

Insurtech Global Outlook 2025

Emerging Technologies

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Emerging Techs: The Fuel for the Next Waves

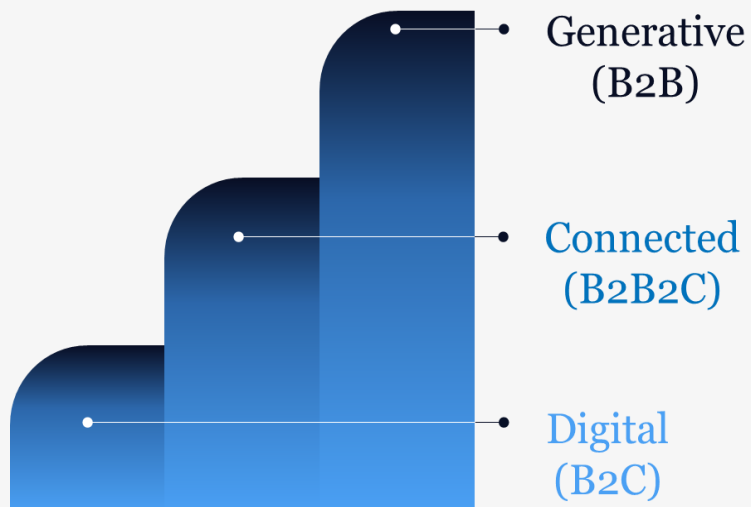
The Fuel for the Next Wave

The latest Insurtech Global Outlook delves into the evolution of the three waves of Insurtech. Looking ahead, generative insurance promises to usher in a new era of productivity and innovation, fueled by the transformative potential of emerging technologies

Overwhelming investments in emerging technologies are set to redefine the Insurtech landscape. Artificial Intelligence alone is fueling both private and public

markets, with AI investments projected to reach \$200 billion, according to Goldman Sachs.

Three Insurtech Waves



Challenges and Pain Points

- Emerging Technology Challenges
- Generative Insurance
- Tech Challenges
- Integration with Ecosystem
- Business Challenges
- Legacy and Culture

Over the past five years, the insurance sector has navigated numerous challenges. During this time, we've witnessed the rise and fall of innovative insurance models and ongoing debates surrounding the true value of Insurtech. The search for a definitive "winner" in this space remains unresolved and, likely, never will be.

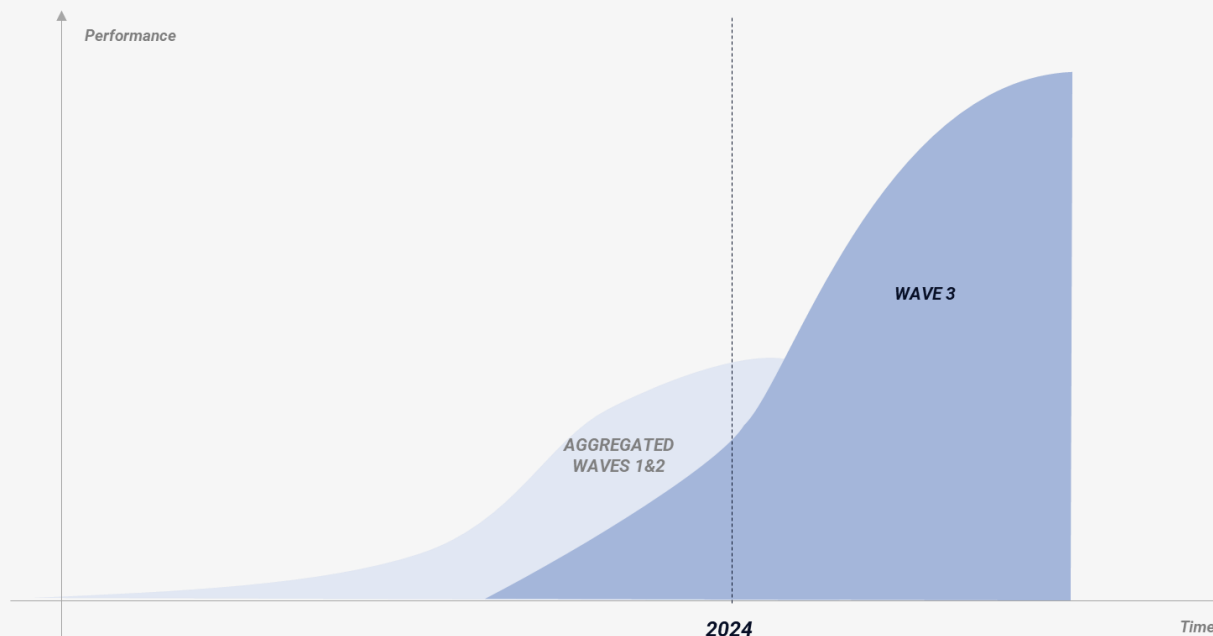
The mission is to provide valuable insights demands a fresh perspective. The notion that the insurance industry was evolving in one clear direction has proven to be an oversimplified explanation of the complex challenges, opportunities, and trends facing the industry. Instead, we must acknowledge both the current realities and future expectations to gain a comprehensive understanding of the insurance landscape.

DIFFERENT PERSPECTIVES	WAVE ONE	WAVE TWO	WAVE THREE
Insurers	■ Focused on transitioning from legacy systems to digital platforms, collaborating with Insurtech to enhance customer engagement.	■ Evolved to become orchestrators in connected ecosystems, integrating IoT, UBI, and real-time data for personalized services.	■ Challenged to solve complex emerging risks such as Cyber Threats and Climate Risk
Insurtech	■ Disruptors introducing customer-focused, transparent, and automated solutions but struggled with profitability.	■ Shifted to become enablers, supporting traditional insurers through APIs, data analytics, and embedded insurance models.	■ Technology oriented companies leveraging emerging tech to provide specific insurance solutions
New Entrants	■ Tech companies (Amazon, Google) entered insurance by exploring tech infrastructure's role in insurance, without fully disrupting the core business.	■ Tech companies, financial services and Industry Leaders move into the insurance sector distributing or managing new insurance products.	■ New entrants in the insurance sector include AI-driven Insurtech, quantum computing pioneers, all leveraging emerging tech for a leap in productivity

The evolution of AI has transformed the insurance market landscape. Over the past years, a marked optimism about technology has accelerated the digital transformation of the entire market at an impressive pace. Emerging techs are poised to impact the sector profoundly, from reshaping competition and infrastructure to transforming insurance products.

Emerging technologies will inevitably reshape the insurance sector. For industry players, opting out of this transformation is simply not an option. In the evolving global context—characterized by automation, efficiency, and technological innovation—failure is a risk, but it pales in comparison to the consequences of failing to adapt.

Innovation Insurtech Waves



Emerging technologies are shaping key priorities such as efficiency, sustainability, and risk coverage. Emerging Technologies are personalizing customer experiences, while pricing tech enables real-time, data-driven pricing. Cleantech enhances climate risk assessments, Blockchain improves transparency, and Digital twins aid disaster planning.

Emerging technologies are reshaping industries with a wide range of impactful use cases, showcasing their transformative potential. Within this expansive landscape, certain applications stand out for their proven success and significant market influence. These

examples highlight tangible innovation and strategic partnerships that enhance their real-world relevance. Below are the highlighted examples that serve as benchmarks for ongoing technological evolution.

