

SOFTWARE SOLUTIONS

Data Visualization for Oracle Business Intelligence

Great Lakes Oracle Conference Tim Vlamis Wednesday, May 18, 2016

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





Specialized Oracle Business Intelligence Foundation Suite 11g



Dan Vlamis

Tim Vlami

ORACLE APPROVED





D Tim Vlamis

Vice President & Analytics Strategist

- 30+ years in business modeling and valuation, forecasting, and scenario analyses
- Oracle ACE
- Instructor for Oracle University's Predictive Analytics, Data Mining Techniques and Oracle R Enterprise Essentials Courses
- Professional Certified Marketer (PCM) from AMA
- Adjunct Professor of Business Benedictine College
- MBA Kellogg School of Management (Northwestern University)
- BA Economics Yale University



Presentation Agenda

- Human cognition insights
- OBIEE demo
- Table design
 - Best practices
 - When and when not to use
- Graph design
 - Best practices
 - Use cases for different graph types
- Data Exploration
- Questions from audience at all times



Main Uses of BI Systems



vlamis

Many BI Systems Can Create Beautiful Results

and a state

THURSDAY

OBI Operates at a Different Scale

OBIEE Demo Content from Chap 1



Copyright © 2016, Vlamis Sc

Vlamis

Good



% of All Rows :

59.49%

* Month

Between

12 H12

6 |Z

1

Carrier

Ω

Delay Performance by Geography Key Metrics and Associated Delays

Passenger - Delay Perf Orig Airport # of Flights % of Total Miles (M) % All Orig Airports 3,709,454 100.0% 9.1% 328,034 691,998 18.7% Midwest Region 48,525 10.8% East North Central Division 491,158 13.2% 33,998 10.9% 1 West North Central Division 200,840 5.4% 14,527 10.4% Northeast Region 423,226 11.4% 44,389 8.2% South Region 107,799 1,492,575 40.2% 9.9% 177,198 East South Central Division 4.8% 7,199 11.3% South Atlantic Division 821,345 22.1% 67,067 9.8% West South Central Division 494,032 13.3% 33,533 9.5% West Region 1,101,655 29.7% 122,759 7.6%

Late Flight Trends

By Time and Performance % Thresholds





Origin Airport





Good _







Best Practice Focus for Dashboards

- Best practices are objective guides for effectiveness
- Visualizations should be guided by:
 - Human cognition
 - Accurate representations of data
 - Preferred message (consciously designed by visualization developer)
- Visualizations should NOT be guided by:
 - Taste or what looks "good" to one person
 - Entertain users
 - A desire to "fill the white space"



The Principles of Human Cognition Should Guide BI Dashboard Design



Classic Optical Illusions



Which Soldier is Tallest















Owensboro Police Department 2005 Annual Report

Baccalaureate Degree Institutions of New Graduate Students- Fall Quarters-Percentages from Type of Institution





Weekday Server Load









	Store 001	Store 002	Store 003	TOTAL
Total Invoices	298,943	687,091	313,140	1,299,174
less				
Cash Invoices	207,256	449,064	141,305	797,625
leaves				
Non-cash Invoides	91,687	238,027	171,835	501,549
consisting of				
Suppressied Invoides	18,888	15,527	6,501	40,916
and				
Customer Invoices	72,799	222,500	165,334	460,633
for purchases from				
Suppressed Customer Names	2,123	4,306	870	7,299
and				
Active Customer Names	2,103	14,747	8,342	25,192
which include				
Duplicate Customer Names	70	693	619	1,382
leaving				
Unique Customer Names	2,033	14,054	7,723	23,810
which include				0.000
Bad Address es	1,055	5,759	2,406	9,220
amis Succession leaving	070	0.005	E 047	10.000
Mailable Customer Names	978	8,290	0,31/	14,690



Graphs and Tables

Graphs and Charts depict visual representations and relationships



New Product Market Penetration

Tables show data organized for lookup of specific, precise values or items.

Order Type	No of Orders	Sales	Billed Quantity	Actual Unit Price
Express	13,980	\$14,027,034	1,117,199	\$12.56
Secure	29,347	\$28,513,745	2,326,540	\$12.26
Standard	27,673	\$27,459,221	2,213,482	\$12.41
Grand Total	71,000	\$70,000,000	5,657,221	\$12.37



Characteristics of Tables

- Can present data at drastically different scales.
- Can present very different data types simultaneously.
- Can repeat and include multiple sets of the same data values.
- Are extraordinarily dense and include numerous data relationships without direct distortion of the data itself.
- Tables can present "federated" data from different sources in a single simultaneous view.



