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Model Risk Management Time to make a pit stop

Deloitte Middle East | March 2021



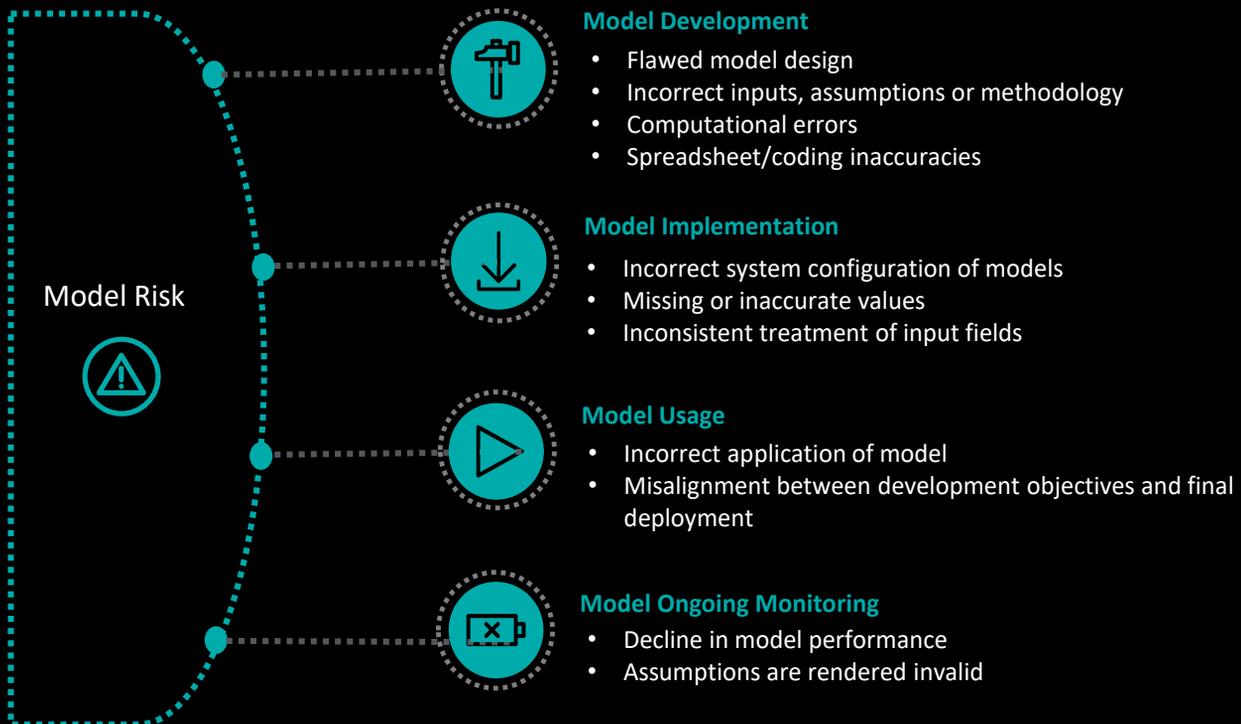
MAKING AN
IMPACT THAT
MATTERS
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“Model risk can be defined as the potential loss an institution may incur, as a consequence of decisions that could be principally based on the output of (internal) models, due to errors in the development, implementation or use of such models (CRD IV, Article 3.1.11).”

While certain elements of model risk may be state driven (i.e., prevailing at a certain stage of the model lifecycle) - such as model initiation, development, implementation, usage, ongoing monitoring and decommissioning – the risk of model decay is ubiquitous and may materialize at any point during a model’s existence.

What is model risk and where does it arise?

Today, the use of models, i.e., either complex statistical algorithms or a set of rules, has grown out of a necessity to accelerate the transformation of the plethora of data into essential decision facilitators. However, with the use of models comes inherent model risk, which is prevalent at various stages of the model's existence and in various forms.



Risk managers over the years have drawn parallels between ineffective model risk management and notable monetary **losses** and reputational damage. Much attention is now paid to models due to a diverse set of recent control failures that have made the news.