Gen AI	01 / 02 / 03 /	Enhanced Underwriting Distribution, Sales & Support Claim/Fraud-free Insurance
Blockchain	01 / 02 / 03 /	Enhanced Underwriting Distribution, Sales & Support Claim/Fraud-free Insurance
Metaverse	01 / 02 / 03 /	Virtual Claim Management Underwriting Customer Experience
Cleantech	01 / 02 / 03 /	Advanced Climate Risk Assessment Sustainable Underwriting & Green Incentives Renewable Energy Insurance
Quantum Computing	01 / 02 / 03 /	Risk analysis, Underwriting & Fraud Claim management Portfolio optimisation
Digital Twins	01 / 02 / 03 /	Accuracy in Risk Assessment Scenario Analysis & Disaster Response Fraud Detection & Cost Reduction
Satellite & Data	01 / 02 / 03 /	Weather forecasting Location data Predictive Model & Risk Assessment
Pricing Tech	01 / 02 / 03 /	Data-Driven Pricing Optimization Real-Time Risk Assessment Personalized & Targeted Insurance
AV	01 / 02 / 03 /	Enhanced Risk Assessment and Pricing Automated Claims Processing Fraud Detection & Verification
Smart Robotics	01 / 02 / 03 /	Claims management Policy administration Predictive Model & Risk Assessment
Emotional Recognition	01 / 02 / 03 /	Real-Time Risk Assessment Mental Health Scoring Improved Customer Support
Digital Human	01 / 02 / 03 /	Digital Agents Automated Customer Support Augmented Underwriting

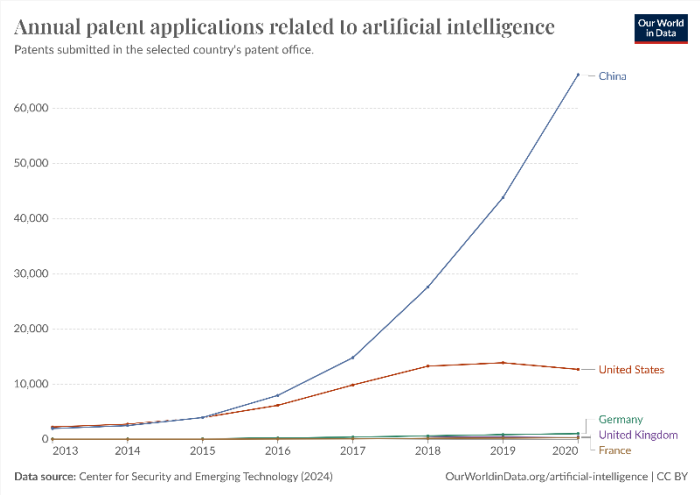
Regulation in the Context of Emerging Technologies

Partnerships between insurers and tech giants to implement deep tech solutions illustrate how early adoption can provide competitive advantages. However, the debate over AI regulation remains crucial. Over-regulation could stifle AI adoption, leaving Europe behind in the global race. Regulators will need to balance ethical concerns, such as privacy and fairness while maintaining the rapid pace of innovation.

In a game theory framework, we’ve created regulators and tech players have competing strategies. Short-term, delaying regulation gives players a first-mover advantage but risks unethical practices. On the other hand, immediate regulation builds trust but slows adoption. In the long run, a shift toward balanced regulation could benefit those who act responsibly from the start.

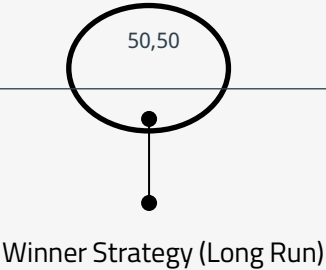
Hence, this simple game has a dangerous incentive to delay regulation as much as they can in the next gold rush, especially in a context in which China and the USA fight for leadership.

Illustration of AI Competition



Source: Our World Data

A/B (Market share %)	Regulate now		Delay	
	Regulate Now		Delay	
Regulate Now	50,50		0,100	
Delay	100,0		50,50	



Regulation Game Theory Framework: Made by the Authors. Table 3

Europe Regulation-Competitiveness Dilemma

The EU Data Act and the Future of European Competitiveness report both underscore the vital role of AI in securing Europe’s future, albeit through different lenses. For the insurance sector, this presents a nuanced challenge: balancing the acceleration of AI-driven innovations such as automated underwriting, claims management, and risk modeling, with the need for responsible governance to ensure transparency, fairness, and compliance.

Over-regulation risks slowing down AI adoption, which could weaken Europe’s ability to compete globally in areas like Insurtech and predictive analytics.

AI has catalyzed broader discussions on Europe’s competitiveness, but innovation at large remains at stake. For insurers, staying ahead in this emerging tech landscape is critical, as European companies face increasing competition from American Tech Giants and rapidly advancing Chinese Players.

Europe Opposing Angles

	European Data Act	Future European Competitiveness
AI Regulation vs Innovation	Emphasizes strict regulation on high-risk AI systems to protect privacy, safety, and fundamental rights.	Calls for less regulatory friction to foster growth in AI-driven sectors and encourage investment to close the gap with the US and China.
Speed of Innovation	Regulation prioritizes caution and ethical considerations, potentially slowing down AI innovation in sectors like medical AI, or automated decision-making.	Warns that slower innovation due to regulation will leave Europe behind global competitors. Suggesting that AI could be key to reigniting growth across sectors.
AI Development & Scaling	Focuses on ensuring safe deployment, with heavy compliance costs for scaling AI solutions, especially in critical sectors.	Encourages Europe to support AI startups and innovative companies to scale up quickly without burdensome regulations.

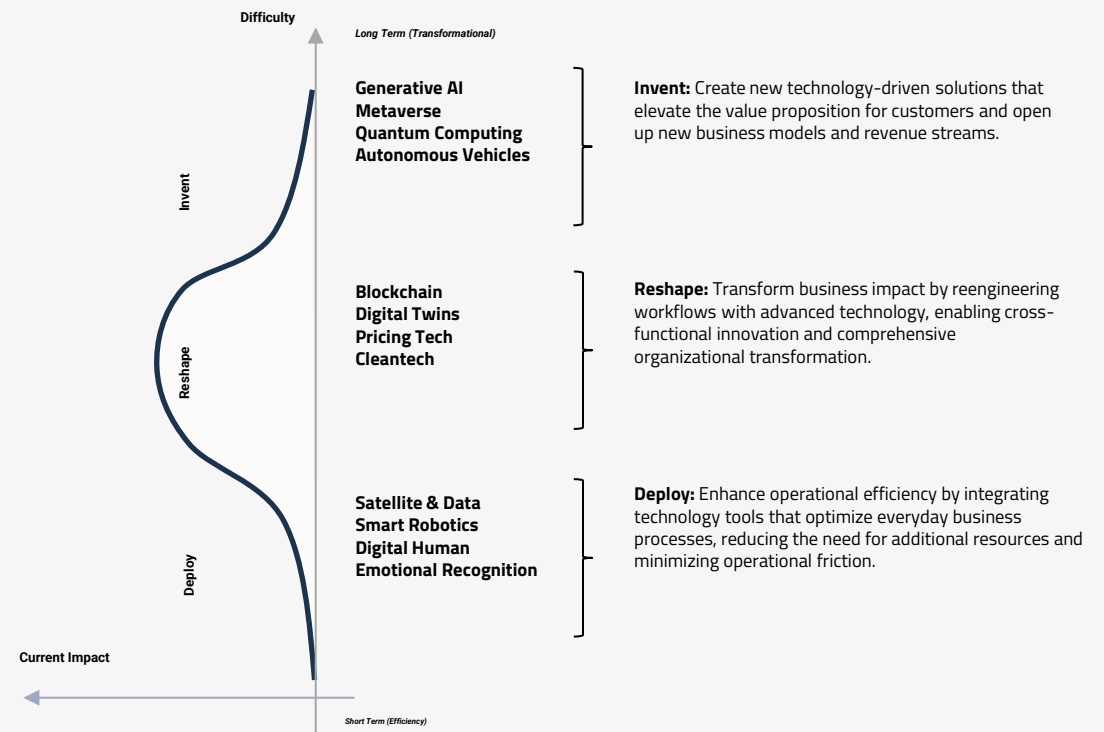
The Speed of Adoption: Implementation Stages.

