



Top Actuarial Technologies of 2022-2023

September | 2023

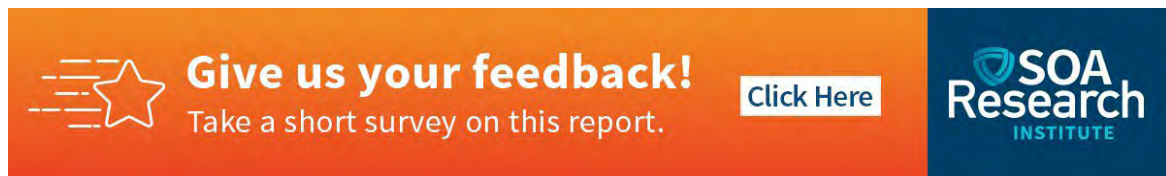






Top Actuarial Technologies of 2022-2023

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Top Actuarial Technologies of 2022-2023

Over the past decade, the emergence and application of new technologies and the growth of data science have presented both challenges and opportunities for actuaries and the role of the profession. In order to keep actuaries informed about new technologies and their impact on the future direction of the industry and the profession, the SOA commissioned LIMRA to conduct a research study on the Top Actuarial Technologies of 2019 to examine top actuarial technologies currently in use, as well as those expected to grow in the future.

This report represents the second installment of the ongoing series. Top Actuarial Technologies of 2022-2023 provides updates on the current and planned uses of various technology types and tools, highlights those technologies expected to grow the fastest among actuaries in the next 12 months, and assesses the status of adoption versus expectations from 2019.

Key Findings

Primary Actuarial Technologies

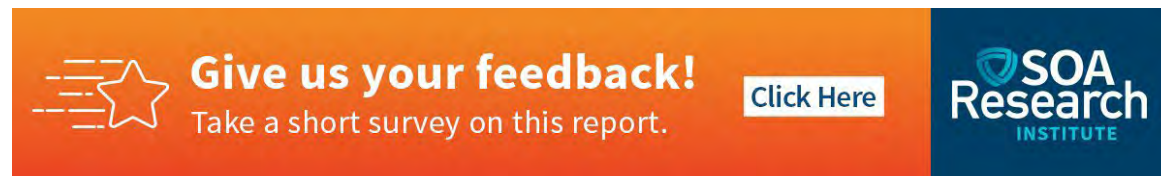
- The three main technologies used by survey respondents in their actuarial work during 2022-23 are data visualization, predictive modeling, and cloud computing/storage. This was also the case for the 2019 study of top actuarial technologies.
- Other technologies less often cited as used in current actuarial work include blockchain/distributed ledger technology, version control/shared coding platforms, and robotic process automation.
- There are also emerging technologies that actuaries expect to leverage in their work beyond 2023. Those most commonly identified include Artificial Intelligence, Machine Learning, ChatBots, and Unstructured Data.

Frequency of Use

- Although the top three technologies in use for 2022-23 are the same as those cited in 2019, significant increases in the frequency of use for the three main actuarial technologies have occurred. The percentage of survey respondents frequently using data visualization, predictive modeling, and cloud computing technologies has grown significantly since 2019 - from 42% to 60% (data visualization), 16% to 40% (predictive modeling), and 31% to 60% (cloud storage and computing).
- Data visualization is not only the fastest growing technology among actuaries; it is also used by more actuaries compared to other technologies in the survey. In terms of expectations regarding growth in the technologies used beyond 2023, actuaries expect to see continual increases in the usage of the three main technologies, with no one surveyed expecting to see a decrease.
- Factors driving the increased use of these technologies include both accounting and regulatory changes, new approaches to experience analysis of mortality, morbidity, and behavior factors, and the drive toward faster and more effective risk selection techniques.
- Data analytics experts interviewed as part of this project are optimistic that actuaries are capable of learning new skills, adapting, and effectively using new technologies in their work.

Software and Tools

- Predictive modeling tools most often cited by surveyed actuaries include Excel, R, Python, and SAS.
- Data visualization tools with the greatest use among survey respondents include Microsoft Office Tools (Excel, PowerPoint, Access) (88% of respondents), Power BI (65% of respondents) and Tableau (47% respondents).
- Cloud computing and storage vendors most often cited by actuaries include Microsoft Azure Cloud (32%) and Amazon Web Services (AWS) (23%).



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Methodology

In order to gather a broad source of opinion and insight regarding newer technologies and their applications in actuarial work, the study consisted of both qualitative interviews and a quantitative survey. All data collection occurred between October 2022 and April 2023.

QUALITATIVE INTERVIEWS

Researchers conducted 30-minute interviews with 18 individuals who were selected based on their level of involvement with data analytics and actuarial technology applications for their organization. Of the 18 individuals, 14 had a life and annuity focus, three had a health insurance focus, and one worked in property/casualty insurance. The interview questions focused on the following areas:

- What technologies are actuaries frequently using in their current work?
- What do they expect to be using in the next 12 months?
- What technologies or areas of technology do they see increasing in the future (3-5 years and beyond)?
- How ready is the actuarial profession to use new technology effectively?

An interview guide was provided to interviewees in advance of the discussions and a copy of the guide can be found in appendix A of this report.

QUANTITATIVE SURVEY

Following the 18 qualitative interviews, a short quantitative survey was developed. Survey invitations were sent to a targeted sample of actuaries in the life, health, retirement, and property & casualty fields, with line of sight into technology, pricing/reserving, and other functions. The goal here was to better understand broad actuarial profession views on current and planned usage of specific tools in various technology areas. The survey was completed by 180 actuaries.

