AIA - IMS – MSFT Azure ML Capability

Cognizant's Commitment to Azure First

2094+	**5500+**	**400+**	**535+**	**75+**
Associates trained on Azure ML	Associates trained on CIS stack	Associates awarded Cortana trained Digital badges from Microsoft	Associates Trained on MS Cognitive Services	Associates trained on Microsoft R server

151 CIS Architect certification completed

Cognizant is the leading Partner

North America 21

Nordics 8

UK 3

Europe 4

APAC 115

Key Highlights

Microsoft features Cognizant **as Go To Partner for Cognitive services**

Joseph Sirosh,
Corporate VP, Data Products (C+E)

"The Microsoft-Cognizant partnership has yielded significant outcomes throughout 2016 as our strategic relationship has deepened and grown stronger. A noteworthy highlight is Cognizant's laser focus on talent enablement resulting in more than 2,500 Cognizant associates trained across the CIS with over 75 certified in implementing Big Data Analytics solutions using CIS of Services. On the wings of this ongoing talent investment we are confident that our joint market presence will continue to flourish in 2017"

Strategy and Consulting

- Assessment of Client's landscape, Cognitive Solutions for Business enhancement
- Implementation roadmap, use case definition, business case development and point of views

Prebuilt Cognitive Solutions

- Bolt-on Implementation of NLP, Semantic Understanding and ML to provide Visual/Text/Speech Analytics
- Integrate Cognitive API's with existing Enterprise IT
- Implementation of Virtual Assistants – Chatbots

Platforms and Solutions

- End to End Process Automation Solutions (Automatika)
- BigDecisions: A system of Intelligence Platform incorporating Big Data, Advanced Analytics and Cognitive Services

Innovation and Assets

- Chat Bot Builder, an automated framework to enable faster and efficient Chatbot building with LUIS API
- Cognitive Gallery, a showcase for innovative PoCs on Cognitive APIs

Cognitive Service Offerings

Cognizant's Bigbets with Microsoft

Products & Resources	Modern Workplace Solutions	**Data & Analytics**	Hybrid Cloud Transformation	
Healthcare & TriZetto				

Our Offerings

- BigDecisions – Advanced analytics and digital platform
- Data and Decision sciences as a service
- BigFrame – Teradata offloading to the cloud
- Consulting & Implementation Services
  - SQL 2016 – Upgrades, Migrations, New Use Cases
  - SAS to R/MRS Migration
  - Analytics (new & cross-sell from IOT)

- Custom Solutions on the CIS stack
  - Data repository (Azure Data Lake Store)
  - Predictive Analytics
  - Cognitive Analytics (BOT, NLP, and LUIS)
  - Self-service BI Dashboards (Power BI)

Vision & Approach
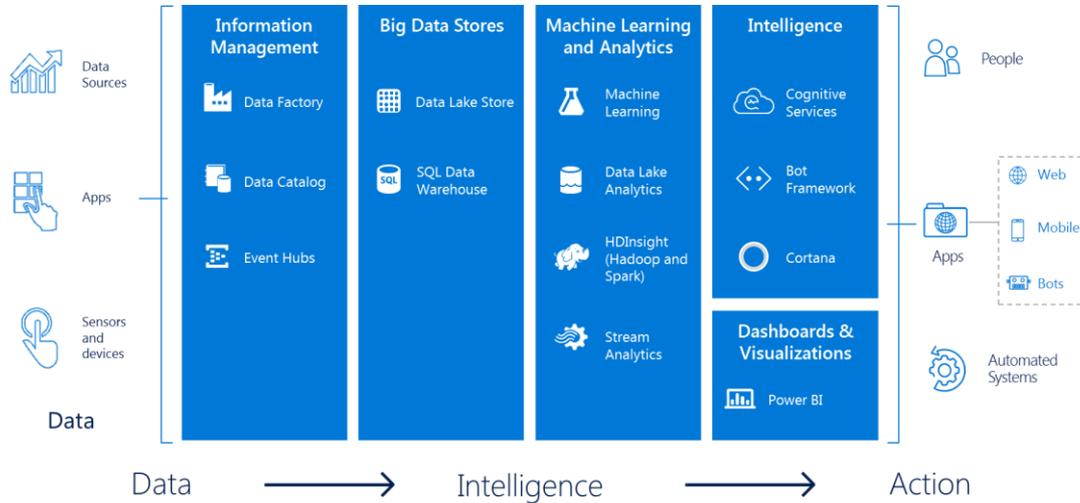
Higher Joint Value Proposition

- Analytical Services Powered by Azure ML
- HDInsights

- Azure Cloud
- Digital Analytics

- Stream Analytics
- Power BI

Key Innovations

End-to-end Business Solution Platform	OneRetail	nXg dH	Car360°	SightPrism	BigFrame

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Cortana Intelligence Suite | Transform Data into Action

Analytics that enable action
Augment and improve your decision making processes with proactive alerting and prescriptive analytical recommendations on actions to take

Intelligence
Augment users' experience, customize responses, and drive appropriate actions with intelligent agents.

