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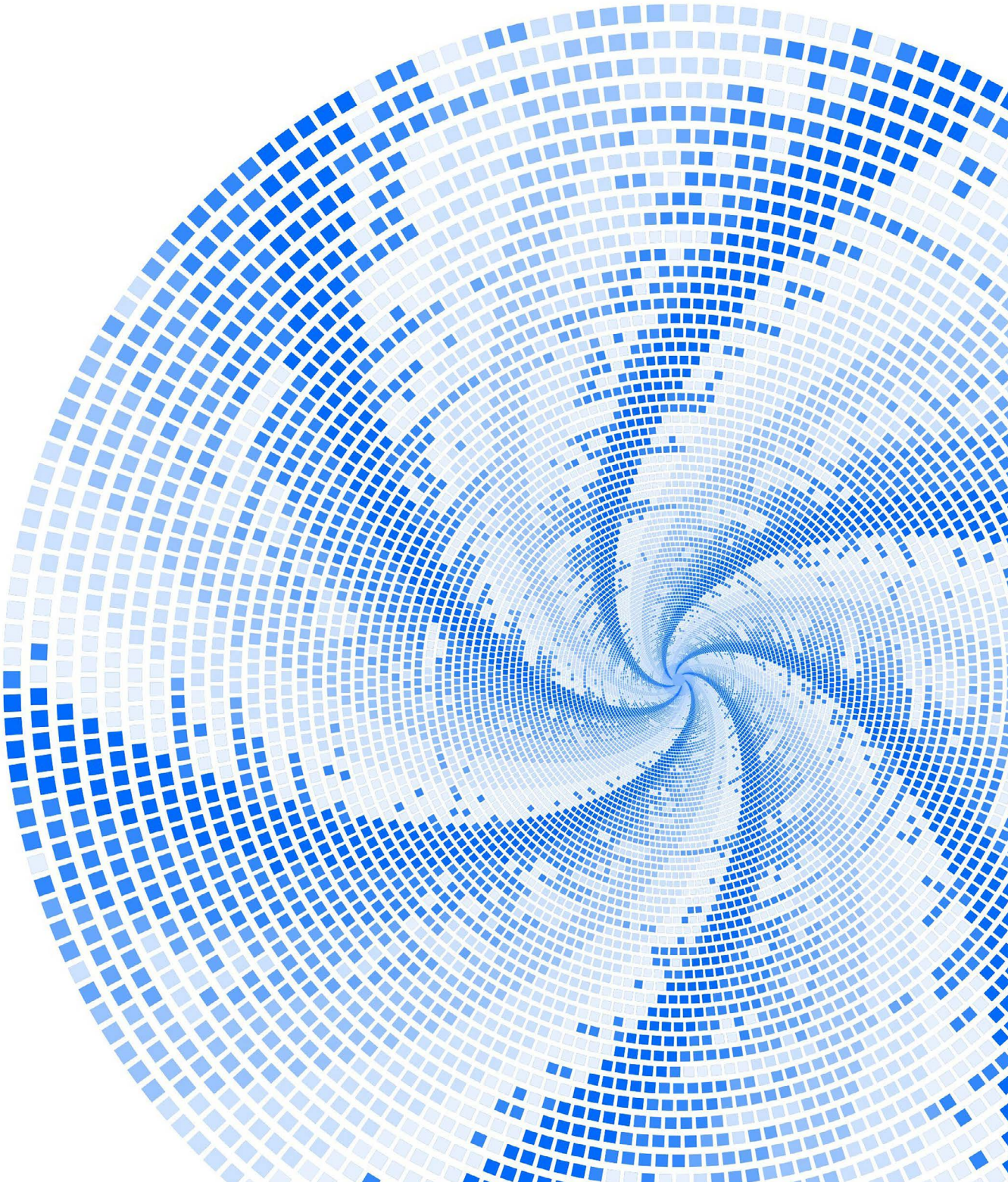
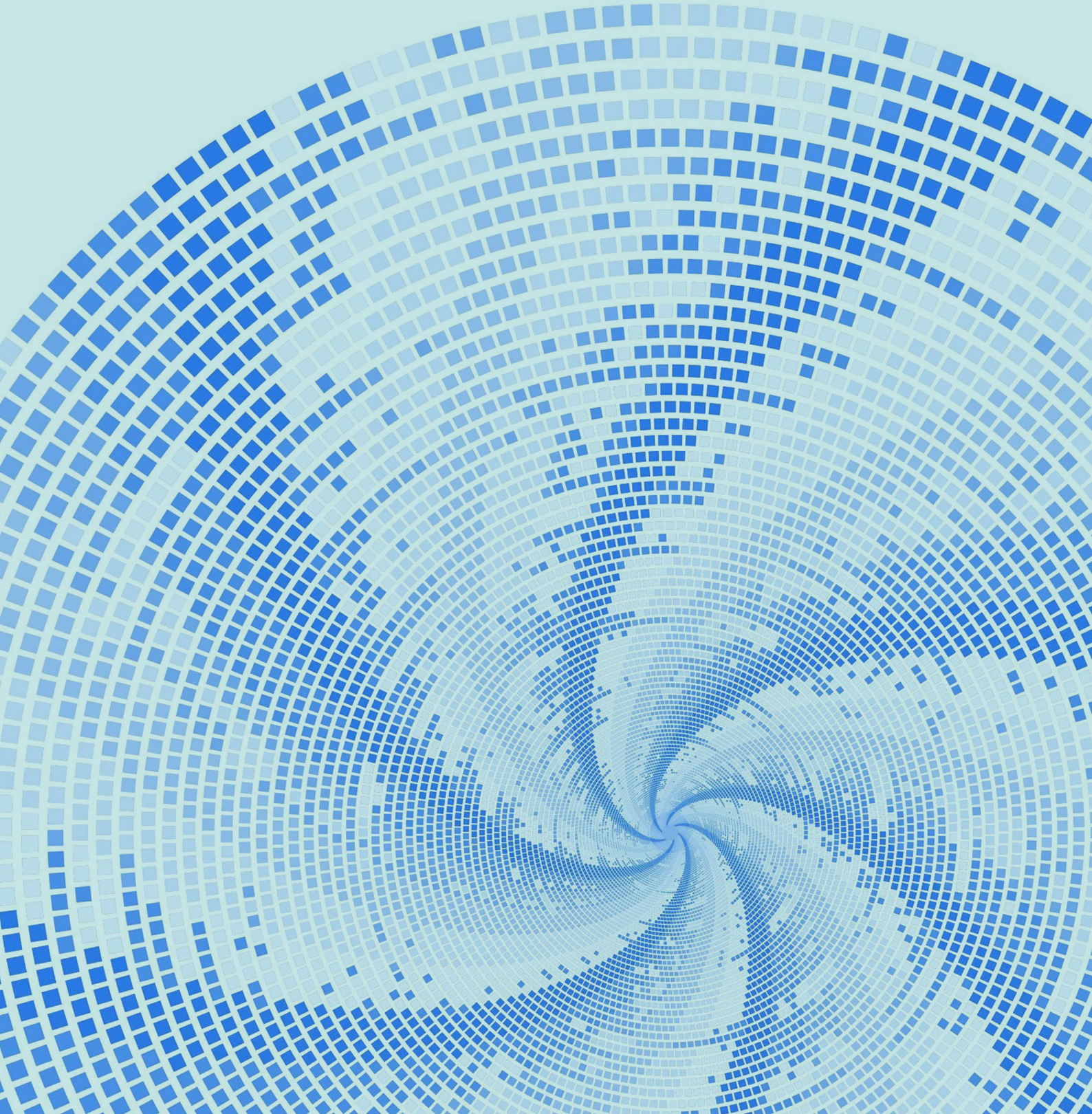
# Actuarial modelling in Asia Pacific

