

Future proofing model risk management (MRM) by using an integrated MRM platform

Meeting the need for quickly adapting to market changes, shortening production cycles, increasing cost efficiencies and improving model performance.



Model Edge

A PwC Product



In a world of rapid change and evolving threats, model risk teams are contending with growing numbers of risk models, increased model complexity, and the need for increased speed and flexibility. They need to shorten model production cycles, conduct more frequent monitoring and recalibration, implement more robust governance controls, and in general increase effectiveness and efficiency across their model lifecycle/workflows. This will require more than just automation and GRC software; it will require both automation and implementation of integrated model risk management platforms that support end-to-end model lifecycle activities.

The use of model risk management (MRM) technology solutions among Tier 1 and Tier 2 financial institutions is often limited and fragmented, creating disconnected flows and increasing inefficiencies across the model lifecycle. That hinders the ability to keep up with the growing demands on model risk management.

The use of automation and integrated, end-to-end MRM platforms can improve governance and increase the effectiveness of model risk management — while reducing costs and increasing speed and agility in model operations. That is one of the key findings from recent research conducted by KS&R and PwC, which examined the state of model risk management at Tier 1 & 2 U.S. financial institutions (\$50B or more assets under management). The research explored the challenges they face across the risk model lifecycle and workflows, along with the approaches they are using and the impact of technology on their efforts. The research shows that financial institutions that have been moving to broader use of integrated technology are seeing significant benefits across different phases of the model lifecycle, compared to those using little or no automation.




Risk modeling is becoming more complex. An integrated end-to-end model risk management platform will be essential to navigate the future risk landscape. GRC software alone won't be as effective.

Key findings from recent research conducted by KS&R and PwC, which examined the state of model risk management (MRM) at Tier 1 & Tier 2 U.S. financial institutions (\$50B or more assets under management).

Model risk management (MRM) is increasingly complex and challenging, requiring faster production cycles, more frequent monitoring and recalibrations, more robust governance controls and greater effectiveness across model lifecycles/workflows.

Contributing

- Growing use of AI/ML based models
- Faster pace of market changes
- Increased regulation and scrutiny
- Growing number and complexity of models
- Internal challenges related to data and systems impacting 1st and 2nd Lines of Defense



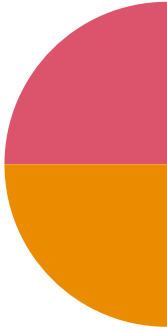
Use of an end-to-end model risk management platform is growing among Tier 1 and Tier 2 financial institutions (FI). In the meantime, FIs that haven't migrated to this approach experience duplicative, inefficient activity across workflows, where silos hinder effective model risk management and ability to address increasing complexities.

Contributing

- Many Tier 1 & Tier 2 FIs see technology and automation as a way to address the above complexities.
- This is being applied in a traditional, piecemeal fashion: off-the-shelf and GRC software and automation used at various phases of the model lifecycle and workflows but not integrated across it.

An integrated end-to-end MRM solution, involving all elements to manage the model lifecycle, as well as incorporating technical/coding capabilities to support model development/testing, model documentation, model validation, and execution of ongoing performance monitoring, **significantly increases effectiveness of model governance.** GRC components are not as effective. This approach addresses the key priorities of speed with model development, validation, monitoring and change management, along with improved model governance. Model risk is reduced by increased accuracy, improved documentation and fuller visibility into all models.

Benefits of an integrated end-to-end MRM solution:

- The research shows that financial institutions that have been moving to broader use of integrated MRM technology are seeing significant benefits.
 - These include improved governance and greater effectiveness of risk models, from model inventory to model development, validation and monitoring, compared to those using little or no automation.
 - Fully automated and integrated MRM platforms can also keep costs down and increase speed, flexibility, and accuracy in MRM. The research shows that it can help cut labor costs, reduce risk, and shorten production cycles, cutting weeks out of the time needed to develop risk models.
 - Those using GRC software with some MRM components do not see the same level of benefits. The key, then, is integration. A patchwork of MRM components is not enough to drive significant improvements.
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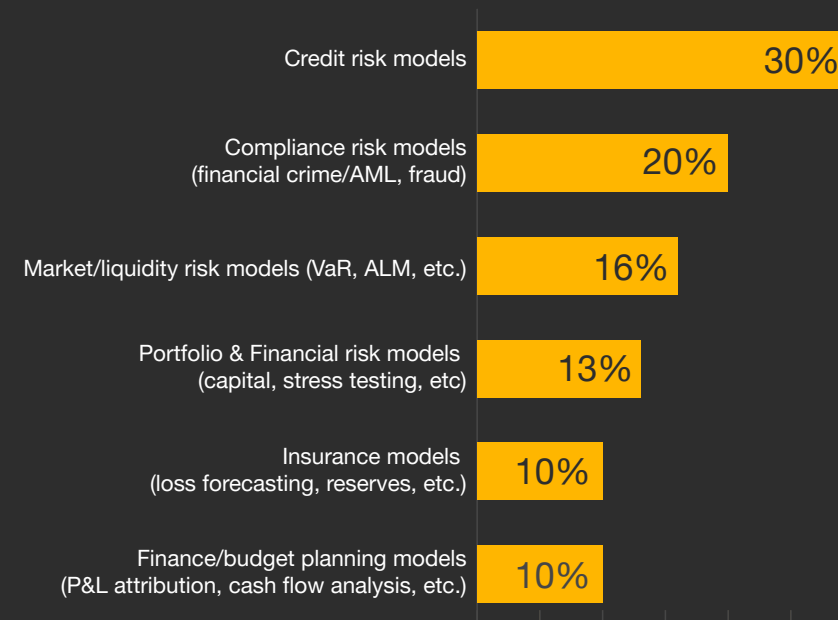
MRM: More work, more complexity, more scrutiny

Currently, credit risk models are the most prevalent type of model used at financial institutions, followed by compliance models and market/liquidity risk models. (See Figure 1) Various pressures have increased the focus on risk models over the past few years, in terms of managing both risks and costs.

