MOTIVE PARTNERS

Trade Surveillance Utility

WHITE PAPER

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MOTIVE LABS

Trade surveillance utility

RECENT STUDIES SUGGEST THAT DESPITE REGULATORY PUSH FOR MORE OVERSIGHT, NON-COMPLIANT TRADING BEHAVIOR IS MORE PREVALENT THAN PREVIOUSLY THOUGHT*. CURRENT BANK TRADE SURVEILLANCE EFFORTS HAVESTRUGGLED TO DELIVER RELIABLE DETECTION DESPITE SIGNIFICANT OPERATING COSTS, AND COMPLIANCE PROFESSIONALS ARE OVERWHELMED BY FALSE POSITIVES AND DISPARATE TOOLSETS.

THIS PAPER SETS OUT AN INNOVATIVE APPROACH, APPLYING THE LATEST TECHNOLOGIES TO TRADE SURVEILLANCE TO DRAMATICALLY IMPROVE QUALITY.

FURTHER, INDIVIDUAL FINANCIAL INSTITUTIONS SHARE IN THE INDUSTRY'S OVERALL REPUTATION, IT IS IN THEIR COMMON INTEREST TO REDUCE AND ELIMINATE NON-COMPLIANT BEHAVIOR. EACH HEADLINE DESCRIBING A SCANDAL REFLECTS NEGATIVELY ON ALL BANKS, NOT ONLY THE BANK DIRECTLY INVOLVED. THEREFORE, THE PAPER RECOMMENDS BANKS ADOPT A SHARED APPROACH, INVESTING IN A COOPERATIVE UTILITY TO IMPLEMENT A CROSS-INDUSTRY SOLUTION, SHARING INSIGHTS AND BEST PRACTICES AS WELL AS THE COSTS AND RISKS, TO ACHIEVE THE GOAL OF MORE COMPREHENSIVE TRADE SURVEILLANCE.

* IRRC Press Release (June 12, 2014): Two Groundbreaking Academic Mergers & Acquisitions Studies Win IRRC Institute Investor Research Award at Millstein Governance Forum https://irrcinstitute.org/wp-content/uploads/2015/09/Informed-Options-Trading_June-12-20141.pdf

Substantial additional investment is required

Bank management is expected to increase allocation of scarce resources to trade surveillance in 2018 and the foreseeable future. Increased expenditure is necessary to address demands by regulators (See MAR in Europe and FINRA 2017 Regulatory and Examination Priorities.) as well as address the current challenges. Expenditures have increased on average 12 percent since 2010 and are expected to continue at that pace (see figure 1).

Why is so much investment required?

Banks have taken an operations approach to a problem requiring forensics. Re-using technology and processes from other surveillance solutions, structured data is ingested, filtered and alerts are generated. This approach results in a high volume of false positives (industry avg. ~95%) requiring significant manual effort to investigate. Additionally, banks are solving what appears to be an industry-wide problem in isolation, each implementing a combination of off-the-shelf and custom-built solutions. The results: Compliance teams are drowning in poor reporting and false positives while non-compliant behavior continues to make headlines. Expandedinvestment spend has not yet delivered a better outcome nor improved productivity.