## From status-quo to future-fit





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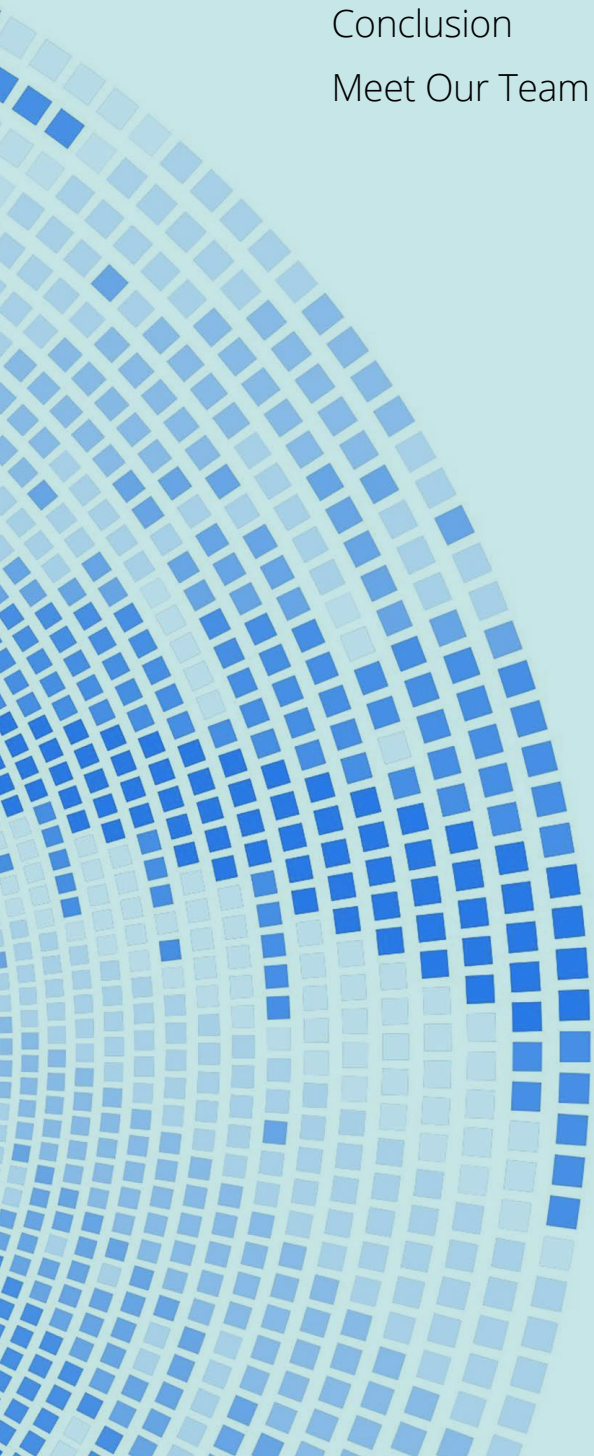


# Introduction

The actuarial modelling status-quo is under pressure to transform – we are in the midst of one of the most significant regulatory changes in decades through IFRS 17, combined with a rapidly changing technology landscape. It is imperative for companies to revisit their actuarial modelling ecosystem to ensure it is future-fit. Our paper explores this in the following dimensions – the people, models, systems and data.

