7A-7C below show the aggregated results of the interview responses from the 17 companies.

Figure 7A
CURRENT USE OF ADVANCED ANALYTICS

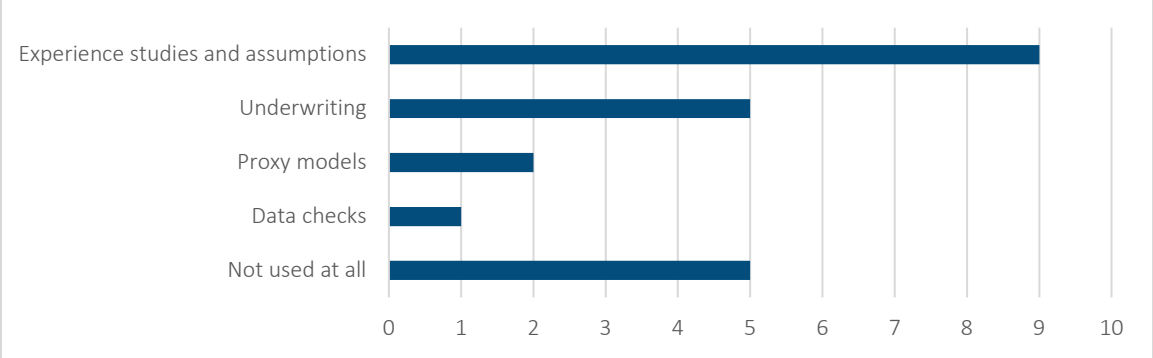


Figure 7B
FUTURE USE OF ADVANCED ANALYTICS

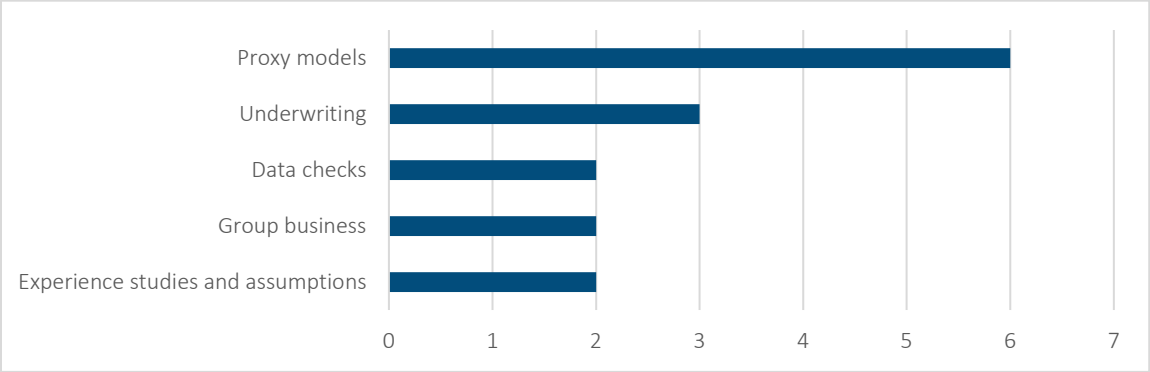
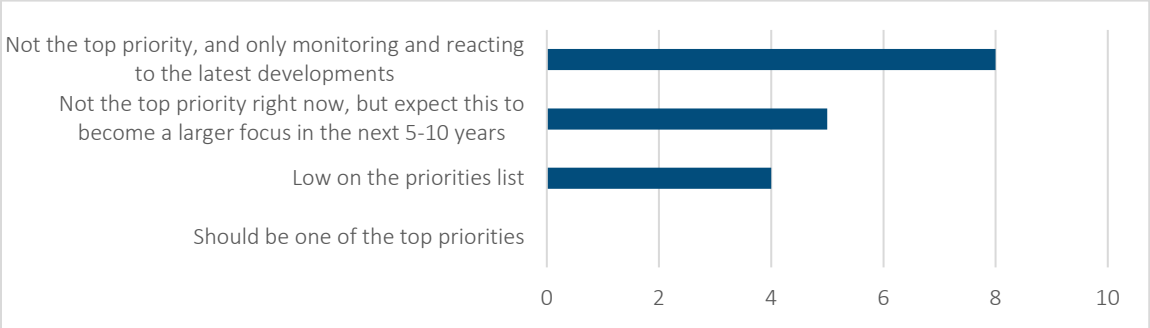


Figure 7C
PRIORITY OF ADVANCED ANALYTICS



Nearly half of the actuarial leaders mentioned that they have adopted Advanced Analytics in their experiences studies and assumption setting processes, particularly around mortality and lapse risks. The underwriting process, although not normally considered an actuarial function (but has direct implications for product design, pricing, experience studies and assumption setting), was ranked as the second most frequent use of analytics. The same number of companies also responded that they do not have any current use for Advanced Analytics. Actuarial leaders indicated that analytics haven't made material differences beyond those two applications. We noticed that the current use of Advanced Analytics is mostly within the areas where there is a heavy lift of data usage and, for the companies that do utilize Advanced Analytics, the actuarial leaders indicated that there are separate data science teams within the companies that work closely with actuaries (figure 7A).

For the future use of Advanced Analytics, many actuarial leaders are interested in proxy modeling given the computing power required to calculate and project actuarial values for life and annuity business, especially for valuations that rely on stochastic or nested stochastic modeling (for fair value, principle-based reserve, risk or other metrics). The increasing interest in proxy modeling, perhaps, is primarily driven by the recent accounting and regulatory changes, where principal-based reserving, including nested-stochastic modeling, significantly increased the demands for computing power and actuarial modeling efficiencies (figure 7B).

As shown in figure 7C, although none of the actuarial leaders expect analytics to become one of their top priorities in the next 5-10 years, they still view Advanced Analytics as an essential topic for their continued Actuarial Transformation journey. Less than one-fourth said it is low on their list of priorities, about one-third expect the priority to increase, and others are monitoring and reacting to the latest developments on this topic. However, actuarial leaders indicated they are still looking for better foundational capabilities and

an application that would influence the bottom line before committing more resources and time to Advanced Analytics.

Figure 7D below shows the highlights of all the interview responses collected from each of the companies interviewed.

Figure 7D

USE OF ADVANCED ANALYTICS – INTERVIEW RESPONSES

Company	Use of Advanced Analytics
Company #1	• Insurance companies still have to improve a lot of the basics, and do not yet have the foundation to move into more Advanced Analytics. • Analytics is not a priority for us right now, and likely not in the near future.
Company #2	• We have a data scientist team that is working closely with experience study actuaries, focusing on mortality and lapse. Underwriting is guided by these experience studies. • We are still in the early stages of implementing AIML, but this should be more incorporated into what we do in the near future. • We can't just keep building and running 10s of thousands of scenarios – we would like to shift to a big data/AI solution to get the results we need. E.g., For liability duration and stochastic capital use cases.
Company #3	• We are leveraging big data tools to build predictive models and machine learning models, although the development of AIML is still siloed (as opposed to an enterprise-level effort). • We use predictive models for policyholder behavior assumptions, and also for testing economic scenarios generated from our ESG (instead of full actuarial model runs).
Company #4	• We use predictive models for accelerated underwriting. We have looked into setting assumptions with predictive models but are still early in the process and need to clearly articulate the benefits. • We are also looking into using predictive analytics to cut down our model run time, especially for projection models.
Company #5	• We use predicative techniques in Lapse and Group Medical claims experience studies. • We are trying to replicate actuarial models with machine learning. • Actuaries will definitely use more of AIML, and we will use it in areas that have not been thought of yet.
Company #6	• We have been using predictive analytics for underwriting and understanding policyholder behavior to develop assumptions. These are common in the industry and likely table stakes now. We are also interested in using analytics to help manage Group business. • We have to get the foundational data work done first, and the opportunity to use analytics will be huge afterwards. Currently, getting the data still takes a lot of effort. • Analytics have the potential to help businesses operate with greater profitable growth.
Company #7	• We are working to utilize predictive analytics to improve the quality of our assumptions, but we are still at a very early stage to explore analytics in assumption development and underwriting. • The use of analytics will change when someone is able to turn an investment in analytics into a return.
Company #8	• We have dabbled in analytics – mostly testing what was already built by others. We have not yet gotten our data foundation in place to be able to go into big data, predictive analytics or AIML. • We are interested in exploring using analytics for group business.
Company #9	• We have not implemented AIML in actuarial. We see it as a more sophisticated statistical analysis, and we still need to get comfortable with our standard analysis first. • We see value in at least using AIML for underwriting. • AIML will be a joint effort by actuaries and data scientists.
Company #10	• Advanced Analytics has not been our top priority. There could be value, but for financial reporting we are not sure the "answer" would change all that much with analytics. For risk-taking functions such as sales and consumers analytics, Advanced Analytics could be more impactful. • There could be changes when the data become more readily available and as we gain a better understanding of data and analytics, although we really need to have a use case that makes a meaningful difference to our bottom line before we invest the required resources and effort.
Company #11	• We have not used analytics much, other than limited focus areas such as developing mortality and lapse assumptions. We are interested in utilizing AIML for forecasting though and data quality checks. • We are not expecting the use of analytics to change materially in the next few years.
Company #12	• We have an Advanced Analytics team, but the focus has been limited to underwriting. • Eventually we can see analytics being utilized for data quality checks and proxy models.

Company	Use of Advanced Analytics
Company #13	• Actuaries have already been utilizing statistical techniques similar to predictive analytics. Data need to be more available for us to use more of these techniques. • We also have concerns over AIML. It is not transparent and can just be another black box. We cannot make decisions based on AIML if we do not know it well. • Data scientists, without knowledge of the business, can sometimes present non-sensical analysis based solely on what they see in statistical models. • This may change in the future. If it is easier for actuaries to pick up AIML, such as low code / no code tools, we might be able to advance AIML further.
Company #14	• We use analytics in underwriting and assumptions setting. We are also interested in epigenetics. • In the future actuaries may have hybrid roles that involved data science.
Company #15	• We have not used AIML much. • We are currently using big data solutions in assumptions setting, e.g., mortality. We also think analytics is relevant for group business and underwriting. • We expect this to change materially in the next 5-10 years, as better tools and techniques become widely available.
Company #16	• We have incorporated some analytics in what we do. The main areas of focus are experience studies / assumption setting and underwriting. • We see a wider adoption as actuaries start getting more comfortable with analytics.
Company #17	• We use AIML to validate premiums and actuarial models. We want to evolve to be able to do this in real time automatically instead of doing it retrospective. We also see AIML replacing actuarial models in some places.