As we've seen, one important aspect to consider is the speed of adoption. Emerging technologies can be categorized by their maturity and impact on the insurance sector.

Satellite & Data, for example, is among the most advanced, leveraging AI, IoT, and ML to drive real-time, personalized product innovations. Its lower implementation complexity is already reshaping the industry.

On the other hand, technologies like the Metaverse and Quantum Computing will take longer to fully mature and require more infrastructure and cultural adoption, while blockchain and digital twins are ready for early application. Therefore, there are three levels of speed adoption on the emerging technologies that helps to understand the impact from the insurance perspective:

(1) Transformational Technologies, (2) High Foundational Emerging Technologies (3) Low Foundational Emerging Technologies



Source: Made by the authors. Table 5

Transformational and Foundational Emerging Technologies

Transformational Emerging Technologies

Redefining the Insurance Landscape

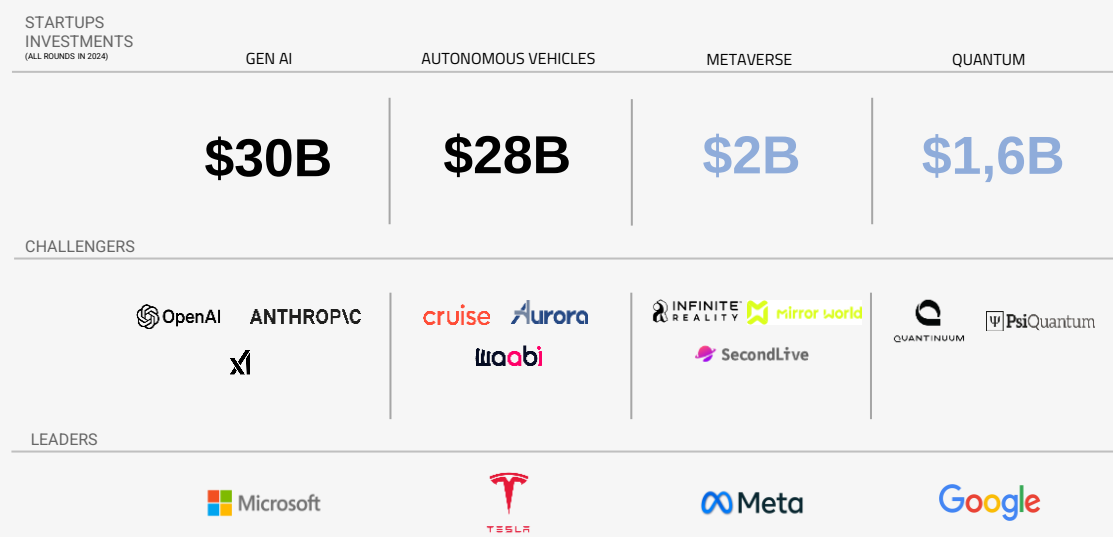
Transformational technologies are reshaping the insurance industry, backed by massive investments from tech giants like Nvidia, OpenAI, Google, Meta, Microsoft, and Apple. With combined efforts in fields such as generative AI, autonomous vehicles, quantum computing, and the metaverse.

Transformational Emerging Technologies

Transformational Emerging Technologies will change the playfield of the Insurance sector. These techs impact on the whole Insurance ecosystem changing the underlying assets, efficiency standards and insurance ecosystems borders. Insurers have little or no control on the development of these technologies and will apply them as they come relying heavily on tech companies or enablers.

Emerging technologies are changing the insurance ecosystem, impacting assets, efficiency standards, and boundaries. Startup funding in Generative AI and autonomous vehicles is reaching \$30 billion. Metaverse and Quantum Computing have a large amounts invested by Governments and Tech Giants, but limited startup funding. Insurers have limited control over these technologies' development and will rely on partnerships with tech giants, who are positioning themselves as leaders in these fields through significant investments. For instance, Meta efforts on Metaverse is estimated at 46 B USD.

Emerging Tech Transformational: Startup Investments



Insurers As Catalysts for the Transition In Major Industries

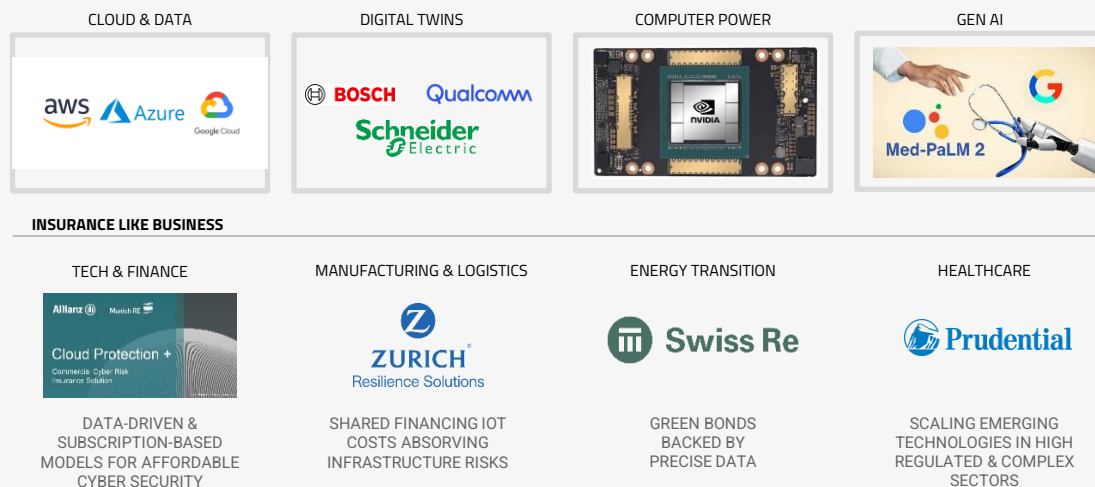
Tech giants' substantial investments in emerging technologies are not direct threats to the insurance industry but rather enablers that reshape the technological foundation insurers rely on. These partnerships are paving the way for a more agile, data-driven insurance ecosystem, unlocking opportunities for innovation and collaboration.

For example, subscription-based models in sectors like cybersecurity and clean energy financing.

These models allow insurers to help businesses overcome high upfront costs, enhance operational resilience, and facilitate smooth transitions to emerging risk landscapes. Leading

players in the industry, such as Allianz and Munich Re, are driving cybersecurity adoption through subscription offerings, while Zurich, in collaboration with IoT providers, supports upfront investments, enabling accessible and proactive risk management.

Strategic Partnerships Insurance and Tech Titans



In addition, firms like Swiss Re and Prudential are pioneering similar strategies, particularly in highly regulated, complex markets. These efforts not only reduce risks but also improve scalability and operational efficiency, creating value for clients and stakeholders alike.

Catalysts for Change: Trailblazing Cybersecurity: Munich Re, Allianz, and Google Cloud Redefine Risk Management with Cloud Protection+.

Munich Re's collaboration with Google Cloud and Allianz highlights the transformative impact of partnerships between insurers and tech giants. These alliances leverage technological advancements to address emerging challenges while reshaping the insurance industry's foundational strategies.

With businesses increasingly relying on cloud computing, the risks of data breaches, operational disruptions, and regulatory challenges have intensified. In response, Munich Re and Allianz introduced Cloud Protection +, a cyber insurance product designed specifically for Google Cloud customers.