Many insurers across Asia Pacific struggle to adapt and maintain their actuarial models to meet the increasingly complex reporting requirements (such as IFRS 17 and local RBC frameworks) of an ever-evolving business and regulatory environment.

Industry is heading towards the need for high data granularity and scalable systems to handle the increasing data and business demands.

The Deloitte Asia Pacific actuarial modelling community organised a series of workshops to consolidate our viewpoints on what the future should look like for actuarial modelling ecosystems.

The workshops highlighted that actuaries have traditionally prioritised complexity and accuracy of model calculations over future-fit architecture and process requirements. This is understandable as it leans on the traditional actuarial strengths, however it can lead to solutions that lack the depth and efficiency to provide the insights and response times required by its business stakeholders.

In practice, there is often a communication gap between business stakeholders and the actuarial modelling team – neither necessarily speak the same language. This gap can lead to poor outcomes for insurers that can cause increased operational risks, cost overruns on development and execution, disenfranchised team members working overtime and/or on non-value adding tasks, and lost or delayed insights.

Specific poorer outcomes we have observed across Asia Pacific include:

- Models that are difficult to update and maintain, and frequently poorly documented and controlled;
- Many hours are wasted on routine maintenance and upgrading of models;
- Risks associated with manual intervention, obsolete models and the time needed to update;
- Under-utilised data and lost insights that could have been derived from a better-designed ecosystem;
- Actuarial modellers confused about the true nature of actuarial work as they are overloaded by technology related activities.

This paper describes what a future-fit actuarial modelling ecosystem should look like to help solve these issues, focusing on two main parts:

1. **People:** key skillsets required;
2. **Systems, models and data:** frameworks and governance on actuarial models, system architecture and data to support the ecosystem.

# People and Skillsets

No transformation can succeed without the right investment and focus on the people who will need to support this ecosystem.

In our experience, a future-fit actuarial modelling ecosystem requires people with the following critical skillsets:

- **Business analysis** skills;
- **System architecture** skills;
- **Risk management**;
- **Technical actuarial and data coding** skills for the relevant software/language required; and
- **Stakeholder and program management** skillsets.

These skillsets may exist within the same individuals. It is critical that any gaps are dealt with in the insurer's team structure and/or its construction to meet the needs of its stakeholders. Without all these skillsets, the execution and service to stakeholders will typically become fragmented, inefficient, and challenging to maintain.

> In our experience, it is common for insurers to have gaps in skillsets in multiple of these dimensions - this is why the actuarial modelling status-quo will often not be fit-for-purpose.

We discuss some of these key skillsets below.

**Business analysis skillset**
This skillset is required to perform the 'bridge' between the modelling team and its stakeholders.

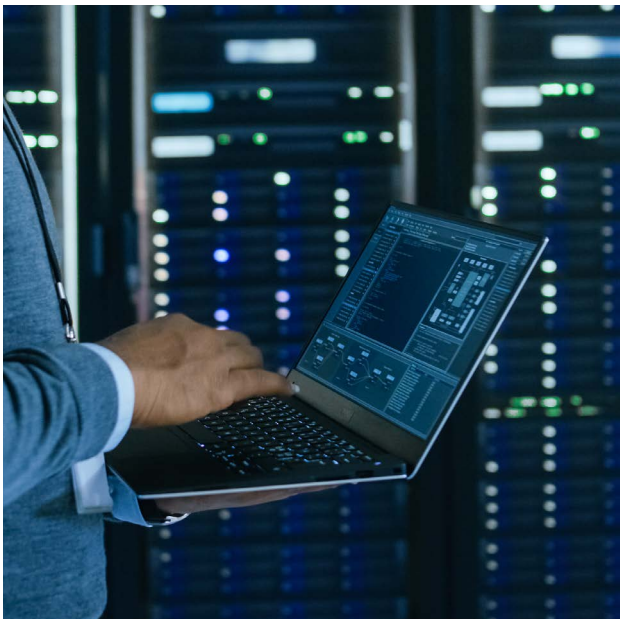
This skillset is very visible (and critical) inside information technology teams. However, the same level of importance is not often seen inside actuarial systems teams, and this can often be one of the key root causes of model implementations failing the needs of its stakeholders.

To be effective, there must be a strong understanding of the technical and business requirements from both 'sides of the fence' e.g. the person with this skill might have started off as a coder, then moved up the ranks to lead teams of modellers in terms of training, oversight and technical review.

Thereafter they may have obtained further experience within product or valuation teams where exposure is obtained in terms of understanding how the models and results align with tactical and strategic business initiatives. In doing so, those individuals who can demonstrate strong communication and influencing skills are the best candidates to hold this responsibility.

This is because this role requires stakeholder engagement, and then the ability to interpret those discussions into the 'business requirements documentation' (which stakeholders will then be able to sign off on). These business requirements will then need to be further translated into technical modelling requirements, which is used by the coders.

