Analytics in Banking

Conquering the Challenges Posed By Data Integration, Technology Infrastructure, and Right Talent to Operationalize Analytics in Banking

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Executive Summary

Analytics is helping the banking industry become smarter in managing the myriad challenges it faces. While basic reporting and descriptive analytics continues to be a must-have for banks, advanced predictive and prescriptive analytics are now starting to generate powerful insights, resulting in significant business impact.

Advanced analytics-backed solutions are enabling banks to not only manage the increasing cost of compliance, but also the risk (both monetary and reputational) of non-compliance. Product and portfolio optimization modeling is helping banks achieve profitable growth in an environment with significant volatility across asset classes and rising losses in traditional banking products. Sophisticated risk modeling presents a powerful way to understand short- and long-term profitability and capital adequacy or, in other words, chances of bank’s survival in future. Fraud and AML/KYC analytics are helping banks stay ahead of fraudsters, drug cartels, terrorists, organized mafia, and others in preventing money laundering and associated potential losses. Consumer behavior and marketing analytics are driving sustainable competitive advantage in an era with eroding product differentiation, waning customer loyalty, and exploding volume, velocity, and variety of data.

As a result, adoption of third-party analytics business services in banking is growing rapidly and is expected to quadruple by 2020.

However, the overall penetration of analytics services in banking is still in the nascent stage and penetration levels are in low single digits. This implies significant untapped value creation potential. Multiple competing priorities, functional silos, talent crunch, and inadequate data and systems infrastructure are key challenges in effectively operationalizing analytics in financial institutions.

This paper describes the “art of the possible” in analytics, and within the context of how it adds value to the banking industry. The paper focuses on:

- Banking industry challenges and opportunities where analytics can play a role
- Range of analytics leveraged in banking and examples of how analytics creates value for business
- Critical challenges and emerging best practices in operationalizing analytics in banking
Banking Industry Challenges Requiring Greater Insight

The economic crisis of 2008 changed the face of the banking industry. Regulatory oversight expanded dramatically, increasing the cost of compliance as well as the risk of non-compliance. Achieving profitable growth, while ensuring long-term solvency, became challenging with greater volatility across most asset classes and traditional products losing money. Managing enterprise risk, as well as the increasing incidence of fraud, became a strategic priority. Advancements in technology are significantly improving the speed-to-market, thereby eroding product differentiation and customer loyalty. Analytics is helping banks become smarter in managing these challenges (see Exhibit 1).

Drivers of analytics in banking

- Eroding product differentiation and customer loyalty
- Explosion in volume, velocity, and variety of data
- Faster response time to changing macroeconomic variables
- Evolving and more stringent regulatory environment
- Increasing cost of compliance
- Significant risk of non-compliance
- Greater volatility across asset classes
- Traditional retail banking products losing money
- Increasing incidence of fraud
- Integrated risk management at enterprise level
- Profitable growth and solvency

1. Rising cost of compliance and risk of non-compliance

The financial crisis of 2008 exposed the inter-linkages between credit risk, market risk, and liquidity. This unleashed a wave of newer and stricter regulations such as Basel II/III, Dodd-Frank Wall Street Reform, Consumer Protection Act, Credit Card Accountability, Responsibility, and Disclosure Act, and the Durbin Amendment. Central banks are acknowledging the fact that some financial institutions may be a “systemic risk” and are demanding greater say and transparency in adherence to risk norms. Several state and federal government consumer protection laws (such as servicer consent orders and servicer alignment initiatives, amongst others) have also been passed.

New regulatory demands for managing AML/KYC\(^1\) and fraud have also emerged including FATCA\(^2\), FCPA\(^3\), FINRA\(^4\) rules, BSA\(^5\)/AML amendments, MiFID\(^6\), global PEP\(^7\) lists, and several others. These regulations continue to be refined, changed, and made more stringent. Consequently, compliance budgets have increased significantly over the last few years. Yet, most banks feel their compliance

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1. AML – Anti-Money Laundering; KYC – Know Your Customer
2. FATCA – Foreign Account Tax Compliance
3. FCPA – Foreign Corrupt Practices Act
4. FINRA – Financial Industry Regulatory Authority
5. BSA – Bank Secrecy Act
7. PEP – Politically Exposed Person
departments are under-staffed and over-burdened, and the risk of non-compliance is greater than ever before. Penalties for non-compliance have risen in a tough and uncertain economic environment where funds are limited.