Fast and Flexible
Build with our partner solutions for your industry, or extend our basic building blocks to tailor the solution to your specific need

Secure and Scalable
Continue to get value from your data in a secure, compliant, and scalable way as your business grows and your data grows

Cognizant's Capabilities | Azure Machine Learning

AZURE MACHINE LEARNING
Predict outcomes and prescribe decisions
Powerful machine learning and Hadoop-based advanced analytics for driving action in real time.

COGNIZANT'S OVERALL ML EXPERIENCE

INNOVATIONS	BENEFITS
Hydro Analytics: Models based on Machine Learning regression algorithms were built to predict the water flow in advance	Virtual sensor: Predict water flow where gauges may not be installed, Managing failures: Virtual sensor replacing failed gauges Elevating Accuracy: Increase density via Virtual sensors
C-Eye: Machine Language based predictive algorithms were used to analyze treatment outcomes	Digitize patient data, Unearth unparalleled insights, Correlate critical factors, Predict treatment outcomes, Improve trust in medical procedures
Educational Analytics: Cloud-based BI and machine learning system with predictive modeling for drop-out chances detection	Student Dropout Predictor, Student Teacher collaborative platform, Valuable Action' glossary for NGOs
CRM Decision Accelerator (A joint GTM initiative) Application that listens to 'Social Media', collects IoT data and provides lead, opportunity scoring and helps in predictive maintenance	Identify potential leads / cases / connections, Lead Scoring, Opportunity scoring, Cross-sell and up-sell recommendations for products

2094+

Associates trained

PROJECTS

5+

Powered by

Azure ML	Spark Mlib	Python/ R	HDInsight	Azure Blob	Azure Data lake	PowerBI

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Cognizant's Capabilities | Microsoft Cognitive Services

Microsoft features Cognizant as Go To Partner for Cognitive services. Cognizant takes lead in Bot Hackathon

400+
Trained Consultants

75+
Participants in **Chatbot Hackathon**

10+
Use Cases demonstrated

Cognizant Solution
- Cognizant's **'Personalized Information Framework'**
- **Intelligent solution Automation-** Automation of data collection while performing the transaction and extract meaningful insights / feed to the Business team

OUR SERVICE OFFERINGS

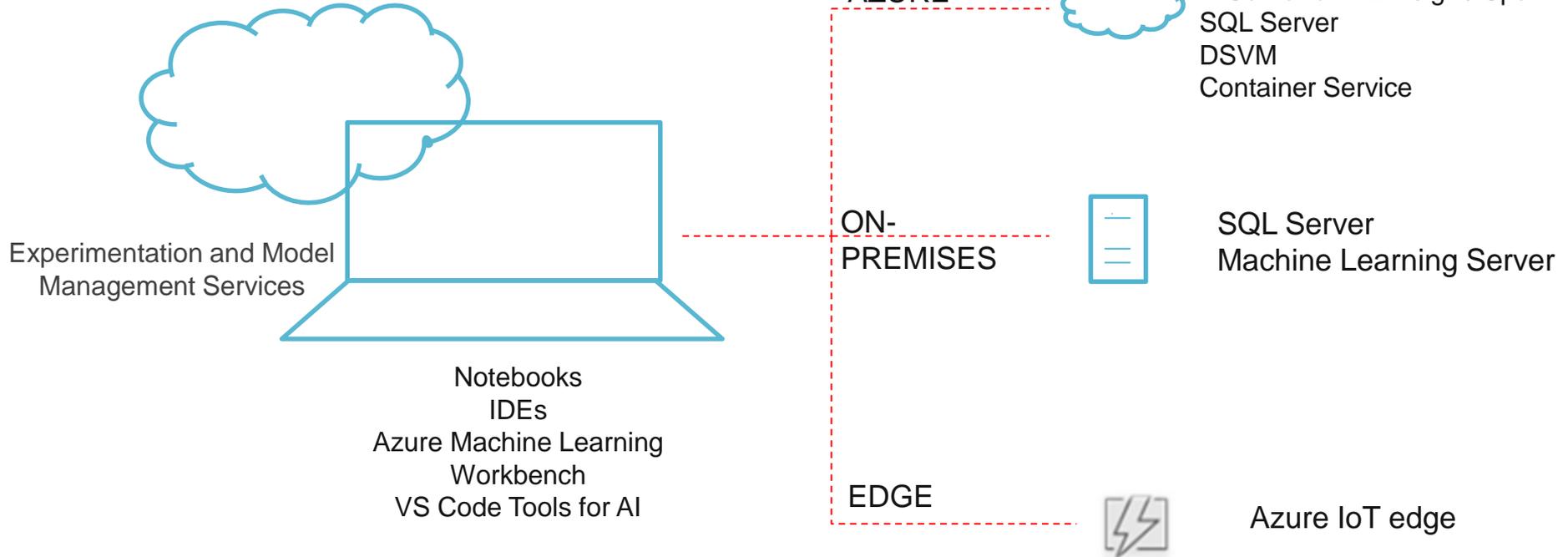| Strategy and Consulting	▪ Assessment of Client's landscape and provide Strategic Consulting on the application of befitting Cognitive Solutions to their Business enhancement ▪ Provide Roadmap on implementing Cognitive Services in client's existing Business landscape ▪ Use case definition, Business case development and Point of views.
Precognitive Solutions	▪ Integrate 3rd Party Cognitive API's with client's existing Enterprise IT infrastructure ▪ Bolt-on Implementation of Natural Language Processing, Semantic Understanding and Machine Learning to provide Visual/Text/Speech Analytics to clients ▪ Implementation of Virtual Assistants like Chatbots ▪ Custom Cognitive Solutions based on Domain Use cases
Platforms and Solutions	▪ End to End Process Automation Solutions (Automatika) ▪ BigDecisions A System of Intelligence Platform incorporating Big Data, Advanced Analytics and Cognitive Services
Industry Solutions	▪ iSmart – Integrated Social Media Analytics tool ▪ News Analytics Solution based on Real Time Semantic Search & NLP Tools ▪ Client Central 2.0 a customer 360 solution using Big Data & NLP Capabilities ▪ Real World Evidence: a Pharma solution to analyze Real world data and support observational research