In our view, to be effective in this role, the business analyst cannot be a generalist. The most effective ones should have a background in both the technical software being used and an understanding of actuarial techniques and performance drivers of the business.



**System architecture skillset**
The actuarial modelling team lead may not have enough influence and stature to advise executive management appropriately. Too often we see the actuarial modelling team default to the wrong software or system for the need (due to 'comfort' with the system), or default to a legacy system that may not be scalable into the future. This further entrenches the insurer into past poor practices and systems, creating a downward spiral in ineffectiveness.

The system architecture skillset is required to effectively oversee all integrations and to lead the analysis and selection of the appropriate software (whether in-house or off-the-shelf technology), aligned to the insurer's latest strategy.

It requires a strong understanding of relevant software systems in the market, and an ability to keep an eye on the developing systems within the industry and markets. This skillset is again common within information technology teams, but less so in actuarial modelling teams. It may be that this responsibility sits jointly within actuarial and IT.

**Risk management skillset**
Actuarial models are core to producing results for regulatory and prudential reporting, and for business decision making. This means strong controls on these models are critical to an insurer's risk management framework.

While insurers will typically have a dedicated second line of defence 'risk management' team, the risk management skillset is also critical to have within the actuarial modelling team as they will need to execute in line with those requirements.

Indeed, for controls to be effective, the actuarial modelling team should provide and co-design the model management framework for the insurer.

Actuaries, by way of their training, would typically be natural risk managers. However, the gap we see is usually in the level of proactive involvement and influence they may have in driving the design of the framework to ensure it is fit for purpose.

**Program management skillset with knowledge of insurance data and actuarial models**
In the last decade, more sophisticated insurers have moved to an agile enterprise method of project execution. This was most evident inside information technology and operations teams; however, we have also seen this deployed by actuarial modelling teams.

Agile methods of project execution better allow for a progressive "text and learn" development, enabling the insurer to regularly assess its return on investment through the learnings from the delivery 'sprints'. Regardless as to whether the insurer uses agile or more traditional project management techniques, the absence of this skillset is one of the key root causes for execution failure.

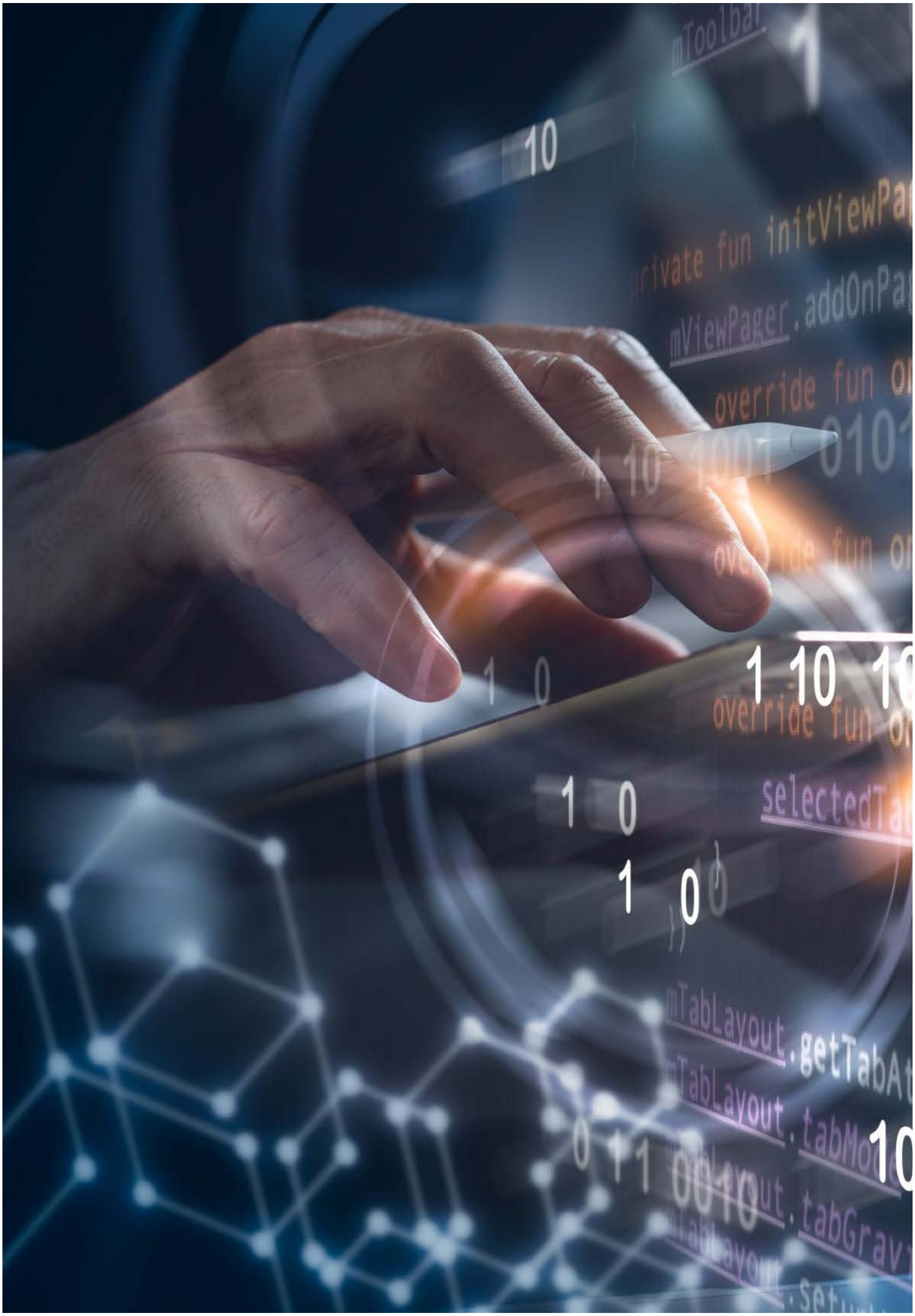
Our observation is that a generic project management skillset does not often work for insurers who 'parachute' in general PMO resources from inhouse teams or externally. The result is often delayed and over budget execution, with too many surprises.