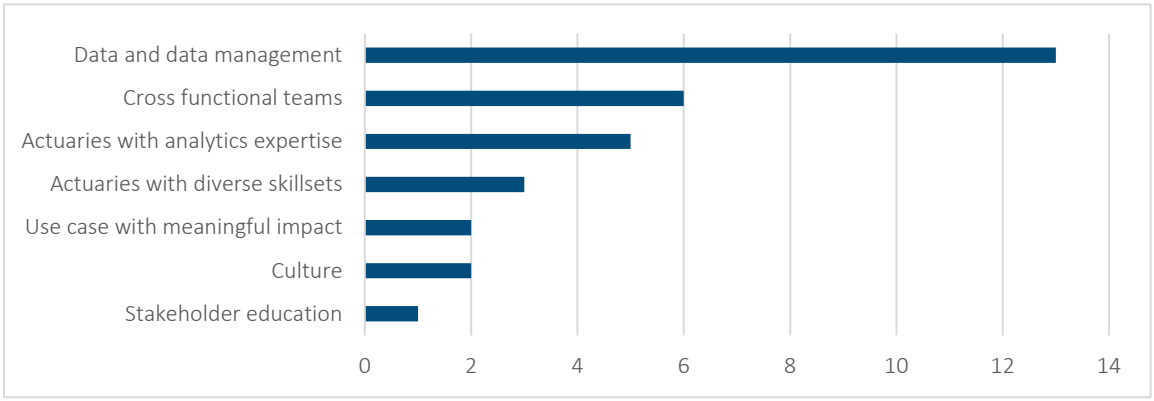
2.6 PROSPECT OF ADVANCED ANALYTICS

In this last section, we aimed to understand actuarial leaders' views regarding what needs to be changed to make Advanced Analytics more impactful. The following question was asked of the interviewees and the responses were summarized and analyzed:

> *"What are the most significant enhancements that will be needed to your actuarial function and operating model to leverage the potential of these new techniques (referring to Advanced Analytics)?*

Figure 8A below shows the aggregated results of the interview responses of the 17 companies.

Figure 8A
PROSPECT OF ADVANCED ANALYTICS



As shown in figure 8A, actuarial leaders from 13 companies, out of 17, believe that they need the foundational data capabilities in place before they can focus on analytics. Additionally, some actuarial leaders suggested that upskilling of actuaries to be more capable of utilizing Advanced Analytics is the key

need for actuaries to utilize Advanced Analytics in an impactful way; this also includes building up cross-functional teams to partner with data scientists.

To complement the graph above, figure 8B below shows the highlights of all the interview responses collected from each of the companies interviewed.

Figure 8B

PROSPECT OF ADVANCED ANALYTICS – INTERVIEW RESPONSES

Company	Interview Responses
Company #1	• We need to communicate better across different business functions, so that we can leverage each other's models and help each other solve business problems.
Company #2	• We need to be humble and accept that we do not know everything. The more diverse skills we have, the stronger the team will become. Challenges with new technology will solve themselves if we have the right people, encourage them to try new things and allow failure – our team celebrate failure and discuss what we learned. • Actuaries who know coding and can work with data scientists will be valuable in getting better solutions. • We need enhancements in data quality and the speed we receive data.
Company #3	• We need to continue to consolidate and centralize core data. • We also need resources with data science skill sets. However, we question how deep actuaries have to be in data science.
Company #4	• We need an agile team with actuaries, data scientists, IT, and project managers. • We need access to a lot of additional data, data that come in good order, a data repository, and better data quality tools.
Company #5	• We have a huge need for data, and data need to be clean. We have started developing our data mart. • We need to find talent who bring different perspectives – not always from the traditional actuarial route. It is more important to find people who are curious, persistent, able to explain what they are doing in plain English and be influential.
Company #6	• Actuaries need to understand the vision and lean into the skills needed as work will be more analytically focused and less process oriented.
Company #7	• We need a diverse set of skills: project management, project execution, presentation, data management and knowledge of the business. • We need more external information, such as financial and mortality data. We also need to be better at data structures, cloud cost management and consolidating our tools. • We also need to educate stakeholders.
Company #8	• We have a data science team working with our experience studies actuaries. We are not sure we need more actuaries, but we do need additional data.
Company #9	• We need to identify a use case that makes a meaningful difference to our bottom line before committing to analytics. • We need to have quality data, the ability to understand data and analytics, and be able to drive business decisions with analytics.
Company #10	• We need to have the right skillset and get the right resources involved. • Data needs to be available first. We need to harvest data which is useful, and it is extremely hard.
Company #11	• We need to be able to code (e.g., Python, R) and communicate with technology professionals. • We have to be able to get good quality data at low cost, and have a good foundation to manage data.
Company #12	• N/A
Company #13	• We can take advantage of new and cheaper technologies to look at how we obtain and transform data, and how data move across the organization. Our people need to get what they need when they need it. • Actuaries don't need to learn data science. We just need to understand the art of the possible and then partner with data scientists to implement it.
Company #14	• N/A
Company #15	• Our Advanced Analytics team is focused on better, more impactful external data. The actuaries are also encouraged to leverage new data analytical technologies such as Alteryx, R, Python. And we believe that this would impact all key business processes.
Company #16	• Actuaries need to learn how to source, and efficiently access data. We need to work on increasing data literacy in actuarial.
Company #17	• We need a powerful data warehouse with enough storage and processing capabilities to bring in external data. We also do not have the skills to transform unstructured data into useful information. • Someone will figure out where analytics will have a meaningful impact, and that will lead to us prioritizing analytics more.

Section 3: Survey

The researchers conducted an online survey of some SOA members to investigate the cross impact between Actuarial Transformation and analytics. This section covers the survey approach and provides a detailed analysis of the responses received.

3.1 OVERVIEW

Online surveys were distributed by the SOA to a random sample of all SOA members and candidates. The objective of the survey was to understand how individual actuaries perceive Actuarial Transformation and technology in their jobs, with a focus on the impact of Advanced Analytics. The questions were mostly multiple-choice. The survey requested individual rather than formal company responses. It used an anonymous electronic format that encouraged the expression of individual opinions rather than company positions. Many multiple-choice-format questions were followed up with questions asking "why" or "provide examples," allowing expansion of the concept, comparison from prior surveys, and additional learning for readers of the results.

Survey questions focused on the following aspects:

- Actuarial Transformation
- Advanced Analytics
- Cross impact between Actuarial Transformation and analytics

The survey was sent to a random sample of all members, in multiple batches, until a sufficient number of responses were received. There were 111[10] respondents, representing a 1.3% response rate, from both US and non-US companies, insurers, consultancies, and reinsurers. Over 50% of survey respondents had some familiarity with Actuarial Transformation, and over 50% of respondents had some experience with Advanced Analytics, providing a sufficient sample of respondents with knowledge and experience in the survey topics.

Please see the appendix for an overview of the demographic mix of the respondents.

[10] We cleaned survey data after collecting the results. The 111 survey results included in the report were completed surveys received. Some participants only answered part of the questions. These survey results were excluded from the report.

3.2 RESPONSES

This section includes the complete results received for the online survey. Highlights of the results and potential implications are discussed throughout the section.

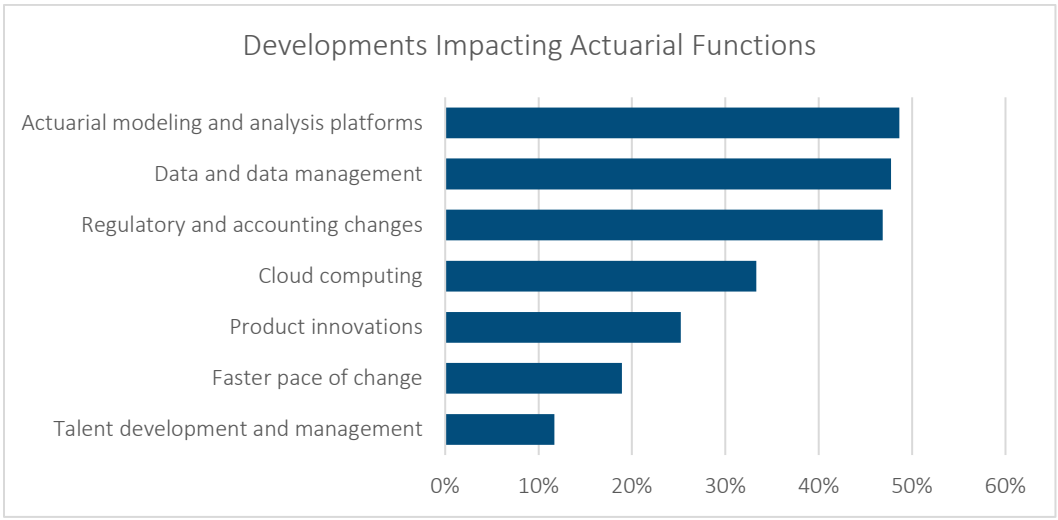
3.2.1 ACTUARIAL TRANSFORMATION

This section aimed to understand the work done by respondents in Actuarial Transformation, major successes and obstacles, and respondents' thoughts on how actuarial work might change over the next decade.

1. Most significant developments that have impacted actuarial functions

Question 1: In your view, what have been the most significant developments and innovations that have impacted actuarial functions and driven the Actuarial Transformation efforts to date?

