

WAVESTONE

Boardroom Briefing

The Bionic Actuary

How can Insurance companies become more efficient and effective using AI & Smart Tech?



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Introduction

The insurance terrain of tomorrow will be markedly different from that of today, molded by the seismic shifts in technology, climate, and consumer behavior.

The next decade will see the industry grappling with the digital revolution, which brings both the promise of innovation and the challenge of disruption.

Insurers will need to adapt to a landscape where artificial intelligence, machine learning, and big data analytics play pivotal roles in risk assessment and policy customization.

The modern insurer's blueprint emphasizes the need for highly tailored and adaptive insurance solutions. In an era driven by consumer demand for personalization, insurers are tasked with crafting policies that cater to individual needs and circumstances.

This approach is not merely about product customization; it's about reimagining insurance as a service that can dynamically adjust to the life changes of the policyholder.

Future insurers will rely heavily on data analytics and machine learning to understand their customers deeply, predicting needs and offering solutions proactively.

This strategic shift is about building long-term relationships, fostering loyalty, and providing real value that stands the test of time.



Eduardo D'Alma

**Insurance Partner
Wavestone**

**"The winners in insurance will be the ones who orchestrate best, not the ones who automate the fastest.
AI at scale starts with your people."**

Eduardo D'Alma

Executive Summary

Modernizing Actuarial functions with AI: Unlocking speed, accuracy and strategic impact in insurance

The actuarial function is at a critical inflection point. Global insurers face growing regulatory complexity driven in part by adoption of Solvency II and IFRS 17 amid surging data volumes and escalating demand for real-time, personalized offerings.

Traditional actuarial models, built for a different era, are straining under the weight of these demands.

AI offers a significant opportunity to reimagine the role of the actuarial function. By combining actuarial expertise with AI's speed, scale, and pattern recognition, a new generation of "Bionic Actuaries" is emerging; professionals who are not replaced by technology but empowered by it.

These AI-augmented actuaries can move beyond retrospective analysis to proactive insight, using real-time data to detect emerging risks, adapt pricing dynamically, and anticipate shifts in behavior, morbidity, or climate patterns.

For insurers, this transformation is about more than operational efficiency or regulatory alignment.

It's about building smarter, more agile functions that actively protect customers and insurers from future risks while offering early warning, more accurate reserving, scenario modelling and tailored coverage based on real time content, behavior and contextual augmentation.

Our Wavestone thought leadership paper, *The Bionic Actuary*, explores how AI is modernizing actuarial functions to drive competitive advantage and true strategic value enhancing underwriting decision making, strengthening portfolio resilience, and enabling insurers to fulfil their core purpose: safeguarding a policyholder's future in an uncertain world



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"The proportion of insurance companies experiencing a significant financial impact (at least 1% growth in EBIT margins) from AI investments doubled from 10% to 20%, outperforming other industries..."

Moving from Traditional Actuary to Bionic Actuary

A Bionic Actuary combines traditional actuarial skills with advanced capabilities in data science, automation, AI, machine learning, and digital tools. The term "bionic" implies enhancing, and not replacing, the actuary. Instead, empowering them with technological augmentation to improve efficiency and effectiveness for the whole organization.

Traditional Actuary VS Bionic Actuary

Process	Traditional Actuary	Bionic Actuary	Improves
Data collection and preparation	Manually extracts and cleans data from multiple sources.	Automates data ingestion, cleaning, and validation.	
Risk assessment and exposure analysis	Uses pre-defined methodologies and historical trends.	Identifies hidden risk patterns and trends.	
Developing actuarial pricing models	Builds models based on statistical techniques and assumptions.	AI-powered models to refine risk factors.	
Premium calculation	Uses spreadsheets or traditional Actuarial tools.	Automates calculations, reducing manual input.	
Stress testing and scenario analysis	Runs simulations manually, requiring extensive setup.	Performs scenario testing with adaptive learning.	
Reserving and technical provisions	Applies standard actuarial methods with periodic updates.	AI enhances risk factors in the reserving process.	
Reporting and documentation	Prepares reports manually, formatting data for stakeholders.	AI auto-generates reports with visual insights.	