Actuarial modelling development requires a program manager who also has SME knowledge of the insurance data, the actuarial models and good understanding of the software. This is required to be able to reorient and reprioritise the tasks when needed, and to understand what is needed to mitigate the expected imminent and future risks the development will face.

**Being future fit from a people perspective**
As observed, a high performing actuarial modelling team requires a combination of actuarial business and technical depth of knowledge, information technology, risk and program management skillsets.

There is no one ideal structure to adopt for an actuarial systems team, as this needs to be designed based on the insurer's targeted operating state. A large complex insurer (from a structure and product perspective) will need a different solution to a smaller one.

We recommend therefore that insurers consider and review the critical skillset gaps that they may have and ensure that individuals within the actuarial modelling ecosystem are able to adequately cover the core skillsets required in the target state. We observe that there is a trend of individuals within the actuarial ecosystem moving towards a career path focussing more on technology and infrastructure. Regardless, we recommend that insurers develop different career paths within the actuarial function to accommodate the demand for these skillsets. Importantly, the responsibilities need to be made clear, as certain individuals may play multiple of these roles.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# Models, Systems and Data

In this section, we explore our key observations and insights covering implementation lessons on:

- Governance of model development processes;
- Model development frameworks; and
- Architecture solutions.

**Governance of model development processes**

We have observed that another root cause for poor outcomes from model execution is from ill-defined governance over the model development cycle. This can occur in both one-off projects and in 'business as usual' (BAU) model change processes.

Team members of varying skill levels and individual preferred practices may be adjusting models without a defined framework, process or modelling principles. This can lead to inconsistent methodologies being applied to the models, which over time increases inefficiencies in both the maintenance effort and runtimes. The ultimate consequences tend to increase execution costs and operational errors.

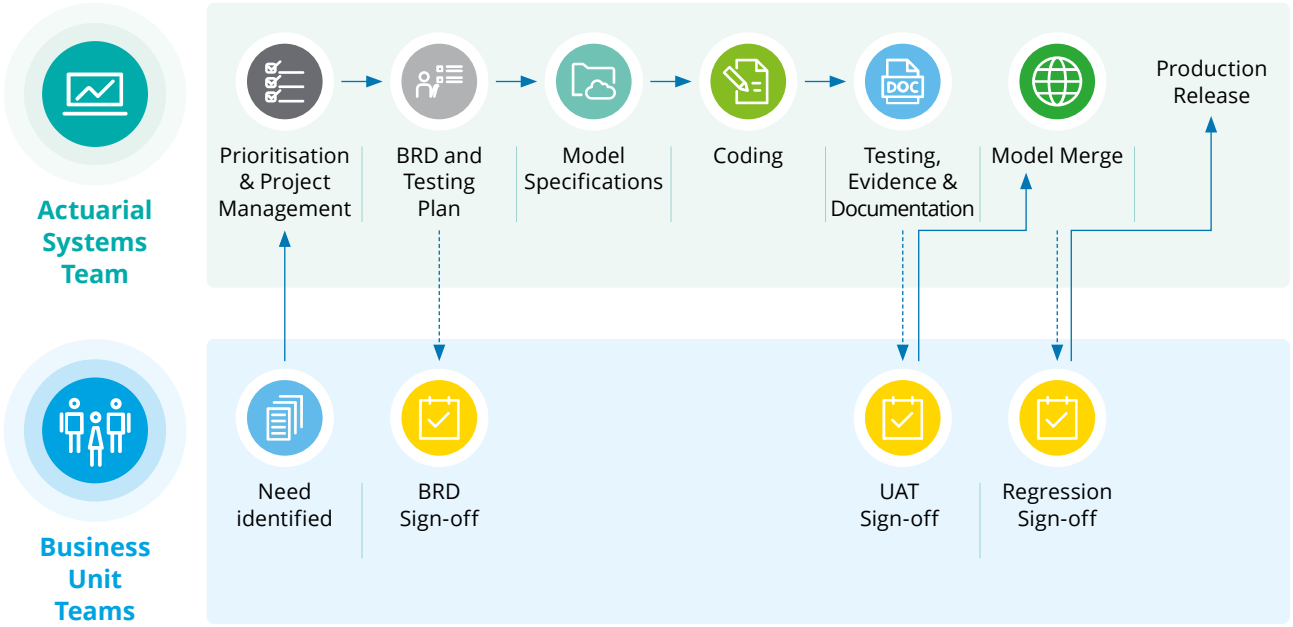
> To enhance governance, we have seen a shift in the region towards having a centralised modelling team (combined with offshore modelling support).

