Predictive Analytics and Data Visualization at Beckman Coulter

Erik Lavin

Tim Vlamis

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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 – VP & Analytics Strategist
  - Joined Vlamis Software Solutions 10 years ago
  - Expert in data visualization, machine learning, and data analysis
  - Named contributor to and expert instructor for OU's Data Mining, Oracle R Enterprise, and Predictive 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. For more than 80 years, our products have been making a difference in peoples' lives by improving the productivity of medical professionals and scientists, supplying critical information for improving patient health and delivering trusted solutions for research and

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
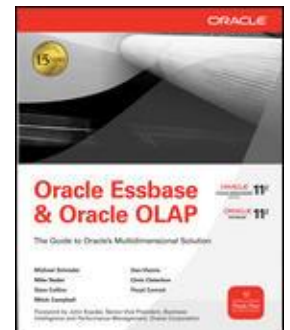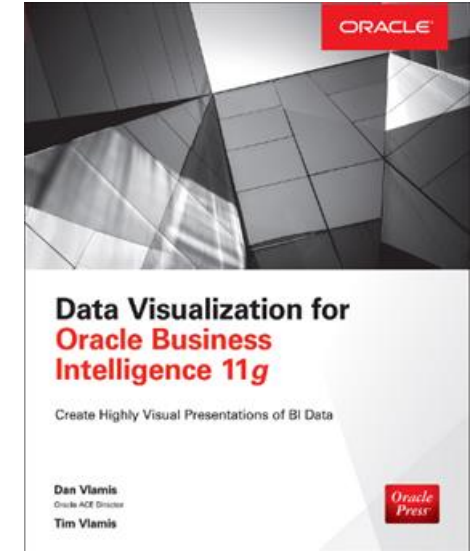
Infrastructure at Beckman Coulter

- 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

"What if we don't change at all ... and something magical just happens?"
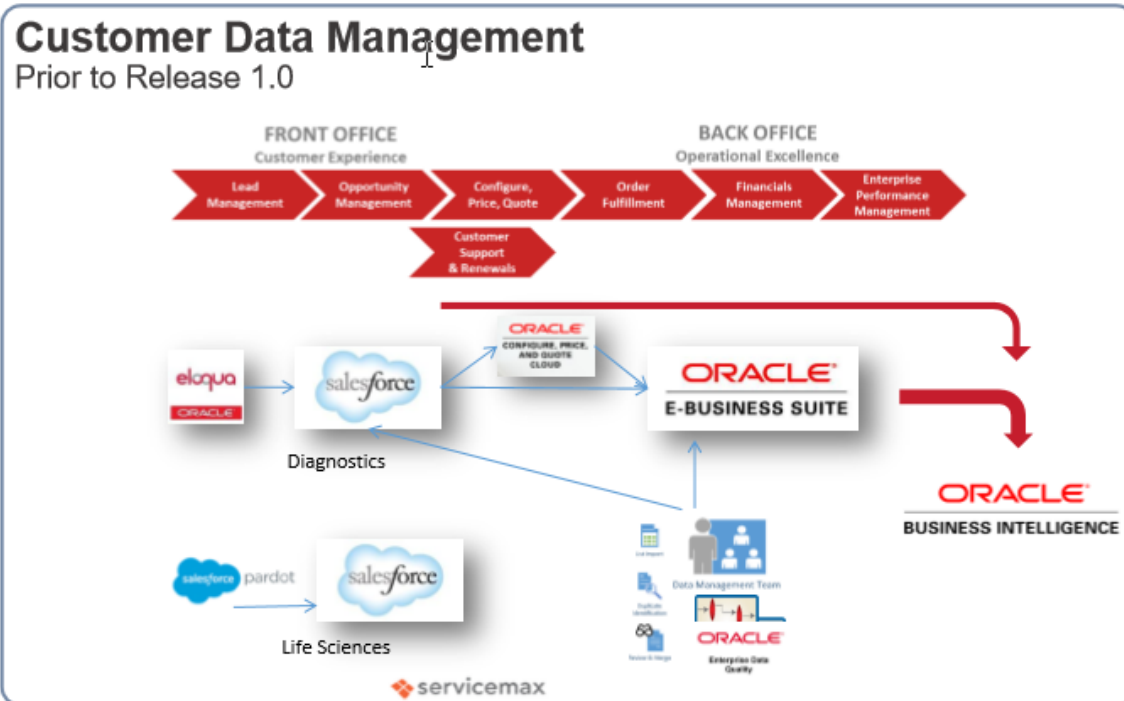
Analytics = Evidence-Based Analysis