2. Profitable growth and long-term solvency challenges

Acquiring and retaining “profitable” customers is more challenging than ever in today’s hyper-competitive financial services market. Traditional banking products (such as checking accounts) are losing money as a result of changing customer preferences. Incidences of fraud and money laundering are also increasing. The mortgage meltdown over the past decade has also shown that most financial asset classes can be volatile; hence managing market volatility, credit risks, and liquidity risks becomes imperative for financial institutions.

Historically, all these risks were managed by individual Lines of Businesses (LoBs) somewhat separately. However, post the economic crisis of 2008, the need for integrated risk management at the enterprise level has increased significantly to understand short-term and long-term profitability and capital adequacy or chances of a bank’s future survival. By quickly determining exposure, portfolio value at risk, and liquidity coverage, a bank can determine products to take to market, or markets to exit, much faster. It can also fine-tune responses to changes in interest rates, exchange rates, and counterparty risk to ensure profitability and long-term solvency.

Effective risk management can also lead to significant business advantage. For instance, the outputs from credit risk models help banks in risk-based pricing, exposure and concentration limits setting, Risk Adjusted Return on Capital (RAROC), managing portfolio-return profile, setting loss reserves, and economic capital calculation. The stress testing requirements, mandated by the U.S. Federal Reserve led to design and implementation of such models, and now these models are being utilized as potential sources of input for designing features of new and existing products.

3. Creating a sustainable competitive advantage

Advancements in technology are significantly improving speed-to-market, thereby eroding product differentiation and customer loyalty. Customer demographics, buying behavior, and needs are also changing and evolving. Today, banks need a 360-degree view of each customer to target the right products, cross- and up-sell, and adapt to customers’ changing needs.

Banks generate huge volumes of internal data (customer accounts, credit scoring, payments, assets, etc.) and now need to understand its linkages to external data (interest rates, macroeconomic variables, and customer preferences). The velocity of this data creation is also increasing exponentially. This is compounded by the variety of non-traditional or digital touch-points that have emerged – ATMs, Internet, IVR systems, social media, and mobile, among others. The explosion in volume, velocity, and variety of data is also forcing banks to leverage advanced analytics to make sense of the huge and complex information sources, and make near real-time decisions to stay competitive.
The Role and Impact of Analytics in Banking

Analytics is helping banks become smarter in managing the myriad challenges they face. Consequently, adoption of third-party analytics business services is growing rapidly, and is expected to quadruple its current size by 2020 (see Exhibit 2). The overall penetration of analytics services in banking is still in a preliminary stage and penetration levels are in low single digits implying significant untapped value creation potential.

Analytical solutions have grown tremendously over the last decade, in terms of their sophistication and the resulting business impact they create. There is a range of analytics that banks are deploying today (see Exhibit 3). While basic reporting continues to be a must-have for banks, advanced predictive and prescriptive analytics are now starting to generate powerful insights.

1. Reporting. Basic version of analytics solution that focuses on building data repositories and reporting the current situation using simple and uni- or bi-variate data. Typical examples in banking include suspicious activity
reporting and account validation against watch lists

2. **Descriptive analytics.** Generating actionable insights on the current situation using complex and multi-variate data. Typical examples in banking include customer segmentation and profitability, campaign analytics, and parametric Value at Risk (VaR) calculations

3. **Predictive analytics.** Predicting the likely future outcome of events often leveraging structured and unstructured data from a variety of sources. Typical examples in banking include pattern recognition and machine learning to predict fraud, generating risk alerts at customer/product/geography level, designing personalized and next-best offers, and trigger-based cross-sell campaigns

4. **Prescriptive analytics.** Prescribing action items required to deal with predicted future events using big data from a variety of sources, often associated with simulations in various business scenarios. Typical examples in banking include behavioral PD\(^1\), LGD\(^2\), and EAD\(^3\) modeling, channel mix modeling, real-time offer models, next-best offer models, and stress testing for mandated and custom scenarios

Significant technological advancements over the last decade have made this possible. Traditional data storage and processing technologies could not handle unstructured data; handling of large data sets was time consuming and prohibitive; response time was too large; and the systems were not flexible and scalable. Several technological advancements have helped overcome these challenges:

- The NoSQL movement created alternatives to relational databases that were unable to handle unstructured data
- Hardening of Hadoop framework enabled parallel processing, thus enabling faster response time and ability to handle larger data volumes at a cheaper price
- Cloud-based utility computing provides virtual shared servers reducing upfront capital expenditure and increasing accessibility

There are three key areas in banking where analytics has created maximum impact: 1) Consumer and marketing analytics 2) Risk, fraud, and AML/KYC analytics, and 3) Product and portfolio optimization modeling. Typical analytics in each of these areas is summarized in Exhibit 4 on next page.

