

# The Challenge of AML Models Validation

September 2015

## Executive Summary

Anti-money laundering (AML) violations and enforcement actions have hit the headlines so often these past two decades that the attention of senior management and board members on AML/compliance risk management has been triggered. Still, businesses do struggle to satisfy regulatory requirements and face fines, penalties and enforcement actions.

Regulators and international standards agencies like the Financial Action Task Force (FATF) provide the requirements and guidelines with respect to AML/compliance risks, including that of AML/compliance risk management models. One of the most important principles that many firms have failed to satisfy the regulator on is the validation of AML models. Many questions were raised whether financial institutions are managing their AML risks adequately and efficiently and how the risk mitigation was verified and validated.

Many firms, including Citibank, N.A, which is part of Citigroup, have failed to satisfy the Office of the Comptroller of the Currency (OCC) regarding managing Bank Secrecy Act/anti-money laundering (BSA/AML) compliance requirements. Important topics raised were the management of AML model's risk and insufficient validation of AML systems.

This white paper has as objective to help BSA/AML personnel to address the most common challenges faced with examiners regarding the validation of AML models.

This white paper starts with a background on the need for technology and systems to help in addressing AML risks. Following that, the AML model's definition and benefits are discussed, and the next step is to provide an overview of the identification of different sources of AML risks and risk assessment to design an AML model. The next section provides solutions to resolve AML deficiencies that were introduced earlier in "models validation." A notice is made on how to address questions regarding risk and what, when, where and how to validate AML models. After the questions are raised, guidance is given on how to address the top challenges of AML model validation and recommendations are given on how to overcome these challenges. The concluding section of the paper discusses the benefits of the validation process throughout the life cycle of the AML system in scope.

## Table of Contents

Background.....	3
Chapter 1: AML Models .....	4
Definition.....	4
Benefits.....	4
Risk Assessment and Model Designing .....	5
Top AML Models Deficiencies Spotted by Examiners .....	6
Chapter 2: AML Models Validation.....	8
I. Components of Validation .....	8
II. AML Systems Validation: .....	10
III. General Recommendations on Model’s Validation.....	12
Conclusion .....	13
Appendix A .....	15
Glossary.....	16
Bibliography.....	17

## Background

In the global marketplace, money laundering represents one of the most pressing issues facing regulatory authorities. Most regulators across the globe, including OCC, would expect financial institutions to conduct business with responsibility towards their clients and to protect national security from money laundering and terrorist financing (ML/TF) risks. Regulators also encourage businesses to benefit from technology to manage various relevant risks including ML/TF. At the same time, regulators demand that financial institutions manage the risks associated with using new technology and dependency on the output of automated systems (including AML systems/models). As a result, many firms failed regulatory examinations as the expectations were high on the regulator's side.

The fierce competition in the products and services by financial institutions to provide the fastest, easiest and customized products and services to the consumer market had made it more difficult to track the flow of funds throughout the global financial system. The shortened financial transaction execution time has made it much more difficult to timely identify the source for ML/FT risks. Technology developments like the introduction of mobile banking have added to the time issue significantly. Financial institutions are finding it more challenging, day by day, to manage and mitigate their AML risks.

Most of the enforcement actions are related to AML models and the ineffective validation of the same. Most banks struggle to bring their AML models up to the expectation of the regulators. The factors that come into play are: competition is getting higher, the products are more complex, and the regulatory environment keeps developing day by day, in addition to the complexity of AML models themselves. All these factors add to the difficulty and challenge faced by banks to advocate for their systems and processes and to prove that they are adequate and effective in managing AML risks.

For example, several sections of Citibank, N.A., OCC Consent Order, refer to model risk management failure, weaknesses in the scope and documentation of the validation and optimization process and ineffective independent testing of AML models. This has prompted the author to produce this white

paper to guide compliance officers and AML analysts to keep their systems under control in order to minimize the risks of AML fines, penalties, enforcement actions and mandated look-backs.