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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**)

Customer Data Management
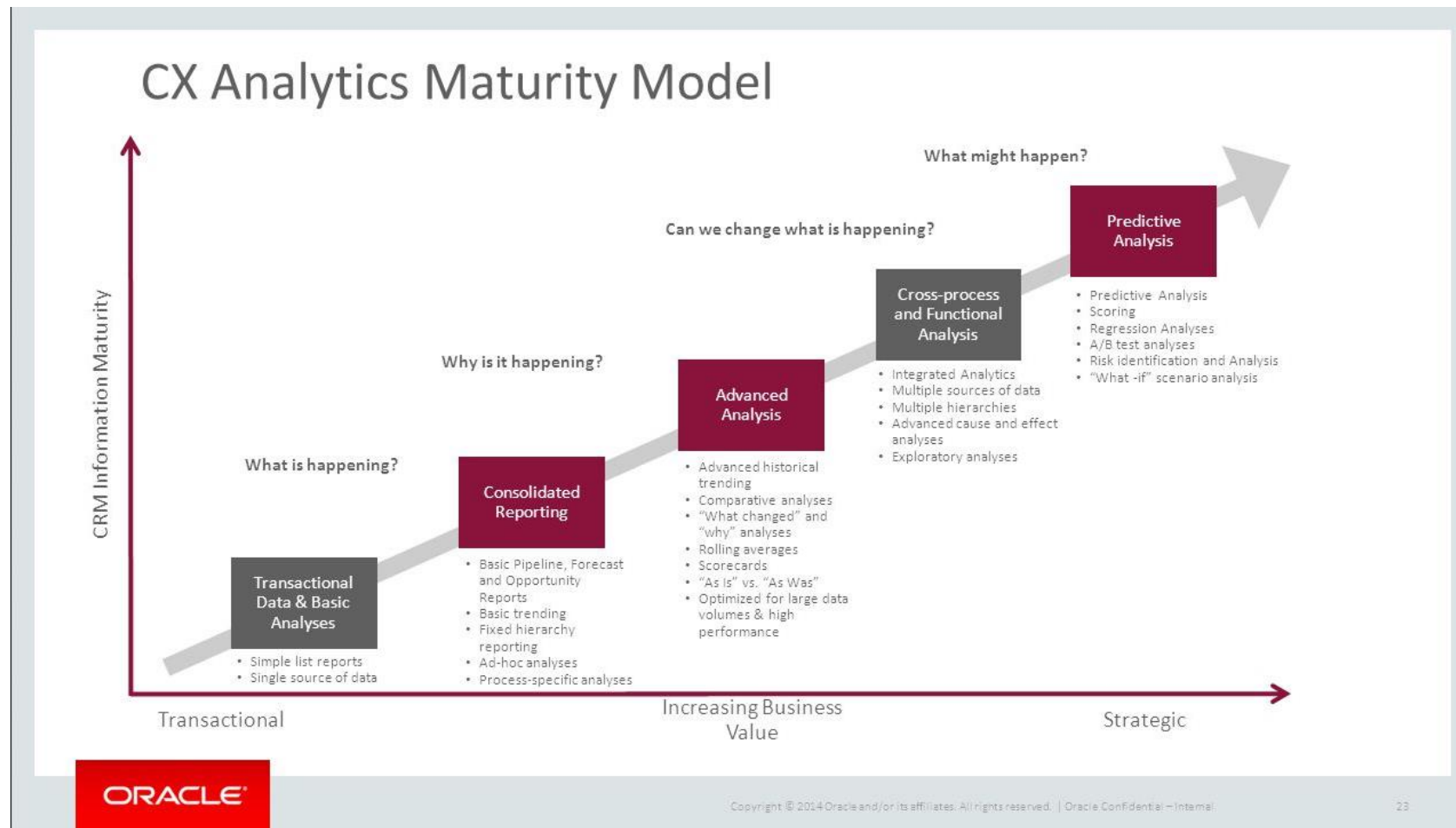Prior to Release 1.0

