



Limpert Instituut

Model Governance

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Model Governance

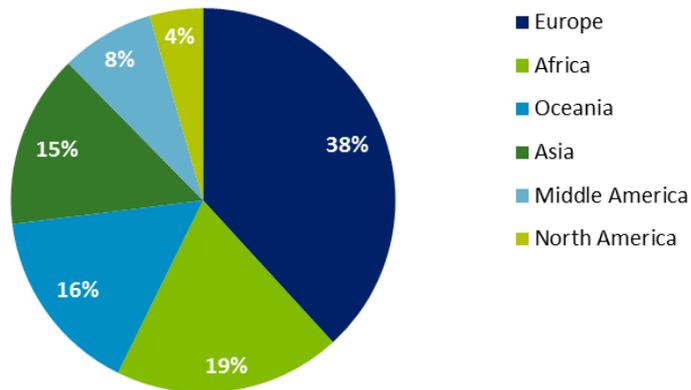
1. *Introduction*

2. Model governance
3. Model development
4. Model validation
5. Discussion

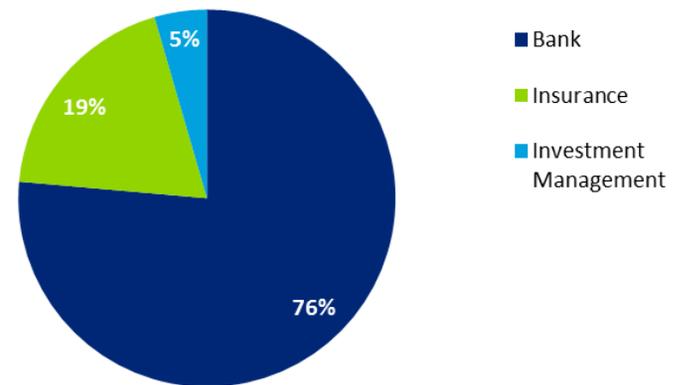
Introduction GMPS

89 FSI respondents worldwide in various roles

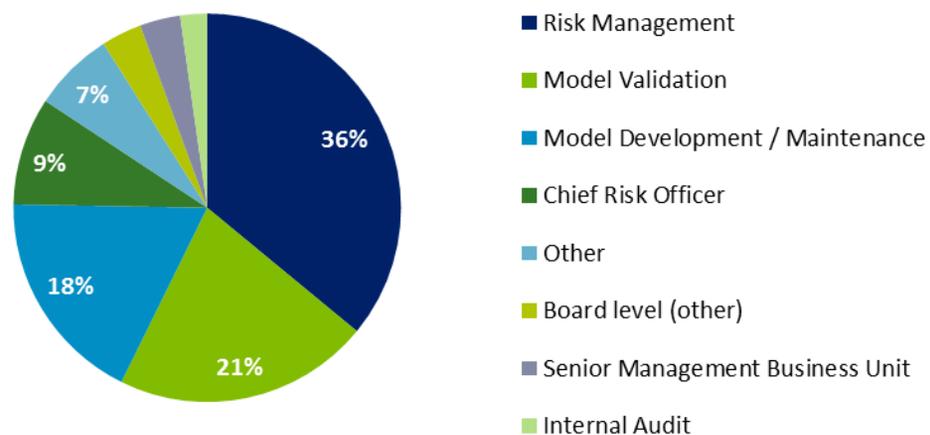
Geographical distribution



Respondents per industry



Role of respondents



GMPS

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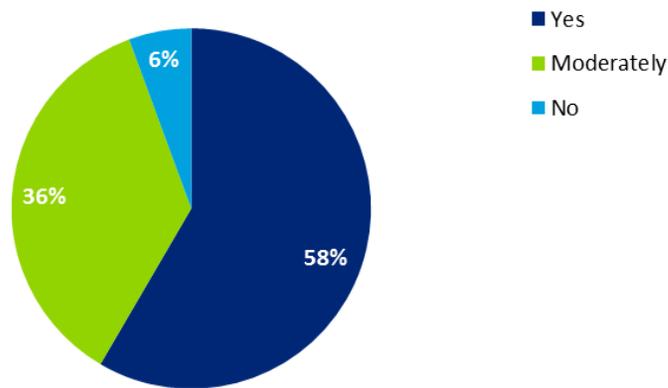
Model life cycle

Stage	Objective
1 Project Initiation	<ul style="list-style-type: none">• Have a project plan that is approved and endorsed by stakeholders.• Have an established network within your organisation in order to quickly engage relevant stakeholders when necessary.
2 Model Design	<ul style="list-style-type: none">• Have an agreed upon model design in place that fits with the requirements of stakeholders: Business Risk Management, Systems & Projects and Model Validation, while at the same time carefully considering concerns prescribed in finance theory.
3 Model Implementation	<ul style="list-style-type: none">• Have the chosen model peer reviewed and robustly implemented in code.
4 Model Testing	<ul style="list-style-type: none">• Have documentation that describes the performed tests.
5 Model Documentation	<ul style="list-style-type: none">• Have clear and thorough documentation for your Model Validation department and Model Committee that meets external as well as internal requirements.
6 Model Validation	<ul style="list-style-type: none">• Have the model independently validated by your Model Validation department as efficient and effective as possible.
7 Knowledge Sharing	<ul style="list-style-type: none">• Have knowledge shared and transferred through-out the process as well as by means of a workshop at the end of the process.
8 Project Closing & Evaluation	<ul style="list-style-type: none">• Have all open issues solved.• Have all deliverables signed off by you.• Have all deliverables transferred to you.