Based on discussions with interviewees, the top actuarial technologies in 2022-23 were focused on the following general areas:

- **Data visualization** is the graphical representation of information and data using visual elements, such as charts and graphs, to provide a means of identifying trends, outliers, and patterns in data.
- **Predictive modeling** is a commonly used set of statistical techniques to facilitate the prediction of future outcomes using historical data.
- **Cloud storage** is an offsite, online data storage and sharing medium.
- **Cloud computing** is the delivery of computing services such as software and analytics tools via the internet (“the cloud”). Cloud computing can provide faster computing speeds and economies of scale.

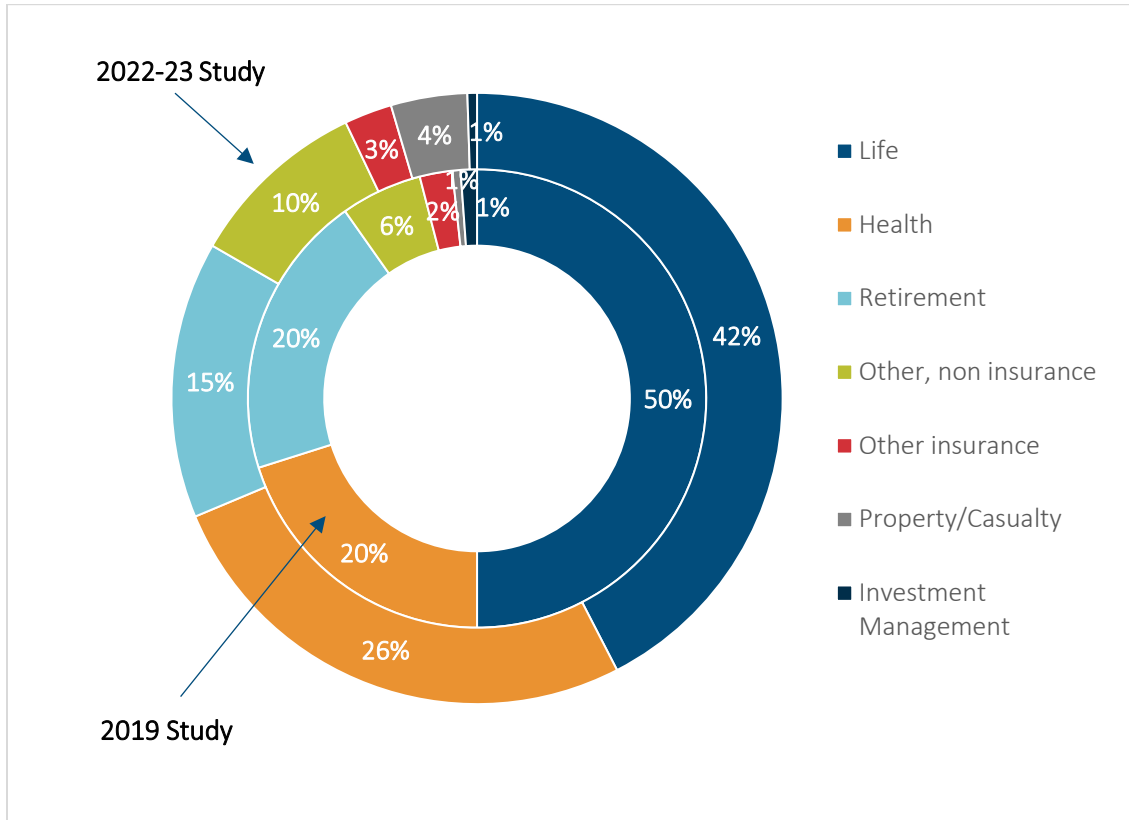
The survey focused on these areas, collecting greater detail regarding specific technical tools used in each category, and the frequency of use of these tools by actuaries.

Among the 180 survey respondents, there were a small number of instances where multiple actuaries from the same company completed a response. Given the small number of instances, a decision was made to include all individual survey responses in the analysis, regardless of the actuary’s employer.

SURVEY RESPONDENT PROFILE

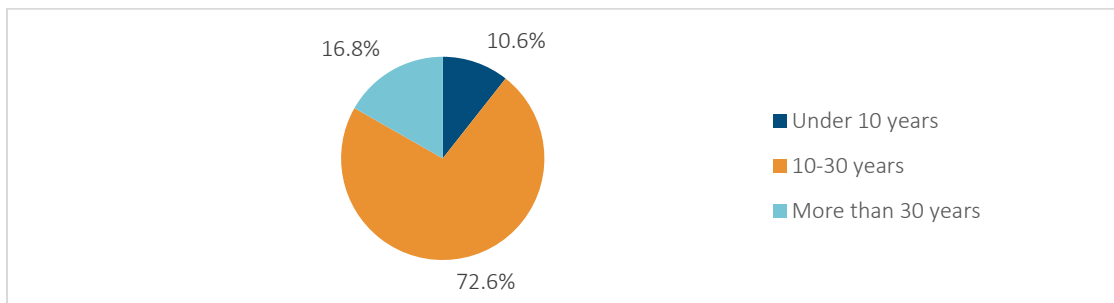
Survey respondents represented various areas of industry practice, with the largest proportion of respondents focused on the life, health and retirement areas in both 2019 and 2022-23. There was a slightly greater diversity of respondents in 2022-23 with greater percentages of actuaries from property/casualty, other non-insurance and health areas (figure 1a).