Cognitive Gallery (Prelim)   Embarking Cognitive Journey

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# AZURE MACHINE LEARNING SERVICES

TRAIN & DEPLOY OPTIONS

Experimentation and Model Management Services

Notebooks
IDEs
Azure Machine Learning Workbench
VS Code Tools for AI

AZURE

Azure ML
R Server on HDInsight/ Spark
SQL Server
DSVM
Container Service

ON-PREMISES

SQL Server
Machine Learning Server

EDGE

Azure IoT edge

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Azure tools/ services for data preparation & model development

Tool	Key Benefits	Considerations
Azure Machine Learning Studio - Its is a cloud-based, visual development environment for creating data experiments, training machine learning models, and publishing them as web services in Azure.	1. Interactive visual interface enables machine learning modeling with minimal code. 2. Built-in Jupyter Notebooks for data exploration. 3. Direct deployment of trained models as Azure web services. 4. Invoke HDInsight cluster	1. Limited scalability. The maximum size of a training dataset is 10 GB. 2. Online only. No offline development environment.
Azure Notebooks - an online Jupyter Notebooks service that enables data scientists to create, run, and share Jupyter Notebooks in cloud-based libraries.	1.Free service—no Azure subscription required. 2.No need to install Jupyter and the supporting R or Python distributions locally—just use a browser. 3.Manage own online libraries and access them from any device. 4.Share notebooks with collaborators.	1. User will be unable to access their notebooks when offline. 2. Limited processing capabilities of the free notebook service may not be enough to train large or complex models.
Data science virtual machine - an Azure virtual machine image that includes the tools and frameworks commonly used by data scientists.	1.Reduced time to install, manage, and troubleshoot data science tools and frameworks. 2.The latest versions of all commonly used tools and frameworks are included. 3.Virtual machine options include highly scalable images with GPU capabilities for intensive data modeling.	1. The virtual machine cannot be accessed when offline. 2. Running a virtual machine incurs Azure charges, so user must be careful to have it running only when required.
Azure Machine Learning Services (Preview)- a cloud-based service for managing machine learning experiments and models. It has a cross-platform client tool named Azure Machine Learning Workbench provides a central interface for script management and history	1.Central management of scripts and run history, making it easy to compare model versions. 2.Interactive data transformation through a visual editor. 3.Easy deployment and management of models to the cloud or edge devices.	1.Requires some familiarity with the model management model and Workbench tool environment.