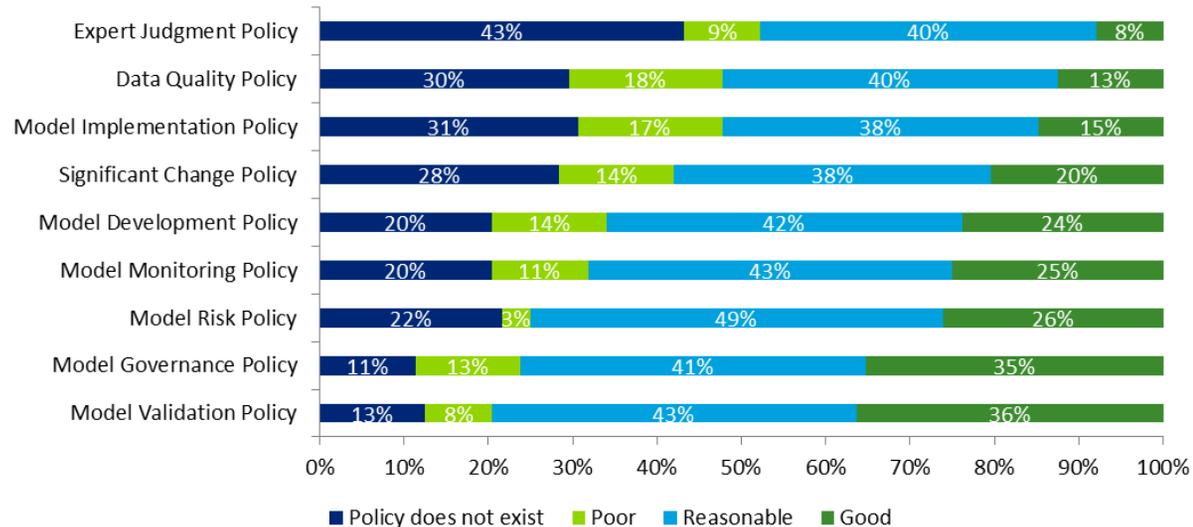
Model governance

Complex model environment

Do you consider your model environment to be complex (in terms of e.g. model dependencies, system architecture, policy framework and sourcing of data)?



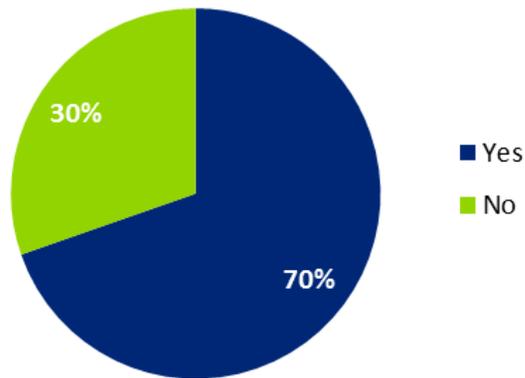
How do you perceive the quality of the following policies?



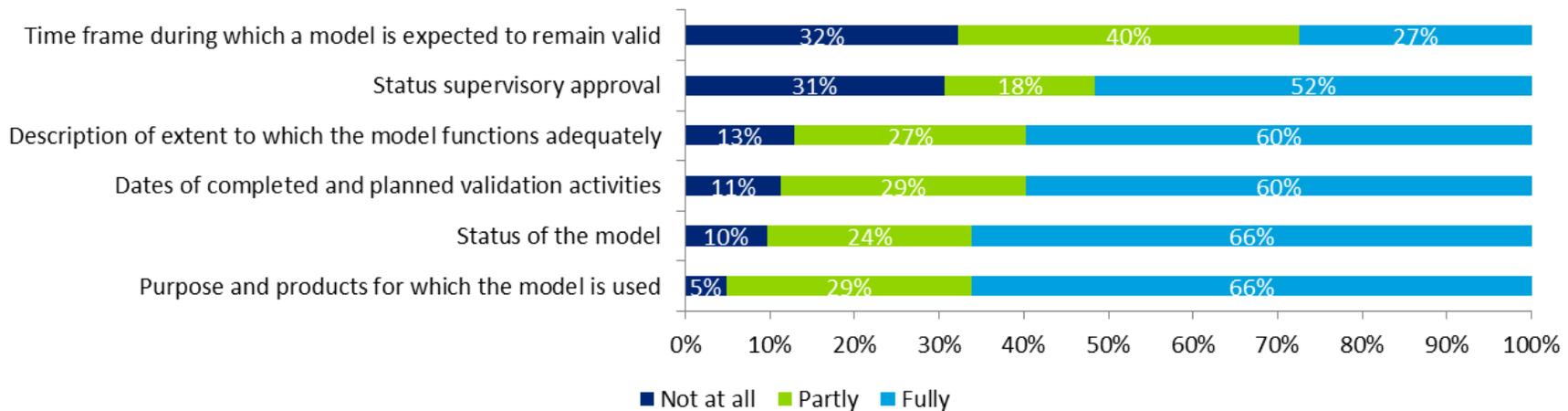
Model governance

Model inventory

Do you have a model inventory?



