COLLABORATE17
TECHNOLOGY AND APPLICATIONS FORUM
FOR THE ORACLE COMMUNITY

Developing a Strategic Connection with Business: Oracle Business Analytics at Beckman Coulter

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Tim Vlamis, Vlamis Software Solutions

@TimVlamis

Session ID: 10323

Presenters

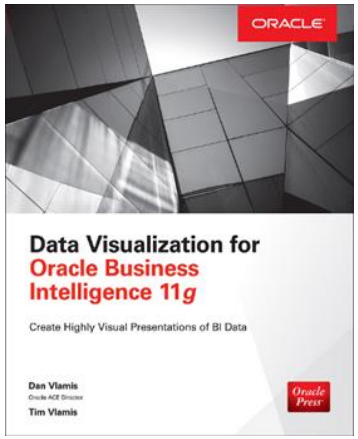
- Erik Lavin – Senior Manager Analytics
  - 7 years with Beckman Coulter
  - Responsible for business intelligence, visual analytics, predictive analytics
  - Expert in Master Data Management, presented at OOW16
  - Managing Partner with BI and DW consulting firm for 8 years
  - MBA Finance USC's Marshall SoB
- Tim Vlamis
  - Vice President and Analytics Strategist
  - Joined brother Dan's firm 10 years ago
  - Named contributor to and expert instructor for OU's Data Mining, Oracle R Enterprise, and Oracle Advanced Analytics courses
  - BA Yale University, MBA Northwestern's Kellogg SoM

Beckman Coulter develops, manufactures and markets products that simplify, automate and innovate complex biomedical testing. More than 275,000 Beckman Coulter systems operate in both Diagnostics and Life Sciences laboratories on seven continents.

BECKMAN COULTER

Vlamis Software Solutions

- Vlamis Software founded in 1992 in Kansas City, Missouri
- Developed 200+ Oracle BI and analytics systems
- Specializes in Oracle-based:
  - Enterprise Business Intelligence & Analytics
  - Analytic Warehousing
  - Data Mining and Predictive Analytics
  - Data Visualization
- Multiple Oracle ACEs, consultants average 15+ years
- www.vlamis.com (blog, papers, newsletters, services)
- Co-authors of book “Data Visualization for OBI 11g”
- Co-author of book “Oracle Essbase & Oracle OLAP”
- Oracle University Partner
- Oracle Gold Partner



ORACLE EDUCATION RESELLER

ORACLE APPROVED EDUCATION CENTER

ORACLE Gold Partner
Specialized
Oracle Business Intelligence
Foundation Suite 11g

Infrastructure at Beckman Coulter

- E-Business Suite
- Oracle Exadata Data Warehouse
- Oracle Master Data Quality
- Oracle Business Intelligence
- Oracle Enterprise Data Quality
- Oracle Eloqua
- Oracle Configure, Price and Quote Cloud
- Oracle EVERYTHING (70-100 applications)
- Also plenty of Salesforce, SAS JMP, Tableau, and a hundred other products that people downloaded themselves.

Importance of Business Intelligence

- More than 3000 users
- All functional areas need to do analytics
  - Marketing
  - Sales
  - Finance
  - Service
  - Logistics and Manufacturing
  - HR
- Danaher KPIs rule the business