AI in an insurance organization

Pricing	Underwriting	Risk & Actuarial Function
Input data collection and preparation	Collect risk data	Identify and assess risks
Defining the reinsurance treaty terms and structure	Analyze claims	Quantify risks using statistical methods
Exposure assessment and comprehensive risk analysis	Evaluate risk exposure	Optimize risk/return profile through risk control strategies
Developing and calibrating actuarial pricing models	Review policyholder's risk	Stress testing scenario
Calculating premiums based on actuarial models and risk factors	Set premiums using actuarial models coming from the pricing area	Calculation of Technical Provisions and SCR
Model validation and sensitivity testing for accuracy and compliance	Define policy terms	Produce quarterly/annual Reports



Effectiveness improvement



Efficiency improvement



Both

01. How can innovation supercharge an organization to deliver measurable business benefits?

Innovation and optimization are revolutionizing actuarial areas by enabling faster, more accurate processes and enhancing strategic decision making.

Across the insurance value chain, AI and advanced analytics drive efficiency, predictive power, and regulatory alignment.

Together, these advancements empower actuaries to deliver greater business value, boost profitability, and sharpen competitive advantage.



01. How can innovation supercharge an organization to deliver measurable business benefits?

AI and innovation are transforming actuarial functions, enabling faster, smarter, and more strategic operations. From valuation to capital management, these advancements are helping actuaries deliver greater business impact.

- In **valuation and reserving**, AI accelerates complex actuarial modelling and simplifies business assumptions, significantly reducing the time needed for financial reporting. This frees up actuarial teams to focus on strategic decisions that improve business performance and budget efficiency.
- For **risk management**, automation streamlines repetitive actuarial tasks, allowing teams to focus on higher value, strategic work. Advanced analytics powered by AI and ML enhance predictive insights, improve assumption setting, and support regulatory compliance, driving better risk adjusted outcomes.
- Regarding **product development and pricing**, continuous innovation demands that products, processes, and IT systems evolve dynamically. This also requires upskilling or reorganizing teams to adapt to the changing environment and maintain competitiveness.
- In **capital management** innovation enables dynamic, real time capital optimization using AI, cloud technologies, and real time data. Predictive analytics improve capital efficiency and cost reduction, while explainable AI models enhance regulatory compliance and trust, strengthening market and supervisory positioning.

AI driven innovation is reshaping actuarial work across all areas, enabling smarter decisions, greater efficiency, and sustained competitive advantage.

**"The world is moving.
The risk of being left
behind is as important
as the risk of working
and adopting the
technology."**

Halina von dem Hagen
Chief Risk Officer, Manulife



02. What value creation can be achieved through augmenting actuarial functions with advanced intelligence?

By integrating actuarial expertise with cutting-edge technologies, actuaries not only enhance efficiency across pricing, risk management, and product development but also unlock deeper insights and strategic foresight.

Embracing this evolution positions organizations to thrive amidst complexity, driving sustained value creation and long-term competitive advantage.



02. What value creation can be achieved through augmenting actuarial functions with advanced intelligence?

A Bionic Actuary creates value by merging traditional actuarial expertise with advanced technologies such as AI, ML, and automation to deliver enhanced insights, strategic foresight, and operational efficiency across the entire actuarial spectrum. By empowering actuaries to move beyond routine tasks and toward strategic advisory roles, the Bionic Actuary drives measurable improvements in profitability, operational resilience, customer value, and long-term shareholder returns.