## Chapter 1: AML Models

### *Definition*

As per OCC 2011-12 Supervisory Guidance on Model Risk Management, “the term model refers to a quantitative method, system, or approach that applies statistical, economic, financial, or mathematical theories, techniques and assumptions to process input data into quantitative estimates.”<sup>1</sup> Models are simplified representations of real world relationships among observed characteristics, values and events. “The guidance has a broad scope that includes multiple aspects of model risk management, expanding on existing guidance and industry experience. A key element of this and previous guidance is the need for independent review and model validations.”<sup>2</sup>

### *Benefits*

A well-designed AML model can benefit the business in more than one way, most of the common well-known benefits are:

- Models improve risk management by minimizing and mitigating risk within the AML program
- Satisfying regulatory expectations and requirements for the soundness of models in use within the AML program
- A well-designed model will likely increase productivity and efficiency, which in turn will improve the quality of AML audits
- A well-defined organization structure with clear definition of accountability and responsibility among the different lines of business

---

<sup>1</sup> “Model Risk Management: Quantitative and Qualitative Aspects,” Management Solutions, 2014, <http://www.managementsolutions.com/PDF/ENG/Model-Risk.pdf>

<sup>2</sup> “AML Model Risk Management and Validation,” EY, 2013, [http://www.ey.com/Publication/vwLUAssets/EY\\_-\\_AML\\_model\\_risk\\_management\\_and\\_validation/\\$FILE/EY-AML\\_model\\_risk\\_management\\_and\\_validation.pdf](http://www.ey.com/Publication/vwLUAssets/EY_-_AML_model_risk_management_and_validation/$FILE/EY-AML_model_risk_management_and_validation.pdf)

- Effective customer due diligence (CDD) processes
- Improve business decisions since models enable banks to predict and identify risk more accurately
- Cost effective on the long run and by avoiding fines and penalties imposed by regulators
- Automated solutions, which will reduce staffing cost
- The confidence of a well tracked AML risks across all products, services and lines of business
- Being proactive in identifying and addressing elevated risks in AML to the business

### ***Risk Assessment and Model Designing***

Similar to other areas of setting up a business, a plan needs to be made to design an AML model. In order to have an effective and adequate model to manage ML risks, we first need to identify all possible and potential AML risks that our firm is likely to be exposed to. There are mainly four sources of risks: customer, products/services, geography/locations and regulatory risks (refer to Table 1 for examples of each risk category). Once all potential risks had been identified and understood by the business, a plan to design controls and procedures in a way to manage and mitigate those risks should be crafted. Controls are to be imbedded through the three lines of defense, front end, compliance and internal audit. The model should take into consideration all other factors that will affect the business exposures to ML risks, like known ML trends in business location and CM's location.

“An AML model must be designed based on the documented objectives of the model and various functional and technical requirements. Any limitations of the model must be documented and considered as the model is developed.”<sup>3</sup> Model limitations will be an important consideration when model risk is assessed. “Examples of model limitations are a lack of key data elements needed to

---

<sup>3</sup> Brookton N. Behm, John A. Epperson and Arjun Kalra, “Effective AML Model Risk Management for Financial Institutions: The Six Critical Components,” October 2014, [http://www.crowehorwath.com/folio-pdf/EffectiveAMLModelRiskMgmtforFIWP\\_RISK15931.pdf](http://www.crowehorwath.com/folio-pdf/EffectiveAMLModelRiskMgmtforFIWP_RISK15931.pdf)

identify AML risk, limited functionality of a system to produce model results, or an absence of reporting metrics needed to analyze the effectiveness of a model.”<sup>4</sup>

Table 1

Type of risks	Example of high risks in each type
Customer	Sanction risk (customer on sanction list), politically exposed persons, correspondent banks, identification of the ultimate beneficial owners and bearer shares
Products/Services	Improper design of products and services that leave it vulnerable for misuse by criminals for ML activities, private banking, wire transfer, high-risk products
Geography	Sanctioned countries, countries known for high rate of corruption and ML, neighboring countries to sanctioned countries
Regulatory	Sanctions risk, legal, fine, penalty, enforcement, loss of license and imprisonment for individuals involved in the ML offence

### ***Top AML Models Deficiencies Spotted by Examiners***

AML risk continues to increase. Technological developments in enhanced delivery channels for bank products are creating new risks to ML and TF activities. Over the past five years, the number of OCC formal enforcement actions related to AML has remained relatively consistent (see Table 2).