Figure 1a
SURVEY RESPONDENT PROFILE – PRIMARY AREA OF PRACTICE



Also, there is a good variety in terms of tenure in the actuarial profession, with a cluster in the 20 years and less category and another cluster in the over 20 – 30 year category (figure 1b). The average tenure of actuarial responding to the survey was just over 21 years.

Figure 1b
SURVEY RESPONDENT PROFILE – NUMBER OF YEARS IN THE ACTUARIAL PROFESSION



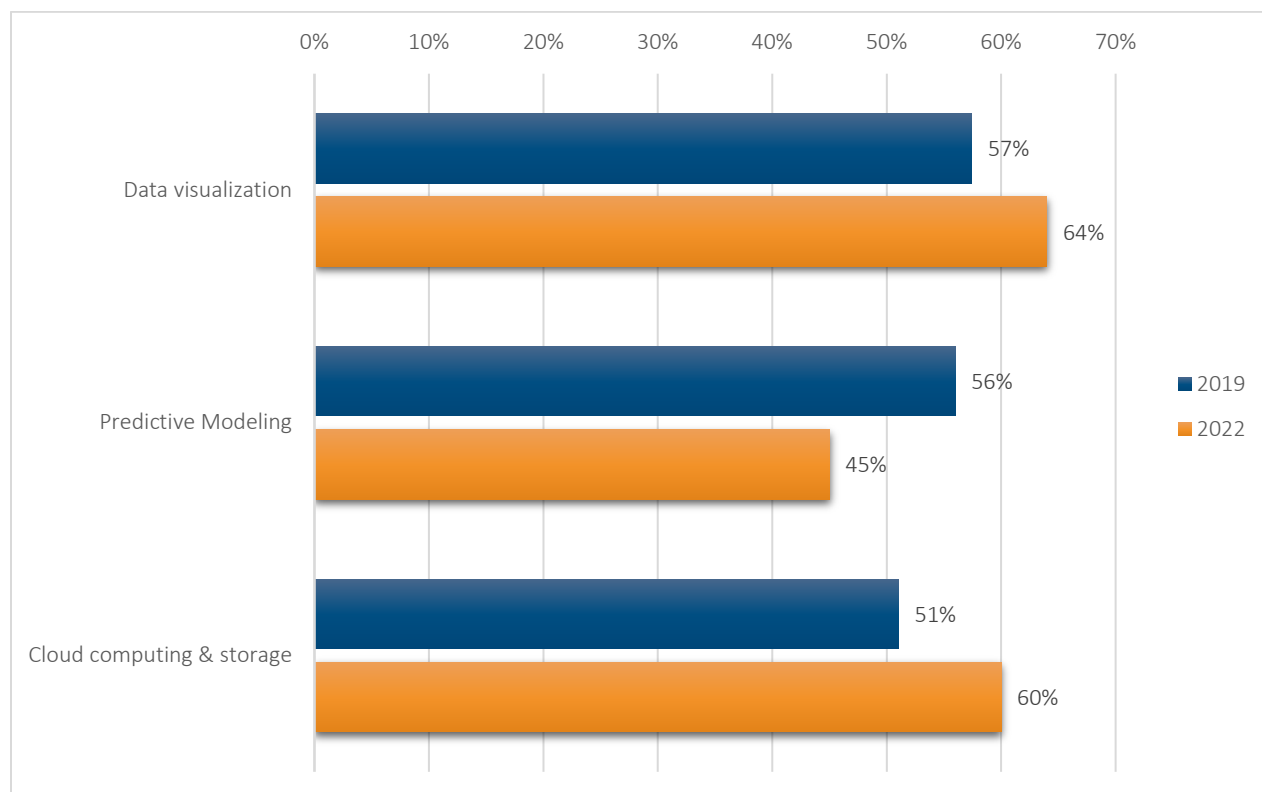
Section 1: Top Actuarial Technologies

For purposes of this research, the *top technologies* are defined as those most frequently identified by actuaries as expected to increase in usage over the next 12 months. This definition includes both technologies currently used by the actuary, as well as those that actuaries are not using today but plan to begin using in the coming year.

The top three technologies identified by survey respondents for 2022-23 are the same as those identified by respondents to the 2019 study – data visualization, predictive modeling, and cloud computing and storage. Figure 2 shows the percentage of respondents who identified these top technologies in the 2019 and 2022-23 surveys. The remainder of this section will examine these responses in greater detail.

Figure 2

TECHNOLOGY AREAS EXPECTED TO GROW FASTEST IN THE NEXT 12 MONTHS*



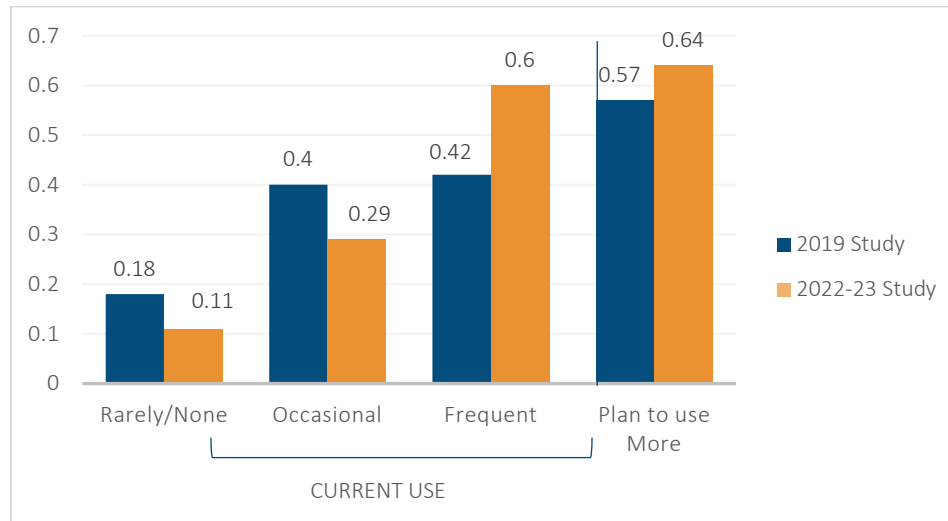
*Percentages represent the percent of actuaries surveyed who believe their usage will increase in the next 12 months.