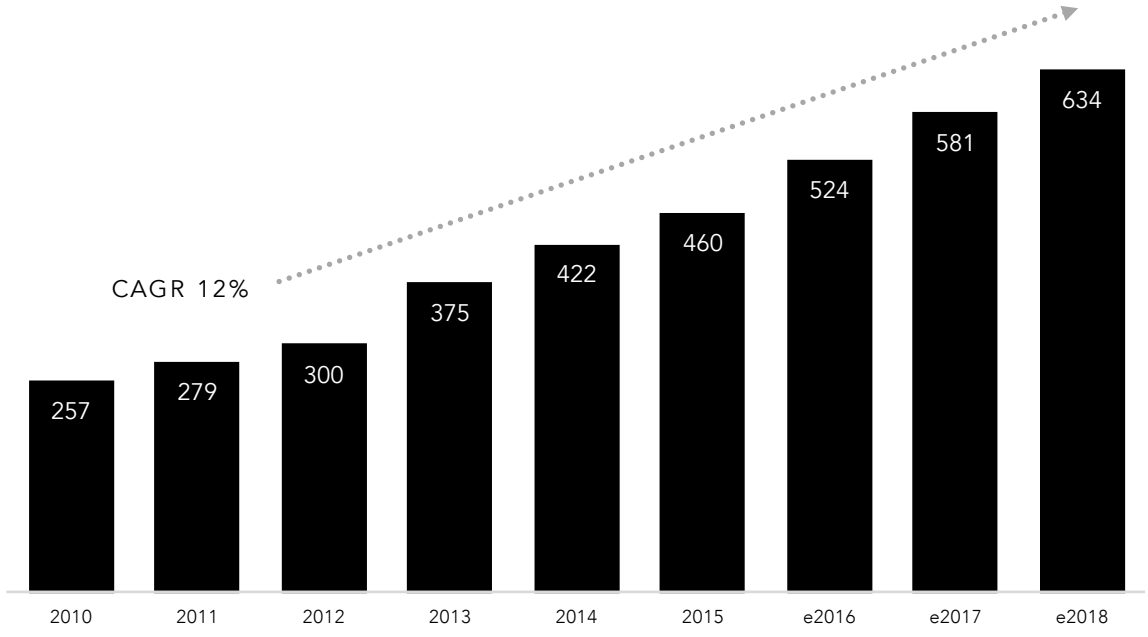


Figure 1. Projected vendor IT spending on market surveillance and trade compliance, 2010 to e2018 (in US$ millions)
Source: Aite Group

Today's platforms must ingest vast amounts of both structured and unstructured data to properly surveil traders and trading activity. Many organizations struggle to ingest this data into a single platform. Even once ingested, these platforms must normalize and link the data. These steps require application of cutting edge technologies including natural language processing, machine learning and graph databases. Even if investment budget was available, finding sufficient personnel with the proper skill sets is challenging.

What's the best solution?

The best solution would:

1. Share the cost of infrastructure as well as the cost of compliance;
2. Apply best of breed and the latest technologies to surveillance, and continue to Invest as new technologies become available;
3. Attract and retain the most talented people; and
4. Support an industry-wide surveillance solution for an industry-wide surveillance problem, while allowing for both customization and privacy for each participant.

Shared cost: Trade surveillance is not a competitive function. By establishing a cooperative utility, participants would share the cost of investment, maintenance and operations. Each bank would reduce their individual costs. Further, this would properly align economic and industry interests since many non-compliance events result in reputation risk shared by all. The industry participants need to address the challenge together. While individual banks would still be responsible for their regulatory relationships and compliance programs, this entity will work closely with participants and regulators to streamline that compliance. In addition to sharing costs, the participants can share their experiences and learning. Utility participants not only reduce their overall costs but reduce their risks.

Best of breed: The best solution would adopt an architecture that supports application of the latest technologies and allow continued investment. It would switch its focus from an operational approach to forensics. The platform would support testing of specific compliance rules to determine whether a policy or rule has been violated. The platform would also apply machine learning to analytic scans searching for suspicious behavior patterns. Finally, the platform would enable the benchmarking of actual activity versus expected activity enabling the identification of outliers. This three-prong approach would reduce the number of false positives, significantly improving the quality of the results.

Shared knowledge: Modern non-compliant trading schemes are often complex, and frequently traverse multiple parts of financial organizations. A cooperative utility's ability to analyze trading patterns across silos in an organization, and in some cases across organizations would improve detection rates, where a siloed view of one organization would not have a chance. Additionally, any insights of a single organization become available for all participants instantly, subject to well defined governance and privacy rules In the cooperative entity, while currently this type of information is generally not shared.

