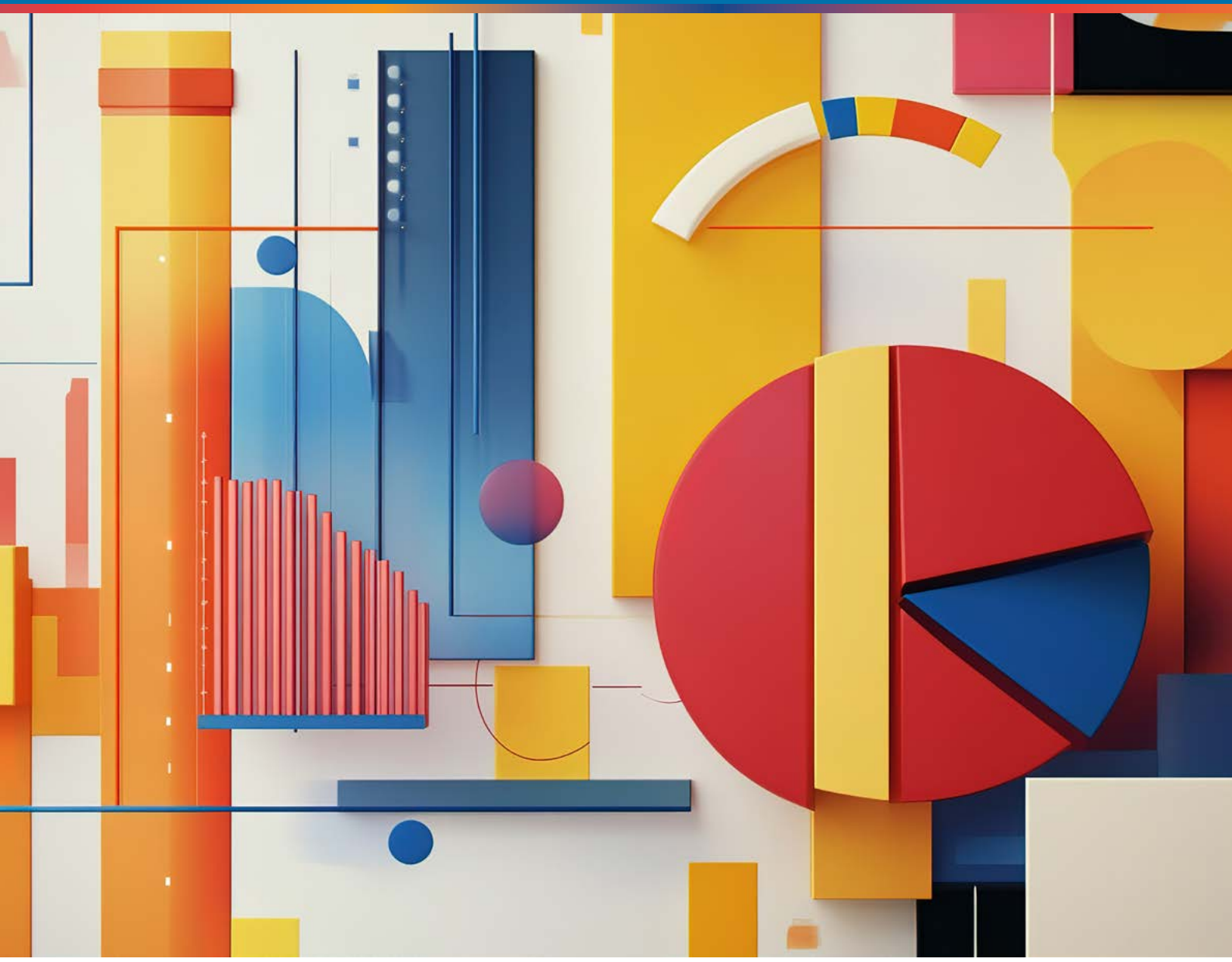
Actuarial Modelling

A special report on processes, systems and opportunities

June 2025



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Introduction

It is my pleasure to introduce our special supplement on actuarial modelling, which describes the latest trends in the systems and processes being used to improve the performance and efficiency of actuarial tasks.

The technological changes we are seeing everywhere in the world – particularly the access to cheaper and faster processing power, and the rapid development of artificial intelligence (AI) – are also driving an evolution in the approach to actuarial modelling.

The cloud has given us readily available and scalable compute power, but actuaries are now looking to GPUs and quantum computing as the new frontiers for modelling power.

The leaps and bounds in AI technology have been most visible in society through the application of large language models such as ChatGPT. These have been useful for actuaries in aspects such as coding and documentation, but there are other AI technologies that are helping to revolutionise specific modelling tasks and the automation of processes.

The technological advancements also bring new risks. The reliance on digital systems opens up operational risks, and regulators are busy putting guardrails around new technologies that threaten consumer protection and financial stability goals.

Of course, actuarial modelling is not just about the technology. Practitioners and businesses must understand the cost of owning and operating an actuarial modelling system – a requirement that asks us to look below the surface of vendor model costs, and into people and infrastructure costs.

Understanding the future for actuaries themselves is also important. Technological advances always come with societal impacts; think back to the 19th century Luddite textile workers who sabotaged the weaving machines that were taking their skilled jobs. For actuaries, there is a hope that tech will eliminate dull and repetitive tasks, but at the risk of making it harder for junior staff to learn.

Christopher Cundy
Editor
InsuranceERM

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The hidden costs of actuarial modelling systems

Why understanding total cost of ownership means thinking beyond software licences to people, processes and risk, Joshua Geer reports.

In an era where data-driven decisions underpin every move in insurance, actuarial modelling systems have never been more vital or more complex. But while these systems help insurers assess, price and manage risk, the cost of operating them is often only partially understood.

It's tempting to see these systems as self-contained or simply a line item in a software budget, but experts say this view misses significant layers of cost – not just technological, but operational, regulatory and human.

Understanding these hidden dimensions is essential for insurers that want to remain competitive, scalable and compliant in a fast-evolving market.

InsuranceERM has spoken to actuaries spanning the market to explore how insurers are defining and managing the real cost of actuarial modelling, where they're still falling short, and how future developments could reshape the cost landscape.

What does total cost of ownership really mean?

The first challenge is one of scope. While the first focus will inevitably be on licensing, infrastructure and vendor fees, when thinking about total cost of ownership, this view is dangerously narrow.

"You have actuarial systems in that 'little box' of your IT infrastructure, but there's a lot of other IT infrastructure that underlies it," says Ronald Richman, former chief actuary of Old Mutual and founder of consultancy InsureAI.

He relates an experience of moving a data system from one platform to another, which broke the inputs to the actuarial system. "So the total cost of ownership needs to be end-to-end in the value chain. It can't just be 'I'm paying for this little box' and ignoring the technical debt that can be accumulating in your data flows, in your reconciliations, in your financial systems that actually enable good actuarial work to be done," he explains.

This end-to-end view is echoed by actuary Cecilia Wang, who is head of pricing and longevity at French insurer Scor.

For her, the costs of actuarial systems span four major categories: "First is IT cost, things like software licences, IT infrastructure and IT support. Second is system development and maintenance, which is a big chunk of the cost. Third is operational cost, the day-to-day use of the system. A more efficient system reduces this cost. The fourth area is governance and regulatory costs (audit, approvals, controls) which are a big part of the agenda for large companies."

"The primary cost driver for my team, is the number of opportunities we are unable to price because of human bandwidth"

Cecilia Wang, Scor

Still, these conventional categories fail to capture what Wang and others argue is one of the most significant hidden costs: humans.

For example, she highlights the impact of missed opportunities due to limited human bandwidth.

"The longevity market is so busy that pricing teams have to choose which opportunities to take. So, it's critical that our people spend time on high-value tasks like applying judgment or analysing results, not on repetitive or manual work," she says.

Jeremy Levitt, CEO of the consultancy network Graeme Group and an actuary and former director at Axa, agrees the total cost of ownership is often misunderstood or underexplored.

"The total cost of actuarial modelling systems is determined by implementation costs, ongoing licensing fees, the cost of running

> "Most insurers rely on peer comparisons and internal efficiency metrics, like headcount or turnaround time, to assess and manage costs"
>
> **Ben Sheldon, Convex**

the system on the cloud, vendor consulting fees to resolve issues/maintain the modelling infrastructure and the opportunity cost of not using other, potentially more efficient platforms," he says.

"There are also indirect and qualitative costs, such as the flexibility of the contract terms in place with the software vendor, ease of integration, the level of support received by the vendor, and the ease of governing the model."

The silent drains

As the quotes suggest, people – and what they are or aren't enabled to do – represent one of the most substantial, yet overlooked, cost drivers.