Table 2: Trends in OCC BSA/AML-Related Enforcement Actions<sup>5</sup>

Fiscal year	2010	2011	2012	2013	2014	2015	Total
Formal enforcement actions	14	10	15	16	16	6	77

Note: Data for 2015 include enforcement actions issued through Feb 27. All other data as of year-end.

<sup>4</sup> Brookton N. Behm, John A. Epperson and Arjun Kalra, “Effective AML Model Risk Management for Financial Institutions: The Six Critical Components,” October 2014, [http://www.crowehorwath.com/folio-pdf/EffectiveAMLModelRiskMgmtforFIWP\\_RISK15931.pdf](http://www.crowehorwath.com/folio-pdf/EffectiveAMLModelRiskMgmtforFIWP_RISK15931.pdf)

<sup>5</sup> Source: FinCEN Consolidated Quarterly Reports

The top common criticisms by regulators were related to:<sup>6</sup>

- “A conceptual framework that is inconsistent with regulatory expectations;
- Applying a logic or methodology not commensurate with the unique AML risks of an organization;
- Failing to identify elevated risks associated with certain customers or transactions;
- Reliance on unidentified models for aspects of AML compliance;
- The absence of risk-based model controls is consistent with the level of dependence, business assumptions and regulatory impact of each system;
- Unclear lines of authority and accountability;
- A lack of appropriate resources and expertise to effectively manage model risk management activities;
- Fundamental logic errors, which produce inaccurate output;
- An inconsistent approach and a lack of detailed documentation and quantitative analysis to support model risk management activities; and
- Failure to identify changes in an organization’s activities that have an impact on AML models.”

The above mentioned criticisms are mainly related to deficiencies in AML models. The issues above and regulatory risks can be mitigated by having an effective and well-designed AML model. The best control to have in place is through testing and ongoing validation of AML model.

---

<sup>6</sup> Brookton N. Behm, John A. Epperson and Arjun Kalra, “Effective AML Model Risk Management for Financial Institutions: The Six Critical Components,” October 2014, [http://www.crowehorwath.com/folio-pdf/EffectiveAMLModelRiskMgmtforFIWP\\_RISK15931.pdf](http://www.crowehorwath.com/folio-pdf/EffectiveAMLModelRiskMgmtforFIWP_RISK15931.pdf)



## Chapter 2: AML Models Validation

When starting with AML models validation, make sure to build a case for senior management that maintaining the model requires time and effort. The validation process should begin early, i.e., during design and development planning and system implementation. A critical point to consider, and should be documented as well (in the validation plan/procedures), is the frequency of model validation. Most firms are undertaking this validation on an annual basis; however, the same is not sufficient anymore. The frequency and triggers for validation timings came up many times in many different audits. Changes in products/services offered, regulatory environment, business expansion, emergence of news risks in the market and many other factors could be affecting AML risk factors. “Ongoing validation activities help to ensure that changes in markets, products, exposures, activities, clients, or business practices do not create new model limitations.”<sup>7</sup> A firm can have a fixed cycle for a validation process (e.g., a semi-annual or annual basis), however, the same must be flexible and must take into consideration any need for revalidation due to changes to the model, data, or the theory of model logic.

All model components and phases, including input, processing and reporting, should be subject to validation—this applies equally to models developed in-house and to those purchased from outsourced vendors. Refer to Appendix A for a summary chart.

### *I. Components of Validation*

- **Conceptual Design** – Evaluate the logic and design of the model. This is a critical validation point. The model was designed in a way to achieve a certain objective, (i.e., mitigate certain AML risk(s)), now the question is: Is the model designed in a way to do exactly that? Is there anything missing? Are all risks that our firm is exposed to taken into consideration? All products and services? Client types? Market risks? Is the system flexible in a way that can accommodate changes due to new products/services/client’s types and any other factors? The list of red flags

---

<sup>7</sup> “Supervisory Guidance on Model Risk Management,” OCC, April 4, 2011, <http://www.federalreserve.gov/bankinforeg/srletters/sr1107a1.pdf>

and risks that our firm is exposed to can be a starting point for this part of validation process. You can start from scratch and build on it. How is your model addressing these risks? What was the logic used? Were the guidelines and recommendations from global agencies and standard setting bodies taken into consideration? Are there any gaps in the process, products or clients? How was the logic for the model documented? Was the documentation detailed in a way that can be updated or modified in the future, if needed? Do not forget that the same team who designed the model would not be doing the updating, if required, in the future. The documentation should be detailed and comprehensive for any third party to understand the logic of the model.

