# OPTIMALLY LEVERAGING PREDICTIVE ANALYTICS IN WHOLESALE BANKING: THE WHY AND HOW

## Abstract

Myriad challenges beset wholesales banks today – heavy regulations, evolving customer needs, decreasing profit margins, increasing transaction volumes, massive competition from both traditional banks and the newer non-banking finance companies, increased high-tech financial crimes, and rapid technology changes, to name just a few.

Managing these challenges requires timely and deeper insights on risks, customer relationships, costs, revenues, liquidity positions, and other key parameters. While, over the years, wholesale banks' data analysis methods have evolved from basic reporting to descriptive BI applications and more investigative data mining, the next stage of evolution towards predictive analytics has not yet been reached.

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## Understanding predictive analytics

Predictive analytics is the statistical analysis of historical experiences to ascertain the explicatory variables of customer, risk, cost, and other key dimensions to predict the future behavior and outcome. It is a data mining solution and comprises methods and algorithms that are used on all data types (including structured and unstructured data) for predicting the outcome.

Predictive analytics is strategic in nature. It can provide insights on why a certain event happened and what would happen next. It forms a key component of Big Data solutions and differs from the traditional BI in numerous ways as listed below.

| Differences between traditional BI and predictive analytics | |
|---|---|
| **Traditional BI** | **Predictive analytics** |
| Helps monitor historic and current performance of the business | Supports ongoing learning from current / historic data and uses it to predict future outcomes |
| Optimized to answer already known questions | Enables discovery of unknown outcomes, insights, and patterns. Is more in-depth and proactive |
| Data storage structure, data entry, and publishing must be predefined in accordance with the established business requirements | Requires building of statistical models through existing data mining and business rules for enabling predictions |
| Principally, relies on structured data pertaining to the business transactions | Able to consider all internal and external data sources (both structured and unstructured) related to business transactions, opinions, real-time market feeds, news events, etc. Does not need a predefined cube data structure for analysis |
| Information reported through charts, tabular data, and visualizations | Visual discovery tools and advanced visualizations used for information analysis |
| Uses dashboards, ad hoc analysis, and customized reports | Is primarily leveraged through ad hoc analysis by business experts |

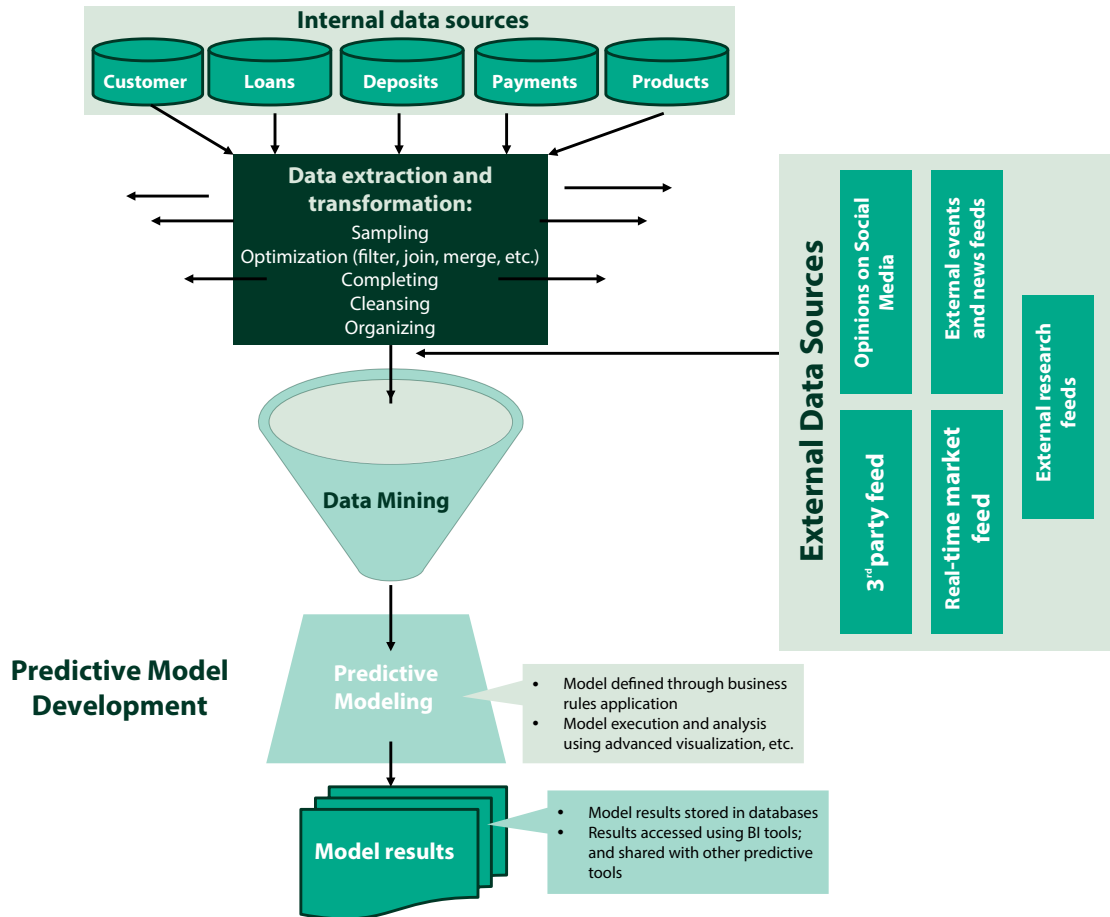| Predictive analytics – key characteristics | |
|---|---|
| **In-depth analytical capability (both current and historical data)** | • On numerous data sources (internal, external, structured, unstructured, etc.)<br>• On very high data volumes |
| **Business domain contextualization** | • Business models and rules<br>• Bespoke business parameters |
| **Enables superlative predictions** | • Enable multi-scenario outcome predictions<br>• Enables patterns and insights |
| **Enhanced usability** | • Advanced visualization in multiple modes<br>• Reduced IT support needs |