Scor's Wang elaborates: "Actuaries are expensive, and they need to be involved in both development and maintenance. And for system development projects especially, they can easily last over one year or two years, if not longer.

"The primary cost driver for my team, is the number of opportunities we are unable to price because of human bandwidth."

This "opportunity cost" doesn't appear in traditional budget reports but has a real and material impact on business growth and deal success, says Wang. The inability to deliver fast and accurate pricing in competitive markets like longevity could mean losing business entirely.

Benchmarking

Ben Sheldon, group chief actuary at speciality re/insurer Convex added while direct costs such as software licensing, implementation and maintenance are "relatively simple to assess," he noted understanding the significant cost of staffing is complex.

"Insurers will assess how many actuarial professionals are required to run their processes and often compare team size relative to the scale of their reserves or operations as a benchmark against peers," he said.

But Sheldon explained benchmarking in this fashion can be imprecise, as the workload required to run a model varies based on factors such as the number of legal entities, lines of business and responsibilities split between the actuarial and finance teams.

"In practice, it's a difficult and resource-intensive process to compare the costs of modelling systems and their demands. While insurers sometimes undertake this process during major overhauls or RFP processes, doing it on a continuous basis is unrealistic due to its complexity. Ultimately, most insurers rely on peer comparisons and internal efficiency metrics, like headcount or turnaround time, to assess and manage costs," he stated.

Taha Ahmad, an experienced actuary currently working at Verisk, highlights the traditional benchmarks used to assess actuarial costs, such as licensing per actuary or gross written premium (GWP) per head, are increasingly ineffective.

"For a profession which is very numbers driven, it's not a very numbers-driven thing to do – to estimate the cost of ownership of actuaries," he says.

"Often people use things like number of actuaries or GWP per actuary, and then you benchmark that," Taha says. But he explains the expense ratio model can be very different depending on the type of insurer.

As such Ahmad adds, beyond cost metrics, it's crucial to define "value-add criteria" that reflect the actual contribution of actuarial teams. "That could be numerical, commercial, or a complementary service to the front-of-house trading role... understanding what the value drivers are and making sure you're assessing against those is essential."

Technology's promise

Despite widespread belief in technology's ability to reduce costs, many insurers have not yet seen improvements in expense ratios.

"As an industry, we haven't been great at reducing our expense ratios," Ahmad says. "They haven't really shifted a lot, even with the growth and rate increases we've seen".

Where savings do occur, they are often eroded by implementation inefficiencies, he adds.

In efforts to reduce system costs, some vendors have worked on optimising data storage and management, a strategy that can help lower licensing fees by shrinking the overall data footprint.

Ahmad notes: "One thing we've done is improve how our systems store and manage data… we've been able to reduce our licensing costs significantly, because we've reduced data storage costs significantly."

One cost that has surprised some is the cloud hosting fees. Christo Muller, a partner at MBE Consulting who has worked on many actuarial software implementations, says there is now more understanding that cloud-based systems are metered and may not produce the expected savings.

"Because most actuarial platforms are not cloud-architected and effectively are just re-hosted from on-premise data centres to

cloud data centres, that's been one massive cost increase I see for a number of insurers."

An added complication is that firms often incur new costs through third-party involvement.

Implementation projects may require specialist consultants or temporary staff, which can quickly absorb any savings gained on licensing.

Ahmad says: "What ends up happening is they hire contractors or consultants, which eats into the savings they would have seen from reduced licensing costs. So yes, we're charging a lower fee for licensing. But then the client uses third parties to implement it and that cuts into the saving."

> "For a profession which is very numbers driven, it's not a very numbers-driven thing to do – to estimate the cost of ownership of actuaries"
>
> **Taha Ahmed, Verisk**

Wang agrees that technology can be a cost saver but only when tightly integrated.

At Scor, her longevity team chose to develop a proprietary pricing system with a modular architecture, shared across markets. "This structure makes things much more efficient, especially for ongoing development... if we want to make a change to a central module that applies to five countries, we can do it once rather than five times."

The system is fully end-to-end and automated, eliminating tool-switching and manual error. "That reduces human error, which is actually one of the biggest hidden costs. A mistake can lead to reputational risk or significant financial loss."

And AI is starting to play a material role, says Wang. "AI tools like ChatGPT are already very good at generating initial code for large, complex projects... That saves a lot of time," Wang notes.

Sheldon added the integration of machine learning and data allows actuarial teams to access and analyse data frequently moving away from quarterly "Big Bang" processes toward continuous analysis.

He said Convex, for example, has reduced its end-to-end quarterly reserving process to just over a week, this includes production of the reserving committee paper and management information for the wider business. "The frequent analysis, and identification, of data trends are relevant for the whole business, not just the actuarial team".

Levitt adds that in the longer term, technology should improve efficiency, but only if complexity is managed.

"Generally, we expect the impact of AI and evolving technologies to reduce the total cost of actuarial modelling systems over time. Model runs will become significantly faster to extract and model output easier to interpret," he says.

However, he cautions this may also raise the bar: "Advanced technology will enable actuaries to increase the level of sophistication of their models. It will become easier to use first-principles methods in actuarial modelling instead of approximate or simplified methods."

Future-facing risks and rising governance pressures

Even as systems become more advanced, new layers of cost – particularly around model risk – are emerging. These are now critical concerns for both regulators and boards.

"If you have a highly automated model, there's a greater risk that actuaries use it as a black box, and they don't understand what's inside," warns Wang. "To address that, we make sure every actuary works on all areas, including model development and maintenance... That builds familiarity and reduces risk."

Sheldon also noted as new tech is adopted, governance challenges will emerge. "Faster cycles mean less time for traditional checks, so we are also working on embedding appropriate controls into automated systems". He said Convex, for example, is developing governance frameworks to support its move toward continuous reserving.

It is clear version control, end-user computing controls, and audit trails are also becoming essential.

Climate risk and regulatory stress testing are further adding cost and complexity, says Wang. "Climate risk assumptions, modelling, and stress testing are all getting more complex. This leads to more complex models and longer run times, which adds to cost."

Yet the market is moving in the opposite direction demanding faster pricing and onboarding. Firms unable to match this pace face not just cost inefficiency, but strategic risk.

According to Convex's Sheldon, at this stage, advanced actuarial modelling should incorporate ML and AI capabilities to make the actuarial process smarter and leaner, thus keep the actuarial headcount constant while producing more analysis.

"The cost of adding ML and AI capabilities into actuarial modelling will be less than the cost savings of a smarter and more engaged actuarial team," he stated. But he emphasised, linking back to his point about ensuring governance, that future cost savings will depend not just on the technology itself, but on how effectively it is integrated, governed and scaled across the organisation.

Still, the actuaries voice optimism that innovation and competition will push costs down over time.

"I'm hopeful that as more players enter the technology space, competition will drive down prices over time," says Wang.

Ahmad adds: "When you combine licensing savings, operational efficiency, and more efficient implementation, and once all of that becomes business as usual, I think we'll really start to see a difference and systems costs come down."

Towards a more strategic and integrated view

What actuaries have made clear is that the total cost of ownership for actuarial modelling systems is not just a budgeting problem. It's a strategic challenge that touches nearly every part of the insurance enterprise from system design and staffing to risk governance and competitive execution.

"A persistent problem for actuarial modellers stems from the need to work within a traditional framework, whilst looking to innovate for the future," says Sheldon.

As insurers race to modernise, those that take a more integrated, forward-looking views of total cost of ownership recognising the interplay of technology, people, and regulation will be the ones best placed to manage today's costs and tomorrow's competitiveness.

Control your ~~partial~~ total cost of ownership for actuarial modeling technology

Unlock real value with all-around savings (on more than compute costs)

As an insurance company, you need to drive down the compute costs of modeling. But you likely spend far more on people, system maintainance and compliance.

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Find out more at fisglobal.com/products/fis-insurance-risk-suite

More power for actuarial modelling

Christopher Cundy investigates the strengths, weaknesses and applicability of two technologies – cloud and GPUs – that are helping improve the speed of actuarial modelling

Accelerating the performance of actuarial modelling calculations can be achieved via improvements to both software and hardware. This article focuses on the latter, and specifically on the use of cloud computing and graphical processing units (GPUs).

The practical applications of cloud computing emerged in the early 2000s and it began to spread widely in actuarial circles a decade later. The idea that processing and data storage would no longer be handled by an in-house computing system, but by an third-party provider, provoked many concerns – some of which linger today – about data security and operational resilience.

