17th Current Issues in Life Assurance (CILA)
2 December 2021

Introduction to model governance

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Model Governance

Three lines of defense

Model development

- Assign roles
- Risk assessment
- Model controls
- Change processes
- Model documentation

Model validation

- Independent model validation team
- Focus on fit for purpose and efficiency
- Identify gaps/flaws in processes/documentation
- Critically test the model

Internal audit

- Focus on controls and processes
- Ensure all practices are followed
- Findings should be documented and shared with senior management

The oversight and direction to be provided by the 'model governance committee'
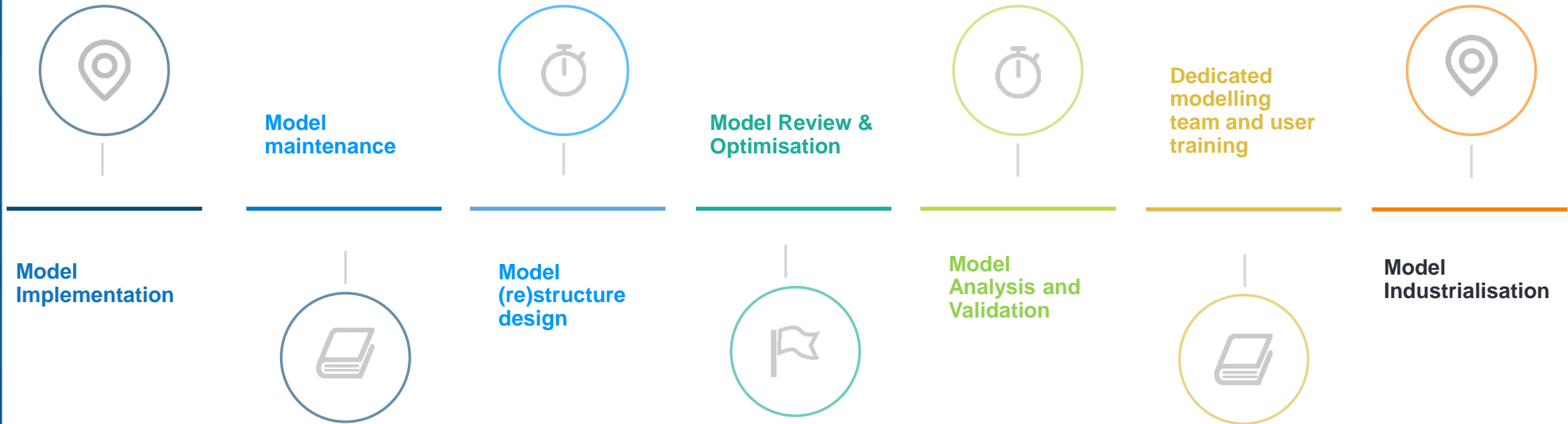
Why does it matter?

Cost of neglecting appropriate model governance

Requirement	Considerations	What if not addressed
Complex modelling requirements and ever-growing reliance on models	• Regulatory changes • Increasing complex and forward-looking financial statements • Models / model systems are no longer restricted to actuarial function	Increased scope of errors and no cohesion with multiple model versions used for different requirements
Effectively manage model risk	• Existing policies on model changes • Level of model governance • Major changes are an opportunity to adopt best practices	Lack of trust in the model results; costly if mistakes not caught in time

Best practices

Through the model life-cycle

Model Implementation

Model maintenance

Model (re)structure design

Model Review & Optimisation

Model Analysis and Validation

Dedicated modelling team and user training

Model Industrialisation

Model Implementation

Key factors to consider for new model implementations

- Define scope – key objectives, final deliverables, milestones, timelines for development, testing, release of model, products in scope, out of scope items, etc.

- Expertise and systems – assess the requirements, assess existing capabilities

- Budget and effort – Plan out budget, resources and effort required for the implementation; given the scope and required expertise/systems.

