Digital Experiences and Architectures in Financial Services

Nadeem Asghar
Field CTO- Financial Services

FinDay - NYC
April 17 2017
Financial Services and Big Data

Focused around business and technology vectors:

**Technology vectors**
- Cloud computing (OpenStack)
- DevOps and PaaS
- Mobility
- Big Data and analytics
- BPM and Microservices
- Software-defined datacenters

**Business vectors**
- Regulation and risk management
- Compliance and regulation
- Trading systems
- Omni-channel wealth management
- Payments systems
- Bank 3.0
- Cyber Security

Digital Bank
Bank 3.0s
Key focus areas within the financial services industry

<table>
<thead>
<tr>
<th>Segments of Banking</th>
<th>Common Focus Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Markets</td>
<td>Risk Mgmt</td>
</tr>
<tr>
<td></td>
<td>Cyber Security</td>
</tr>
<tr>
<td>Retail Banking</td>
<td>AML Compliance</td>
</tr>
<tr>
<td>Securities Processing</td>
<td>Omnichannel</td>
</tr>
<tr>
<td></td>
<td>360 degree view</td>
</tr>
<tr>
<td></td>
<td>Customer Service</td>
</tr>
<tr>
<td></td>
<td>Fraud Detection</td>
</tr>
<tr>
<td></td>
<td>Predictive Analytics</td>
</tr>
<tr>
<td>Capital Markets</td>
<td>Data</td>
</tr>
<tr>
<td>Credit Cards &amp; Payment Networks</td>
<td></td>
</tr>
<tr>
<td>Corporate Banking and Lending</td>
<td></td>
</tr>
<tr>
<td>Wealth &amp; Asset Management</td>
<td></td>
</tr>
</tbody>
</table>
Data Inhibitors for Digital in Banking

- Fragmented Book of Record Transaction systems
  - Lending systems along geographic and business lines
  - Trading systems along desk and geographic lines

- Fragmented enterprise systems
  - Multiple general ledgers
  - Multiple Enterprise Risk Systems
  - Multiple compliance systems by business line
    - AML for Retail, AML for Commercial Lending, AML for Capital Markets...

- Lack of real time data processing, transaction monitoring and historical analytics

- Typically proprietary vendor and in-house built solutions that have been acquired over the years building up a significant technological debt.

- Unable to keep pace with the progress of technology

- Data Silos - Move to combine Fraud (AML, Credit Card Fraud & InfoSec) into one platform

- Issues with flexibility, cost and scalability
### Customers using HDP to Meet FSI Priorities

#### Top Priorities

- **Agile, Low Cost, Regulatory Compliance**
- **360 View of Entities**
- **Infrastructure Cost Reduction**
- **Cyber Security**

#### Key Business Requirements

- Single source of transaction data that drives Finance and Risk
- Provide a complete audit trail from Board and Regulatory reports back to the book of record lending, trading, collateral management and collections systems
- Ability to reproduce results for any point in time
- Ability to react quickly to new regulations.
- Understand what entities buy what products
- Provide profitability reporting by entity by product
- Product Recommendation Engine (Consumer and Advisor)
- Advisor/Sales productivity reporting.
- Operations error and productivity reporting.
- Reduce hardware and software costs
- Streamline reconciliation processes to reduce operational costs
- Reduce IT data loading costs
- Reduce audit costs
- Reduce analytic development costs
- Reduce analytic vetting costs
- Reduce market data and credit bureau costs

#### Relevant Banking Use Cases

- **Transaction Data Lake**
- **360º Degree Customer Profitability**
- **Market, Securities and Risk Rating Data Lake**
- **Analytic Development Framework**
- **Risk Reconciliation and Reporting Framework**
- **Displace expensive relational systems, Cyber security systems and BMA’s**
Financial Services Journey: Top 5 International Bank

Journey to a data-driven business
- Digital Transformation
- 100+ Use Cases since original project
- In-house talent + SI + HWX PS
- 100s of PBs & 40 million+ customer accounts across LOBs
- Gradual replacement of legacy solutions
- $100M+ annual savings due to lower-cost storage and compute

Cost Reduction & Capital Markets
- Teradata Augmentation & Replacement
- Started with a range of use cases across Capital Markets – single view of customer/risk

Cards & Wealth Management
- Single View of customer
- Customer segmentation
- Automated Investment Advisory

Risk Management
- Credit
- Market
- Basel & CCAR
- Operational Risk
- InfoSec & Fraud Detection
- Cyber Security
- Trading floor surveillance