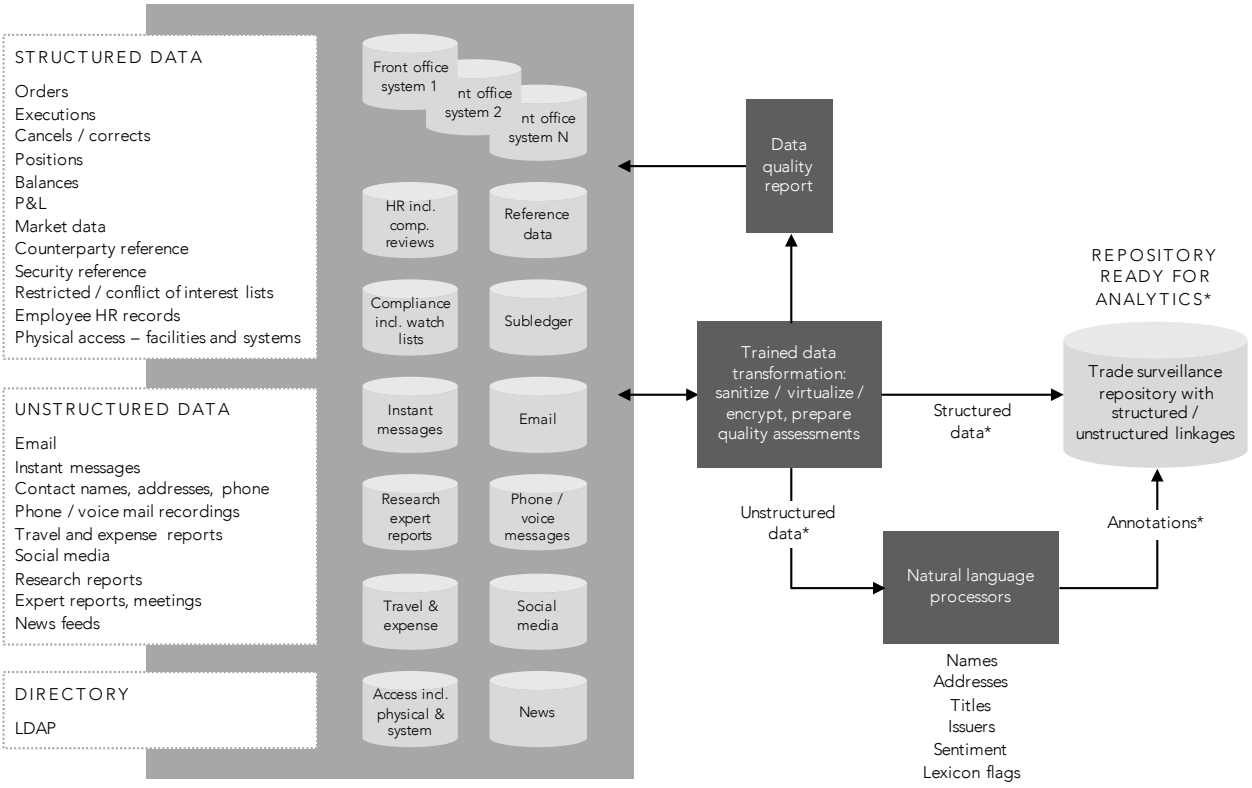
Talent: Compliance, forensics and key technology skills are already actively bid for in the market. An industry utility applying cutting edge technology in a multi-bank environment would serve as a magnet for the best and brightest. Skills devoted to machine learning, artificial intelligence and graph data bases would all be required.

Customization and privacy: cooperative Industry entites are frequently a correct-seeming answer to a problem but infrequently applied. Two root causes are: 1. Potential participants refuse to conform to the mandated requirements of the utility; or 2. Potential participants fear losing their data privacy. Advances in technology processing power as well as encryption allow a new utility to address both issues. The cooperative utility architecture recommended here levers innovations to protect each participant's privacy. No one has access to a participant's data other than the participant, not even the utility! The design also provides flexibility by giving each participant access to common rules as well as the option to implement user-defined rules and parameters. These technological constraints must be enforced not only In the software but also In the governance structures of the cooperative entity.