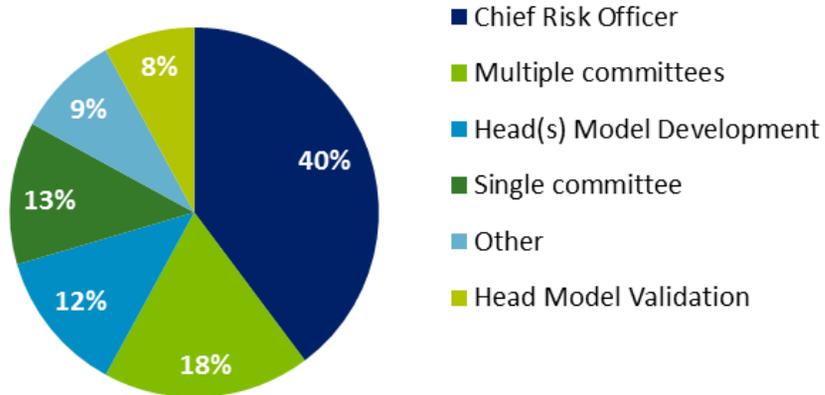
To what extent are the following aspects captured for each model by your model inventory (if present)?



Model governance

Model governance framework

Who is the owner of the model governance framework?



Model governance

Main conclusions

The model governance framework is considered to be complex

Most survey respondents experience their model governance framework as being complex.

Model practice policies could be improved

Up to half of the respondents indicate that one or more of the identified policies do not exist or are of poor quality. The largest improvements can be made in the areas of expert judgment, model implementation and data quality policies.

The ownership of the model governance framework is not always safeguarded

20 per cent of respondents indicate that multiple committees have ownership of the framework. Furthermore, 20 per cent of respondents indicate that ownership is assigned to either the model development department or the model validation department.

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Model Development

“I suspect that if we had a world today without models the first thing we’d do would be to build some.”

M. Onak (1998)

Building blocks of the model methodology improvement

When a methodology needs to be improved or redeveloped, several steps need to be taken to arrive at a model which is documented and ready for validation:

Improvement of model methodology

- | | |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Workstream initiation | Set up a workstream meeting and finalise the project plan with stakeholders. |
| 2. Model design | Identify all relevant model requirements, draft the functional specification as well as the mathematical description, define test scenario's, submit the draft documents for approval. |
| 3. Model building | Build the model in a programming environment like Matlab or Excel, conduct a peer review on the code and improve the code based on the peer review. |
| 4. Model testing | Test the model using the test scenario's, improve the model based on the test results and draft a test report. |
| 5. Model documentation | Draft the model documentation and policies, submit documentation for approval and prepare for validation. |

Expert judgement



Developing expert judgement

To define expert judgement, the following methodology could be used. It is a process that includes questionnaires in two rounds; a workshop and analyses when the questionnaires are filled out.

1. First questionnaire

Based on the formulated findings, formed during phase 1 and 2, a questionnaire is developed which will be filled out by the experts. They are asked to define solutions and provide these with their line of reasoning.

2. Analyses

We will summarize the expert judgements given in the first questionnaire. After that, we will provide a summary to each expert so they can redefine their judgement and prepare for the workshop.

3. Workshop

During the workshop the experts are asked to explain their solutions and a discussion will follow.

4. Second questionnaire

The outcomes of the workshop will be used as information for the second questionnaire. Which will be again distributed across the experts.

5. Define expert judgement

We will define the expert judgement on the results of the final questionnaire.

Advantages

The advantages of this approach are summarized below.

1. Individual preparation

With the help of the first questionnaire the different views on the findings can be listed. This will also help the experts to come well prepared to the workshop.

2. Group dynamics

Based on the analyses the workshop makes it possible for a discussion on the finding. This can create new and innovative solutions.

3. Converge to best practice

Science showed that using a methodology like this helps to granular work to the best solution.

