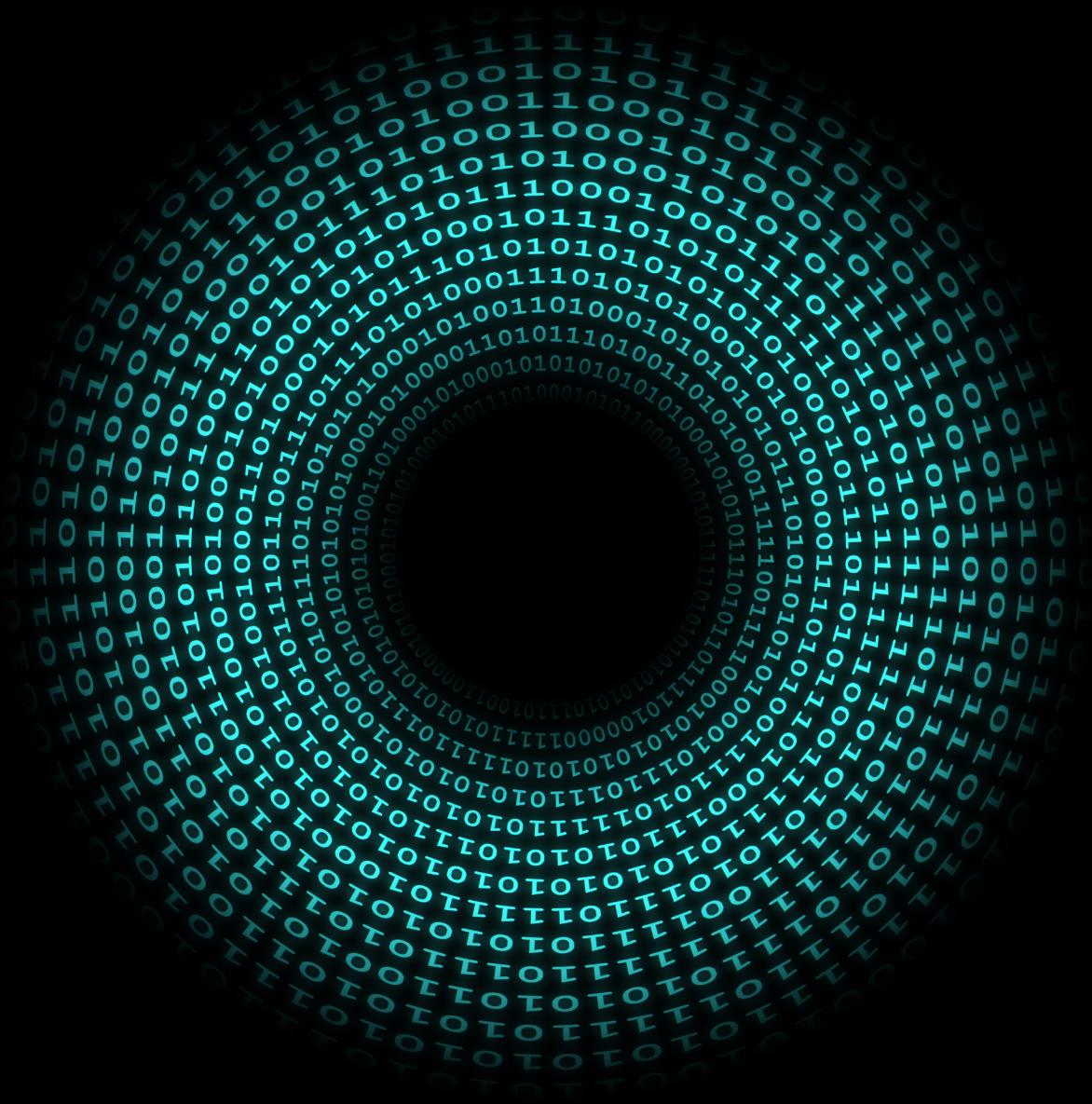


# Deloitte.



## Advanced credit risk rating platform

A launch pad for better risk management

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# Introduction

There has been considerable attention placed in recent years regarding the use of models in financial institutions. This has stemmed from a combination of multiple factors, including regulations and—more importantly—institutions' own growing needs to manage business risks and operations more reliably using better predictors and indicators. Models are intrinsic to the functioning of financial institutions and are deployed in variety of areas (businesses, finance, risk, operations) to manage multiple core functions, such as:

-  • lending
-  • fraud
-  • pricing
-  • business analytics
-  • asset and liability management
-  • risk management
-  • allowance/reserving
-  • accounting
-  • regulatory

While there has been much discussion surrounding the accuracy of models and managing inherent risks in those models, there has been relatively less attention paid to model realization and execution.

We refer to model realization and model execution as a core set of processes and technologies that are instrumental in

institutions' abilities to rapidly deploy the models in the field and to quickly have the end-users (such as credit analysts and underwriters) use them effectively to conduct day-to-day operations. Models are typically implemented via scorecards that are created specifically to address the unique requirements of different types of obligors and facilities. Several organizations experience model deployment as a "choke point," whereby even if a model is ready and approved, it takes several months to implement the models in a rating platform. The effort is complicated further by the fact that rating platforms in organizations are typically archaic and fragmented. The deployment of new models takes considerable time, effort, and resources, and is done surgically by making modifications to mission-critical applications. The pace of changes to models, driven by internal and regulatory mandates, have further strained such implementation efforts.

In this whitepaper, we explore the ecosystem in institutions regarding the model lifecycle, with emphasis on emerging practices on model realization and execution. Advanced risk rating platforms have emerged as a central constituent of this ecosystem and play a key role in model realization, as well as model execution. Such leading platforms offer several benefits, including:

- Tighter integration between model developers, model risk management, and business teams
- Ease of rapid implementation to technology teams
- Flexibility in terms of interfacing with

several upstream and downstream processes, such as underwriting and allowance/reserving

- Scenario analysis and planning during trigger events, including portfolio acquisitions and merger integrations, and other regulatory aspects, such as stress testing and Comprehensive Capital Analysis and Review (CCAR)

Additionally, the emerging rating platforms represent a generational leap in model deployment by effectively using advanced technologies, such as cloud computing, advanced analytics, robotic process automation, and artificial intelligence, in several areas of the end-to-end business process. Financial institutions have started to derive significant cost and process efficiencies by such deployments.

This paper presents leading practices in the industry, case studies, and an approach that institutions may want to consider to assess the potential benefits of such an undertaking.