- Start with proof of concept before full development

- Structure and design of the model – cash flows interaction, multiple basis, master vs same as products, table structure, etc.

- Standardization, ease of use, run-time involved

- End state – Key reporting variables, any unmodelled adjustments that can be included in the model build

- Validation and documentation – how model implementation will be tested (parallel excel models or approximation checks or replication Python tools)
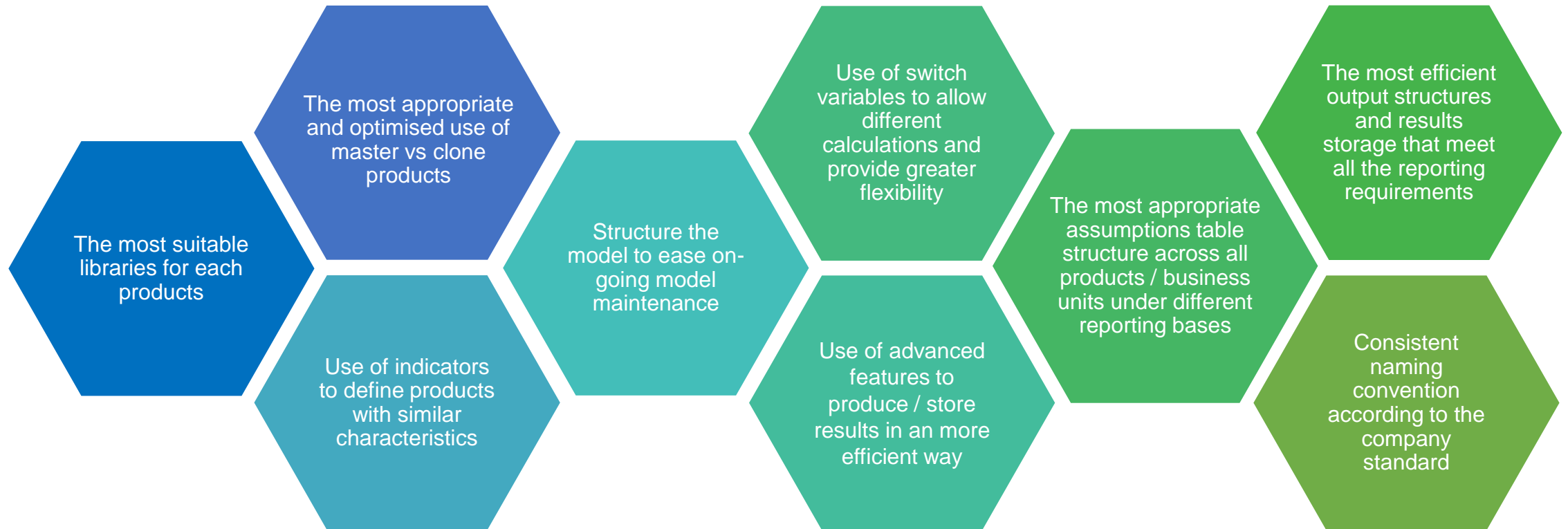
Model maintenance

