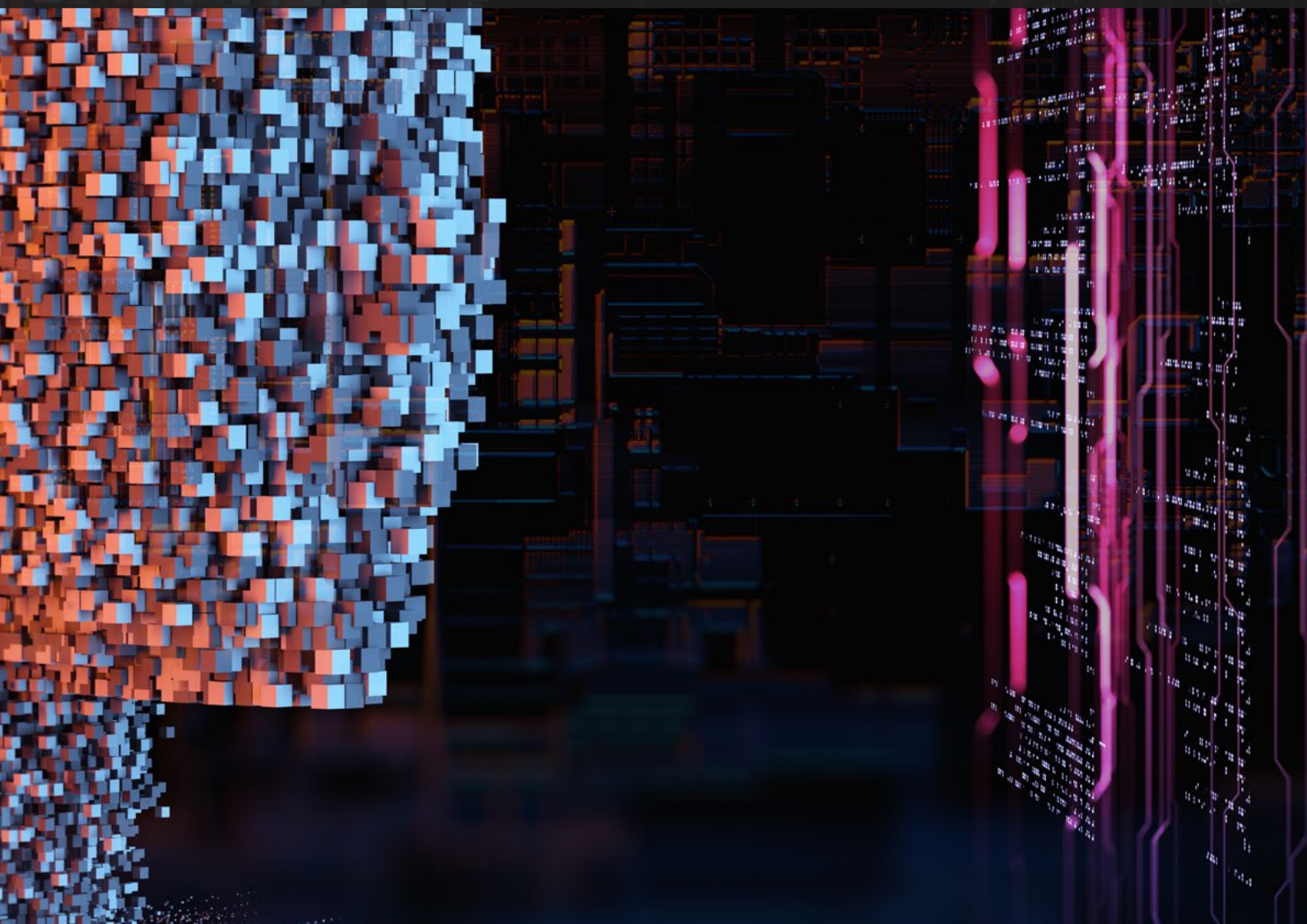
Munich RE

NOT IF, BUT HOW

Digitalisation:

Augmented Automated Underwriting: The next generation of underwriting



Introduction

In many ways, life insurance is like any other business. Success is largely dependent on efficient processes, satisfied customers and sustainable profit margins. However, there are important caveats: the customer experience is inherently problematic and the on-boarding process is complex and can involve multiple independent parties, making it inefficient by design. Moreover, the desire for decent margins co-exists with sensitivity around the societal impacts of profit-at-all-cost and the 'social good' of this kind of insurance.

These challenges have existed for as long as life insurance itself. Degrees of automation have been introduced over time to incrementally address some of these issues, but the fundamentals have not changed significantly – until now.

Currently, the life insurance industry exists in a world where customers' expectations have been transformed by technology in both their personal and professional lives. Convenience and speed are now of supreme value and place traditional life insurance practices in an unflattering spotlight. Attracting, engaging and retaining customers through the entire on-boarding process is becoming ever more challenging, putting margins at risk.

New technological capabilities allow us to directly confront these challenges. However, before we further explore this topic, there are questions of terminology to address.

Artificial Intelligence (AI), which will be discussed in greater depth in the next paper in this series, can often be used as an all-encompassing term for advanced analytics or to suggest a more advanced technique than is actually being used.