This is most common for larger organisations, with more complex networks of teams throughout their various regional business units and significant modelling needs. A centralised modelling process is characterised by an actuarial systems team that oversees the whole of the model development cycle, and is responsible for the quality and the timeliness of the model development execution. The actuarial systems team in this instance:

- Sets the standard (templates) for business and modelling requirements, including providing guidance on testing strategies;
- Manages model change requests and their prioritisation;
- Manages model development and coding (including any offshore modelling teams), and enforcement of coding best practice;
- Ensures formal sign-offs are obtained at the various parts of the model development cycle;
- Manages the model risk register and risk ratings, and ensures a cycle of model reviews are adhered to in accordance with the agreed risk management framework for actuarial models;
- Manages the deployment of the development models into production release.

The responsibilities within a centralised modelling process are typically split between the actuarial systems team and the business unit stakeholders as per diagram 1.

**Diagram 1 – Responsibilities under Centralised Modelling Process**



As can be deduced, the key benefits of a centralised modelling process is in the greater consistency that is applied across the modelling process, which assists with efficiencies, reduced operational errors, and enhanced expectations management with business stakeholders.

Smaller and less complex organisations may be able to operate with a 'hybrid' modelling process. However, well-defined governance processes are still required whether insurers adopt a centralised or hybrid modelling structure.

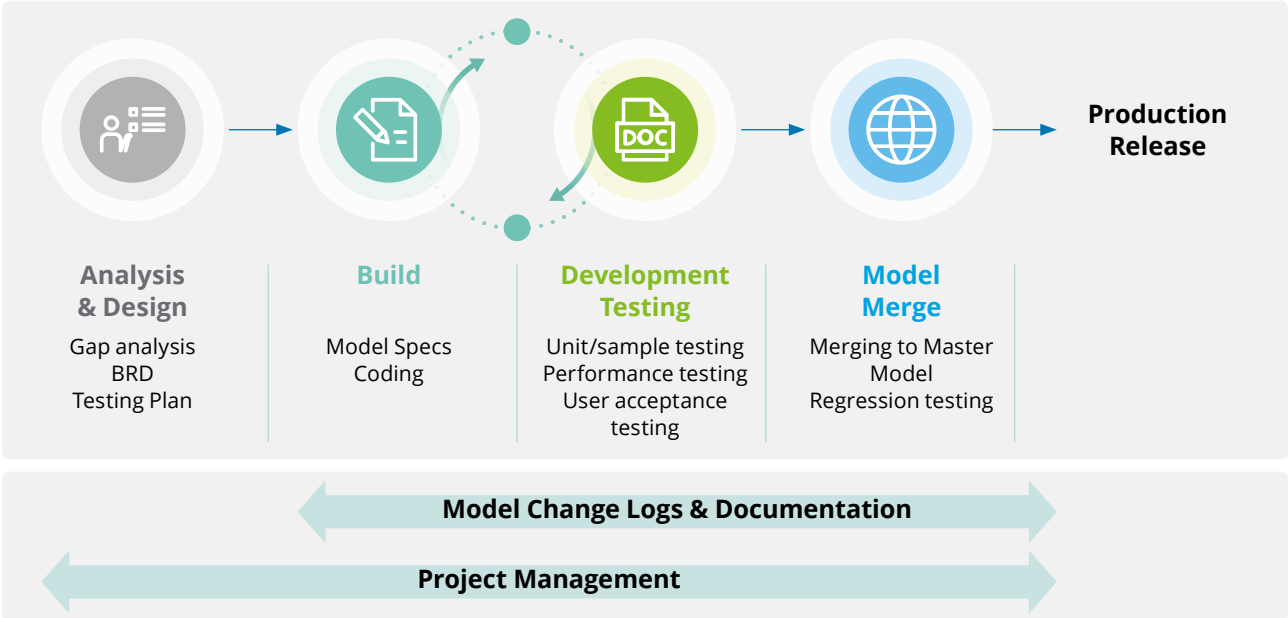
> The greatest challenge with the use of a 'hybrid' approach is to manage the gaps in ownership through the model development cycle.

It is common for inconsistencies and inefficiencies to arise under hybrid practices as the quality throughout the cycle is more complex to manage and enforce, and this is particularly the case for larger insurers.

### Model development frameworks and lessons learned

We've made references throughout to the need for a well-defined model development framework. This framework in combination with the requisite skillsets (refer earlier section 'People and skillsets') are critical to be able to execute successfully. Refer to diagram 2 for a high level view of the Model Development Framework.

**Diagram 2 – Model Development Framework**



While the process appears intuitive, there are certain parts which we have consistently observed to be the cause for executions not delivering to quality and time expectations. These include:

- ***Lack of an agreed business requirements document prior to the development.***
  The scope of the work must be clearly defined and understood. Stakeholders should be involved in the scoping to cover all modelling focus areas as discussed.

- ***Lack of an agreed testing plan prior to the development.***
  This can often lead to significant issues after the build and increases the likelihood of rework. It is therefore important that insurers clearly define and agree the testing methodology and responsibilities upfront and that they plan ample time for this phase. Part of the testing should also consist of performance (runtime) testing, which will test the efficiency of the code setup as well as whether the architecture is sufficient to support the model.