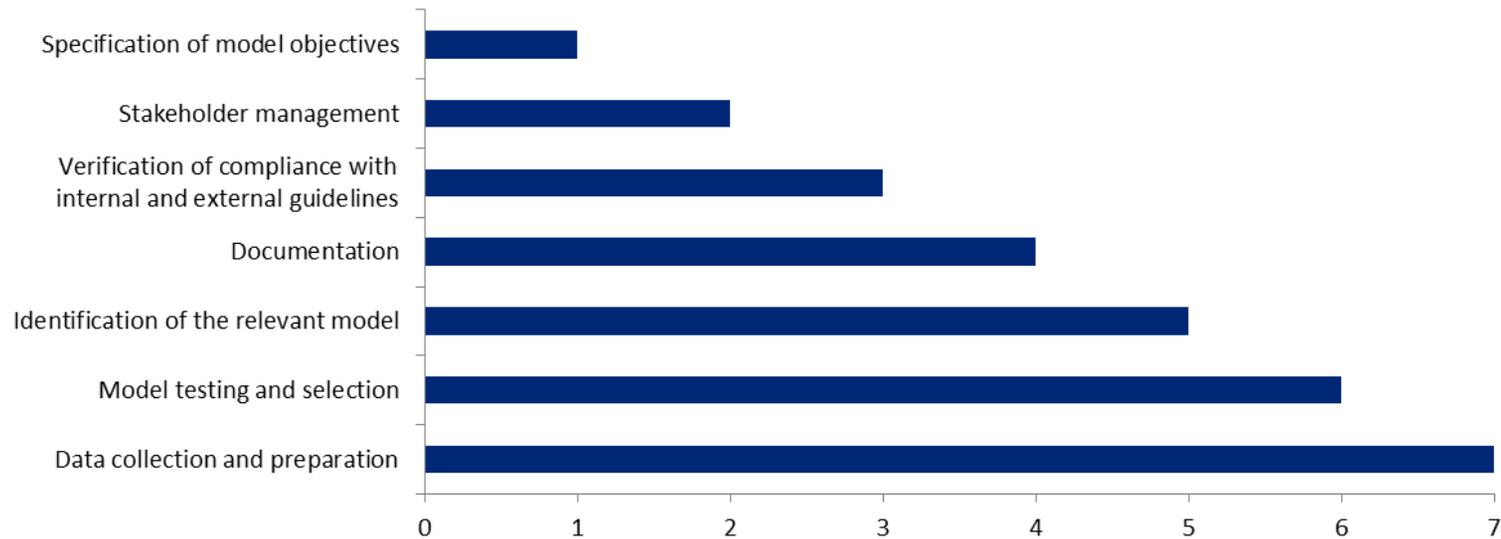
4. Efficient

By first distributing a questionnaire among the experts a first assessment of the best practice on the findings can be made. If an agreement on the finding can be made without the workshop and the second questionnaire this will be very efficient.

Model development

Time allocation

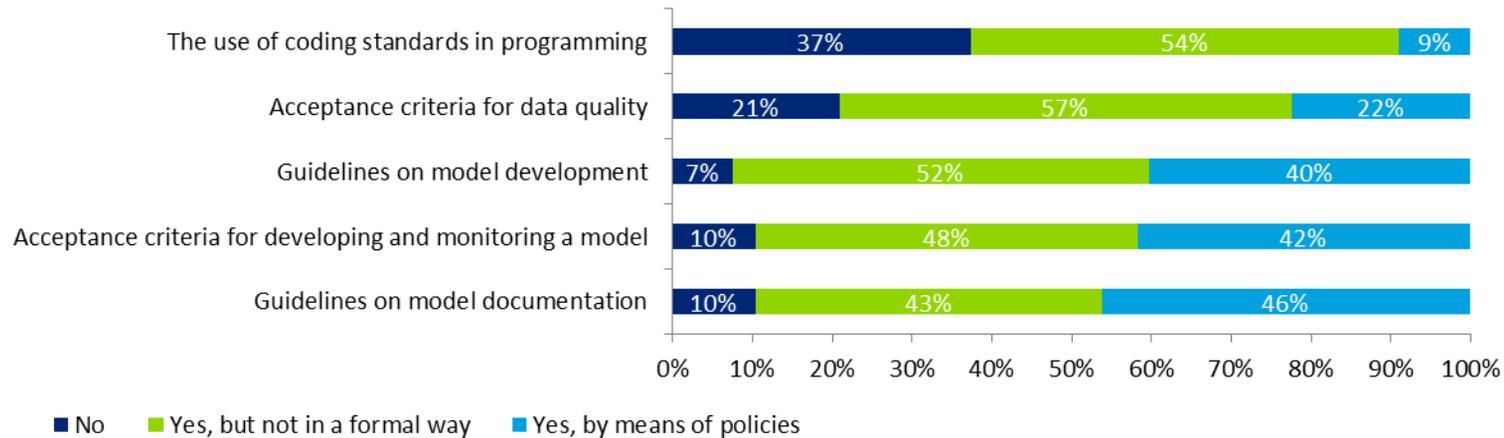
To what extent does your organization spend time on each of the following activities for a model? Please order activities from least time spend (1) to most time spend (7).