But the sector was generally won over by the opportunities presented by the cloud, chiefly the potential cost savings from having a more flexible and scalable IT resource, and the way the cloud facilitates collaboration and rapid deployment of modelling tools.

GPUs, as their name suggests, contain specialised circuitry to perform the intensive calculations required to display computer graphics. They have been around since the early days of computing, but their performance has been driven forward in leaps and bounds by two trends: the mining of cryptocurrency; and the developments in artificial intelligence (AI) and machine learning.

The advantage of GPUs over the chips usually at the heart of a computer (CPUs) is that they are capable of parallelisation, i.e. solving problems in parallel rather than sequentially. This makes them well suited to certain actuarial tasks such as stochastic modelling. GPUs can be accessed in the cloud or installed in-house.

Pros and cons

So where should an actuary turn if they want faster and more efficient processing?

Alexey Mashechkin, chair of lifelong learning for data science and AI at the Institute and Faculty of Actuaries (IFoA), says both cloud computing and GPU technologies can improve processing power and actuaries will benefit from processing larger data volumes with more modern algorithms.

"On the flip-side, these technologies require investment and organisations must be satisfied that their use and the extra cost is justified. Another risk is that of privacy and data leakage where internal data is being processed outside of the company's IT landscape, as in the case of the cloud."

Christo Muller, partner, IT services at MBE Consulting, says: "There's clearly benefit technologically from the use of GPUs in terms of speed of certain types of calculations.

"There's clearly benefit technologically from the use of GPUs in terms of speed of certain types of calculations"

Christo Muller, MBE Consulting

Some vendors have specifically targeted that architecture and have proven there is a speed benefit. However, if the software is not architected for it then – just like with the cloud – it's not going to bring the most benefits."

"If an insurer has got a system today that is optimised for CPUs and they want to use GPUs, it's not necessarily a flick of a switch even if the vendor has added support for GPUs. Depending on the type of model it can be a fundamentally a different way of thinking about how you vectorise those code calculations to obtain maximum use of GPUs. Clearly there's a cost-benefit case to think about," explains Andy Maclennan, vice president, product management, insurance risk at software vendor FIS.

"We will be building example models on which customers can layer on their customisations, and also bring more of the product types that really perform well on GPUs into our standard libraries and support them going forward," he adds.

Muller notes there are potential downsides to GPUs when it comes to programming. "GPU architecture is highly complex in terms of coding. And although the vendors are abstracting that away from the users, it does still introduce some challenges for users when there are issues – which there always are."

He continues: "In the more traditional CPU-based space, there is definitely more opportunity and ability to debug and fact-find. Of course it's possible in the GPU space, but it's highly complex and very specialised."

Specific calculations

Cloud and GPU solutions both offer powerful means to process the data and carry out calculations needed for actuarial modelling purposes.

But as Iain Macintyre, head of risk and capital in the Insurance & Financial Services division of consultancy Hymans Robertson, explains: "The catch is that cloud or GPU alone are not sufficient as it is likely the case that work is required to adapt actuarial models to make the most of the additional power.

"The greater scope there is for parallel running across policies, model points, products, and/or simulations, the greater the value that can be obtained. So work is needed to identify and isolate those calculations and dimensions before migrating some of the computation to the cloud or GPU compute."

GPUs are good at performing matrix-based calculations on a large amount of data. In terms of actuarial tasks, that means nested stochastic simulations used in capital modelling, best estimate liability projections, seriatim valuation and discounting cash flows under multiple economic scenarios.

But CPUs tend to perform better when there are many different types of calculation required, or when there are a lot of dependencies to model.

Cost

Choosing between cloud and GPUs, or a combination of both, is not straightforward. FIS's Maclennan says: "Comparing GPUs with CPUs on speed alone doesn't provide the full picture – you really need to know which tool gives you the necessary speed for the lowest cost. Users can generally make runs go faster by adding more CPU cores, at least on the cloud. Some GPUs cards are very expensive and there is a trade off on cost. There is no point buying GPU on premise if it is going to sit idle for most of the year. We want to give clients the choice of which is best for their purpose: CPU, CPU+AVX, GPU or, in the future, even quantum computing."

Some firms have uncovered significant performance improvement and cost savings with the transition to the cloud. But others have been surprised by the bills from cloud-based systems as actuaries take advantage of more powerful and easily accessible tools to perform more analysis.

Conclusion

Regulatory requirements such as Solvency II and IFRS 17, as well as demands from the business to better understand risks and opportunities, have put pressure on firms to improve the speed and reduce cost of actuarial modelling.

Cloud computing and GPUs offer potential routes to achieving this, but the software solutions must be appropriately tailored to the hardware. GPUs offer large potential gains, but only for a limited number of actuarial applications.

What's the potential for quantum computing?

Quantum computing refers to a novel branch of computing that uses the principles of quantum mechanics to perform calculations – and promises a huge increase in processing speeds.

The hardware to perform quantum computing is best described as 'in development', but there are quantum simulators that have enabled actuaries to develop algorithms proving the potential for a rapid increase in processing speeds for various optimisation tasks – such as asset-liability management (ALM) and portfolio management – and value-at-risk calculations.

Consultant actuaries Tim Berry and James Sharpe's paper, *Asset–liability modelling in the quantum era*, published in the *British Actuarial Journal,* describes a quantum approach to optimising the selection of a Solvency II matching adjustment (MA) portfolio.

Running on a traditional computer, their software solution took five to 10 minutes to complete a typical MA optimisation task. The actuaries were able to show the quantum computer has the potential to solve MA optimisation tasks in a fraction of a second.

In Muhammad Amjad's paper on *Quantum internal models for Solvency II and quantitative risk management*, also published in the *British Actuarial Journal*, he investigates how quantum computing could be used in the context of an insurer's internal model.

He reported the implementation of an internal model differs significantly between quantum and classical computing, due to the fundamental differences in how each technology processes information, and building a quantum model would be such as significant task that it might not be worthwhile.

But the quantum model's advantages emerge when insurers are required to calculate the solvency capital requirement numerous times, for example to map out the multidimensional capital and risk landscape for understanding sensitivities to market and non-market risks, and for setting risk appetite.

German actuary Matthias Dietsche has identified an opportunity for quantum computing in optimising a non-life underwriting portfolio.

Speaking at the most recent International Congress of Actuaries, he said: "We're quite good at calculating with our statistical models a risk, but what we're not doing in the underwriting process...is assessing the portfolio impact of [each] risk," he says.

Part of the reason is the time it takes. But applying quantum computing takes the process down from hours to seconds.

"It won't change the whole thinking of our IT systems, but quantum computing is useful for some specific problems, for example optimisation," he said.

The shifting landscape of AI modelling rules

The increasing complexity of regulations on artificial intelligence are impacting how actuaries approach the use of AI in their models. Ronan McCaughey explains

Actuaries have been busy examining how artificial intelligence (AI) can transform their approach to modelling risk, pricing, reserving and decision-making across the insurance value chain.

However, AI's potential to create new risks, or enhance existing ones, means regulators, supervisors and standard setters worldwide are increasingly drafting rules and guidance to help actuaries navigate these challenges, and still produce quality actuarial work.

The four main risks identified with the use of AI in modelling are: the lack of transparency or explainability of the model; data privacy breaches; intellectual property theft; and biases that lead to discriminatory outcomes for customers.

The rapidly developing technology combined with evolving regulations, both specific to insurance and economy-wide, has conspired to create some uncertainty among actuaries about how to correctly implement AI tools.

Amerjit Grewal, deputy chief actuary at AEGIS London, tells *InsuranceERM*: "We've seen a rapid growth in AI-driven solutions from consultancies and insurtechs, aimed at enhancing reserving, pricing, and portfolio management processes. However, regulatory guidance on the use of these tools remains relatively underdeveloped, and so there is reliance upon companies to ensure robust internal AI/ML governance frameworks are in place."

She adds: "As more of these products enter the market, I expect increased regulatory focus on how outputs are validated, audited, and monitored by regulators, auditors, and other stakeholders.

"That said, I don't view this as a major hurdle. The actuarial community has a solid track record of sharing thought leadership and technical materials on emerging topics like AI – including transparency around model methodologies, limitations, and associated risks. This openness should help the industry adapt as guidance evolves."

A survey of London market actuaries and chief risk officers, conducted by the Lloyd's Market Association and consultancy, Barnett Waddingham, found significant uncertainty and concern about how AI and machine learning (ML) applications will be governed in the future.

"There is a general hesitancy that adopting these solutions today could inadvertently put insurance professionals at a significant risk in years to come. There is increased exposure to heightened regulatory scrutiny, accidental compliance violations, confidentiality risks, security breaches or even legal challenges," the AI and ML in Actuarial and Risk report said.