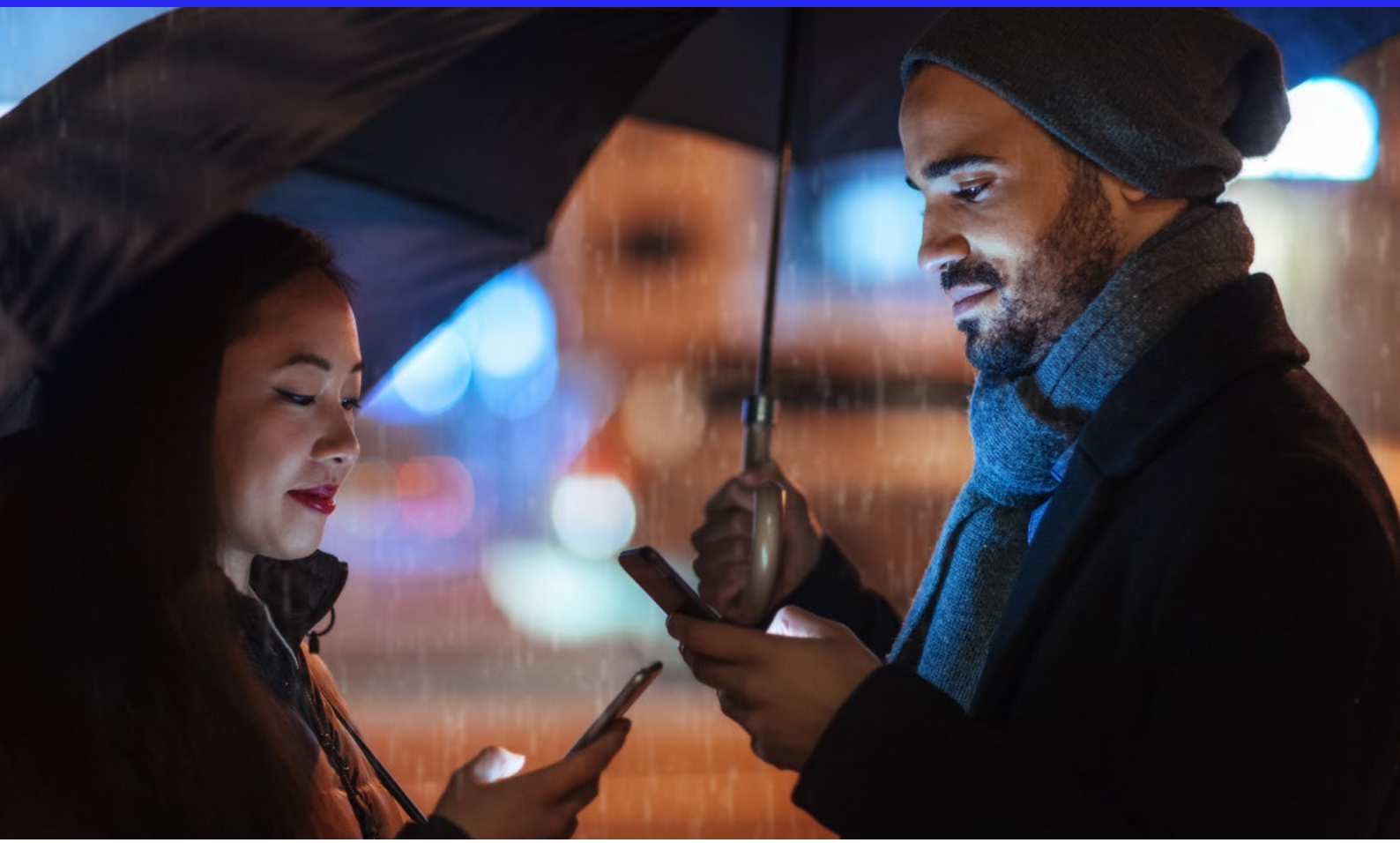
In addition, different regional histories and regulatory priorities have diversified language: what we call augmented automated underwriting (AAU) may also be described as augmented underwriting with AI, accelerated underwriting, or predictive underwriting, among other terms.

For the sake of simplicity, we use AAU in this paper, in which we examine:

- How AAU builds on and evolves previous technology investments and implementations
- How advanced analytics, predictive modelling, and machine learning change underwriting processes and transform the customer experience
- Whether AAU is the inevitable destination for life insurance underwriting

Part I:

Digital customers, digital technology



A new customer cohort

AAU is all about revolutionising the customer experience for the better. A generation of consumers, well-versed in researching, buying and reviewing products online, has entered the market for life insurance – but they are facing a buying experience that does not align to the expectations of 'digital natives'. As a result, our global customer base faces a broadly consistent set of challenges, despite regional differences.

This generation includes millennials, who are often dismissed as experience-driven, spendthrift consumers who are actively harming their own financial well-being. This stereotype is neither helpful nor accurate. The oldest members of this net-native cohort are fast-approaching 40, and have the same financial concerns and core needs as earlier customers.

Millennials are already acquiring and accessing bank accounts, payments, foreign exchange, mortgages and other insurance products through mobile apps, aggregators and price comparison sites. The contrast with the inconvenience, time and type of questions being asked for life insurance could not be more stark. Those questions and tests require details that people rarely share with anyone outside their closest family.

Even those who have no intention of falling out of the process are often left by the wayside, particularly when doctors' appointments, medical tests, blood-work and requests for further details frustrate the process. Evidence from aggregator sites shows us that speed to decision is key: prospective buyers are 50 per cent more likely to purchase the offers that appear most quickly. Traditional life insurance comes with too many barriers to entry, and too many decelerating factors.

Equally important, traditional sales techniques are losing their appeal, which is deeply problematic for what is traditionally a 'sold' product. Millennial customers, who are often more focused on near-term, tangible needs, are less likely to see brokers or agents that do not offer a digital and speedy process as an essential part of the sales process. This is a fairly substantial shift from Generation Xers – those born between the mid-1960s and late 1970s – who remain comfortable with more traditional approaches and slow turn-around times.

This shift is taking place against a backdrop of increasing pressure to push down the cost of onboarding customers as part of broader efficiency measures. Our own experience tells us that this is often coupled with a shortage of underwriting experience in certain regions, which places further constraints upon the business.

Finally, overlooking all of this are regulators and ombudsmen who are increasingly taking a punitive view of poor decision-making, risk management and asymmetric information between the consumer and the insurer.