Figure 9
MOST SIGNIFICANT DEVELOPMENTS THAT HAVE IMPACTED ACTUARIAL FUNCTIONS



Note: Percentages represent the percentage of total respondents selecting a given response. Multiple responses were allowed so the total of all responses can be greater than 100%.

The top three drivers based on the survey results are:

- Actuarial modeling and analysis platforms
- Data and data management
- Regulatory and changes

This result is broadly consistent with the findings from the interviews of actuarial leaders. The one exception is that the actuarial leaders were more likely to list talent development and management as a key development. Another reason actuarial leaders suggested that they view this topic as having more importance is that leaders want their actuaries to be able to work on cross-functional teams and non-traditional roles, and they value a diverse set of skills.

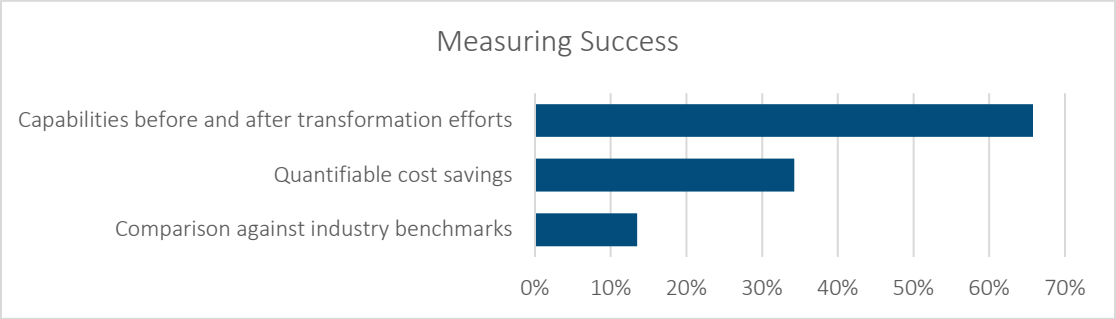
Breaking the results down by demographic factors, we note the following interesting results:

- Actuaries with 25+ years' experience were less likely to list all of the developments, when compared to their more junior colleagues.
- Health actuaries were less likely to list all of the developments, when compared to other industries. This was expected as the list of developments were designed for life and annuity companies. For example, while Health insurers were affected by regulatory changes, such as the Affordable Care Act (ACA), they were less affected by the recent accounting changes, such as Principle-based reserving (PBR) or US GAAP Long Duration Targeted Improvement (LDTI), or changes in actuarial models.
- Respondents who considered themselves "very familiar" with Actuarial Transformation or who had some experience with Advanced Analytics were more likely to list "data and data management" as a key factor.

2. Measuring success of Actuarial Transformation efforts

Question 2: How do you think the success of Actuarial Transformation efforts should be measured?

Figure 10
MEASURING SUCCESS OF ACTUARIAL TRANSFORMATION EFFORTS



Note: Percentages represent the percentage of total respondents selecting a given response. Multiple responses were allowed so the total of all responses can be greater than 100%.

Other written responses received included:

- *Comparison of "Actual to Expected"*
- *Process throughput*
- *Reduced risk of human error, time savings on manual work*
- *Efficiency & productivity metrics*
- *Consistency across models and improved/streamlined ability to make model updates*
- *Perceived quality of work life / work-life balance*

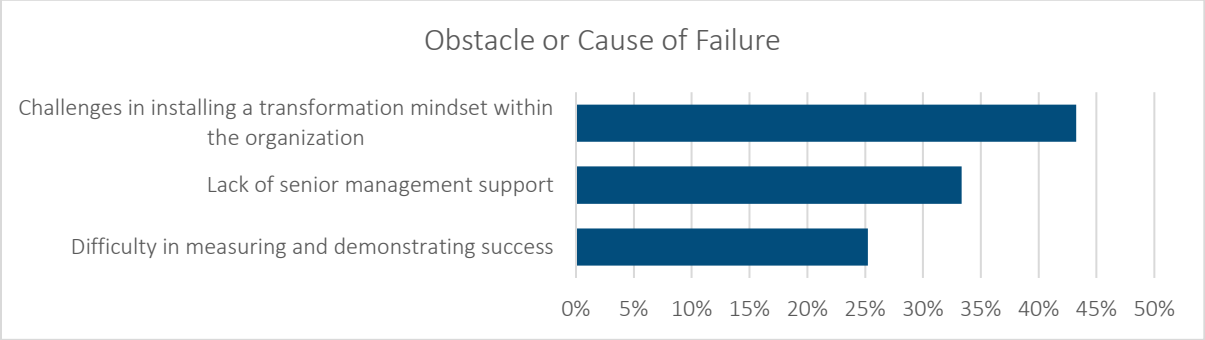
The majority of respondents suggested comparing capabilities before and after transformation as being the best measure of success of Actuarial Transformation efforts, although this may be difficult to quantify in practice. There were no major differences in responses received by geography, years of experience, specialty, familiarity with Actuarial Transformation, or familiarity with Advanced Analytics.

As organizations transition from implementing Actuarial Transformation initiatives to realizing benefits from these initiatives, it is important to clearly measure and communicate the benefits for the entire organization. The written responses received provide some interesting ideas on how actuarial leaders can communicate the successes and benefits of Actuarial Transformation.

3. Major obstacles or causes of failure for Actuarial Transformation efforts

Question 3: In your view, what has been the major obstacle or cause of failure for Actuarial Transformation efforts that did not go well?

Figure 11
MAJOR OBSTACLES OR CAUSES OF FAILURE FOR ACTUARIAL TRANSFORMATION EFFORTS



Note: Percentages represent the percentage of total respondents selecting a given response. Multiple responses were allowed so the total of all responses can be greater than 100%.

Other written responses received included:

- *Lack of effective planning, e.g., cost and time to implement both much larger than estimated up front*
- *Lack of the right people with the right skillset and mindset leading through the change*
- *Lack of broad skill set, ease of adoption, lack of clear definition of objectives & challenges*
- *Lack of understanding of what needs to change*
- *Poor data management*
- *Unreasonable expectations from leadership*

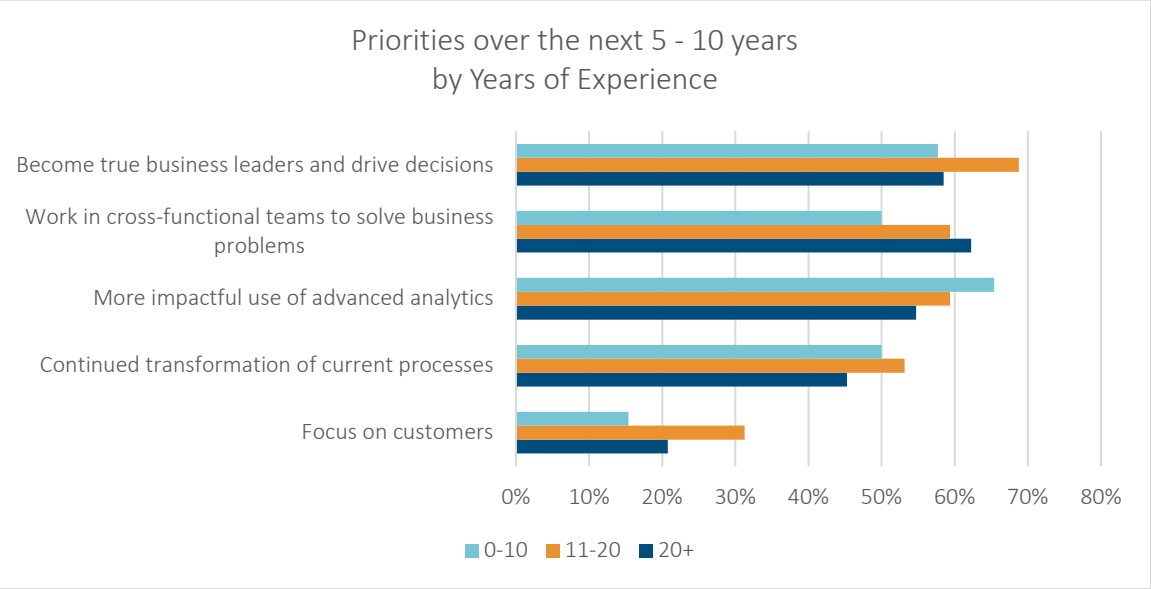
Respondents selected "challenges in installing a transformation mindset within the organization" as the most common response. There were no major differences in responses received by geography, years of experience, specialty, familiarity with Actuarial Transformation, or familiarity with Advanced Analytics.

The selection of "challenges in installing a transformation mindset" is consistent with actuarial leaders' primary focus on talent development and management. The actuarial leaders clearly stated that they want to recruit people who are good at Actuarial Transformation and able to work on cross-functional teams, i.e., those who already have a transformation mindset.

4. Priorities for actuaries and areas requiring upskilling

Question 4: In your view, which of the following areas (or other areas not listed) should actuaries prioritize over the next 5 – 10 years?

Figure 12
PRIORITIES FOR ACTUARIES OVER THE NEXT 5-10 YEARS



Note: Percentages represent the percentage of total respondents within an experience band selecting a given response. Multiple responses were allowed so the total of all responses can be greater than 100%.

Other written responses received included:

- *Technical competence and computer science proficiency*
- *Develop a broad, generalist, skillset*
- *Focus more on climate and sustainability risks*
- *Focus on improving quality of work life & workplace culture with transformation. It's not all business-related.*

Figure 12 shows the survey results on the areas actuaries should prioritize over the next 5-10 years.