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Azure tools/services for deploying machine learning models

Tool	Key Benefits	Considerations
Azure Machine Learning web service -It helps in deploying machine learning model as a web service when created using Azure Machine Learning Studio.	1. Ease of development and deployment. 2.Web service management portal with basic monitoring metrics. 3.Built-in support for calling Azure Machine Learning web services from Azure Data Lake Analytics, Azure Data Factory, and Azure Stream Analytics.	1.Only available for models built using Azure Machine Learning Studio. 2.Web-based access only, trained models cannot run on-premises or offline.
R/ Spark on Azure HDInsight- The Microsoft Machine Learning library for Spark (MMLSpark) also provides deep learning algorithm support for predictive models in Spark.	1. Spark is a distributed platform that offers high scalability for high-volume machine learning processes. 2. User can deploy models directly to Spark in HDinsight from Azure Machine Learning Workbench, and manage them using the Azure Machine Learning Model Management service.	Spark runs in an HDinsght cluster that incurs charges the whole time it is running. If the machine learning service will only be used occasionally, this may result in unnecessary costs.
Microsoft Machine Learning Server - It is a scalable platform for R and Python code, specifically designed for machine learning scenarios.	1.High scalability. 2. Direct deployment from Azure Machine Learning Workbench.	User need to deploy and manage Machine Learning Server in their enterprise.
Web service in a container - User can deploy a machine learning model as a Python web service in a Docker container.	1.Containers are a lightweight and generally cost effective way to package and deploy services. 2.The ability to deploy to an edge device enables moving the predictive logic closer to the data. 3.You can deploy to a container directly from Azure Machine Learning Workbench.	This deployment model is based on Docker containers, so one should be familiar with this technology before deploying a web service this way.

Machine learning reference architecture

Case Studies

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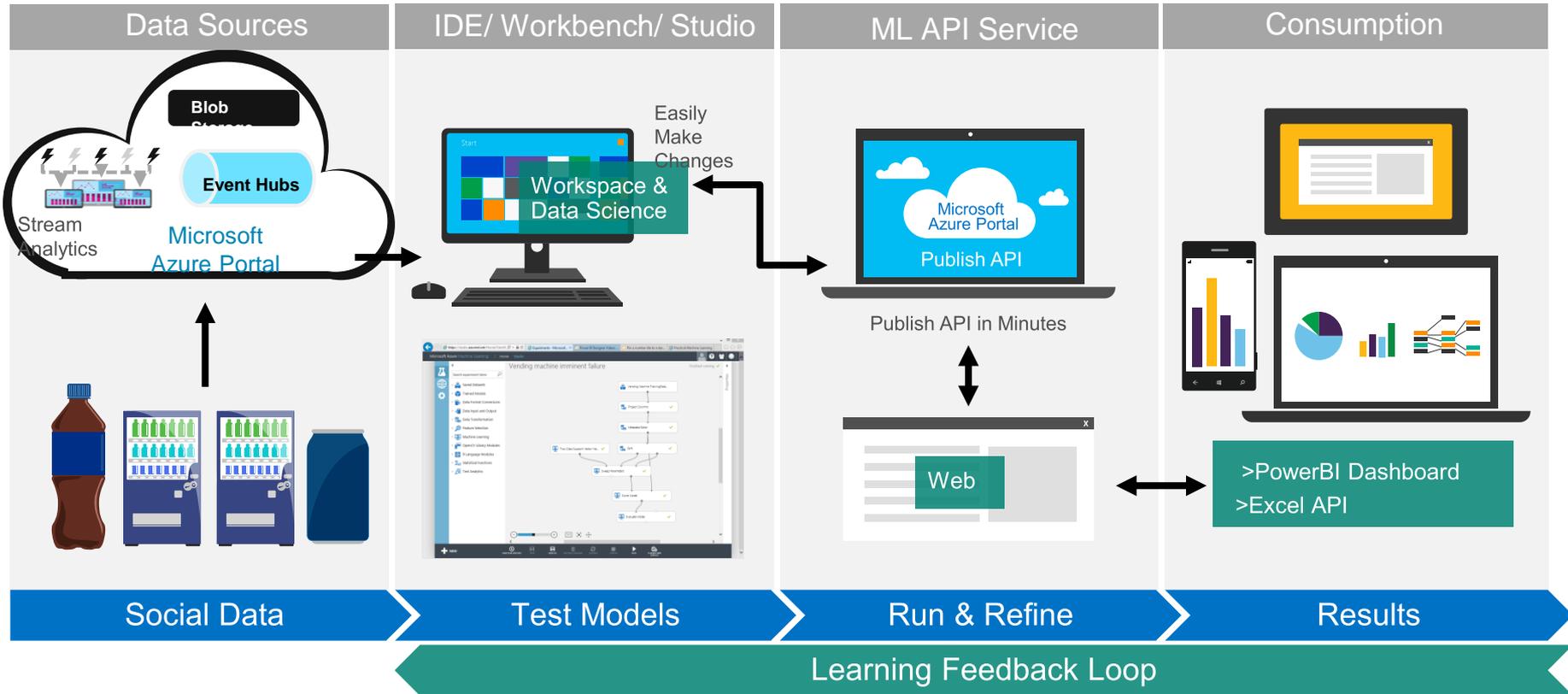
Guided Analytics powered by ML algorithms @ Leading E-commerce Fashion Retailer

Background of POV

The Retailer in question has been an established name in the Retail segment and is setting up his Data & Analytics landscape for their eCommerce operations.