Digital Transformation
- Real-time analytics
- Predictive analytics
- Customer Journey
- Micro & Macro persona marketing in real time to increase yield by 35%
- Mine Customer emails, CDRs, other core banking data to provide functionality across retail lines of business

Data Products - FinTech
- Cross Company Data Lake
- Being leveraged across mortgage banking, InfoSec, as a service to the US Govt etc
- Credit Watch
- Robo-Advisors
- Payments
- AML Compliance
- More usecases emerging

Journey to a data-driven business
100+ Use Cases since original project
In-house talent + SI + HWX PS
100s of PBs & 40 million+ customer accounts across LOBs
Gradual replacement of legacy solutions
$100M+ annual savings due to lower-cost storage and compute

Cost Reduction & Capital Markets
Teradata Augmentation & Replacement
Started with a range of use cases across Capital Markets – single view of customer/risk

Cards & Wealth Management
Single View of customer
Customer segmentation
Automated Investment Advisory

Risk Management
Credit
Market
Basel & CCAR
Operational Risk
InfoSec & Fraud Detection
Cyber Security
Trading floor surveillance

Digital Transformation
Real-time analytics
Predictive analytics
Customer Journey
Micro & Macro persona marketing in real time to increase yield by 35%
Mine Customer emails, CDRs, other core banking data to provide functionality across retail lines of business

Data Products - FinTech
Cross Company Data Lake
Being leveraged across mortgage banking, InfoSec, as a service to the US Govt etc
Credit Watch
Robo-Advisors
Payments
AML Compliance
More usecases emerging
Some Common Big Data Use cases
Capital Markets

Trade Lifecycle
Trade strategy development, backtesting across asset classes; looking for correlations etc.

Sentiment Analytics
Leverage Social Media and other data feeds to drive trading strategies and portfolio rebalancing decisions

Client Benchmarking
Single View of Customer Activity & Risk across multiple trading desks

Risk Reporting, AML/FATCA Compliance & Market Surveillance
Market integrity & investor protection

Data Products
Analytic tools (statistical modeling, functional grouping, time series analysis) to clients around trade data; Reduce Market Data Storage Costs
Wealth & Asset Management

ADVISOR MANAGEMENT
- Advisor Dashboards
- Investment Research
- Performance Management

RISK & COMPLIANCE
- Pre Trade and Post Trade
- AML Compliance Reporting
- Fraud Detection and Prevention
- Trade Surveillance and Monitoring
- Transaction Cost Analysis

INVESTMENT RESEARCH
- New Fund Creation
- Data discovery and market research
- Transaction Cost Analysis
- Trading and Portfolio Management

CUSTOMER KNOWLEDGE
- Unified View of Customer
- Customer Segmentation
- Customer Analytics and What if analysis
- Robo-Advisors

Big Data in wealth and asset management
Problem: Existing Cyber Security Solutions Don’t Scale to the Challenge

Current security tools installed in the data center can’t handle volume of data & threats from everywhere

- **82% of breaches happened in minutes**
- **8 months**: Average time an advanced security breach goes unnoticed
- **70%-80% of breaches are** first detected by a 3rd party.

*2016 Verizon Data Breach Investigations Report*
Cyber Security Customers using Hortonworks to Meet Security Priorities

Top 3 Priorities

- Improve Threat Detection
- Visualize Value of Security
- Improve Efficiency

Key Business Requirements

- Ability to detect compromised account activity.
- Ability to correlate and enrich threat activity for efficient triage.
- Enable rapid detection of new threat patterns
- Detect and contain compromise before loss occurs

- Ability to create and visualize cyber security KRI & KPI metrics
- Ability to tie metrics to top and bottom line business impact
- Ability to interactively drill from business metric to data source.
- Ability to quantify cyber security risk to normalize against business risk
- Provide single integrated view of security risk posture

- Transform cyber security program from point solutions to integrated platform
- Ability to automate metric data collection and presentation
- Enable efficient integrated security program workflow

Relevant Use Cases

- Actionable Intelligence
- Single View of Risk
- Prioritized Protection
- Visualize Value
Digital Banking Solution Architecture

Retail Banking Enterprise Data & Compute Lake

- Governance & Integration
  - Batch
  - Search
  - In-Memory
  - Real-Time
- Enterprise Security
  - SQL
  - Predictive
- Business Workflow
  - Pivotal HAWQ

Data Operating System
- Multi-purpose platform enablement

Distributed File System
- Staging, Database, Structured, Unstructured, Archival, Document

Cloud Computing Stack (Public or Private)
- Public Cloud, Private Cloud, Hybrid Cloud supporting a full stack of VMs and Docker