Average Break out of Risk Models across Risk/Functional Types

(n=41)

Figure 1: Average distribution of risk models in use across risk/functional types





Increasing regulatory pressure and recent high-profile bank failures are leading regulators to scrutinize risk-model governance, inventory and validation practices in the industry, and require banks to demonstrate proper controls for the development and monitoring of models—especially complex market-liquidity models.



The digital transformation is creating more frequent changes in market factors, which means that model risk management operates in a world that demands ever-increasing speed. So too does the evolution of digital technologies and the expanding internet of things (IoT).

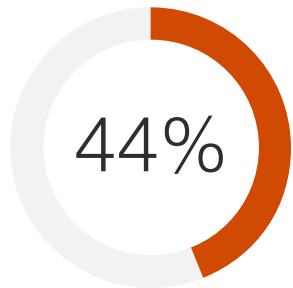


Cybersecurity and related compliance risks are growing with the digital transformation, crypto and AI giving criminals new tools and new avenues of attack. Furthermore, recent sanctions and additional regulations have increased the workload and cost associated with compliance.

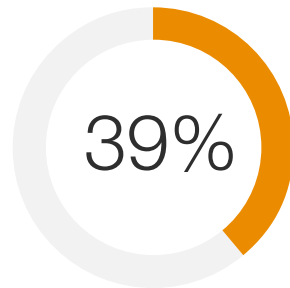


Quickly changing market factors are impacting not only compliance risk analyses, but also front-office sales and marketing functions—particularly in credit lending as banks compete with non-traditional lenders for real-time business opportunities. This means that models are important for correcting pricing transactions so that FIs can be agile as markets evolve while not loading up on risks; models should adapt quickly to new cyber and algorithm challenges; models should provide revenue protection and cost/speed savings.

As tier 1 & tier 2 financial institutions try to keep up with these pressures, the continued acceleration in model growth adds to challenges



of Tier 1 & Tier 2 respondents expect an increase in the number of models used over the next two years

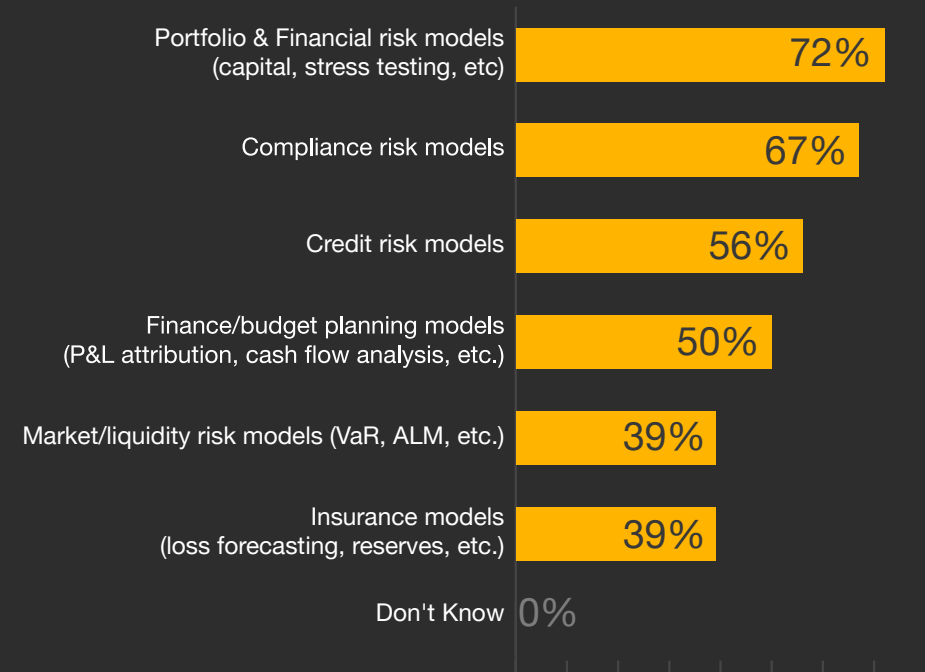


indicate growth of models as a top challenge with model governance, lifecycles and use

Risk/Functional Areas Expecting an Increase in the Number of Models (For those who expect the number of models to increase)

(n=18)

Figure 2: Expected increase in number of models, by area



The need for change

In this environment, financial institutions will need to recalibrate existing risk models, especially where models have not been updated to incorporate information on the latest patterns, and thus do not take into account factors such as rapid digital transformation, the greater complexity of regulations and uneven economic conditions.

Institutions will need to:



Conduct more frequent performance monitoring to assess model drift and ensure greater accuracy.



Re-examine processes for developing, validating and maintaining models with an eye to reducing risk-production cycles to keep pace with change.



Have models that can adapt quickly to new cyber and algorithm challenges, including the emergence of generative AI and increased cyberthreats that require advanced modeling solutions.



Have models that better support accurate pricing transactions, revenue protection and cost savings.



Be agile in taking advantage of evolving markets without loading up on risks.



Have a more complete and better organized model inventory and reporting processes.

Data integrity, disparate databases and documentation are barriers to improving model risk management — especially as current challenges continue to grow with the expansion of the model landscape and increased regulatory scrutiny

The need for such improvements is clear, but there are barriers to achieving them.

Survey respondents put problems with inputs for models, a lack of data integrity, and a lack of historical data at the top of the list, followed by disparate model databases and locations and scaling up systems to handle the acceleration of model growth. Many also cited documentation and audit trail quality. Of those who pointed to audit trail quality as a key challenge, only 33% said that their audit trail provides a detailed description of each change, and only 28% said that changes are automatically documented.

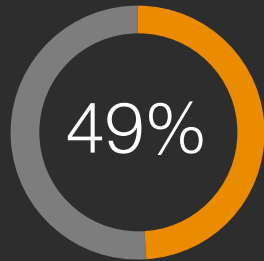
Those challenges are driving a number of concerns.