A new customer cohort

In order to enhance customer experience, the challenges facing the life insurance industry are broadly recognised. However, so are the desired improvements. The industry's common goals include:

1. **Greater efficiency**

   Enabling firms to use fewer resources to deliver appropriate outcomes

2. **Greater effectiveness**

   Allowing resources to be allocated where they are most effective and can reach 'better' outcomes faster

3. **Greater consistency**

   Producing consistent outcomes and reducing monitoring through repeatable processes

4. **Greater transparency**

   Simplifying the decision process to produce a clear path to outcomes and ensuring actions are auditable

5. **Greater knowledge**

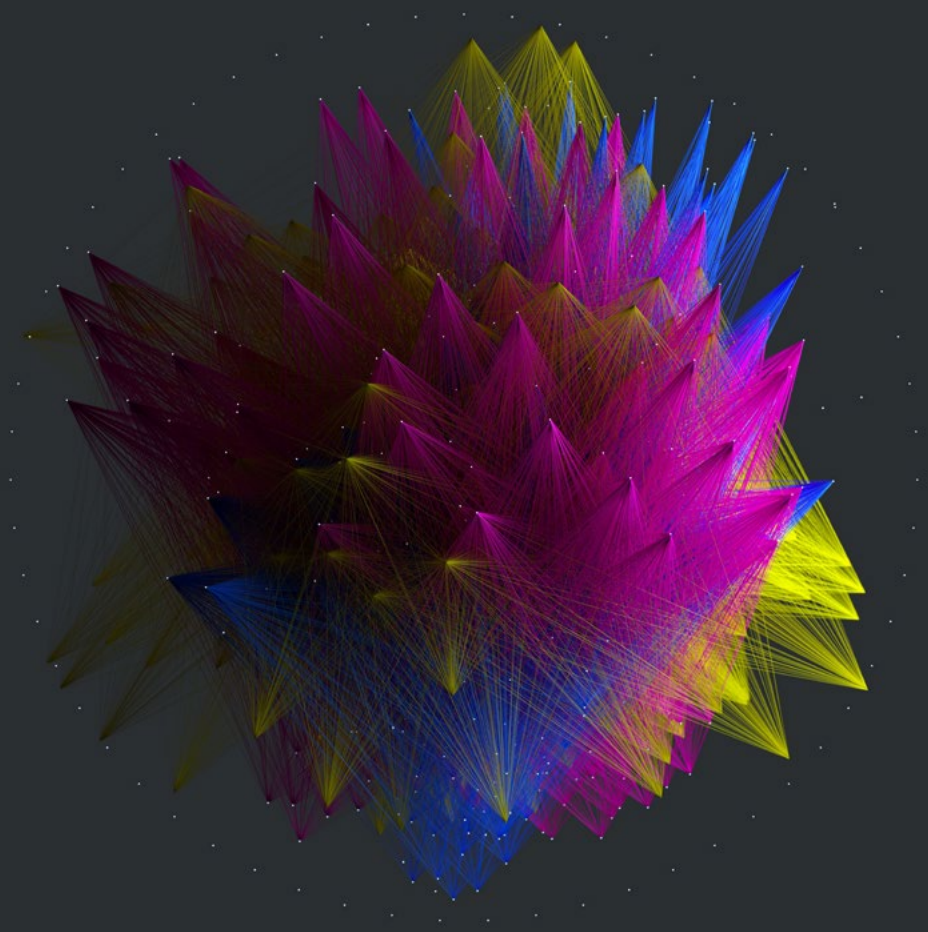
   To unlock better insights and improve opportunities for iterating success

As the next evolutionary stage in the history of technology and underwriting, AAU can deliver on all of these goals.

From automated to augmented

Technology has rightly been seen as a major part of the solution to the challenges outlined above for some time. The emergent class of 'insurtech' is the latest iteration of what has been a fairly lengthy evolution towards greater digitisation, as human judgement has been replaced by a more mathematical and scientific approach.

This digital evolution can be broken down into five distinctive phases, of which the first three will be familiar to most in the life insurance business.



First Generation: Black-box systems

Insurers digitised their systems and implemented jet-casing or clear-casing systems for online and back-office modes – the predecessors of the underwriting rules engine. These systems were often developed in house and intended to introduce some automated capabilities to the underwriting process. Typically, these 'engines' would allow application forms that had no disclosures to be expedited through the system and checked for some basic business validation rules. By speeding up the onboarding process, they provided a degree of efficiency. But they did not 'show their workings', which meant they gave no insight into how best to improve the underlying underwriting philosophy; and because they were mainly hard-coded rules, they offered only limited ability to adjust boundaries or parameters.

Second Generation: Electronic underwriting

The next iteration of systems gave underwriters the opportunity to review and amend their own underwriting philosophy. These systems allowed behavioural economics and external data to be introduced, but in most cases, they still required IT and programming expertise. Change requests had to be sent to IT and/or the reinsurer, leading to the build-up of lengthy queues. This became a strong constraining factor and did little to aid competitive differentiation.