*Exhibit 1- Predictive analytics – salient features*

## Internal data sources

Customer | Loans | Deposits | Payments | Products

**Data extraction and transformation:**
Sampling
Optimization (filter, join, merge, etc.)
Completing
Cleansing
Organizing

**External Data Sources**

Opinions on Social Media

External events and news feeds

External research feeds

3rd party feed

Real-time market feed

**Data Mining**

**Predictive Model Development**

**Predictive Modeling**

- Model defined through business rules application
- Model execution and analysis using advanced visualization, etc.

**Model results**

- Model results stored in databases
- Results accessed using BI tools; and shared with other predictive tools

*Exhibit 2 – Predictive analytics process*

## Key impediments in using predictive analytics

### Lack of use

Not used much for revenue preservation and growth

Primarily focused on the risk aspects

### Relationship managers' belief

"Know all clients' needs" attitude

Heavy reliance on customer relationships for ascertaining needs

### Implementation issues

Lack of understanding on optimal implementation approach

Lack of budget, skills, expertise

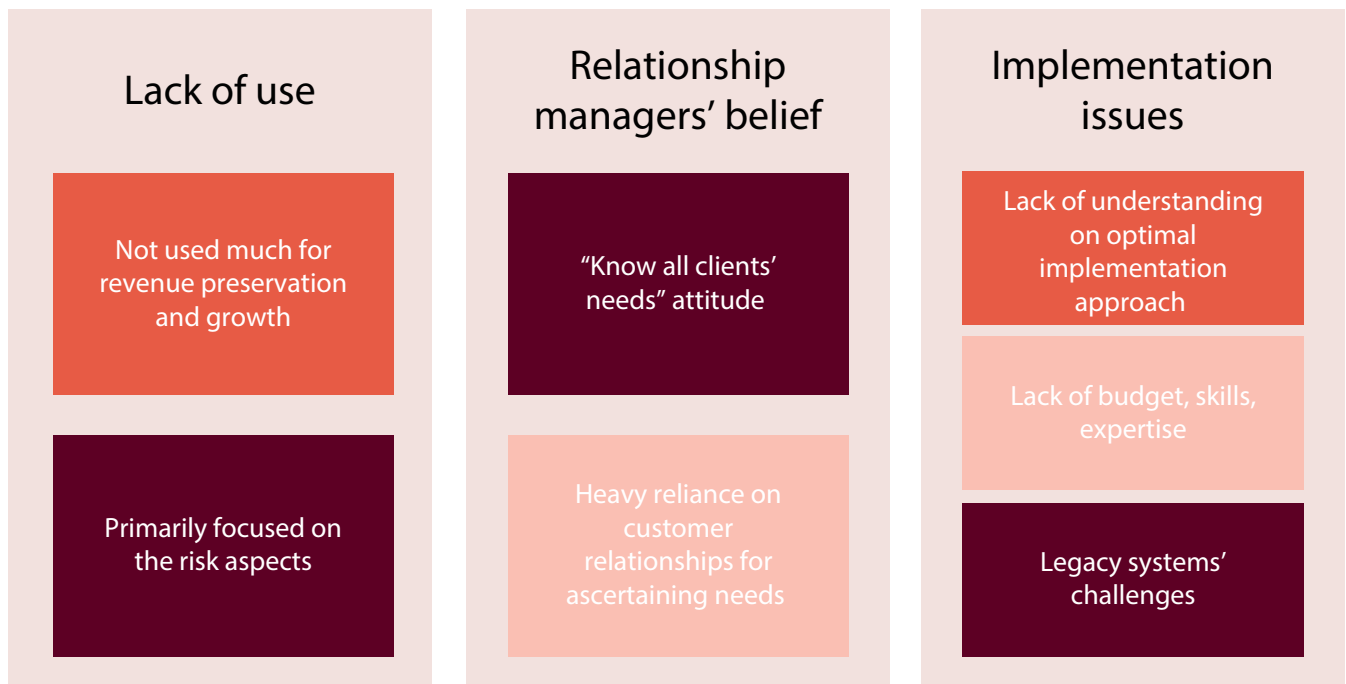Legacy systems' challenges

*Exhibit 3 – Key impediments to using predictive analytics in wholesale banking*

**Lack of use:** While retail banks leverage predictive analytics for cross-selling, reducing customer attrition, and acquiring customers; its use in wholesale banks is very low. Today, predictive analytics is not used much in wholesale banks for revenue preservation and growth. Rather, it is primarily focused on the risk aspects — portfolio risk analysis, underwriting, fraud detection, etc. The revenue analysis tools that are used currently are rarely predictive, especially at individual customer level. Instead, they focus on the entire customer segment or portfolio.