"The actuarial community has a solid track record of sharing thought leadership and technical materials on emerging topics like AI"

Amerjit Grewal, AEGIS London

"Most respondents would appreciate more practical guidance on how AI and ML could be responsibly and effectively integrated into their professional work. Other ethical concerns around data handling amplify the hesitation of the industry to incorporate these models into their daily work.

Ronald Richman, a renowned actuary who quit as chief actuary for Old Mutual Insure to start a consultancy focused on providing AI tools for actuaries, says companies are currently the ones setting boundaries.

Asked if regulations are stifling his AI work, Richman said: "In the landscape in which we're developing models, we currently don't have too much AI regulation. Forward-thinking companies already have AI policies that go beyond the strict letter of the law. That's where you need to demonstrate explainability, transparency and other things such as having a risk of proxy discrimination."

National and international actuarial associations have contributed to thought leadership around these issues. The Actuarial Association of Europe's discussion paper on AI and the opportunities and challenges it presents to insurability, urges actuaries to design

systems in a responsible manner, and thoroughly test models to avoid biases and technical errors.

"Exceptional care is taken to make sure the models do not cause harm to vulnerable groups, with extra care in relation to cover that is essential for social inclusion," it says.

> "AI models are often not explainable and are difficult to verify. There is also a risk that AI models are based on data imbalances or prejudices."
>
> **BaFin**

UK rules

In the UK, regulatory scrutiny on AI usage for actuarial modelling is intensifying, particularly as insurers adopt more advanced data science tools in areas traditionally governed by actuarial standards, such as pricing, reserving, and risk capital modelling.

The UK's financial regulators – the Prudential Regulation Authority (PRA) and the Financial Conduct Authority (FCA) – expect insurers to apply the same rigorous standards to AI-driven models as to traditional actuarial models, but with added scrutiny on explainability, accountability and governance.

In April 2024, the FCA issued an update recognising the complexity of AI models "may require a greater focus on the testing, validation and explainability of AI models as well as strong accountability principles, reinforced by corporate cultures operating with openness and transparency".

Six months later in October 2024, the UK's Financial Reporting Council (FRC) published guidance to support actuaries in applying the principles-based Technical Actuarial Standard 100 (TAS 100) when using AI and ML. The guidance provides examples relating to model bias, understanding and communication, governance and stability when using AI/ML models in technical actuarial work.

The UK government did pledge to introduce an AI bill but nothing has emerged so far. The House of Lords is currently debating an AI bill tabled by Conservative peer Chris Holmes, but without government support its future is uncertain.

Appearing before the UK parliament's Treasury Committee in May, David Otudeko, director of regulation at the Association of British Insurers (ABI), has said insurer risk management practices for AI are "fundamentally" sound, but the industry needs to keep sharpening its expertise to cope with the risks of the evolving technology.

Otudeko was asked whether the top 20 UK insurer AI model risk management policies would "pass muster?"

"I'd hope to god they would," Otudeko commented, noting the PRA's chief executive, Sam Woods, wrote to the CEOs of the insurance sector in his 2024 business plan saying exactly that.

European focus

The EU is leading the way on AI regulation with its AI Act that entered into force on 1 August 2024 and whose provisions will be fully in place within three years.

The law will have implications for the insurance industry particularly because AI systems related to pricing and underwriting in health and life insurance are considered high-risk AI applications and therefore subject to closer scrutiny.

The EU AI Act's broad definition means more traditional actuarial models may fall within in the definition of AI. According to consultancy Milliman, insurers will need to assess the risk level of their existing and planned AI applications, implement appropriate measures to ensure compliance and monitor and review their AI performance and impact on a regular basis.

In Germany, AI was highlighted as one of the focus areas of supervision by federal regulatory body BaFin for 2025. It said: "AI models are often not explainable and are difficult to verify. There is also a risk that AI models are based on data imbalances or prejudices."

US model bulletin

In the US, regulations on actuarial model use are evolving, but remain somewhat fragmented due to the state-based regulatory structure. The focus is on ensuring fairness, transparency, explainability and consumer protection.

As far back as 2020, the National Association of Insurance Commissioners (NAIC) published AI Principles stressing fairness, accountability and transparency in alignment with OECD and EU frameworks.

In 2023, the NAIC adopted the Model Bulletin on the Use of AI Systems by Insurers. This covers the use of algorithms, predictive models and AI, with the aims of setting out clear expectations for state insurance departments.

The Model AI Bulletin is heavily influenced by various AI policy frameworks and laws, including the OECD AI Principles, G20 AI Guidelines, the US Executive Order on AI, and the EU AI Act, according to law firm Kennedys.

Since the NAIC adopted the bulletin, nearly half the states have enacted the Model AI Bulletin, reflecting a growing commitment to these standards across the US.

Kennedys notes the Model AI Bulletin may require insurers to provide documentation regarding the development and use of AI, including details on governance, risk management, and internal controls, as part of an investigation or market conduct action.

Global review

In 2023, the International Association of Insurance Supervisors (IAIS) FinTech Forum conducted a thematic review of existing guidance on AI/ML and model risk management from 12 supervisory authorities and international organisations.

This review reported that several IAIS members had issued high-level principles, or more detailed standards or guidance, to complement existing legislation and address supervisory concerns.

"This is particularly the case in the area of model governance and model risk management principles for AI/ML models, data usage and management (including fair use of alternative data), and management of third-party service providers," the IAIS said.

While policy responses differ by jurisdiction, the IAIS noted: "What is clear is that all interviewed jurisdictions expect the need for continued enhancements in this area to keep pace with the rapidly evolving risks, including those arising from generative AI and large language models."

The true cost of actuarial modelling

Unlock real value with a holistic approach to insurance risk management

Every day, money flows into your insurance company in the form of premiums and out again to settle claims. You need to quantify and price the risks you're covering at the right level, so you can turn a profit, shore up capital and keep money hard at work.

Your actuaries have all the skills necessary to meet these challenges. But as their risk models and calculations become more complex and grow in volume, your compute costs are bound to increase.

However, compute costs make up just a small fraction of the total cost of owning and using an actuarial modelling and risk management platform. To help you lower that cost and make money work even harder, you need a complete view of what you spend on technology.

See the bigger picture of actuarial modelling costs

For medium-sized to large insurance companies, a range of overheads make up the total cost of ownership for actuarial platforms. At around 5% to 10% of that total, the cost of compute is among the smallest components (see Chart 1).

So, while it's important to keep the cost down, any savings you make on compute resources won't make a major difference to your overall expenditure – and may result in increased costs elsewhere.

Seven steps to reducing your total cost of ownership

After providing enterprise actuarial solutions globally for almost 20 years, FIS® takes a holistic approach to helping insurers manage their costs. With FIS Insurance Risk Suite Prophet, our industry-leading platform for actuarial modelling and risk management, we build savings directly into our solutions and services.

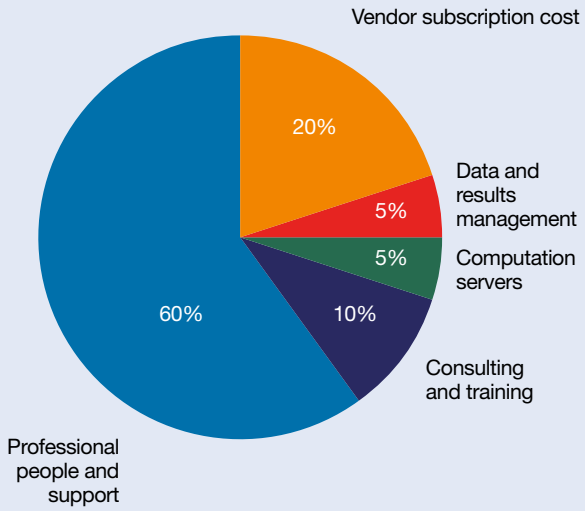
Here are seven proven ways that Insurance Risk Suite empowers you to reduce your true spending on technology and help money work harder.

1. Power up with the right PU

When it comes to running models faster and more cheaply, a particularly popular focus of recent debate is the merits of graphical processing units (GPUs) over central processing units (CPUs).

GPUs have been powering computer monitors and gaming applications for decades. More recently they've been used to train AI engines. And to make best use of available technologies, FIS has incorporated GPU capabilities into Insurance Risk Suite, alongside CPUs.

Chart 1: Illustrative profile of total technology costs for an insurance company



The key is to configure your models to make the most effective use of the hardware resources available and to consistently get the best from GPUs it is important that calculations be "vectorised", and data be managed in a way that reduces branching which could otherwise impact performance. These are normally not topics that actuaries need to consider when building models using CPUs where the nature of the calculations and data have less of an impact.