Practices to follow to ensure model remains close to initial implementation

- Ensure standardization and best practices are followed

- Do, check, review process

- Local vs global level coding

- Ease of understanding

- Remove redundant codes and tables

- Remove redundant basis/functionality not needed anymore

- Version controls; controls and checks in place throughout the process

- Periodic model merge in case of multiple developers

- Plan model maintenance cycle and periodic assumption updates in advance

- Documentation – model changes (reason for the change and its implementation), version history, testing procedures, etc.
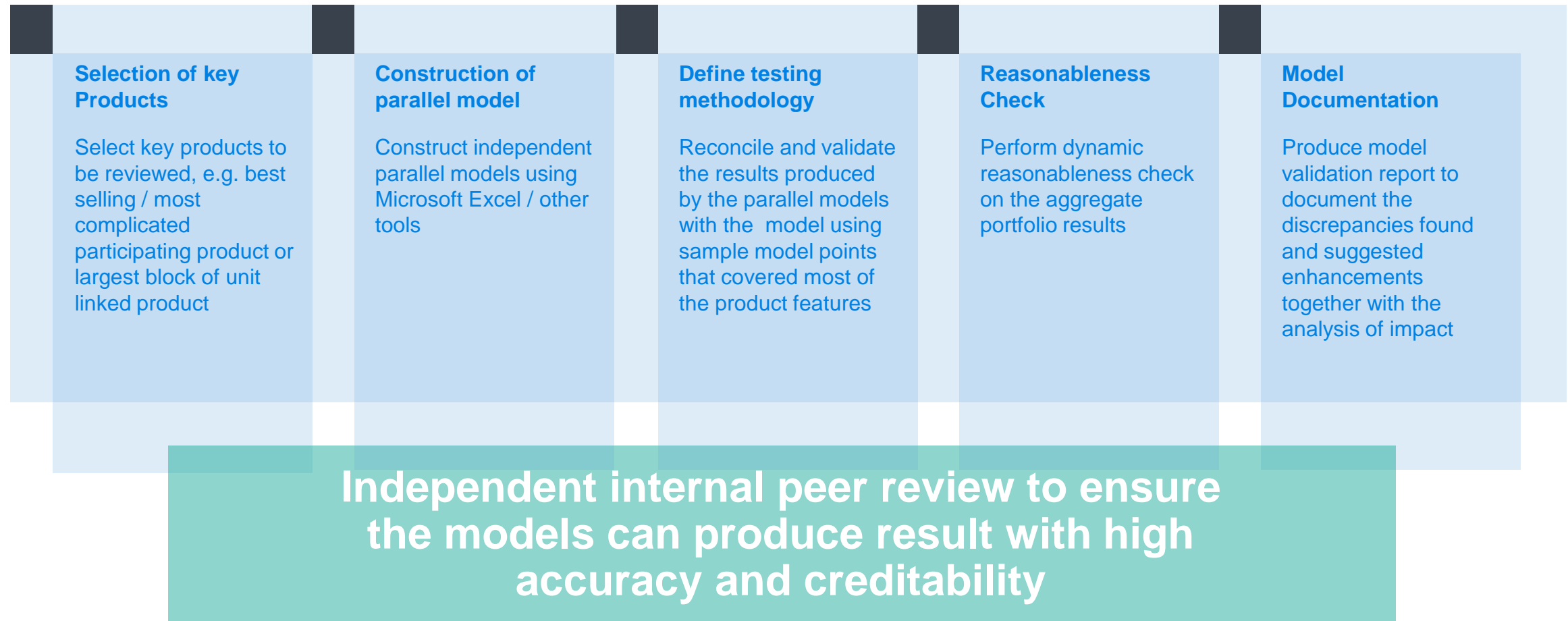
Model architecture / (re)structural design

Revisit model design often

- **The model architecture is a critical part** of model implementation, as poor initial design is likely to lead to subsequent problems and inefficiency

- The model should be developed to be transparent, flexible and efficient such that it fits users' needs.

The most suitable libraries for each products

The most appropriate and optimised use of master vs clone products

Use of indicators to define products with similar characteristics

Structure the model to ease on-going model maintenance

Use of switch variables to allow different calculations and provide greater flexibility

Use of advanced features to produce / store results in an more efficient way

The most appropriate assumptions table structure across all products / business units under different reporting bases

The most efficient output structures and results storage that meet all the reporting requirements

Consistent naming convention according to the company standard

Model review & optimization

Model accuracy: a proven and successful approach

Selection of key Products

Select key products to be reviewed, e.g. best selling / most complicated participating product or largest block of unit linked product

Construction of parallel model

Construct independent parallel models using Microsoft Excel / other tools

Define testing methodology

Reconcile and validate the results produced by the parallel models with the model using sample model points that covered most of the product features

Reasonableness Check

Perform dynamic reasonableness check on the aggregate portfolio results

Model Documentation

Produce model validation report to document the discrepancies found and suggested enhancements together with the analysis of impact

Independent internal peer review to ensure the models can produce result with high accuracy and creditability

Model review & optimization

Model efficiency and auditability

- Actuarial modelling is not an "exact science" as there are often many ways to achieve the same outcome.