A dominant global entity made losses of over \$7bn due to a model shortcoming, where an error in the VaR metric understated the risk by 50%, enabling risky investments

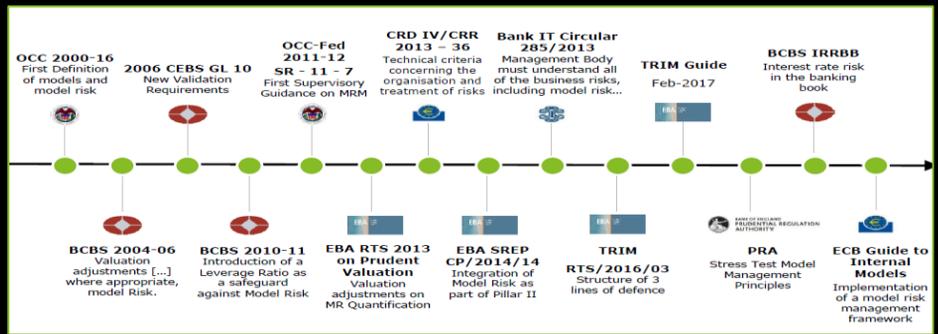
One of the main causes of the 2008 financial crisis, which cost banks over \$523bn, was rating models assigning AAA ratings to securities backed by pools of unhealthy loans

A large American trading institution made a colossal \$440m loss in the space of just 30 minutes due to a shortcoming in the internal technical framework

Why is MRM imperative now more than ever?

Over the years, the lower precedence assigned to effective model risk management (MRM) has cost many institutions millions in reparations, which has contributed to the growing importance of model risk management.

Model risk management can be interpreted as the identification, assessment, monitoring, and mitigation of risks that arise from model deployment. While MRM had started to gain momentum following the global financial crisis, regulatory principles and guidance have been in effect since the early 2000s.



Factors contributing to the growing importance of MRM



Regulatory expectations and audit requirements

- Regulatory expectations in the form of acts and guidelines are being published
- Regulators across the globe are moving towards mandating a comprehensive model risk management framework to be implemented as part of the risk management practices of banks
- Auditors rely on ongoing validation and monitoring to ensure the accuracy of the models deployed and that the outputs effectively capture the required provisions and capital buffers



Interdependency across business units and models

- Models are pervasive and are used across business units
- The same models are used for various purposes such as forward-looking macroeconomic models for ICAAP, stress testing, IFRS 9, etc.
- Shortcomings result in a domino effect magnifying errors and losses



Model complexity is rising

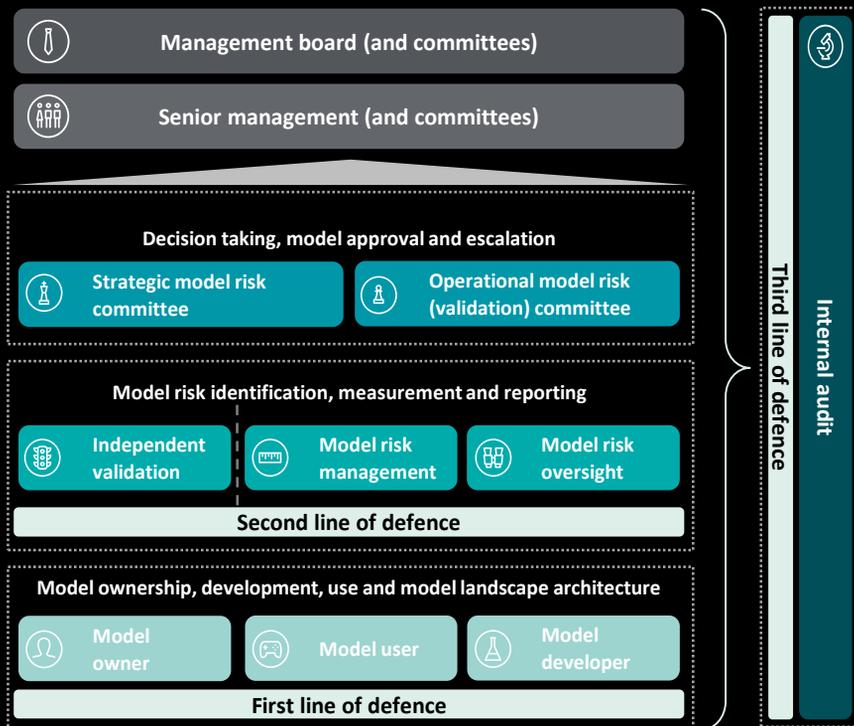
- The complexity of the model frameworks is exponentially increasing to keep up with the evolving ecosystem.
- To cope with the evolving market and help banks move towards better and more effective risk management, sophisticated approaches are more widespread, but pose more complex risks