Not surprisingly, respondents cited problems with data being incomplete, inaccurate or biased as top concerns. These were followed by technical errors leading to poorly specified models using assumptions that aren't aligned with the business or conceptual frameworks. In addition, some concerns were related to non-technical management problems, such as process or implementation errors and incorrect model usage.

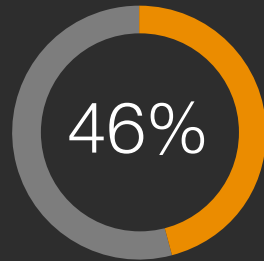


By the numbers

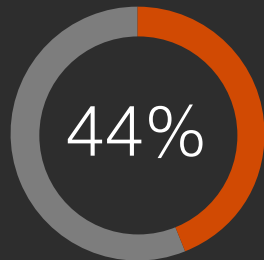
% selecting the following as a top challenge with model governance, lifecycle and use



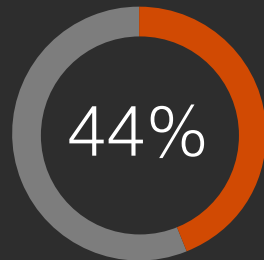
Lack of data integrity



Lack of historical data

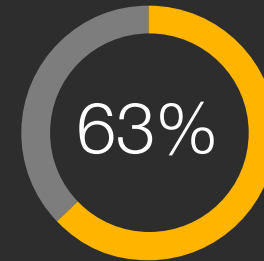


Disparate model inventory database and locations

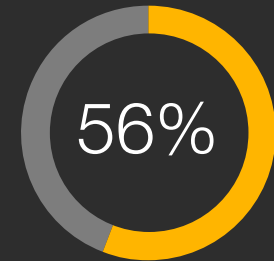


Limited quality of audit

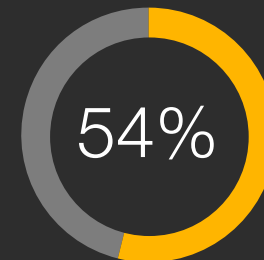
% selecting the following as a top concerns/issues posed by current risk models



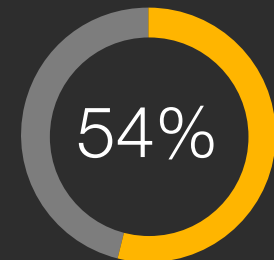
Data issues – incomplete, inaccurate, biased



Technical errors – model not statistically sound



Poorly specified models



Model performance issues; not as expected

These challenges are impacting model inventory and various parts of the risk model framework across both the first and second lines of defense

About two-thirds said that model inventory was a particularly key challenge, related to the impact of more complex models, data integrity, disparate locations of data and limited audit trail capabilities.

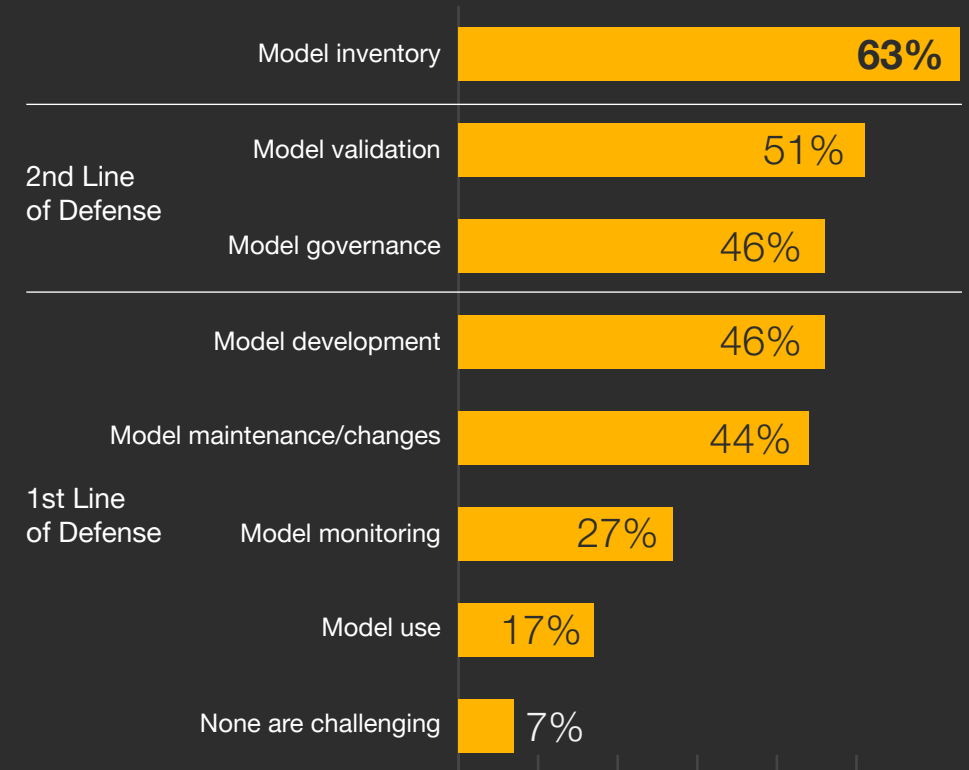
On the list of challenges, model inventory was followed by model validation, governance, development and maintenance/changes.

Those indicating challenges with model inventory were also more likely to cite the following overall challenges

- Documentation with increasing number of models **80%**
- Increasing complexity of models **77%**
- Tracking changes **71%**
- Lack of data integrity **70%**
- Disparate model inventory databases **67%**
- Limited audit trail **67%**

Tier 1 & 2 Most Challenging Parts of Risk Model Framework

(n=41)



For the first line of defense, model development and model maintenance/changes top the list.

Respondents citing model development were more likely than others to say that they had encountered problems with legacy systems being barriers to integration and collaboration; with a lack of integration between various data sources; with disparate model databases; and with an increasing number of models. Those citing model maintenance/changes were more likely to have had problems with limited reporting capabilities, increasing complexity of models, and the tracking of changes.