- **System Validation** – Validate the system to ensure that it is properly designed to perform. The technical part should be validated as well. After ensuring that the conceptual design is adequate in mitigating AML risks, the system itself should be tested to ensure that it reflect the same (technically). It is not uncommon for a design that was theoretically good on paper to fail to produce the same results as it was designed to. For example, testing the output and effectiveness of the generated alerts to drive further tuning of the thresholds and scenarios.
- **Data Validation** – Validate that accurate and complete information is captured by a system to execute an AML model. A system can be designed and implemented so professionally to achieve its objective, however, it can end up failing badly due to the data integrity issue. A model, in its core functionality, is processing input data to produce quantitative estimates. So, if the input data is not reliable, the output would not be in a position to give any value nor would be accurate. This part will require identifying source systems and transaction codes, ensuring accurate data feeds and selecting scenarios aligned with the firm’s risks.
- **Process Validation** – Ensures the adequate design and ongoing sustainability of the processes and administration of the AML system and model. Review the process documented for the AML model and ensure that no gaps are identified. “[Process validation] includes an evaluation of controls, the reconciliation of source data systems with model inputs, and the usefulness and

accuracy of model outputs and reporting.”<sup>8</sup> For example, for the case of validating AML transaction monitoring, what is the process for any unusual or suspicious event that has been identified and what are the procedures documented? Are the same aligned with regulatory requirements? What are the alert and time frames for review? Is the escalation process adequate and well defined? Are the reporting requirements for suspicious activity reports clearly documented?

## ***II. AML Systems Validation:***

Most “banks are using AML models for customer risk scoring and [CDD] risk. Most banks [are also] relying on automated transaction monitoring systems, [CM risk rating and due diligence,] and watch-list filtering systems—all of which are considered models under the guidance.”<sup>9</sup> “AML system breaks are considered a leading reason for fines, penalties, enforcement actions and mandated look-backs.”<sup>10</sup>

### **Transaction Monitoring:**

This is a vital control mechanism that an entity could ever have. The setup of scenarios/parameters/threshold limits should be in line with the overall risk profile of the firm, taking into consideration the various products, services, client types and geographies covered. The objective is to focus AML resource on the true/positive alerts rather than waste time to find the true hits. Failure in this leads to the greater risk of not generating the accurate alerts to timely review it in order to fulfill regulatory reporting requirements.

---

<sup>8</sup> Robert Burns, “Model Validation,” December 5, 2005, [https://www.fdic.gov/regulations/examinations/supervisory/insights/siwin05/article01\\_model\\_governance.html](https://www.fdic.gov/regulations/examinations/supervisory/insights/siwin05/article01_model_governance.html)

<sup>9</sup> Brookton N. Behm, John A. Epperson and Arjun Kalra, “Effective AML Model Risk Management for Financial Institutions: The Six Critical Components,” October 2014, [http://www.crowehorwath.com/folio-pdf/EffectiveAMLMoelRiskMgmtforFIWP\\_RISK15931.pdf](http://www.crowehorwath.com/folio-pdf/EffectiveAMLMoelRiskMgmtforFIWP_RISK15931.pdf)

<sup>10</sup> “Navigating Intensified Examiner Expectations of AML Risk Management,” January 18, 2013, <http://www.fiba.net/files/644.pdf>

**Customer Risk Rating:**

This is a critical system in order to evaluate the risk exposure by the client. A failure or inaccuracy in this will lead to handling customer's risk inappropriately, which might lead to ineffective monitoring and detection of suspicious activity. The criteria for each risk factor should be evaluated and flexible to any future addition or modification required.

**Screening System:**

This is crucial to comply with embargoes and sanctions requirements. A failure, delay, or any inaccuracy of such process will leave the firm exposed to the risk of regulatory enforcement. The input, timing, accuracy of output, escalation process and responsibilities allocation across the lines of business should be validated to ensure compliance with regulatory requirements.