Many are not comfortable with Analytics

Analytics = Evidence-Based Analysis

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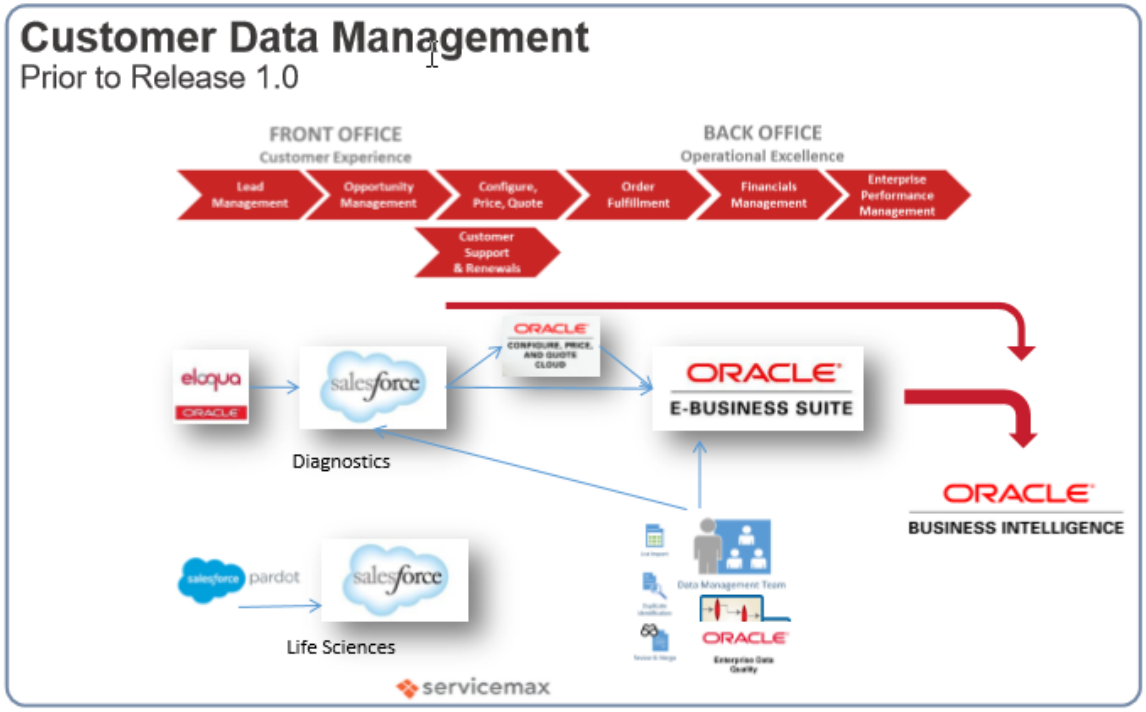
The Ultimate Goal is Data-Driven Decision Making

Data Quality is Key to Analytics

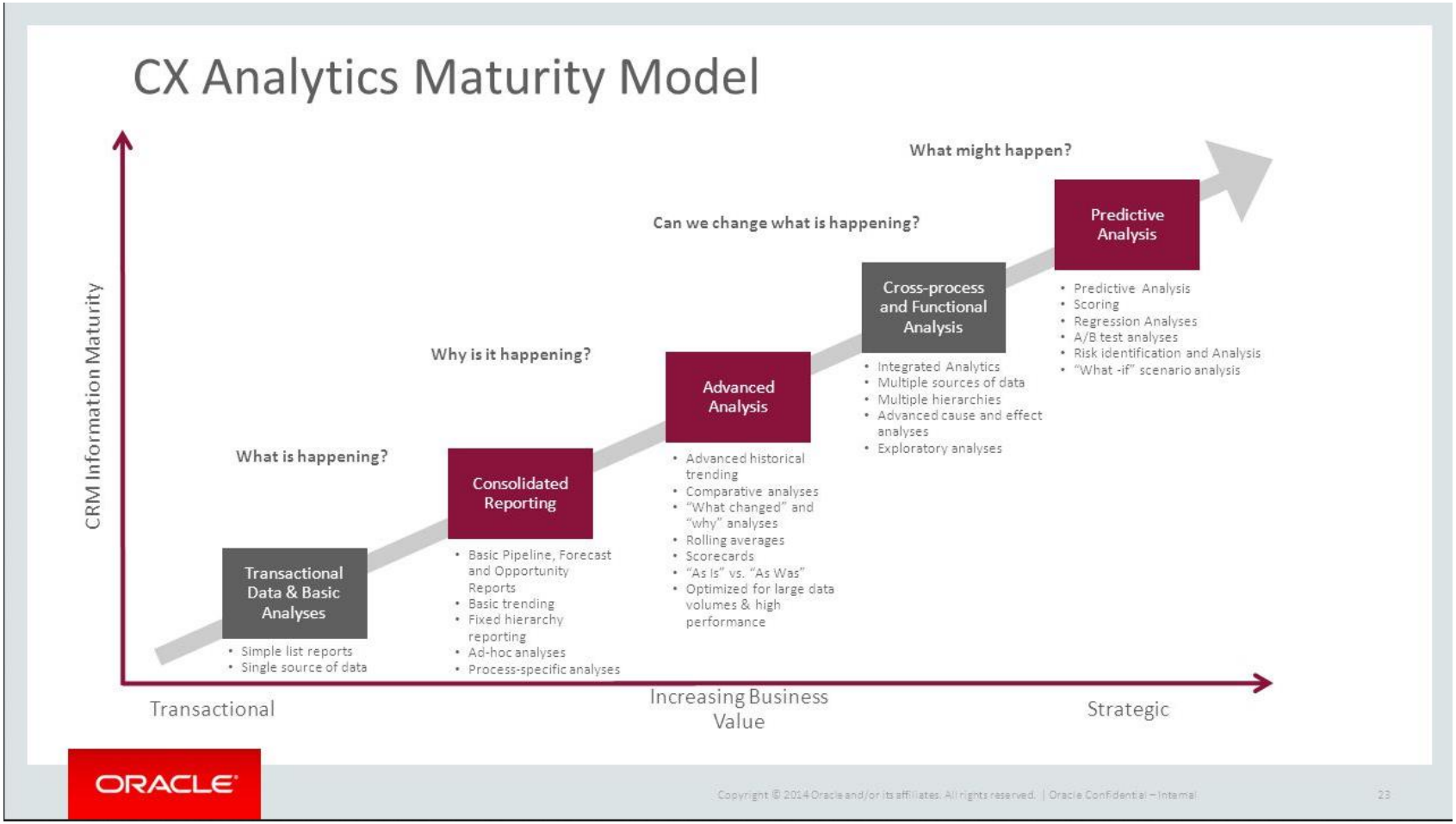
Before Customer Data Management Release 0.5 (**2015Q2**)