**Relationship managers' belief:** Many relationship managers believe they know all their clients' needs and predictive analytics tools won't provide them any new insights. They rely heavily on personal relationships with customers to ascertain their needs and sales potential. This along with the fact that there are relatively smaller numbers of wholesale banks' clients has led to minimal adoption of predictive analytics. However, the bitter truth is that relationship managers rarely know all their clients as well as they think they do.

**Implementation issues:** Many banks are confused about the best approach for predictive analytics implementation. For example, they are unsure about starting with the MDM system or the customer file. Many banks find implementing predictive analytics a daunting task for one or more of the following reasons:

- Complex and heterogeneous legacy technology architectures
- Siloed systems and processes
- Fragmented data spanning multiple databases
- Budgetary constraints
- Lack of required skills and expertise
- Lack of information foundation (e.g., detailed CRM data across all business lines, all past and present transaction data, lack of integration with external data, etc.)

## Seven areas where predictive analytics works wonders

While the use of predictive analytics has been limited in wholesale banking, its potential to deliver value across the entire spectrum of wholesale banking sub-functions is immense. Here are seven:
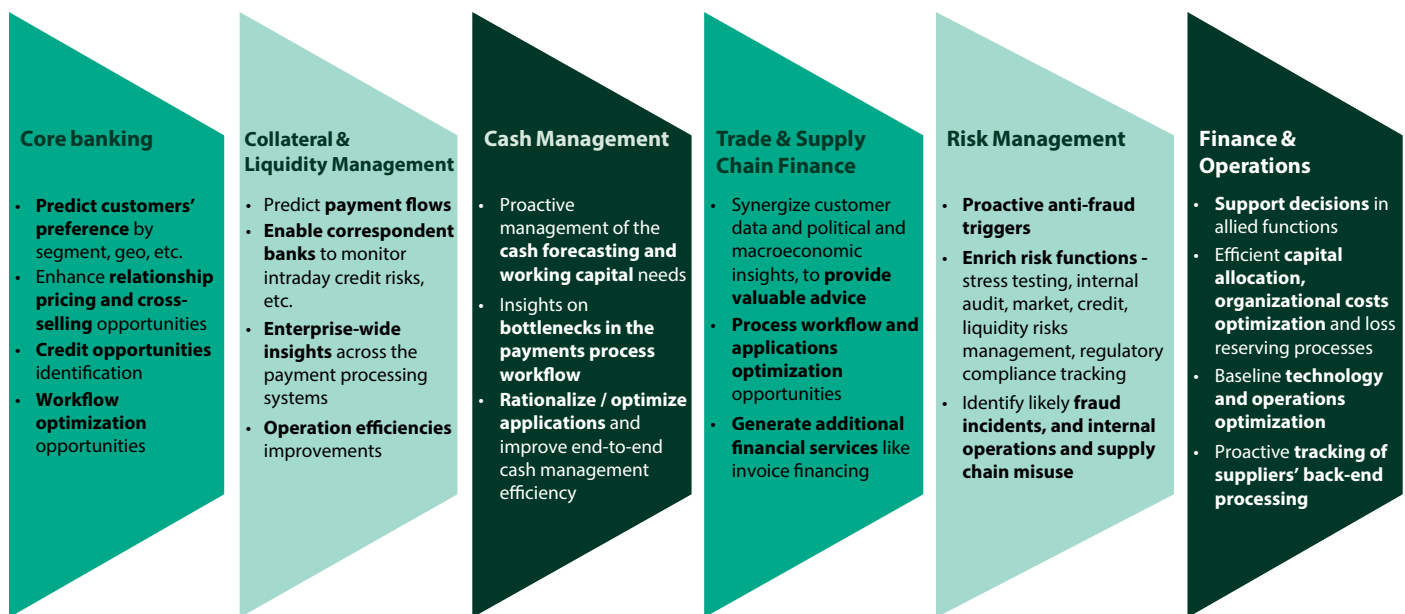
**Core banking**

- **Predict customers' preference** by segment, geo, etc.
- Enhance **relationship pricing and cross-selling** opportunities
- **Credit opportunities** identification
- **Workflow optimization** opportunities