Get the best of both worlds with FIS

Comparing GPUs with CPUs on speed alone doesn't provide the full picture – you really need to know which tool gives you the highest speed for the lowest cost. Users can generally make runs go faster by adding more cores, at least on the cloud.

With Insurance Risk Suite, clients can choose to run models on both GPUs and CPUs, selecting the right tool for every calculation. Indeed, models coded and created for GPUs can run effectively on CPUs using advance vector extensions (AVX), providing users with more choice.

Why limit your options when you can get the best of both worlds in one open platform like Insurance Risk Suite?

2. Reduce errors

Generating incorrect results from actuarial models can cost insurers dearly, with the potential for regulators to require capital add-ons – and at worst, the risk of insolvency. More commonly, errors lead to poor investment decisions, not treating cohorts of customers fairly or breaching model risk frameworks.

To minimise errors, Insurance Risk Suite provides a complete, end-to-end data management platform which automates and integrates the business processes that underpin actuarial risk management. So, there is less need to re-run models to correct manual mistakes – and less duplication of operational costs.

As well as lowering operational overhead, automated data management ultimately helps cut the cost of regulatory penalties.

3. Free up your people

Actuaries aren't cheap. And as they – and your IT team – typically represent 60% or more of the costs of running an actuarial system, you need to reduce expensive manual effort.

To this end, Insurance Risk Suite delivers out-of-the-box actuarial libraries and regional and regulatory templates – and a readymade end-to-end IFRS 17 group calculations and accounting solution. We also offer managed cloud services, so actuarial and IT spend less time managing the solution.

And the more valuable time we save you on building models, performing calculations and running IT, the less money you spend on repetitive manual tasks or intricate modelling processes.

4. Minimise maintenance work and cost

Another way to ease pressure on your people is with an actuarial system that's fully maintained by your vendor. That means supporting constant investment in models and streamlining updates to the system and codebase to keep down the cost of human resources.

In the U.S. Insurance Risk Suite comes with vendor-maintained actuarial libraries that take care of changes to valuation code and integrate them into the core of your models. This reduces the number of actuaries required to monitor regulations and simply keep models up to date – passing on big economies of scale while removing another major contributor to cost.

5. Reduce implementation risk and cost

When you select an actuarial modelling system, you should make sure its technology has a good track record behind it and a strong roadmap for the future. But you also need to know that you can implement it easily and with as little risk as possible.

Insurance Risk Suite has already been implemented by more than 1,000 insurers around the world and is gaining more clients every year. With a proven methodology for implementation, we work closely with regional and global consultants to help firms replace legacy systems with minimal disruption and cost.

6. Store data more efficiently

For insurers that run their actuarial operations in the cloud, storage of modelling results can cost as much as, or more than, computing.

That said, storage overheads are very much in your control. Insurance Risk Suite gives you the flexibility to use distributed databases for calculation results and choose what results you store. You can select which technology best suits each individual task – balancing runtime and cost.

However, with replication and disaster recovery included, the fastest types of storage are still expensive. So, we've made efficient archiving solutions an integral part of the managed cloud services that support Insurance Risk Suite. Now you can cost-effectively store the data you need for immediate reporting – and archive the rest even more cheaply in the long term.

7. Count on expert support

Trusted support from your technology provider can massively reduce costs. Wherever you are in the world, you need assistance in your local language from a vendor that can solve your problems quickly, will deliver timely updates and is focused on your success.

FIS provides just that level of support while delivering high-quality software that we test extensively to minimise end-user issues. And with software-as-a-service (SaaS) solutions that are updated regularly to improve functionality and security, we help reduce the large hidden cost of upgrading software.

Unlock real savings on actuarial modelling with FIS

Insurers can't significantly reduce their actuarial costs by addressing their compute costs alone. To reduce your overall total cost of ownership, you need powerful technology and holistic solutions designed to help you make savings in every aspect of your modelling operation.

At FIS, our mission is to keep developing and improving Insurance Risk Suite to stay ahead of insurers' changing requirements, cut their total cost of ownership and make their money work harder. Get in touch to learn how we can save money all around for your insurance business.

If you would like to learn more or discuss how our solutions can help your business to unlock growth, please contact us here

Adapting to an evolving risk landscape

As actuarial operations become more automated, employ AI and rely on cloud infrastructure, firms are grappling with the implications. Martin Assmann reports

Historically, actuarial modelling operations have relied on manual oversight and key-person expertise to ensure resilience. Now, with the integration of technologies such as AI, shared model libraries and third-party cloud computing, actuaries are having to confront new operational threats.

Actuarial departments – which often heavily depend on external software for valuation, reserving or pricing – are having to work more closely with IT, risk and compliance to ensure modelling tools meet internal governance and security standards.

Some industry leaders worry that too much automation could introduce fragility. Insurers are trying to counter this by fostering cultures where model results are regularly challenged and tested. Leading companies have introduced model governance frameworks, and stress tests of fallback processes are becoming increasingly common in the industry.

Software controls

One of the biggest risks associated with modelling is errors in software that arise from poor governance around developing, testing and deployment in a production environment.

In response, insurers are adopting software engineering best-practices, such as better version controls, peer reviews and automated testing of models. These measures provide audit trails and allow rapid rollback of changes.

"The more connected and automated the models are, the easier it is to make unintended changes that go unnoticed," says Cecilia Wang, head of pricing for longevity at French reinsurer Scor.

"That's why version control tools like DevOps are so important," she adds, referring to the practice of combining development (Dev) and operations (Ops) to increase the efficiency, speed, and security of software development compared to traditional processes.

Swiss Re has adapted a process called 'red teaming' to mitigate modelling errors. The phrase comes from the cybersecurity sector, where a 'red team' tests an organisation's security system by simulating a cyber-attack.

Ermir Qeli, Swiss Re's head of data science and AI, explains they probe the models "the same way our end users would".

"You have to test with thousands of cases, with human experts reviewing the results of these tests," for the company to ensure the accuracy of its models, he says.

But this requirement for thorough testing of new technology needs to be balanced with the commercial reality.

Naomi Venables, client partner at UK-based consultancy 4most, says: "One of the biggest hurdles that we need to overcome with technological change and use of AI is assurance and validation.

"If we can overcome that, we can make the most of all the solutions that are coming available and adapt so much quicker. No longer will we need to have a model release process that takes 12 weeks from preparation to testing to sign-off – we could do it weekly or monthly instead."

AI risks

Companies like Swiss Re and Zurich have told InsuranceERM they are already employing AI in-house to speed up model creation and assist with coding.

But AI use is governed closely. Pravina Ladva, chief digital and technology officer at Swiss Re, cautioned that to ensure resilience and "due to the nascent nature of the technology, humans must still be involved in every final decision".

In its latest poll of risk professionals about emerging risks, the Society of Actuaries and Casualty Actuarial Society found concerns about AI were led by cybersecurity and deepfake risks. An overreliance on AI-generated outputs, as well as risks of embedded bias and discrimination, significantly outweighed worries about AI hallucinations or copyright infringement (see Table 1).

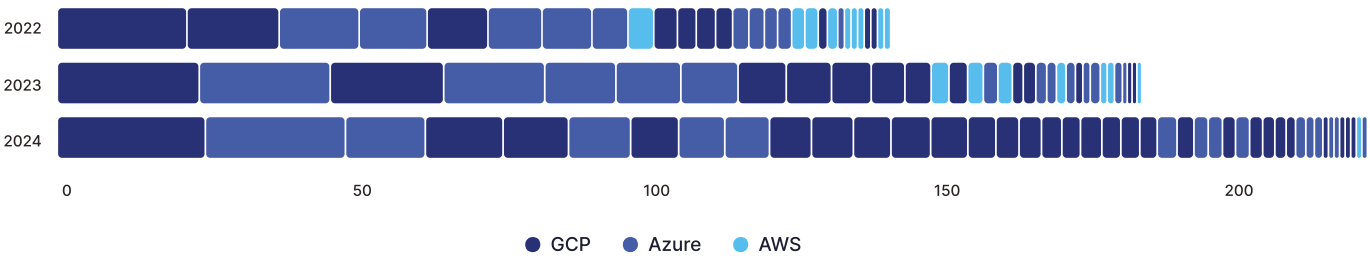
Table 1: Top AI risks

Rank	Risk	Selected 1-3
1	AI rank – Increased Cybersecurity risk	94
2	AI rank – Manipulation leveraging AI capabilities, including Deepfake	90
3	AI rank – Bias and discrimination	61
4	AI rank – Overreliance on AI responses	51
5	AI rank – Lack of transparency	44
6	AI rank – Impact on workforce with AI replacing positions	36
7	AI rank – Risk of not using AI	26
8	AI rank- Synthetic data (Using AI to train AI) degrading the quality of the response	25
9	AI rank – Hallucinations	24
10	AI rank – Copyright infringement	22

Figures show how often a risk is selected in a respondent's top three risks.