1.1 DATA VISUALIZATION

Data visualization continues to be the most commonly cited technology where growth is expected for use in actuarial work. From the current study, 60% of surveyed actuaries utilize data visualization *Often or Frequently*, with almost two-thirds of current users planning to increase their usage (64%), and the remaining one-third expecting to use it about the same (figure 3). The most widely used data visualization tools include MS Office Tools (Excel, PowerPoint, Access) (88%), Power BI (65%), Tableau (47%), and R/Python Native Graphical Tools (41%).

Typically, these tools are used for developing visuals for reports or presentations (e.g., pricing or modeling results, financial results), for decision-making (e.g., predictive model selection, assumption setting reviews), and for creating interactive dashboards to be used for data review and analysis or for providing Key Performance Indicators (KPIs) to line of business leads.

Figure 3
CURRENT AND EXPECTED FUTURE USE OF DATA VISUALIZATION BY ACTUARIES



Based on interviews and open-ended responses, this trend is driven by increased recognition of the value of data visualization tools in understanding and explaining data, and the accessibility of more centralized data sources to actuaries (e.g., centralized data warehouses). In addition, point and click tools, like Tableau and Power BI, are much more accessible to the average user with a much quicker learning period.

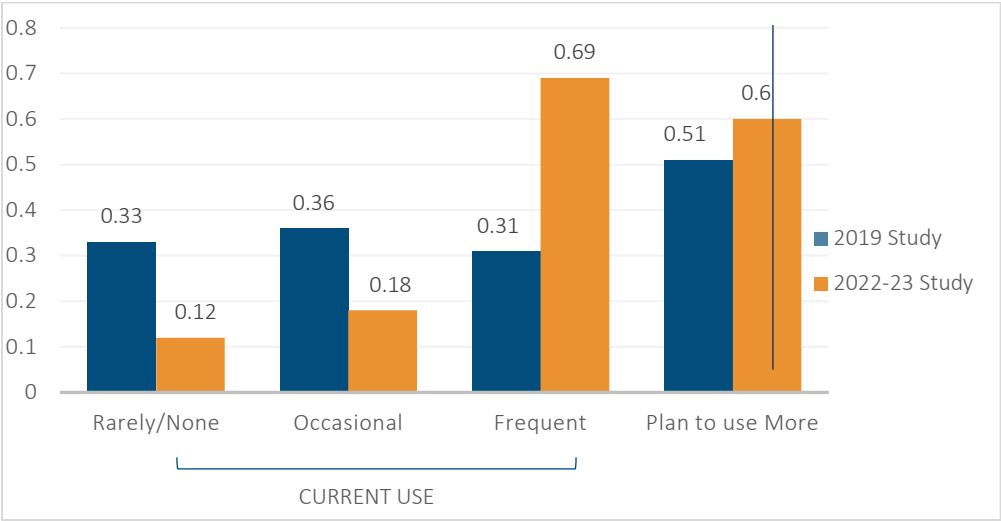
1.2 CLOUD COMPUTING AND STORAGE

Usage of cloud computing and/or storage has increased significantly since the 2019 study, from about 31% using it frequently or often to 69% in 2022-23. While one in three expect to use this technology about the same amount, six in ten anticipate increased usage. This seems to verify the shift from storing data in centralized warehouses on premises to third-party storage, often cloud-based providers. Cloud computing is mainly being used to facilitate sharing of data, allow for more effective coding collaboration, and increase the speed of computation for massive models that are being used by the industry in today's environment.

Based on interviews and open-ended survey responses, these changes are largely the result of major data-focused efforts to respond to recent accounting and regulatory changes. Implementations of IFRS 17, LTDI, principles-based reserving, stochastic modeling, and predictive modeling applications were all cited as projects with current focus by companies that have fast-tracked the need for greater storage space and faster processing speeds.

Among those surveyed, two platforms were most prevalent – a majority (56%) of respondent organizations use either Microsoft Azure or Amazon Web Services. Far fewer mentioned other services such as Snowflake (18%) and DataBricks (13%).