The best solution can be viewed in two parts:

1. Data ingestion including quality assessment, natural language processing and linking of disparate data structures; and
2. Trade surveillance applied using three classes of analytics.

DATA INGESTION INCLUDING QUALITY ASSESSMENT, NATURAL LANGUAGE PROCESSING AND LINKING OF DISPARATE DATA STRUCTURES

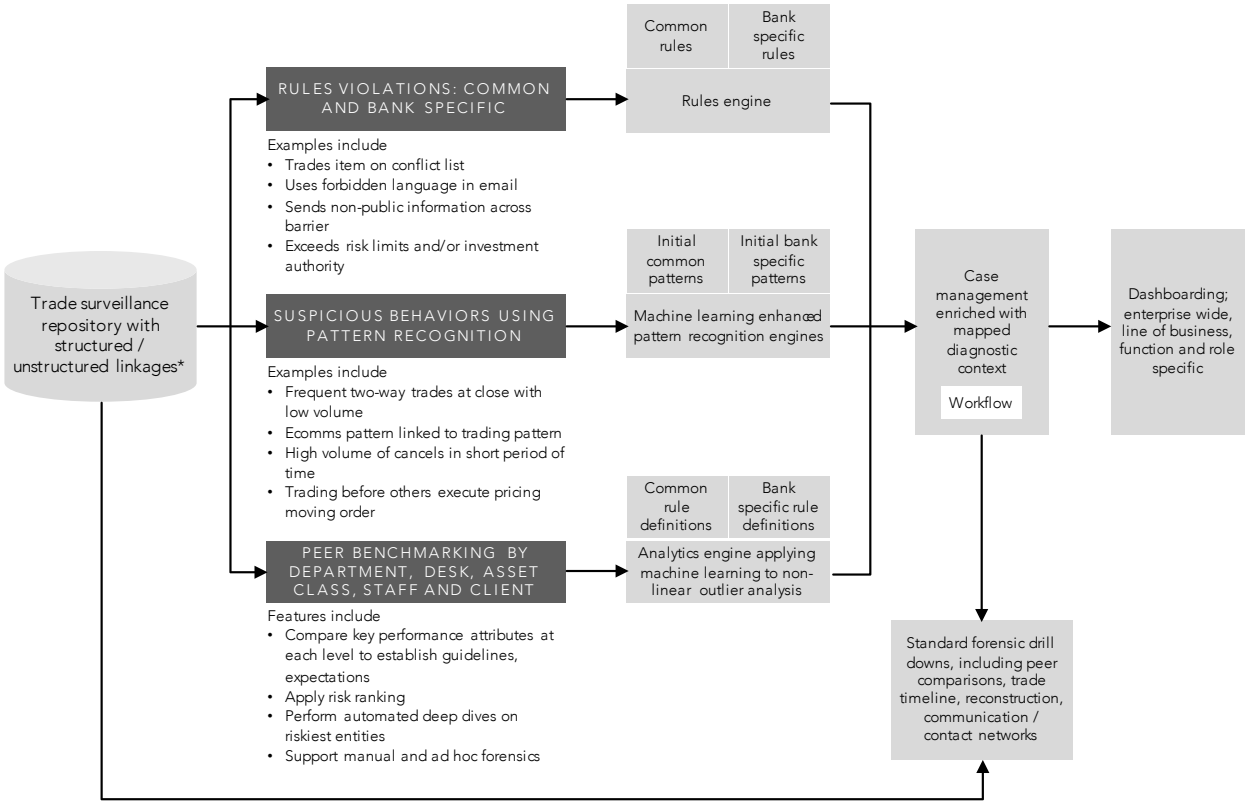


* While in transit and at rest, all bank data will be subject to hierarchical key management and immutable audit trail.