Respondents using less automation were significantly more likely than others to cite model development (53% vs. 24%) and monitoring (44% vs 18%) as challenges.

From a second line of defense perspective, roughly half of Tier 1 & Tier 2 financial institutions said that model governance and validation is challenging.

This was cited most often by those who also experience challenges with increased regulatory requirements, increased complexity of models, and the risk of errors in manual activities.

Second on the list was model governance, cited by those who were most likely to also say that the increasing number of models, acquiring and retaining skilled resources, and the risk of errors in manual activities were key challenges.



Traditional GRC software falls short with model risk management

To handle the growing volume and complexity of model risk management—coupled with the need for speed—financial institutions will need to adopt more efficient approaches. This will require more automation and more integration across the model lifecycle and workflows to enable the end-to-end management of model risk processes.

First and second lines of defense see the value in automating processes, but many are making only limited use of technology. For example, while many Tier 1 and Tier 2 financial institutions say they are using a single integrated end-to-end MRM platform solution, a fair number are not. Instead, they are relying on piecemeal solutions in specific areas, or on traditional GRC systems that may or may not include MRM components.

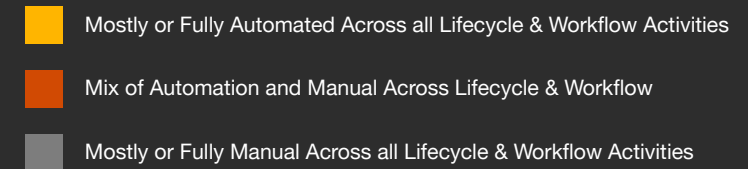
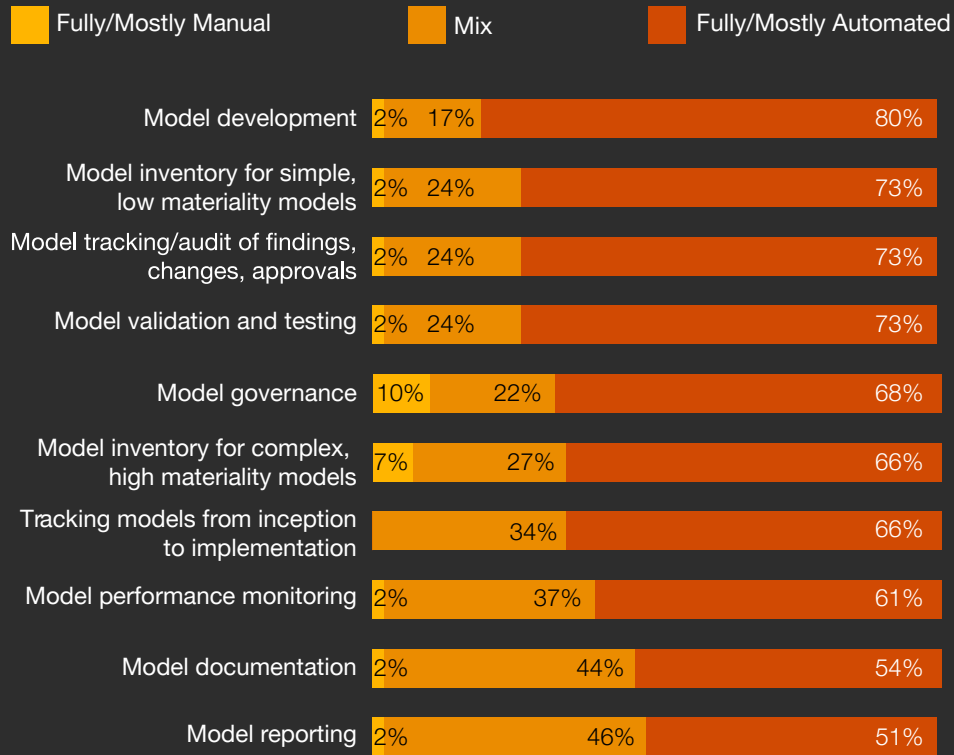
Further, only 12% of Tier 1 and Tier 2 financial institutions have mostly or fully automated activities across the full model lifecycle and workflows. The rest are using a mix of automation and manual work at select phases, with FIs indicating automation being applied to an average of 4 phases in the lifecycle and workflows. These most commonly include model development, model inventory for simple, low-material models, model tracking/auditing of findings and model validation/testing. (See Figure 5).



Degree of Manual or Automated Support Across Model Lifecycle & Workflows

(n=41)

Figure 5: Manual versus automated support across Tier 1 & Tier 2 model lifecycle and workflows



Avg. Number of Lifecycle/Workflow Phases with Automation 4

This type of patchwork approach to automation hinders model risk management in a number of ways.

Inefficiencies: The use of multiple and often-disparate tools makes model maintenance more complicated and expensive.

Barriers to development and agility: It tends to create process and data silos that inhibit the ability to develop, recalibrate and validate models quickly.

Barriers to validation and audit tracking: This can become difficult based on incomplete data about updates and prior actions. So too can the documentation of changes, audits, validations, and various upstream and downstream interactions necessary to accurate model inventory.