**Collateral & Liquidity Management**

- Predict **payment flows**
- **Enable correspondent banks** to monitor intraday credit risks, etc.
- **Enterprise-wide insights** across the payment processing systems
- **Operation efficiencies** improvements

**Cash Management**

- Proactive management of the **cash forecasting and working capital** needs
- Insights on **bottlenecks in the payments process workflow**
- **Rationalize / optimize applications** and improve end-to-end cash management efficiency

**Trade & Supply Chain Finance**

- Synergize customer data and political and macroeconomic insights, to **provide valuable advice**
- **Process workflow and applications optimization** opportunities
- **Generate additional financial services** like invoice financing

**Risk Management**

- **Proactive anti-fraud triggers**
- **Enrich risk functions** - stress testing, internal audit, market, credit, liquidity risks management, regulatory compliance tracking
- Identify likely **fraud incidents, and internal operations and supply chain misuse**

**Finance & Operations**

- **Support decisions** in allied functions
- Efficient **capital allocation, organizational costs optimization** and loss reserving processes
- Baseline **technology and operations optimization**
- Proactive **tracking of suppliers' back-end processing**

*Exhibit 4 – Example of areas where predictive analytics can be used in wholesale banking*

**Core banking services:** For banks, predictive analytics can help predict customer demand and product preferences by geography and segment, increase cross-selling opportunities; aid in effective relationship pricing, demand-based pricing models, better targeted offerings, better product profitability analysis, identification of next-best offer, and more. In commercial deposits, acquiring new customer and retaining existing ones, account takeovers prevention, money laundering and fraud prevention are some of the key challenges. Predictive analytics can enhance a bank's campaign management quality, help identify a customer's next-best action and enable proactive and real-time anti-fraud triggers and insights. In commercial lending, identifying credit opportunities, minimizing credit losses and automating paper-intensive and manual credit analysis processes are the key business challenges. Here predictive analytics can help identify a customer's next-best action, discover and predict credit quality deterioration, and identify system automation and workflow optimization opportunities. In non-credit services, identifying a customer's needs and improving communications with the customer are the key challenges. Predictive analytics can enable effective campaign management and identification of a customer's next-best action.

**Some examples:**

*In 2012, Citigroup expanded TreasuryVision, its treasury management portal to allow corporates to better track compliance and performance for lending amongst parts of the same businesses. The intercompany lending module provides enterprise-wide visibility on investment and cash enabling credit optimization through forecasting and predictive tools. FICO has worked with Business Development Bank of Canada which provides commercial lending to Canadian entrepreneurs. The bank leverages FICO-provided tools for lending risk analysis, origination processes, and other related processes. FICO has hundreds of patents pertaining to predictive analytics.*

**Collateral and liquidity management:**
Accurate collateral and liquidity management is important, more so in high-value payment systems. Predictive analytics can help banks predict their outgoing and incoming customer and proprietary payment flows. Predictive insights get refined in real-time throughout the day as the payment flows occur. This can help banks in proactive scheduling of their payments. Further, predictive analytics can enable correspondent banks to monitor their indirect participants' payments flows and the resultant intraday

credit risks. Similarly, central banks and the payment system operators can leverage the predictive insights for forecasting the end-of-day and intra-day positions for the settlement banks and the subsequent collateral shortfalls. Predictive and near real-time analytics would also benefit all counterparties through the provision of enterprise-wide insights across the payment processing systems and sources. It would allow banks to test the stressors' impact on their liquidity position and enable operation efficiencies improvement towards liquidity management.

**Some examples:**

*In 2014, Simulocity developed a future modeling platform that simulates highly complex real-world business scenarios enabling corporates to expeditiously improve their business decision quality. These simulation tools comprised sophisticated modeling platforms and predictive analytics and allows clients to better understand their future complexities and market scenarios, and strategize for costs reduction, capital deployment, and compliance aspects. Simulocity's liquidity insight enables improvements in the liquidity management processes including forecasting, reconciliation, and collateral management.*

**Cash management:** Wholesale banks' customers often focus on their capital's protection, working capital cycle and efficient use of their cash. Predictive analytics' sophisticated forecasting mechanisms can enable these corporate customers to proactively manage their cash forecasting and working capital needs. It can forecast cash flows across the customers' account. Such ongoing forecasting would enable the customers' relationship managers to proactively discuss the adjustments to credit lines and limits, and optimize cash balances. Predictive analytics can also provide insights on bottlenecks in the payments process workflow, help rationalize / optimize applications, and improve end-to-end cash management efficiency.