# New approach to credit risk management

With the rapid evolution of the US banking regulatory and market landscapes, risk rating (especially in the context of credit risk) and related processes have become increasingly critical. From a previously siloed activity, risk rating currently occupies center stage in almost every aspect of a bank's day-to-day operations. There is an increased focus on the models underlying risk rating due to several factors:

- Regulations: New regulations, such as Basel III, Comprehensive Capital Analysis Review (CCAR)/stress testing, and liquidity coverage ratio (LCR), have resulted in the need for a larger inventory and increased overall complexity of models (see Sidebar 1) with greater focus on ongoing model accuracy.
- Market conditions: Challenging US market conditions and the prolonged low interest rate regime have driven institutions to revise underwriting models and adopt superior technologies to facilitate efficient model rollout.
- Positioning for Growth: As financial institutions are re-calibrating their business strategy to position for growth, the increased pace of product innovation, acquisition of selected portfolios, etc. mean new risk models need to be rapidly developed and deployed.
- Advanced analytics: The emphasis on more sophisticated internal reporting and analytics, as well as regulatory expectations for risk and model data (e.g., BCBS 239, SR 11-7) and model overlay, are driving a need for more robust risk rating data infrastructure, integration, traceability, and model inventory management.

- Cost and Process efficiencies: Several institutions are exploring means of leveraging new technologies such as digitization, robotic process automation, natural language processing and generation and machine learning to reduce the cost and effort involved around risk rating processes.

- Oversight and governance: There is an increased responsibility placed on banks' senior management and boards to provide the appropriate level of governance and oversight across capital planning and risk management processes, driving the need for robust risk rating model execution processes with built-in control mechanisms.

## Sidebar 1: Inventory of models is growing and becoming more diverse

A typical financial institution today employs models in a wide variety of areas as detailed below.

### Line of business and operations

- Underwriting and portfolio management:
  - Customer targeting and profitability
  - Risk-based pricing
  - Consumer behavioral models
- Operational controls and compliance:
  - Anti-money laundering (AML)
  - Trade surveillance
- Other:
  - Mergers and acquisition
  - Product pricing and valuation (e.g., derivative and structured products)
  - Actuarial models (for insurance business)

### Treasury and finance

- Capital management:
  - Regulatory capital
  - Economic capital
  - CCAR / Dodd Frank Act Stress Test (DFAST)
- Liquidity risk
- Asset liability management

*Note: Although this document focuses on credit risk rating models, many of the principles and ideas are equally applicable to other models.*

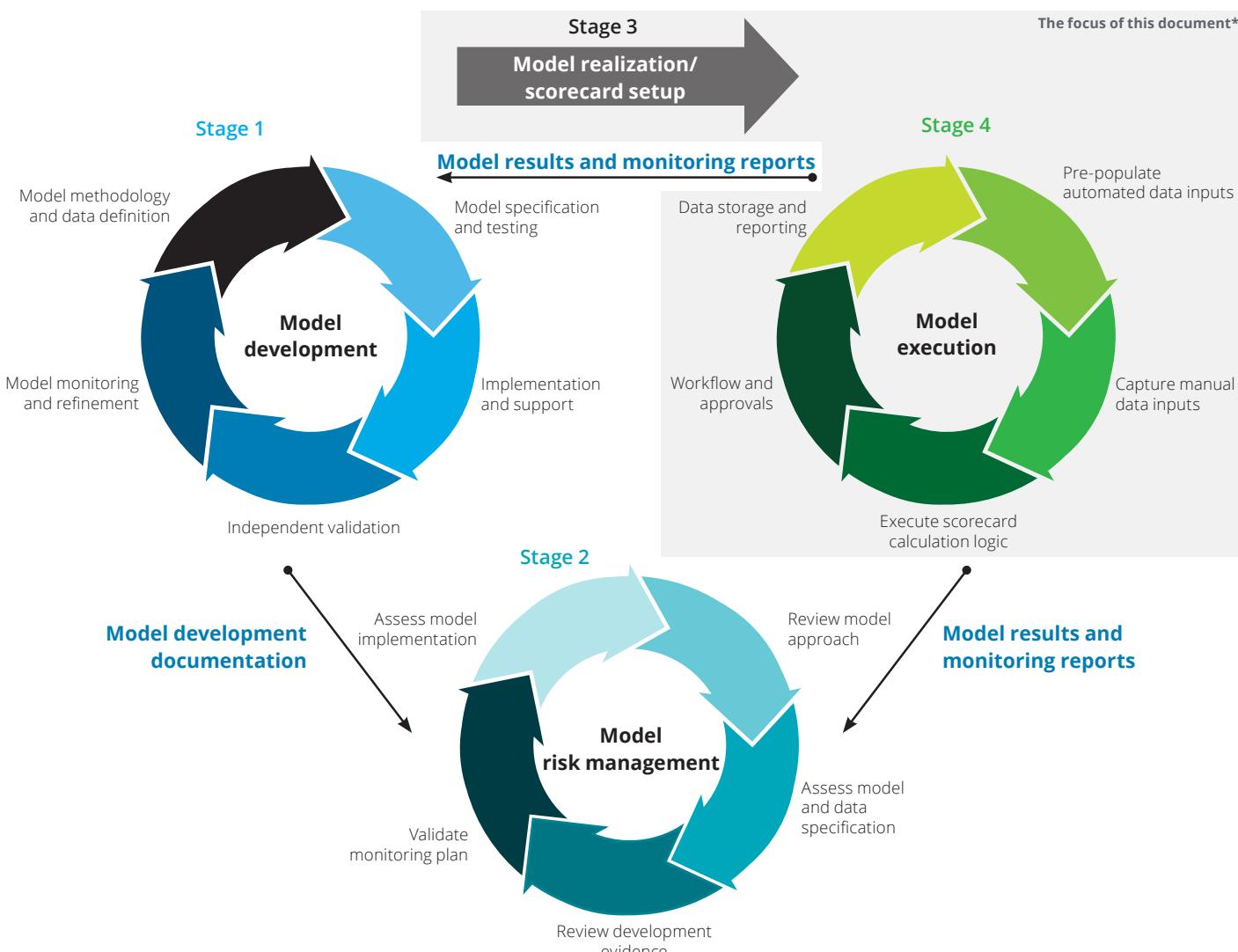
### Risk management

- Wholesale/retail credit risk models:
  - Risk rating models (e.g., Obligor Ratings, Facility Ratings, etc.)
  - Risk segmentation models
- Market risk models:
- Operational risk models

# A complex ecosystem being further challenged

Risk rating models pass through a complex lifecycle encompassing model development, initial and periodic model validation, model realization, and ongoing model execution to generate ratings. Various internal and external drivers are placing an increased emphasis on banks' infrastructure supporting rating models across their lifecycle.

**Figure 1. Credit risk model lifecycle (illustrative)**



\*This whitepaper explores the ecosystem in institutions regarding the model lifecycle with emphasis on emerging practices around model realization and execution, tightly integrated with loan underwriting and decisioning.