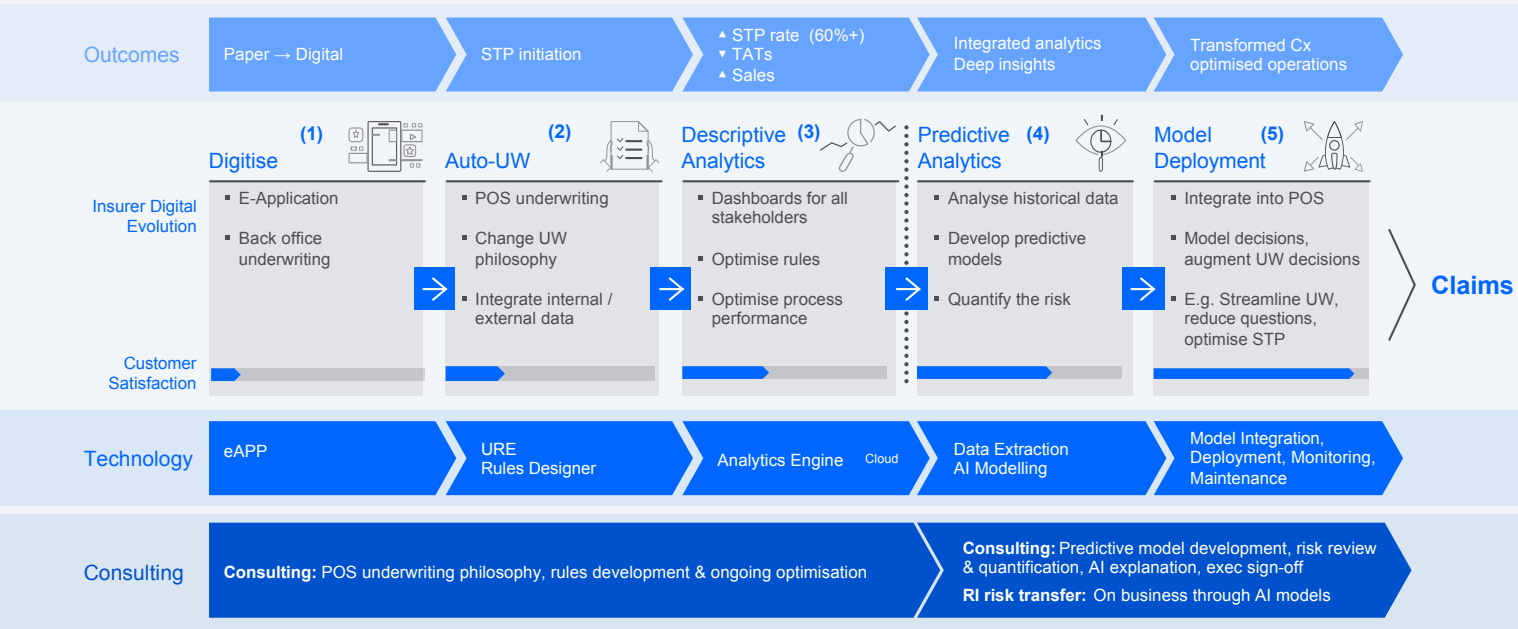
From automated to augmented

Third Generation: Descriptive analytics

This stage of system evolution offered descriptive analytic power via insights from dashboards and reports, better visualisation techniques and graphical user interfaces (GUIs). These improvements gave greater flexibility and power to individual underwriters, placing them in the driving seat and enabling them to manage and implement new business processes and change rules without IT or programming support. On the compliance front, reinsurers with conduct post-hoc auditing, either on-site or remotely, ultimately putting decision-making power in the hands of underwriters.

The majority of life insurance businesses use second or third-generation systems. However, the evolution is continuing. The fourth stage is where insurers are now able to obtain deeper insights from their data, using advanced analytics techniques, and developing predictive models that can further improve the customer experience, increase sales and enhance business performance.

Digital Roadmap...
from rules engines to AI/augmented underwriting



The Fourth Generation: Predictive analytics

Fourth generation solutions introduce advanced analytics.

This is a giant leap forward. All risk-based decisions hinge on making connections between various data points and identifying patterns within them; however, these patterns aren't always immediately discernible by humans. Advanced analytics can reveal these previously hidden connections and relationships with an exceptional degree of accuracy.

By using AI and machine learning techniques, insurers can, for example, identify which data-points in the application process are irrelevant or simply redundant, and which applications are now suitable for immediate straight-through processing (STP). The system can assess risk profiles and, in certain circumstances and with appropriate risk management, the number of questions asked can be significantly reduced with little to no impact on risk taken on by the life insurer. Certain parts of the application process may safely be eliminated altogether.

To illustrate the impact that analytics can have, consider the case of a potential customer aged 25-35, with an unusual condition, but common enough that there is plenty of data about other individuals with the same condition in the same age group. That data may show that a cohort of this group is still a low-risk category with an average life expectancy.

The data may also show that this cohort of customer is usually approved for standard life cover once all personal evidence has been reviewed. In other words, the insurer requires intrusive tests, asks multiple questions, and adds roadblocks to the process when the customer will be accepted anyway.

While some conditions can be obvious flags for life insurers, and the subsequent request for medical tests and evidence feels correct. Human judgements have been built into the system. However, what appears to be a common-sense decision is not necessarily the correct one. With AI and machine learning techniques, insurers gain a deeper understanding of these kind of counter-intuitive realities as well as the effects – past and present – of their chosen approach.

"Use predictive models to eliminate questions, reduce variables, change rules and secure an optimal result."

The Fifth Generation: AAU becomes business-as-usual

Many insurers have embarked on advanced analytics initiatives, but face challenges in effectively deploying the models developed. Fifth-generation systems leverage advanced analytical modelling by fully integrating predictive models into existing underwriting and new-business processes. This is what we mean by augmented automated underwriting (AAU).

To enable underwriters and data scientists to quickly and effectively deploy, integrate, monitor and evolve models over time, such that model management becomes business as usual, is a major challenge.

Technology that can predict an applicant's risk with an acceptable level of accuracy significantly improves the consumer experience and reduces onboarding barriers. AAU therefore has the potential to draw more people into the life insurance application process, and then keep them in that process for longer, to the benefit of customers and insurers alike.

Importantly, the adoption of this new technology does not require a 'rip and replace' approach. Instead, insurers can choose their preferred models, use existing rules-development capability to define interactions with those models, and incorporate those models by reconfiguring their existing underwriting processes. The final underwriting decision for life insurance applications may therefore use a model as an input to support and augment the rules-engine decision.

Models can be selected and deployed to achieve one of a number of goals, including but not limited to:

- Streamlining the underwriting process
- Transforming the consumer experience
- Reducing manual underwriting and medical evidence costs
- Improving turn-around times
- Increasing STP rates
- Decreasing the number of questions asked
- Identifying fraudulent behaviour
- Implementing up- and cross-selling campaigns

The degree to which the model response is used to determine the final underwriting decision will, of course, vary by insurer, use case, data availability and model confidence, as well as geographic location and regulation.

For example, one insurance firm in North America is in the process of transitioning to predictive modelling rather than opting for an overnight switch. Its use of predictive models allows individual underwriters to compare their decision-making with the model, and highlight where human and model are in sync to build confidence in the model itself as it increasingly influences decision-making.
On the other hand, two life insurers in Southeast Asia transitioned fully to predictive underwriting with models and technology developed by Munich Re.

The Fifth Generation: AAU becomes business-as-usual

This generation is not just about model development, however. Creating a product from the model has knock-on implications, including: understanding and quantifying the risk it may imply; quantifying any pricing implications; considering the explainability of the model; and obtaining executive sign-off before it goes into production.

It also requires that underwriters, operations staff and technologists work closely with actuaries, data scientists and data engineers in the development and sign-off of the model and its intended deployment. In many instances, insurers will want to share the risk of the model as it is eventually deployed, because it is such a departure from traditional approaches.