- 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

Predictive Analytics Summit Overview

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

- Danaher Labs familiarize associates with the fundamentals of Predictive Analytics.
- 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.
- Identify where Beckman Coulter is on the Analytics Maturity Curve Model – journey to the upper right.
- 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
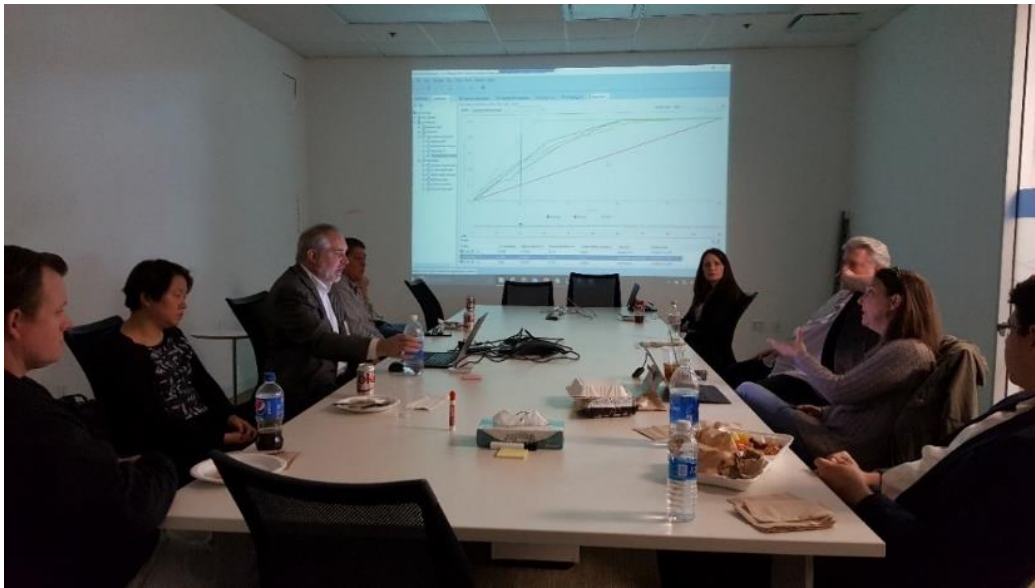 - Mid-Day Presentations on Functional Groups Storyboards

Physical Layout

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

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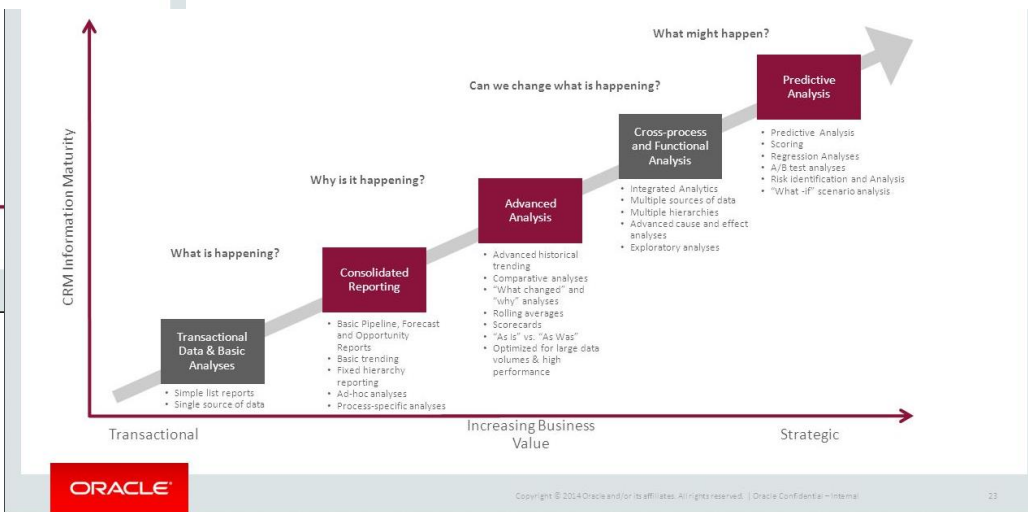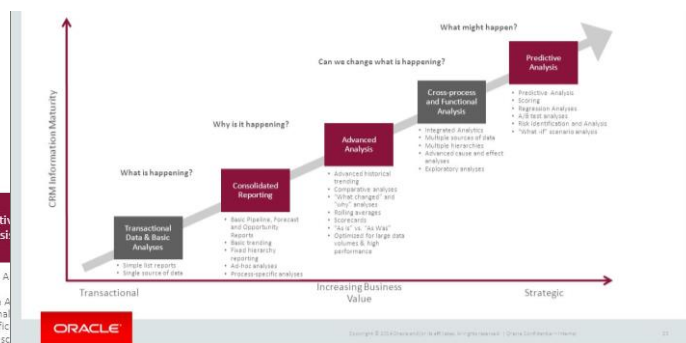
$$\left(1 - \sum_{i=1}^{p} \phi_i L^i\right)(1 - L)^d X_t = \delta + \left(1 + \sum_{i=1}^{q} \theta_i L^i\right)\varepsilon_t.$$