The typical model lifecycle (see Figure 1) includes several sub-processes that are highly inter-dependent and involves activities across multiple teams. Risk rating model development typically involves the statistical analysis of historical loss data to arrive at a model specification. The model specification defines a calculation algorithm that employs specific attributes of the obligor or exposure (e.g., financial ratios, external ratings) to predict the corresponding credit risk parameters (e.g., PD, LGD, EAD). An independent model risk management team evaluates the process of model development and provides approval for the model to be made available to raters/underwriters for use. The process of model realization translates the approved model specification to a technology solution which can then be used by the raters/underwriters to perform model execution (i.e., generate ratings using the model calculation algorithm). The model risk management also performs an independent evaluation of the model realization process and performs ongoing monitoring of model execution. The model development team also performs continuous analysis of outputs generated by the model to evaluate model performance and recalibrate/redevelop the model as appropriate.

In our experience the end-to-end process of development, validation, and realization of a complex new model takes six months or more. Various factors play a role in elongating the model lifecycle. Availability of usable historical loss data is a typical constraint that slows down model development. Also, the sources of data and pre-processing techniques employed during model development may not be relevant for model execution. Model development and execution are typically carried out in different technology environments—the former typically uses analytical tools such as SAS and R while the latter may employ a variety of technology solutions ranging from excel spreadsheets to custom applications and tools. As part of model realization,

## Banks are enhancing existing models while also developing new models at a rapid pace, thus experiencing the need to significantly compress the risk rating model lifecycle.

significant time and effort is needed to bridge these data and technology gaps. Finally, the complex inter-dependencies across model lifecycle necessitate careful coordination between the model development team, validation team, raters, and various technology/business teams. Many of these stakeholders may be in different locations and time-zones, leading to significant delays.

The various processes supporting the model lifecycle are becoming more sophisticated, robust, and integrated with each other and with banks' broader risk management and reporting processes and infrastructure. With the increased emphasis on shortening the model lifecycle, several new challenges have emerged across the various stages in the model lifecycle.

**1. Model development** activities include methodology selection, development dataset definition, model specification, testing, ongoing monitoring, and re-development/re-calibration. As financial institutions are moving toward development of more statistically grounded models and continuous model refinement, they are faced with several challenges, including:

- Obtaining timely and high-quality data for model development and refinement (including historical rating data inputs and outputs, charge-off and recovery data, and external market data such as ratings and financial statements)

- Integrating data across multiple sources and data pre-processing, which may require significant effort
- Performing scenario and sensitivity analyses on new models and ongoing monitoring of model performance, which can be time-consuming and labor-intensive

**2. Model risk management** activities are geared toward providing independent oversight over models across its development, implementation, and ongoing execution. Financial institutions may face challenges because:

- Validation efforts could be hampered by limited transparency into the model implementation and execution processes including data sourcing and complex pre-processing, calculation algorithm, handling of exception scenarios, model version control, and change management
- There may be limited implementation testing evidence to indicate that the implemented model aligns with the model specification that was approved
- Model performance monitoring requires advanced reporting and analytics functionality

**3. Model realization** includes the set of implementation activities that make the model available to the underwriters for risk rating. The need to implement new and updated models that are increasingly complex is placing significant stress on model realization processes.

- Initial model implementation and their ongoing maintenance typically requires extensive involvement from banks' information technology staff and can result in significant delays and costs
- Limited involvement of business stakeholders in the process may result in invalid implementation and incorrect ratings
- Testing of implemented models to ensure their consistency with the expected behavior under various scenarios can also be time-consuming

**4. Model execution** encompasses the capture of model input data, execution of the model algorithm to generate risk ratings, and rating approval workflow. Increasing complexity in model data sourcing and

calculation processes pose several issues during model execution.

- Sourcing of input data from disparate internal and external data sourcing presents challenges around ensuring timely availability of accurate data
- Appropriate control mechanisms need to be established around execution steps that require manual input (ranging from selection of model for rating and incorporating manual rating inputs to manual override of system-generated ratings) to minimize user error
- Integration of rating model execution processes with the overall underwriting process and other consumers of rating outputs (including model development and validation processes) is critical

#### Risk rating enablement: Different stakeholders, common needs

There are a variety of bank stakeholders with different roles and responsibilities across the model lifecycle. However, these stakeholders have several common needs with respect to credit risk rating that need to be addressed by the infrastructure and processes supporting rating enablement (see Figure 2).

**Figure 2. Risk rating — diverse stakeholders with common needs**

#### Several bank stakeholders representing various functions are involved in credit risk rating processes:

- Model developers
- Raters / underwriters
- Risk / portfolio management
- Line of business
- Finance / treasury
- Information technology
- Senior management
- Model risk management
- Internal audit
- Regulators

#### Stakeholders have common needs which need to be addressed by rating enablement infrastructure and processes:

- Meeting regulatory expectations around rating systems, model risk management, risk data, reporting etc.
- Adoption of advanced technologies to achieve data integration with source systems and consumers of rating output
- Achieving improved transparency through reporting and analytics and greater business involvement
- Improving overall process efficiency through automation and improved usability
- Risk-focused supervision and improved support for ongoing model monitoring / validation

# Emergence of the advanced risk rating platform

The advanced risk rating platform (RRP) represents a paradigm shift from conventional approaches to credit risk rating enablement. It has several dynamic new features that can help holistically address the demands of a diverse set of stakeholders.

- Business self-service:** The advanced RRP enables business stakeholders, such as model developers and risk/portfolio managers, to take ownership of the model realization and maintenance activities. Users are able to easily configure pre-built solution components to implement models quickly, rather than engaging in custom development activities. This

tends to increase model implementation accuracy and overall transparency. There is also a drastic reduction in technology team efforts that reduces the time and cost to implement new and updated models.

- Use of advanced technologies:**

Cloud-computing technology is leveraged to enable institutions to quickly stand up a comprehensive and scalable solution with minimal infrastructure investments. Advances in business rules and workflow management technology are employed to enable business users to use visual "drag-and-drop" interfaces to implement model calculation algorithms and generate rating screens. A functionality-rich analytics and

data management layer supports a wide range of stakeholders needs including model performance monitoring, sensitivity analysis, and operational/analytical reporting.

- Upstream and downstream data integration:**

The platform supports the easy integration with sources of model input and consumers of model output using a variety of robust and flexible interfaces. Workflow management features also allow for easy integration with enterprise user authentication, as well as credit approval and origination business processes.



The advanced risk rating platform is at the core of a streamlined credit risk rating ecosystem (see Figure 3).

- **Sources:** Several databases and data warehouses form the source of input data to risk rating models.