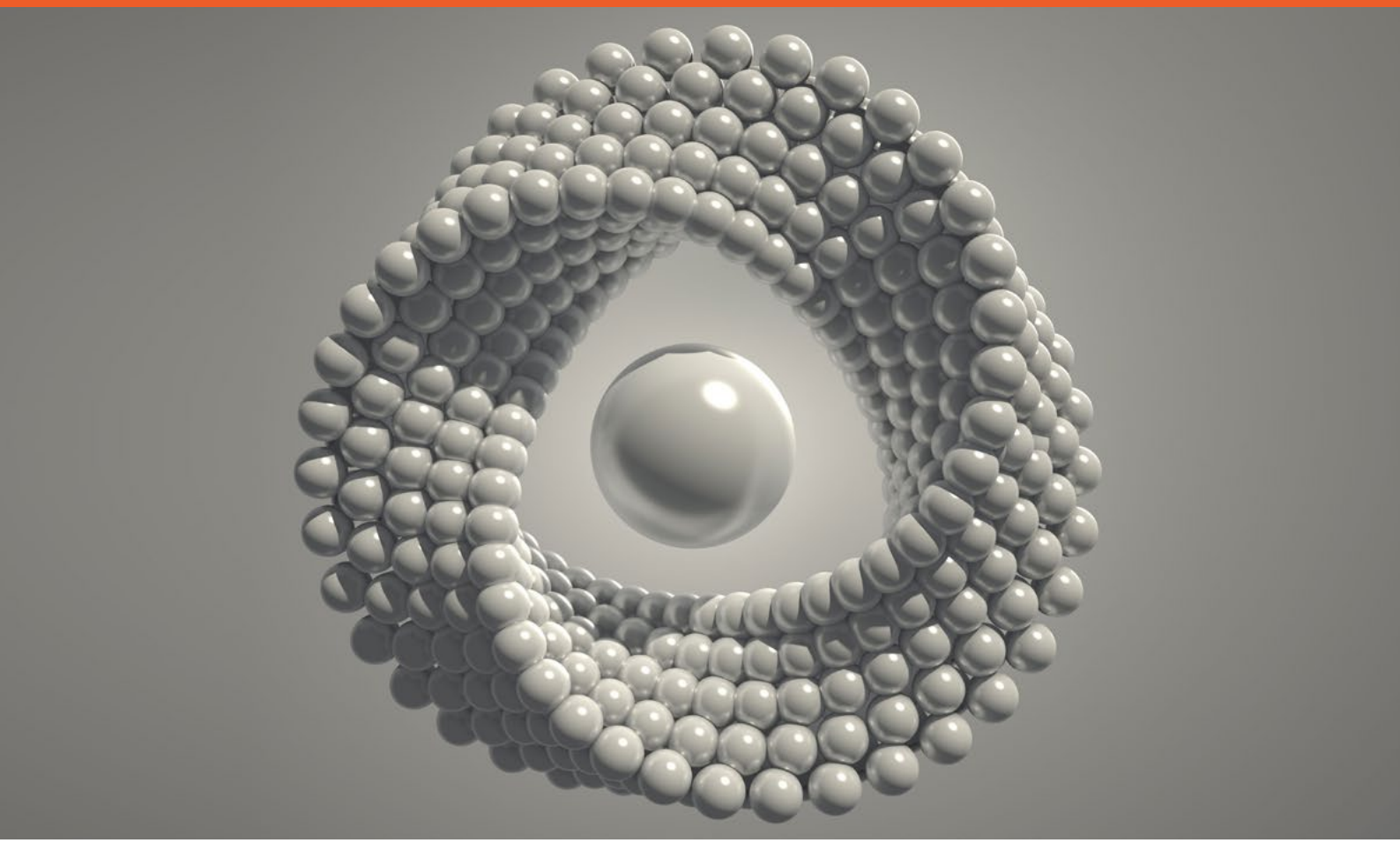
By deploying AAU, insurance firms have already achieved significant improvements to their STP rates and costs, but with only negligible increases to their own risk. Some examples from Munich Re's experience:

- Company A reduced the amount of medical evidence required of its potential customers, shortened its questionnaire significantly, and decreased the amount of manual processing undertaken by its underwriters, which increased its STP rate from 30% to 70%
- Company B pursues a stringent underwriting philosophy to safeguard profits but still increased its STP rate from 35% to 60%, decreasing its manual underwriting requirements and the associated costs, as well as minimising the amount of medical evidence demanded of applicants
- Company C increased its STP rate from an already impressive 60% to 80%, again decreasing its manual underwriting requirements and the associated costs, as well as minimising the amount of medical evidence demanded of applicants
- Despite eliminating 80% of its previous underwriting questions, Company D was able to offer standard rates to 50% of its applicants with only a minimal price increase

"Model selection and seamless integration for streamlined applications and accurate offers."

Part II:

Questions and answers



Regions and regulations

The fifth generation can therefore be seen as the next stage in the evolution of insurance technology, streamlining the customer experience while maintaining or even enhancing the life insurer's confidence in its risk evaluation processes.

While all paths may lead to AAU, the journeys are not identical. So far, we have discussed AAU as a general concept. However, there are regional differences which will determine how underwriters will effectively transition to AAU.

If we consider regulatory jurisdictions as a spectrum, the European model is at one end, while the general US model – allowing for variations within the 50 states – is at the other.

In general, the US market is fact-based and relies on extensive proof to validate the information that is provided. This creates a complex, parallel and multi-stage underwriting process, which requires detailed questionnaires and multiple data sources and leads to complex outcomes: preferred plus; preferred; standard; rated; declined; or postponed.

Automation is therefore also complex, with plenty of manual processes still required. For example, the demand from regulators in New York and California that underwriting rules be registered, places serious constraints on an underwriter's ability to update those rules in response to changing data patterns. In addition, the contestability period of 24 months means the burden of proof remains on the underwriter when decisions are challenged. The primary goal for US underwriters, therefore, is to accelerate and simplify this process.