This solution offers extensive coverage for first-party and third-party cyber risks, including enhanced features such as extended restoration periods, trade secret protection, and tailored liability coverage for Google services. Allianz complements this initiative through its expertise in risk analysis and operational resilience, ensuring a robust and comprehensive approach to addressing cloud risks.

The integration of Google Cloud's Risk Manager tools ensures efficient risk assessment and underwriting, setting a new industry standard for accessibility and ease. This collaborative effort builds confidence in adopting cloud-based solutions, aligning with trends in subscription-based, scalable risk management that promote operational efficiency and innovation.

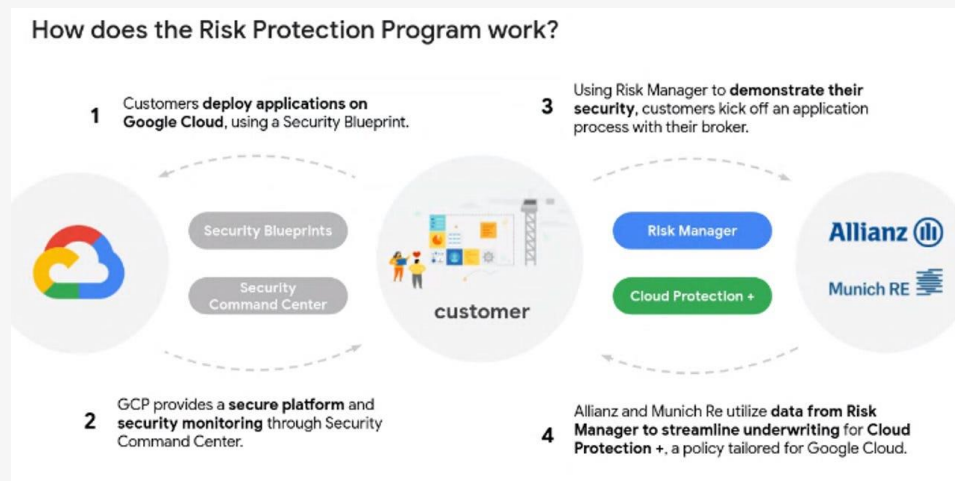


Image from <https://www.cloud-protection-plus.com/en.html>

Catalysts for Change: Swiss Re and NVIDIA Unite Technology and Sustainability to Drive Climate Resilience

Swiss Re exemplifies how insurers are harnessing advanced technologies to drive global sustainability and address climate risks. While NVIDIA revolutionizes computing power with cutting-edge chips, enabling faster data processing and analysis, insurers like Swiss Re use these technological advancements to develop precise, data-driven models for assessing and managing climate-related risks.

Swiss Re Asset Management's climate action approach:

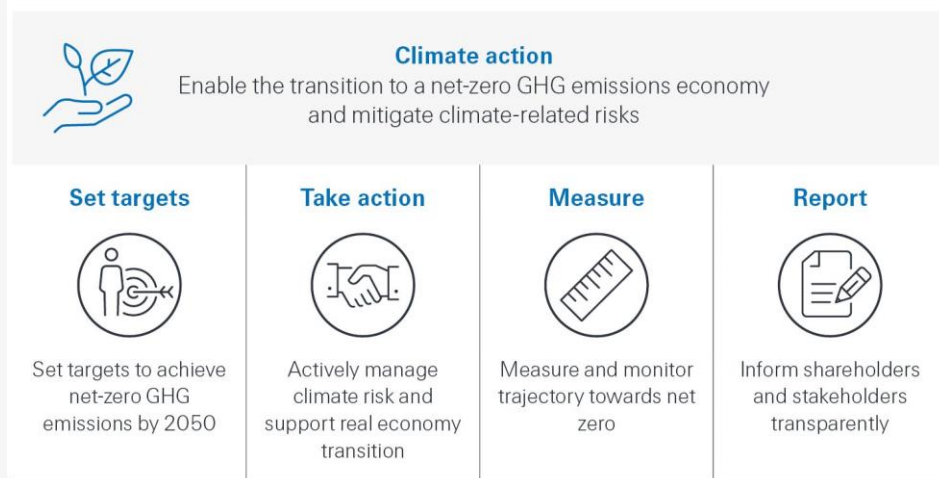


Image from <https://www.swissre.com/our-business/managing-our-assets/responsible-investing-in-practice/climate-action.html>

In 2023, Swiss Re exceeded its target of holding USD 4 billion in green, social, and sustainability bonds, reaching USD 4.4 billion. These investments, rigorously assessed against the International Capital Market Association's Green and Social Bond Principles, contribute to real-world outcomes such as renewable energy projects and social infrastructure.

NVIDIA's advancements in computing power indirectly enable insurers to process and analyze complex data more efficiently, strengthening their ability to measure the impact and effectiveness of these investments. Swiss Re also allocated USD 1.2 billion to renewable energy and social infrastructure debt, exceeding its target.

Enhanced computational capabilities empower the insurance industry to optimize capital deployment, evaluate risks with precision, and refine models for financing sustainable projects. This case underscores how insurers, supported by technological breakthroughs, are transforming sustainability into a measurable and actionable strategy.

Catalysts for Change: Prudential and Google Pioneering AI-Driven Innovations Transforming Healthcare Accessibility

Prudential plc's partnership with Google Cloud highlights how insurers are utilizing advanced technologies to redefine healthcare service delivery and accessibility. Through the integration of Google Cloud's MedLM, a suite of foundation models tailored for healthcare applications,

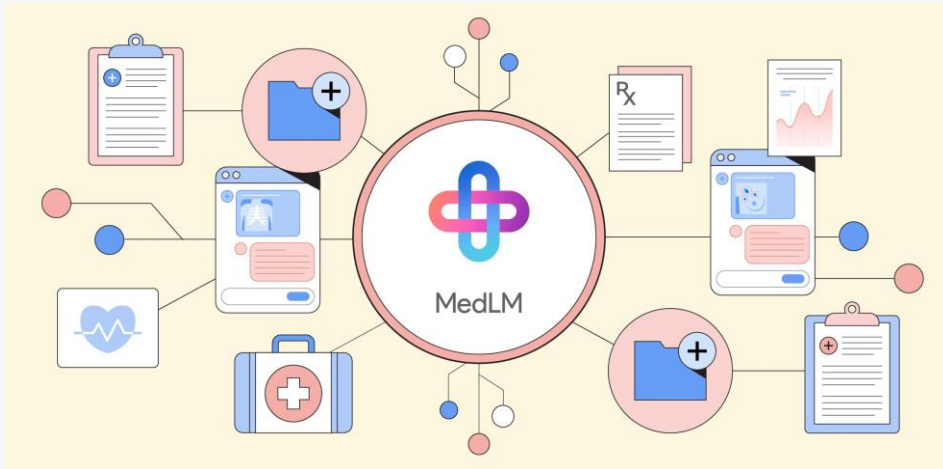


Image from <https://cloud.google.com/blog/topics/healthcare-life-sciences/introducing-medlm-for-the-healthcare-industry>

Prudential is transforming the medical insurance claims process. This technology enables the efficient analysis and summarization of claim-related documents, such as medical reports and invoices, leading to faster approvals and payouts while enhancing operational precision.

In 2024, Prudential and Google Cloud launched an AI Lab, the first of its kind in the insurance sector across Asia and Africa. This initiative focuses on developing cutting-edge AI-driven solutions to enhance customer experiences, streamline internal processes, and make healthcare and financial security more widely accessible. These advancements directly address the unique challenges of underserved regions, improving access to essential services.

Prudential's strategy demonstrates the transformative potential of combining advanced computing capabilities with data-driven models. These efforts position the insurer as a leader in driving healthcare innovation, addressing systemic inefficiencies, and improving accessibility. Such collaborations underscore the critical role insurers play in catalyzing technological advancements to create scalable and impactful solutions for global healthcare challenges.