- Integrating AI, predictive analytics, and automation into actuarial **risk management** delivers improved risk assessment accuracy, more proactive compliance, and faster identification of strategic opportunities. These technologies are enabling actuaries to evolve from purely quantitative roles into strategic advisors, **enhancing the organization's ability to manage complex scenarios, reduce inefficiencies, and drive long-term profitability.**
- In **valuation and reserving**, AI significantly reduces manual effort in valuation and reserving processes while improving output quality. Fewer model runs are needed, and AI can flag anomalies early by predicting expected outcomes. This enables teams to focus on higher-value analysis, increasing the credibility of financial forecasts and reserve estimates, while also improving efficiency and reducing error rates.
- Advanced intelligence is reshaping **capital management** by enhancing forecasting, allocation, and oversight:
 - **Scenario planning:** AI enables more precise and rapid ORSA modelling, climate stress testing, and geopolitical simulations.
 - **Capital allocation:** Real-time AI-driven models support dynamic, granular assessment of risk-adjusted returns, optimizing ROCE across portfolios.
 - **Solvency monitoring:** Continuous solvency assurance replaces periodic reviews, with AI providing early warnings of capital strain, enabling timely intervention and greater resilience.
- In **pricing and product development**, the "Bionic Actuary" integrates advanced analytics and automated code generation into pricing workflows, accelerating the development of accurate, customized models and simulations. This reduces time-to-market for new products, boosts responsiveness, and positions actuarial teams as agile enablers of innovation and competitive advantage.

"On average, a typical insurance company in the US spends 20 to 30 days finalizing all quarter-end deliverables internally, before submitting their 10-Q SEC filing or NAIC submission by the 45th day after the end of each quarter.

Now imagine cutting those days in half with AI!"

Tina Mashhadian

Senior Managing Consultant, Wavestone



"Actuaries are seen by some in the Insurtech community as conservative, not transformative; driven by regulation, not innovation."

Daniel Schreiber

CEO, Lemonade



03. As the world navigates an increasingly complex risk landscape, how could a Bionic Actuary help?

As the world faces an increasingly volatile and interconnected risk landscape, the actuarial profession must evolve to enable Insurance companies remain agile and effective.

By blending human judgment with machine intelligence, the Bionic Actuary ensures actuarial outputs remain robust even under volatile market conditions.



03. As the world navigates an increasingly complex risk landscape, how could a Bionic Actuary help?

The Bionic Actuary empowers Insurance companies to pull ahead from competitors. It is a transformative concept that merges the analytical rigor of actuarial science with the speed, scalability, and intelligence of emerging technologies such as AI, ML, and advanced data analytics.

- The Bionic Actuary is transforming how insurers approach **risk management** enabling a shift from reactive to proactive strategies. By leveraging predictive analytics and autonomous decision-making tools, actuaries can assess emerging threats and respond in real time. For instance, when regulatory changes or market volatility arise, AI models can rapidly analyze large datasets, run impact scenarios, and inform timely strategic adjustments.
- In **valuation and reserving**, the Bionic Actuary streamlines manual, data-heavy tasks, allowing actuaries to focus on assumption setting and insights. AI enhances accuracy by flagging anomalies and deviations in real time, strengthening early detection and improving the reliability of reserves and financial disclosures.
- From a **capital management** perspective, AI-enhanced actuarial tools are especially valuable in periods of volatility. In response to shocks like interest rate changes, cyber incidents, or natural disasters, these tools can combine internal risk profiles with real-time external data to quickly reassess capital needs. This enables timely actions such as adjusting investment strategies or securing reinsurance to protect solvency.
- Lastly, in **product development and pricing**, advanced analytics improve risk classification and pricing by enabling more precise identification of emerging risks. Actuaries can use these insights to better align product design with enterprise risk strategy, supporting more responsive and data-driven decision-making.

At the same time, a critical function of the Bionic Actuary is to understand and communicate the *limits* of AI – ensuring that ethical considerations, model governance, and human oversight remain integral parts of the decision-making process.

“The integration of AI into actuarial practice has accelerated dramatically in recent years, potentially transforming how actuaries approach traditional tasks and creating new opportunities for professional growth.”



**Society of
Actuaries (SOA)**

04. Which actuarial functions would benefit most by embracing AI?

AI is rapidly transforming the actuarial landscape, offering groundbreaking potential across the full range of actuarial responsibilities.

Functions involving large volumes of data, repetitive tasks, and complex modeling stand to benefit the most – especially in valuation, reserving, capital optimization, risk management, and product development.