What an effective model risk management framework should entail

Although the use of models by financial institutions has brought objectivity in their decision making, it has also led to a significant increase in model risk. Mitigation of model risk requires effective and robust implementation of an MRM framework that involves defining ownership, describing roles and responsibilities and enabling various stakeholders to work together in a synchronized manner.

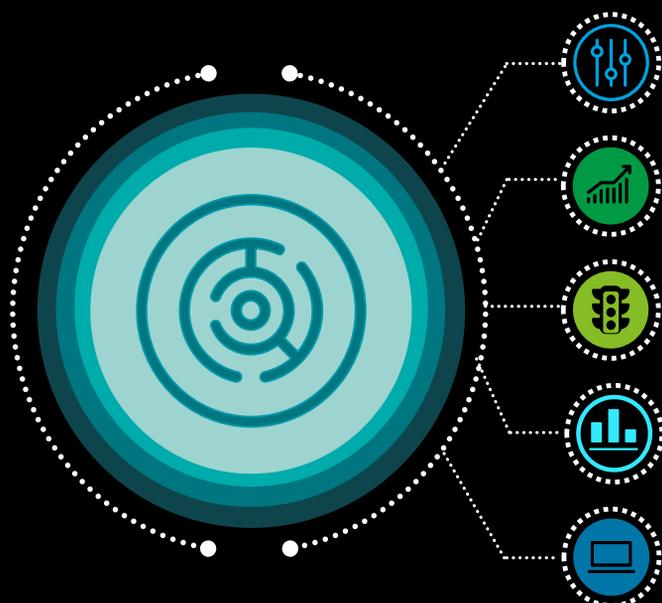
The MRM function acts as a key point of reference for all matters related to model risk and paves the way for setting up the guidelines on model development, validation, classification, monitoring, documentation, inventory and reporting.

Regardless of the size and complexity, a '3 Lines of Defence' model been identified as an effective way to manage and control the model risks within an organization, when actively supported and guided by the organization's governing body and senior management and enabled by a robust framework.



Building blocks of the effective MRM framework

The following are 6 essential building blocks for any financial institutions to build an effective MRM framework.



Organization and Governance

MRM policy, Roles and responsibilities, control framework and rationalization, strategic integration with model risk appetite, MRM monitoring, MRM risk awareness and mind-set.

Model Lifecycle Management

Model definition, Model discovery, model inventory, model categorization, model documentation

Model Control Framework

Validation procedures, separate and independent model development and validation teams, periodic coordination between MRM, development and validation processes, model prioritization

Model Risk Quantification

Quantitative techniques for model risk mitigation regarding data, estimates and uses.