Keys to Effective Tables

Prefer smaller tables

- Words are important
 - Enable roll overs for meta data for commonly used tables
 - Write informative titles for tables and column head descriptions
- Make tables clean and easy to read
 - Eliminate unnecessary gridlines
 - Use space (padding) to create groups of data
 - Left justify text cells and Right justify numerical cells
- Make numbers easy to read and understand
 - Judiciously use conditional formatting
 - Avoid putting text in color
 - Align the decimal point for numerical cells
 - Use symbols to denote units of measure (%, \$, etc.)
- Enable column and row sorting
- Avoid scrolling (if possible)
- Be transparent about data selection



Keys to Effective Tables

Year 2010 🗸

					Sales				
Product Type	Company	Active Singles	Baby Boomers	Others	Rural based	Seniors	Students	Urban based	
Accessories	Genmind Corp	\$95,916	\$29,746	\$23,710	\$40,947	\$60,397	\$59,891	\$77,722	~
	Stockplus Inc.	\$128,470	\$29,693	\$38,455	\$68,506	\$100,349	\$120,508	\$111,572	
	Tescare Ltd.	\$104,461	\$35,374	\$27,900	\$56,392	\$96,501	\$121,121	\$93,280	
Accessories	Total	\$328,847	\$94,813	\$90,064	\$165,845	\$257,247	\$301,520	\$282,574	
Audio	Genmind Corp	\$168,612	\$50,236	\$21,842	\$74,952	\$126,754	\$133,788	\$124,072	
	Stockplus Inc.	\$215,921	\$42,336	\$55,632	\$124,469	\$149,511	\$169,330	\$144,029	
	Tescare Ltd.	\$173,022	\$61,713	\$30,048	\$102,717	\$162,078	\$202,451	\$161,995	
Audio Total		\$557,555	\$154,285	\$107,522	\$302,137	\$438,343	\$505,569	\$430,096	
Comoro	Coppied Corp	¢154.020	¢50.452	622 02E	é72 260	¢100,190	£142 £09	¢126.450	
Camera	Gerinina Corp	\$134,930	\$30,455	\$23,933	\$73,300	\$129,109	\$101.047	\$130,439	
	Stockplus Inc.	\$189,520	\$45,571	\$57,449	\$88,445	\$154,237	\$181,047	\$162,000	
	Tescare Ltd.	\$182,757	\$83,650	\$45,512	\$89,213	\$140,187	\$208,441	\$151,215	
Camera Tot	al	\$527,207	\$179,675	\$126,895	\$251,019	\$423,613	\$533,096	\$449,674	
Cell Phones	Genmind Corp	\$120,376	\$40,799	\$24,293	\$61,451	\$82,200	\$103,754	\$97,480	
	Stockplus Inc.	\$161,238	\$47,570	\$37,670	\$71,548	\$129,511	\$133,459	\$144,812	
	Tescare Ltd.	\$157,717	\$50,948	\$30,873	\$79,242	\$130,167	\$164,272	\$116,630	
Cell Phones	Total	\$439,331	\$139,317	\$92,837	\$212,241	\$341,879	\$401,484	\$358,921	
Fixed	Genmind Corp	\$144,814	\$35,190	\$20,000	\$94,115	\$128,411	\$152,767	\$138,280	
	Stockplus Inc.	\$234,518	\$56,263	\$53,554	\$109,985	\$160,065	\$238,484	\$180,872	
	Tescare Ltd.	\$197.073	\$57.671	\$50,893	\$121.302	\$170.018	\$173.601	\$177,137	Y



Pivot Table "Needs" Sentence

I want to see fact/measure (specifies cell values) by dimension and dimension (defines rows) across dimension and dimension (defines columns).