Cognizant socialized the ONERetail platform built on the core concept of "Guided Analytics post which Cognizant was requested to showcase "Proof of value" with Retailer's data set.

ONERetail application consists of ML algorithms suited towards **Diagnostics** & **Predictions** to **GUIDE** the retailer to arrive at Insights within "4 clicks".

Guided Analytics for cause effect patters for e-commerce

Business Drivers

- Demonstrate the viability of the diagnostic engine for KPIs related to Retailer's business
- Demonstrate "point of view" on scalability of Analytics platform across business processes

Solution Highlights

- Data sets provisioned by client: eCommerce transactions & Google Analytics (GAP) data sets
- Leveraged ONERetail's Diagnostic algorithms to derive cause-effect patterns for eCommerce use case
  - Dimension Reduction to identify most important independent variables that impact the use case
  - Weighted average across inferences from multiple ML algorithms to rank the causal effects
  - Dynamic visual representation by rendering widgets on the fly

Technology Stack: Azure SQL PDW, Qlikview, R Studio, Azure ML

Outcome achieved

- Proved value of ONERetail to understand the drivers for sales and take decision based on insights generated within 4-clicks
- Acceptance from the customer on fitment of the tool and agreement to partner to expand the scope to other business scenarios
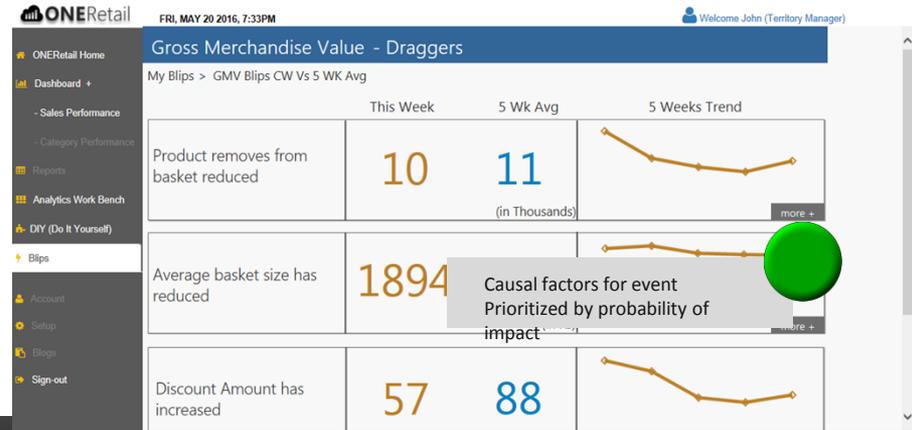
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Guided Analytics in action ….

"Guided Analytics" – ML algorithms for a probabilistic path of analysis
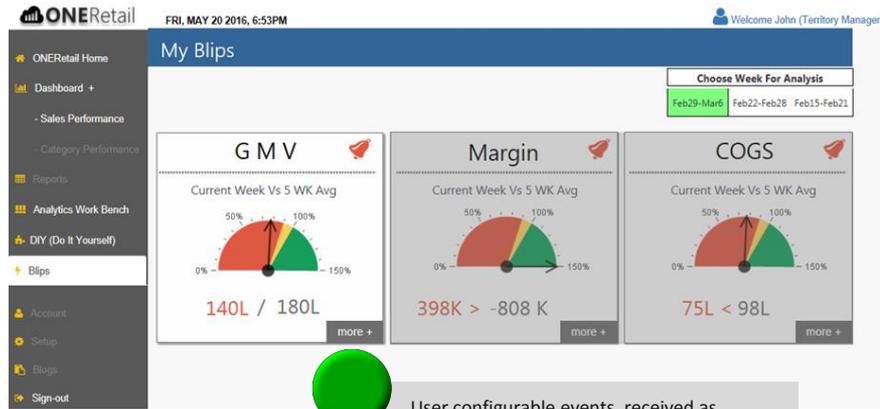
User configurable events received as BLIP
Click on more to uncover the Why?

