Organizations face many challenges in managing analytical model collections. For many, it is an inefficient manual process that takes too long. Model decay from underlying market or behavioral changes diminishes model effectiveness and can lead to poor decisions. Failure to update models frequently enough can result in loss of revenue as competitors act on changing trends before you do.

The lack of a common framework for managing model collections is also painfully evident as organizations struggle to meet deadlines from external agencies. Not understanding why the champion model was chosen or how a particular score was calculated makes it hard to meet regulatory requirements, which can result in penalties, fines and loss of reputation.

SAS® Model Manager is a web-based application that helps streamline analytic model management and administration. It enables all stakeholders to collaborate as they manage analytic modeling workflow in an efficient, cost-effective manner.

### Benefits

- **Streamline your analytical modeling processes.** This web-based software simplifies the entire process of creating and managing model collections. An automated and collaborative process lets you track each step of the modeling project process, defining customized workflows for different types of models. Those interacting or interpreting models get a unified view of each model’s currency, definition and function.

- **Gain confidence from complete knowledge of model collections.** With an efficient, repeatable process for registering, validating, monitoring and retraining models, you can track models from creation to usage through retirement. Comprehensive version control contains a snapshot of model properties and files whenever a version is created. Models are secured, and model version history is locked down and retained.

- **Govern model workflow.** For more efficient model processing and governance, analytical models can be easily tested and compared, performance benchmarking reports and alerts generated, and workflow notifications sent. Modelers can collaborate and reuse models, and automatic detection notices can be sent when scoring results change over time, indicating model decay.

- **Ensure auditability and compliance to meet regulatory requirements.** A centralized model repository, lifecycle templates and version control provide visibility into analytical processes so they can be audited, providing compliance with internal governance and external regulations. Basel II risk model validation reports provide transparency by assessing the soundness of internal credit risk measurement systems, tracking down anomalies and answering regulator inquiries on demand.

---

**What does SAS® Model Manager do?**

SAS Model Manager streamlines the tedious and often error-prone steps of creating, managing, monitoring and administering analytical model collections.

**Why is SAS® Model Manager important?**

Analytical models enable better decision making. SAS Model Manager provides a web-based environment to support lifecycle management and governance of models. Easily manage modeling processes and identify champion models for deployment. Performance monitoring and alerting automate the model updating process to address model degradation and ensure that models reflect current conditions.

**For whom is SAS® Model Manager designed?**

It’s designed for model validation and compliance analysts, data scientists and other analytic professionals concerned with performance degradation. Business unit leaders who manage analytic teams will also benefit from centrally managed model administration.
Overview

SAS Model Manager is a web-based product that streamlines the process of creating, managing, administering and monitoring your analytical models. It offers a patented, secure analytic model repository that is complemented by a rich, underlying metadata structure consisting of projects and portfolios.

A repeatable framework makes it easy to register, validate, track, monitor and retrain analytic models to ensure they’re performing well. A common environment allows stakeholders across your organization to collaborate and treat analytic models as high-value assets throughout their life cycles.

Extensive tracking, validation and auditing reports are produced as analytical models are used across different departments and marked as champions for use in other applications. Ongoing monitoring identifies when it’s necessary to refine or retire a model. Model retraining relies on model refinements from the same processing environment for increased efficiency. The web-based interface makes it easy to automate the model management process, and enables more effective collaboration by letting users track the progress through each step of the modeling process.

Model performance tasks in conjunction with performance dashboards support automated notifications to alert users when models have degraded below allowable thresholds. Performance monitoring and reporting help automate the model updating process to ensure that models perform at their highest levels at all times.

Integration with SAS Scoring Accelerator enables the registration and validation of scoring functions within the following databases and appliances: Hadoop, Cloudera, Hortonworks, MapR, Pivotal, BigInsights, SAP HANA, IBM DB2, IBM Netezza, Oracle, Teradata Aster and SAS Scalable Performance Data Server.

Web-based, centralized and secure repository for managing models

The SAS Model Manager repository stores extensive documentation about the model, scoring code and associated metadata. And it permits collaborative model sharing based on users’ group authentication – retaining version control and auditability. Analytical professionals analyze historical data and register the predictive models into the repository along with the required data structure for the models’ usage instructions.

Analytical workflow management

You can easily define and track custom workflows for model lifecycle management. This can include all phases from problem-statement creation to model development and utilization.

Figure 1. A web interface makes it easy to view model project content and manage model settings.