Source: SOA & CAS 18th Annual Survey of Emerging Risks

Chart 1: Critical Events Overall Duration (Hours), by Single Event Block



Source: Parametrix 2024 Cloud Outage Risk Report

Cloud risks

Cloud platforms have become integral to actuarial modelling, as cloud computing provides scalability and efficiency, as well as easing collaboration between remote sites and the rollout of new tools.

But with this efficiency comes with new exposures to cloud outage and cyber-attacks.

The number of critical outages is increasing as cloud usage becomes more prevalent (see Chart 1) and the market dominance of AWS and Azure – estimated to each hold 30-40% of the UK market share, for example – has raised concerns among regulators about concentration risks.

"Ten years ago, I remember a lot of big insurers saying they were never going to cloud, but Covid-19 changed all that. Also, regulators have become more comfortable with it, and so most new software solutions are SaaS-based," says Martin Sarjeant, head of solutions management, insurance and climate risk at software vendor FIS.

"Recent events have highlighted the risk of bad actors trying to get hold of data or holding companies ransom. Security is paramount for FIS and our customers. We have multiple layers of security such as multi-factor authentication, encryption of data, regular penetration testing, ongoing security training, vulnerability scanning monitoring and much more."

"As some customers came onto our managed hosted cloud, they evaluated the security of the public cloud with our service, compared to their private data centre. The public cloud was considered more secure than their private data centre. That gave them confidence to go to the cloud."

Regulators have responded to these emerging risks with rules such as the EU's Digital Operational Resilience Act, which came into effect in early 2025 and will further tighten requirements around ICT risk management. For actuarial teams, this means increased scrutiny of the cloud-based modelling platforms and outsourced data services they rely on.

Veekash Badal, principal and consulting actuary at Milliman, says firms must put in place robust cybersecurity frameworks and foster a security aware culture – while making sure third parties adhere to the same standards.

"Seamless integration of external systems through compatibility assessments, sound data governance, and strict access controls further ensures key operating functions, including actuarial practices, remain precise and resilient. A well-documented incident response plan aimed at swift recovery is vital for maintaining continuity and confidence in the business. Continual staff education on cyber threats, including phishing and social engineering, safeguards against operational disruptions," he says.

Resilience for the next generation

The risks associated with technology extend to talent. As AI tools and automated workflows become embedded in day-to-day operations, there is growing concern that junior actuaries may miss out on learning the foundational skills of building and validating models from first principles.

"Some more experienced actuaries have talked about how doing certain things which are perhaps going to become automated soon was a really important part of their training," says Taha Ahmad, an actuary currently working at Verisk.

He warned an overuse of AI in learning could lead to an erosion of vital skills in the actuarial field.

"You can get an AI assistant to write a code for you. You don't need to be able to write the code, but you need to be able to test that code, read that code, and ensure that it does what it needs to do," he says.

Insurers are responding by integrating digital skills into actuarial training and encouraging rotation across technical and business functions. Communication and commercial awareness are also being prioritised, with actuaries increasingly expected to explain model limitations and assumptions to non-technical stakeholders.

"To address that, we make sure every actuary works on all areas, including model development and maintenance. Everyone has to tweak the model at some point to meet the specifics of a deal. That builds familiarity and reduces risk," said Scor's Wang.

For a profession traditionally focused on modelling future outcomes, the task of ensuring their own processes are robust and can withstand disruption is becoming a present strategic priority.

Rewriting the script on process automation

Process automation promises to eliminate the dull and repetitive tasks actuaries typically undertake. The reality sometimes falls short, but AI technology could be a game changer. Christopher Cundy reports

There is a solid theoretical case behind the drive to automate repetitive tasks. First, it reduces the operational risks that can arise from manual errors or omissions. Second, it speeds up the modelling process. The result is that actuaries spend more time on analysis and insights, and less time on fixing problems or 'cranking the handle'.

The approach has found a natural place in performing model runs for regulatory or management reporting, but it is far from widespread.

"It still surprises me how many processes are very manual and we have skilled analytical actuaries turning the handle repeatedly every quarter," says Naomi Venables, client partner at consultancy 4most. "It feels like we can make the most of actuaries' skills by freeing them from these repetitive tasks, those that are usually best suited for automation."

In the early 2010s, the introduction of Solvency II in Europe gave the sector a big push towards automation, "because of the regulation's requirement to document models and processes. If you can write it down, then you can put process automation around it," explains Martin Sarjeant, head of solutions management, insurance and climate risk, at software vendor FIS.

"Other drivers were more frequent period-ends, which means firms must have a repeatable process, and a desire to eliminate manual errors," he adds.

Iain Macintyre, head of risk and capital for insurance and financial services at Hymans Robertson, says the trend towards automation of reporting has been ongoing for several years, but he notes actuarial teams have faced interruptions to their carefully choreographed processes.

"Significant regulatory change, such as IFRS 17, often landed with compromise, and increased demand for actuarial modelling has disrupted these processes. There is another round of optimisation required to make these processes sustainable and create capacity in finance and actuarial teams," he says.

Untapped potential

Aside from reporting, Macintyre sees other actuarial modelling tasks that are ripe for automation include new business pricing, asset-liability management and stress testing.

"Stress testing is often treated as a one-off exercise, where we see value in defining a process and automating this using digital tools to respond to increased business and regulatory demand. We have seen some insurers doing exactly that, to deliver efficiencies and improved insight, but we feel others may have some way to go," he says.

Naomi Venables, 4most

Iain Macintyre, Hymans Robertson

Venables says: "I've seen some really good use of automation in the data cleansing area. It takes time and investment to get those right, but these tasks that are typically very manual and challenging for a person to undertake can be really sped up with automation."

Automation need not be restricted to core actuarial systems, but to the wider applications used by actuaries to perform their tasks, from Excel spreadsheets to tools programmed in Python or R. Automating processes based on these platforms is particularly beneficial, as they tend to have evolved as one-off manual solutions to a problem that is now part of a crucial operation.

FIS's Sarjeant says: "Automation tools have got much better over the years. Ours has been simplified down to a 'drag and drop' system and a structured workflow around actuarial period end closing. But insurers are also wanting to have 'best-of-breed' tools or the ability to connect with ETL (extract, transform, load) tools and company-wide automation tools. So having strong APIs is really important for any vendor."

Approach to automation

For those thinking about automation, the first step is to document the processes, Sarjeant explains.

"Even for a small insurance company with a fairly simple process, you're probably into the hundreds of steps quite quickly. The next step is to figure out which steps can be done with simple automation like an ETL tool. You must also understand where the approval points would be, and how you want to set up your automation tool: as a dashboard that updates through the process that everyone can view? Or actively sending notifications to people?"

"I would also advise thinking about the objectives in the business case. There should be a cost saving in terms of process efficiency, but there should also be a risk mitigation in terms of the operational risks of making mistakes," he adds.

For Christo Muller, partner at MBE Consulting, process design must be addressed before automation tools are introduced. "We've observed a number of cases where process automation has been overlaid onto a badly designed process or systems. That just adds complexity and overhead to what's there already."

He says that rather than adding an overarching process automation layer, "the way we approach automation is to look at specific points where it makes sense to do so. For example, inputs into the model: if the modelling platform has that capability, then it makes sense to use that."

Muller notes the ideal of having automation with ETL capabilities as a constant throughout the process is rarely achieved in practice. "There are very few actuarial functions that actually have the budgets to implement that at the right level," he says.

Another ideal that is often dashed against the rocks of reality is having a model ready and waiting to ingest data, which runs automatically and provides instantly available outputs.

"We've all seen the demos of that and there are some implementations where that is the case. But in most cases, unfortunately, the data quality and the requirement to intervene at the appropriate points in the actuarial context always stop those automations. It then actually adds overhead because now we have to be slaves to this master that says we have to do it this way," says Muller.

Part of the reason for this fragmentation of processes is the nature of the work that actuaries must do. "The approach to everything is so piecemeal. It's either in reaction to a regulatory trigger or it's trying to solve a particular problem that's the burning issue of the year," says Muller.

That's not to say that human intervention and review cannot be part of a well-designed process. As 4most's Venables says: "If you look at the working day timetable for a reporting process, there are lots of hand-offs going on. There are clearly a lot of checkpoints that can be slotted into that process. I think it's about finding the real pain points – those slowing us down and potentially introducing human error - which could be eliminated by simplifying and automating the process, ensuring consistent execution."