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1 PD – Probability of Default
2 LGD – Loss Given Default
3 EAD – Exposure At Default
### E X H I B I T 4

**Types of analytics in banking**

<table>
<thead>
<tr>
<th>Reporting and descriptive analytics</th>
<th>Predictive and prescriptive analytics</th>
<th>Banking segments with significant use of analytics</th>
</tr>
</thead>
</table>
| - Customer Lifetime Value (CLV)  
  - Customer profitability dashboards  
  - Drill-down reporting by customer  
  - Campaign analytics | - Value at Risk (VaR) calculation (historical / non-parametric)  
  - Suspicious activity reporting and customer risk scoring  
  - Account validation against watch-lists  
  - Risk alerts at customer/ geography/product level | - Detailed asset level reporting  
  - Portfolio dashboards  
  - Static analysis of portfolio to estimate capital requirements  
  - Collateral analysis  
  - Collections delinquency |
| - Customer segmentation  
  - Channel mix modeling  
  - Conversion and engagement by channel and segment  
  - Silent and proactive churn  
  - Next-best offer  
  - Trigger-based cross sell  
  - Bundled pricing  
  - Social media listening and measurement | - Value at Risk (VaR) calculation (variance-covariance and Monte Carlo simulation)  
  - Behavioral PD, LGD, and EAD modeling  
  - Stress testing against multiple macroeconomic scenarios  
  - Pattern recognition and machine learning to predict fraud  
  - Test and review current risk thresholds | - Simulations to predict default or repayment risk based on lagging and leading indicators  
  - Stress testing for mandated or customized scenarios  
  - Determining regulatory and economic capital based on credit portfolio model  
  - Central limits management |

### Examples of marketing analytics impact
- A 15% increase in assets by designing unique offers for customers
- Improve time-to-market by ~25%
- Cut marketing costs by 20%

### 1. Consumer behavior and marketing analytics

Advanced analytics now offers banks the power to study their customers and prospects like never before. Banks that leverage analytics to study customer behavior have been able to significantly improve marketing outcomes (greater topline impact, ability to leverage digital channels, and faster time-to-market) without a proportionate increase in marketing budgets. Key benefits reported include increased ability to identify profitable customers, expand wallet share with profitable customers, identify relevant cross- and up-sell opportunities, migrate customers from less profitable relationships to more profitable ones, acquire new profitable customers by targeted marketing campaigns, and launch new product offerings that are in line with customer expectations.

### 2. Risk, fraud, and AML/KYC analytics

Risk modeling and analytics allow financial institutions to analyze any/all portfolios (of assets as well as liabilities) to forecast likely losses, and make provisions for those adequately. Analytics also enables banks to understand risk dimensions faster, without expanding the pool of human resources. Advanced analytics solutions also help reduce the complex and expensive burden of compliance on AML and KYC departments.

Effective use of analytics to fight fraud helps improve profitability, reduce payouts and legal hassles, and most importantly, improve customer satisfaction. Analytics bolsters the ability of existing fraud experts to focus on real threats more efficiently and effectively (by expanding monitored transactions and reducing false alerts). Automated alerts can also be sent to the customer directly. Advanced analytics also helps recognize patterns of fraudulent transactions, and then use these to be one-step ahead of fraudsters, predict the next such fraud in progress, and recommend...
preventive action for saving both the bank and the customer. This also helps banks in protecting themselves against potential fallout (non-compliance fines and reputation loss risk, amongst others) of AML incidents.

3. **Product and portfolio optimization modeling.** Advanced portfolio analytical solutions not only help determine asset pool quality, they also help to determine prepayments, delinquencies, defaults, and cash-flows. Analytics allow firms to adjust LTV ratios, in accordance with regulations, to meeting capital requirements. If the mortgage portfolio is used for trading/investment, it can also be used to calculate various portfolio risk measures (for instance VaR).