- **Rating platform: rating execution layer:**

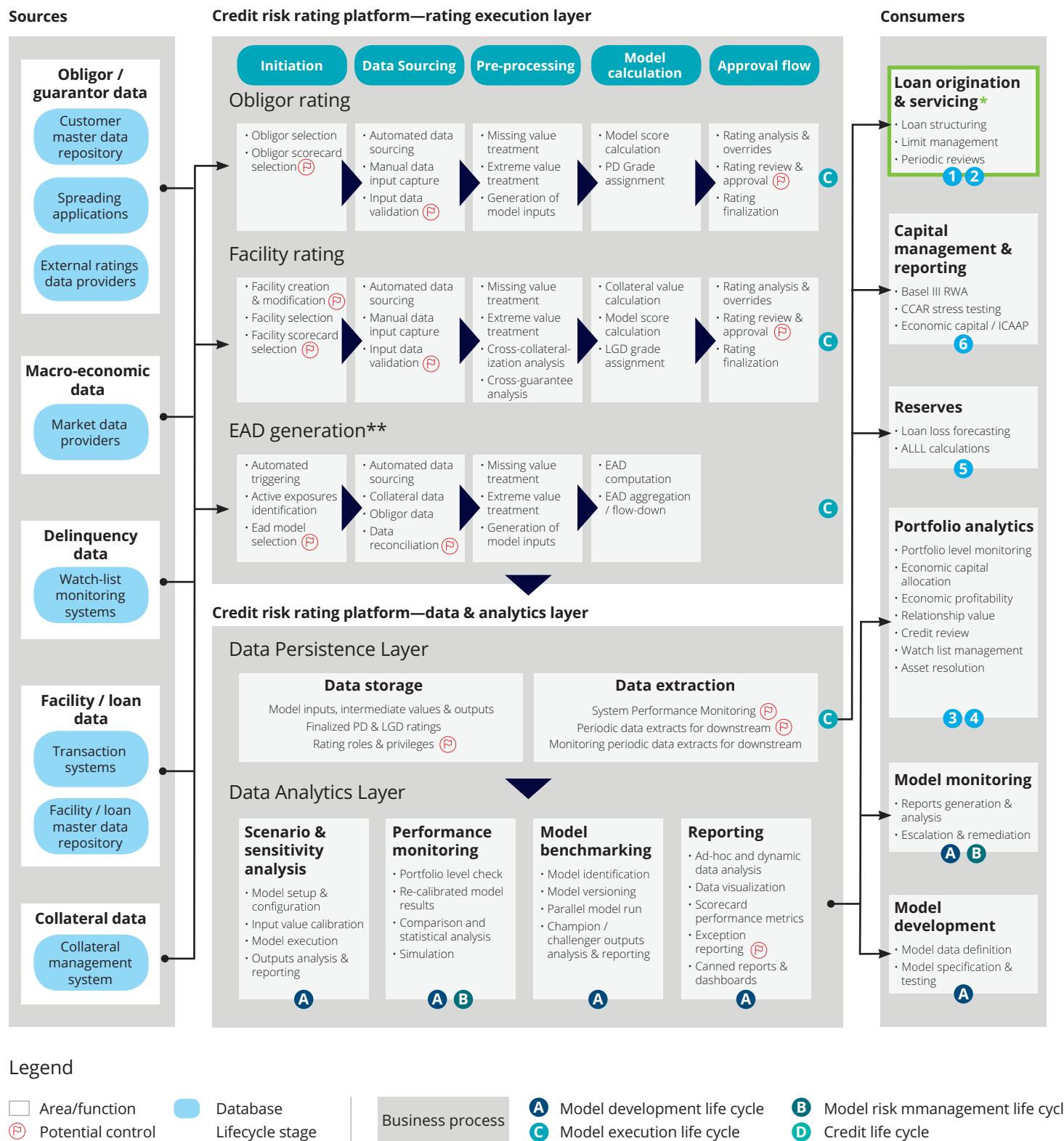
This is the part of the platform where the rating inputs are processed based on the model calculation logic to generate outputs. The execution layer facilitates the initiation of the rating, including manual or automated selection of the obligors and facilities to be rated and the selection of the appropriate models to be used. Data inputs needed for the rating are then sourced either automatically from source systems or from raters. In the case of re-ratings, rating inputs may be pre-populated from a prior rating, where appropriate. Data inputs are validated and any requisite pre-processing steps are performed. The model calculation algorithm is then executed using the data inputs to generate the ratings. At this point, the rater may be provided with the ability to override the system-generated rating. The rating may also pass through an approval workflow before it is finalized.

- **Rating platform: data and analytics layer:**

**layer:** This module stores the final output (Obligor/Facility rating, EAD amount, model inputs, etc.) from the rating execution layer. The data layer also publishes data extracts to downstream consumers of rating outputs. The data analytics layer enables scenario and sensitivity analysis of models, monitoring of model performance, benchmarking of model outputs, and analytical reporting.

- **Consumers:** Various downstream systems and teams are dependent on the rating data generated by the platform. The final obligor and facility ratings are used in the loan origination process to make decisions around loan approval and structuring. Outputs from periodic re-rating of obligors and facilities is factored into ongoing loan servicing processes. Obligor ratings, facility ratings, and EAD outputs also play a central role in determining the calculation of regulatory and economic capital and Basel III/CCAR reporting. Rating outputs are also used to estimate expected loss reserves. Several portfolio analytics functions—such as portfolio monitoring, economic capital allocation, economic profitability analysis, relationship value assessment, watch-list management, and asset resolution—depend on rating outputs generated by the platform. The model development team is dependent on the availability of historical rating inputs, intermediate values, and outputs for use in model re-calibration and re-development efforts. The ongoing monitoring of model performance also relies on the availability of rating outputs in a timely manner.

**Figure 3. Credit risk rating ecosystem (illustrative)**



\*Integration of the risk rating platform with underwriting systems provides the most immediate beneficial impacts.

\*\* Although not traditionally considered within the scope of the risk rating platform, some institutions are now also incorporating EAD generation within their risk rating platform implementations, given that EAD is model-driven and also drives credit decisioning, capital management decisions, etc.

# Harmonization of technology, data, and processes across the model lifecycle

The advanced risk rating platform orchestrates the harmonization of technology components, data flows, and business processes to address the diverse needs of the various stakeholders across the model lifecycle.

## **Model development:**

The platform provides production data and analytics support for model development activities, including scenario/sensitivity analysis, data visualization support, and model redevelopment/recalibration.

- **Model development data:** The data persistence layer provides high-quality rating data on a real-time basis for use in model development and recalibration, thus enabling the bank to fine-tune its models rapidly in response to internal and external triggers.
- **Model testing:** The data analytics layer provides scenario/sensitivity analysis functionality for stress testing developed models prior to roll-out. This enables a comprehensive impact analysis of the model on the bank's existing portfolio to identify potential changes to regulatory/economic capital, provisions, etc. It also helps to identify sensitivity to specific inputs and assumptions.

- **Ongoing monitoring:** The analytics, data visualization, and alerting capabilities can significantly enhance ongoing model performance monitoring. The platform can also assist with comparing model performance with challenger/ benchmark models.