- Lack of single and complete 360View of Customer and Contact Information impacting
  - **Marketing Effectiveness**
  - Sales Effectiveness
  - Operational Inefficiencies for Order to Cash Process
  - **Data Management Inefficiencies**
- Revenue Growth is hampered by inaccurate, incomplete, disparate data
  - Up/Cross-sell
  - Customer Experience
  - **Lack of trusted, actionable Data and Analytics (BAMV)**
- Risk Management Impact
  - IT Project Risk
  - Regulatory Compliance Risk

https://oracle.rainfocus.com/scripts/catalog/oow16.jsp?search=%22data%20quality%20for%20the%20cloud%22&showEnrolled=false

Need for Advanced and Predictive Analytics




STATISTICAL
BEHAVIOR
USED
FUNCTIONS
METHODS
VARIABLES
MODELING
DEPENDENT
REGRESSION
PREDICTIVE
LEARNING
CLASSIFICATION
ANALYSIS
MODELS
TIME
ANALYTICS
VARIABLE
DATA
SERIES
NETWORKS
TECHNIQUES
DECISION
MODEL
CUSTOMER
LOGIT
MULTIVARIATE
DISTRIBUTION
RELATIONSHIP


Predictive
Analytics
Straight Ahead

Data Discovery Workshop Summer 2016

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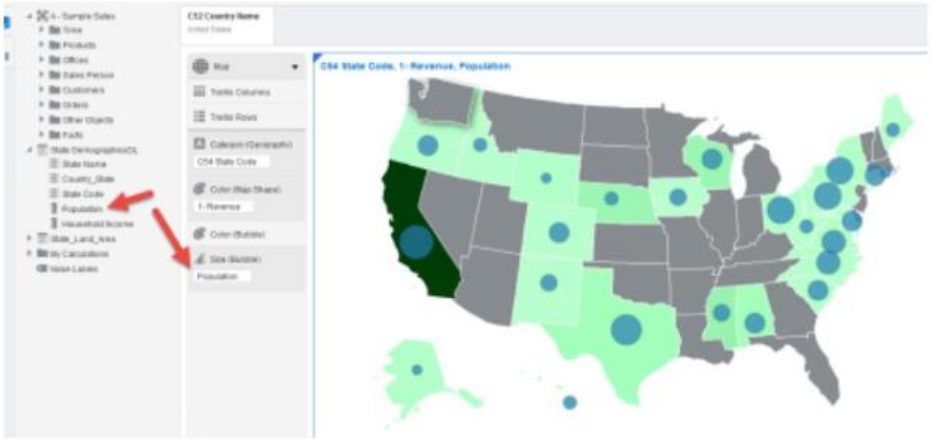
Add Population from State DemographicsDL sheet to the Map Size (Bubble)