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.
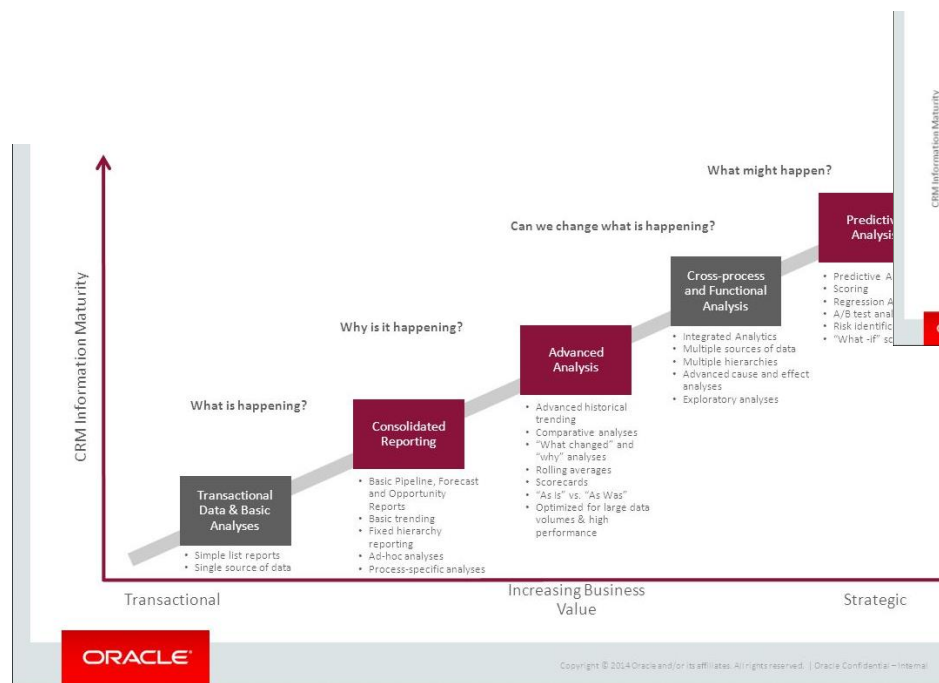
Think like a venture capitalist. Place a large number of small bets rather than one or two large bets.

Plans for Predictive Analytics Summit

- Four Day Program Feb 21-24
- Attendees from across Beckman functional business units
- Two Day Danaher Labs Data Science Boot Camp
  - R is focus
  - Participants required to watch series of videos in advance of workshop
  - Leverage corporate expertise, build support and coherence
- Two Day Visualization and Predictive Analytics Workshop
  - Uses Oracle Business Intelligence 12c and Data Visualization Desktop
  - Presentations from Oracle and 3rd party Silicon Valley thought leader
  - 1.5 days of hands-on with Vlamis
  - Participants bring own data sets
  - High instructor to participant ratio

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
- Used 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

Preparation for Analytics Summit

- Sample Business Questions for Use Cases
  - What are the key business questions and/or predictions that are of interest?
  - How will these answers be used?
  - Who is the audience for these answers?
  - …
- Sample Custom Data Set Guidelines
  - 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.)
  - …

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?

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 (Uncovered excess xM in excess inventory):
        - 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 (Decrease churn):
        - Service activities impact future revenue.
        - Activities that impact the reduction of churn.
        - Customer profitability and price erosion.
    - Service (Decrease service activities and improve repair effectiveness):
        - Service Notes predictor of instrument failure.
        - Use of Spare parts usage by instrument, region, associate.
        - Service effectiveness 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.
- 30+ individual projects resulting from workshop

Results

- Anecdotal
- Survey Monkey
  - 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.
- Hard ROI
  - Significant dollars identified in savings.
  - Expect non-linear results
- 30+ individual projects resulting from workshop