- ***Lack of a model specification that follows internally agreed best practice.***
  This is particularly important if the coding is being outsourced to the business units and/or offshore coders. The model specification should promote consistency, alignment, and rationalisation of models as far as possible.

- ***Stakeholder sign-offs are left to the end, and are not obtained at the right points through the development cycle.***
  A common omission in the process is obtaining stakeholder sign-off at the business requirements stage. This omission can often result in a build that does not meet stakeholder requirements in either the output or the UAT evidence, and therefore can lead to unplanned for rework.

- ***Lack of a prioritisation process for model changes as required by the insurer.***
  It is usual for the many business stakeholders to require, and request, multiple modelling changes. This can build up into a lengthy development list. To achieve strong model governance, it is critical for the insurer to have an agreed policy in place as to how to prioritise the many requests, in order to achieve the development-production release cycle it is aiming for. This policy might typically be based on some quantifiable metric such impact size (on reserves) and/or efficiency gain. The final prioritised list for the next production release will need to factor in the estimated effort involved including time for change management.

- ***Lack of a suitable transition plan from the model development team to the BAU team (users in production environment).***
  The better transition plans would include not only an explanation of the key changes and the impacts on results, but also a walkthrough of the top 3-4 changes that the business users may be required to perform with these new models (e.g. model runs, input/ parameter changes, results extractions etc), and any potential downstream impacts on other models.

Many companies are also pursuing further automation to their production processes. However, lift and shift of a highly complex process to a highly automated workflow could lead to a "black-box" being created with historical errors and bugs retained. It is important to go through a process of streamlining models and to codify processes before automation is attempted.

**Architecture system solutions**

The systems architecture refers to actuarial cashflow projection systems, reporting systems, as well as the data systems that support these.

It is common for short term tactical solutions to be deployed into the actuarial modelling ecosystem, based sometimes on the capability and capacity of the team members at the time. This may not be future-fit and can, over time, lead to emergent and significant issues with an inability for the insurer to scale adequately for future requirements, speed issues, as well as key person risk (for example, related to the continued use of a legacy system that is no longer widely used in the industry).

Emerging actuarial cashflow projection tools and/or additional modules to existing tools are always being developed by vendors. There is ongoing development of automation, tools that have greater user friendliness and transparency, tools that enhance auditability and controls etc. It is therefore worthwhile for the insurer to keep abreast of the latest relevant solutions to ensure its target operating model is still future-fit.

Data must also be at the core of future-fit actuarial models. Data transformation is the process of taking raw data (often as extracts from a policy administration or claims systems) and executing programs to clean, convert, standardise, or summarise the data to produce a format ready for consumption by the actuarial models. Many companies do not consider this as part of the actuarial model development cycle and therefore do not have a robust change management process for their data transformation systems.

This can lead to many bespoke databases being created to satisfy the latest actuarial modelling requirements, creating duplication and reconciliation issues for the insurer over the years. A lot of data conversion tools / systems are slow to run, difficult to maintain, and can change inexplicably due to a lack of version control or inadequate testing. Data tools may also be chosen purely based on the existing capability of the team that owns the process, and in some cases can lead to a less than effective tool being used given the insurer's need e.g. SQL is superior in managing and storing large volumes of data (data management) while R is better for analysis (e.g. regression, statistical analysis). Both are commonly used by actuarial and data teams, sometimes chosen dependent on the capability and owner of the process, rather than the most efficient and scalable solution for the insurer's need.

As business and regulatory requirements grow ever more complex, with disclosures at more granular levels, many actuarial teams face challenges in meeting their reporting deadlines because the existing models and/or systems were not designed to be scalable for large datasets.

> Reporting timetables are continuously under pressure, and so looking at options to reduce run time is an important consideration.

Some solutions we have observed include:

- increasing CPU memory and storage (with associated increasing Information Technology costs);
- grouping or clustering data to reduce the number of data points at the cost of reduced accuracy; and/or
- identifying and eliminating redundancies through streamlining of model code and setups e.g. this could arise from the use of unnecessary complex coding, legacy code no longer used, unnecessary inter-job dependencies and manual processes.

For example, an actuarial model's runtime was halved by removing several "debugging" variables from the reporting output groups. In another example, an insurer faced a vast data storage bill after moving its infrastructure to the cloud. However, over 90% of the actuarial output stored in the cloud would never be used and have limited business value.

As datasets grow more extensive, it is imperative that the actuarial model can handle this increased demand efficiently. This involves a scalable architecture focusing on big datasets in new model development and regularly reviewing the existing models to identify means to improve data efficiency. We had observed that more companies are migrating from legacy vendor-provided software to ETL (Extract, Transform, Load) focused platforms (e.g. SQL, Alteryx) or even to in-house custom solutions based on Python or .NET. to bring efficiency and scalability to the processes.