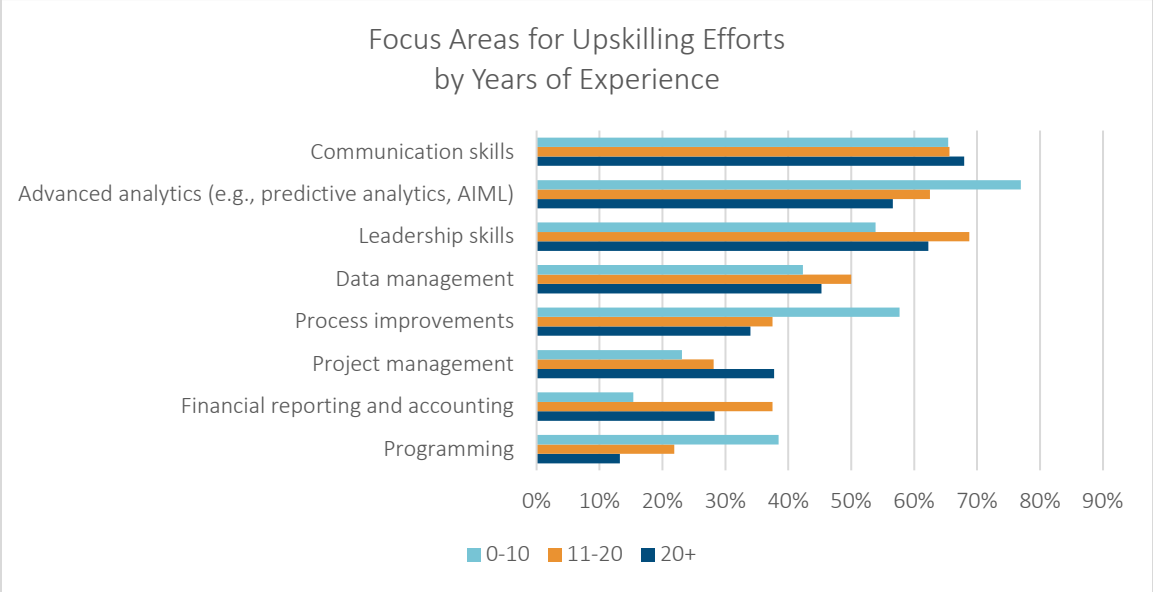
The top four (4) priorities, receiving roughly equal support, were "becoming true business leaders and drive decisions," "work on cross-functional teams to solve business problems," "make impactful use of Advanced Analytics," and "continued transformation of current process." Although the top four (4) selections were consistent across participants' year of experience, the number 1 priority is different. Participants with 0-10 years of experience indicated "more impactful use of Advanced Analytics" as their top priority, participants with 11-20 years of experience indicated "becoming true business leaders and driving business decisions" as their top priority, and participants with 20 and more years of experience indicated that "working in cross-functional teams to solve business problems" was their top priority.

Results also varied by specialty, with Life and Annuity, and Reinsurance, actuaries indicating "becoming true business leaders and driving business decisions" as their top priority, while health actuaries selected "more impactful use of Advanced Analytics" as their top priority.

The focus on becoming business leaders and driving decisions may reflect some of the profession's priorities over recent decades, whilst the focus on Advanced Analytics may suggest changes in both the profession's education pathways and research priorities in more recent years.

Question 5: Which of the following areas should actuaries focus their upskilling efforts on over the next 5-10 years?

Figure 13
FOCUS AREAS FOR UPSKILLING EFFORTS BY YEARS OF EXPERIENCE



Note: Percentages represent the percentage of total respondents within a specialty selecting a given response. Multiple responses were allowed so the total of all responses can be greater than 100%.

Other written responses received included:

- *Focus on customer and meeting their needs*
- *Communicating items in terms of business impacts*
- *Actuaries lack of technology skills is holding us back.*
- *Finding ways to work with data experts and data scientists instead of trying to become data scientists*
- *Should focus on human component: Staff development, improved skills in decision making & analysis, encouraging contributions & creative thinking skills, etc.*

Figure 13 above shows survey results on the areas actuaries should focus their upskilling efforts on over the next 5-10 years. Generally, all actuaries agreed that the three most important areas to focus upskilling efforts on are Advanced Analytics, communication skills and leadership skills. In terms of years of experience, actuaries with 0-10 years of experience placed a higher priority on Advanced Analytics and process improvements compared to actuaries with more years of experience. This may reflect the fact that the work of junior actuaries is often more technical in nature and process focused, while the work of more experienced actuaries often requires more leadership and communication skills.

In terms of differences by specialty, Health actuaries proposed a larger focus on process improvements, perhaps reflecting that the health industry has undergone less Actuarial Transformation than others. Life and annuity actuaries placed a higher priority on leadership skills than others, whilst reinsurance actuaries placed a higher priority on financial reporting and accounting than other specialties.

5. Other comments and insights regarding Actuarial Transformation

Question 6: What other important insights regarding Actuarial Transformation would you like to share with the industry?

The following are selected responses received from survey participants:

- *Actuarial Transformation will be a journey and is iterative. There is no one right answer and the solution will be different for different organizations and actuaries.*
- *Actuarial Transformation should always be on the minds of actuarial leaders, we should always be asking ourselves if there is a better way of getting things done and providing a better/faster analysis of results to help enable better/quicker/more informed decisions.*
- *Actuarial Transformation is more about changing processes than implementing technical changes. I.e. the technical implementation is relatively easy; it's getting people to change processes that is hard.*
- *People's mindset has to change as well not just the systems, processes, and data.*
- *The industry needs to define better what the goals of the transformation are.*
- *Actuaries need to be more collaborative with other functions and service providers, especially IT*
- *Actuarial Transformation should be outcome driven, not technology focused.*

3.2.2 ADVANCED ANALYTICS

This section aimed to understand respondents' experience with and thoughts on Advanced Analytics (e.g., predictive analytics, machine learning, AI).

1. Current use of Advanced Analytics by the participants and their companies

Question 7: In which ways have you worked with Advanced Analytics?

Figure 14A
RESPONDENTS' EXPERIENCE WITH ADVANCED ANALYTICS BY GEOGRAPHY

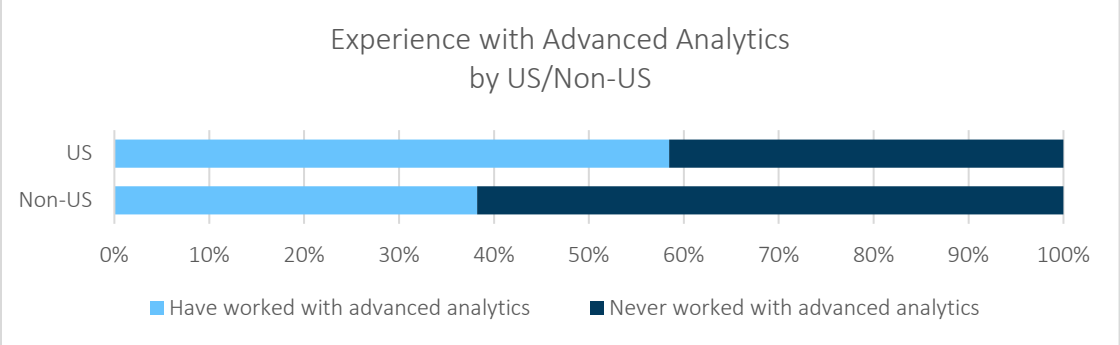


Figure 14B
RESPONDENTS' EXPERIENCE WITH ADVANCED ANALYTICS BY YEARS OF EXPERIENCE

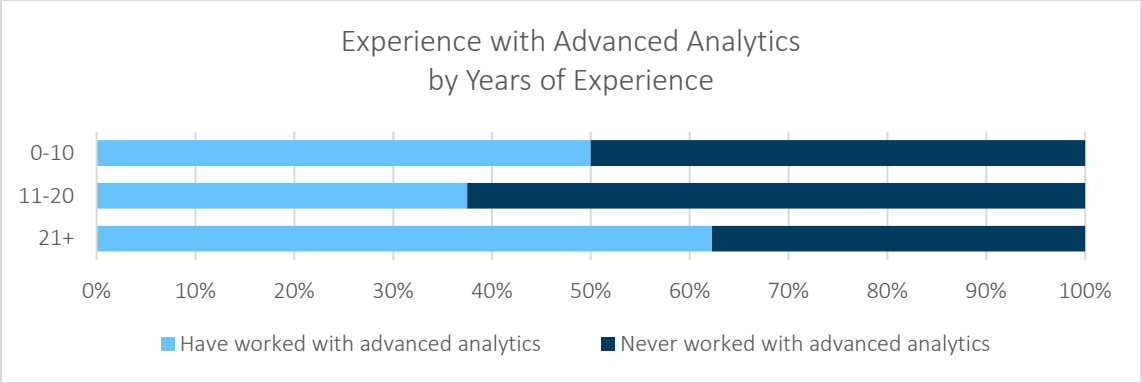


Figure 14C
RESPONDENTS' EXPERIENCE WITH ADVANCED ANALYTICS BY SPECIALTY

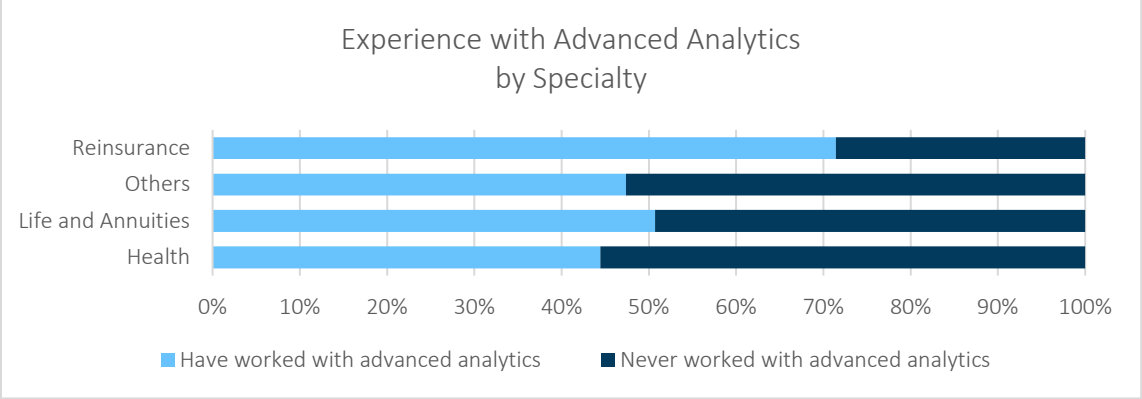
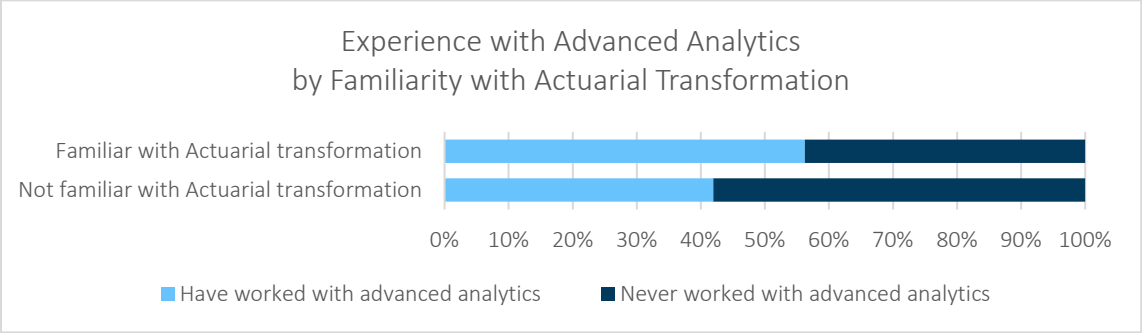