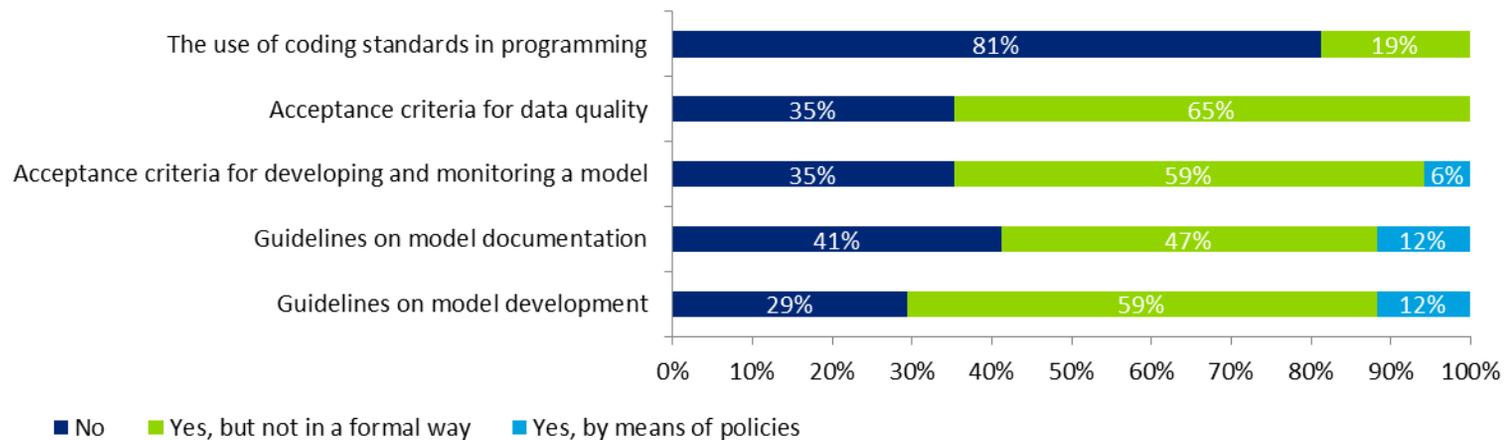
Model development

Process standardisation

Is the model development process standardized in the following areas? (Banking)



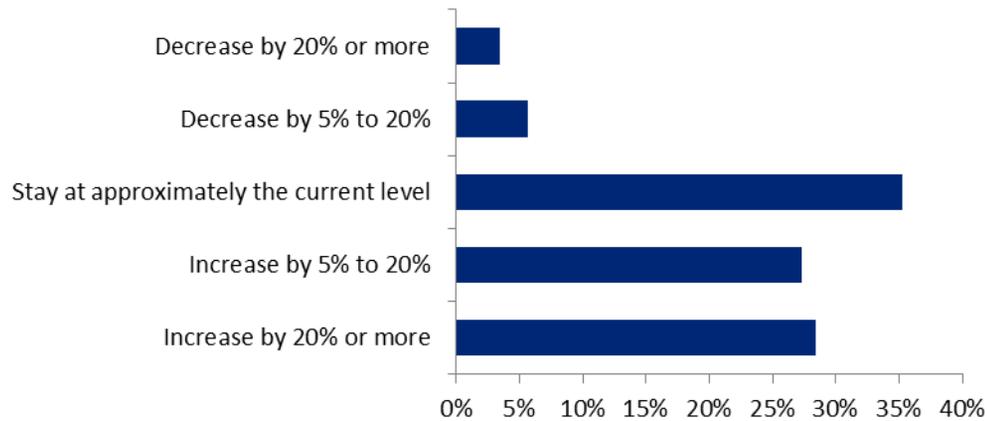
Is the model development process standardized in the following areas? (Insurance)



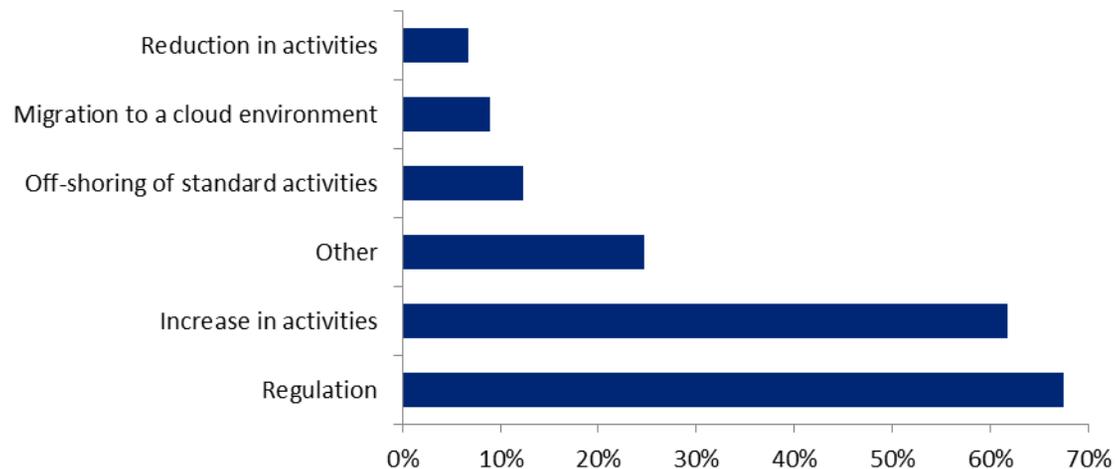
Model development

Expected changes

Over the next three years, how do you anticipate your annual spending on model development will change (in % compared to last year)?