Potential for AI

Generative artificial intelligence (GenAI) tools have already helped to improve the productivity of some actuarial tasks such as writing code and documenting it. .

"What is perhaps more exciting is the new potential introduced by the development of AI agents, made possible by adding interfaces between GenAI and other tools/platforms, including other GenAI," says Macintyre at Hymans Robertson. "This could be useful for automating many processes, for example, certain parts of reporting processes or in application to data-intensive processes like experience analysis."

The Institute and Faculty of Actuaries' GenAI Working Party has published a series of articles exploring this topic. They say introducing autonomous AI agents into actuarial work "promises to overhaul traditional workflows. By integrating AI agents capable of autonomous planning, external tool use, and dynamic adaptation, many routine tasks could be automated."

The working party says productivity gains are most likely to be achieved in administrative tasks – managing documents, reporting and communications management – and in modelling (see Table 1).

"Routine or repetitive processes – data ingestion, formula translation, regression testing, and documentation – will increasingly fall to AI agents designed for the actuarial domain. AI agents will become embedded in various aspects of the modelling process beyond code generation, enabling actuaries to focus on more complex and value-added tasks," the working party says.

The interest and enthusiasm in the industry for AI tools means they will likely find their way into workflows soon, and actuarial modellers will benefit from this next wave of technology.

Table 1: Deployment of AI Agents within the actuarial modelling life cycle

Task	Role of AI Agent
Converting requirements	Agents transform high-level requirements into detailed first draft model specifications for a human actuary to review
Developing and implementing models	Agents autonomously generate entire solutions based on these model specifications rather than generating code bases on a line-by-line basis
Data validation and cleansing	Agents will automate data validation and cleansing through autonomously identifying issues with the data and generating appropriate cleansing rules to be applied
Generating test cases and debugging	Agents will generate comprehensive sets of test cases and autonomously run these tests and debug and correct failing tests iteratively until all tests pass
Documentation generation	AI agents will generate detailed documentation for all parts of the modelling solution artifacts they generate, ensuring model transparency and regulatory compliance
Reporting and analysis	AI agents could automate report generation and formatting, enabling actors to focus on interpreting results and decision making

Source: Actuarial Modelling in the Age of AI Agents, IFoA GenAI Working Party

The future for actuarial careers in the AI era

Technological advances and opportunities from AI will mean the actuary of the future doing less number-crunching, more coding and communicating the implications of AI models with clarity. Ronan McCaughey explains

Actuaries are no strangers to change. As Sanjiv Sharma, head of actuarial and exposure management at the Lloyd's Market Association, points out, the profession has gone from using electrical mechanical calculators, as well as employing people as 'computers' to assist calculations, to using highly complex algorithms to decipher trends from masses of cloud-based data, almost in an instant.

But with sophisticated artificial intelligence (AI) tools now at their fingertips, what skills will future actuaries need the most? And how can tomorrow's actuaries stand out?

InsuranceERM spoke to almost a dozen senior actuarial experts in Europe and the US to answer these questions and understand what cross-disciplinary knowledge will become essential for actuaries.

Sharma defines the actuarial skillset "as a unique blend of mathematical expertise, the ability to think strategically, a depth of commercial awareness and – perhaps key – is being able to translate complex technical concepts across to non-actuaries".

Looking ahead, he says technological change has supercharged what actuaries are able to do, the insights they can bring and the need for actuaries to translate the complex to the understandable. "The need for this will only increase as the world around us becomes more technologically complex," says Sharma.

Tasks for AI

Jeremy Levitt, chief executive of US-headquartered actuarial consultancy Graeme Group, says every area of actuarial work will be affected by AI to some degree in the next five to 10 years.

He expects actuarial work to be outsourced to AI-first vendors or performed using custom built in-house AI technology. For actuaries working in life insurance, he expects there will be a significant impact.

"Among the areas that will be inevitably affected are model development (e.g. coding and programming models), business-as-usual tasks (e.g. quarterly valuations), model extraction (e.g. for downstream regulatory compliance purposes) and documentation (e.g. model reports). This underpins significant portions of valuation, pricing, forecasting, financial reporting and capital roles," Levitt says.

Adam O'Reilly, chief actuary at speciality insurer AEGIS London, believes several aspects of actuarial work are likely to be automated by AI and technology in the next 10 years.

> "[The actuarial skillset is] a unique blend of mathematical expertise, the ability to think strategically, a depth of commercial awareness and – perhaps key – is being able to translate complex technical concepts across to non-actuaries"
>
> **Sanjiv Sharma, Lloyd's Market Association**

First cut analysis, for instance, may be replaced where machine learning techniques can provide an early indication of trends and results, comments O'Reilly. While this still requires a human in the loop, O'Reilly says new techniques allow insight early on in a process to determine where best to spend most of the analytical time.

He adds that by working alongside data analysts and business intelligence developers, actuaries can develop and automate some of the visualisation aspects of their work, be it via automated dashboards or reports.

Alexey Mashechkin, chair of lifelong learning for data science and AI at the Institute and Faculty of Actuaries (IFoA), argues that external data discovery, data preprocessing and base analytics are most likely to be automated by AI within the next decade.

"Actuaries who position themselves as bridges between emerging technologies and business strategy ... will always have a seat at the table"

Sanjiv Sharma, Lloyd's Market Association

Staying relevant

With automation playing a growing role in eliminating routine tasks such as reporting and the drafting of regulatory returns, Jasvir Grewal, a director at re/insurance broker BMS Group, says the actuary of the future will need a versatile skillset to remain relevant.

She says programming and data science skills will certainly help, but as technological developments continue to lower the barriers to entry, understanding the commercial implications of these applications will be equally important.

Grewal says: "Actuaries who position themselves as bridges between emerging technologies and business strategy – translating complex innovations into tangible opportunities and insights – will always have a seat at the table."

Well-known actuarial expert Matthew Edwards, and a former senior director in WTW's insurance consulting and technology practice, says the main new skills resulting from AI developments are the ability to understand, manage and challenge AI applications in their field. He says understanding relates both to realising the potential applications of AI in particular tasks "as well as understanding potential pitfalls in results generated by AI".

Mashechkin says actuaries of the future will continue to carry cross-function business knowledge. However, in his view, they are likely to spend less time on data processing and concentrate more on analytics. To execute the latter, he stresses actuaries have to upskill in machine learning techniques, concentrating on understanding which methods to apply for certain data and targets.

"For the development of technical pilots and their possible implementation, it is better to cooperate with data scientists or, in the short to medium-term, use AI-based copilots."

Catherine Drummond, a partner at UK actuarial consultancy LCP, says actuarial work in the future is likely to make far more use of machine learning and AI tools, which can spot trends and interactions between factors that traditional tools and expert judgement cannot.

In her view, actuaries will need to understand this emerging toolkit intuitively. However, technical skills alone won't be enough.

Drummond says: "The ability to exercise sound judgment, especially when interpreting and validating complex models or outputs, will be more important than ever. Communication skills will also remain essential – articulating risks, uncertainties, and assumptions to non-technical audiences is a core actuarial strength that won't be automated anytime soon."

Junior-level challenge

As automation and AI continue to drive the need for greater efficiency, BMS's Grewal says actuarial teams across the market will become leaner over the next decade.

She says: "I see technology reshaping how junior actuaries are perceived. Rather than being seen as 'Excel experts' or go-to support for technical grunt work, they will increasingly be viewed as broad quantitative generalists capable of contributing across a wider range of analytical and business-focused tasks. This shift can only be a positive development."

Grewal believes that senior roles – focused on stakeholder engagement, designing processes, and aligning actuarial work with broader business strategy – will continue to evolve, but their core responsibilities are likely to remain largely unchanged.

In contrast, she notes that "much of the junior-level work – particularly tasks like data cleansing, augmentation, and preparation – will be increasingly automated or outsourced over the next five years. This trend can already be seen across several carriers."

Drummond also believes technology is likely to change the shape of actuarial careers, rather than reduce demand outright.

She comments: "There's a risk that automation of entry-level tasks makes it harder for junior actuaries to build the experience needed to develop judgment and progress. That's something the industry needs to actively address – through intentional training, mentoring, shadowing opportunities, and careful task design, especially in a hybrid working environment where informal learning is harder to come by. There will also be the need for new training, such as learning how to review AI model outputs effectively."

Edwards is clear that AI means there will be a reduced demand for junior-level actuaries "given how much more productive an actuary can be at coding and related work when that actuary is AI enhanced".