Foundational Emerging Technologies

Building Efficiency and Precision in the Insurance Value Chain

Foundational emerging technologies like Clean Tech, Pricing Tech, Blockchain, and Digital Twins are creating efficiencies across the insurance value chain. Insurers are leveraging their capabilities to achieve 20% faster claims processing, enhanced pricing accuracy, and improved transparency in operations.

Foundational Emerging Technologies - High

High foundational technologies are driving significant changes in the operations and business models of insurers. Advanced tools such as digital twins, clean technology, and blockchain are at the forefront of reshaping the insurance ecosystem by enabling more efficient, precise, and scalable solutions.

Supporting these innovations, underlying technologies like AI, machine learning (ML), and IoT have matured to unlock next-level applications.

For example, sensors combined with AI can now process vast datasets at unprecedented speeds, facilitating innovative underwriting models such as dynamic pricing and enhanced risk assessment.

Furthermore, the interplay between emerging technologies and critical risks cannot be overlooked. The value these technologies create for insurance stakeholders is undeniable, as they address pressing global challenges, including: Misinformation and disinformation, Extreme weather events, and Cybersecurity threats.

Main Insurance Applications

Technology	Main Applications	Insurtechs
Cleantech	Green Supply Chain, ESG Scoring, Climate Risk	Ecovadis, Claims Carbon, ClimateX
Blockchain	Digital Assets, Cargo Insurance, Smart Contracts	CoinCover, Chainlink, Insurwave, Everledger, Settlemint
Digital Twins	Visual Intelligence, Cost Prediction / Repair Estimation, Claims Automation	Simulytic, One Concern, ZestyAI, Binah.ai
Pricing Tech	Health Scoring, Telematics, Microsegmentation, Underwriting	Akur 8, Gradient AI, Earnix

Made by the authors. Table 5

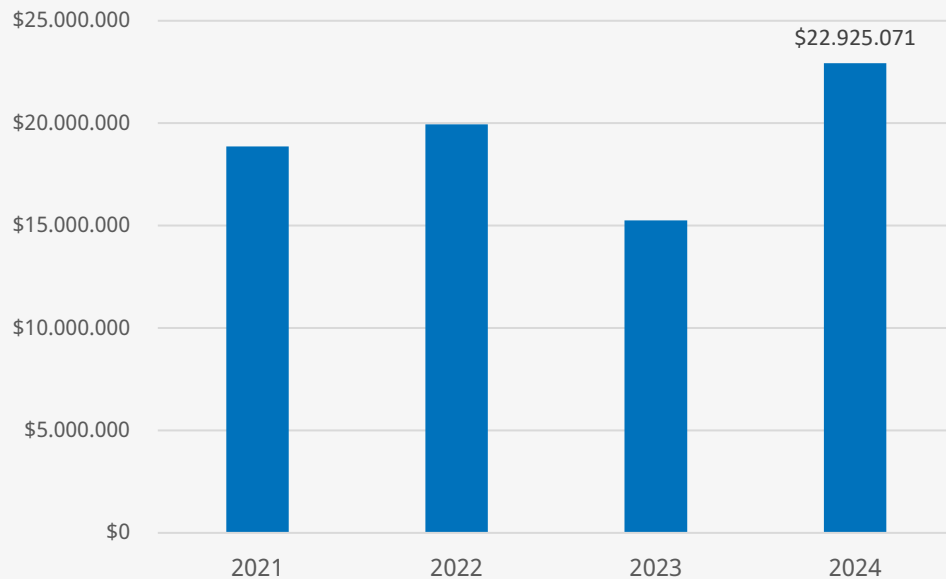
Pricing technology stands out as the most mature Foundational Emerging Technology within the Insurtech landscape. While other insurance technologies have seen funding levels around \$100M USD, pricing technology has surged to over \$1B USD in 2024, accounting for nearly 30% of all Insurtech investments.

Notably, the average deal size in pricing tech now surpasses the record-breaking year of 2021, reaching an impressive \$23M USD in 2024. The adoption of AI and machine learning (ML) has been the

primary driver behind this growth. However, for these technologies to enable scalable and sustainable businesses, transparency in AI-driven pricing models remains essential.

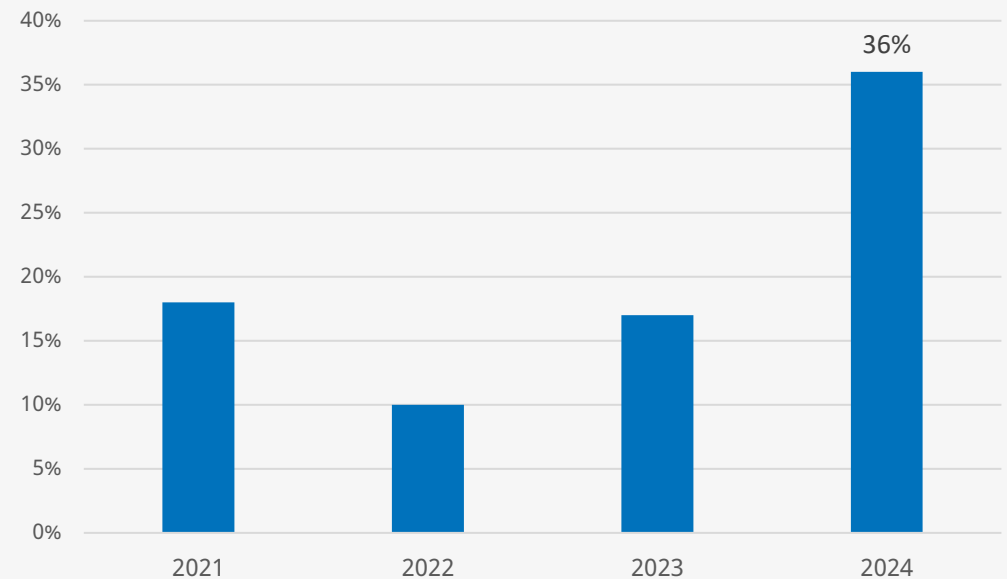
For CIOs, one of the core modernization challenges lies in bridging the gap between business and IT. This emphasizes the growing need for clear, understandable, and transparent AI models to ensure trust, adoption, and alignment across the organization.

PRICING INSURTECH AVERAGE DEAL SIZE



Made by the authors. Graph 1

PRICING INSURTECH AI & ML (% of Money Raised)

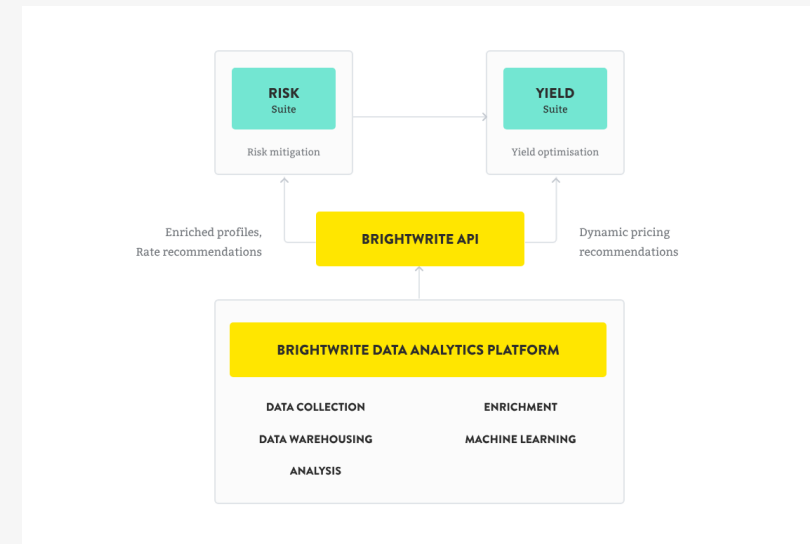


Made by the authors. Graph 2

The rise of APIs and microservices has transformed the insurance industry, particularly in Property & Casualty (P&C). These technologies allow insurers to integrate real-time data streams and flexible system architectures, enabling dynamic adjustments to policy pricing.