In contrast, most countries in Europe apply the principle of utmost good faith. Customers provide information to insurers, who take it on trust when assessing risk. The process is typically simpler and more linear: interview, decision, additional evidence, and final decision. The complexity of the underwriting questionnaire depends on a number of factors, including product, distribution channel, engagement model, pricing, and marketing practice, but commonly accepted outcomes are standard; rated; declined; or postponed. The level of automation already in place also depends on a number of factors, ranging from market maturity and availability of structured data, to the nature of the underwriting process itself.

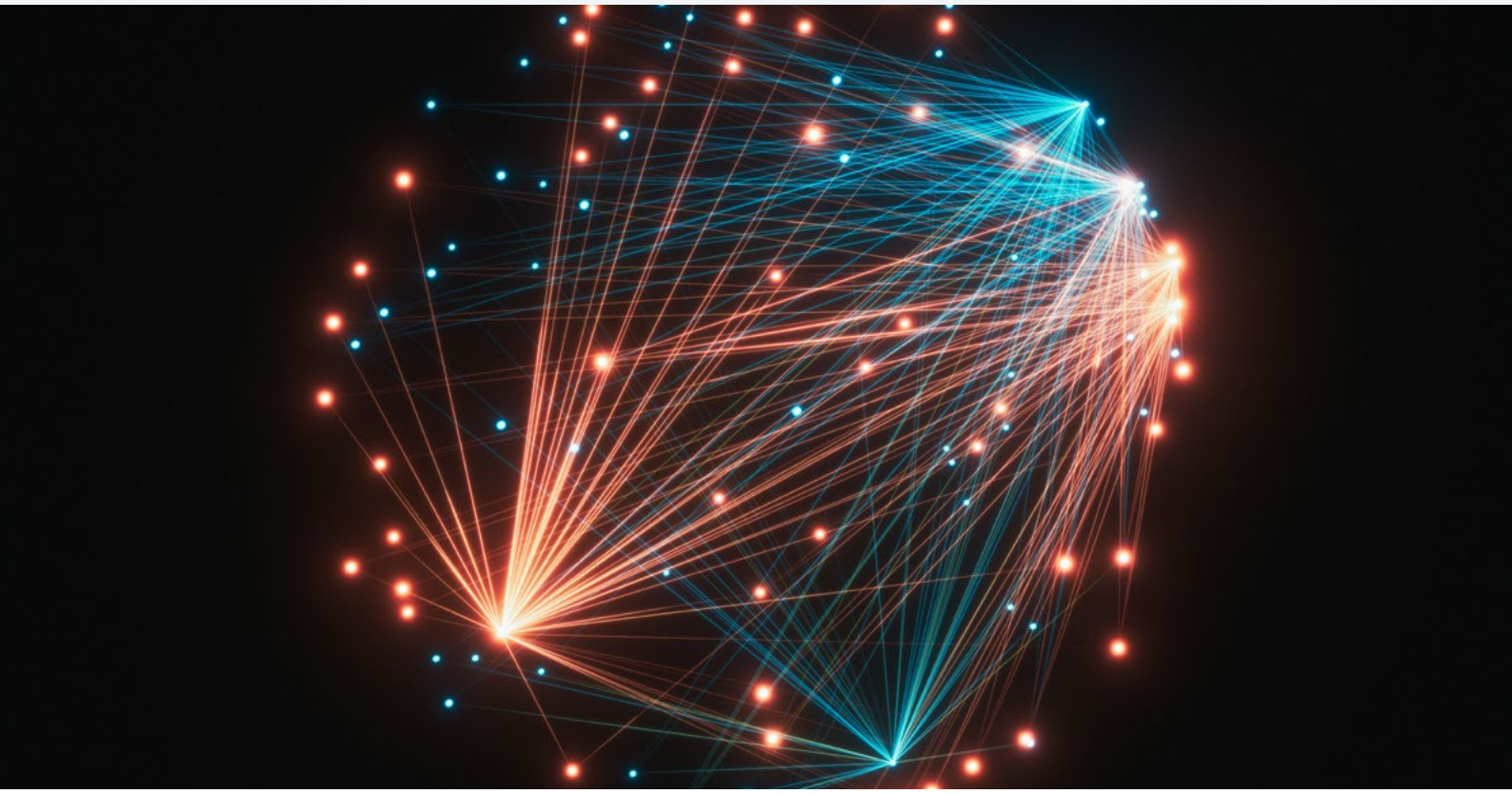
Regions and regulations

In Europe, the burden of proof lies more with the customer than the underwriter; as a result, contestability is usually shorter and more swiftly addressed. The goal here is to use data models in a way that improves underwriting accuracy, minimises false positives and reduces 'spikes' in risk.

The APAC region is different again. Japan and other countries in South East Asia have similarly high levels of automation as their peers in Europe, while the level of automation in Australia is still comparatively low. The journeys to greater automation and augmented automation within the region will therefore take slightly different routes.

The nature of medical records in a particular region also has an impact on the adoption of AAU. As an example, UK health files are digitised throughout the National Health Service (NHS). The challenge is that family doctors have traditionally acted as a gatekeeper of those records and were paid by reinsurers to provide them. As a result, there is some resistance to change, which can slow progress.

Meanwhile, there are plenty of countries that do not have readily available, coherent records. However, fifth-generation technology is effectively agnostic. It can incorporate an underwriter's fundamental philosophy, bring in models that support that, and pull data in from other sources if necessary. As a neutral data hub, it allows for disparate data sources and formats to be incorporated, from which AAU can be achieved.



Explainability and transparency

Despite regional differences, there are two universally recognised requirements for AAU: explainability and transparency. These key factors often differentiate life insurance from other financial products.

AAU places underwriting in the realm of complex models that leverage machine-learning techniques.

Insurers will therefore be increasingly required to use expert judgement when selecting models for use in AAU, since they are the means by which they achieve their fundamental underwriting philosophy. However, insurers will still need to prove to regulators and ombudsmen that the chosen approach is sound and the decision-making is valid. This raises two key questions:

1. Philosophically, how does human intelligence understand and describe even the earliest forms of artificial intelligence?
2. Practically, how does an underwriter explain in a court of law that a machine algorithm made the correct decision?