**Some examples:**

*Commerzbank AG, HSBC, BNP Paribas, and J.P. Morgan provide detailed cash forecasting services. Bank of America leveraged Big Data analytics capabilities to ascertain the reason for many of its commercial customers defecting to the smaller banks. Based upon the analytics insights, the bank realized that its end-to-end cash management portal was too rigid and not user-friendly for customers who wanted the flexibility of accessing the supplementary cash management services from other financial services organizations. This helped the bank to launch, a more flexible online product (Cash Pro Online) and a mobile version (Cash Pro Mobile) in lieu of the earlier product providing all-in-one offering.*

**Trade and supply chain finance services:** Predictive analytics can be used to synergize the customer data along with the political and macroeconomic insights to provide customers with valuable advice. Events reported by ERP systems as well as sensor-driven technologies for tracking financial data goods can additionally generate financial services such as invoice financing, credit, and draw-down on

the credit lines, etc. Today, the lack of automation and end-to-end workflow, and manual and paper intensive processes are the key constraints faced in the trade and supply chain financing function. Predictive analytics can provide insights on process workflow and efficiency improvements and applications optimization opportunities.

**Some examples:**

*Transcepta launched the trade and supply chain financing options aided by strategic partnership with Integrate Financial (InFin) which is a leader in the trade and supply chain finance. InFin and Transcepta are leveraging analytics-based approach for financing decisions which is underpinned by predictive analytics and data integration capabilities.*

**Risk management:** Predictive analytics can enrich a number of risk functions including stress testing, internal audit, bank failure prediction, market, credit, operational and liquidity risks, regulatory compliance tracking, etc. Regulatory demands like Dodd Frank, SCAP, FATCA, Basel III also implicitly necessitate predictive analytics implementation. Real-time view of risks in the portfolio by geography, product, counterparty, and time period would be enabled along with the indicators and their correlations. Further, each business line's risk characteristics and their exposure across counterparties can be enabled. Predictive analytics would help fight sophisticated frauds and keep the level of the false positives to a minimum. Likely sources of fraud and incidents and internal operations and supply chain misuse can be proactively identified.

**Finance analytics:** Predictive analytics can be applied to leverage the general ledger and sub-ledger data, connect the transactions with the causal business processes and thereby support operational decisions in other allied functions. It can enable proactive efficient capital allocation, organizational costs optimization, effective general provisioning, and loss reserving processes. Through predictive analytics, banks can better understand their profitability and costs sensitivity to the market factors. The 'what-if' business scenarios generated by the predictive models can enable robust individual product and portfolio level strategies, profitable billing and collection practices, and financing options. Predictive analytics can help banks transform their CRM approaches and thereby garner higher profitability.

**Operations analytics:** Through predictive analytics banks can optimize their baseline technology and operations and thereby reduce cost. Insights on

databases and systems rationalization and the scope for greater technology leverage across the enterprise can be generated. Operational inefficiencies and their impact in quantitative terms and operational bottlenecks by product, line of business, counterparty, and geography can be identified. Further, operational savings through efficiency enhancement of the supply chain function can be achieved. Predictive analytics can enable process controls and tolerance limits implementation for the key performance indicators. This would aid robust policy management and governance. Further, through predictive analytics, banks can track their suppliers' back-end processing more proactively and effectively. Banks would also have enhanced visibility into their vendors' performance. Similarly, through predictive workforce analytics, banks can manage their workforce aspects (for e.g., workforce planning, people-management decisions, recruitment analysis, etc.) more efficiently.

## Predictive analytics implementation in banks: Key imperatives

To maximize the success of their predictive analytics implementation, wholesale banks should:

- Set clear business goals
- Understand the data from myriad sources (including external data sources such as third-party data, government agencies, social media, etc.)
- Prepare the data by performing comprehensive data pre-processing
- Develop the predictive model, evaluate it, and then deploy it
- Monitor the model's effectiveness