Figure 14D
RESPONDENT'S EXPERIENCE WITH ADVANCED ANALYTICS BY FAMILIARITY WITH ACTUARIAL TRANSFORMATION



Figures 14A-14D show results on the respondents' experience Advanced Analytics. The survey results provide the following insights:

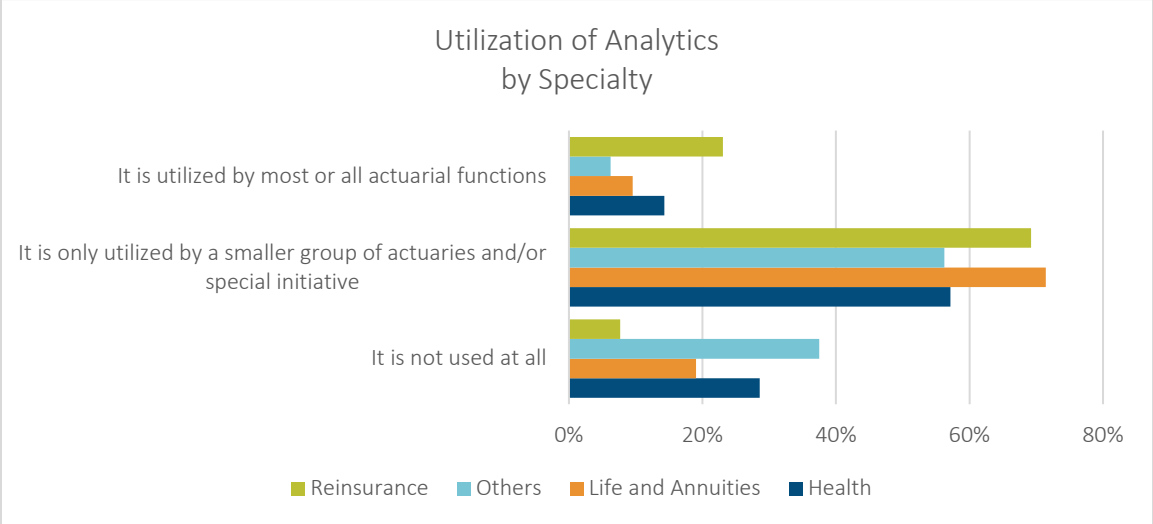
- Over 51% of US actuaries have worked with Advanced Analytics, while only 32% of non-US actuaries have worked with Advanced Analytics, suggesting greater adoption of analytics within the US than elsewhere.
- Differences are seen when results are grouped by actuaries' years of experience. Actuaries with 20 and more years of experience exhibit the largest percentage at 53%, followed by actuaries with 0-

10 years of experience at 42%, and the lowest percentage from actuaries with 11-20 years of experience at 34%. The greater use of analytics by less experienced actuaries comes as no surprise, given those junior actuaries often have more technical, hands-on roles, and many have come through the SOA education pathway since the changes to include more analytics concepts and courses. The survey results show higher use by the most experienced actuaries based on those actuaries either "managing an Advanced Analytics team" or having "collaborated with an Advanced Analytics team," rather than having hands-on experience themselves.

- Actuaries who selected reinsurance as their specialty were significantly more likely to have worked with Advanced Analytics (71% vs 49% for all other specialties), reflecting the greater adoption of analytics within the reinsurance industry due to the greater volume of available data. Traditionally, because of reinsurers' access to greater amounts of data, direct companies have often looked to their reinsurance partners for additional insights on assumptions and trends, e.g., post-level term lapses, and some reinsurers have been early adopters of Advanced Analytics.
- Actuaries who are familiar with Actuarial Transformation were only modestly more likely (56% vs 42%) to have worked with Advanced Analytics than those who are not familiar with Actuarial Transformation. While this may come as a surprise given the high focus on data and data management within Actuarial Transformation initiatives, it is consistent with the findings that Actuarial Transformation initiatives have, in general, not included Advanced Analytics projects at their outset, or been modified to include Advanced Analytics as the initiatives have progressed and enhanced the data management capabilities of actuarial functions.

Question 8: Which of the following best describes how actuarial functions at your organization utilize Advanced Analytics?

Figure 15
UTILIZATION OF ADVANCED ANALYTICS BY RESPONDENTS' COMPANY



Note: Percentages represent the percentage of total respondents within a category selecting a given response.

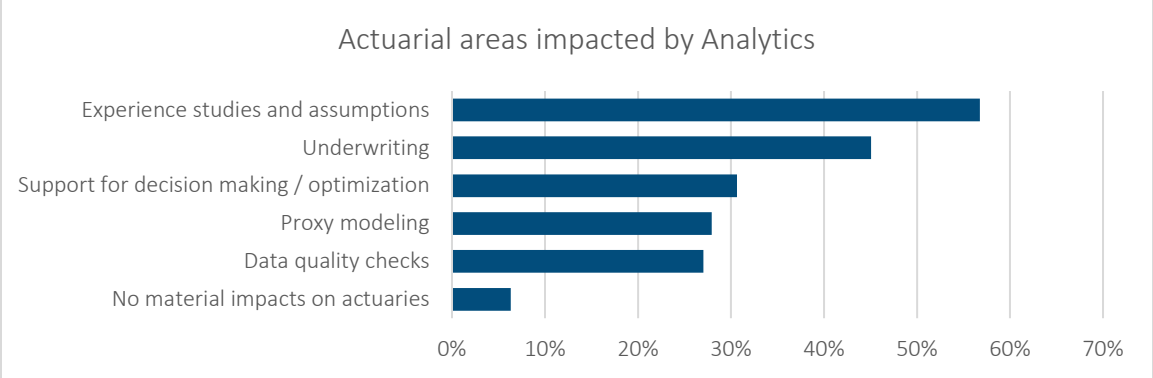
Figure 15 shows survey results on how actuarial functions at the respondents' organizations utilize Advanced Analytics. The survey results indicated most actuaries agree that, in their organizations, Advanced Analytics is only utilized by a smaller group of actuaries and/or a special initiative. Reinsurance actuaries utilize Advanced Analytics more in their actuarial functions compared to other specializations (23% of reinsurers utilize analytics in most or all actuarial functions vs 9% in aggregate for other specialties,

whilst only 8% of reinsurers do not use analytics in actuarial functions at all vs 23% in aggregate for all other specialties).

2. Impacts on actuarial functions brought by Advanced Analytics

Question 9: Which areas of actuaries' work do you think Advanced Analytics has had the most impact?

Figure 16
AREAS OF ACTUARIAL WORK MOST IMPACTED BY ADVANCED ANALYTICS



Note: Percentages represent the percentage of total respondents within a category selecting a given response. Multiple responses were allowed so the total of all responses can be greater than 100%.

Most participants think Advanced Analytics has had material impacts on actuaries. There were no major differences in responses received by geography, years of experience, specialty, familiarity with Actuarial Transformation, or familiarity with Advanced Analytics.

As expected, experience studies and underwriting are the two most common applications of analytics in use today. This is consistent with the feedback from actuarial leaders and industry experience. Both actuarial leaders and survey respondents indicated that analytics have not made a material difference beyond these two areas.

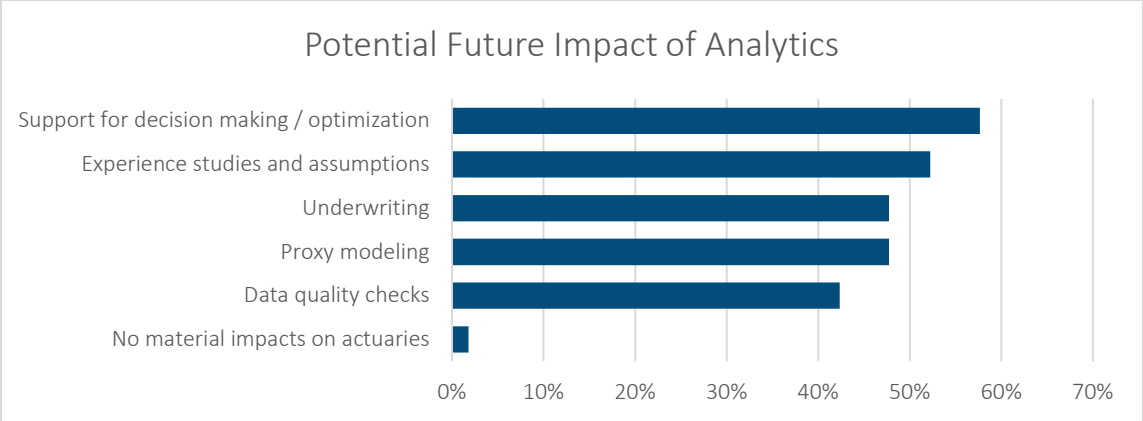
Support for decision making/optimization, proxy modeling, and data quality checks were all selected by around 30% of respondents. These areas are emerging as potential use cases for analytics. The reinsurance industry in particular is starting to utilize analytics for data quality checks.