Survey Results

- Oracle SC Quotes:
  - I will use a condensed version of the workshop structure in sales cycles, as an extended and controlled lunch and learn workshop to get prospects or current OBIEE users familiar with DV in an effort to grow the account or keep competitors at bay. –Phue Nguyen, Oracle SC
  - What stands out to me is that the event was well prepared, well organized (helps having an internal sponsor), right participants (i.e. higher level stakeholders with good use cases to prove value) and good content (i.e. engaging, proper mix of PPT, labs and participation). –Tom Burnes, Oracle SC
- Participant Quotes
  - I would like to see more hands on with the visualization software. We only had one day of hands on that was very good. I really liked that the oracle team was there. They provided a lot of good information. –business user class participant
  - I only wish we had more time dedicated to working on our own projects after learning the new tools. It is so hard to come back to our normal work and ensure we integrate what we learned so having more dedicated time would allow for us to better understand the information and be more independent once we get back home. –business user class participant
  - I think this was a great introduction and has a lot of potentials. I wish we had more time to practice with our own data while the experts were available. –business user class participant

Survey Results

- Question: What was the most insightful information and beneficial activities of the Summit?
  - the oracle team session was very appreciated. the practical and working with the data was also good. i really liked having all the help right there in the same room. that was one of the most helpful things.
  - That predictive analytics is actually being used for business use cases (not just IoT) that support decisions
  - how easy it is to use the software
  - Most insight from interacting with some of the senior analytics group internal and consultants. Ability to hear from the field in terms of what is actually possible and how to manage the expectations of management, and our own teams.
  - Data Science as a Journey was a very important take-away. Definitely looking forward to coding up some more ideas in R. Uniting advanced analytics with the rigor of DBS, would really help us generate better action plans, and even predict what we should do next, as opposed to reacting to gaps.

Survey Results

- How likely would you recommend the Summit to other Associates?
  - Absolutely 48%
  - Very likely 31%
  - Likely 21%
  - Not likely 0%
- Printed 50 workbooks. Some people had to share.
- > 70% Plan to leverage OBI as source for Advanced Analytics

How to Improve

- Playing around with our own data was good.
- Wish we had more time to apply our own data.
- A little more 1-on-1 training.

Replicating Workshop

- Have 1-page PDF of workshop deliverable
- Vlamis has proven methodology
  - Fully-developed preparation materials
  - Have questions to elicit business interest
  - 35-page analytics class using OBI-AA technology
  - Ready for delivery now
  - Half-day session to create interest
- What clients would benefit?
  - Already have BI system where we can pull data
  - Interested in Advanced Analytics but want a proven successful program

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

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.

Don't Miss These Webcasts!
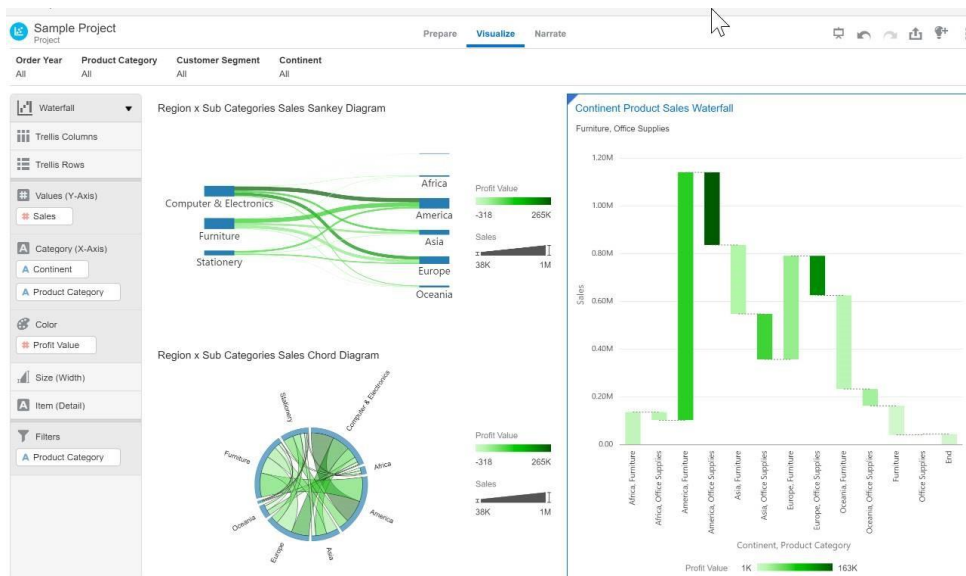
- DVD 4.0 New Features – October 24, 2017
  - Registration now open!
- OAC 4.0 New Features – November 14, 2017
  - Registration now open!
- Visit www.vlamis.com/papers for more information

Analytics and Data Summit

All Analytics. All Data. No Nonsense.
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Formerly called the BIWA Summit with the Spatial and Graph Summit
Same great technical content…new name!

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Call for speakers is now open with rolling acceptances until December 3, 2017

Thank You! Questions?

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- Tim Vlamis   tvlamis@vlamis.com