Year 2010 🗸

					Sales				
Product Type	Company	Active Singles B	Baby Boomers	Others	Rural based	Seniors	Students	Urban based	
Accessories	Genmind Corp	\$95,916	\$29,746	\$23,710	\$40,947	\$60,397	\$59,891	\$77,722	~
	Stockplus Inc.	\$128,470	\$29,693	\$38,455	\$68,506	\$100,349	\$120,508	\$111,572	
	Tescare Ltd.	\$104,461	\$35,374	\$27,900	\$56,392	\$96,501	\$121,121	\$93,280	
Accessories	Total	\$328,847	\$94,813	\$90,064	\$165,845	\$257,247	\$301,520	\$282,574	
Audio	Genmind Corp	\$168,612	\$50,236	\$21,842	\$74,952	\$126,754	\$133,788	\$124,072	
	Stockplus Inc.	\$215,921	\$42,336	\$55,632	\$124,469	\$149,511	\$169,330	\$144,029	
	Tescare Ltd.	\$173,022	\$61,713	\$30,048	\$102,717	\$162,078	\$202,451	\$161,995	
Audio Total		\$557,555	\$154,285	\$107,522	\$302,137	\$438,343	\$505,569	\$430,096	
Camera	Genmind Corp	\$154,930	\$50,453	\$23,935	\$73,360	\$129,189	\$143,608	\$136,459	
	Stockplus Inc.	\$189,520	\$45,571	\$57,449	\$88,445	\$154,237	\$181,047	\$162,000	
	Tescare Ltd.	\$182,757	\$83,650	\$45,512	\$89,213	\$140,187	\$208,441	\$151,215	
Camera Tot	al	\$527,207	\$179,675	\$126,895	\$251,019	\$423,613	\$533,096	\$449,674	
Cell Phones	Genmind Corp	\$120,376	\$40,799	\$24,293	\$61,451	\$82,200	\$103,754	\$97,480	
	Stockplus Inc.	\$161,238	\$47,570	\$37,670	\$71,548	\$129,511	\$133,459	\$144,812	
	Tescare Ltd.	\$157,717	\$50,948	\$30,873	\$79,242	\$130,167	\$164,272	\$116,630	
Cell Phones	Total	\$439,331	\$139,317	\$92,837	\$212,241	\$341,879	\$401,484	\$358,921	
Fixed	Genmind Corp	\$144,814	\$35,190	\$20,000	\$94,115	\$128,411	\$152,767	\$138,280	
	Stockplus Inc.	\$234,518	\$56,263	\$53,554	\$109,985	\$160,065	\$238,484	\$180,872	
	Tescare Ltd.	\$197,073	\$57,671	\$50,893	\$121,302	\$170,018	\$173,601	\$177,137	$\mathbf{\mathbf{v}}$



Pivot Table "Needs" Sentence

I want to see Sales (specifies cell values) by Product Type and Company (defines rows) across Market Segments (defines columns).

Year 2010 🗸

					Sales				
Product Type	Company	Active Singles	Baby Boomers	Others	Rural based	Seniors	Students	Urban based	
Accessories	Genmind Corp	\$95,916	\$29,746	\$23,710	\$40,947	\$60,397	\$59,891	\$77,722	~
	Stockplus Inc.	\$128,470	\$29,693	\$38,455	\$68,506	\$100,349	\$120,508	\$111,572	
	Tescare Ltd.	\$104,461	\$35,374	\$27,900	\$56,392	\$96,501	\$121,121	\$93,280	
Accessories	Total	\$328,847	\$94,813	\$90,064	\$165,845	\$257,247	\$301,520	\$282,574	
Audio	Genmind Corp	\$168,612	\$50,236	\$21,842	\$74,952	\$126,754	\$133,788	\$124,072	
	Stockplus Inc.	\$215,921	\$42,336	\$55,632	\$124,469	\$149,511	\$169,330	\$144,029	
	Tescare Ltd.	\$173,022	\$61,713	\$30,048	\$102,717	\$162,078	\$202,451	\$161,995	
Audio Total		\$557,555	\$154,285	\$107,522	\$302,137	\$438,343	\$505,569	\$430,096	
Camera	Genmind Corp	\$154,930	\$50,453	\$23,935	\$73,360	\$129,189	\$143,608	\$136,459	
	Stockplus Inc.	\$189,520	\$45,571	\$57,449	\$88,445	\$154,237	\$181,047	\$162,000	
	Tescare Ltd.	\$182,757	\$83,650	\$45,512	\$89,213	\$140,187	\$208,441	\$151,215	
Camera Tot	al	\$527,207	\$179,675	\$126,895	\$251,019	\$423,613	\$533,096	\$449,674	
Cell Phones	Genmind Corp	\$120,376	\$40,799	\$24,293	\$61,451	\$82,200	\$103,754	\$97,480	
	Stockplus Inc.	\$161,238	\$47,570	\$37,670	\$71,548	\$129,511	\$133,459	\$144,812	
	Tescare Ltd.	\$157,717	\$50,948	\$30,873	\$79,242	\$130,167	\$164,272	\$116,630	
Cell Phones	Total	\$439,331	\$139,317	\$92,837	\$212,241	\$341,879	\$401,484	\$358,921	
Fixed	Genmind Corp	\$144,814	\$35,190	\$20,000	\$94,115	\$128,411	\$152,767	\$138,280	
	Stockplus Inc.	\$234,518	\$56,263	\$53,554	\$109,985	\$160,065	\$238,484	\$180,872	
	Tescare Ltd.	\$197,073	\$57,671	\$50,893	\$121,302	\$170,018	\$173,601	\$177,137	$\mathbf{\mathbf{v}}$