Figure 4
CURRENT AND EXPECTED FUTURE USE OF CLOUD COMPUTING AND STORAGE AMONG ACTUARIES

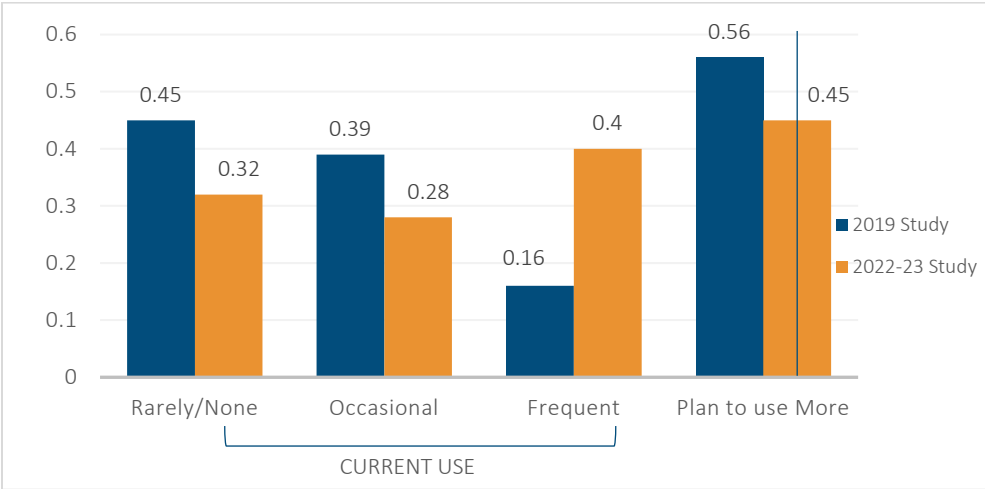


1.3 PREDICTIVE MODELING

Property and casualty actuaries have been applying these techniques for many years, and the rest of the profession is increasingly finding new applications. In reviewing the responses in this section, it is important to keep in mind that most of the interviewees and survey respondents are currently working in the life, health and retirement industries rather than in property/casualty, investment management or other insurance or non-insurance areas.

The use of predictive modeling and research around potential applications has increased substantially within the actuarial community. In 2019, only 16% of survey respondents indicated they were using predictive modeling often or frequently, while the figure has more than doubled for the current report to 40% (figure 5). This was coupled with a decrease in those who expect to use predictive modeling more in the future (from 56% in 2019 to 45% in 2022-23). However, the potential increase in the next several years is still quite large and the decrease should be expected given the significant increase in frequent users.

Figure 5
CURRENT AND EXPECTED FUTURE USE OF PREDICTIVE ANALYTICS AMONG ACTUARIES



Excel and R were the most commonly cited technology tools used for predictive modeling, with 44% and 45% of respondents, respectively, indicating that they use one of both of these tools in their work. Excel and R were followed closely by Python, at 39%, and SAS (Base and/or Enterprise Guide versions) at 15%.

The most commonly mentioned use case for predictive modeling in actuarial work continues to be analysis and modeling/forecasting of product experience. This includes mortality and morbidity experience, as well as policyholder behavior focused factors, including lapse and surrender, as well as the utilization of guaranteed and non-guaranteed elected benefits. Some respondents talked about experiments pairing predictive modeling tools with behavioral economics principals in more advanced applications. Predictive models allow the actuary to better understand the key drivers of product experience, allowing for more accurate pricing and forecasting.

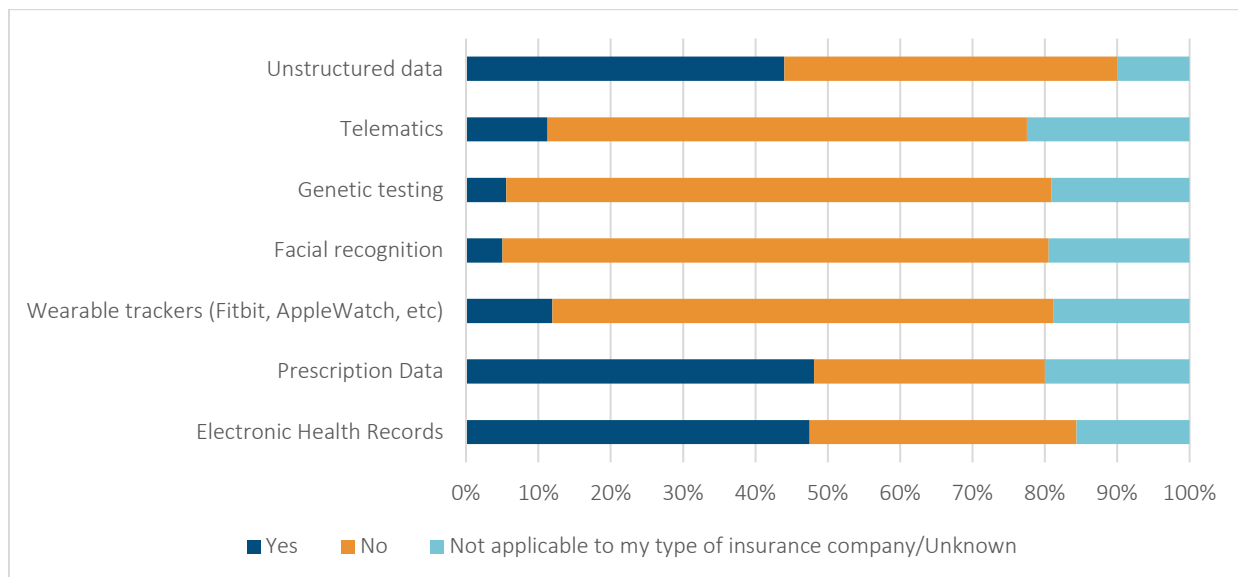
Section 2: New Data Sources

Based on interviews with actuaries and survey responses from both the 2019 and 2022-23 studies, the utilization of new data sources has emerged as another focus for applications of new actuarial technology. The growth in this area seems to be driven by insurers efforts to underwrite business (life and health products were both mentioned) more quickly, but without significant loss of risk assessment accuracy. Accelerated underwriting programs are now prevalent in the industry and many of the external data sources cited by survey respondents are focused in this area.

