

"All models are wrong, but some are useful." Dr. George E.P. Box, British Statistician (1913-2013)

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Model Risk Management Comes of Age - Boards Take Notice

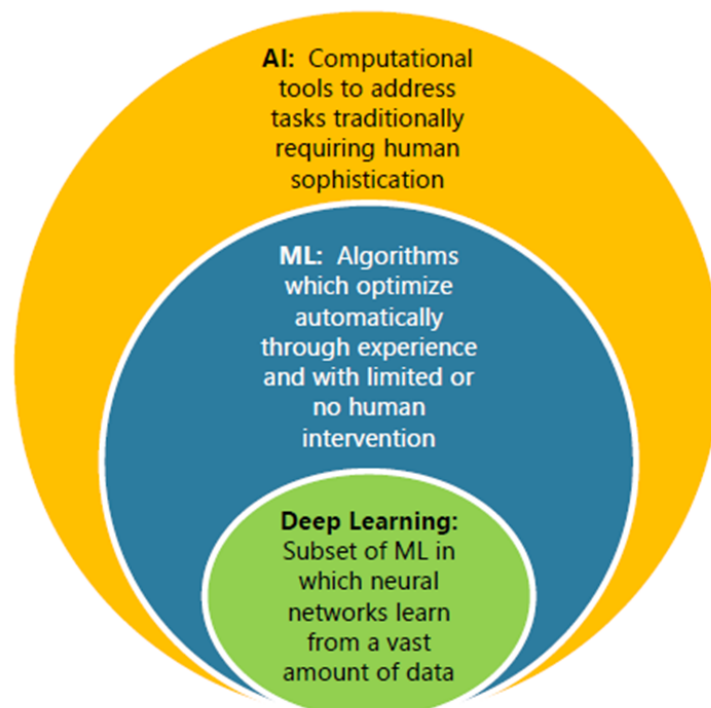
By Mark G. Holladay and John Hopf

Model risk has become so widespread that it is now often considered a risk category of its own. [1]

As the number, scope, and complexity of models continue to increase, further transformation of model risk management is needed and is already underway at many organizations. Unfortunately, many organizations do not understand the extent to which insufficiently vetted models may increase strategic, reputational, credit, compliance, and operational risks, among others.

Following the 2008-2009 financial crisis, the publication of banking industry Model Risk Management (MRM) supervisory guidance transformed MRM practices globally within the financial services sector. [2]

This report focuses on several topics that are central to the transformation of MRM: the dominance of Artificial Intelligence (AI), and in particular Machine Learning (ML), in today's models; the importance of formalizing the model lifecycle; and understanding the evolving staff skills needed to effectively conduct model risk management functions.



MACHINE LEARNING AND MODEL RISK MANAGEMENT - A COMPETITIVE EDGE

Boards should be aware of both the potential competitive edge that AI/ML can provide to their firms as well as the corresponding challenges and risk that accompany model technology. Because AI/ML seems to be near the top of the “Hype Curve”, board members should be wary of inflated performance expectations from technology solution providers, many of whom are simply rebranding older solutions to take advantage of the current AI hype.

Technological advancements have facilitated the transformative ability to process significantly increasing amounts of volume, velocity, and variety of new data, enabling significant growth.

That growth has spurred model development utilizing Machine Learning (ML). A broad range of Machine Learning capabilities has enabled reduced business costs and increased efficiencies, the identification of more complex statistical relationships such as those between customer and product features, significantly improved business results, all while further improving model performance and accuracy.

Along with the benefits of more powerful models come a series of challenges, some of which have made headlines (see, for example: [NYT](#), [WSJ](#), [WP](#)). Model outputs have been hurt by data quality issues, exposed companies to privacy issues, and produced clearly biased (and unlawful) outcomes when used, for example, to qualify customers for banking products. Because many models are purchased from third parties, model operational transparency has suffered. Some firms adopt models based on hype rather than as a result of an informed decision-making process. [3]

These challenges have subsequently spurred significant regulatory interest, resulting in increasing attention to the use of Machine Learning in modeling within supervisory guidance. [4]

Questions Boards Should Consider [5]:

- Are we tracking all uses of AI/ML within our organization, and identifying services we utilize from third parties?
- Do we have appropriate sound governance in place to address the unique risks posed by AI/ML models?
- Do we have the necessary processes in place that promote sound model development, implementation, use, and independent review of AI/ML models?
- Have we tailored the appropriate extent of risk management to each use case in AI/ML models?
- Do we have the necessary expertise and resources across all relevant areas that develop, use, and validate AI/MIL models?

THE CRITICALITY OF EFFECTIVE MODEL LIFECYCLE MANAGEMENT

A lifecycle approach is key to improving model effectiveness and efficiency while minimizing model risk. Sustainable lifecycle management processes are needed and are often missing from organizations that seek to support model development, validation, monitoring and maintenance.

The path to model deployment is traditionally cumbersome because model deployment can be difficult, time-consuming, and often requires resources from a range of teams across an organization. With the

increasing adoption of predictive analytics and escalating model complexity, the demands on model risk management functions have accelerated. Models have become more accurate and they have also required more frequent updating, monitoring, and support regardless of an organization's size. Smaller organizations have often lacked the ability to fund increasingly complex support requirements. [1]

An emerging term used to describe an agile operating structure that improve model lifecycle management is "Model Operations." Agile approaches typically utilize cross functional teams whose makeup is intended to eliminate silos in order to fully meet the needs of stakeholders.