Surveillance is challenging for a variety of reasons. One of the most significant challenges is being able to aggregate data across many data sources and synchronize. Our recommended solution executes three major steps during data ingestion:

1. **Trained Data Transformation:** Data from a wide variety of sources, structured and unstructured must be ingested, categorized and prepared for surveillance analysis. Many current solutions skip data quality assessment at this juncture. Our approach **sanitizes, virtualizes and encrypts the data while preparing quality assessments.** Encryption would rely on hierarchical key management and an immutable audit trail. Quality assessment feedback is an essential step in improving the quality of the surveillance as well as assisting the bank improve the quality of data from its upstream systems.
2. **Natural Language Tagging**: Various NLP engines are applied to unstructured data at this juncture enabling the tagging of key attributes such as issuers, people, sentiment as well as flagging of lexicon violations.
3. **Linkage**: Surveillance repository must be updated with disparate data sets linked. Key assumption is that relational data base structures alone cannot support all the connections necessary among the data sets. We recommend a hybrid approach levering cutting edge data structures that can be used to draw insights from the data.

TRADE SURVEILLANCE APPLIED USING THREE CLASSES OF ANALYTICS



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Our recommended approach applies three classes of surveillance to the prepared data set: Rules Violations, Suspicious Behaviors and Peer Benchmarking. Rules violations and suspicious behavior monitoring have been part of industry solutions over the last decade, but they have been grouped together within each system's models, scenarios or sentinels. We recommend treating them separately given the differences in response and management.

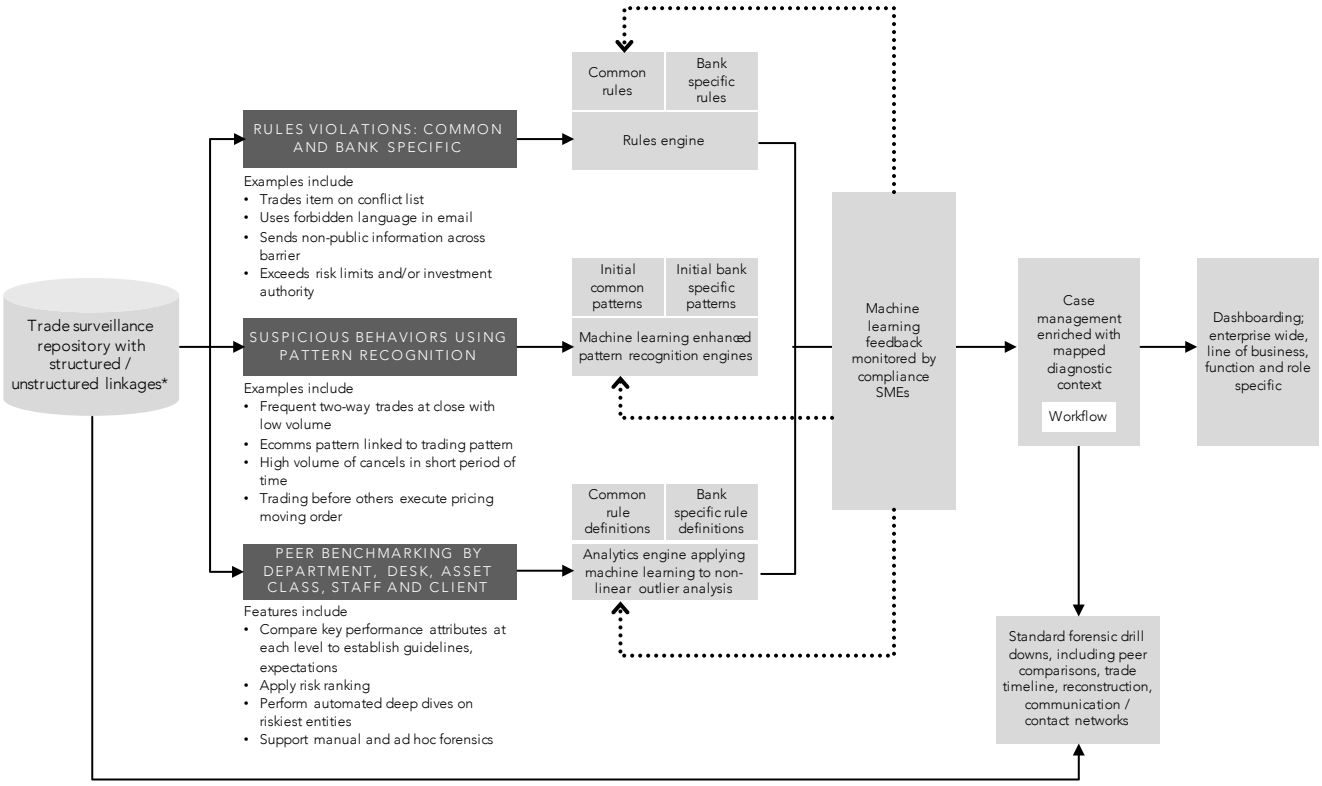
Peer benchmarking is new to the surveillance landscape. It addresses the weaknesses present in the bottom-up approach of suspicious behavior monitoring. Suspicious behavior monitoring has traditionally suffered from the "rear-view mirror" problem. Models used to detect wrongdoing are based on known patterns of wrongful behavior. New wrongful techniques or patterns are not programmed until discovered, which is too late. Peer benchmarking compares key behavior attributes to both expected behavior as well as peer behavior. Outliers require further investigation. Having applied these techniques in the field already, we can report they are very effective. We also believe that we can peer benchmark at an aggregation level which protects individual data privacy guarantees of a particpant while still allowing useful refinement of surveillance models.