The aforementioned steps should be followed cyclically to ensure effectiveness. Further, banks' predictive analytics endeavor must be well-supported and underpinned by a robust enabling ecosystem.
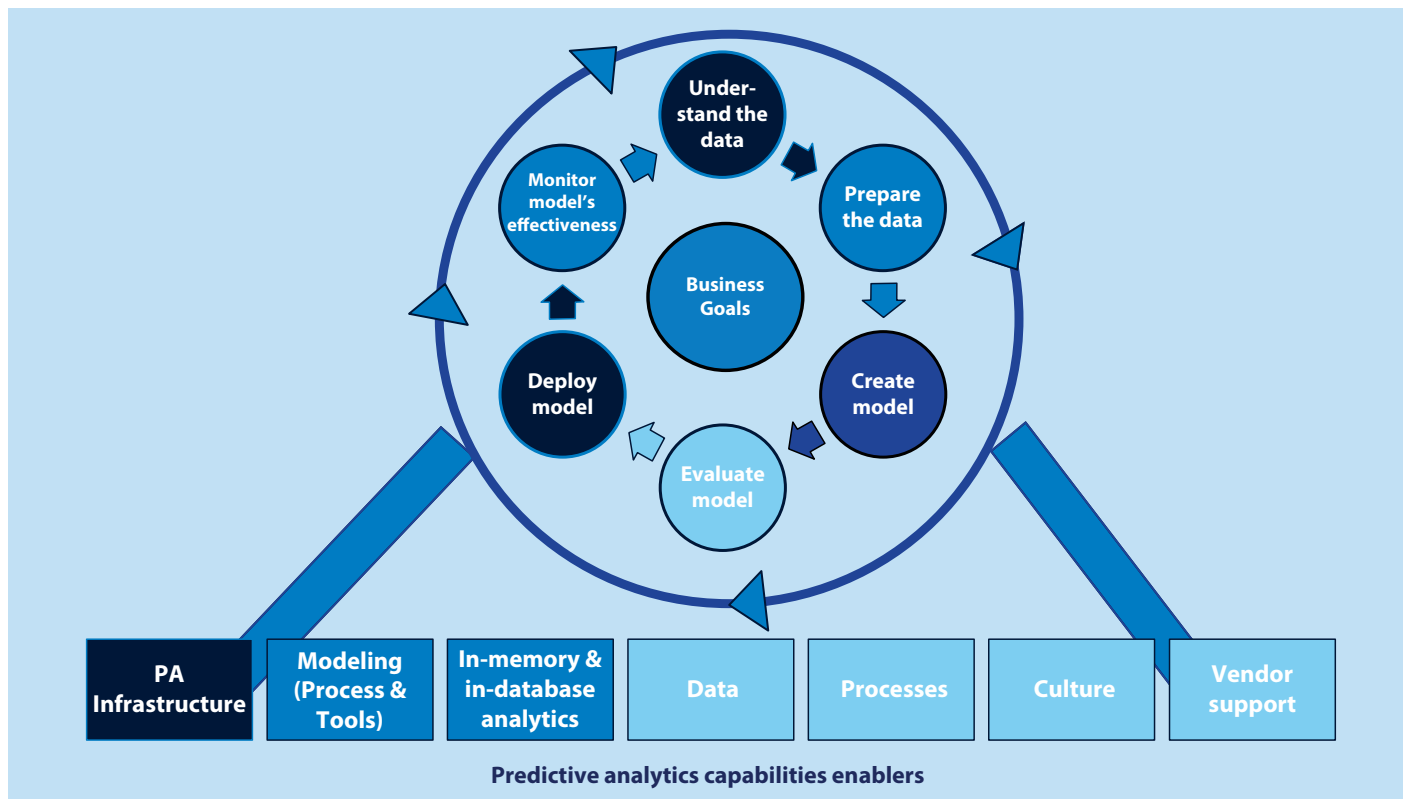


Exhibit 5 - Predictive analytics implementation imperatives

## Predictive analytics infrastructure

Many banks have infrastructure for predictive analytics such as desktop applications, data warehouse in place. However, banks need to further take an ecosystem approach towards predictive analytics. The data warehouse forms one of the components of this ecosystem. Banks must leverage advanced technology and infrastructure components - BI infrastructure, advanced analytics platforms, in-memory and in-database analytics, open source analytics, NoSQL, Hadoop, tools like open source R, etc. Open source solutions allow a wider community to engage in collaboration and innovation. Banks' predictive analytics and data mining infrastructure should:

- Allow discovery, extraction, profiling, transformation, cleansing, loading, and preparation of analytical data sets from the structured formats such as RDBMS tables

- Enable DW-integrated data preparation and pushing of advanced analytics deep into the EDW

- Support both unstructured and structured data

- Support the management and storage of predictive models and analytical data sets in an EDW / analytical data mart

- Allow middleware integration for delivering the models deeply into diverse SOA-enabled platforms

- Support application logic development in open frameworks (for e.g., MapReduce and Hadoop)

- Consolidate analytical data marts, EDWs and analytics tools into an all-embracing, massively parallel, multi-domain EDW to obviate RAM, CPU, and storage resources issues

## Predictive modeling imperatives

- **Process:** Predictive modeling process should combine deep knowledge of the wholesale banking marketplace and customer behavior. To this end, a robust mix of backgrounds and skillsets in the model development team including formal banks' business acumen, statistical skills, and cross-disciplinary banking relationship knowledge is desirable. For model development, incorporating input from all concerned business members including relationship managers, customer-facing staff, senior executives, product specialists, and sales executives is important. A dedicated group for nurturing deeper collaboration between the model development team and the business owners is recommended. Banks should leverage robust techniques such as time series, decision trees clustering, linear regression, and ensemble modeling for predictive modeling. Operationalizing predictive analytics, for e.g., entrenching the predictive models in the systems feeding other operational systems to make it more usable is crucial. The models should be owned by the business and revisited regularly. Models cannot be developed once and executed forever as underlying variables change over a period of time. A formal and robust model management process should be implemented. Towards this, best practices like model versioning with alert facility to notify of the model getting outmoded, directory structure for models, etc. can be considered.