What do you expect to be the biggest change(s) in the model development area over the next five years?



Model development

Main conclusions

Modellers spend much time on data collection and preparation

Professionals involved with the development of models spend a relatively significant amount of time on retrieving, preparing and cleansing data.

Activities in order to enhance model practice are expected to increase

In the coming years the activities for the model development department are expected to increase. Moreover, regulatory authorities are expected to initiate new and more stringent requirements on model performance. Given that financial institutions already face capacity constraints, it may be a challenge in the coming years to complete model improvements on time, let alone research and innovate new methodologies.

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Guiding principles regarding Model Validations

A uniform approach safeguards high quality validations of financial models. The approach should accomplish complete, accurate and consistent deliverables that fulfil the information need in a transparent environment.

An approach could consist of the following three steps:

- **Intake**

The validation leads to optimal results when all relevant information is known from the beginning. Therefore an intake meeting with all people from the client who are involved in the model validation process is conducted first. The meeting typically focuses on issues that came across during model use and will be used to demonstrate the model to the validation team. This meeting also ensures that the client and the validator become acquainted with each other such that future communication is smoothed.

It is possible that the intake meeting leads to the conclusion that existing deliverables are not yet sufficient. In such instances the feasibility of adhering to the existing planning is questioned and new time lines are proposed. This safeguards an efficient use of time.

- **Analysis**

During the actual validation the correctness and completeness of the methodology underlying the model as well as the quality of the available documentation are evaluated. Standards are applied in order to increase the level of objectivity. Where possible tests are performed in an automated fashion such that efficiency is gained and the risk on errors is mitigated.

Continuity and high quality deliverables are ensured by involving three roles in the actual validation.

- A validator is involved on a daily basis, thoroughly evaluates the documentation and performs all analyses.
- A subject matter expert provides guidance, functions as a sounding board and performs the review of the initial draft of the validation report.
- A partner is involved for Quality Assurance of the validation report.

- **Reporting**

Even though each model is unique we strive to report in line with a template. This consistency enables stakeholders (e.g. risk management and internal audit) to swiftly assess the quality of the model and appropriateness of conclusions and recommendations.

Before submitting the final validation report to the client a draft of the validation report is discussed with the head of the risk management team.

Approach; Model validations



- Smooth validation process for the model which ensures efficient use of resources and budget.

Prepare

- Screening the available documentation.

Conduct intake meeting

- Meet with risk management team of the client to gain knowledge of the model environment and development. Items typically discussed are:
 - Model structure (intended use, history, rationale).
 - Model philosophy and methodology.
 - Obtain and understand portfolio characteristics (geography, sectors, concentrations).
 - High level quality assessment of available documentation.
 - Bottlenecks identified by the client prior to the validation
- Agree on drafting process.
- Plan dates for future meetings.

- Minutes of intake meeting.
- Validation plan.
- Detailed planning and refined fee-estimate.

Approach; Model validations



- Validate the model in accordance with internal guidelines, market practice and the validation plan.

Execution validation

- The actual model validation comprises the following four steps:
 - a) Qualitative validation (i.e. assumptions, expert judgement).
 - b) Quantitative validation (i.e. data analysis, statistical test).
 - c) Assessment of available model documentation.
 - d) Compliance with internal guidelines.
- Applying standards where possible to limit the extent of subjectivity.
- Hold workshop after the qualitative validation to discuss the draft findings resulting from the qualitative validation.
- Draft version of selected section of the validation report on the model.
- Meeting and discussing with subject matter expert.

- First drafts of selected section of the validation report on the model.

Approach; Model validations



1. Intake

Objectives

- Having a high quality, complete and correct validation report on the model.
- Having a model validation report that is known and accepted with the head of the risk management department.
- Aiming to deliver final validation report according to the timelines set in the validation plan.

2. Analysis

Activities

Finalise validation report

- Assemble the validation report.
- Review by the subject matter expert on the first draft.
- Process comments in second draft.
- Review by the head of the risk management department and by the partner on the second draft.
- Process comments in third draft.
- Discuss the third draft validation report with the developer.
- Process comments in final validation report.
- Draft the final validation report.

If desired, discuss validation reports with the clients approval bodies.

3. Reporting

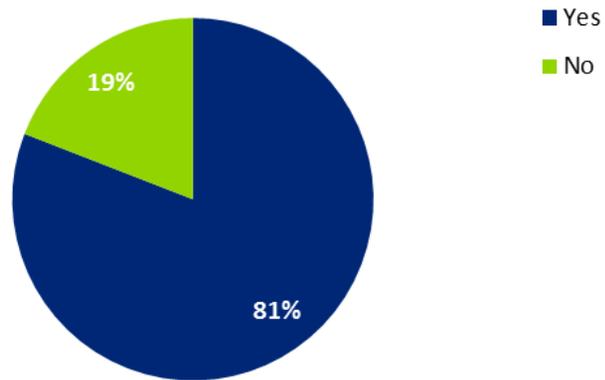
Main deliverable

- Validation report on the model.

