Dashboard Design and Visual Data Exploration

Selected Excerpts from Freakalytics Tableau Training Course

Stephen McDaniel

Co-founder and Principal Analyst
Freakalytics, LLC
http://www.Freakalytics.com

Copyright © 2009 Freakalytics, LLC,

Stephen's Background

- **Author**
  - "*Rapid Graphs with Tableau*"
  - "*SAS for Dummies*"

- **Co-Founder of Freakalytics, LLC**
  - Freakalytics is a Tableau Education Partner providing
    - **Public training – learn the in's and outs of Tableau while learning solid presentation and dashboard design principles**
    - **On-site training**
    - **Expert dashboard design and analytic strategy consulting**

- **Director of Marketing Analytics**
  - Netflix, Razorfish and REI

Copyright © 2009 Freakalytics, LLC

Stephen's Background

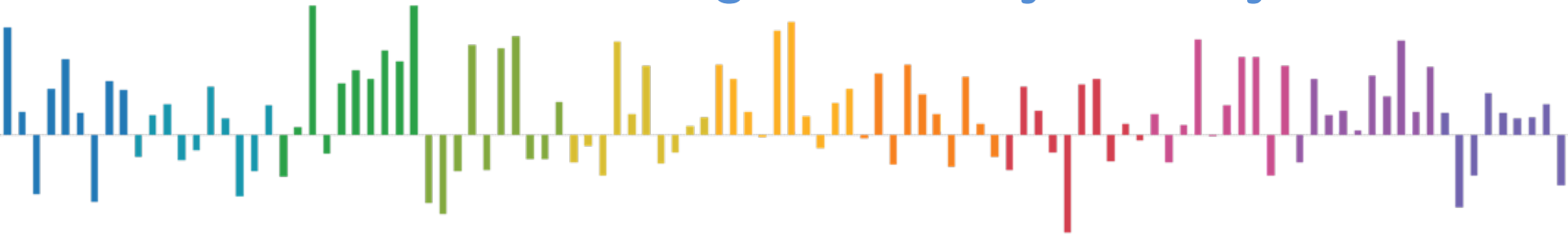
- **Director of Software Development**- analytics
  - SAS
- **Technical Architect**- BI, analytics & data warehousing
  - Oracle, Brio, Takeda Abbott Pharmaceuticals, Pfizer, Bristol Myers
- **Senior Product Manager**- BI & analytics
  - Brio Technology and SAS
- **Statistician**
  - Six Sigma- pharmaceutical manufacturing
  - Biostatistician- AIDS, asthma, birth control, heart failure and allergies

Copyright © 2009 Freakalytics, LLC

Data Exploration and Dashboard Design

Dashboard Principles

Adapted from "*Information Dashboard Design*" with permission of Stephen Few Combined with original work by Freakalytics



Stephen McDaniel

Co-founder and Principal Analyst
Freakalytics, LLC
http://www.Freakalytics.com

Copyright © 2009 Freakalytics, LLC,

Why a dashboard?

Copyright © 2010 Freakalytics, LLC

Why a dashboard?

Your dashboard should
enlighten and
empower your
audience on a
periodic basis.

Great dashboards enable
better decisions and
inspire new questions
in the business.

-Stephen McDaniel

Copyright © 2010 Freakalytics, LLC

What is a dashboard?

Copyright © 2009 Freakalytics, LLC,

What is a dashboard?