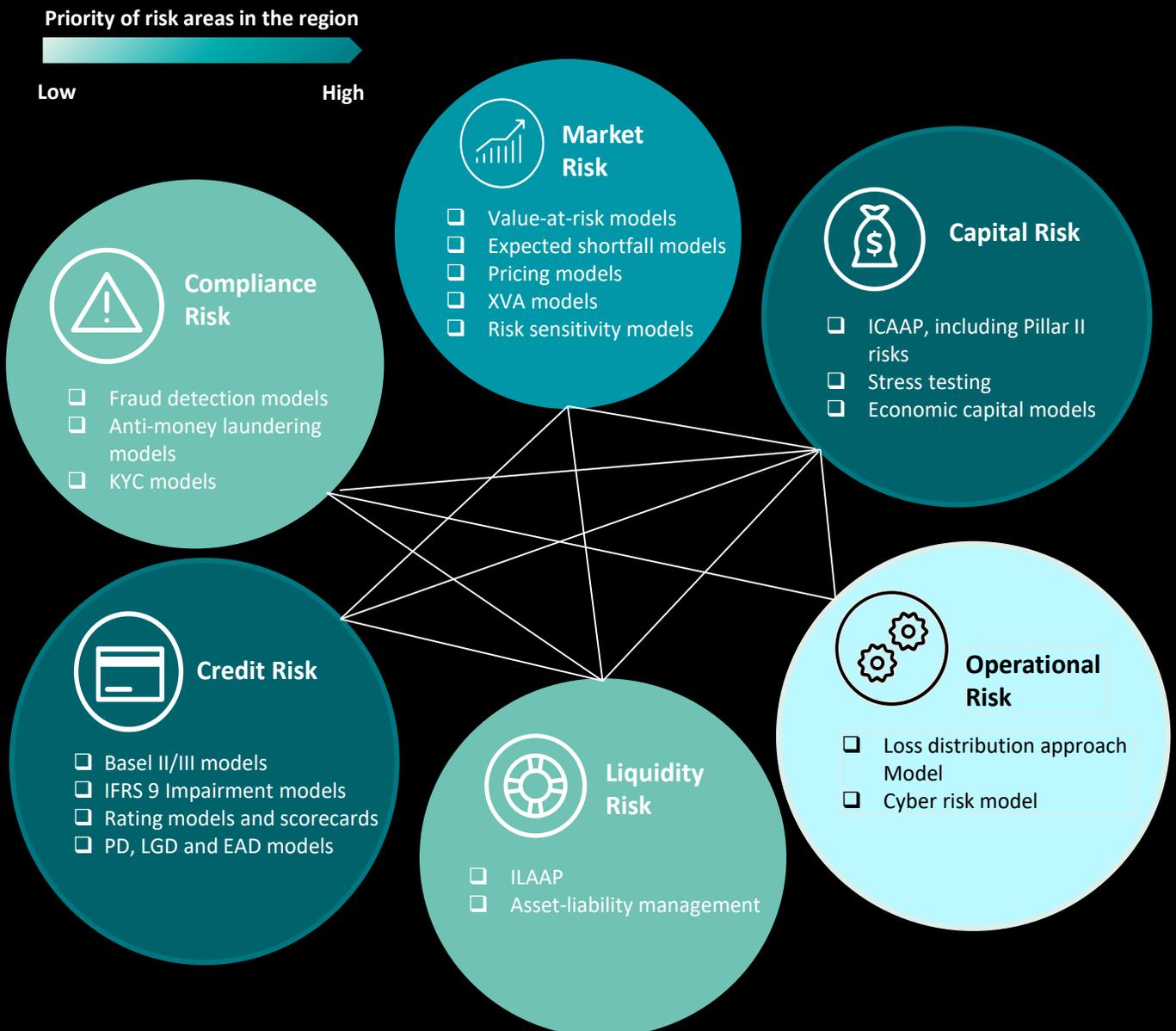
Model Risk Management Processes & Technology

Technology infrastructure and workflow management for integrating various processes in the MRM framework.

What areas of risks and models should be covered to manage model risk?

Model risk is both an omnipresent and integrative risk.