Other written responses received included:

- *Support pricing the health insurance, e.g., use predictive models to compute projected loss ratio or projected incident rate*
- *Focus on business needs*

Question 10: And which areas of actuaries' work do you think Advanced Analytics has the potential to have the most impact?

Figure 17
AREAS OF ACTUARIAL WORK WHERE ADVANCED ANALYTICS HAVE POTENTIAL FOR MOST IMPACT



Note: Percentages represent the percentage of total respondents within an experience band selecting a given response. Multiple responses were allowed so the total of all responses can be greater than 100%.

Responses received on the *potential impact* of Advanced Analytics are generally consistent with the view that the participants have shared regarding the *current impact* of Advanced Analytics in figure 16. However, actuaries expect the most impacted area in future to be "support for decision making / optimization," whilst proxy modeling and data quality checks also show an increased proportion of responses, again suggesting that these areas are emerging as potential use cases for Advanced Analytics. This result is consistent with the responses from actuarial leaders that suggested they are interested in using analytics for proxy modeling applications to reduce model run time in computationally intensive use cases, such as hedge models, projection models, liability calculations, and stochastic capital runs. One proposed use case for decision making is in group business, which is more similar to P&C business than other life, health, and annuity products and, as such, presents as a potential area to replicate the wider use of analytics that we see in the P&C industry.

Again, there were no major differences in responses received by geography, years of experience, specialty, familiarity with Actuarial Transformation, or familiarity with Advanced Analytics.

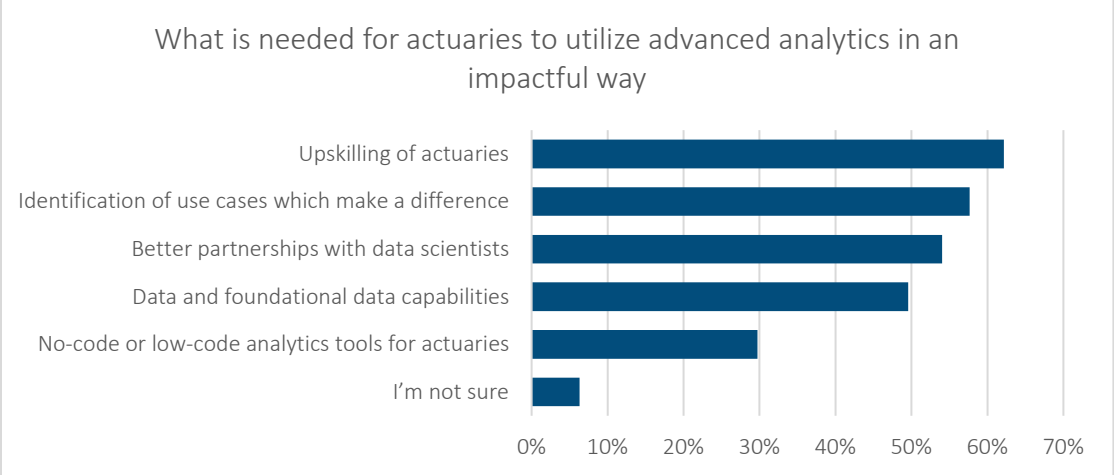
Other written responses received included:

- *Projecting business needs (Human Resources, capital deployed, etc.)*
- *Sales*

3. What is needed for actuaries to utilize Advanced Analytics in an impactful way

Question 11: What do you think is needed for actuaries to utilize Advanced Analytics in an impactful way?

Figure 18
WHAT IS NEEDED FOR ACTUARIES TO UTILIZE ADVANCED ANALYTICS IN AN IMPACTFUL WAY



Note: Percentages represent the percentage of total respondents within a category selecting a given response. Multiple responses were allowed so the total of all responses can be greater than 100%.

Nearly two thirds of the participants suggested that the upskilling of actuaries to be more capable of utilizing Advanced Analytics is the key need for actuaries to utilize Advanced Analytics in an impactful way. "Identification of use cases which make a difference (e.g., material impact on the bottom line)," "better partnership with data scientists," and "data and foundational data capabilities" were all selected by greater than 50% of the respondents.

The high response rates to all of the response options indicates that there is a lot of work to be done before analytics can be utilized in an impactful way, and reflects the consensus that either actuaries still have a long way to go on the analytics journey, or that analytics may never have a meaningful impact on actuarial functions.

These responses are broadly consistent with the responses of actuarial leaders, with the exception that actuarial leaders saw "better data management" as the clear #1 need for actuaries to utilize analytics in an impactful way.

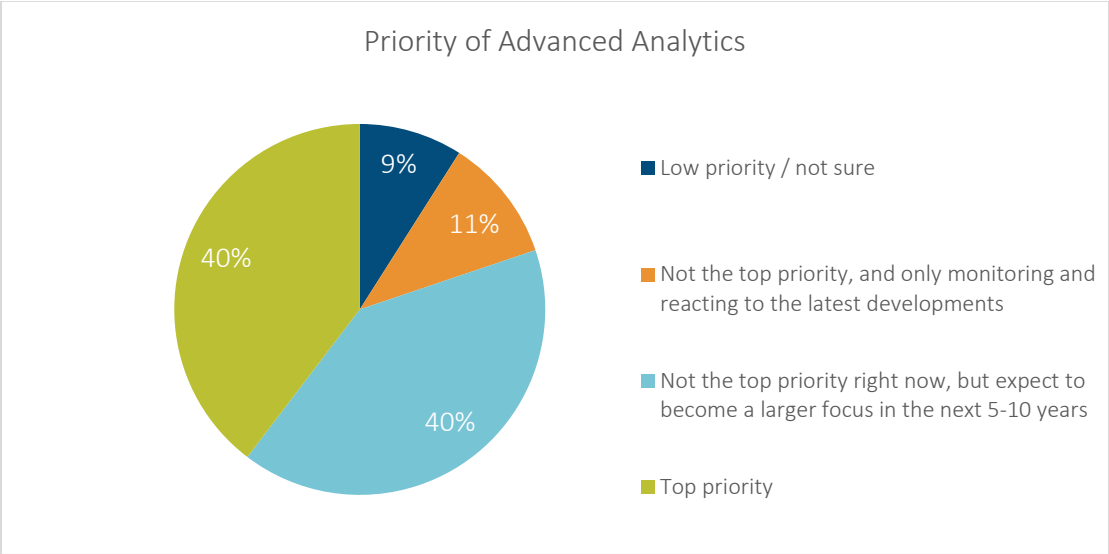
There were no major differences in responses received by geography, years of experience, specialty, familiarity with Actuarial Transformation, or familiarity with Advanced Analytics.

Other written responses received included:

- *A clear vision of what they are trying to accomplish*
- *Coding/programming competency*

Question 12: Overall, how would you prioritize Advanced Analytics within Actuarial Transformation efforts?

Figure 19
PRIORITY OF ADVANCED ANALYTICS WITHIN ACTUARIAL TRANSFORMATION EFFORTS



Forty percent of the participants think Advanced Analytics should be one of the top priorities for Actuarial Transformation efforts, while another 40% expect it to become a larger focus in the next 5-10 years. A small portion of the participants think it should remain a low priority, or actuaries should only monitor or react to the latest developments.

These results contrast with the responses of actuarial leaders, who mostly suggested they are monitoring and reacting to the latest developments. Actuarial leaders are looking for better foundational capabilities, and an applicable use case that really impacts the bottom line, to help make the business case to commit more resources and time to analytics.

Breaking the results down by demographic factors, we note the following interesting results:

- Health actuaries were more likely to say that analytics should be a top priority (67% vs 37% in aggregate for other specialties).
- Actuaries with 11-20 years of experience were less likely to say that analytics should be a top priority (19% vs 43% for actuaries with 20+ years of experience, and 58% for actuaries with 0-10 years of experience). Actuaries with 11-20 years of experience were more likely to say that actuaries should be only monitoring and reacting to the latest developments (22% vs 6% in aggregate for other experience bands).
- Actuaries familiar with Actuarial Transformation were less likely to suggest analytics should be one of the top priorities (35% vs 52% for those not familiar with Actuarial Transformation). This result can perhaps be explained by the fact that actuaries familiar with Actuarial Transformation are more likely to understand the major data management challenges that need to be solved to enable analytics.
- Actuaries with some experience in analytics were more likely to say analytics should be one of the top priorities (48% vs 30% for those with no experience). It's not surprising that those who work in analytics already think it should be a priority for their companies.

4. Other comments and insights regarding Advanced Analytics

Question 13: What other important insights regarding Advanced Analytics would you like to share with the industry?

The following are selected responses received from survey participants:

- *We should focus on how actuaries can assist in improving business results, not just focusing on accounting, underwriting, or purely financial metrics but in a broader way including ESG considerations.*
- *The journey to adopting Advanced Analytics will require experimentation and adaptability and some initial efforts will have no impact.*
- *My personal perspective is that we (actuaries/SOA) are overemphasizing Advanced Analytics and underemphasizing managerial/communication skills and branding ourselves as industry executives rather than quantitative specialists.*
- *I think the SOA has focused too much on Advanced Analytics without the relevant expertise required to actually use those skills. I would like to see the SOA focus more on core data skills first, then get to Advanced Analytics.*
- *Often, simple analytics tools are more useful than advanced stuff.*
- *Advanced Analytics can only be used reliably once an organization has developed robust data management capabilities. Good databases, S3 buckets, ETL, data warehousing is a critical precondition for Advanced Analytics.*
- *One of the biggest obstacles I have found is the projects that involved Advanced Analytics often require individuals with a strong background to hit the ground running. And unfortunately, it is difficult to get a good foundation without exposure to real-world problems.*
- *Advanced Analytics can be a useful supplemental tool, but until actuaries get back to understanding the story and the fundamental issues, the risk of over emphasizing the trees exist. I see so many places where the tools are used as an excuse not to understand the risks involved and allow the leveraging of assets to increase short term "profits".*
- *I do not think actuaries need to become data scientists - but we can't blindly request models from them and just use them either. We need much stronger communication during the model-building process so we know what we're getting, and the data scientists can advise us on the model risks.*

Section 4: Conclusions

Through their Actuarial Transformation efforts, life actuaries have made significant progress with meeting the needs of their organizations, the customers they serve and other key constituencies, such as regulators and investors. Looking forward, although it is impossible to know which innovations and capabilities will be the most important in the years ahead, the need for change, as well as the increase in the pace of change, will likely continue. Actuaries will need to become good at transformation to continue helping their organizations invest in innovations, stay nimble and respond to changing conditions, and focus on the right "big bets."