Click Add Calculation and create a new measure called Rev Per Person by dragging the revenue and population measures into the column formula box and creating the following formula "1-Revenue/Population". Type "Rev Per Person" in the Display Name field. Click "Validate" to confirm the syntax is properly formed. You can also create formulas using the functions located in the right hand pane.

Predictive Analytics Summit Overview

"Fostering a Culture of Analytics with Data-Driven Decision Making"

- Danaher Labs familiarize associates with the fundamentals of Predictive Analytics.
- Identify where Beckman Coulter is on the Analytics Maturity Curve Model – journey to the upper right.
- Hands on workshop on Visualization, Advanced and Predictive Analytics pertinent to business unit.
- Gemba Visit to Beckman's Vision Center to better understand instrument data and lab operations.
- Analytics products Beckman Coulter is currently providing external customers.
- Data Quality, Data Virtualization and supporting projects on our collective Analytics journey.
- IT footprint and Roadmap for Analytics applications and business enablement.
- Develop and codify Business Cases where Advanced Analytics will have a material impact.
- Leverage experts in both predictive analytics and the IT tools leveraged at Beckman.
- Held in February 2017

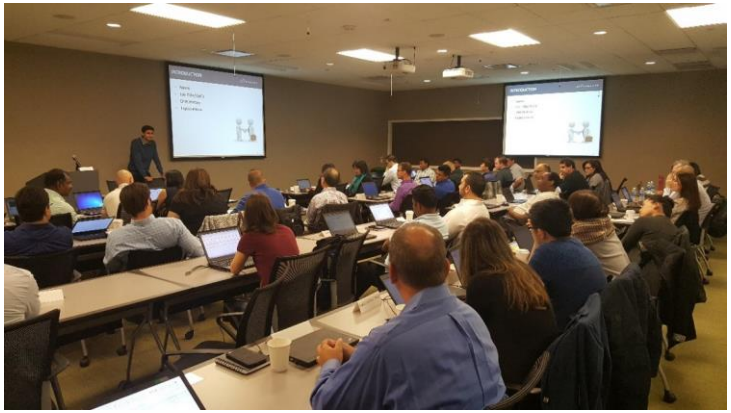
Agenda February 2017

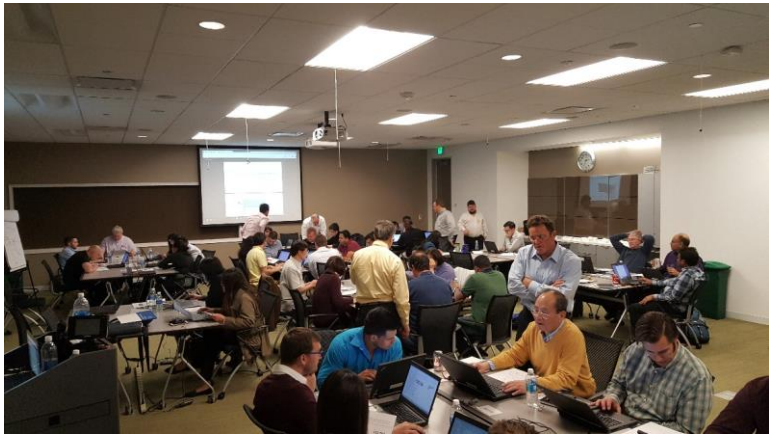
- Days 1 & 2
  - DHR Labs traditional 2 days of Predictive Analytics Boot Camp
  - Gemba Vision Center Tour 2pm
  - Power Users Breakout – assist to validate Data Sets