In 2024, pricing Insurtech are leveraging these capabilities to refine policy offerings, creating more personalized and competitive products. This dynamic approach not only enhances customer satisfaction but also ensures pricing precision in response to shifting market conditions and customer needs.

The Cover Genius BrightWrite is a dynamic pricing interesting case and lies in its ability to drive total transaction value (TTV). Leveraging customer behavior, historical data, and real-time inputs, BrightWrite enhances the TTV by aligning product offerings with individual customer needs and preferences. This data-driven optimization enables insurers to achieve greater efficiency and profitability while providing customers with relevant, cost-effective solutions. As pricing technologies continue to evolve, insurers embracing these tools are better positioned to thrive in a highly competitive and dynamic marketplace.

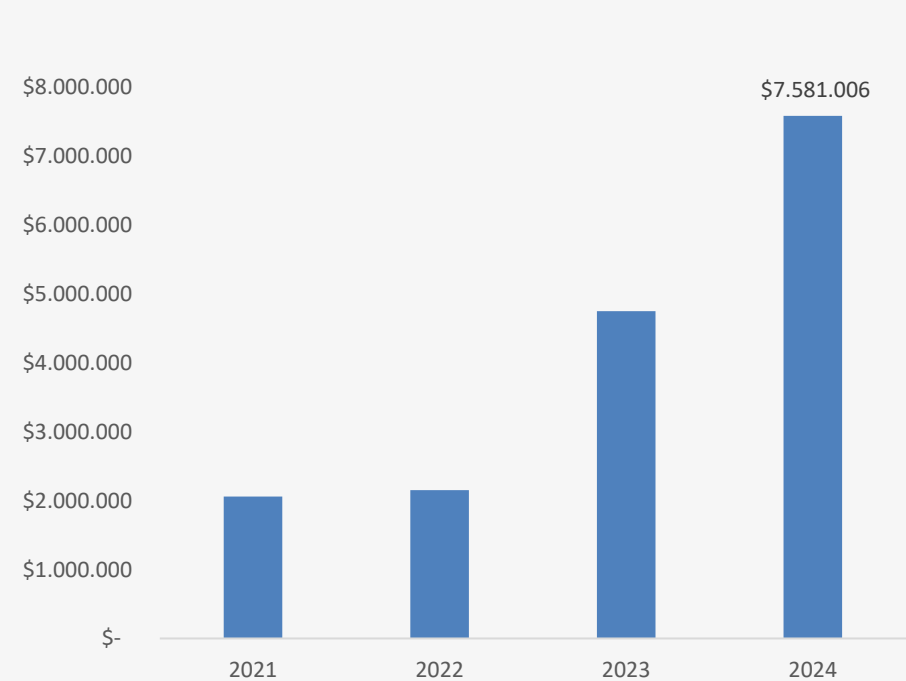


Source: covergenius.com/brightwrite, Access in Dec 2024

Blockchain Insurtech average deal size in increased significantly, primarily driven by the growth of parametric insurance. The escalating risks associated with climate change have reinforced the adoption of smart contracts for parametric coverages, enabling faster settlements through predetermined triggers and payout mechanisms.

Smart contracts also play a pivotal role in improving transparency and standardization, fostering better collaboration among investors, insurers, and regulators.

BLOCKCHAIN INSURTECH AVERAGE DEAL SIZE



Made by the authors. Graph 3

They enhance privacy while automating health claims processing, creating efficiencies and building trust within the ecosystem. Innovative companies like Arbol, Re and MediConCen exemplify blockchain’s potential in insurance.

BLOCKCHAIN INSURTECH HIGHLIGHTS 2024



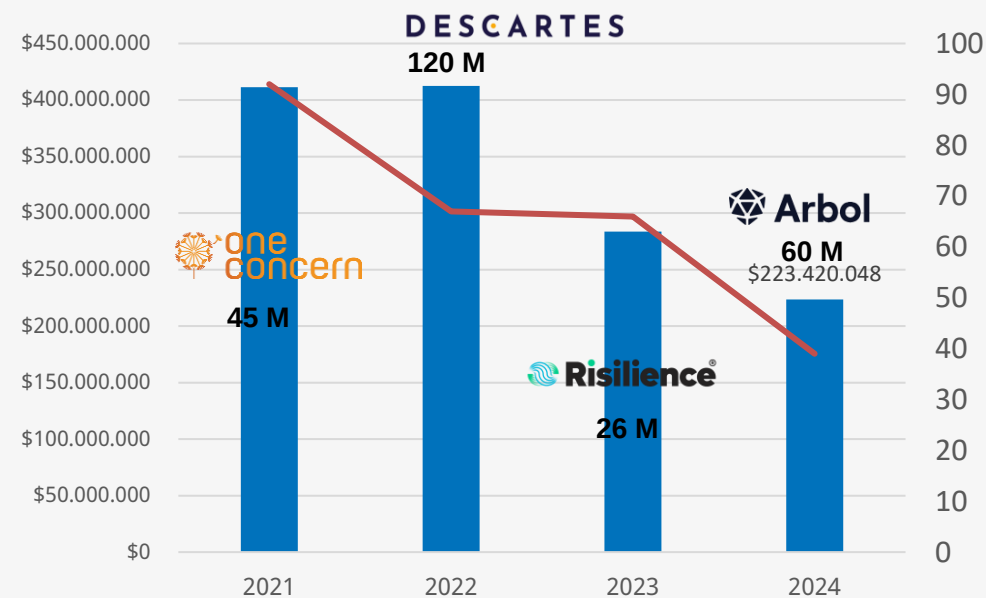
Made by the authors. Graph 4

Climate Risk and Other Emerging Technologies

The connection between blockchain and climate risks is gaining prominence in the insurance industry, driven by its role in enabling parametric coverages and enhancing transparency in settlements. At the same time, climate risks are catalyzing investments in Digital Twins, Clean Tech, and Satellite & Data technologies, which offer transformative potential for analyzing and mitigating environmental threats.

Despite these advancements, the trajectory of investment in climate-focused Insurtech significantly lags behind the broader climate tech market. In 2024, around \$200 million USD was allocated to Insurtech solutions focusing on Clean Tech, Satellite & Data, and Digital Twins, compared to \$1.3 billion USD raised by climate fintech startups, according to Dealroom research.

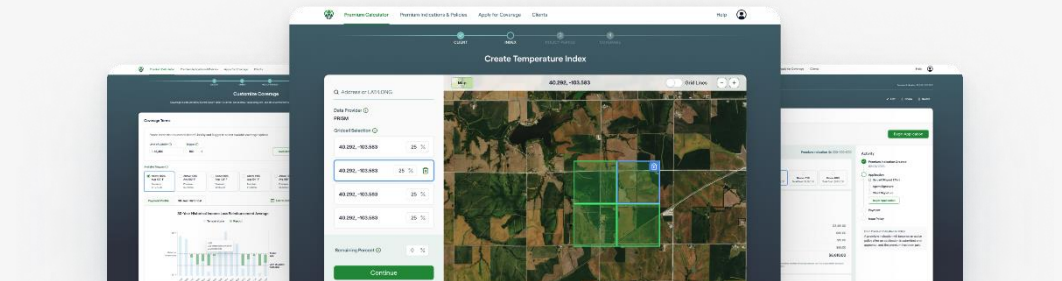
CLIMATE RELATED INSURTECH - MONEY RAISED (BAR) AND NUMBER OF DEALS (LINE)



Made by the authors. Graph 5

Blockchain technology is driving innovation in parametric insurance, particularly in addressing climate risks. The integration of distributed ledger systems with a growing array of data sources, including IoT sensors and satellite imagery, enables insurers to harness real-time, verifiable information to structure precise insurance solutions. AI and machine learning further enhance the accuracy of climate risk models, offering advanced predictive capabilities and the ability to analyze vast datasets, which is essential in adapting to an increasingly volatile risk landscape.