7 Keys to Effective Graphs

- Do not use 3-D effects.
- Avoid "stop light" color palette.
- Prefer pastel color palettes and avoid bright colors.
- Eliminate gridlines, drop shadows, and other graphics.
- Enable interaction for "exploration" graphs.
- Prioritize a single message for "explanation" graphs.
- Above all else, show the data!



Line Graph



- Show a pattern or progression over a continuous range.
- Can be valued within a range to highlight a particular pattern (careful!).
- Maintain a rectangular shape close to golden proportion.
- Use scale marker lines and ranges for context.



Line Graph



- Use darker versions of standard colors.
- Eliminate grid lines.
- Use zoom function for detailed line graphs.
- Choose curved lines to smooth overall shape.
- Choose stepped lines to emphasize point transitions.

Target Revenue % by Brand for 2012



Bar Graphs



- Show nominal data values in comparison to one another.
- Start with zero.
- If use a logarithmic scale, clearly notate.
- Think through sort order carefully.



Bar Graphs



- Add data labels as interactive rollover.
- Balance colors.
- If change is most important, graph change.



Stacked Bar Chart



- Somewhat confusing, not great for representing change.
- Total is most clearly represented number.
- Typically stack with largest values on the bottom.
- Single scale can make for interesting intra-bar comparisons.







- Typically used for showing parts of whole by percentage.
- Not great for piece to piece comparisons.
- Limit number of pieces.
- Can be interesting to show many pies together if significant differences exist.
- Stephen Few hates them.
- Do not use 3-D.



Scatter Plot



- Shows single data points at the intersection of two values.
- Often depict a large number of discrete data points (hundreds or thousands).
- Useful comparisons of two variables.
- Trend lines are often added.
- Clearly notate if use logarithmic scale(s).

Bubble Chart



- Special type of scatter plot.
- Size of bubble is related to a third variable.
- Color is related to a fourth variable.
- Reduces number of points that can be depicted.
- Best for depicting approximate values and comparisons.



ColorBrewer2.org











of optimally distinct colors.





A Dashboard is a visual presentation of current summary information needed to manage and guide an organization or activity.



BI Dashboards are Different

- No mechanical systems needed to move indicators.
- Decisions are not typically made on a second-to-second basis.
- BI dashboards are not primarily single situation or single person devices.



BI Dashboards

- Role-based.
- Data selection and filtering are extremely important.
- Dashboards support evidenced-based decision making.
- Shared understanding of business situation is a key benefit.
- Content may be individualized.
- Design should be standardized.



OBIEE Dashboard Overview

- Designed with columns and sections (containers).
- Presentation server is often separate from BI server.
- Dashboards are web-based and are viewed with browsers.
- HTML, XML, and Java coding skills are useful, but not required.



Dashboard Principles

Promote user interactivity

- Prompts
- View and column selectors
- Hierarchical column drills
- Column sorts
- Guided navigation and action links
- Promote data transparency
 - Prompts
 - Filter views
 - Narrative views
 - Master detail linking

Establish design guidelines for consistency





- Humans think spatially
- Types of maps
- Map best practices
- Making meaningful maps
- Built-in data sets
- Sources for additional data sets





Why Maps are Powerful





When Are Map Views Useful?

- Visualizing data related to geographic locations.
- Showing or detecting spatial relationships and patterns.
- Showing lots of data in a relatively small area.
- Drilling down from a (map) overview to a detailed report, chart, or graph.
- When is location important? Can the dimension be plotted on a map?