**Risk Assessment Systems:**

This system can render the firm helpless and destroy it if not designed and implemented effectively. Risk assessment is the foundation of any AML compliance system. Critical business decisions will be determined based on the output of this system. A proper documented validation will ensure that the relevant risks are managed and mitigated with proper controls embedded into the risk assessment system.

A failure in any of the above control systems means failure to the whole AML program. An effective AML system must satisfy regulatory requirements, span the entire enterprise, rapidly detect all suspicious behavior, reflect industry best practices, be easy to use and change, and provide long-term effectiveness.

### **III. General Recommendations on Model's Validation**

“Validation should not be thought of as a purely mathematical exercise performed by quantitative specialists. It encompasses any activity that assesses how effectively a model is operating. Validation procedures focus not only on confirming the appropriateness of model theory, but also test the integrity of model inputs, outputs, and reporting.”<sup>11</sup>

- Involving bank senior managements in AML compliance program (by regular meetings and calls to track remediation efforts to strengthen the bank's BSA/AML compliance program).
- Effective validation of AML models including the adequacy of internal controls designed to ensure compliance with the BSA and its implementing regulations
- Risk-based approach to be a utilized in designing and implementing AML models in order to focus resources and efforts adequately commensurate to the level of risk posed.
- Sufficient experienced and independent personnel to conduct the validation timely and efficiently.
- Identify frequent/common deficiencies to accelerate your validation projects. Make use of regulator findings/comments on banks with reference to models validation. This will help in predicting the examiners expectation with regard to the same and the new trends/expectation.
- Validation procedure: Have a plan documented for the validation process by defining what is to be accomplished through the model validation effort. “Validation plans specify areas such as scope, approach, resources, schedules and the types and extent of activities, tasks and work items.”<sup>12</sup> “These procedures establish how to conduct the model validation effort. The

---

<sup>11</sup> Robert Burns, “Model Validation,” December 5, 2005,  
[https://www.fdic.gov/regulations/examinations/supervisory/insights/siwin05/article01\\_model\\_governance.html](https://www.fdic.gov/regulations/examinations/supervisory/insights/siwin05/article01_model_governance.html)

<sup>12</sup> John E. Lincoln, “Device Software Validation Considerations,” 2012,  
[http://www.ivtnetwork.com/sites/default/files/IVTJVT0512\\_026-032\\_DeviceR2-%7B1244270%7D.pdf](http://www.ivtnetwork.com/sites/default/files/IVTJVT0512_026-032_DeviceR2-%7B1244270%7D.pdf)

procedures should identify the specific actions or sequence of actions that must be taken to complete individual validation activities, tasks and work items.”<sup>13</sup>

- Validation is an independent task. The team who is responsible or undertaking the validation process should not have been involved in designing or implementing the model itself. This is necessary in order to have a clear thought process and can challenge the designers and implementers of the systems. If they were the same team, it would be hard for the same team to highlight any shortcomings in the model itself.
- “Validation documentation should be sufficient to demonstrate that all model validation plans and procedures have been completed successfully.”<sup>14</sup>

## Conclusion

AML models validation is viewed with high scrutiny given recent big AML model failures. Bank’s board and senior management are giving the due attention, assigning responsibilities and allocating more resources to model’s validation. The cost for AML compliance programs and systems are steadily increasing as regulators are not satisfied and they enforce penalties on the banks.

The core of regulators’ concerns regarding the banks’ efforts in managing their AML risks is that these efforts were not commensurate with the overall risk to the banks (across different lines of business, products, services, clients, etc.). Or to be more precise, the banks did not validate their systems with the risk assessment or risk-based approach concept in mind. The systems, controls and models that were in use were outdated or did not capture the full risk posed by added features to the products or new emerging risks in the market. The model’s limitation and inability to take more enhancements was a challenge for most banks.

Thus, banks are left with two options: either compete and move on or get lashed by the regulators (and, if lucky, survive afterwards). Being in the news headlines will add business difficulties as well as reputational ones. So, the advice is to apply ongoing validation of all business models including AML/CTF models. Validation starts at an early stage and continues throughout the life cycle of the model. Validate starting from the identification of

---

<sup>13</sup> Ibid.