- Diagnostic algorithm will prioritize the factors at each level

- Also offers predictions for each causal factor to guide the analyst to ensure that analyst gets "Maximum return on effort"

- ONERetail guides the path of analysis and guarantees actionable insights within 4 clicks

Causal factors for event
Prioritized by probability of impact

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Azure based Data Enablement for a Non-Profit Organization

Key Highlights

Receiver Operating Characteristic @ .97

20 Mn+ Patients Data

30 GB Data was Analyzed

Business Drivers

- Need for insight on geo/demography-wise patient data (not available in eyesmart -> existing system)
- Connect data from remote primary care centers to tertiary and advance tertiary centers
- Empower medical practitioners to analyze disease patterns and treatment outcomes

Solution Highlights

Cognizant implemented a cloud-based Business Intelligence, Machine Learning system:

- Data from existing systems were moved to Microsoft Azure (Cloud Platform)
- Azure ML (Machine Language) based predictive algorithms were used to analyze treatment outcomes
- Geo-spatial (data superimposed on map) dashboards and reports were built using Power BI

Technology Stack: SSIS | SQL Server | Azure ML | Power BI

Business Outcome

- Cloud based solution resulted in providing Better **Care** -> Better **Education** -> Better **Research** (on patterns, disease trends)
- **Improved credibility** as treatment outcomes were discussed with the patients (by analyzing data over Azure)
- Reduced health related issues as a result of **proactive campaigns** powered by geo-specific analysis

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Azure based Data Enablement for a Non-Profit Organization

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Challenges Faced

- Building Machine Learning model with less negative examples

- Parsing patient details and creating geo-tags for PowerMap view

- Customization of graphs to enable better views in PowerBI studio for Ipad
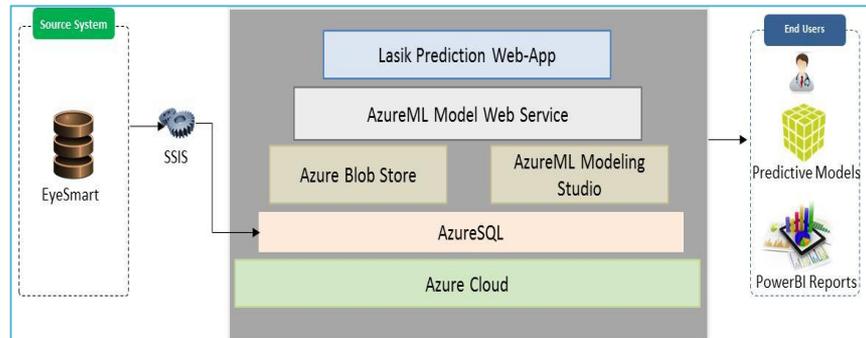
Future Recommendations

- Creating a Mobile Application to extend the adoption of predictive models to doctors on the field

- Create a consortium of non-profit eye care organizations to get more data and refresh the model

- Extend the model to other eye-care areas

Recommendation

Solution Details

- Data from the Eye Smart application was ported to Azure cloud by SSIS package

- The analytics module predicted the success of a treatment, e.g. Lasik surgery based on the patient's historical and certain critical data including retina measurement.

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Business Drivers

- Improve forecast accuracy of products demand on a weekly basis for seasonal flu under influence of factors such as weather, incidence, tweets, google flu trends and past orders

- Optimize cost & revenue by reducing stock outs / overstock of the products at distribution centers

- Leverage Big data (e.g. twitter, weather, flu trends, etc.) with the past order information to build a cost effective solution for fast information dissemination providing predictive business insights

Key Highlights

Information and Big Data analytics machine learning platform providing scalable, adaptive mobile enabled Dashboard & predictive solution in near realtime

Solution providing insights into Order distribution characteristics across regions and significant factors contributing to demand

Solution is customizable to suit similar requirements allowing for rapid prototyping and deployment

Solution Highlights

Cognizant proposed an architectural model capable of predicting the demand of products, identify flu outbreaks and display the results as a mobile enabled dashboard

- To Forecast the demand, historic demand-supply data was analyzed along with weather information and twitter data

- HDInsight was used to integrate weather data, twitter data, flu trends, incidence and demand data

- Best-in-class prediction algorithms are used using Azure Machine Learning with R to predict the demand of products based on the combination of weather, past orders, flu outbreak and tweets

- The dashboards could showcase the flu outbreaks, relationship between parameters and predicted demand quantities. Dashboard can be accessed via smart mobile devices providing insight to data

Technology Stack: HDInsight | Azure ML | Hadoop | Spark | Hive | R

Business Outcome

- Helps the client to ensure that products are available at the appropriate distribution centers at the right time to meet the spikes in demand due to the flu outbreak

- Interactive representation of data helps in analyzing the influence of certain factors for order demand. E.g. *Tweets* was the significant factor for deciding the promotional requirements in region 4