Map View Tips

- Think about what scale to use. Different map scales will reveal different patterns and insights.
- Use Variable marker to display two measures on a map at a point – size and color.
- Avoid overlapping shapes too much.
- Be aware of spatial distortions E.g. Texas is larger than Connecticut.
- Look at color palette. <u>www.colorbrewer2.org</u>



Map Definitions

- FEATURE
 - Provide a spatial context: cities, highways, rivers, etc...
 - Features of Interest: store location, postal boundaries, pipelines, etc...
- STYLE
 - Define rendering properties for features
 - Can control fill color, border color, line thickness, line style and more
- THEME
 - Collection of features
 - Typically associated with a spatial geometry layer
 - County/state boundaries, major highways, etc...
- BASEMAP
 - A grouping of themes to create a map
 - Maps can share themes
 - When associating a theme with a map, can specify min scale and max scale (sometimes known as zoom control)
- MAP
 - Basemap with additional themes overlain



Map Interactivity in OBIEE

Display BI data on top of maps

- Color fill
- FOI point display
- Interact with other Dashboard Elements
 - Drive map content with dashboard prompts
 - Drive map content through drilling and navigation
 - Drive other dashboard elements through map interactions
- Reveal additional information on maps through mouseovers
- Drill to map detail



Map View Formats

- Color Fill (choropleth)
 - Percentile, Value, Continuous binning
 - Dashboard user run-time slider
- Graphs Bar, Pie
 - Adjustable graph size
 - Series by second dimension
- Bubble (variable sized)
 - Min-Max size specification
 - Color specification

- Variable Shape
 - Circle, Triangle, Diamond
 - Customizable
- Image
 - Imported via MapViewer
 - More can be added from MapBuilder
- Custom Point Layer
 - Uses Lat / Long
 - Does not require a Layer Def



Trellis Charts

- Trellis layout of smaller charts in a grid with consistent scales
- Great for finding structures / patterns in complex data
- Use 2D layout to view multidimensional data





Trellis Views

- May not require Exalytics, but need a fast Presentation Server
- Can display LOTS of data in compact form
- Capable of dense visualizations
 - Great for snapshot of trending
 - Great for comparing patterns across dimension values
- Two types
 - Simple (shows full graphs per cell)
 - Advanced (sparklines no scales per cell, separate scales)
- Need to think what you're trying to show on a trellis



Trellis View - Simple

Single type of inner visualization

Rows

- Common synchronized scale across all graphs
- Has scale showing by default (can turn off)
- Lots of graph types
 - Vertical Bar
 - Horizontal Bar
 - Line
 - Area
 - Line-Bar
 - Pie
 - Scatter
 - Bubble

Copyright © 2016, Vlamis Software So



Airlines Delay Performance Matrix

By Distance Group by Departure Time





Trellis View - Advanced

- Pivot table with numbers or graphs in cells
- Each microchart has its own scale and not shown
- Most often used to see trend lines
- No axis description, so across should be time
- Can have different visualizations for different measures

Spark barSpark line

Spark line

Spark area

numbers



SOFTWARE SOLUTIONS

OBI Scorecard & Strategy Management

- Integrated toolset in OBIEE
- Follows "Balanced Scorecard" methodology
- Enables corporate goals and objectives to be monitored and managed
- Includes strategy maps, strategy trees, KPI watch lists, and cause and effect maps





vlamis

SOFTWARE SOLUTIONS

New Contribution Wheel Visualization



Strategy Tree View



SOFTWARE SOLUTIONS

Strategy Map View





Where to Start

- Workshops
- Assessments
- Training
- Standards development and documentation



Foundations of Data Discovery

- Reveal relationships, patterns, and features in data sets.
- This is virtually the same definition we use for data mining.
- Data discovery needs to come to masses because of the 3 V's



Starting with Data Discovery

- Begin either with a specific question or a framework
- Avoid "wandering around"
- Most of your visualizations will not produce new insights
- Move quickly through visualizations
- Be prepared to open a lot of browser tabs





- New to a data set, true exploration
- Familiar with data, looking for new insights
- Looking for new ways to see known relationships



Finding is not Explaining

Process of interaction has a huge impact on the contextual

understanding of an insight

- When someone discovers something, they believe it more
- Human Cognition Biases



General Advice

- Working with BI Catalog
- Development Standards
- Working with Executives
- Working with IT and DBAs
- Developing Trust in BI Systems
- Getting Started
 - Workshops
 - Assessments
 - Training
 - Standards Development and Documentation
- The Long Road



Drawing for Free Book

Add business card to basket or fill out card



Data Visualization for Oracle Business Intelligence 11g

Create Highly Visual Presentations of BI Data

Dan Vlamis Oracle ACE Director

Tim Vlamis







Data Visualization for Oracle Business Intelligence

Tim Vlamis tvlamis@vlamis.com www.vlamis.com