Banking Sources
- Business Logic Layer
  - Retail Banking Apps
  - Marketing Apps
  - Customer Journey
  - SVC
  - NBA

Applications & Workloads
- Social
- RDBMS
- Mainframe
- Document Mgmt Systems
- Data Silos
- Core Banking
- Industry Ref.
- Web Logs

Processing

Storage

Business Logic Layer

Cloud Computing Stack (Public or Private)

Data Science
- Other...
- SAS
- BI & Reporting
- Business Analytics

© Hortonworks Inc. 2011 – 2016. All Rights Reserved
Digital transformation Journey--360 degree view

Customer segmentation process

Data Sources
- Social media data
- Customer Master
- Trade Systems
- Other finance systems

Data Ingestion
- Account
- Portfolio
- Digital Transactions
- Ancillaries
- Preferences

Data Processing
- Discover Segments
  - Ultra High net worth
  - Platinum
  - Gold
  - Silver
- Customer Assignment Rules
- Assign Customers to Segments

Actionable Insights
- Visual Analytics
- Pattern Discovery
- Recommendations:
  - Customer Realignment
  - Design targeted promotions to improve performance in specific markets

Calibration on Historical Data
Incrementally add new Data
Risk and Regulatory reporting

Banks are under a heavy regulatory burden – Dodd Frank, Basel III & BCBS 239 etc

- Lack of a central platform for intraday and end of month data
- Strong need to standardize data feeds
  - Reducing costs
  - Meet Data Governance goals post BCBS 239
  - Panoramic feeds
  - Biometric Data
- Standardizing data ingestion, generic processors and calculator frameworks
- Unified Analytic development environment
- Creating a single lightweight entity identifier to integrate into existing systems

Hortonworks is working with major banking institutions to create an open source community around Risk Mgmt target state architecture, schemas and data governance model (PRAC)
Proposed Solution based on Hortonworks Stack

**Golden Source & Feeds**
- Master Data
- Transaction
- Balances
- Contracts
- Positions
- Market Data
- Factors/Scenarios

**Hortonworks Data Platform**

**LANDING DATA ZONE L0**
- RAW Data (hdfs)
- Original Data (hdfs)
- Unstructured Data (hdfs)

**STANDARDIZED DATA ZONE L1**
- Hive/Spark/Scala
- Standardized Data (Hive/Orc)

**CANONICAL DATA ZONE L2**
- Hive/Spark/Scala
- Standardized Data (Hive/Orc)
- Materialized View (Hive/orc)

**REPORTING/ANALLYTICS ZONE L3**
- Hive/Spark
- Scala/Java
- TBD??

**Common Repositories/Meta Data Management**
- Apache Atlas/Falcon/Custom Solution
- Apache Ranger/Atlas and Custom/Partner Solution

**Security**

**Regulatory Reports**
- Internal Reports
- External Reports
- Search
Journey to Digital Bank
The Digital Bank

360 Customer View

Customer Journey Management

Marketing Campaign Management

Dynamic Digital Capabilities

Big Data Lake

Existing OSS/BSS

Core Banking Data

Loan Data

Payment Data

Risk/GL Data

Docs, emails

Server logs

Streaming: Network Probes, Click Stream, Sensor, Location

Batch: Call Detail Records

On-Line: Customer Sentiment

Unstructured: Txt, Pictures, Video, Voice2Text

Delivery

Personal Data Analysis & Customer Insight Services To Customer & Partners
Increased Use of Customer Analytics in Retail Banking

- Understanding customers is the foundation to a sustainable competitive advantage in financial services. As a result, organizations can no longer wait to embrace the power of advanced analytics to gain insights and evaluate opportunities that will improve cross-selling, increase up-selling and enhance customer value.
Embrace the Rich Data Diversity

THE SEVEN MAIN KINDS OF NON TRADITIONAL DATA

Government & Economic Data

Geolocation Data

Big Data based Analytics System

Machine Generated Time Series Data

Curated Datasets

Corporate Documents E.g. Corporate Filings, Investment Research Notes

Social Media Feeds

Consumer Transaction Data & Supply Chain Info

Seven Ways in which Non Traditional Data drives business insights

- Satellite imagery data and location specific datasets. Can reveal hidden visual insights. E.g. retail shopping volume, bank branch usage, damage to remote work sites & fall hard to reach buildings for insurance claims. Location data is being used extensively in fraud detection in banking, to assess the health of manufacturing facilities & the health of commodities like corn & soybean crops. This data is then used to feed trading strategies on the commodities exchanged like the Chicago Merc.