While estimates may vary slightly, only approximately 50% of the best models get deployed. Investments in resources to operationalize models have not kept pace with more traditional analytics-based investments of hiring data scientists, buying analytics tools, and building data warehouses and lakes. [6] Better orchestration of people, process, and technology/automation are needed to deliver quality models quickly at scale. Boards should be aware of this potential inefficient utilization of resources, as well as the technology solutions that can complement an effective model risk management framework in order to help drive positive strategic outcomes.

Questions Boards Should Consider:

- Do we have a standardized and well-defined process to manage the model life cycle for our inventory of models?
- Do we have adequate technology infrastructure required to properly develop, implement, validate, and monitor the number and type of models used within our organization?
- Do we have the necessary systems in place to quickly modify or replace models if they materially degrade in performance or as customer behaviors evolve?
- Are there low-cost automation opportunities to increase the efficient use of our available resources?

BUMPS ON THE ROAD - ADDRESSING MODEL RISK MANAGEMENT RESOURCE CHALLENGES

The scarcity of model building and testing expertise has presented challenges to firms wanting to properly staff model risk functions. Data Science talent is in extremely short supply. Boards should be aware that the extremely competitive environment to acquire and retain talent will likely impact their organization's ability to address model risk management needs. [1]

Today, organizations must compete with other firms in what has become a very hot market. The skills required for model development and validation are evolving and qualified candidates are increasingly scarce. As more and more firms recognize the broad opportunities to improve competitive advantage through the use of machine learning, retraining existing staff to more effectively address AI/ML challenges has become paramount.

A term that is sometimes used to describe the future role within both Model Development and Model Validation functions is the "Model Engineer." Along with the skills needed to succeed as a Data Scientist, a Model Engineer has an enhanced understanding of applicable technology, automation, and Model Operations.

Boards should seek personnel with skill sets that fit the requirements for Model Engineers and should make sure their firms are equipped to integrate personnel with those competencies into model development and management workstreams.

Questions Boards Should Consider:

- Have we identified the extent of specific technical staff skill sets required to validate our models given the number, complexity, and type of models used within our organization?
- If our organization utilizes AI/ML models, does our validation staff possess the underlying mathematics and coding expertise required, or do we have a plan to upskill our workforce in order to properly validate AI/ML models?
- Do we have members within our validation staff with relevant experience in automation technology and data or software engineering?
- Do we have sufficient depth of staff knowledge regarding our higher-risk models, or do we have key-person risk within our validation staff?
- Do we have career paths that facilitate staff cross-over between model development, model validation, and other IT or risk functions within the organization?

RESOURCES

- [1] Wallace, Raggl, Tejada, Agarwal, "[Model Risk Management, Latest insights into the evolution of model governance practices across North America, Europe, and Asia,](#)" December, 2019.
- [2] OCC 2011-12, Office of the Comptroller of the Currency, "[Supervisory Guidance on Model Risk Management,](#)" April 4, 2011.
- [3] Palmer, Knickerbocker, Ficklin, Lyons, "[Use of Artificial Intelligence and Machine Learning \(AI/ML\) at Supervised Financial Institutions,](#)" December 16, 2020.
- [4] Comptroller's Handbook Safety and Soundness, Office of the Comptroller of the Currency, "[Model Risk Management,](#)" Version 1.0, August 2021.
- [5] Gerhard, Silva, Wallace, Tejada, "[The next S-Curve in Model Risk Management,](#)" January 13, 2021
- [6] SAS, "[Getting started with ModelOps, A proven approach to deploying analytic models that deliver real business value,](#)" 2020.

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Holladay oversees enterprise risk management operations and related activities at Synovus Financial Corporation. He is responsible for providing the overall leadership vision and direction for Enterprise Risk Management. Direct Reports include Compliance, Operational Risk, Credit Review, and the Enterprise Risk Management Department. Holladay started his career at Columbus Bank and Trust Company in 1974 as a part-time teller and participated in the bank's management trainee program. After two decades of industry achievement, Holladay was named Executive Vice President of the Commercial Group, and in 1998 he was promoted to Executive Vice President of Banking/Client Delivery. In 2000, Holladay accepted the role of Executive Vice President and Chief Credit Officer. In 2008, he was named to the role of Executive Vice President and Chief Risk Officer at Synovus. Holladay holds a BS in Biology from Columbus College and attended the Louisiana State University Graduate School of Banking of the South, as well as the Masters' Program of Banking at LSU. He is a Board Member and Treasurer of the Calvary Christian School, as well as an Advisory Board Member of Shared Assessments.

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John joined the Model Risk Management (MRM) team at Synovus in 2011. Before joining MRM, John served in various roles within Synovus Card Services culminating as Group Vice President and also worked as an Industrial Engineer at Michelin North America. John concurrently served in the U.S Army Reserves in a variety of capacities to include Strategy and Plans Officer prior to retirement in 2021. John holds a BS in Electrical Engineering from the United States Military Academy at West Point, NY, as well as a Master's in Business Administration and a Master's in Strategic Studies.

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