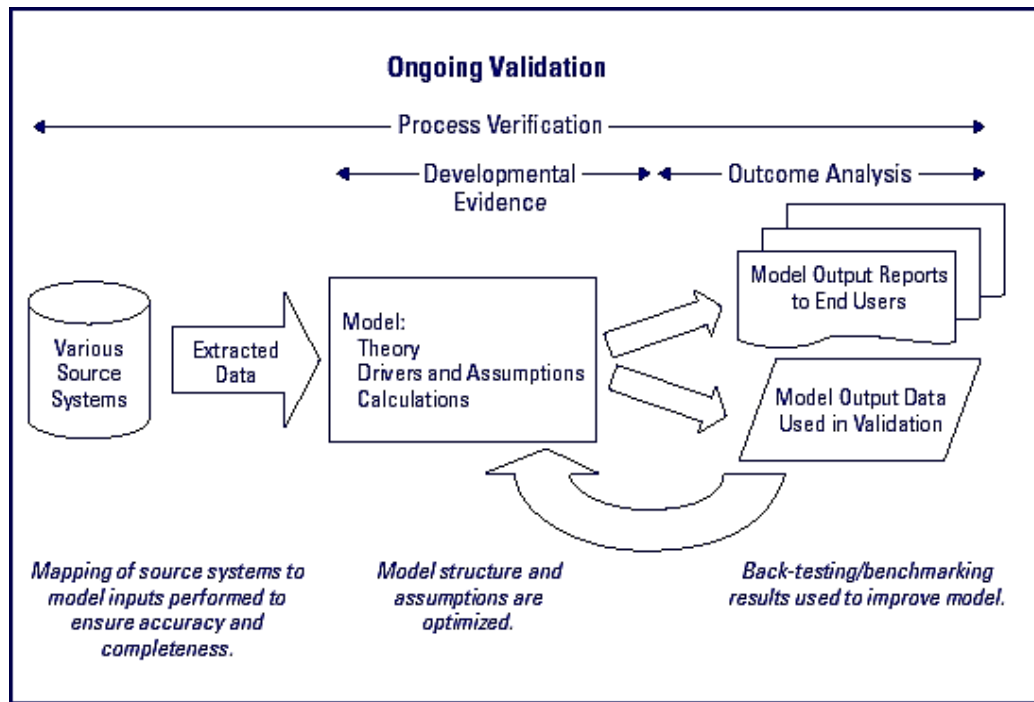
<sup>14</sup> Ibid.

the risks to the output results and action workflow after that. Ensure that the work in validation is supported by records and documents. Make it detailed in a way that any third party/examiner would be able to understand the workflow. Do not leave any questions or loop-holes unanswered or unaddressed. Make a validation plan and assign responsibilities and accountability across different parties involved. Ensure that questions like changes in product features, new market trends, new payment channels, and new AML risks identified have a place to be addressed in your model's validation. Always think like an auditor and try to think what will attract the examiner's interest and curiosity. Employ a risk assessment to assess your models and the risk taken with regards to the dependency on your model's output for a business decision. Risk-based approach in model validation can be useful and effective as well.

An effective validation would be to ensure that the outputs are accurate, consistent and reliable. Not only at the current time, but for the future. We need to ensure that we are ready to meet not just today's challenges, but the evolving risks that will confront us tomorrow. The challenge is to continue to build on the improvements we have made, so that the system continues to adapt to meet the challenge of evolving risks.

## Appendix A

### Validation Life Cycle



Source: Model's Validation (Banks Examination- Supervisory Insight 2005)

[https://www.fdic.gov/regulations/examinations/supervisory/insights/siwin05/article01\\_model\\_governance.html](https://www.fdic.gov/regulations/examinations/supervisory/insights/siwin05/article01_model_governance.html)



## Glossary

**AML:** A set of procedures, laws or regulations designed to stop the practice of generating income through illegal actions.

**BSA:** 'Bank Secrecy Act'- USA Government legislation that was created in 1970 to prevent financial institutions from being used as tools by criminals to hide or launder their ill-gotten gains.

**CM: CUSTOMER:** An individual or business that purchases the goods or services produced by a business. The customer is the end goal of businesses, since it is the customer who pays for supply and creates demand.

**Consumer's risk or Consumer risk** is a potential risk found in all consumer-oriented products, that a product not meeting quality standards will pass undetected though the manufacturer's quality control system and enter the consumer marketplace.