Arbol provides a compelling example of blockchain's potential in parametric insurance. Through the use of smart contracts and global, tamper-proof datasets, Arbol automates claims settlements based on pre-defined triggers, such as weather anomalies. This approach eliminates manual intervention, reduces delays, and ensures transparency, while also lowering operational costs. Arbol's model not only addresses inefficiencies in traditional insurance but also extends coverage to underserved markets by making parametric solutions more accessible and scalable.



Source: www.arbol.io/solutions/platform, Access in Dec 2024

This disparity underscores the gap between insurers' reliance on emerging technologies and the scale of climate risks they face. Initiatives such as Seaya's €300 million climate-tech fund and the European Investment Fund's €350 million commitment to Kembara's deeptech and climate fund are making strides in addressing climate challenges.

Similarly, Mundi Climate Fund channels capital into scalable solutions for climate resilience, while Bill Gates underscores a pivotal moment in the deployment of climate technologies, drawing parallels to the global health efforts of the early 2000s. Much like the unified response to reduce child mortality through scaling existing solutions and fostering innovation in global health, the climate tech sector is now entering a phase of rapid scaling and deployment.

CLIMATE TECH INVESTOR INTEREST

European Investment Fund puts €350M into Kembara's deeptech and climate fund

Kembara aims to invest in Series B and C startups, focusing on deeptech and climate, mainly in Germany, Spain, France, and Sweden, as well as in other EU Member States.

Seaya closes €300 million climate-tech fund, Southern Europe's biggest investment vehicle for impact-driven companies



Bezos Earth Fund launches \$100 million AI for Climate and Nature Grand Challenge

Application now open for innovative solutions as part of its AI for Climate and Nature Grand Challenge

The climate insurance-linked security (ILS) market has demonstrated growth in issuance volume, increasing by \$2.5 billion to reach \$17.9 billion in 2024. However, this expansion occurs against the backdrop of an overall market contraction, with total size declining from \$63 billion to \$45.6 billion. This trend indicates a fragmented growth trajectory where increased issuance does not fully translate into broader market scaling.

A key contributing factor may be the uneven alignment of insurers' internal climate risk management strategies and the accessibility of reliable data to enhance underwriting capabilities. For instance, climate fintech investments of \$1.3 billion further underscore the gap between innovation and broader integration in the insurance ecosystem. In contrast, the cyber ILS market remains in its early stages but exhibits incremental growth.

The observed Insurtech and Markets gap may reflect internal efforts by insurers to manage climate risks through traditional means, the lack of specialized financial instruments, and the limited accessibility of robust climate data for underwriting purposes. Addressing these factors will be essential to fostering the growth and scalability of climate-related insurance solutions.

		NEW ISSUANCE VOLUME	TOTAL MARKET SIZE	TOTAL INSURERS
2024	CLIMATE INSURANCE-LINKED SECURITY MARKET	\$17.9B	\$45.6B	64
		\$15.4B	\$63B	13
2023	CYBER INSURANCE-LINKED SECURITY MARKET	\$575M	NEW MARKET	5
		\$400M	NEW MARKET	4

Foundational Emerging Technologies - Low

Technologies like Satellite & Data, Smart Robotics, Digital Humans, and Emotional Recognition are transforming insurance by enhancing automation, climate risk management, and customer experience. Satellite & Data solutions, used by Insurtech like Descartes and ICEYE, enable precise risk assessments for floods and extreme weather, improving underwriting and claims efficiency. Smart Robotics, led by platforms like UiPath, streamlines back-office operations, automating repetitive tasks such as claims processing and policy administration.

On the customer side, Digital Humans like Nettle AI and Soul Machines deliver personalized, round-the-clock service, while Emotional Recognition tools such as Wysa enhance mental health support and nuanced risk assessments. These innovations collectively empower insurers to better manage risks, optimize operations, and improve customer engagement with scalable, data-driven solutions.

Main Insurance Applications

Technology	Main Applications	Insurtechs
Satellite & Data	Climate Risk, Property Risk, Extreme Weather, Flood Insurance	Descartes, Arbol, ICEYE, Kettle, Neptune, Etherisc
Digital Human	Customer Service, Digital Agents	Nettle AI, Soul Machines, Glia
Smart Robotics	Automation	UiPath, Automation Anywhere
Emotional Recognition	Mental Health, Risk Assessment	Wysa, Verisk

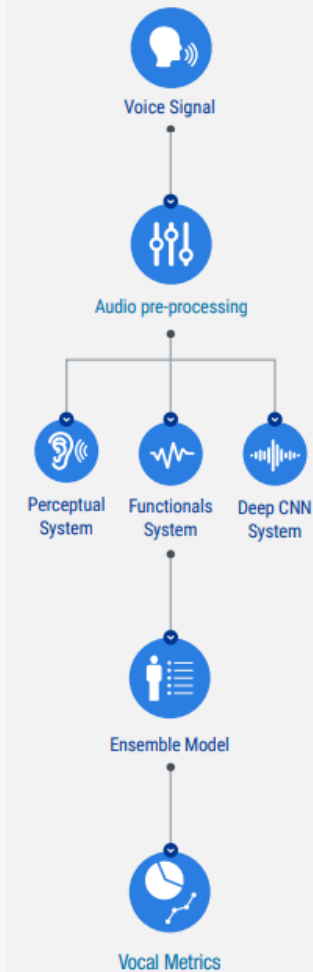
On the lower end of Foundational Emerging Technologies, insurtechs such as Nettle AI, Verisk, ICEYE, and Peak 3 focus on improving distinct aspects of the insurance value chain. Nettle AI enhances customer engagement by delivering personalized support through digital human interfaces, while Verisk utilizes biometrics and emotional recognition to refine risk assessments and claims processing.

These targeted innovations aim to address specific challenges within customer experience and underwriting, offering incremental improvements rather than transformative change.

On the operational side, ICEYE leverages satellite data to support precise climate risk management, enabling insurers to assess property risks and extreme weather events more effectively. Although these technologies provide measurable benefits, their broader impact remains limited due to the complexity of implementation and integration into insurers' legacy systems.



Figure 1: The detection system



Complex Systems in Insurance

The Connected Tech Insurance Ecosystem

As emerging technologies integrate more deeply into the insurance ecosystem, the industry's increasingly connected and digitized nature has amplified its complexity. Traditional models, once foundational, are becoming obsolete, and causality often lacks clear explanation in this evolving environment.

Consequently, insurers are compelled to move beyond parsimonious models and explore more sophisticated, data-driven alternatives to effectively navigate this dynamic landscape.

Interconnected Emerging Risks

As technological advancements accelerate, the interconnectedness among corporations, governments, and society continues to deepen. Consequently, emerging risks are becoming increasingly linked, blurring traditional business boundaries and challenging existing frameworks.