- **Tools:** Banks' predictive analytics and data mining tools should be able to:

  - Offer agile and interactive visualization (in the form of box plots, heat maps, etc.)

  - Model numerous business scenarios (complex models using ensemble modeling, strategy maps, champion-challenger modeling, etc.)

  - Develop models comprising numerous independent variables

  - Leverage various statistical approaches for modeling (constraint-based optimization, regression, neural networks, etc.)

  - Include varied information types into the models (including unstructured data and real-time feeds)

  - Enable seamless deployment of models into BI, DWH, OLAP, CEP, BPM, and MDM

  - Apply numerous model quality metrics (lift charts, model quality scores, etc.)

  - Enable modelers to interactively explore and engineer the models

  - Support languages (e.g., Java, C++), APIs, web services, open source environment for statistical modeling (e.g., Weka, R), and IDEs (e.g., Visual Studio, Eclipse)

**In-memory computing and in-database analytics:** In-memory computing is a data processing method where the data is stored in the memory. This reduces disk I/O which in turn helps the models to run faster. In-memory computing is useful for interactive tasks like data discovery and visualization. In-database analytics entrenches the analytics in the database. For large amount of data, keeping the computation closer to the data reduces the cost. In-database analytics enables more pervasive entrenchment of the predictive models within the mission-critical applications and business processes. In in-database analytics, banks migrate their data mining, predictive analysis, and other compute-heavy analytic functions to execute in the EDW. This enables full leverage of the EDW's scalability, parallel-processing, and optimization features. In-database analytics can help banks speed development, reduce cost, and strengthen governance on the advanced analytics programs. Further, it allows for flexible deployment of a gamut of advanced analytics functions onto immensely scalable analytic databases.
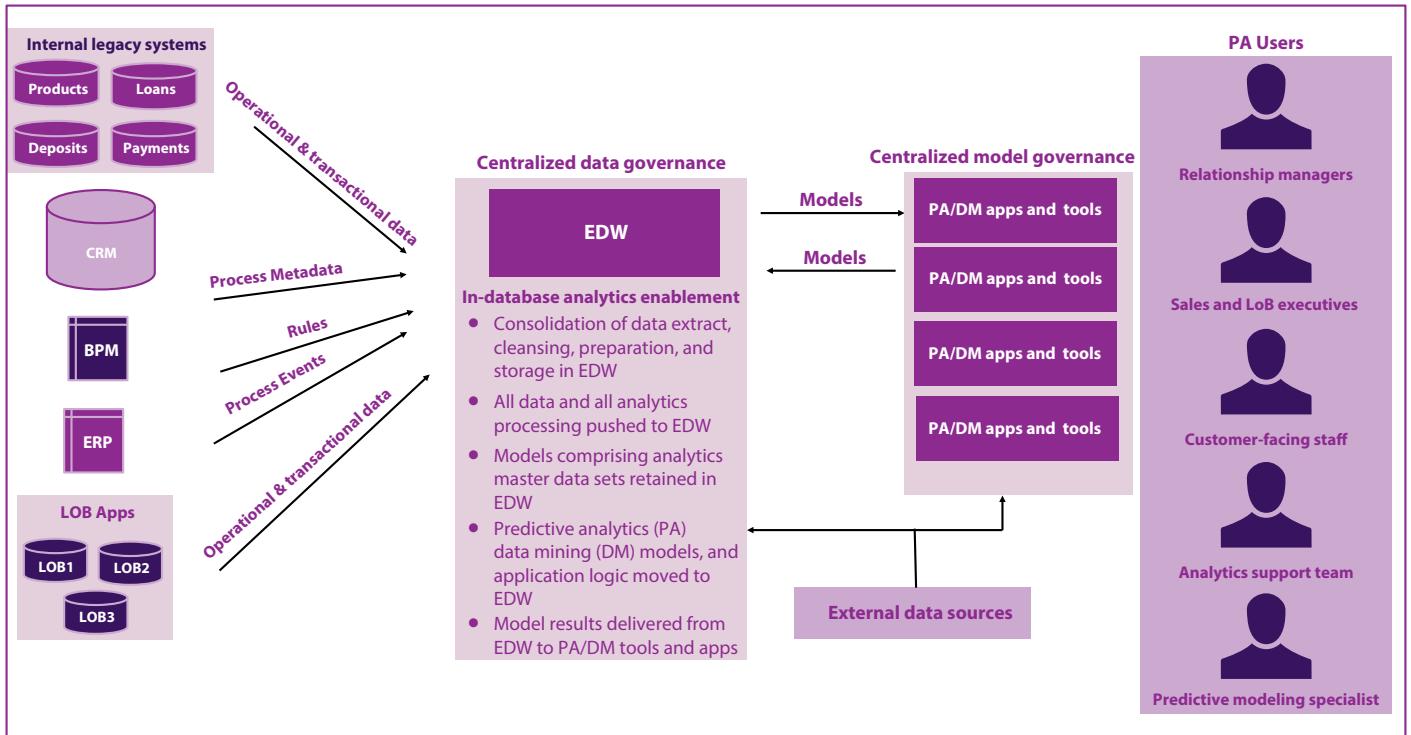