Almost half of the actuaries surveyed use external data, including prescription data (48%) and Electronic Health Records (EHRs)(48%), as additional data sources. Other common external data sources include wearable trackers (12%) and telematics (11%) (figure 6). Some InsurTech companies are also examining links between mortality and genetic information or even dental data records.

Figure 6

USE OF NEW SOURCES OF DATA



While technology that allows companies to access prescription information has been in use for a decade or more, the use of electronic health records is new to many companies. The ability of EHR to allow companies to directly access health records could replace the largely manual and expensive process of obtaining physician health records, allow for a more comprehensive health data profile, and ultimately lead to a better and less costly risk selection process.

Despite significantly lower current adoption, some new data sources warrant a mention, including internet-of-things (IoTs), drone technology, facial recognition, and genetic testing. Companies are exploring data sourced through fitness trackers and telematics. These efforts have produced immense amounts of data causing challenges in storage, understanding, and defining applicable uses.

Section 3: Emerging Technologies

In the three years since the 2019 report was published, the adoption and utilization of top actuarial technologies increased at a fast pace. At the same time, new technologies continued to emerge. The velocity of technological advancement is virtually certain that every year will bring new tools for actuaries to understand and assess for their ability to make current processes more efficient, increase the quality of work, and maintain relevance in the industry.

Interviewees and survey respondents identified a number of technologies that are not currently in widespread use, but are expected to grow in use among actuaries in the near and longer term.

3.1 ARTIFICIAL INTELLIGENCE / MACHINE LEARNING

Artificial Intelligence (AI) was certainly top of mind for many, as evidenced by the interviews and open-ended survey responses. Actuaries interviewed for this study discussed the potential for assistive technologies like AI and machine learning to revolutionize the very nature of actuarial work. AI can be deployed to automate processes, enhance risk modeling, and improve decision-making. Some organizations are already using AI for claims processing and fraud detection, as well as accelerating their underwriting processes. Machine learning algorithms can analyze historical data to make predictions and enhance risk management strategies.

There were also concerns regarding AI and machine learning voiced by some actuaries. Some see the potential for automation to replace lower-level actuarial roles in the near future and possibly even higher-level jobs over time. There was also concern that the skillset required to use machine learning models effectively and responsibly may be markedly different from what actuaries have used in the past.

“I feel as though the nature of actuarial technology and work has the potential to change dramatically over the next few years as actuaries become more familiar with assistive technology such as AI and machine learning. The skillset needed to properly use this technology may be quite different from what actuaries are used to.”

3.2 CHATBOTS

While only 19% of respondents are currently using ChatBots (ChatGPT, etc.), another 9% are planning to use this technology in the next 12 months.

In the insurance sector, ChatBots are largely deployed in support areas to handle more routine customer service or claims functions. However, ChatBots collect important customer data during these interactions, which would allow actuaries and data scientists to conduct data-driven analysis if that data can be captured and organized.

Some actuaries interviewed for this study are just beginning to think about potential uses of technologies like ChatGPT in actuarial work. One of the commonly cited areas to begin exploring is the ability to provide code snippets in languages like R, Python or other commonly used coding languages and receive a quick response on how to correct code logic.

We would like to point out that utilization of technologies like these could be limited by internal governance. Some companies are still evaluating the use of ChatGPT and, in the meantime, have prohibited its use due to risk concerns. If approved, we expect the percentage of users would increase significantly.

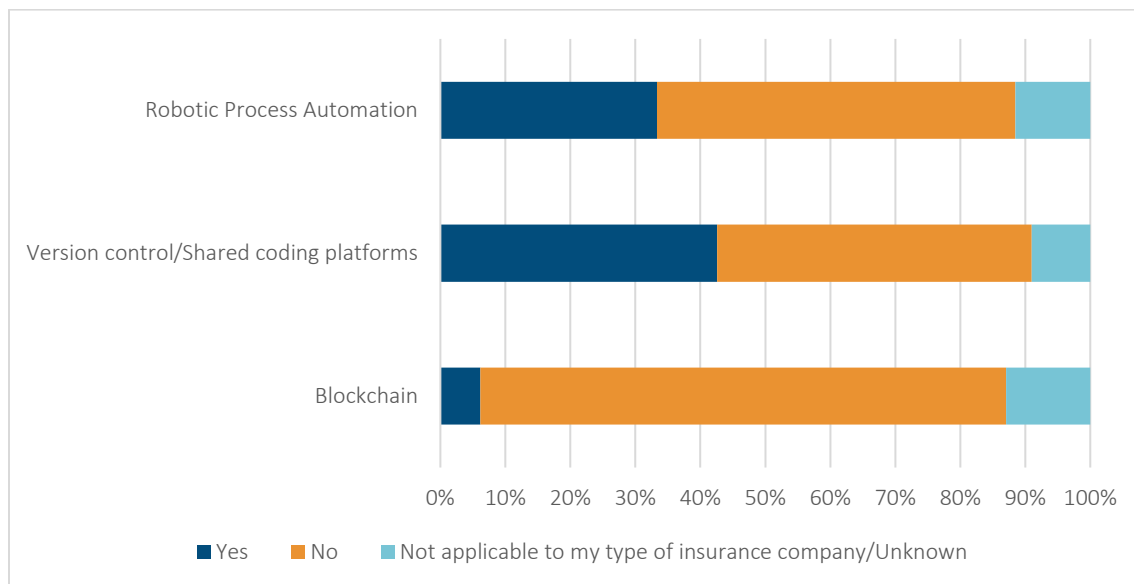
3.3 UNSTRUCTURED DATA

Currently, 44% of surveyed actuaries use unstructured data and another 7% plan to use it in the next 12 months. Typically, unstructured data does not have a predefined data model or organizational structure. Examples mentioned include recordings or transcripts of customer service interactions, competitor website information, earnings call transcripts, and information from social media feeds or other similar sources.