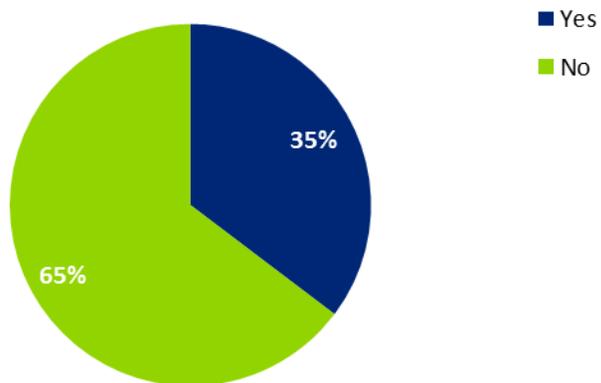
Model validation

Independent validation function

Does your organization have an independent model validation function? (Banking)



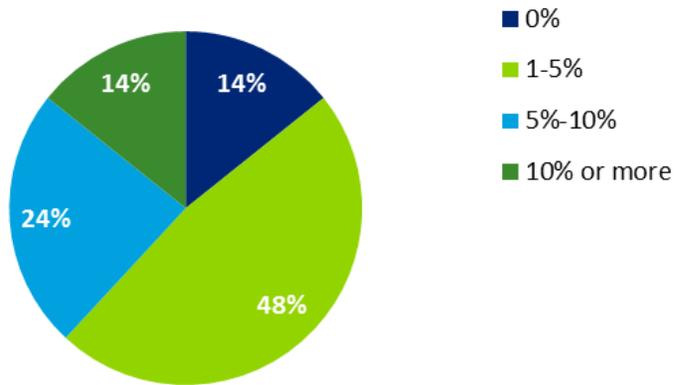
Does your organization have an independent model validation function? (Insurance)



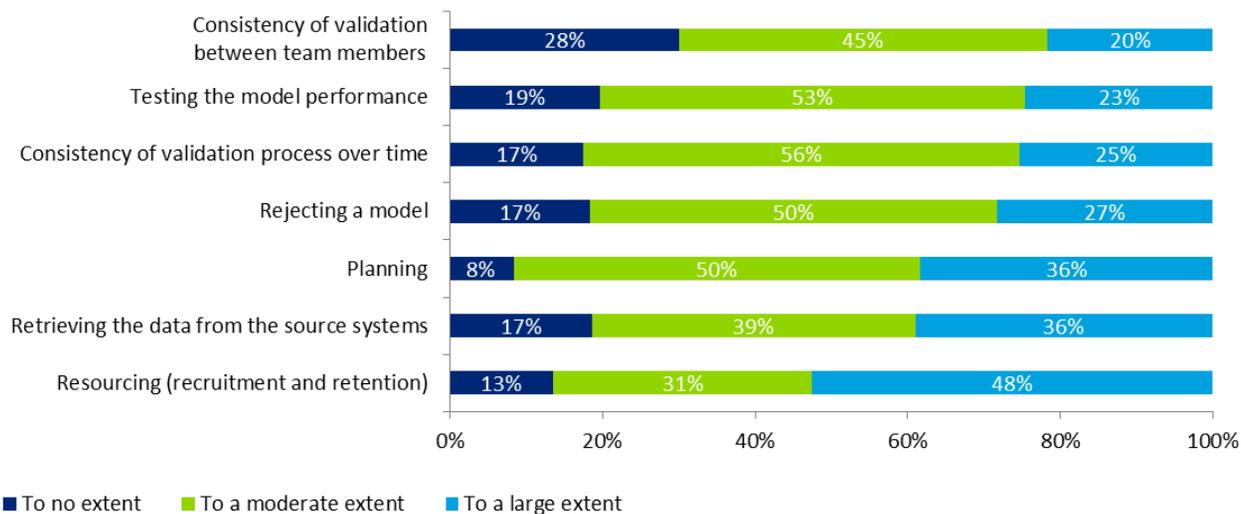
Model validation

Challenges and rejections

On average, how many models are rejected by the model validation function (as a percentage of all models that require validation)?