- It is important to understand different approaches available and to develop the optimal solution. The following three key factors should be focused on:

Accurate and robust code

- Well-structured code reduces debugging effort and time for future coding developments.
- Well-coded design to provide greater flexibility.

Minimised runs times

- Removal of manual touchpoints – industrialisation of inputs / automatic reporting modules (see industrialisation).
- Automatic controls and reconciliations.
- Integrated sensitivities.
- Use of advanced coding techniques (looping, rebasing) to minimise number of runs.

Efficient processes

Use of best practice coding approach: optimised table read, appropriate use of extended formulas and looping / rebasing, reduction of calculated / output variables, reduced unnecessary calculations in the coding.
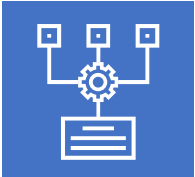
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Model validation

To keep a check on your model

Parallel testing

Ensure select output from models can be demonstrated and reproduced using an alternative model or high-level tool.

Static validation

Reconcile the appropriateness of the policy of population data to administrative systems

Dynamic validation

Dynamic validation is the process of analyzing how projected cash flows roll forward across a spectrum of scenarios and comparing that analysis to the originally inputted assumptions

Sensitivity testing parameters

Understand the stability of a model by determining how sensitive a model is to changes in key inputs
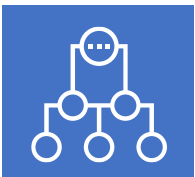
Other validation tests

There are a wide range of possible validation tests. Other validation tests not covered above include expert judgement, historical back-testing, reconciliation with other reports etc.

Model Analysis and validation

Going beyond the code

- Ensuring the model is fit for its purpose

- Ensure that all regulatory requirements are met by the model

- Reviewing model design (especially when incorporating model changes)

- Validate the source of the assumptions and if the assumptions are used appropriately

- Controls on the model

- Adequate documentation of the model and its processes

- Appropriateness of the modelling platform

- Sustainability of the model for future use

Model documentation

People / roles change but good documentation stays

- Typically, **model documentation** covers the following:

    - Explanation of the structure of the data management system and the actuarial model. This includes the purpose of each model implemented within the centralised model and the summary of flow chart from end-to-end process;

    - Important input data and output variables including in the reporting templates;

    - Model version control, including the list of all variables with their coding and short description for the methodology or assumptions assumed;

    - Assumption table set-up. This include the details of the assumptions table and the update input process in each valuation date;

    - Technical details of bases, assumptions and related formulas for each of the different reporting bases;

    - Regression test results – new centralised model results compared against the results produced from the existing model; and

    - Model governance covering the coding process, input preparation, data validation process, model validation process, naming convention standard, model developer, version control and change log requirement according to the company's internal standard.

- In particular, the **model validation** should be documented as it provides assurance that model validation was adequately performed.

Case Study. Managing model risk

Challenge   How a large global insurance company organized itself to better manage its model risk and control financial impact

Approach

Results

Clear identification and segregation of roles

- Separate teams for model development, model user/owner, model supervisor, and model controls

- Independent peer review and documentation

Modernization

- Input catalogs (data dictionary / Assumption catalogs) / assumption manager tool
- Process automation including automated checks
- Model ticketing system
- Enterprise modelling platform

Independent governance and audit committee

- Risk / change classification based on the estimated financial impact; committee approval for changes above defined financial threshold

- Validation of the estimated financial impact against actual impacts

Robust model governance with complete visibility across all levels.

Thank you

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