Section 5: Acknowledgements

The researchers' deepest gratitude goes to those without whose efforts this project could not have come to fruition: the Project Oversight Group and SOA staff for their diligent work overseeing the scope development and reviewing this report for accuracy and relevance.

Project Oversight Group members:

Brett Heineman, FSA

Bruce Friedland, FSA, MAAA

Kashif Khalid, ASA, ACAS

Mujtaba Ali, MBA

Naxine Chang, FSA, MAAA

Paula Schwinn, FSA, MAAA

Qi Rao, FSA

At the Society of Actuaries:

Korrel Crawford, Senior Research Administrator

Emily Rafferty, Director of Business Insights, Strategy & Innovation

David Schraub, FSA, CERA, MAAA, AQ, Senior Practice Research Actuary

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Appendix: Research Methodology

The research consisted of both qualitative interviews and a quantitative survey. This section lays out details of the research methodology used. The research was divided into two phases:

1. Interviews with actuarial leaders (including chief actuaries and leaders of Actuarial Transformation programs)
2. Survey of SOA members

Researchers conducted 60-minute interviews with 17 actuarial leaders (including chief actuaries, head of Actuarial Transformation program, etc.) from different life and annuities insurance companies based in the US. Following the interviews, a short survey was developed based on the interview responses. The survey was sent to SOA members to better understand their perspectives of Actuarial Transformation and Advanced Analytics.

All data collection occurred in 2022.

INTERVIEW GUIDE

The following interview guide was provided in advance for each of the interviews conducted.

Background Information

EY is assisting the SOA with a research project focused on the Actuarial Transformation journeys of life insurers and how analytics is expected to impact actuarial functions in the future.

The research team is conducting 45 – 60 minute interviews with actuarial leaders at selected life insurers to gather executive insights on these topics. Information gathered from these interviews will be synthesized and incorporated into the final research report on a no-names basis. The research team will also be conducting a broad and more detailed survey of actuarial practitioners in the industry designed to supplement the insights gained from the executive interviews.

Interview Questions

1. In your view, what have been the two or three most significant developments and innovations that have impacted the actuarial functions at life insurers over the last few decades? (See attachment)
2. Transformation to date…
    a. What has been the primary focus of your organization's recent (last few years) and current Actuarial Transformation related initiatives?
    b. What are the main drivers for and objectives of your transformation initiatives to date?
    c. Biggest successes to date? Biggest challenges to date?
    d. Critical success factors?
3. Looking ahead, how will the business focus and needs for actuaries change over the next 5 – 10 years? What new opportunities do you see for actuaries?
4. To what extent have Big Data, predictive analytics, and Artificial Intelligence / Machine Learning (AI/ML) been incorporated into your current actuarial function and key activities/processes?
5. Do you expect this will change materially in the next 5-10 years, and if so, how?
6. What are the most significant enhancements that will be needed to your actuarial function and operating model to leverage the potential of these new techniques?
    a. Resources and skill sets needed?

b. Internal and external data needs?
c. New tools, technologies, and techniques?
d. Impacts to key business processes?
e. Other?

7. Do you have any other feedback to share on these topics?

SURVEY METHODOLOGY, FIELDWORK AND RESPONDENT FIRMOGRAPHICS

The objective of the survey was to understand how individual actuaries perceive Actuarial Transformation and technology in their jobs, focusing on the impact of Advanced Analytics. Specifically, the following aspects:

- Actuarial Transformation
- Analytics
- Cross impact between Actuarial Transformation and analytics

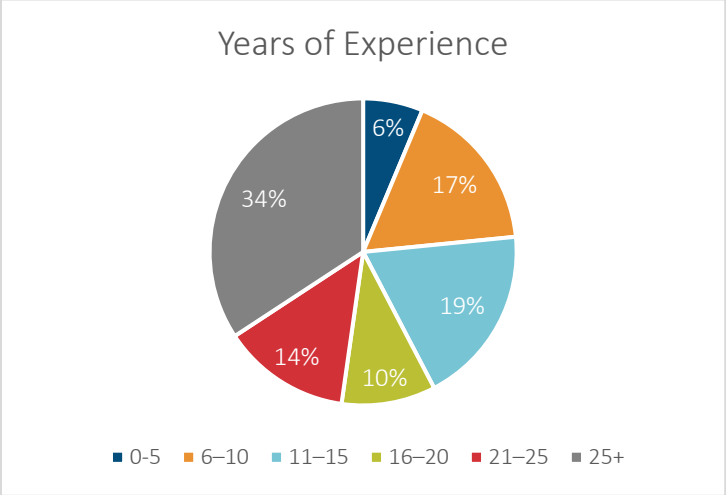
To answer this objective, the SOA distributed an online survey to a random sample of SOA members from August 22 – September 19, 2022.

One-hundred eleven[11] respondents completed the survey:

- Ninety-one percent have some familiarity with Actuarial Transformation
- Thirty-one percent have ever worked in Actuarial Transformation
- Forty-five percent have some experience with Advanced Analytics

Respondents have a range of experience, working at both US and non-US companies. The demographics for the participants are shown in the charts below.

Figure 20A
RESPONDENT DEMOGRAPHICS – YEARS OF EXPERIENCE



[11] Survey responses were cleaned after fieldwork. The 111 survey respondents included in the analysis all completed the survey. Any survey respondents who started, but did not complete, the survey were excluded from the analysis.