04. Which actuarial functions would benefit most by embracing AI?

Artificial Intelligence is reshaping actuarial work by automating complex, data-intensive tasks with greater speed and precision. It enhances efficiency, insight, and governance across functions like valuation, capital planning, and risk management—empowering actuaries to deliver stronger strategic value.

In **valuation and reserving**, AI improves the efficiency and accuracy of traditionally manual tasks such as stochastic modelling, assumption setting, roll-forwards, and earnings attribution. These processes are often error-prone and time-consuming.

AI enables faster execution, automatic anomaly detection, and real-time oversight through version control and model validation – reducing risk and increasing transparency.

In **capital management**, AI transforms capital management from a compliance-focused activity into a strategic driver. It enhances model calibration, integrates real-time and high-dimensional data, and improves capital adequacy assessments.

For forward-looking planning, AI enables more dynamic scenario analysis and stress testing, supporting more agile and resilient balance sheet management.

Within **risk management**, AI enhances risk management by improving financial and market risk models, detecting emerging patterns early, and enabling dynamic adjustment of exposure models. It supports frameworks like ORSA through ongoing risk monitoring and scenario generation, while also strengthening operational controls – particularly in fraud detection and behavioral analytics – across claims and underwriting..

Product development and pricing AI drives smarter segmentation, behavioral prediction, and real-time pricing optimization. Actuaries can rapidly test pricing strategies, align products with risk appetite, and respond faster to market shifts, enabling more competitive and tailored offerings.

AI enhances – not replaces – actuarial expertise, boosting decision speed, accuracy, and impact. Those using AI will lead in the evolving insurance industry.

“Artificial Intelligence is transforming actuarial work in ways we never thought possible.”

Ronald Richman
Founder & CEO, insureAI



Valuation and reserving actuaries can boost accuracy and efficiency by adopting bionic approaches in their work

Grouping

Grouping insurance contracts, also known as risk pooling or segmentation, is essential for efficient risk assessment, pricing, and reserving.

By grouping contracts with similar risk characteristics, insurers ensure homogeneity, regulatory compliance and actuarial precision.

AI techniques like clustering and classification streamline this process by rapidly analyzing large datasets, uncovering complex patterns, and enhancing data quality to optimize reserving.

Calculation

AI can greatly optimize complex stochastic calculations in insurance valuation.

For example, Canadian mortgage insurance actuaries run about 10,000 scenarios per bank certificate to assess default risk. Since each scenario takes up to an hour, evaluating 500,000 policies becomes computationally intense and time-consuming.

AI reduces the number of full-path scenarios while maintaining accuracy. It predicts key metrics like default rates and capital needs, and flags large discrepancies between expected and actual results. This enables early detection of model issues and timely corrections before regulatory deadlines.

Data Validation

Integrating AI into workflows automates processes and improves model accuracy, leading to more reliable data validation.

- AI automates data cleaning by detecting missing values and inconsistencies, ensuring high-quality inputs for actuarial models and reducing errors in projections and risk assessments.
- AI platforms validate models by checking assumptions, data sources, grouping, and outputs, enhancing result reliability.
- Real-time anomaly detection enables insurers to quickly spot and address significant changes or issues.

Reporting

Valuation actuaries are key to financial reporting under standards like Solvency II and IFRS 17, often spending significant time on documentation and narrative reports.

Generative AI can automate much of this by learning from past reports producing initial drafts that interpret model outputs and explain assumption changes. Actuaries then refine these drafts, improving consistency and reducing manual effort.

This shortens reporting timelines and frees actuaries to focus on strategic analysis and decision making.

Decision Making

AI is becoming a key driver of strategic decision making.

- It provides early warnings for risk-based capital planning by analyzing emerging risks like cyber and climate threats from trusted news sources.
- Bionic actuaries use machine learning to simulate scenarios – such as market crashes or regulatory shifts – for proactive capital and reinsurance adjustments.
- Enhanced forecasting enhances predictions of claims, premiums, and investment income, aiding CFOs in capital allocation, dividends, and M&A decisions.