Two additional elements of the new architecture require highlighting. While rules violations do not require machine learning or artificial intelligence, these analytic techniques are required for both suspicious behavior monitoring and peer benchmarking. Such techniques help reduce the rear-view mirror weakness as well as recognize that patterns change over time, relying on human analysts in this space will both slow the process as well as ultimately cost more than necessary.

The final item worth noting is the standard forensic drill down capability that augments standard dashboards and reports. Powerful tools that support analyst exploration of the data and the relationships within the data will speed the review and resolution of the suspicious behavior and peer benchmarking alerts. Forensic drill down capability includes trade timeline reconstruction which is a graphical display of the activities traders executed before, during and after a trade. The graphical display provides a time ordered view of activities taken along with links to in scope documents, emails, IMs, news, market data, trades, phone calls, contacts and phone messages. This allows a compliance analyst to quickly understand the context that trade occurred within.

This UX Investment Is one most organizations skip when working In silos, but Is critically Important for the success of a product. We believe a cooperative utility would have the resources and the motivation to excel In this area.

Machine learning used to continuously improve results



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In addition to new and improved classes of analytics,our recommended approach to trade surveillance includes machine learning techniques which can learn patterns and evaluate non-compliant activity orders of magnitude more quickly than humans. The progress and results would be monitored and further guided by experienced compliance subject matter experts.

Why is this different?

Today's trade surveillance platforms face several challenges:

1. Banks approach trade surveillance individually as a bank, and sometimes individually as a department in a bank, rather than as an industry;
2. Banks take an operations approach to the analysis, that is examining trades rather than examining traders;
3. Since data is sourced from silos, it is examined in silos rather than holistically;
4. The latest advances in technology including machine learning, natural language processing and graph analytics, have not been broadly applied to trade surveillance.

This papers recommended approach addresses each of these challenges. By forming a cooperative entity, the industry can significantly improve the quality of trade surveillance while reducing individual bank costs and risks, dramatically improve the quality of trade surveillance. With proper governance and communications with regulators, participant banks can achieve the rare "triple play:"

1. Significantly improve the quality;
2. At a reduced total cost of ownership; with
3. Less risk.

Conclusion

Much needs to be done to improve trade surveillance platforms. Given this is an industry challenge, banks should band together to share the learnings as well as the cost of the effort. Recent improvements in several technology areas need to be applied to address shortcomings of the current state as well as facilitate a cooperative approach. Trained data transformation, encryption using hierarchical key management, graphical data repositories and analytics enhanced with machine learning can be applied to

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