- Machine generated time series data. In IoT datasets from "things" like sensors, actuators and other field equipment can help augment the usual manufacturing, telco, energy & utilities, oil & gas drilling. In government, smart cities are being made more intelligent from a traffic management and essential services delivery standpoint by storing, transforming and analyzing this data.

- Curated and specialized datasets are increasingly prevalent in verticals and micro verticals. For instance, algorithmic traders in high finance analyze years of churned market and company data to better inform their investment decisions. Similarly, chain data for large manufacturers are analyzed to understand demand patterns. Firms like Airbnb possess valuable occupancy data that can provide insight into regional markets from a hospitality standpoint.

- Financial analysis in domains such as Investment Banking, Private Equity, Auto Finance, etc. has begun relying on collecting vast amounts of data across distribution channels. These datasets range from regulatory filings, financial statement data such as balance sheets, other research notes. This data now supports a range of use cases that permit to due diligence on both the buy side and the sell side. For retailers and consumer finance companies, this enables them to better target their promotions in specific geographies.
Facilitate Smooth Payments Across All Channels
Key Payment Industry Trends in 2016

• Payments has become the eye of the FinTech boom
• Digital Payments increasingly replacing cash
• Payments moving to an Omni channel world
• Loyalty Programs getting increasingly sophisticated
• Increasingly sophisticated regulations – E.g. PSD2
• National Payments infrastructures move to real time
• New Revenue models to strengthen fee income
• Digital Banks drive cost efficiencies
• More and more players want to “own the customer”
• Payments as part of the customer journey
• Cyberattacks keep increasing

• Legacy application architecture
  – Product and LOB focused vs. Customer Centric
  – Disparate data sources
  – New data sources – no ability to manage
Advanced Analytics Applications across Credit Cards & Payments..

**IT Optimization**
- Data Staging
- Business Reporting
- Extract Load Transform ETL/ELT
- Operations Analysis - ODS
- Enterprise Logs Search Analytics
- Cyber Security
- Risk Scoring in Real-time

**Merchants**
- Customer 360
- Targeted Offers based on location
- Fine grain automated marketing
- Market Basket Analysis
- Sentiment analysis
- Cross sell/upsell/NBA

**ISO’s**
- Chargeback Analytics
- Risk Analytics
- Fraud Analytics
- Merchant Analytics – Cross Sell
- Next Best Action – Up Sell

**Issuers**
- Customer Acquisition/Attrition
- Customer Spend Analytics
- Risk & Fraud Analysis
- Customer feedback
- Click stream analysis optimization
- Path to purchase
- Sentiment analysis

**Acquirers**
- Merchant Performance Analytics
- Chargeback Analytics
- Risk Analytics
- Fraud Analytics

**Card Networks**
- Customer Spend Analytics
- Attrition Management
- Chargeback Analytics
- New Product Ideation
- Risk Analytics
- Fraud Analytics
- AML Analytics (Batch & Realtime)
- Payment platform convergence
Use Data Science to drive Data Monetization
Data Science Process in Banking

1. Raw Data
   - Transaction Data
   - Loan Data
   - Payment Data
   - Wire Data
   - Marketing Data
   - Credit Card Data
   - Social Media

2. Analysis
   - Realtime Scoring
   - Network Analysis
   - History
   - 50K+ Patterns
   - Business Rules
   - Ongoing Learning
   - Investigation
   - Modern techniques in Pattern detection using Machine Learning, Neural Networks & a rich patterns database

3. Production
   - Advanced data analysis and visualization techniques open up new opportunities for banks
Banks interact with customers across many channels and points in time -- Omni-Channel

Many call center agents are also overwhelmed with offering complexity and struggle to translate the breadth of the product portfolio.

They lack insight into the customers needs to offer them the right products and gauge their mood.

Data about those interactions is stored in silos.

Difficult to correlate data about customer interactions, marketing campaign results, and online browsing behavior.

Problem is exacerbated by recent company acquisitions and a proliferation in the volume and type of customer data.

Merging that data in a relational database structure is slow, expensive and technically difficult to mine with new unstructured data.

Enterprise-wide data lake of several petabytes

360-degree unified view of the customer (or household) life time value based on usages patterns across time, products and channels.
Financial Services Transformation

Security Risk Mitigation

- 94% reduction in time to process suspicious transactions by using algorithmic insights to largely automate review

New Account Growth

- 10,000 more new accounts added via improved target marketing analytics vs. previous processes

Spend Per Customer

- 25% more accounts per customer after implementation of enhanced cross-sell offers delivered “just in time”

Customer Satisfaction

- 20% reduction in churn rates observed through proactive customer outreach powered by advanced analytics
Thank You