**Customer's risk rating:** The process of assigning a risk rate to the client based on Client acceptance criteria, CM's profile and KYC-CIPP, Country risk rating, Public Figure identification.

**FIs:** Financial Institutions

**Geography risk:** is the risk associated with the location/country of business operation or customers or services/products provided.

**ML/TF:** Money Laundering/Terrorism Finance.

**OCC:** 'Office Of The Comptroller Of The Currency - OCC'. A U.S. federal agency that serves to charter, regulate and supervise the national banks and the federal branches and agencies of foreign banks.

**Products Risk:** Product risk is the risk associated with the software or system, the possibility that software or system may fail to satisfy end user/customers' expectations

**Regulatory Risk:** the risk of having the 'license to operate' withdrawn by a regulator, or having conditions applied (retrospectively or prospectively) that adversely impact the economic value of an enterprise.

**Risk assessment system:** This system is used for identifying and evaluating events (i.e., possible risks and opportunities) that could affect the achievement of objectives, positively or negatively. The risk assessment of products, services, clients, employees, vendors..etc, assigning red flags and benchmarks for the firms.

**Screening System:** Real-Time payment screening is the screening or filtering of relevant payment instructions prior to execution. Screening activity will also include screening of client details both at onboarding and ongoing update of CM's profile.

**Transaction Monitoring :** The automated or manual process of monitoring transactions after execution in order to identify unusual transactions, including monitoring single transactions as well as transaction flows, for subsequent review and, if warranted, reporting to the relevant authorities.

**Validation** is a process of establishing documentary evidence demonstrating that a procedure, process, or activity carried out maintains the desired level of compliance at all stages.

## Bibliography

CURRENCY, C. O. T., 2012. *CONSENT ORDER In the Matter of: Citibank, N.A.*, Sioux Falls, South Dakota: UNITED STATES OF AMERICA, DEPARTMENT OF THE TREASURY.

Customs, H. R. &., 2014. *Government UK*. [Online]  
Available at: <https://www.gov.uk/money-laundering-regulations-risk-assessments>  
[Accessed 10 08 2015].

Disclosed, N., 2015. *Banker Online*. [Online]  
Available at: <http://www.bankersonline.com/security/bsapenaltylist.html>  
[Accessed 10 08 2015].

E&Y, 2013. *Ernst and Young*. [Online]  
Available at: [http://www.ey.com/Publication/vwLUAssets/EY -  
\\_AML\\_model\\_risk\\_management\\_and\\_validation/\\$FILE/EY-AML model risk management and validation.pdf](http://www.ey.com/Publication/vwLUAssets/EY_-_AML_model_risk_management_and_validation/$FILE/EY-AML_model_risk_management_and_validation.pdf)  
[Accessed 25 08 2015].

Event, N. C. A. C. L., 2013. *ACAMS*. [Online]  
Available at: <http://www.acams.org/wp-content/uploads/2014/10/NorCal-ACAMS-Model-Risk-Management.pdf>  
[Accessed 27 07 2015].

Force-FATF, F. A. T., June 2012. *Specific Risk Factors in Laundering the Proceeds of Corruption*, NA: FATF.

Insights, S., 2005. *FDIC-Federal Deposit Insurance Corporation*. [Online]  
Available at:  
[https://www.fdic.gov/regulations/examinations/supervisory/insights/siwin05/article01\\_model\\_governance.htm](https://www.fdic.gov/regulations/examinations/supervisory/insights/siwin05/article01_model_governance.htm)  
[Accessed 30 07 2015].

John A. Epperson, A. K. a. B. N. B., 2012. *Effective AML Model Risk Management for Financial Institutions: The Six Critical Components*, Unknown: Crowe Horwath.

Monroe, B., 2014. *ACFCS*. [Online]  
Available at: <http://www.acfcs.org/demand-for-aml-model-risk-validation-specialists-surgin-in-already-hot-compliance-job-market/>  
[Accessed 20 08 2015].

System, B. o. G. o. t. F. R., 2011. *SUPERVISORY GUIDANCE ON MODEL RISK MANAGEMENT*, United States of America: Office of the Comptroller of the Currency.