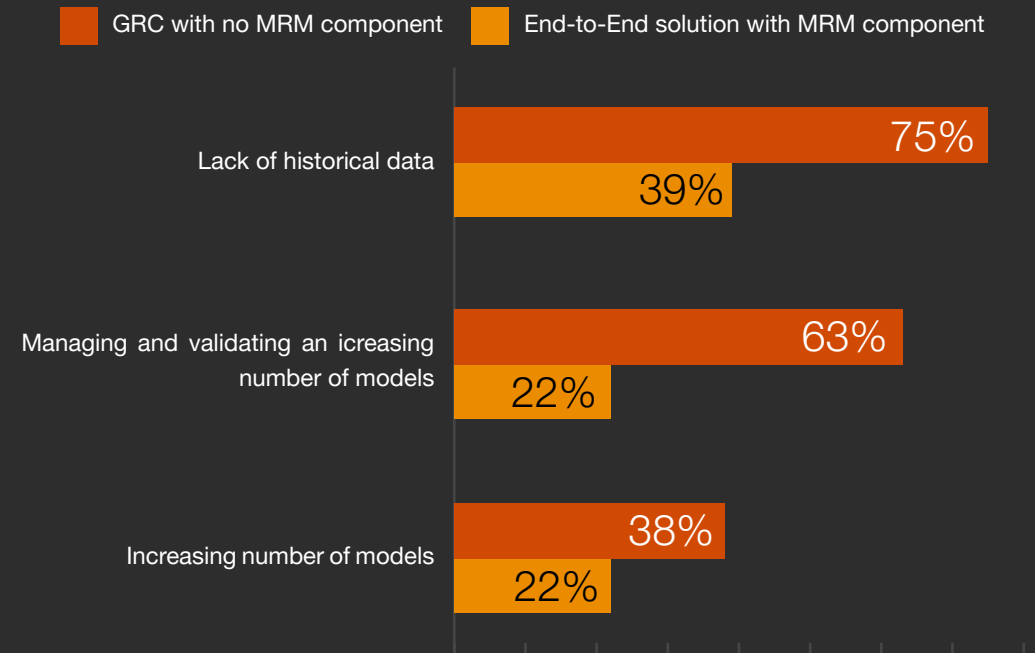
Poorly performing models: The above can lead to poorly specified models, data issues, and, ultimately, models that do not perform as expected.

Altogether, such problems with traditional software approaches often make it difficult for model risk teams to meet today's fundamental challenges associated with data and a growing number of risk models. (See Figure 6)

Tier 1 & 2 Top Challenges with Model Governance, Lifecycle and/or Use

(n=41)

Figure 6: Top challenges with model governance, lifecycle and/or use framework



An integrated end-to-end MRM solution, involving automation, can significantly increase model lifecycle/workflow effectiveness

Two-thirds of Tier 1 and Tier 2 financial institutions that do not currently employ an integrated end-to-end MRM platform solution say they are planning to do so within the next three years.

As more financial institutions turn to increased automation and integrated MRM platforms, they are likely to see significant improvements in the effectiveness of the model lifecycle, workflows and production cycle, the research shows.

Implementing automation across each lifecycle/workflow phase, with an integrated end-to-end MRM solution platform, significantly increases model risk process effectiveness. Just adding MRM components to GRC software does not significantly boost effectiveness.

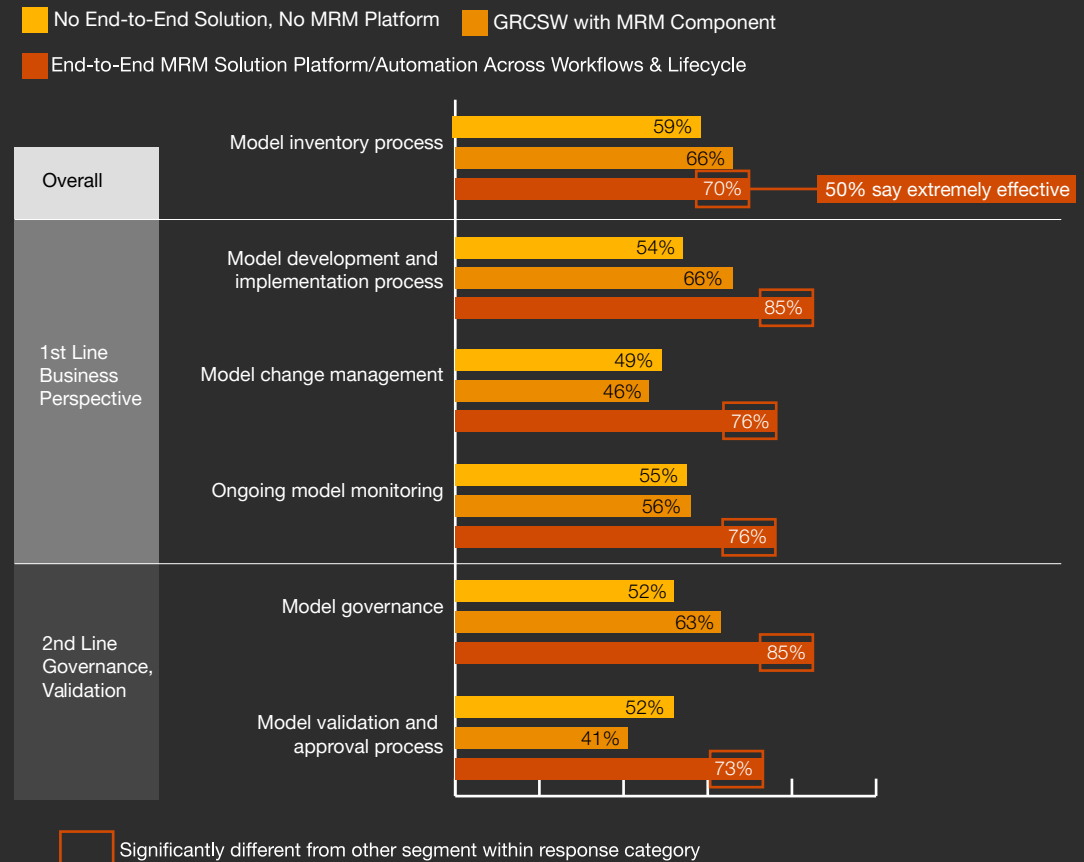


As research findings show below, financial institutions with an integrated end-to-end MRM platform are significantly more likely to say that their various model workflow activities are very effective compared to others. For example, 85% of those respondents said their model development and implementation process was very effective, compared to just 54% of organizations that do not use an integrated end-to-end approach.

Those who use GRC software with some MRM components also lag behind, rating their processes the same or even lower on effectiveness than those with no automation or end-to-end platforms— all of which underscores the relative ineffectiveness of fragmented systems. (See Figure 7).