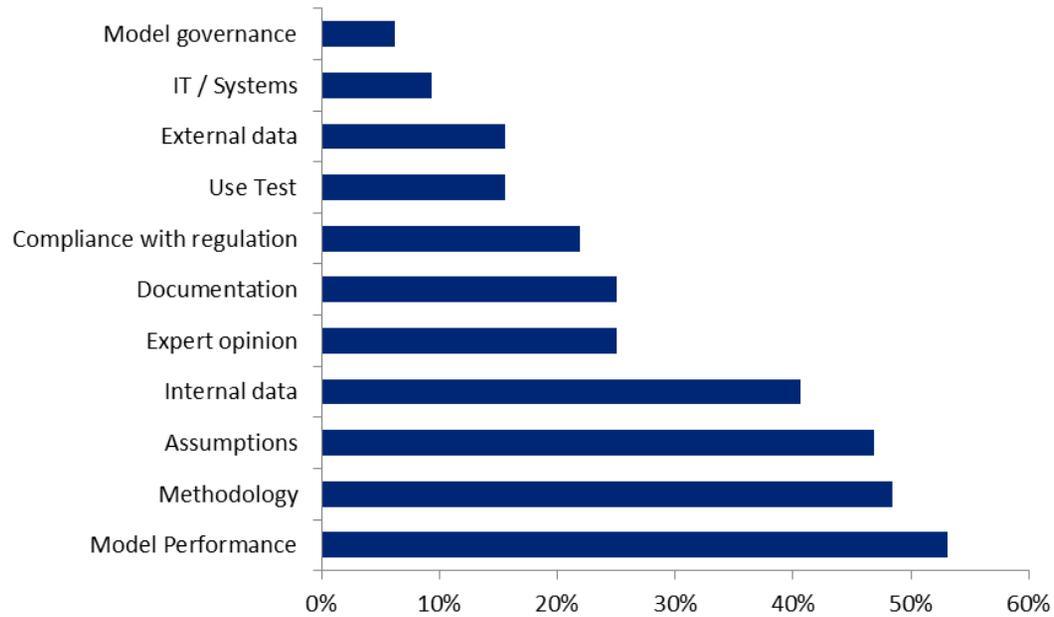
To what extent are the following model validation aspects challenging?



Model validation

Causes for rejection

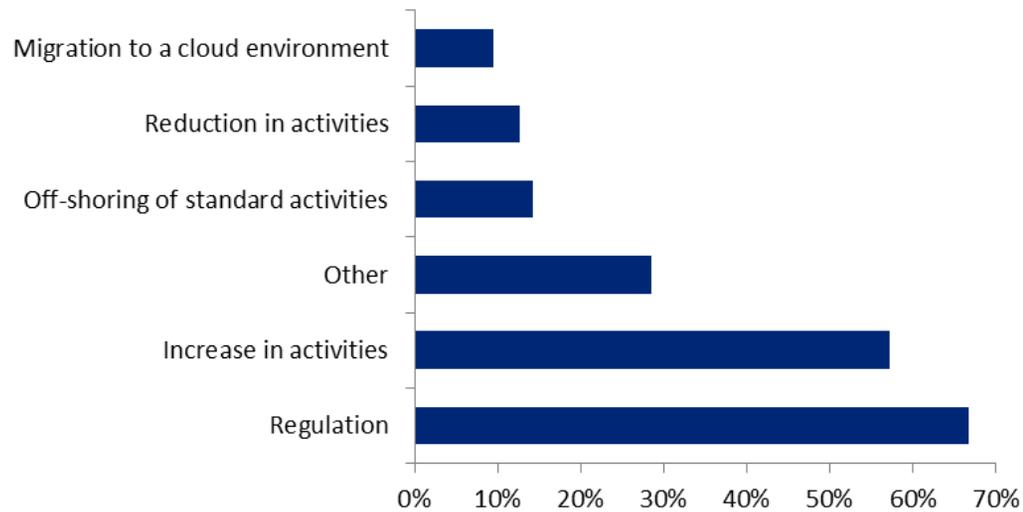
In case a model is rejected by the model validation department, which of the following dimensions of model validation most frequently occur as a cause of rejection?



Model validation

Expected changes

What do you expect to be the biggest change(s) in the model validation area over the next five years?



Model validation

Main conclusions

New model requirements imposed by regulators

Recently, regulatory authorities have been encouraging financial institutions to improve the governance of risk related models and to give model validation a more prominent role in the risk management function. A regular cycle of model validation is required.

Rejecting models is challenging for model validation

Rejecting models is a challenge for model validators. This finding is supported by the observation that 14 per cent of the model validation departments have never rejected a regulatory model.

Activities in order to enhance model practice are expected to increase

In the coming years the activities for the model validation department are expected to increase. Moreover, regulatory authorities are expected to initiate new and more stringent requirements on model performance. Given that financial institutions already face capacity constraints, it may be a challenge in the coming years to complete required validation processes on time.

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Discussion

Main survey results

Rejecting models is challenging for model validation

Rejecting models seems to be challenging for model validators. This finding is supported by the observation that 14 per cent of the model validation departments have never rejected a regulatory model.

Model practice policies could be improved

Up to half of the respondents indicate that one or more of the identified policies do not exist or are of poor quality. The largest improvements can be made in the areas of expert judgment, model implementation and data quality policies.

The ownership of the model governance framework is not always safeguarded

20 per cent of respondents indicate that multiple committees have ownership of the framework. Furthermore, 20 per cent of respondents indicate that ownership is assigned to either the model development department or the model validation department.

The model governance framework is considered to be complex

Most survey respondents experience their model governance framework as being complex.

Modellers spend much time on data collection and preparation

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For more information on the **Global Model Practice**

Survey see www.deloitte.nl/gmps