## **Model risk management:**

The platform supports model risk management activities by enabling model stress tests, providing options for model versioning/ audit trail, and monitoring deployed model performance.

- **Change control:** The platform can enable audit trail and version control capabilities across model realization and implementation processes. This enables model risk management to ensure that any changes made to models and ratings are tightly controlled and validated.
- **Monitoring reports:** Analysis and reporting functionality can help ensure adequate oversight of model performance.
- **Transparent model realization:** The model data sourcing and calculation algorithm is easy to review and validate via graphical interfaces/documentation that is generated by the platform.

## **Model realization and execution:**

The platform provides robust support across all model realization and execution steps to increase efficiency and accuracy of the rating process.

- **Rating initiation:** The platform can enable automated triggering of ratings based on specific criteria (e.g., external rating downgrade). Also, the platform can use pre-defined business logic to identify the appropriate model to be used to perform the rating (e.g., selection of the appropriate PD scorecard based on the obligor NAICS code).
- **Pre-populated rating inputs:** The platform can automatically pre-populate relevant rating inputs sourced from prior historical ratings or from data sources (e.g., spreading application, market data), thus reducing the need for manual input and minimizing user input errors.
- **Data validation:** Business rules can be easily configured to verify the validity of data against specific data ranges, list of values, formats, and other business logic. Rules can also be configured to highlight input values that are outliers with respect to the overall rating population. Robust data validation functionality is critical to ensuring ongoing rating accuracy.

- **Intuitive data capture screens:** Graphical user interface screens are easy to configure and maintain on the platform. This allows for easy design and fine-tuning to meet the needs of raters/underwriters and other users.
- **Data pre-processing:** Rating data inputs may need to undergo several pre-processing steps prior to their use in model execution, including treatment for missing input values, capping/flooring of extreme values, and other data transformations required to generate model input values (e.g., calculation of financial ratios, log transforms, etc.). The risk rating platform allows for easy configuration of data pre-processing steps.
- **Calculation logic execution:** The platform supports the easy configuration of complex mathematical computations associated with the model. In addition, the platform also enables automated execution of the model calculation logic against an input data set. This functionality may be used for automated testing of the calculation logic as well as bulk rating execution against a sub-portfolio based on specific criteria.
- **Workflow and approval:** Inbuilt controls and automated and manual review steps, like the ones listed below, help to provide process checks and balances.
  - Overriding model output to incorporate the impact of factors not otherwise captured by the model. The platform can be configured to capture a detailed audit trail around each override.
- Adjusting model output by specific increments or notches which is subject to controls and audit trail requirements in the same fashion as overrides.
- Configuring the platform to automatically trigger a review and approval workflow based on specific business rules (e.g., deal size exceeds pre-defined thresholds, rating migration exceeding pre-defined number of notches)
- **Data storage and reporting:** The platform persists the input, intermediate, and final calculation values. It also has pre-prepared and template reports for regulatory and management reporting.

**Each of the key stakeholders involved in the risk rating process stands to benefit from the advanced risk rating platform**

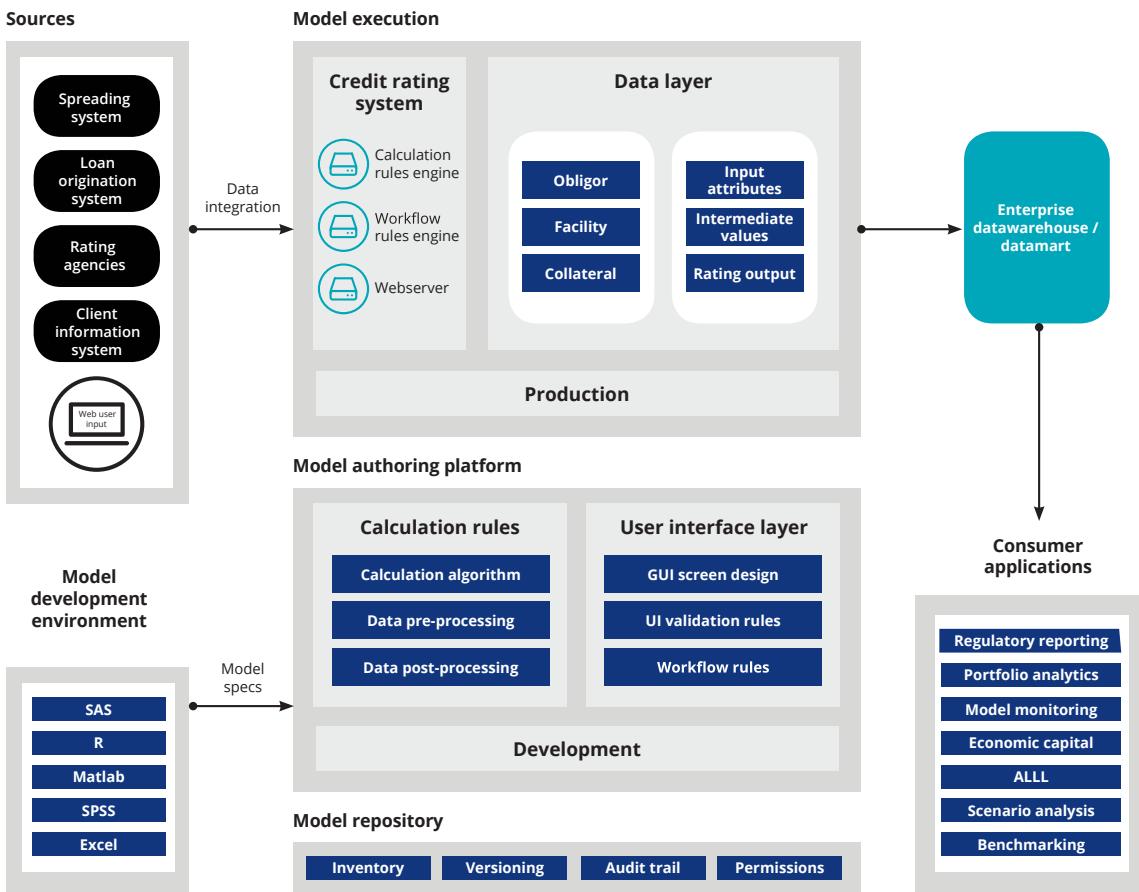
Role	Significant potential benefits
<b>Raters/ underwriters</b>	<ul style="list-style-type: none"> <li>• Improved rating process efficiency driven by workflow automation</li> <li>• Automated execution of re-rating across portfolios based on specific criteria</li> <li>• Pre-populated input data from source systems and prior rating reduces effort</li> <li>• Integration with origination systems streamlines the underwriting process</li> <li>• Ability to rate using various devices including laptops and PDAs</li> <li>• Integration with single sign-on removes need for separate login to platform</li> <li>• Screens can be personalized based on the user profile to improve ease of use</li> </ul>
<b>Model developers</b>	<ul style="list-style-type: none"> <li>• Easy creation of model development datasets integrating internal/external data</li> <li>• Ability to easily analyze model sensitivity to various input parameters</li> <li>• Advanced performance monitoring against challenger models/actual outcomes</li> </ul>
<b>Line of business</b>	<ul style="list-style-type: none"> <li>• Rapid model realization improves overall responsiveness to market changes</li> <li>• Streamlined rating execution reduces time taken for loan decisioning</li> <li>• Improved controls around process raise model accuracy and reduce credit losses</li> <li>• Ability to simulate risk parameter impact of new models, portfolio changes, etc.</li> <li>• Increased transparency improves overall confidence in the rating process</li> <li>• Ability to perform ad-hoc/drill-down analysis on rating data</li> </ul>
<b>Information technology</b>	<ul style="list-style-type: none"> <li>• Reduced total cost of ownership driven by ease of platform maintenance</li> <li>• Emphasis on configuration versus custom build reduces model realization effort</li> <li>• Increased business involvement leads to reduced implementation defects</li> <li>• Easier functional validation of model calculations</li> <li>• Easy to setup scalable technology infrastructure leveraging cloud computing</li> <li>• Efficient change management through streamlined version control capabilities</li> </ul>