Some actuaries see an opportunity to better understand key drivers of lapse and surrender by mining data generated through use of Natural Language Processing with call center interactions and Optical Content Readers converting previously analog data into electronic formats. To date, actuaries have tracked results of key experience factors impacting profitability, but the additional data collected through these tools holds the promise of providing explanations for the results as they emerge.

Finally, figure 7 summarizes some additional technologies mentioned by both interviewees and survey respondents, including robotic process automation, version control and shared coding platforms (such as Git), as well as distributed ledger/blockchain technology. Although a significant number of respondents indicated they work with robotic process automation (33%) or version control/shared coding platforms (43%), blockchain and distributed ledger technologies have not made significant headway with this sample population.

Figure 7
OTHER EMERGING TECHNOLOGIES



In the context of this study, robotic process automation refers to the automation of tasks that are currently performed by actuaries, but have potential to be completely or largely automated, e.g., automation of standard actuarial financial reports that draw from internal data sources. Several interviewees talked about the combination of centralized warehouses making data much more accessible to actuaries and the emergence of new tools, allowing them to easily pull data and populate standard report templates.

Experts believe the pace of development and introduction of new technologies will continue for the foreseeable future meaning that actuaries need to be prepared to identify, evaluate, and adopt new applications in an efficient manner in order to remain relevant as a profession.

Section 4: Actuarial Capabilities

Experts interviewed as part of this project are optimistic that actuaries will continue to evolve by learning new skills and effectively using new technologies.

While newer actuaries are getting more exposure to predictive modeling and data science techniques in their training, it is more challenging for older actuaries to acquire these skills. Many of the experts interviewed believed the actuarial professional development offerings should integrate more coding and predictive modeling techniques specifically in support of actuarial functions such as pricing, reserving, experience analysis and assumption setting, and mortality modeling.

The Society of Actuaries has implemented changes to both its basic education and its professional development programs, including a predictive analytics exam, an advanced topics in predictive analytics exam, and an additional certification in predictive modeling to expand the actuarial skillset.

Several of those interviewed for this report felt that actuaries should not be trying to compete with data scientists, but should work to more effectively complement each other. The required skillsets are overlapping but, while data scientists focus on understanding data and the statistical models available to model that data, actuaries are insurance and financial services technical experts who understand the business, the products, and the accounting and regulatory functions of the industry. As actuaries, we are uniquely qualified to work with data scientists to help select and explain the statistical models so that they can be leveraged to the greatest benefit of the industry.

Section 5: The Path Forward

The last question in the survey allowed actuaries to add any additional comments they had regarding the direction of actuarial technology.

A few themes emerge here including:

- **Automation** and the speed with which many believe AI technology will allow actuaries to eliminate time-consuming and manual processes was cited as a benefit. This was also mentioned as a concern in terms of how future entry-level actuaries will gain the understanding that comes with doing the work.
- **Collaboration** will become more critical over time. Several expressed the importance of establishing effective partnerships within their respective organizations, specifically with IT. Collaboration is the key to keeping pace with rapid change and overcoming challenges with data management.
- **Regulation** will continue to play a major role in the application of new technologies in order to ensure that customers and stakeholders are protected from potential unintended harm introduced by automation and AI.

“Technology is so important, especially as the uses of data become more important in our work. The two go hand in hand, ranging from how we can use the data, analyze the data, store and organize the data. Having a sound data strategy that companies can successfully execute are essential and actuaries are going to be key in this. When we have the skills and technology, then we can use data to the fullest for our work. Technology has evolved so quickly and allowed us to do more than we could have ever expected even just 10 years ago.”

The SOA plans to conduct regular updates of this report in order to keep actuaries informed about applications of new technology and the impacts they are having on the future direction of the industry and the profession.

Section 6: Acknowledgments

The researchers' deepest gratitude goes to those without whose efforts this project could not have come to fruition: the Project Oversight Group and others for their diligent work overseeing questionnaire development, analyzing and discussing respondent answers, and reviewing and editing this report for accuracy and relevance.

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We would also like to thank the interviewees who volunteered their time and expertise regarding current and future technologies and their relationship to the actuarial function. Finally, we would like to thank the actuaries who provided their responses to the electronic survey.

Appendix A: Interview Guide

Top Actuarial Technologies of 2022-23

Interview Guide

In partnership with the Society of Actuaries, we are working to identify the “Top Actuarial Technologies of 2022-23” in a report to be released later this year.

For this discussion, we are focusing on the top actuarial technologies for the next year or two. These are technologies that you believe will be emerging over the coming year and have strong application for the actuarial profession, or exist today and will be rapidly increasing in their use over the next year.

Below are some questions we’d like to ask you during the interview as well as an initial list of technologies and technological applications to consider. We also want to know what is missing from this list. What do you see coming that is not on the profession’s radar screen?

Confidentiality: No one interviewed will be specifically quoted or attributed in the aggregate report. We simply would like to combine your confidential observations with others who have a perspective on actuarial technology to highlight new trends for the actuarial profession.