- Day 3
  - Morning – Speakers include:
    - Beckman IT – Stephen Adams Director ERP, CRM and Business Intelligence
    - Operations and the Kerr-Heijunka Model – Srini Rengaraju
    - Analytics and Clinical Informatics Products– Annapurna Karicherla
    - Oracle Analytics Roadmap – Joe Thomas Sr. Director Analytics
  - Afternoon – Visualization Workshop - Break into Functional Areas
    - Connecting and Mashing Data
    - Build Visualizations, Storyboards, Advanced Analytics – prebuilt Beckman Operations data set

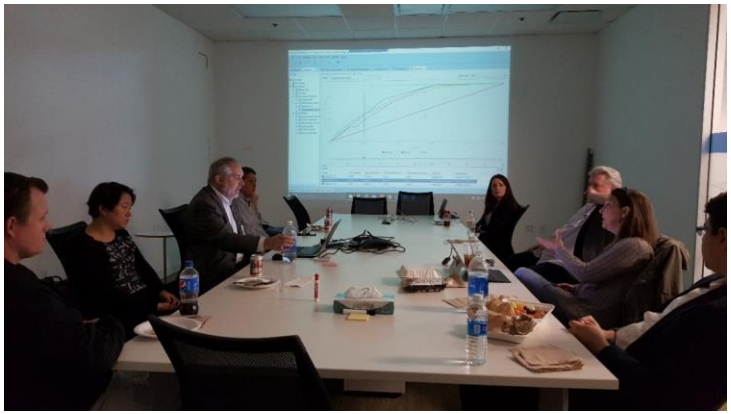
- Day 4
  - Visualizations, Storyboards, Advanced Analytics – on your data
  - Gemba Vision Center Tour 11:30 – 12:30
  - Mid-Day Presentations on Functional Groups Storyboards

Days 1 & 2 Danaher Labs Boot Camp – Classroom setting





Days 3 & 4 Expert Speakers, Visualization and Advanced Analytics Collaborative Workshop



Roundtable Breakout on next-generation Predictive Analytics Technologies, Cloud Data Mining and Discovery

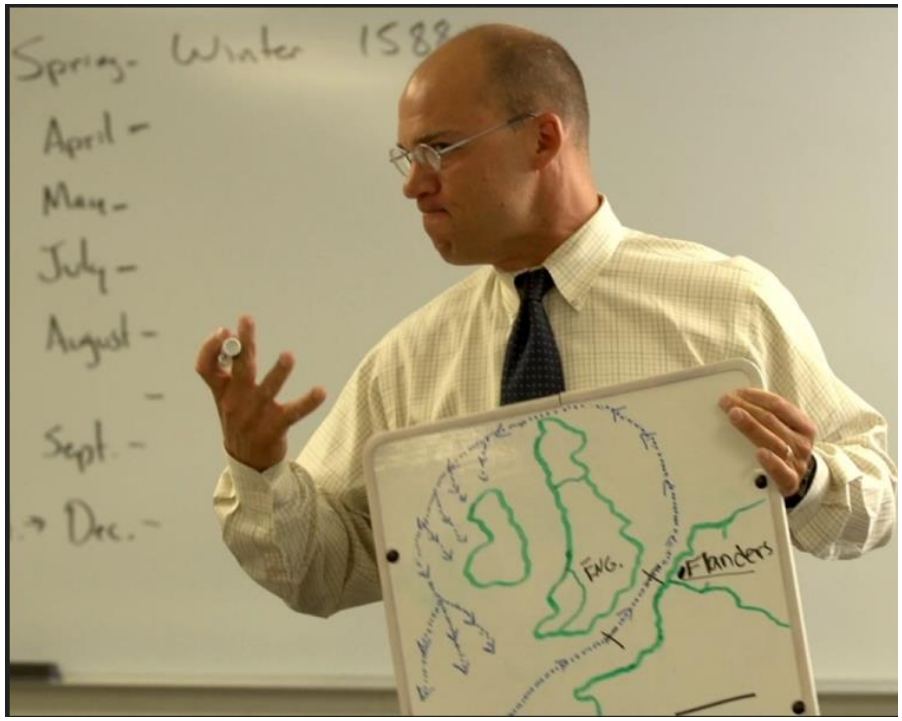
Danaher Labs

- Danaher Labs is our new innovation center bringing together the leading subject matter experts, technologists and engineers for the common purpose of accelerating development and commercialization of Disruptive Computing solutions into the marketplace. Located in Silicon Valley, the heart of global innovation, Danaher Labs is ideally situated to capitalize on the digital mega trends transforming our world, including cloud infrastructure, big data analytics and mobile applications.