Role	Significant potential benefits
<b>Risk/portfolio management</b>	<ul style="list-style-type: none"> <li>Eases process of model development, roll-out, and maintenance</li> <li>Input data validation and controls improves rating accuracy</li> <li>Robust repository for models (including archived and challenger models)</li> <li>Increased transparency into model realization process</li> <li>Enhanced ability to track operational efficiency of the rating process</li> <li>Advanced analytical reporting around portfolio risk drivers</li> </ul>
<b>Regulatory compliance</b>	<ul style="list-style-type: none"> <li>Can simulate impact of new models on regulatory/economic capital adequacy</li> <li>Facilitates regulatory compliance around model development and risk rating</li> <li>Supports overall data governance through controls, improved transparency, etc.</li> </ul>
<b>Model risk management</b>	<ul style="list-style-type: none"> <li>Easier to review and validate model implementation</li> <li>Facilitates analysis to monitor model performance and population stability</li> <li>Easy to monitor model use through traceable data flows and user authentication</li> <li>Tight controls around model updates through model versioning and audit trails</li> </ul>
<b>Internal audit</b>	<ul style="list-style-type: none"> <li>Audit can be based on automatically generated system documentation</li> <li>Audit trails around rating overrides, modifications to financial ratios from spreading application, treatment of missing/invalid data inputs, etc.</li> <li>Easy to validate model calculation algorithm through automated test execution</li> </ul>
<b>Senior management</b>	<ul style="list-style-type: none"> <li>Reduced lead time for model realization improves organizational responsiveness to market shocks, regulatory changes, etc.</li> <li>Governance and control mechanisms enable increased confidence in ratings</li> </ul>
<b>Regulators</b>	<ul style="list-style-type: none"> <li>Increased transparency results in more effective supervision</li> <li>Greater alignment with regulatory expectations around risk rating, model development and validation, model data governance, and management oversight</li> </ul>

## Sidebar 2. Credit risk rating platform: Technical architecture

The credit risk rating platform consists of three main modules working in close synchronization, viz., model execution layer, model authoring platform, and model repository.

**Figure 4. Advanced rating platform – technical architecture**



**The model execution layer** is where the rating models are executed to generate credit ratings. The core credit rating system includes a web server which enables the rating user interface screens, a calculation rules engine that incorporates the model calculation algorithm, and a workflow rules engine that orchestrates the rating workflow. The rater/underwriter connects to the credit rating system using web interface to create risk rating for the borrower or associated facility. The execution layer can also support bulk ratings using an automated batch process. The rating data including rating inputs, intermediate values, and final output are all stored in the data layer along with master records comprising of obligor, facility, and collateral data.

The model execution layer pulls the relevant input data from various external sources (e.g., spreading applications, rating agencies) and internal systems (e.g., transaction systems, loan origination systems). Output from the credit risk rating platform is typically fed into an enterprise wide data warehouse or data mart, which serves as the source of all credit rating data for downstream consumers (e.g., regulatory reporting, portfolio analytics, loan servicing, capital requirement/economic capital, ALLL, model monitoring). This data is also used as a feedback for future model recalibration, development, and benchmarking.

**The model authoring platform** is used to configure the rating models, which are used in the execution layer to generate ratings. It enables the setup of calculation rules as well as the user interface and workflow rules for each model. The model configuration is based on the model specification developed in the model development environment through statistical analysis (typically using tools such as SAS and R) of historical default data.

**The model repository** acts as an inventory of all models currently or previously being used or deployed within the credit risk rating platform. It supports model versioning, audit trails, and user authentication.

# Artificial intelligence and advanced automation: Implications for credit risk rating platforms

Financial institutions are increasingly adopting leading technologies, including machine learning, robotic process automation, natural language processing, and natural language generation, to further enhance the value realized from their risk rating infrastructure and processes. The dynamic nature of the market means that it's critical for financial institutions to be able to quickly identify and predict trends and adapt their lending strategy and decision making accordingly.

 **Machine learning** techniques help banks uncover hidden insights from data underlying various rating processes. In addition, it can enable solutions with predictive capabilities that continuously improve their predictive accuracy based on the data they receive over time. The risk rating platform provides a comprehensive repository of accurate and timely data related to risk rating. This, coupled with robust processes, provides a solid foundation for financial institutions to use machine-learning techniques.

 **Robotic process automation** can be employed to efficiently perform high-volume repetitive tasks with rules-based decision making. This frees up underwriters,

model developers, and other business users to focus on high-value activities, such as building customer relationships and product innovation. Automation can improve process efficiencies across various risk rating processes, including data sourcing, loan review, and model performance monitoring.

 **Natural language processing** technologies are being used to derive useful input data for risk management processes from internal and external unstructured data, including analyst reports, industry articles, and loan documentation. Increasing availability of digitization technologies has led to an exponential increase in the amount of unstructured data that is available. The risk rating platform can efficiently integrate natural language processing technology with the core rating processes to increase the financial institution's nimbleness in responding to external trigger events.

 **Natural language generation** is useful in the automated generation of human-readable reports for internal stakeholders, such as credit approvers, model validation, senior management, as well as regulators.

As these technologies are becoming more accessible, financial institutions have already started considering advanced automation and artificial intelligence-related technologies in the model cycle and risk rating platform related processes. Risk rating platforms play a key role in financial institutions, and are tightly integrated with multitude of mission-critical business processes – thus becoming cross-functional areas with immense potential for realizing the benefits of employing these new technologies.

# Leading practices have started to emerge

The implementation of the advanced risk rating platform typically represents a regime shift in a bank's credit risk management practices. Several leading practices have been proven to help financial institutions navigate typical pitfalls during the initial implementation or transformation phase as well as the post-implementation or business-as-usual phase.