Figure 2. You can visually examine model performance results using user-defined performance data.
Scoring logic validation before models are exported into production

Scoring officers using SAS Model Manager have a defined process to follow and a system that records each test the scoring engine performs to ensure the logic embedded within the champion model is sound. A map that details each accuracy checkpoint along with the expected scoring results is captured, recorded and logged in the system. This precise method of checking and double-checking the model scoring logic reduces the risk exposure from incorrect decisions after the model is pushed to production. Champion models can be exported for on-demand and batch scoring only after they are completely validated.

The SAS Metadata Repository can deploy the scoring engine from SAS Data Integration Server or any other SAS product that creates analytical scoring engines. And model dependencies with or between projects are fully traceable with lineage views depicting relationships.

Users can import select models from SAS Factory Miner, SAS/STAT®, SAS/ETS®, SAS® Enterprise Miner™, PMML, generic R models and code snippets from other code bases, and from SAS High-Performance Data Mining. SAS Model Manager is also fully integrated with SAS Decision Manager for deploying models as part of complete decision flows.

Performance monitoring/reporting during test and production cycles

As the champion model reaches test, stage and production lifecycle milestones, model status and performance information is pushed to subject-matter experts who manage the test criteria being evaluated at each milestone. Procedural templates document the validation performance and sign-off process. An audit trail is created as the champion model is marked for production and the predecessor champion model is retired. Performance benchmarks are calculated to display the champion model's scoring performance and document conformity to required standards. Several...
Key Features (continued)

- Add model dependencies and view relationships using SAS Lineage, within the same project version, another project version or to generic models within a folder.
- Provides collaboration across teams with automated notifications.
- Perform common model management tasks such as importing, viewing and attaching supporting documentation; setting a project champion model and flagging challenger models; publishing models for scoring purposes; and viewing dashboard reports.

Scoring logic validation before models are exported to production
- Define test and production score jobs using required inputs and outputs.
- Schedule scoring tasks, and specify where to save the output and job history.
- Publish model updates to different scoring channels and notify subscribers via email or store results to a file system or post to a corporate intranet.
- Create model input and output variables from the score.sas file to generate missing metadata from model variables.
- Integration with SAS Scoring Accelerator for in-database model deployment. Currently supporting Hadoop, Cloudera, Hortonworks, MapR, Pivotal, BigInsights SAP HANA, IBM DB2, IBM Netezza, Oracle, Pivotal, Teradata Aster and SAS Scalable Performance Data Server.

Model performance monitoring and reporting during test and production
- Automated model retraining:
  - Define threshold metrics to trigger alerts when performance is unacceptable.
  - Retrain models automatically when threshold metrics are reached.
  - Automated, configured registration after model retraining is completed.
  - Retraining schedules can be set for regularized processing.
- Model performance reports produced for champion and challenger models include variable distribution plots, lift charts, stability charts, ROC, K-S, Gini, and Basel backtesting reports.
- Wide range of model comparison reports in a host of formats, including Microsoft Excel, HTML and PDFs.
- Easy-to-use wizard for creating, modifying and deleting performance-monitoring dashboard definitions.
- Perform scoring and performance monitoring on a database appliance configured for use with SAS High-Performance Analytics products.
- Support multiple SAS application servers when scoring or retraining a model or monitoring performance of champion and challenger models.
- Specify multiple data sources and time collection periods when defining performance-monitoring tasks.

Overall lifecycle management of analytical models
- Model lifecycle templates for collaborative project management:
  - Add or edit model templates, user-defined templates and report templates.
  - Task-oriented milestone completion and signoff.
  - Progress-completion status reports.

out-of-the-box reports are provided as well as the flexible user-designed reports that monitor performance on an ongoing basis.

An easy-to-use interface generates the data needed to create a series of performance-monitoring dashboards. Model-monitoring dashboards and reports allow for a timeseries statistical overview of all modeling projects. Metrics include many standard compliance and governance-type statistics. The production champion model remains active until business conditions dictate its retirement, or until a new model is created and the predictive model life cycle begins a new iteration.

Overall lifecycle management of analytical models
Prebuilt model lifecycle templates are provided for collaborative project management. In addition, the lifecycle template editor enables you to create custom templates to meet your business process needs. Testing, scoring and sharing of model lifecycle and performance data over established publishing channels are also supported. Accountability metrics and the validation of analytical steps through model creation, visualization and the retirement stages are available.

To learn more about SAS Model Manager, download white papers, view screenshots and see other related material, please visit sas.com/model-manager.