Data Science Labs Vs. Corp Computing

- Data scientists work independently
- Work in smaller, less complex environments
- Emphasis is on data, not business process
- Lessened focus on security, scalability, integration

Data Science Labs Vs. Corp Computing



Challenges: Language

- The language of data science and predictive analytics intimidates many people

Challenges: Starting with Hard Problems

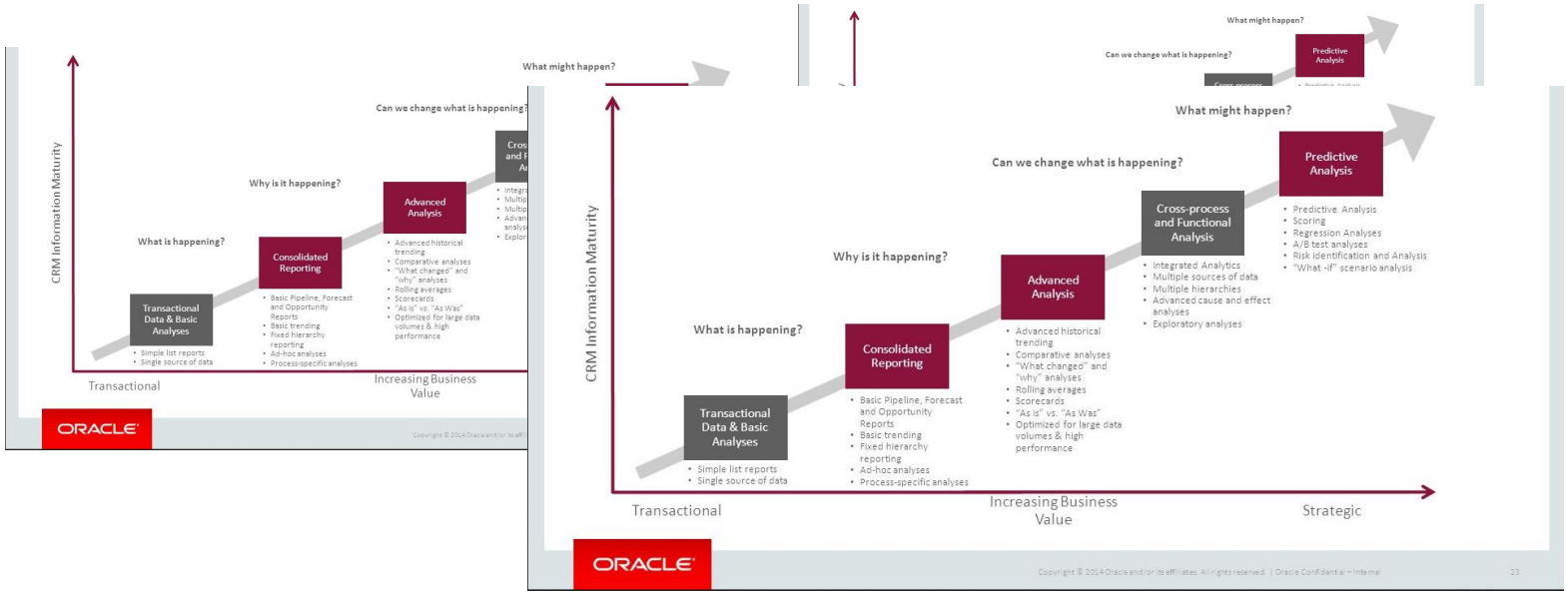
- Many analysts want to start with their hardest problems that they can't solve with traditional tools.

$$\left(1 - \sum_{i=1}^{p} \phi_i L^i\right) (1 - L)^d X_t = \delta + \left(1 + \sum_{i=1}^{q} \theta_i L^i\right) \varepsilon_t.$$

This defines an ARIMA(p,d,q) process with **drift** $\delta/(1 - \Sigma\varphi_i)$.