% Rating Extremely/Mostly Effective Model Risk Management Process

Figure 7: Comparison of effectiveness ratings across the model lifecycle/workflows based on degree of automation and integration



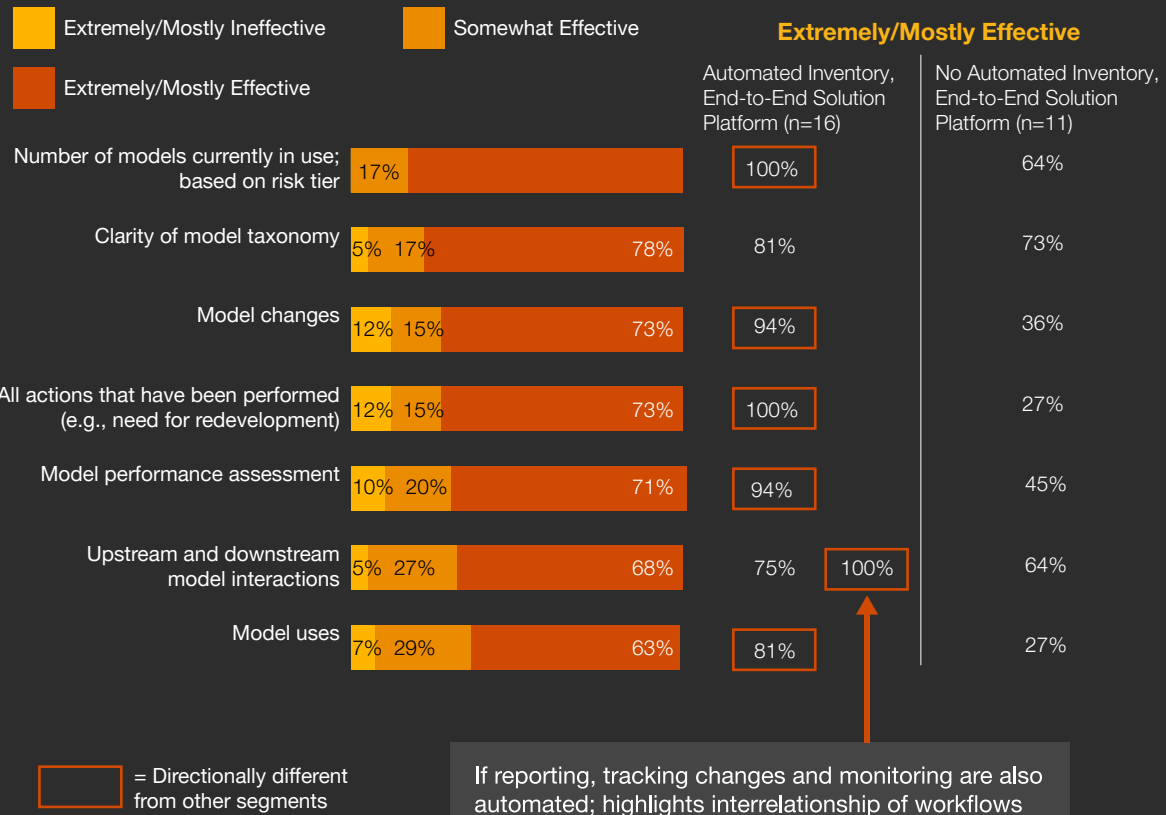
Effectiveness of Identifying, Tracking and Documenting the Following Components of Risk Model Inventory

(n=41)

Figure 8: Effectiveness of identifying, tracking and documenting inventory

Model inventory is significantly more effective among those automating this process with an end-to-end MRM solution.

For example, 94% of those respondents said that their ability to identify, track and document model changes is extremely or mostly effective, compared to 36% of those with no automated inventory or end-to-end solution. This same comparison is found with tracking model use and performance. Model upstream/downstream interaction is even more effective when automation occurs across different workflows, such as reporting, tracking of changes and monitoring. (See Figure 8) This latter observation particularly supports the approach for more integration across workflows.



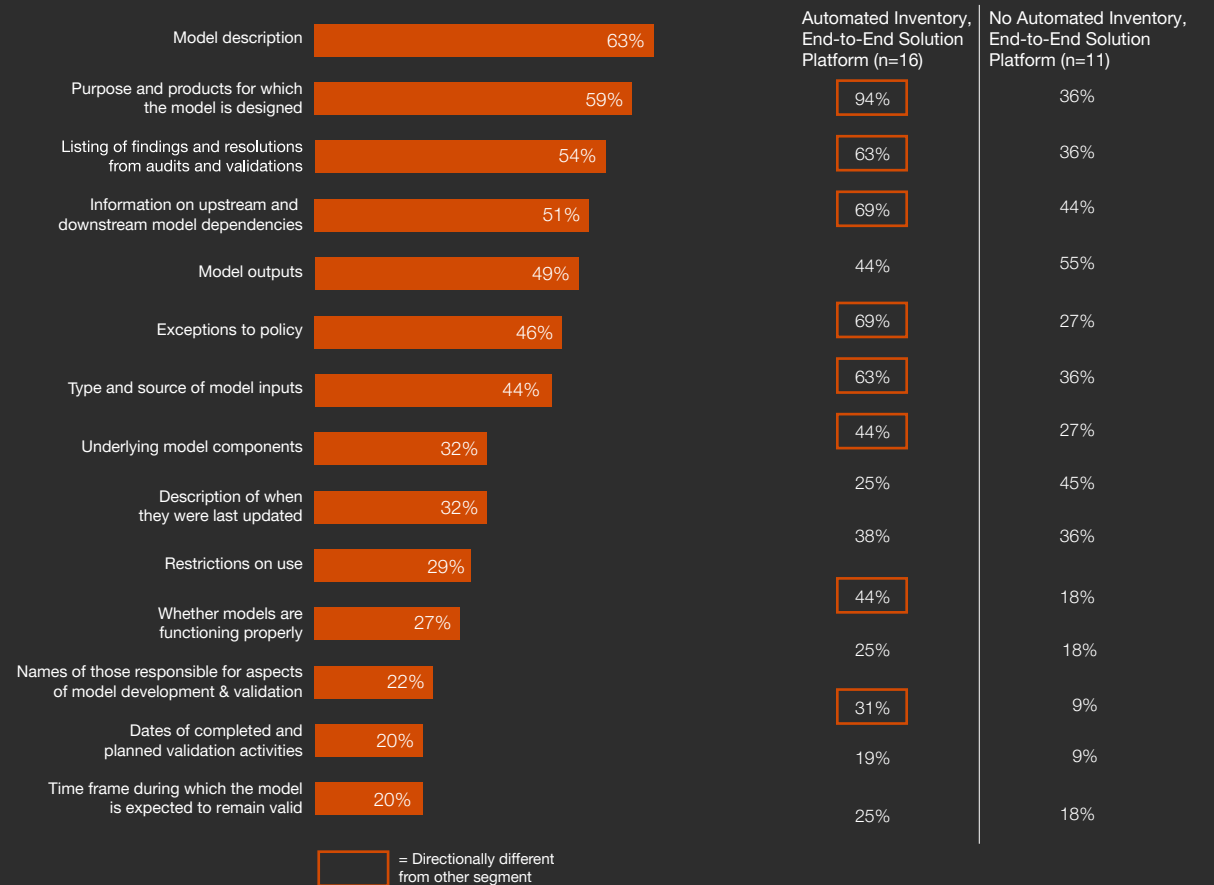
A number of these differences stem from the fact that an end-to-end platform enables the capture of more information related to changes, uses, performance and so forth. (See Figure 9)