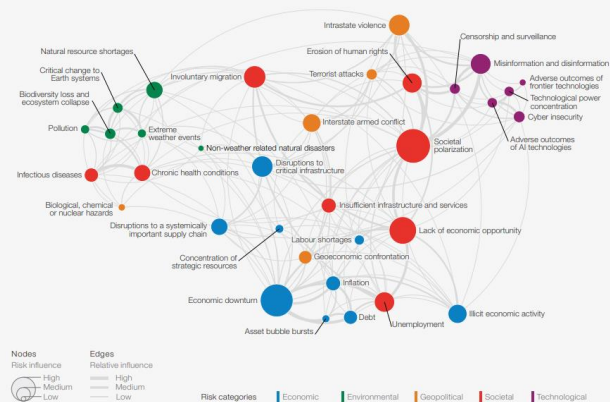
According to the World Economic Forum, emerging risks can be classified into five categories: Economic, Environmental, Geopolitical, Societal, and Technological. These categories do not exist in isolation..

Risk Interconnections Map

For example, a Technological risk such as Cyber Insecurity may disrupt critical infrastructure, which in turn could affect the continuity of chronic health treatments, illustrating the cascading impacts of interconnected risks.

For the insurance industry, these interconnected and relatively new risks pose a significant challenge due to their complexity and lack of relevance of historical data. Despite these challenges, the successful adaptation to these emerging risks presents substantial opportunities, offering new avenues to ensure assets and expand the scope of coverage.

FIGURE 1.7 | Global risks landscape: an interconnections map



► **Complex Risk, but Simple CX by Descartes**

Underwriting: Descartes Underwriting is an innovative Insurtech that has raised over \$140 million from leading investors such as Alma Mundi and Seaya. The company specializes in simplifying complex and emerging risk coverages through parametric insurance, offering clients streamlined processes and enhanced transparency.



Image from <https://descartesunderwriting.com/solutions/ndbi>

Automatic triggers embedded in their policies eliminate the need for lengthy claims processes, creating a seamless and efficient experience for onboarding and payouts.

Initially known for its leadership in climate risk coverages, Descartes Underwriting has recently expanded its product offerings to include cyber insurance. This strategic move has created valuable synergies between the two product lines, enabling the development of new capital solutions such as "Parametric Insurance for Non-Damage Business Interruption."

This comprehensive offering addresses a critical pain point for clients: financial losses caused by business interruptions, whether triggered by direct or indirect variables. The approach reflects a deep understanding of the interconnected nature of emerging risks in today's world. Descartes provides clients with the confidence that they are protected against the unpredictable, no matter the underlying causes of disruption. This approach is a game-changer for businesses seeking to ensure operational and financial resilience in an increasingly uncertain environment.

Non Linear Dynamics

The insurance industry is evolving to incorporate less obvious causalities into its models. Emerging risks, along with their interconnections, reveal that analyzing isolated parts of a system is no longer sufficient to explain the complexities of the whole. A holistic view is becoming essential to truly understand and address the multifaceted nature of risks in today's interconnected world.

Exploring multiple, complementary lines of business is critical to gaining a more comprehensive understanding of the broader insurance landscape. These connections enable insurers to better model and predict risks across different domains, which enhances their ability to adapt to dynamic conditions.

For example, an auto insurance company that integrates insights from health-related variables can significantly improve its risk modeling. Mobility factors alone might not provide the full picture, as correlations between health and driving behavior can uncover hidden patterns that influence claims. While it is feasible to operate within a single domain, this narrow approach risks overlooking crucial causal relationships and interdependencies.

► Revolutionizing CAT Modeling with Terra Quantum

Quantum: Terra Quantum introduces a groundbreaking approach to natural catastrophe (CAT) modeling by leveraging quantum computing and Tensor networks. The probabilistic nature of quantum computation is a perfect match for the inherent uncertainty in CAT modeling, allowing insurers to quantify risks and predict the frequency and impact of rare, high-loss events with remarkable accuracy.

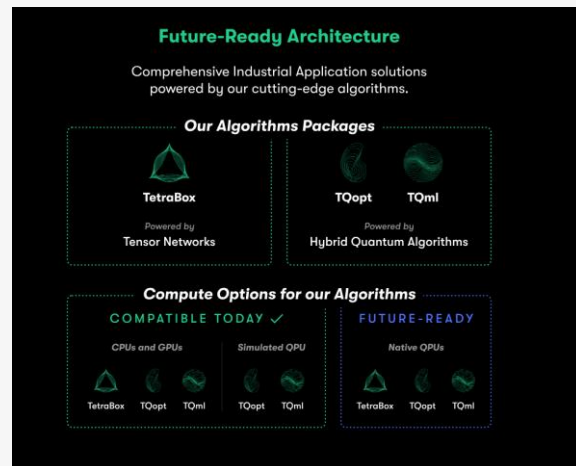


Image from <https://terraquantum.swiss/hybrid-quantum-algorithms>

Key benefits of Terra Quantum's solution include the ability to generate precise predictions from limited datasets, drastically improving processing speed and scalability. These capabilities enable insurers to mitigate one of their largest exposure areas: natural catastrophes. The advanced CAT modeling process reduces non-modeled risks by incorporating additional data factors, enhancing the characterization of historical risk records and enriching event catalogues.

Moreover, Terra Quantum's Tensor networks address critical gaps in traditional methods, such as reducing claims obscurity and preventing financial leakage through better policy modeling. Insurers can now make faster, more informed underwriting decisions while minimizing uncertainty in risk evaluation. Clients not only achieve greater operational efficiency but also enhance their ability to proactively manage significant risks, such as floods, earthquakes, and extreme weather events. This technology marks a pivotal shift in CAT modeling, enabling the insurance industry to better protect against natural disasters with confidence and precision.

The AI Black Boxes

The rise of AI specialists and AI-focused Insurtech has brought to light a critical challenge in the application of machine learning models in insurance: balancing transparency and explainability with the unparalleled power of artificial intelligence. While the strength of advanced AI lies in its ability to create and refine other AI models, this very capability often comes at the expense of clarity and human understanding.

As insurers aim to integrate complex relationships, variables, and advanced models to tap into new markets, the transparency of these systems tends to diminish. There is no question that technologies such as AI and quantum computing will enable the insurance ecosystem to achieve unprecedented levels of productivity. However, the trade-off between advancing technology and maintaining a clear, explainable framework for insurance products remains uncertain and potentially problematic. The core dilemma is exemplified by the question of how to measure the value AI and machine learning bring to the table beyond mere productivity gains.

If these systems operate as "black boxes," it becomes increasingly difficult to assess the true impact and reliability of their outputs. Insurers must confront the reality that maximizing the power of emerging technologies may inherently reduce transparency, presenting a challenge that must be carefully managed. Ultimately, the solution may lie in the intersection of human expertise and AI-driven systems with a suboptimal usage of technology.

Emerging technologies are fundamentally transforming the insurance ecosystem, redefining how risks are assessed, policies are underwritten, and customer experiences are delivered. Generative AI enhances underwriting efficiency and decision-making speed, while quantum computing revolutionizes catastrophe modeling with unparalleled predictive precision. Technologies like blockchain and digital twins are fostering transparency, operational efficiency, and resilience in disaster planning.

Foundational technologies such as pricing tech and satellite data are already driving measurable impacts, with real-time insights enabling personalized and dynamic insurance products. Transformational technologies like the metaverse and quantum computing, though in earlier stages of adoption, promise to reshape competitive boundaries and asset utilization in the long term.

Strategic partnerships between insurers and tech giants are pivotal, enabling insurers to leverage advanced capabilities while addressing challenges like regulatory alignment and ethical AI use. However, as highlighted, failing to adapt risks competitive disadvantages, especially in a global context where American and Chinese tech leaders push ahead. The future of insurance will be defined by agility, innovation, and the ability to navigate an increasingly interconnected and complex risk landscape.