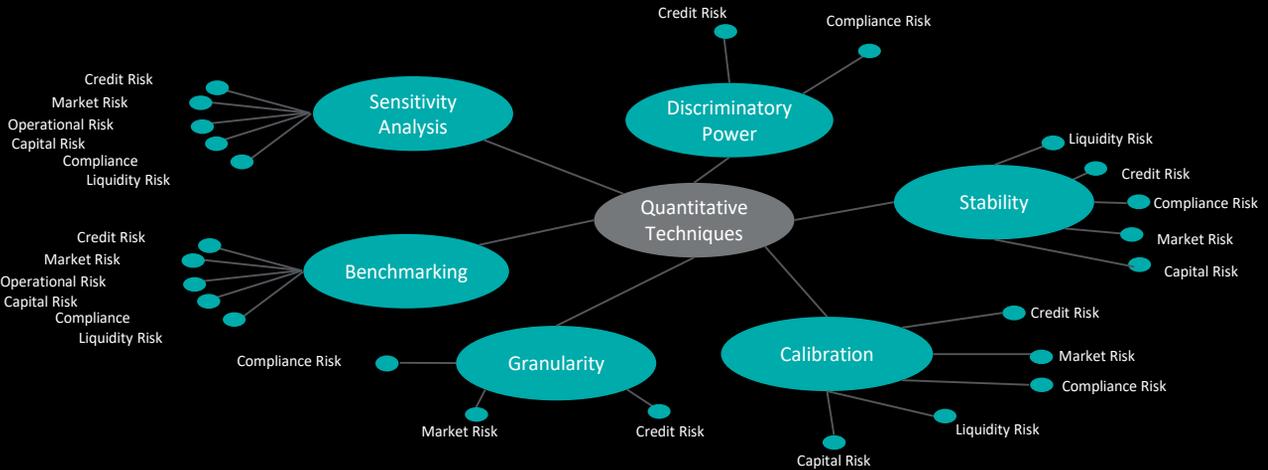
Since models and their functions are largely integrated and dependent on each other to mitigate risk for financial institutions, it is imperative to ensure that a comprehensive set of risk areas and models are considered as part of the model risk management scope. Based on the complexity of the financial institution's operations, there may be a myriad of models that need to be assessed for model risk.



Clearly, there is a multitude of risk areas and models that fall under the umbrella of model risk management. Nonetheless, financial institutions must ensure a consistent and effective validation framework is followed across all models, although the validation techniques may differ across models.

What are the standard techniques to assess if the model is performing and fit for purpose?

Model monitoring is a continuous process which plays an essential role in the early detection of deviations and provides corresponding course correction. It comprises a series of alerts and criteria that will make it possible to objectively determine the suitability of the models. It is not limited to monitoring statistical or mathematical algorithms but covers elements such as decision strategies and expert adjustments as well.



On the other hand, model validation is carried out at standard intervals. The objective is to effectively and independently raise questions on the assumptions and decisions made during model development. This would help financial institutions accurately evaluate conceptual soundness of the modeling methodology and ascertain that the model is performing and fit for purpose.

Model Governance

Evaluate the framework used to control access, implement policy and monitor the activities for the models.

Model Design

Evaluate conceptual soundness of model design, theory and methodology

Data

Assess data used, data quality measures taken and its completeness

Assumptions

Assess if the principles, assumptions, overrides and standards used during model development are fit for purpose



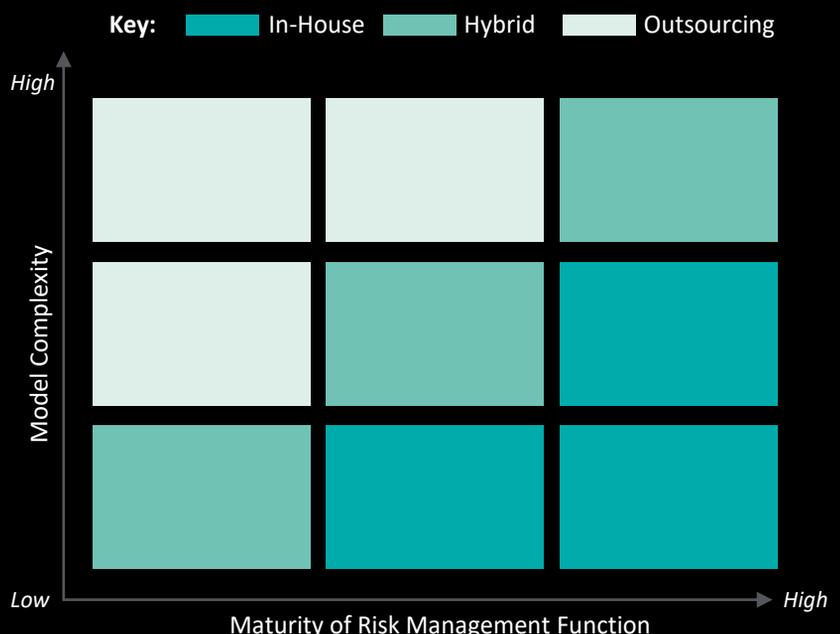
What are the common operating models being used by banks and FIs for effective MRM?