Challenges: Maturity Curve(s)

- Organizations, work groups, and individuals all have differing maturity curve levels.



Oracle Technologies Used

- Combo of OBI 12c and Data Visualization Desktop
  - Want attendees to be able to use Beckman OBIEE Subject Areas
  - Showcase latest Data Visualization features, maximum flexibility
  - May be some confusion for those new to interface
- Will use Oracle R Distribution in OBI
  - Easy install with DVD
  - Runs on BI Server
- Includes “auto” algorithms
  - Cluster (kmeans, hclust)
  - Outlier
  - Regression
  - Trendline
  - Time Series Forecast (ARIMA, Exponential Smoothing)

Preparation Work

Prep Work prior to Summit

- Secure Executive Sponsorship – per business function, tie to PDs and Kaizens. L1 and L2.
- Ensure cross-function participation: Service, Sales, Marketing, Finance, IT, R&D and Operations.
- Confirm Cross-OpCo involvement, new ways to look at shared problems.
- Identify leads for each business function.
- Solicit feedback on content of Summit activities early.
- Two general information sessions on goals and format of Summit - mandatory attendance.
- Two function specific workshops to develop use cases.
- Assess maturity of Analytics per function.
- Develop and define and document Use Cases – per business function. Upload files to Box.
- Identify data sets required and submit to Box, leverage IT to help extract data if necessary.
- Provide instructions to download and install Oracle Data Visualization software from shared drive.
- Associates install Data Visualization and Predictive Analytics software
- Contact each attendee to assist associates who are having issues with documenting use cases or identifying data sets.
- One IT specific workshop to inform IT associates of what is required prior, during and post-Summit.

Business Questions for Use Cases

- What are the key business questions and/or predictions that are of interest?
  - Are the questions related to reduction of costs? Variable? Fixed?
  - Are the questions related to increase of sales? Units? Margin? Greater market penetration? New market (customer) development? New products/service?
- How will these answers be used?
- Who is the audience for these answers?
- How often are the answers required?
- Are there any naturally occurring subsets/partitions of the data set that are clean, well-documented and well-understood?
- Is there a standard Decision Model or Business Process Flow framework in use?
- What data sets are available that are potentially useful in answering this question (be broad)?
- What data is available regarding specific locations?
- What data is available regarding specific customers?

Custom Data Sets Guidelines

- Create an Excel worksheet
- All data should be on a single worksheet
- Row 1 must include Column Names
- Rows 2-X should include data records with no nesting or aggregation rows
- Columns names should be unique and not include any special characters ($, &, etc.)
- Include both numeric (fact) and attribute columns
- Include at least one date column with a consistent, standard date format
- Min six columns and no more than 40 columns.
- Include at least 100 rows of data and no more than 50,000 rows.
- Complete data sets (value for every cell without nulls) work best.

Install Analytics Plug Ins per use case

Sample Use Cases

Use Case Summary

- Each functional group had several use cases prior to Summit. Post Summit the use cases are being refined, expanded and consolidated.
- Key use cases moving forward:
  - Operations:
    - Kerr-Heijunka model, as-is state with visualization. Predict future 'levelness'
    - Freight, where to locate inventory in advance based on future sales.
    - Current excess inventory and leverage predictive for planning.
    - Late shipments by specific distribution centers impacting OTD
  - Sales:
    - Service activities impact future revenue.
    - Activities that impact the reduction of churn.
    - Customer profitability and price erosion.
  - Service:
    - Service Notes predictor of instrument failure.
    - Use of Spare parts usage by instrument, region, associate.
    - Service effectiviness of repair per instrument, part, associate (tenure and training).
    - Indicators, operational or instrument data that contribute to a CAPA – regulatory issues.
  - Human resources, employee retention.
  - Marketing, campaign effectiveness.

Operations Inventory

Objective: Reduce Inventory, Increase Turns

Summit Accomplished:

Uncovered excess xM in excess inventory.

Next Steps: Ascertain the breakdown of product type, product line and org, other attributes to follow depending on findings. Add planning data to increase efficiencies in production.