### Operationalizing Analytics in Banking – Challenges and Emerging Best Practices

Analytics in banking promises significant value creation potential if the solutions are operationalized, keeping the following three success factors in mind:

1. Business insights are created using data
2. Insights are used to take decisive actions
3. Results from business decisions are fed back to improve data and analytics

This “data-insight-action” loop is summarized in **Exhibit 5** below.

**Exhibit 5**

Typical challenges across the “Data-Insight-Action” loop in banking

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**Examples of product and portfolio modeling impact**

- Reduce delinquencies from 147 to 37 BIPS
- Using PD/LGD models to reduce the time needed to identify problem loans from >100 hours to <5 min
- Reduce time-to-market of new offerings by 99% by calculating multiple risk factors automatically

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Operationalizing analytics in banking requires significant investments of time and money across people, process, organization, and technology. This section summarizes key challenges that financial institutions face across each element of the “data-insight-action” loop, as well as provides some of the emerging best practices.
Staying competitive by meeting evolving customer demands and remaining compliant amidst increasing regulatory requirements often pulls banks in different directions. Increasing competition strains a bank’s ability to exercise more stringent fraud prevention. For instance, customers want their cards to be accepted widely, but due to the demands of regulatory compliance, the usage is restricted and care advised. Banks have to walk the tightrope between these forces to succeed.

The emerging best practice. Banks need to change their mindset to consider compliance as a source of competitive advantage instead of treating it as a burden and cost. This is increasingly witnessed in the area of risk management. Enterprise risk strategy should not be to just comply with, but to use risk management for creating competitive advantage. Risk modeling and analytics should be directly linked to business outcomes.

Effective analytics requires a robust and integrated security master, account master, and customer master. Without strong master data management, it is hard to analyze the flow of money, the structure of the instrument/business deal, concentration of liquidity or exposure, and how one component relates to another. However, the underlying data fragmentation makes it hard to get an integrated and reliable internal data stream.

Beyond integrated internal data streams, advanced analytics requires significant amount of external data. For instance, banks need to track online behavior, social media habits, etc., to build a forward looking assessment of Customer Lifetime Value (CLV). Since large parts of data gathered and used for understanding customer behavior are unstructured, it is hard to work with traditional and legacy databases and applications. Rapidly changing customer tastes, preferences, and macroeconomic environment also pose a significant challenge in modeling predictive/prescriptive analytics.

Predictive and prescriptive analytics involve various internal and external data sources across lagging and leading indicators. Processing huge volumes of data requires state-of-the-art IT infrastructure. Regular and clean data inputs are also required to ensure that the model generates valid and meaningful output. As a result, data cleansing is also a major challenge. Most of the existing technologies work with traditional channels but are often rendered ineffective with digital media. Moreover, the cost of system modernization is prohibitive.
The emerging best practice

- Leveraging offshore delivery for data management. Increasingly, banks are leveraging offshore resources (Global In-house Centers (GICs) and/or third-party outsourcing) for data integration and data cleansing. Beyond cost arbitrage, offshoring offers access to new talent pools, ability to leverage different time zones, and manage volume fluctuations for data management.

- Long-term planning for overall application & system integration and an agile organizational structure that can adapt and change quickly. Server virtualization and other cloud solutions are increasingly being leveraged.

Implementing advanced analytics is not just about hiring statisticians with advanced degrees. Banks require analytics professionals with business context, data management, technology understanding, and knowledge of existing and emerging regulatory requirements. The problem is further exacerbated, given that several regulatory requirements (such as PD, LGD, and EAD modeling) emerged less than five years ago. Such talent is scarce and expensive.

- Centralization of analytics resources, via creation of Center of Excellence (CoE). A centralized team works on analytics across different Lines of Businesses (LoBs) and/or across asset classes (mortgages and equity). A CoE-based approach, as opposed to resources embedded within individual lines of business, improves overall utilization of these scarce and expensive resources. It also helps in setting standard processes, driving common governance standards and process rigor, as well as improving ease of accessibility.

- Leveraging global sourcing. Using GICs and/or third-party outsourcing service providers enables banks to tap into a global pool of analytics resources. The business case for global sourcing of analytics is less about cost savings and more about expertise.