Interview Topics

- 1) What are some technologies that exist today but in your opinion will rapidly increase in their usage this year? How will they be applied by actuaries?
- 2) What technologies come to mind that you believe will be emerging over the coming year and how will they be applied by actuaries in their work?
- 3) Looking at the list on the next page, are there any technologies that are in use or you expect to be in use by the profession over the next year that appear to be missing? How will/could they be used?
- 4) What would you expect to see on this list in 3 to 5 years?
- 5) Are there promising technologies that actuaries should be considering but might not be?
- 6) Please describe your perspective on actuaries’ capabilities to use new/emerging technologies. [In other words, if actuaries don’t have the capacity or training to implement these technologies, then the potential impact on the profession in the near term will be limited.]
- 7) Do you have any other thoughts or suggestions to add?

Appendix B: Survey Questionnaire

Title

Top Actuarial Technologies of 2022-23 Online Survey

In partnership with the Society of Actuaries, we are working to identify the “Top Actuarial Technologies of 2022-23” in a report to be released in 2023. The first phase of this study was an interview-based survey, which identified technologies in common use for various actuarial tasks. This second phase of the study is an online survey to generate additional data about the prevalence of technology usage among actuaries.

In this survey, the phrase “actuarial work” includes all tasks, metrics, and reporting that falls under the actuarial function at your company.

Confidentiality: We will not cite or attribute any specific survey responses in the aggregate report. Our intention is to combine your confidential observations with those of others who have a perspective on actuarial technology to highlight new trends for the actuarial profession.

Please provide the following:

Name (1) _____

Company (2) _____

Number of years in actuarial profession (3) _____

Q1a Type of company. Select all that apply.

Property/Casualty (1)

Life (2)

Retirement (3)

Health (4)

Other Insurance (5)

Investment Management (6)

Other, non-insurance (7)

Q1b Primary area of practice, please describe.

Q2 Which of the following functions do you work with/have insight into at your company? Select all that apply.

- Pricing/reserving (1)
 - Predictive modeling (2)
 - Data visualization (3)
 - Cloud computing/data storage (4)
 - Other (including ALM, investment, risk management, etc.), please describe (5)
-

Q3 What actuarial software does your company use to assist in pricing/reserving? Select all that apply.

- MG ALFA, or Integrate (1)
 - Axis (2)
 - Prophet (3)
 - Polysystem (4)
 - Excel (5)
 - Custom/proprietary software (6)
 - Other vendor platforms, please name (7)
-

This function is outsourced (8)

I don't know (9)

Q4 How often does your company apply predictive modeling in its actuarial work?

- Never (1)
 - Rarely (a few times a year or less) (2)
 - Sometimes (a few times each month) (3)
 - Often (a few times each week) (4)
 - Frequently (daily or near-daily) (5)
-

Q5 Does your company plan to use predictive modeling more or less in the next 12 months?

- Less (1)
- About the same (2)
- More (3)
- I don't know (4)

Q6 What software does your company use for predictive modeling? Select all that apply.

- Excel (with or without VBA) (1)
- Python (2)
- R (3)
- Sagemaker (4)
- SAS (Base Code, Enterprise Miner, and/or Enterprise Guide) (5)
- TensorFlow (6)
- Alteryx (7)
- Other, please describe (8) _____
- This function is outsourced (9)
- I don't know (10)

Q7 How often does your company use data visualization (chart/graph generation and/or interactive dashboarding) in its actuarial work?

- Never (1)
- Rarely (a few times a year or less) (2)
- Sometimes (a few times each month) (3)
- Often (a few times each week) (4)
- Frequently (daily or near-daily) (5)

Q8 Does your company plan to use data visualization more or less in the next 12 months?

- Less (1)
- About the same (2)
- More (3)
- I don't know (4)

Q9 What software does your company use for data visualization? Select all that apply.

- Tableau (1)
- Power BI (2)
- R/Python Native Graphical Tools (3)
- Qlik (4)
- Microsoft Office Tools (Excel, PowerPoint, Access) (5)
- Other, please name (6) _____

I don't know (7)

Q10 How often does your company use cloud computing and/or cloud data storage in its actuarial work?

Never (1)

Rarely (a few times a year or less) (2)

Sometimes (a few times each month) (3)

Often (a few times each week) (4)

Frequently (daily or near-daily) (5)

Q11 Does your company plan to use the cloud more in the next 12 months?

Less (1)

About the same (2)

More (3)

I don't know (4)

Q12 What software does your company use for cloud computing and/or cloud data storage? Select all that apply.

Amazon Web Services (AWS) (1)

Microsoft Azure (2)

DataBricks (3)

Google Cloud (4)

Snowflake (5)

Other, please name (6) _____

I don't know (7)

Q2.5 Are there any other functions you work with/have insight into at your company? Select all that apply.

Pricing/reserving (1)

Predictive modeling (2)

Data visualization (3)

Cloud computing/data storage (4)

Other (including ALM, investment, risk management, etc.), please describe (5)

No (6)

Q13 Does your company use any of the following technologies/data sources?

	Yes (1)	No (2)	Planning to in the next 12 months (3)	Not applicable to my type of insurance company (4)
Blockchain/Distributed Ledger (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Electronic health records (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Prescription data (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Version control/Shared coding platforms (GitHub, Jupyter, etc.) (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wearable trackers (Fitbit, AppleWatch, etc.) (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Facial recognition (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Chatbots (ChatGPT, etc.) (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Genetic testing (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Telematics (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Robotic Process Automation (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Unstructured data
(Call center transcripts, customer feedback forms, claim notes, etc.) (11)



Q14 Are there any emerging technologies and/or data sources that your company plans to use in the future that have not been mentioned in this survey?

Yes (1) _____

No (2)

Q15 Please provide any additional comments you may have about the direction of technology use in the actuarial profession.

About The Society of Actuaries Research Institute

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.

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