Expected Benefits:

Possible increased findings of up to xxM.

Sales Retention

Objective: Hypothesis that service activities have a correlation on retention.

Summit Accomplished:

Cross-functional collaboration between Sales and Service. Identify customers at risk for churn as a result of service activities.

Next steps: Add data by area and region and see if there is a particular area/region more prone to Customer Refuses Troubleshooting.

Expected Benefits:

Decrease churn

Operations Kerr-Heijunka Model

Objective: Ascertain factory's "levelness". High levelness = less inventory, less shortages, less OT)

What Summit Accomplished:

Advanced combinations of many data sets. Leveraging tool to gain rapid insight into the data for sustainment.

Next Steps: Apply predictive analysis to the model and combine the Kerr-Heijunka model with other DHR tools such as Inv Mgmt and Dynamic Kanban.

Expected Benefits:

Rapidly identify when the levelling is out of balance and enable the organization to swiftly respond to changing market conditions.

Service Repair Effectiveness

Objective: Reduce Engineer time to read individual Service Requests (thousands) and determine key failure/action paradigm.

Summit Accomplished:

Improvement by 1500x!

Next Steps:

Create R-Based / ML algorithms using to group SR's by key paradigm. Utilizing Latent Dirichlet Allocation, we can cluster documents based on salient terms.

Expected Benefits:

Increase service effectiveness to decrease costs associated with labor and incorrect part usage and increase uptime.

Service Part Usage

Objective: Identify Part problems and repair usage.

Summit Accomplished:

Rapidly explore service requests (xxk+) compare with part usage and replacement data. Found usage over attributes as indicator.

Next Steps: Apply predictive analytics to better manage usage and replacement of parts.

Expected Benefits:

Decrease service activities and improve repair effectiveness.

Action Items and Sustainment Activities

Results

- Anecdotal
- Survey
- Hands-on sessions were by far most popular.
- Statistics terminology turned off some.
- Round tables facilitated team work, but made presentations to the entire room more challenging.
- Millions of dollars identified in savings.
  - Expect non-linear results

Sustainment

- Representatives selected by senior management from each of the functional areas as leads for Analytics projects.
- Functional groups will have a standard cadence for meeting and working together on their various projects.
- Associates requested one point lessons on topics touched on during the Summit, such as ‘data mashups’, best practices for visualizations and predictive models.
- Accelerate Master Data Management capabilities to clean, categorize and standardize data with the understanding that good data results in better analytics.
- Projects kicked off to address data and process issues in our systems since several of the Analytics projects proposed quickly uncovered that the necessary data was challenging to leverage. First applications to undergo review, SalesForce and Eloqua (Oracle marketing application).
- IT to enable the business to conduct their own analysis and promote self-serve capabilities. Currently reviewing next generation data virtualization architectures.
- Repository of analytics materials, use cases and data taxonomy.
- IT Technology Roadmap *attached
- Business prioritize roadmap *attached

Immediate Action Items

- Install Oracle R Enterprise (ORE) on a enterprise server development environment. This will allow R to be executed at essentially the kernel level of the DB and not be constrained by memory or traditional .
- Team with R&D/RMS teams to evaluate products / OpenSource solutions.
- Service leverage Text Analytics to analyze freeform Service notes. We will be leveraging a new feature/algorithm in the Oracle DB version 12c being rolled out. Test hypothesis for one product line, if successful roll out to other lines.
- Oracle has a new Machine Learning Notebook being offered with a rich feature set and sharing capabilities. R&D will participate in the Beta program.
- Productionalize the Visualization and Predictive analytics tool for general access.

IT Alignment to Enable Advanced Analytics
Key Initiatives

- Visualization tool deployment.
- Master Data Management Program, clean data = better analytics.
- Data Virtualization and Data Lake architectures.
- Mobility for Analytics - SalesForce accessing our analytics warehouse.
- Advanced Analytics robust tool sets and infrastructure.
- Resource allocation, 1 to 2 associates per function; Service, Operations, Sales, Marketing, Human Resources
  - Enables business to pull data from various source systems.
  - System knowledge of data flows and connectivity.

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Q&A