- *BigDecisions BD Next Gen BI and Analytics Platform* enables seamless integration and global rollout to achieve effective business expansion
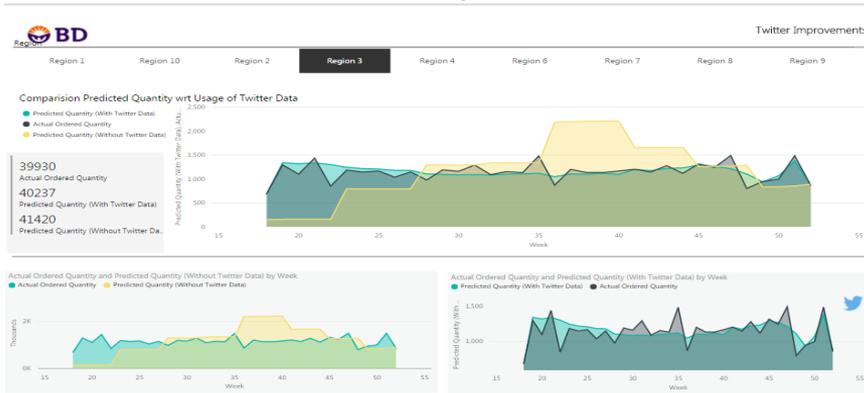
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Predictive Analytics - Solution Architecture and Visualizations (2/3)
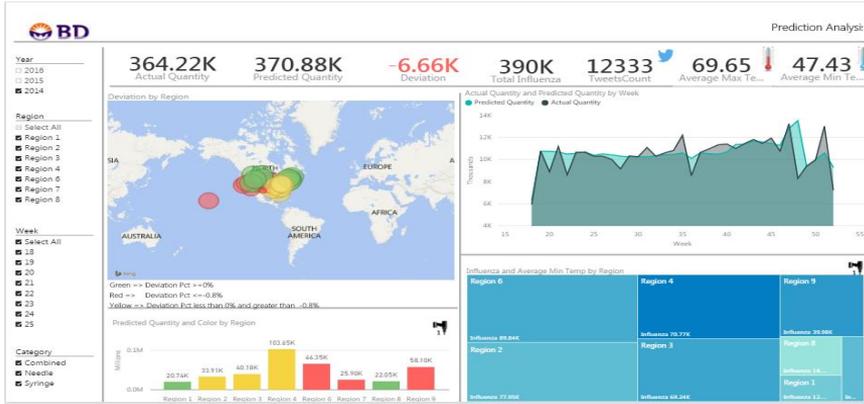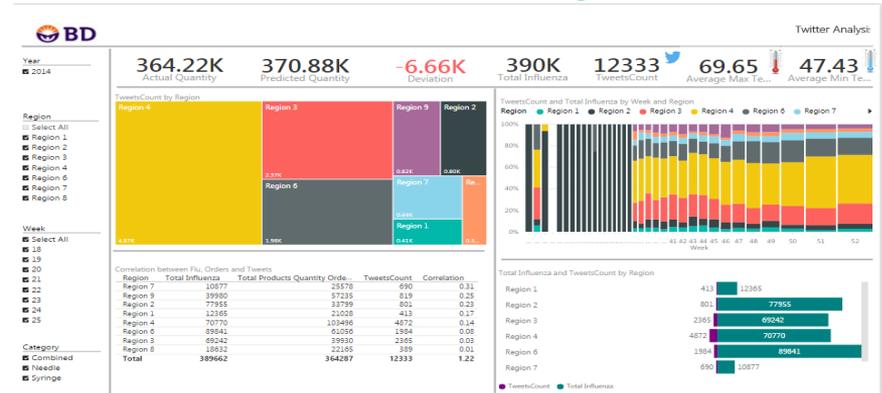

Prediction Analysis
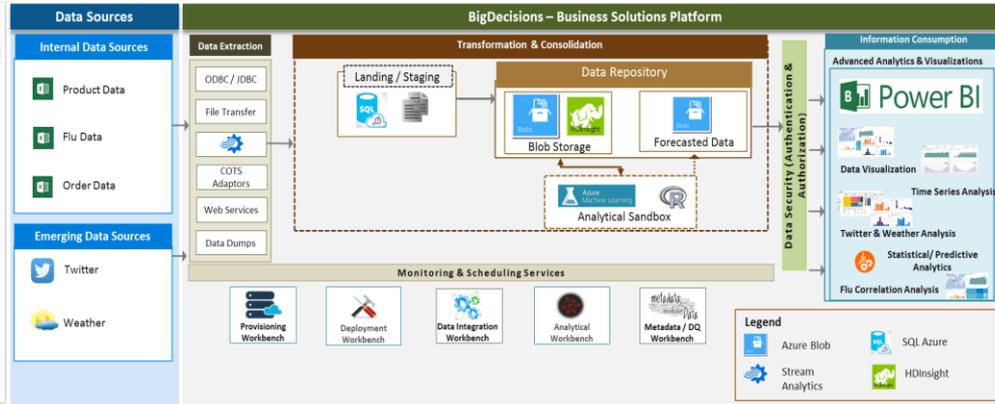
Solution Architecture for BD Big Data PoC