This enables the organization to create a more complete, better organized inventory. Indeed, the effectiveness of model inventory depends heavily on input from other workflow phases. Thus, when reporting, monitoring and the tracking of changes are automated and integrated across silos, the effectiveness of model inventory improves. As the number and complexity of models increases, the role of model inventory will take on even greater importance—again, underscoring the need for a centralized function and an integrated MRM framework.

Types of Information Provided by Model Inventory

(n=41)

Figure 9: Information provided by model inventory



From a first line of defense perspective, Tier 1 and Tier 2 financial institutions with automation and an end-to-end platform are seeing better results than those without.

All of those with automated model development and an end-to-end platform rated the ability to test and regularly adjust models as being very effective compared to just 50% of those without this automated and integrated approach. There is a similar comparison with rigor of pre-implementation testing (94% versus 50%). (See Figure 10)

Most also said that ongoing model monitoring and maintenance processes are effective, with those using automation and an end-to-end MRM platform seeing higher levels of effectiveness than those without.

This is particularly indicated with distribution of reports to users and stakeholders (100% vs. 70%) and supporting an independent review by the second line of defense (100% vs. 50%).

Effectiveness of Model Development

(n=41)

Figure 10: Percent of financial institutions rating model development workflows as mostly/very effective

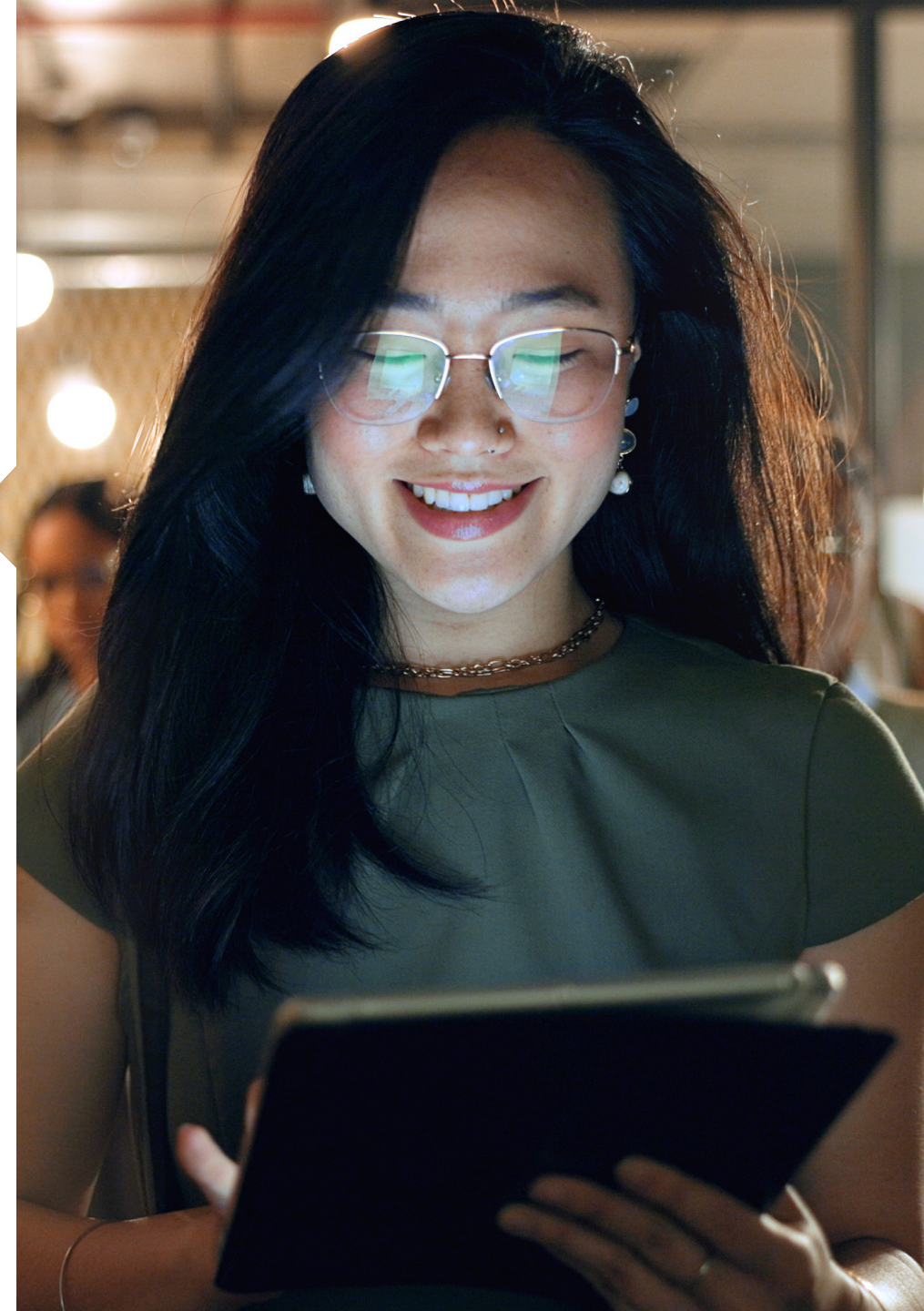
	Extremely/Mostly Effective	
	Automated Development, End-to-End Solution Platform	No Automated Development, No End-to-End Solution
Process to regularly adjust models, account for new data, technology, performance, etc	100%	50%
Rigor of pre-implementation testing procedures	94%	50%
Development of team skill sets	72%	63%
Managing the development process across all models	78%	75%