## Transformation phase

Given the central role of risk rating in banks, the initial implementation of the platform generally involves surgical changes to existing systems, business process, and data flows. Several critical success factors have been identified across the various implementation phases.

Implementation planning	Requirements definition	Solution design and configuration	Functional validation and readiness assessment	User training and rollout
Assess pros and cons of big bang versus phased implementation	Gather current and future requirements from all stakeholders	Ensure flexibility in overall solution architecture	Involve raters/ underwriters early in the testing process	Tailor training to user groups
Align implementation timelines with regulatory deadlines	Incorporate support for analytics and reporting functionality	Design scalable system interfaces	Ensure comprehensiveness of functional validation scenarios	Establish helpdesk support
Program management				
Careful coordination across stakeholders driven by business	Ensure effective organizational change management	Establish clear lines of responsibility across various teams	Promote transparency across stakeholders through frequent communications	Ensure continuous alignment with overall program objectives

- Assess pros and cons of big bang versus phased implementation:** Where feasible, a phased approach may allow for a gradual ramp-up in scope and sophistication of the platform while potentially reducing overall risk and delivering quick business benefits. However, the bank's business processes or technology architecture might mandate the need for implementing all existing models and most of the desired functionality as part of the initial implementation cycle.

- Align implementation timelines with regulatory deadlines:** The platform implementation plan should be aligned with the model development/recalibration timelines to help drive execution so that approved models are rolled out in a timely manner to meet regulatory and business expectations.

- Gather current and future requirements from all stakeholders:** It's important that the requirements gathering effort captures current as well as future requirements from all the relevant business and technology teams including risk/portfolio management, raters/underwriters, model development, model risk management, consumers of risk ratings (such as regulatory capital, economic capital, CCAR, and ALLL) and technology teams including those responsible for enterprise systems architecture, data governance, and application development.

- Incorporate support for analytics and reporting functionality:** Model monitoring, development, and recalibration are critically dependent on sensitivity/scenario analysis and other analytic/reporting functionality. Capture of appropriate rating data attributes and integrating data into the analysis in a timely fashion should also be addressed.

- Ensure flexibility in overall solution architecture:** The platform architecture design should be able to easily incorporate the requirements and risk models that evolve as the product portfolio and business strategy of the bank changes. To develop a robust platform architecture, the following features need to be kept in mind during design.

- Core model: Model implementation should be well designed for easy maintenance, allow detailed debugging, and support traceability.

- Data storage: The underlying data model should be granular enough to capture all rating data inputs and intermediate/final outputs. The data architecture should be scalable to accommodate data from models to be deployed in the future.
- UI Design: The user interface should be designed to allow for easy addition and modification of rating inputs and related data validation/business rules.

- Design scalable system interfaces:** Platform interfaces to external data sources (e.g., spreading applications, external ratings providers) and internal systems (e.g., origination systems, enterprise data warehouse) should be defined in a scalable manner to accommodate for changes in model data inputs/outputs and new models. The interface design needs to be able to bridge potential differences in data structures, granularity, and exchange protocols. The design also needs to consider the timing of source systems data availability for periodic or on-demand model execution.

- Involve representative raters/underwriters early in the testing process:** Early involvement of users can help provide that any inefficiencies in rating execution in the new platform are identified promptly.

- Ensure comprehensiveness of functional validation scenarios:** Validation scenarios should be defined to address extreme values for rating inputs, boundary conditions, and exceptions, such as missing/invalid data.

- Tailor training to user groups:** Any training materials/sessions and user manuals that are developed should be tailored to the various raters (e.g., by business portfolio) and other user groups and cover typical usage scenarios (e.g., rating/re-rating, searching for a historical rating).

- Establish helpdesk support:** To ease the transition for users during and immediately after rollout, it's important to set up a dedicated support helpdesk to address user questions. Publishing an FAQ document with typical user questions and responses would also help ease the transition.

In addition to the above, given the typical scale and complexity of a rating platform implementation, effective program management practices are particularly crucial. This includes:

- Careful coordination across stakeholders driven by business
- Providing effective organizational change management
- Establishing clear lines of responsibility across various teams
- Promoting transparency across stakeholders through frequent communications
- Monitoring continuous alignment with overall program objectives

### **Business-as-usual phase**

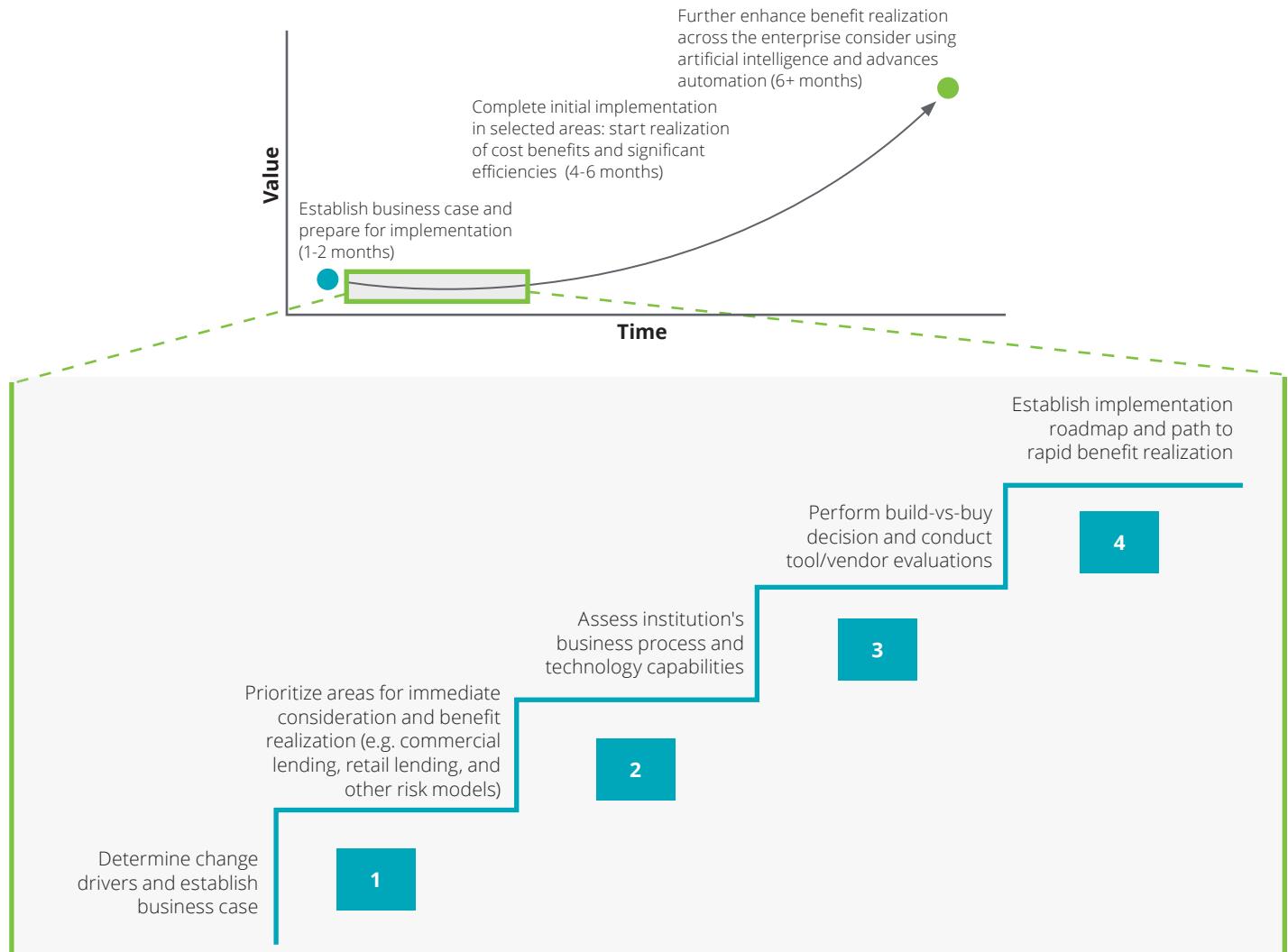
After the completion of the initial implementation, the focus shifts to ongoing enhancement and maintenance activities. This may include deployment of new or redeveloped credit risk models, integration of additional data sources, and incorporation of new reports. The following best practices are relevant post the initial implementation:

- Proactive operational monitoring:** Implementation of a comprehensive set of system and data controls around the rating processes coupled with operational monitoring is critical for early identification of implementation issues. In addition, monitoring can also highlight areas where raters need additional guidance.

- Effective resource model for ongoing platform maintenance:** A cross-functional team including business subject matter experts, technology experts, and functional testers should be established for ongoing platform maintenance. It's important to retain business team participation to allow close coordination with the model development teams and continued alignment with business needs. Business team members should own maintenance/enhancement activities involving configuration changes. Technology team members should take responsibility where development/customization efforts may be required and/or technical complexity is involved.
- Integrated model change management:** The overall model change-management and version-control processes across business and technology teams should be tightly integrated with the version control capabilities in the platform. This can help provide that the platform can be most effectively leveraged as a model inventory across the enterprise.
- Automated bulk rating:** Enablement of platform functionality to automatically execute re-ratings for select sub-portfolios can ease the burden on raters to perform periodic re-ratings. In addition, this feature can also help provide that the relevant risk rating parameters are updated very quickly following the implementation of a recalibrated model.
- Minimizing manual inputs:** As the platform matures, its level of integration with source systems providing model execution inputs should be increased, thereby reducing the need for manual inputs/adjustments as well as increasing the data quality and reliability. Any intermediate data transformations should be automated within the rating system, as opposed to being performed by the underwriter.

## Path to success

The following are the critical preliminary steps to be performed:



# Conclusion

Changes in market conditions and regulations have meant that financial institutions are under pressure to churn out models at a faster pace while ensuring that associated model risks are managed effectively. Rating processes based on spreadsheets or fragmented technology are increasingly being replaced by advanced credit risk rating platforms as institutions strive to remain competitive in the marketplace and comply with regulatory expectations. With strong linkages across each stage of the model lifecycle supported by a robust platform, executives can realize:

Reduced time to market for credit risk models through streamlined implementation and deployment processes

- Incorporated best practices in model development, including support for sensitivity analysis, enhanced model monitoring, benchmarking, and analytical reporting
- Seamless integration across business processes and systems
- Centralized model inventory with robust version control and change management capabilities
- Improvements in risk rating process efficiency and user friendliness

The significance of a fully functional platform lies in its deep impact on various critical enterprise risk management processes, including the underwriting process, capital allocation, and regulatory reporting. The implementation of an advanced commercial credit risk rating platform makes strategic sense given that it can upscale the risk management framework of commercial banks to the next level of maturity and provide a vital competitive advantage in the current market.



### Credit risk rating platform implementation at a large US bank

A large US bank had embarked on a strategic initiative aimed at redeveloping its portfolio of commercial risk rating models. As part of this initiative, the bank also initiated an effort to enhance its credit risk rating infrastructure to improve speed to market and reduce the effort needed to deploy the new models, while ensuring performance stability and reliability. To achieve these business objectives, the bank leadership decided to implement a “best-in-class” commercial credit risk rating solution using sophisticated, off-the-shelf tools.

From project inception, the Deloitte team has provided the bank team with on-the-ground advisory assistance in planning, design, and execution of the

platform implementation. Deloitte worked closely with end users, model developers, downstream consumers, and other business/technology stakeholders to define and document model calculation, workflows, user interface, and other rating-related functionality requirements. The team steered end-to-end implementation of the entire suite of redeveloped commercial risk rating (PD, LGD, and EAD) models, including providing support around design, functional validation, and new platform rollout. Deloitte also provided strategic guidance around the post-implementation target operating model for model realization.

The successful platform implementation at the bank is already powering performance by:

- Reducing the time needed for model deployment and execution
- Supporting the quick rollout of new redeveloped rating models
- Improving end-user experience through better source system integration and a more intuitive user interface

The Deloitte team played an important role in the bank’s transformation journey and helped the bank achieve its goals through our deep experience in credit risk rating platform implementation and related issues around the model lifecycle, regulatory compliance, and change management.

### Credit risk rating platform implementation at US super regional bank

A large banking organization’s growth was taking it closer to the Basel regulatory threshold that defines it as a “core bank.” To better support continued growth and achieve a robust, reliable, and tractable credit process, bank leadership elected to implement a more integrated credit risk rating system (strategic dual risk rating, S-DRR).

The Deloitte team was brought in to assist with the implementation of a third-party vendor platform. In its advisory capacity, the Deloitte team designed and implemented the customized rating workflow

functionality for the rating platform and was instrumental in deployment of all credit risk scorecards (including PD and LGD) in the new platform. As a necessary step for the success of the implementation, the team also designed a tactical obligor-facility repository to support the rating platform. This effort included a one-time migration of historical obligor data and assisted with the integration of the rating platform with spreading applications and reporting data marts.

The bank’s new platform is designed to be more efficient, Basel compliant, and is helping to power performance through:

- **High maintainability** — rating scorecards can be developed, updated, and deployed by end users with limited technology support required
- Advanced rating capabilities — sophisticated stress testing and simulations
- Data integrity — with spreading applications such as Moody’s Risk Analyst and security (e.g., single sign-on)

The Deloitte team was instrumental in the overall success of the implementation project and also provided valuable post-implementation support, including working with the bank executives for future enhancement plans and end-user training.

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