Figure 20B
RESPONDENT DEMOGRAPHICS – FAMILIARITY WITH ACTUARIAL TRANSFORMATION

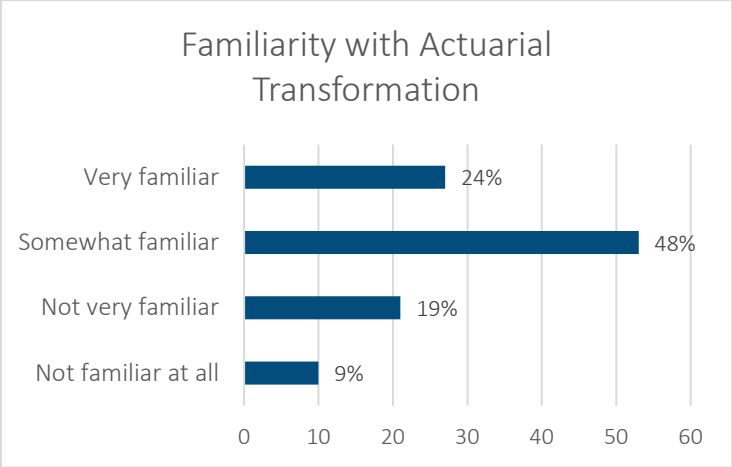


Figure 20C
RESPONDENT DEMOGRAPHICS – FAMILIARITY WITH ADVANCED ANALYTICS

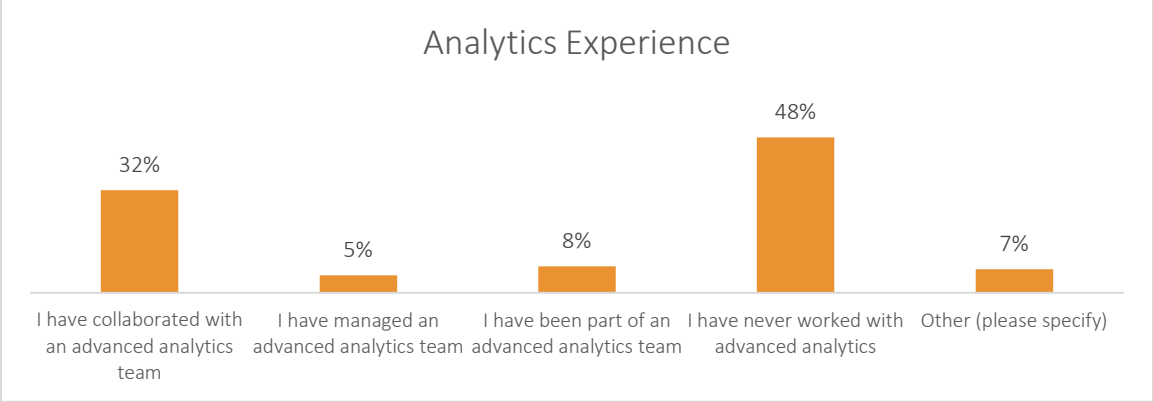


Figure 20D
RESPONDENT DEMOGRAPHICS – US VS. NON-US LOCATION

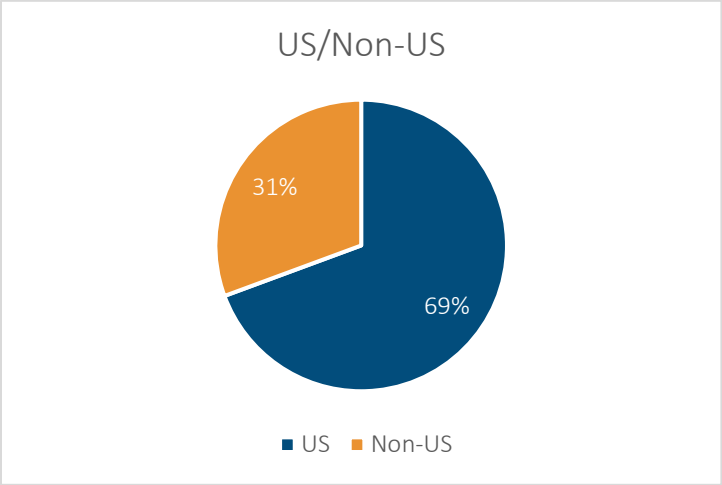


Figure 20E
RESPONDENT DEMOGRAPHICS – SPECIALIZATION

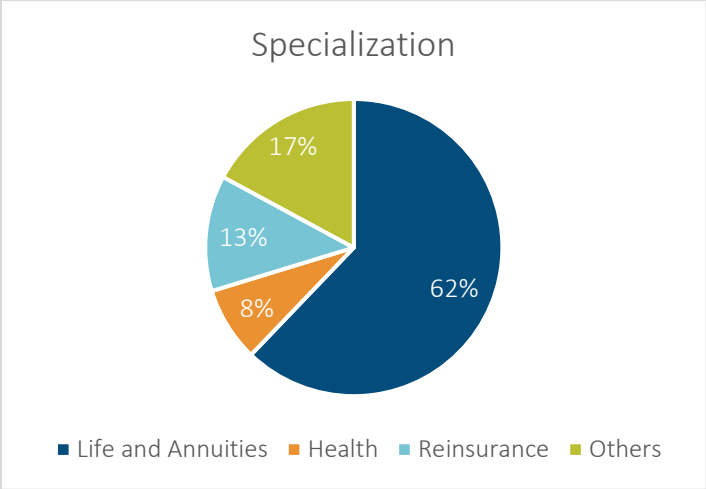
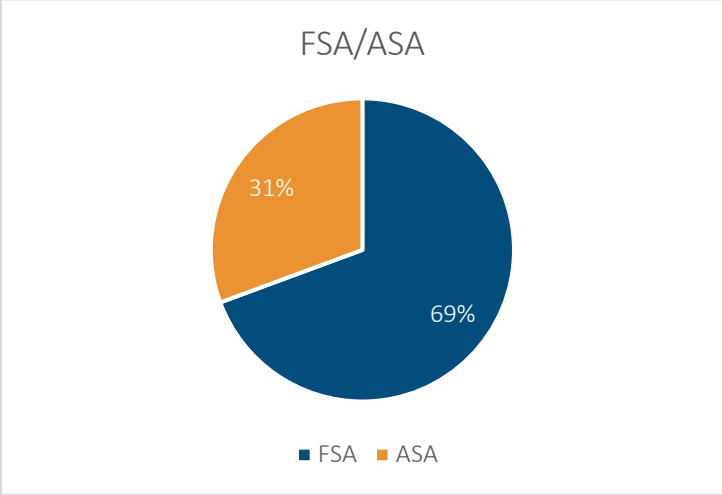


Figure 20F
RESPONDENT DEMOGRAPHICS – QUALIFICATION STATUS



SURVEY QUESTIONS

The online survey consisted of the questions listed below.

Section 1 - Introduction

1. What is your specialization?

Select all that apply:

a) Life
b) Annuities
c) Disability
d) Long-term care
e) Retirement
f) Health
g) General insurance / property-casualty
h) Accounting and finance
i) Investment and asset-liability management
j) Climate risk / sustainability
k) Risk management
l) Reinsurance
m) Technology
n) Other

2. How many years of actuarial experience do you have?

Select one:

a) 0–2
b) 3–5
c) 6–10
d) 11–15
e) 16–20
f) 21–25
g) 26–30
h) 31–35
i) 36–40
j) 41-45
k) 46-50
l) 51-55
m) 56-59
n) 60+

3. Which of the following best describes your current employment status?

Select one:

a) Employed Full time
b) Employed Part time
c) Full time Student
d) Part time student

e) Not employed and seeking employment
f) Not employed and not seeking employment
g) Retired

Section 2 – Actuarial Transformation

1. How familiar are you with Actuarial Transformation?

Select one:

a) Very familiar
b) Somewhat familiar
c) Not very familiar
d) Not familiar at all

2. Have you ever worked in Actuarial Transformation?

Select one:

a) Yes
b) No
c) I'm not sure

3. In your view, what have been the most significant developments and innovations that have impacted actuarial functions and driven the Actuarial Transformation efforts to date?

Select all that apply:

a) Product innovations
b) Regulatory and accounting changes
c) Actuarial modeling and analysis platforms
d) Cloud computing
e) Data and data management
f) Talent development and management
e) Faster pace of change
f) Other: please specify
g) I'm not sure

4. How do you think the success of Actuarial Transformation efforts should be measured?

Select all that apply:

a) Capabilities before and after transformation efforts
b) Quantifiable cost savings
c) Comparison against industry benchmarks
d) Other: please specify
e) I'm not sure

5. In your view, what has been the major obstacle or cause of failure for Actuarial Transformation efforts that did not go well?

Select all that apply:

a) Lack of senior management support
b) Difficulty in measuring and demonstrating success
c) Challenges in installing a transformation mindset within the organization
d) Other: please specify
e) I'm not sure

6. What other important insights regarding Actuarial Transformation would you like to share with the industry?

Optional – free text response.

7. In your view, which of the following areas (or other areas not listed) should actuaries prioritize over the next 5 – 10 years?

Select all that apply:

a) Focus on customers
b) Become true business leaders and drive decisions
c) Work on cross-functional teams to solve business problems
d) Continued transformation of current processes
e) More impactful use of Advanced Analytics
f) Other: please specify
g) I'm not sure

8. Which of the following areas should actuaries focus their upskilling efforts on over the next 5-10 years?

Select all that apply:

a) Leadership skills
b) Communication skills
c) Project management
d) Financial reporting and accounting
e) Data management
f) Advanced Analytics (e.g., predictive analytics, machine learning, AI)
g) Programming
h) Process improvements
i) Other: please specify
j) I'm not sure

Section 3 – Advanced Analytics

1. In which ways have you worked with Advanced Analytics?

Select one:

a) I have been part of an Advanced Analytics team
b) I have managed an Advanced Analytics team
c) I have collaborated with an Advanced Analytics team
d) I have never worked with Advanced Analytics
e) Other: please specify

2. Which of the following best describes how actuarial functions at your organization utilize Advanced Analytics?

Select one:

a) It is utilized by all actuarial functions
b) It is utilized by most of the actuarial functions but not all
c) It is only utilized by a smaller group of actuaries and/or special initiative
d) It is not used at all
e) I'm not sure

3. Which areas of actuaries' work do you think Advanced Analytics has had the most impact?

Select all that apply:

a) Underwriting
b) Experience studies and assumptions
c) Data quality checks e.g., outlier identification
d) Proxy modeling, e.g., shorter runtime for stochastic and nested-stochastic projections
e) Support for decision making / optimization, e.g., rebalancing of hedging positions
f) I do not think Advanced Analytics will have any material impacts on actuaries
g) Other: please specify
h) I'm not sure

4. And which areas of actuaries' work do you think Advanced Analytics has the potential to have the most impact?

Select all that apply:

a) Underwriting
b) Experience studies and assumptions
c) Data quality checks e.g., outlier identification
d) Proxy modeling, e.g., shorter runtime for stochastic and nested-stochastic projections
e) Support for decision making / optimization, e.g., rebalancing of hedging positions
f) I do not think Advanced Analytics will have any material impacts on actuaries
g) Other: please specify
h) I'm not sure

5. What do you think is needed for actuaries to utilize Advanced Analytics in an impactful way?

Select all that apply:

a) Identification of use cases which make a difference (e.g., material impact on the bottom line)
b) Data and foundational data capabilities need to be in place
c) No-code or low-code analytics tools for actuaries
d) Upskilling of actuaries focused on understanding Advanced Analytics
e) Better partnerships with data scientists
f) Other: please specify
g) I'm not sure

6. Overall, how would you prioritize Advanced Analytics within Actuarial Transformation efforts?

Select one:

a) Should be one of the top priorities
b) Not the top priority right now, but expect this to become a larger focus in the next 5-10 years
c) Not the top priority, and only monitoring and reacting to the latest developments
d) Low on the priorities list
e) I'm not sure

7. What other important insights regarding Advanced Analytics would you like to share with the industry?

Optional – free text response.

Section 4 – Company Demographics

1. How many total employees does your company employ worldwide, including all branches, divisions, and subsidiaries?

Select one:
a) 1-49 employees
b) 50-199 employees
c) 200-999 employees
d) 1,000-9,999 employees
e) 10,000 or more employees
f) I don't know

2. How many actuaries does your company employ worldwide, including all branches, divisions, and subsidiaries?

Select one:
a) 0 actuaries
b) 1-5 actuaries
c) 6-10 actuaries
d) 11-50 actuaries

e) 51-100 actuaries
f) 100 or more actuaries
g) I don't know

References

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Serving as the research arm of the Society of Actuaries (SOA), the SOA Research Institute provides objective, data-driven research bringing together tried and true practices and future-focused approaches to address societal challenges and your business needs. The Institute provides trusted knowledge, extensive experience, and new technologies to help effectively identify, predict, and manage risks.

Representing the thousands of actuaries who help conduct critical research, the SOA Research Institute provides clarity and solutions on risks and societal challenges. The Institute connects actuaries, academics, employers, the insurance industry, regulators, research partners, foundations and research institutions, sponsors, and non-governmental organizations, building an effective network which provides support, knowledge, and expertise regarding the management of risk to benefit the industry and the public.

Managed by experienced actuaries and research experts from a broad range of industries, the SOA Research Institute creates, funds, develops and distributes research to elevate actuaries as leaders in measuring and managing risk. These efforts include studies, essay collections, webcasts, research papers, survey reports, and original research on topics impacting society.

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Society of Actuaries Research Institute
475 N. Martingale Road, Suite 600
Schaumburg, Illinois 60173
www.SOA.org