- Intra-industry collaboration. Banks are starting to realize the power of working together, especially in areas such as fraud analytics. Building individual models is costly and time consuming. The solution is for banks to move to network-based models, where fraud detection algorithms from different banks work together for the group, and help achieve more extensive and better results, while also keeping the costs low.

- Inter-industry collaboration. Customer behavior in banking often follows similar patterns as in hospitality and travel industries, amongst others. Banks are taking advantage of this fact to create teams of resources having exposure and experience of multiple industries to create non-linear learning curves.
Due to significant dependencies on branch managers, a single KYC can take up to 20 days.
– Large Germany-based global bank

In today’s banking world, it is the balance—between creativity and discipline, between art and science—that we need to strike.
– CMO of a U.S. bank

The fraudsters are getting better at knowing where the data has been compromised and staying within that particular footprint of that customer, making the detection that much more difficult….
– Senior executive, of a mid-sized card-issuing financial institution

Inefficiencies due to functional silos

Need for greater collaboration to overcome challenges from existing functional silos

The need for ongoing relevance, validity, and improvement of analytical models

Banks today offer a variety of products and services (retail banking, corporate banking, cards, lending, asset management, and wealth management) but are poorly integrated internally from an organization and systems perspective. For example, the view of a customer from the CRM system would not typically incorporate a risk profile, performance history, or regulatory data associated with KYC requirements – yielding an incomplete and possibly inaccurate view of a customer. An end-to-end process view is hard to build, as back-, mid-, and front-office processes are disjointed. This often delays flow of information required to make decisions based on smart analytics. Moreover, it increases the response time when warning signals are generated.

The emerging best practices

• Common analytics platform. Banks are increasingly centralizing certain functions (such as AML) across all geographies and LoBs into a single platform to establish global systems and processes, capture/prevent suspicious transactions, and report to relevant regulatory bodies.
• Collaboration between analytics and business units. Marketing experts across different product lines and analytics SMEs need to collaborate to ensure that analytics insights are taken to action, and the insights themselves are actionable.
• Real-time actions on market insights. Banks are starting to realize the power of cutting time elapsed between understanding customer behavior and acting upon it. Not only that, they are also realizing the immediate effect of their strategies in shaping customer behavior.
• Global knowledge sharing. Digital revolution is fast erasing distinction between customers in different geographies. It is therefore imperative, that different business units within banks today collaborate more between themselves, and make sure that lessons learnt in one geography for customer behavior modeling are utilized in others.

Predictive and prescriptive analytics need to be fluid, dynamic, and open to learning and improving. They are not a one-time exercise and need regular updates and refinements. A continuous feedback mechanism is required from frontline systems, which is hard to implement.

Most variables within an analytics model are – customer demographics, financial data, economic and regulatory environment related data, and the analytical models that need to be designed to accept these data sets. The analytical model, of course, needs to stay relevant and stand the test of time. Making sure that the predicted and actual values stay within a zone of acceptable error is a significant challenge.
Post the 2008 economic crisis, model management needs to be independent of model development. Most models need validation and certification before their release for usage, every 6 to 12 months.

The emerging best practices
- Self-learning and flexible solutions. Analytical and simulation models need to be designed, keeping in mind future adjustment and refinements. For instance, sophisticated fraud models are emerging that have the ability to learn from their own functioning and positive identifications made, in order to evolve and improve, reduce false alerts over time, and help banks stay ahead of fraudsters. Also, enabling sharing of results between algorithms helps in triangulation of results.
- Offshore third-party service providers can also be utilized for testing and ongoing maintenance of models. This enables banks to keep model development and validation separate, as well as improve scalability and speed-to-market.

Conclusion

Sophisticated predictive and prescriptive analytic solutions exist today that can improve a bank’s probability of ensuring survival, compliance, profitability & growth mandates, and competitiveness. However, institutionalizing and operationalizing analytics to take smart business decisions is a challenge given the ground realities of functional silos, talent crunch, competing priorities, and outdated data/system infrastructure. The critical question today is not “why analytics?” or “which analytics?” but “how to operationalize analytics?”

There is no other value-creation lever available today for the banking industry that is as powerful as analytics. But, it needs to be elevated from an IT- or LoB-level discussion to a C-level strategic agenda to really unleash its true potential.

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