Making MRM operations better: an integrated end-to-end MRM solution can help reduce production cycles, labor resources and costs

This approach addresses the key priorities of speed with model development, validation, monitoring and change management, along with improved model governance. Model risk is reduced by increased accuracy, improved documentation and fuller visibility into all models.

The use of automation and an integrated MRM solution improves effectiveness, efficiency and agility of model risk operations. As indicated earlier, findings show that automation has the greatest impact when it is employed across workflows, rather than in a piecemeal fashion or as an add-on to GRC systems. Compared to organizations that use traditional off-the-shelf/GRC software,

- Institutions using higher levels of automation are seeing benefits across the model lifecycle were significantly more likely to rank the following among the top 3 benefits from the current approach: improvements in documentation (50% vs. 15%) and reduced model inventory time/burdens (38% vs 21%).
- Those also incorporating an integrated MRM platform were significantly more likely to include more efficient use of resources in these rankings (44% vs. 29%).



Those also incorporating an integrated MRM platform were significantly more likely to include more efficient use of resources in these rankings (44% vs. 29%).

Financial institutions using automation and an end-to-end MRM platform were also more likely to cite:

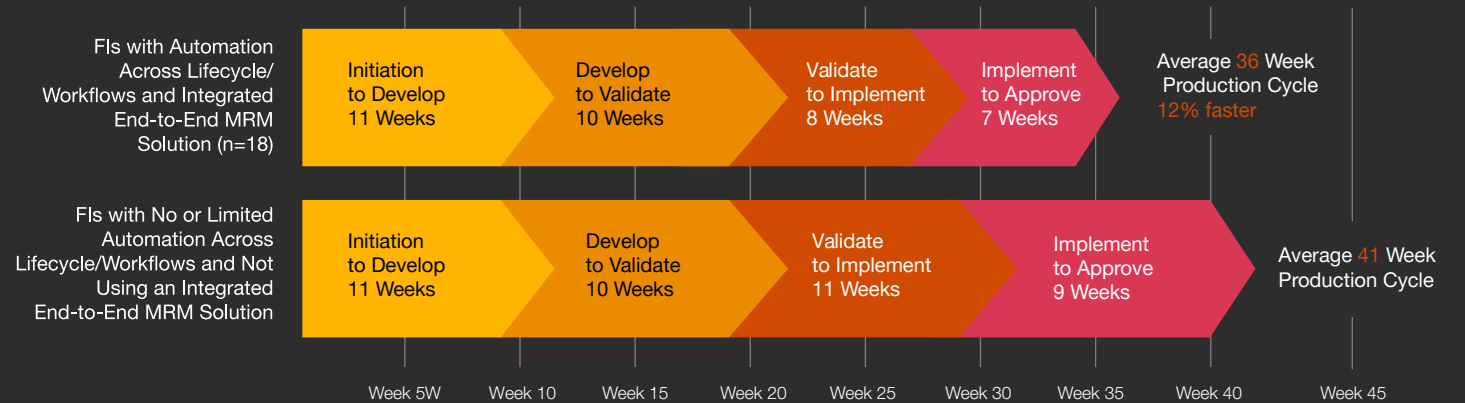
- Greater productivity and lower labor costs in model inventory, with 1.6 times fewer hours per week spent on this task and nearly twice as less cost per FTE.
- Faster production cycles, up to 5 weeks shorter than others. (See Figure 11)

By enabling these operational benefits, automation and end-to-end platforms can help address the need to develop and manage more models and greater complexity, increase speed and work with the agility demanded by an evolving MRM environment.

Average Number of Weeks from Complex/High Materiality Initiation to Approval

(n=41)

Figure 11: Average number of weeks for model production



Future proof your organization for the growing demands of model risk management with an integrated end-to-end MRM solution

The research from PwC and KS&R indicates that the challenges confronting model development and model risk teams are growing. With expanding numbers of models, escalating model complexity and increasing regulations, the need for speed and flexibility is greater than ever. Using fragmented technology that incorporates GRC software and automation is no longer sufficient. As the financial landscape continues to shift rapidly, adopting a holistic MRM solution that combines both automation and integration of capabilities that support all phases of the model lifecycle is critical.

Financial institutions need efficient, fit-for-purpose tools to keep up with the pace of digital change. To navigate the uncertainties that lie ahead, empower your organization with an integrated end-to-end MRM solution that can help adapt and strengthen your preparedness for the growing demands of model risk management—now and in the future.





Model Edge can bring teams together in one platform throughout the model lifecycle with access to technical/coding capabilities to help support model development, testing, model documentation, model validation, ongoing performance monitoring and model risk reporting.

Learn more about Model Edge a PwC product, that can integrate and streamline model creation and model risk management in a single cloud-based solution.

Contact us



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