While AI has the potential to undermine the need for junior-level actuarial jobs, O'Reilly says the demand for actuaries within the insurance sector continues to be high and their multi-disciplined expertise means there will always be a place for actuaries.

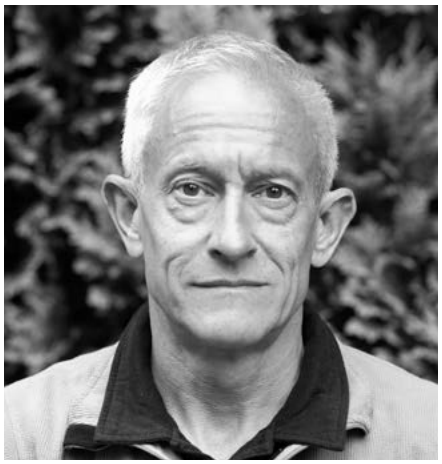
He remarks: "There is also the possibility actuaries can transition into other areas, for example the head of data analytics and portfolio underwriting at AEGIS London started their career as an actuary."

Code your future

Amerjit Grewal, deputy chief actuary at AEGIS London, says actuaries will always get a seat at the table, but the remit will naturally evolve over the next few years.

She comments: "There has already been an explosion in data

Adam O'Reilly, AEGIS London



Matthew Edwards, actuary

Amerjit Grewal, AEGIS London

scientists joining actuarial teams and supporting pricing and the use of external data in setting new rating factors. Actuaries and teams that resist the change are most prone to then losing their seat at the table, whereas those who learn to leverage new data and outputs will continue having a voice. I also think it's a great time for junior actuaries to learn to code Python, SQL, R."

With the advent of more technology-related elements in their day-to-day work, Yusuf Abdullah, director of risk modelling services at consultancy PwC, and a chartered actuary, agrees with Grewal on the need to learn coding skills in programming languages like Python, SQL and R.

He says: "The new generation of actuaries coming on board have Python and SQL coding skills, but existing actuaries need to upskill themselves in these areas."

In Abdullah's view, there is the start of a transition from traditional actuarial model vendors to homegrown modelling environments, particularly based on Python coding.

"This transition is still up and coming, but over the next 10 to 15 years, this is going to be one of the mainstream areas where actuaries are using Python to do more of their work and more of their actual modelling, because it gives them flexibility and minimises third-party costs."

"Overall, the traditional actuary and the future actuary are going to be very different in terms of the skillsets required."

Broader actuarial roles?

Insurance actuary Taha Ahmad tells *InsuranceERM* the actuarial role will not become redundant, but actuaries will start to expand into different roles in the future. At the same time, he says the traditional actuarial roles of reserving, capital setting and understanding an insurance contract's uncertainty will always be needed.

Commenting on the potential for actuaries to transition into other areas, Lloyd's chief actuary Emma Stewart says its market reserving and capital department now contains both actuaries and data scientists, with a number of actuarial students starting on the traditional actuarial route before broadening into data science roles.

Unlike some of his peers, however, Edwards is less optimistic on this particular issue and sees little general scope for actuaries to move from actuarial into broader AI and data science roles, "simply because data scientists are far more fluent in those skills at a lower cost than actuaries".

Edwards says: "Actuaries can of course make the jump but their actuarial background is not going to be a major advantage. I also think actuaries' apparent risk-aversion, conservatism and misunderstanding of ethical aspects will lead to them being less attractive as AI specialists and less likely to be involved in major decision-making in large re/insurers."

Conclusion

It's clear from *InsuranceERM*'s research that the actuary of the future will need to partner with AI for productivity, be able to advocate for its use, but also alert decision-makers to its shortcomings, limitations and risks.

Companies will also need fewer actuaries to execute the same tasks as before, and hence, smaller teams will have a larger impact, as Levitt from Graeme Group points out.

Levitt says: "This will also mean many actuaries' time will be freed up so that they can focus on higher-value work. To stay relevant, actuaries need to embrace communication, interpersonal skills, non-traditional work and strategic and advisory roles."

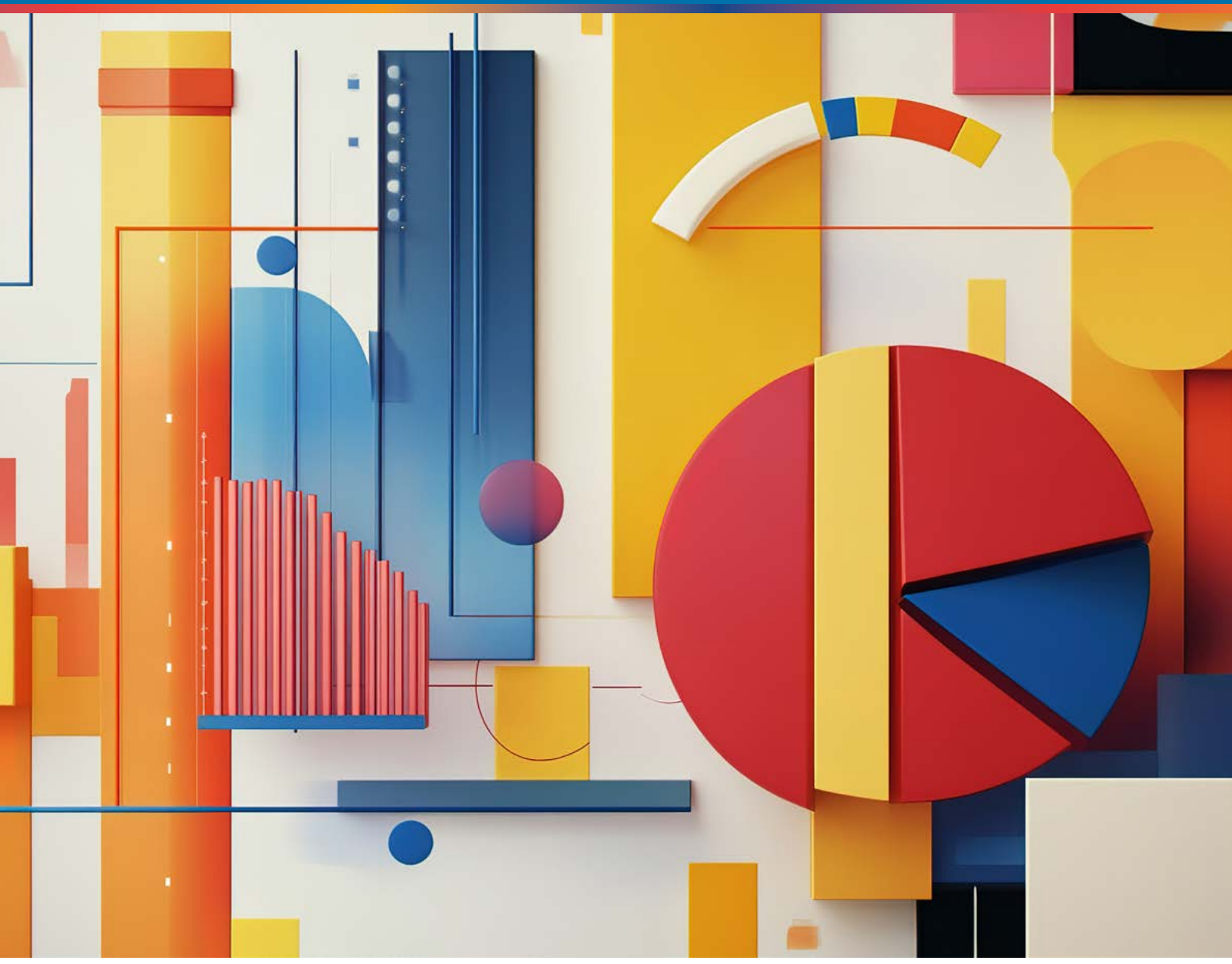
In his view, staying relevant also means actuaries must focus on integrating AI and machine learning into their work, and continuously adapting to newer versions of these technologies as they evolve.

Given advances in automation and generative AI, agentic AI and actuarial modelling, actuaries must therefore upskill, or face becoming irrelevant in many ways.

Becoming a well-rounded professional will also be key as this will enable them to build relationships and partner with other parts of the organisation, such as insurers' IT, finance and risk functions.

The final comment goes to Mashechkin at the IFoA who says: "We believe there will still be demand for actuaries especially as the profession is highly regulated. However, requirements are going to have broader scope and more routine tasks will be automated, leaving actuaries more space for analytical deep dives.

"Could actuaries transition into broader AI and data science roles? Indeed they can and I believe they will as that's exactly the story of my own professional development in the last seven years. However, that will only be possible if actuaries are ready to upskill."



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