*Exhibit 6 - Predictive analytics leveraging in-database: Illustrative functional architecture*

**Data imperatives:** Wholesale banking relationships are complex. These span numerous siloed business lines that use disparate types of data from myriad data sources. Hence, data integration is crucial. Data integration is not simply about ETL but also includes master data and data quality management, and data blending and association. For enterprise-wide data integration, banks should define an enterprise data roadmap and architecture, measure exposures due to the data quality issues for the key processes, develop data redress plans, establish data governance structure, perform auto-reconciliation across the key finance and risk functions, rationalize the interfaces to the EDW and the analytics models, and work towards decreasing the manual reconciliation processes. Banks should utilize different data types – structured, unstructured, internal, and external – to enhance the quality of predictive models. Data must be available on time, accurate, amply comprehensive, of consistent quality, accessible, and enhanced with the situational / contextual data (for e.g., owner demographics). Big Data tools should be leveraged to ascertain patterns in heterogeneous data sources and help in predictive models creation. Data governance is crucial. Data ownership and access rights, metadata development, appropriate data sources selection are all important aspects. For data infrastructure assembly, an ecosystem approach works best.

**Easy-to-use processes:** Considering that relationship managers are unamenable to outside analysis aids and that they would interpret predictive analytics usage as an indicator of lack of confidence in their own capabilities, banks' senior management should proactively work towards overcoming the relationship managers' resistance. They should implement predictive analytics in a way that obviates any perception amongst relationship managers that it is an extra administrative burden. Easy-to-use processes for providing predictive modeling results is important. Towards this, predictive analytics tools should be strongly integrated in an easy-to-use manner with the CRM, BI, and other tools the relationship managers already use. Also, banks should ensure that the new predictive analytics processes have minimal impact on the existing workflow of relationship managers and do not significantly increase their effort requirements.

**Culture:** Banks must focus on overcoming their sales culture. Over and above helping build predictive models, the staff across the banks' organization should be involved in operationalization of the model. Cross-functional predictive analytics centers of excellence can be developed. Senior management should emphasize on collaboration between IT, business users, and other groups. Executing predictive analytics proof-of-concept projects with a business sponsor to get things started would be a good idea. Executive management should also monitor the relationship managers' usage of insights generated by the predictive analytics systems. Effective governance of predictive analytics programs is crucial.

**Vendor:** Banks and solution vendors should work in unison to overcome the barriers towards predictive analytics programs implementation. Vendors should be capable of supporting emerging open frameworks and in providing the SOA interfaces. Banks could engage a vendor for enabling vendor-agnostic in-database development frameworks and ask it to support the open interfaces (for e.g., Hadoop, MapReduce). This would enable writing of complex analytic logic and flexibly deploy the code for embedding in the target clusters, EDW platforms, grids, or BPM analytics platforms. SAP, IBM, Actuate and Tableau Software are some of the key predictive analytics vendors.

## Conclusion

Real-time predictive analytics is a tremendous enabler for wholesale banks. While it can provide superlative predictions of outcomes and responses, the flexibility of decision making, as appropriate would still lay with the relationship managers, operations executives, risk managers, and other key stakeholders. Banks that take a holistic approach and make concerted effort towards their predictive analytics programs implementation will gain immense competitive edge over time.

## About the Authors

### Anjani Kumar

*Principal Consultant, Consumer & Commercial Banking group, Infosys.*

Anjani Kumar has over 17 years of comprehensive IT, domain, and process consulting experience. Currently, he manages several strategic initiatives including the Competency Development Program and thought leadership showcasing efforts. Over the years, he has provided consulting services and managed many large and critical IT engagements for numerous clients. He was also recognized as the lead process auditor for the banking division of a major global bank. He has extensive techno-functional skills and an in-depth understanding of quality and process models – CMMI, Six Sigma, ITIL, etc. Anjani holds a Bachelor of Engineering degree from IIT Roorkee, and over the years, has earned many reputed and industry-recognized domain and process certifications. He can be reached at anjani_kumar@infosys.com.

### Chetna Kothari

*Chetna Kothari, Senior Consultant, Commercial Banking group at Infosys.*

Chetna Kothari is a Senior Consultant with the Commercial Banking group at Infosys. She has over 10 years of combined experience as IT Domain Consultant and Portfolio Manager, specializing in Commercial Banking and Wealth Management operations. Over the years, Chetna has consistently participated in the successful delivery of complex programs for large organizations spanning geographies. Her engagements span a major banking organization that operate across Australia, New Zealand and the Pacific region; a leading U.S. bank; and one of the biggest banks in Switzerland that is also amongst the world's largest private wealth managers. She can be reached at Chetna_Kothari@infosys.com.

For more information, contact askus@infosys.com

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