Transparency and explainability have to be built into both the model and the model-selection process. GUIs, easily configurable rules, transparency, reporting, and now advanced analytics are not unique to life insurance, and we have seen similar moves towards greater automation and machine learning in areas like fraud prevention and detection. Yet the life sector has rejected some of the automated decision-making seen in other areas precisely because of its 'explainability' requirements.

Explainability is therefore one of the key barriers to adoption. However, it is worth noting that the demand for explainability has not always been met by first-, second- or third-generation technologies. Explaining the net effect of thousands of rules is no easy feat, and regulators have often expressed interest in avoiding unfair discrimination against customers by 'black-box' models.

Fortunately, many of the latest machine-learning models have become more 'interpretable' than earlier iterations. As a result, it is possible to explain decision-making at an aggregate level and to drill down into what drives a single prediction for a specific customer. The gap between an explainable model and explaining the impact of 1,000 variables may not be as insurmountable as many believe.

Models and components

As indicated above, achieving AAU is not about implementing a single, monolithic system. Multiple components, or modules, are involved. Claims engines, machine-learning algorithms, monitoring dashboards, underwriting rule sets, data integration, and natural language processing (NLP) all form part of the picture, as does a scalable architecture enabled by cloud capabilities and APIs.

Individually, each of these component parts offers very little value. It is only when they are integrated and overlaid with in-depth knowledge of the life insurance sector – its history, its regulations, its requirements and its broader societal role – that they can be transformed into sources of business value such as point-of-sale predictive models.

The process of selecting the models themselves must also be considered. Companies have to take into account the trade-offs between model effectiveness and performance, complexity and explainability, and find the right balance for their organisation in its market and regulatory context.

All model developers – whether internal or external – must build transparency into their own processes, from data accessibility and data analysis, to model integration, deployment and monitoring. Developers should also strive to avoid the syntax and jargon of data science, so that statistical methodology can be adequately communicated to non-experts.

Currently, independent companies and AI consultancies are developing models for insurance and other purposes. Some are based on publicly available data, while others are based on insurer-specific data. However, models that are built using only public data generally cover only one piece of the puzzle that is a human life to be insured.

As a result, models from within the insurance business offer an advantage. Many insurers therefore may choose to work with models developed by providers with insurance, underwriting, data and actuarial experts who have the ability to explain the implications to risk, compliance and actuarial colleagues and get the models signed off.

This is a big leap to make for the risk-averse insurance sector and represents a profound change in the way insurance works. That change will be required at almost every level.

Capital, modelling and technology expertise

As one of the world's largest reinsurers, Munich Re takes a risk-sharing approach when developing models for clients with the capital to support it. It has business units that are dedicated to developing models, which can be integrated into our underwriting engine alongside models from third parties. However, when Munich Re models are used, tested and validated, and all parties are convinced that the model will make the right decisions, it is prepared to take a significant portion of the risk through a reinsurance arrangement. This 'skin in the game' is a significant advantage reinsurers have in the development of models, unlike, for example, pure AI consultancies. It requires reinsurers to provide utmost diligence in the model development as any model deployment has a significant financial impact if its risks implications are not properly assessed by actuarial, claims, underwriting and data science experts.

Managing the data deluge

Although there are challenges in moving to AAU, there are also powerful reasons for overcoming those challenges. There is also a sense of inevitability surrounding its adoption. The onward march of technological capability, coupled with the rapid evolution of data science, has had a significant impact on the insurance industry as a whole, and is likely to do the same for the life insurance sector. The choice to adopt AAU may, in the end, not be much of a choice at all.

For example, new sources of pertinent health data are becoming readily available. Electronic health records (EHRs), for example, can provide structured information that could be readily integrated into model development, all without inconveniencing customers or physicians. In addition, today's wearable fitness trackers are compiling complementary data sets that may prove valuable to underwriters. The internal data that insurance companies already hold can also be integrated into models and mined for previously hidden insights.

These additional sources of information raise questions about what data could be used in the future. When considering potential data sources, we must ask:

- Will the regulators allow it?
- Will it truly add value?
- Will it undermine principles of either consent or explainability?

Of course, the answers are not always easy to come by. Consider the following:

- The technology behind facial recognition, although not sufficiently accurate at present, could eventually be used to identify a smoker who is reluctant to admit their habit. Is this admissible?
- Genetic data, increasingly available as DIY DNA and ancestry kits grow in popularity, could provide helpful risk information. No regulator currently allows them to be used extensively, and they are unlikely to do so in the near future. But could regulators at some point overcome this reluctance?
- Personal lifestyle information about hobbies, education, diet and other factors is readily available through social media accounts. This information could be incorporated into models, but will it prove problematic when it comes to justifying decision-making? On a related note, should models mine social media as a whole for useful trend analysis and broader societal context, or should this too be inadmissible?