Twitter Improvement

Twitter Analysis

Supply Chain Disruption App
@ a leading Logistics and Supply Chain Company (1/2)

Key Highlights

Increased visibility on Supply chain

Faster response to disruptions

Assess impacts accurately and take proactive action

Business Aspiration Enabled by Digital

- The Goal is to provide business with visibility on impact of Disruptions in the Supply chain – like disasters, strikes, weather changes etc.

- Early warning on Supply Chain disruptions to manage and reduce exposure to supply chain risks

- Automate the entire process with a scalable and a maintainable platform that can address future use cases

Solution Highlights

- Implemented a POC on BigDecisions on Microsoft Azure stack to ingest data from structured and unstructured sources and apply business rules and logic to identify disruptions in terms of significance, magnitude and impact and generate alerts that can be consumed by a Mobile App

- The Disruption engine read from a variety of sources like Twitter, Weather etc, applied Machine Learning algorithms to classify the disruption, assign it a Severity score and accordingly send out feeds.

- The feeds are consumed by a Mobile App which a customer installs on their device and gets alerted instantly when their shipment is impacted.

- The Supply Chain Management is alerted when something disrupts their region's supply chain.

Business Outcome

- Higher accuracy in predicting shipment related info – for example estimated arrival time

- Ensure higher effectiveness of Supply Chain routes and Channels.

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Supply Chain Disruption App
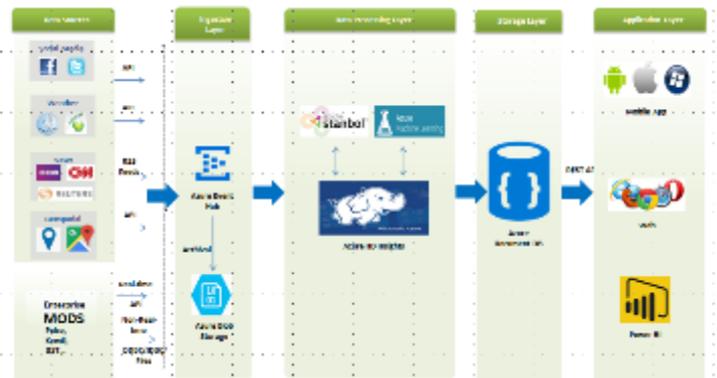
@ a leading Logistics and Supply Chain Company (2/2)

Tech Stack

- Data Ingestion: MS Event Hub & Blog Storage
- Processing: HD Insights, Apache Stanbol
- Storage: Document DB
- Platform: BigDecisions on Azure

Technology Solution Details

- Shipment data comes from Carriers and the organization's Oracle databases
- Disruption data could come from Social Media, News etc. and ingested via Smart Connectors and Azure Event Hub
- Azure ML algorithms assign Severity score based on several parameters and push out qualified disruptions to be consumed by a Mobile App (provided by a Partner). Data can also be consumed via Web services or Power BI Dashboards.

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APPENDIX

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SAR to R Re-platform

Key drivers

- To replace expensive SAS commercial software with an open source freeware 'R'
- SAS is not flexible and algorithms used are not open for research
- Limited performance for real-time / near real – time analytics

Solution Overview

- Data from multiple sources is captured in a text file in SAS Code
- Existing SAS Code is subject to reverse engineering using Cognizant's ZDLC tool and produces documentation of knowledge repository of existing SAS application
- ZDLC Parses the source code, schema and builds meta data & data lineage.
- The SAS code that cannot be converted to R using ZDLC tool is converted manually
- The SAS code is now converted to R and available for further processing such as generating reports, model execution etc.

Case Study: Leading Financial service provider in US

- New solution was built on R-open source platform
- Term Frequency and Inverse Document Frequency (TF-IDF) methodology was provided to give a weighted score to negative sentiments within emails/documents
- Normalized the length of emails/documents by using pivoted length normalization and binning/rank ordering
- Reduced cost by decommissioning SAS license.
- Revamping of existing negative sentiment scoring methodology – the logic was previously unknown
- Created a new solution to efficiently manage customer emails, surveys and online feedback

Cognizant