05. How would a Bionic workforce supercharge a business' net profit and shareholder value?

A Bionic workforce can transform actuarial functions by increasing accuracy, reducing costs, and improving capital efficiency. This enables faster financial closings, smarter risk decisions, more precise pricing, and dynamic capital deployment.

Ultimately, the approach boosts returns, strengthens resilience, and positions businesses for sustainable growth.



05. How would a Bionic workforce supercharge a business' net profit and shareholder value?

The Bionic workforce, where actuarial expertise is enhanced by AI and automation, is reshaping core actuarial functions. This transformation enables faster, smarter decisions that improve efficiency, reduce costs, and enhance competitiveness.

- **Valuation and reserving** actuaries can evolve into bionic actuaries, enabling faster, more accurate work that supports quicker book closures and fewer discrepancies. This reduces operational costs, strengthens capital management, and improves insights into risks and assumptions – ultimately enhancing competitiveness and shareholder value.
- In **risk management** advanced analytics and early warning systems boost efficiency and reduce costly errors. This agility helps businesses respond quickly to market shifts and regulatory changes, optimize capital use, and invest in high – return initiatives – strengthening shareholder value.
- In **product development and pricing**, better risk modelling helps actuaries make smarter use of customer data (e.g., tracking, loyalty apps). This improves pricing accuracy and performance, boosting efficiency without compromising quality.
- In **capital management**, data-driven allocation frameworks boost capital productivity by directing funds to high-return areas without excess buffers. Digital workflows and AI-powered scenario modelling ease impact assessments of strategic moves. Greater transparency and strong solvency signals build investor confidence, potentially lowering funding costs and improving market access.

By integrating Bionic capabilities into actuarial areas, insurers can unlock greater efficiency, resilience, and financial performance in an increasingly complex environment.

Up to **30%**
or an equivalent of **60 person days**
of expert capacity can be freed up during the busiest time of the year.

This leads to a **significant cut in costs**
and to a measurable increase in quality.

GenAI: Impact on reporting times during the Closing Period

The Head of Actuarial Function of a leading International Primary Insurer recently highlighted that preparing a single regulatory report – such as the SFCR, RSR, or IFRS 17 – can require up to 200 person-days per closing cycle across their German entities.

A significant portion of this effort falls on actuarial teams during the already time-critical closing period.

Wavestone's GenAI solution offers a transformative opportunity to reduce this burden. By training GenAI models on historical reports and data, the technology can generate high-quality first drafts of regulatory documentation. This allows actuarial experts to focus on the complex analysis and validation – improving efficiency, consistency and reporting timelines.



About Wavestone

Wavestone is your most trusted consulting partner for strategic transformations worldwide.

With a global presence, we stand by our clients in all regions as they develop solutions for an intensively competitive and fast-changing market.

Becoming more resilient and agile in a sustainable way, as technology, digitalization, and generative AI reshape industries and business operations: this is the incredible challenge we take on every day by your side.

How do we help Insurance clients with AI?

Wavestone's Unified AI Orchestration Framework provides a structured way to scale AI through employee-centered orchestration.

The framework consists of four layers: Foundation, Intelligence, Orchestration, and Transformation, each of which requires progress on both the tech and people fronts to fully unlock value.

View more insights

- [Global Insurance Market Pulse](#)
- [Customer experience will become a major factor in success](#)
- [Large language models in Insurance: hype or real productivity boost?](#)
- [How to succeed in your quest for customer centricity](#)

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Eduardo plays a pivotal role in guiding global insurance and reinsurance clients in critical strategic and operational decision-making concerning their future processes, organizational structure, and supporting systems.



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Reza has a track record of working with Insurance clients to implement digital solutions. These include the roll-out of policy admin systems, data migration solutions as well as supporting app rationalization and consolidation initiatives. He has strong Leadership and Programme Delivery management skills & has lead teams of 100+ people.



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Craig is an enterprise transformation specialist for the insurance industry, bringing disparate teams, processes and technologies together to transform an organization under a singular vision and approach.

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