Upon beginning to assess their model risk, financial institutions face a decision on the best way to conduct the risk assessment. Due to factors such as cost, time and required expertise, financial institutions face a trade-off between performing the model validations internally or externally through a third party. The following three main approaches have been observed in the region.

In-House Approach	Hybrid Approach	Outsourcing Approach
<ul style="list-style-type: none"> Asserts full control of the model risk management approach internally 	<ul style="list-style-type: none"> Collaboration between the internal and external parties enhances the model risk assessment by leveraging the expertise of both into one framework 	<ul style="list-style-type: none"> Ensures complete independence in the model validation assessment
<ul style="list-style-type: none"> Develops and promotes growth of model risk management expertise within the institution 	<ul style="list-style-type: none"> Timeline optimization leveraging internal team and external parties, depending on the management requirements 	<ul style="list-style-type: none"> Ability to choose third-party experts who bring the best services in the market and can meet the bank's requirements
<ul style="list-style-type: none"> Flexibility between on-going assessments while ensuring a smooth and fast process 	<ul style="list-style-type: none"> Integrating the external approach requires additional effort and can be time-consuming 	<ul style="list-style-type: none"> Flexibility to choose between a one-time or an ongoing service based on the bank's needs
<ul style="list-style-type: none"> Can be costly to hire expert resources year-round for model risk management purposes 	<ul style="list-style-type: none"> Relies on effective project management and culture between the parties 	<ul style="list-style-type: none"> The bank does not have full ownership of the model risk management
<ul style="list-style-type: none"> Can lead to biases if there is lack of segregation between in-house developer and validation teams 		<ul style="list-style-type: none"> Due to the reliance on external expertise, in-house knowledge is not developed in this area

Banks and financial institutions strive to adopt an ideal approach based on the complexity of the models and maturity of the risk management function, as shown on the right. However, there are additional factors such as number of models, cost, time, in-house expertise and capacity that are taken into consideration when selecting the best approach to model risk management.

Keeping in mind these factors, financial institutions can also select the optimal approach by risk area and model type. This gives the bank flexibility to assess its capabilities and expertise in each risk area to maximize the efficiency and effectiveness of the model risk assessment as well as the mitigation.



The growing need for model monitoring

Sometimes, the sheer cost and effort involved in developing, calibrating and implementing a suite of first-generation models can tend to bias stakeholders against reexamining the same piece of work. Budgetary constraints and arduous internal processes also contribute towards a thought consensus that favors getting the most 'mileage' out of a single model.

However, live cases have time and again demonstrated the irrationality of using inaccurate, unreliable, poorly implemented or heavily outdated models. The jury is no longer out, with irrefutable evidence in favor of maintaining a strong model risk mitigation plan. Along the journey, model monitoring serves as an essential pit stop – braking to refuel might shave a few seconds off one's lap time, but it significantly improves the chances of making it through to the finish line.



Furthermore, as banks continue to double down on their investments in groundbreaking financial technology, advanced analytical tools and resources skilled in the study of data science, the coverage and sophistication of model development is only slated to increase – modern-day advances in process automation, machine learning and artificial intelligence point towards exponential growth in the ways data can be analyzed and manipulated to create a competitive advantage, from gaining a more thorough understanding of the risks pertaining to business decisions undertaken by institutions to developing strategies for customer targeting and market penetration.

While the use of predictive analytics is on this upward trajectory, investing in a strong model monitoring framework, with dedicated roles and responsibilities extending across all phases of the model lifecycle, is a pressing requirement that banks can no longer afford to circumvent. Just as a colossal skyscraper will crumble without a strong cornerstone, predictive models can only benefit an organization if they have been developed, implemented, applied and reviewed correctly. With great power comes the need for greater due diligence.

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