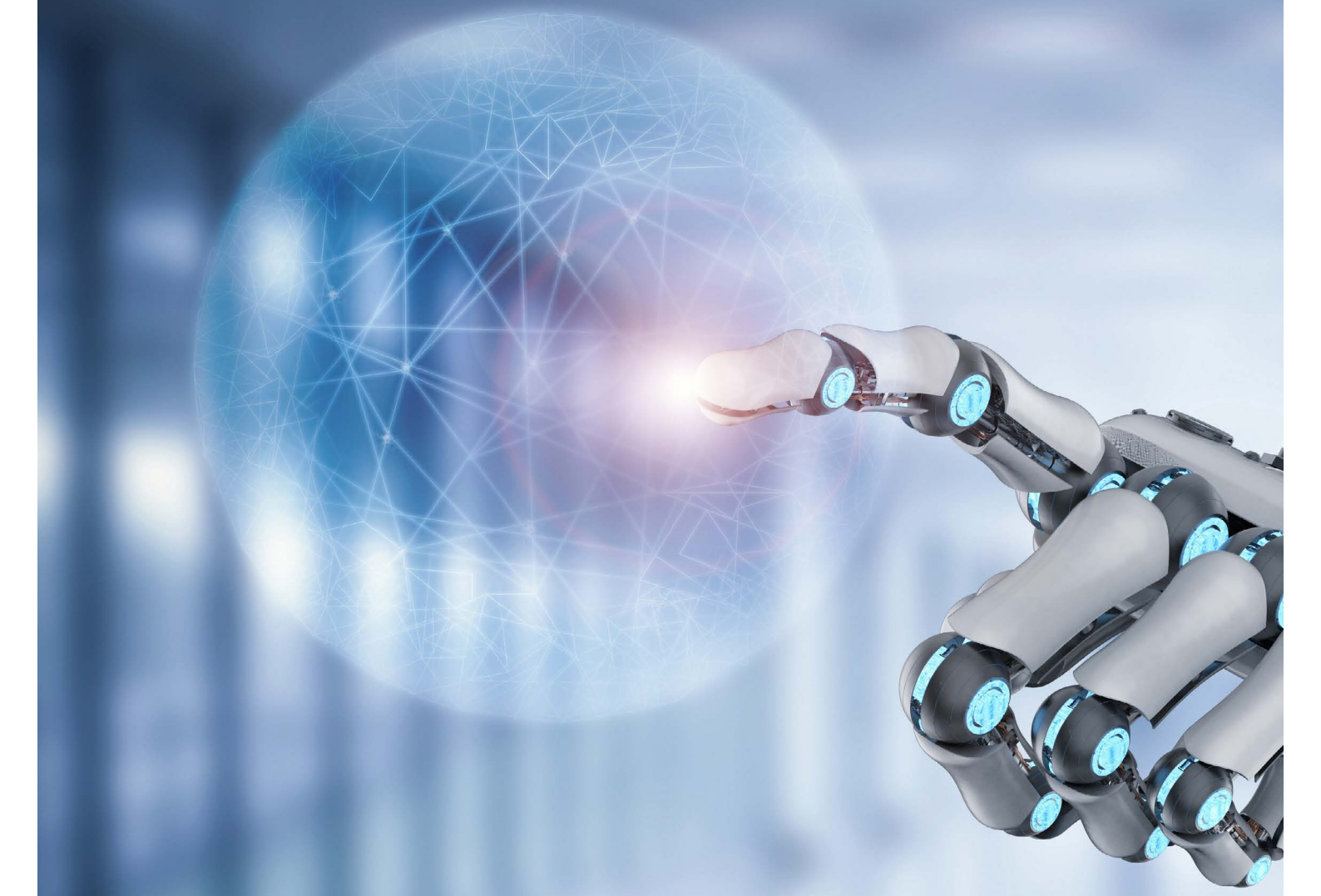
Therefore, it is important that insurers consider:

- the efficiency and scalability of the data tools they choose to use; and
- that these data tools and their governance be considered as part of the actuarial modelling ecosystem development, using the same modelling framework as discussed previously.

# Conclusion

Insurers across Asia Pacific face a challenging business and regulatory landscape. There are industry-wide challenges throughout the modelling ecosystem, such as inefficient and fragmented actuarial models, legacy infrastructure, and poor integration of systems through the end to end process.

The future of actuarial modelling requires a fundamental shift in perspectives, requiring greater emphasis on the technology architecture and efficiency of the actuarial models. Insurers will also need to uplift the requisite skillsets inside their actuarial systems team.



In summary, insurers need to critically consider these aspects in the journey to become future-fit. Specifically:

- The skillsets and structure of the actuarial modelling team: the conventional focus on just technical modelling is no longer sufficient. The future actuarial systems team must embrace diverse roles and responsibilities: business analysis, system architecture, risk management, technical coding, and stakeholder and program management.

- The actuarial modelling end-to-end ecosystem, including the data systems that support the calculation models, needs to be considered holistically rather than component by component.

- The modelling development framework, including the critical steps to ensure the design is based on a future-fit architecture.

**How Deloitte can help**

Deloitte can leverage the best of our experience through our Asia Pacific modelling centre of excellence. We are able to rapidly scale our expert modelling resources flexibly across Asia Pacific, and have successful experience with onshore-offshore execution. We can assist, for example, with the following:

- Gap analysis, options analysis, and target state design for data and finance/actuarial systems; technology and architecture;
- People or functional process redesign and advice;
- Subject matter expertise and model change program management, including construction of detailed delivery plans;
- Implementation support throughout the whole model development cycle; and/or
- Model risk reviews including replication testing and model remediation calculations.

In all our advisory and implementation work, we aim to work alongside our clients in order to provide on the ground training and guidance of modelling best practice principles and execution.

# Meet Our Team

To further discuss any of these topics, please contact our team below.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