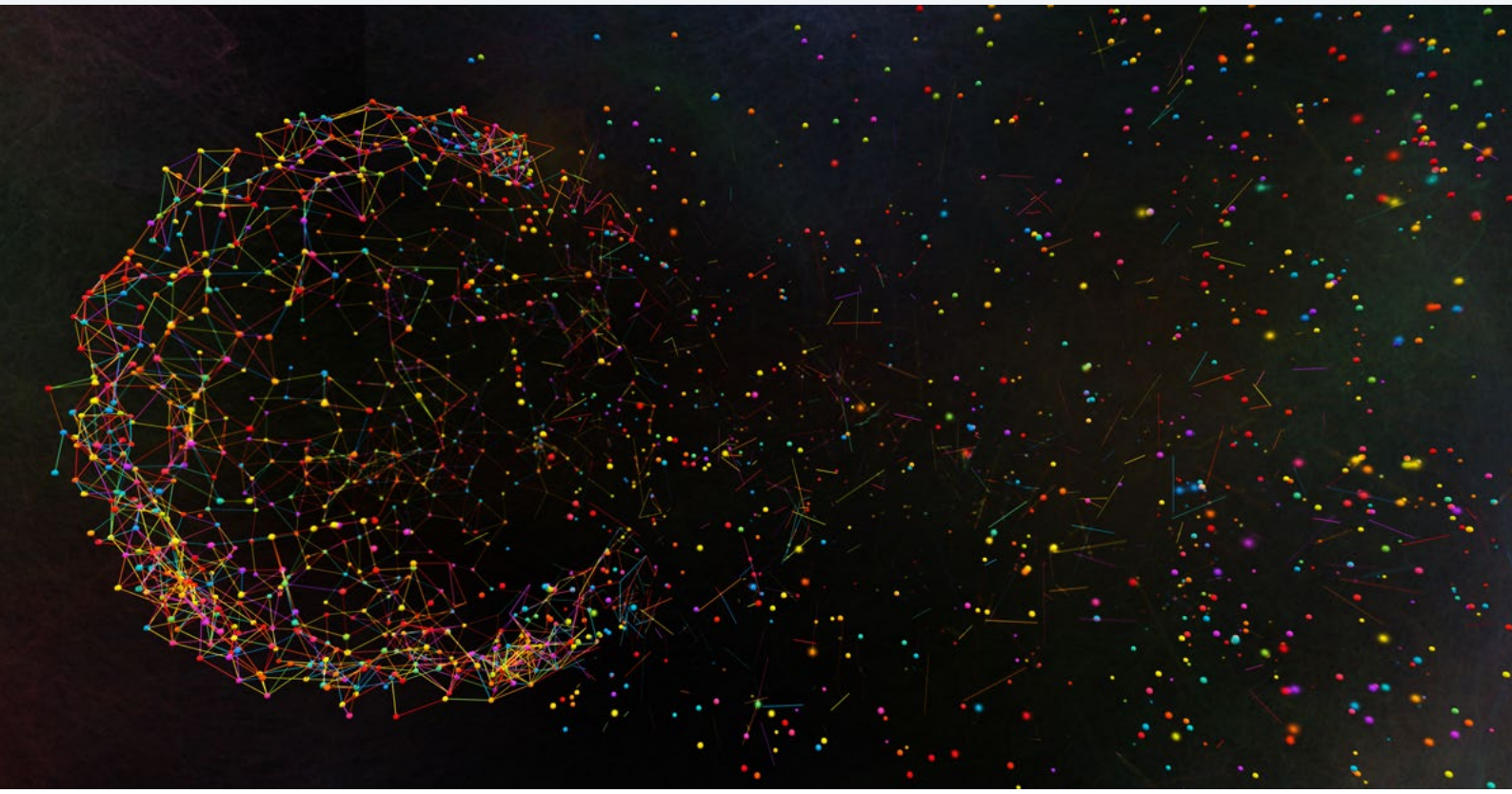
These examples provide insight into some of the questions that will be asked in the near future. Similarly, the asymmetry of information between the applicant and the insurer will have to be addressed by regulators and the insurance industry.

Data science and its technology

In addition to the ethical questions around data use, there is the more practical issue of whether data is readily usable. Structured formats are needed for model analysis and details tend to be gathered in formal processes, which necessarily excludes a vast amount of information. The process of gathering structured data is also prone to distortion, as customers interpret and filter their own personal information to suit their self-perception.

Data science is also in the process of finding better ways to convert more informal or analogue information into structured digital formats. NLP is one method that converts the complexity of normal conversation into more standardised, readable and analysis-friendly data. Equally, the insight gained from data analysis can itself help to structure questions more effectively and to pre-populate forms in a way that provides the most useful information. Analytics can also identify where data could and should be replaced with other sources for even more accurate results.

Finally, cloud computing continues to make an impact on the underwriting industry, particularly as it enables mid-tier firms to employ sophisticated data analysis and modelling. The industry has reached a tipping point with cloud, with most underwriting firms recognising that they require the data and security expertise that technology companies provide. The idea of moving highly sensitive information to an off-site partner, once anathema to most executives, has become mainstream, to the point that nine out of ten new projects that Munich Re now undertakes are off-premise.



Conclusion – what happens next?

Revolutionary in its impact, evolutionary in its implementation, AAU is the product of three core components: technology, analytics and insurance expertise. While the first two components suggest an inevitability to the adoption of AAU, as life insurance cannot evade the onward advances in these core areas, the third component affirms that inevitability does not equal success. Ultimately, selection of the right partners, developers, and providers will be a critical factor in the successful implementation of AAU technologies.

AAU also raises questions that individual businesses, underwriters, and regulators will have to address. Fortunately, some answers may prove less elusive than initially thought; in fact, many of the challenges associated with AAU have already been addressed in previous evolutionary stages of the technology with the help of the appropriate partners and providers.

Ultimately, if primary insurers wish to ensure the long-term sustainability and profitability of their businesses, they must have confidence in the underwriting engines and digital roadmaps that they have developed in response to AAU. The successful adoption of AAU will facilitate the incorporation of increasingly sophisticated, truly intelligent artificial intelligence that can unlock greater business value from an increased number of data sources.

The second paper in this series will therefore examine the role that AI currently plays in underwriting and how that role may change in the future.

Munich RE

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About Munich Re Automation Solutions

Munich Re Automation Solutions, is the world leading provider of digital new business, underwriting and analytics solutions to the insurance industry. Working with forward-thinking customers across the globe, we're on a mission to revolutionise the way life insurance is bought and sold, using next-generation technology to give insurers the power to grow their businesses profitably.

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About Munich Re

Munich Re is one of the world's leading providers of reinsurance, primary insurance and insurance-related risk solutions. The group consists of the reinsurance and ERGO business segments, as well as the asset management company MEAG. Munich Re is globally active and operates in all lines of the insurance business. Since it was founded in 1880, Munich Re has been known for its unrivalled risk-related expertise and its sound financial position. It offers customers financial protection when faced with exceptional levels of damage – from the 1906 San Francisco earthquake through to the 2019 Pacific typhoon season. Munich Re possesses outstanding innovative strength, which enables it to also provide coverage for extraordinary risks such as rocket launches, renewable energies, cyberattacks, or pandemics. The company is playing a key role in driving forward the digital transformation of the insurance industry, and in doing so has further expanded its ability to assess risks and the range of services that it offers. Its tailor-made solutions and close proximity to its customers make Munich Re one of the world's most sought-after risk partners for businesses, institutions, and private individuals.