Visual display

of

the most important information

needed to **understand and manage**

one or more areas of an organization

which

fits on a single computer screen

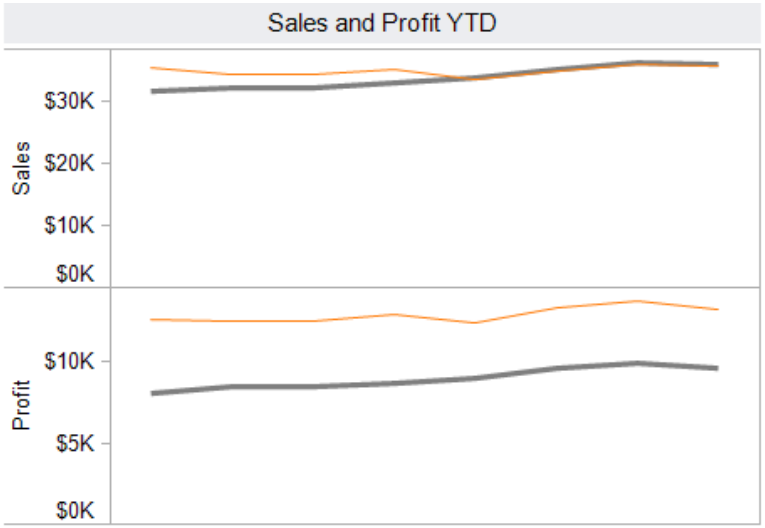
so it can be

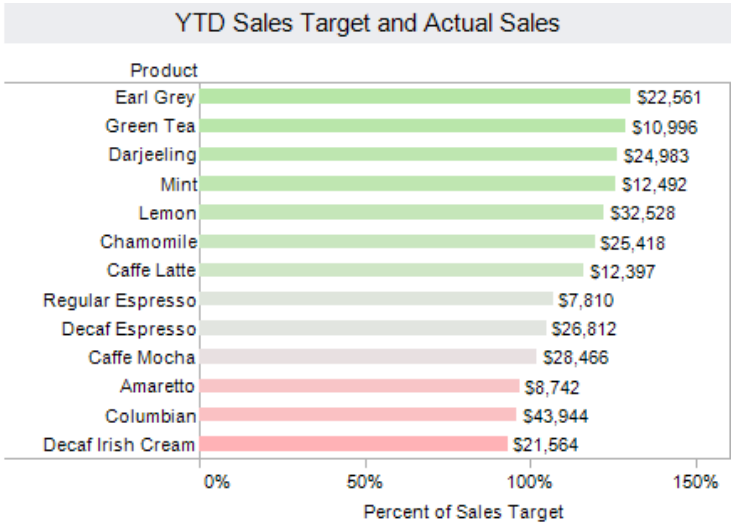
monitored at a glance

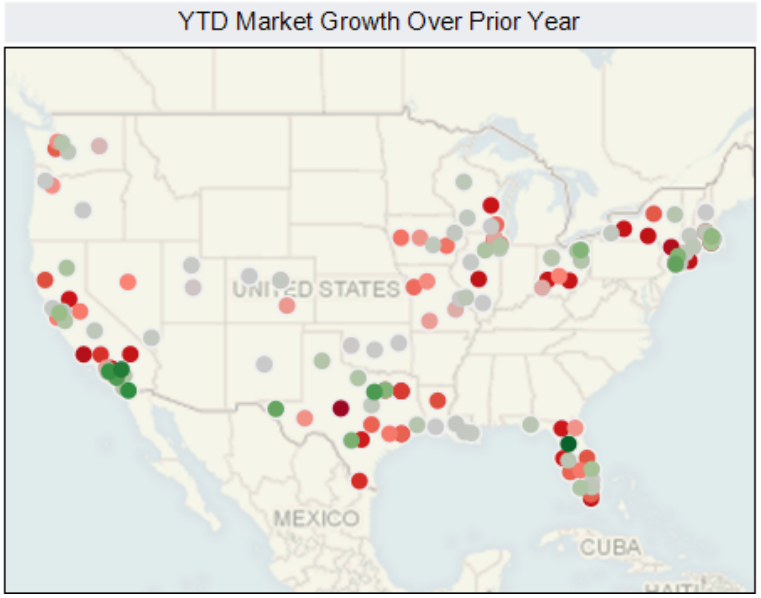
-Stephen Few

Copyright © 2009 Freakalytics, LLC,

Visual display…







Copyright © 2009 Freakalytics, LLC,

…the most important information…

- Strategic, analytical or operational?
- Frequency of update- monthly, weekly, daily, hourly or near real-time?

Copyright © 2009 Freakalytics, LLC,

…fits on a single computer screen… monitored at a glance.

- Static or interactive?
- Graphical, text, text and graphics?
- Conduit to additional analysis or stand-alone?
- **Monitored at a glance**

Copyright © 2009 Freakalytics, LLC,

Common metric themes in dashboards by subject area

- Sales
  - Bookings, billings, sales pipeline, number of orders, order distribution and selling prices
- Marketing
  - Market share, campaign success, customer attributes
- Tech support
  - Number of calls, resolved cases, customer satisfaction and call duration
- Finance
  - Revenue, expenses and profits

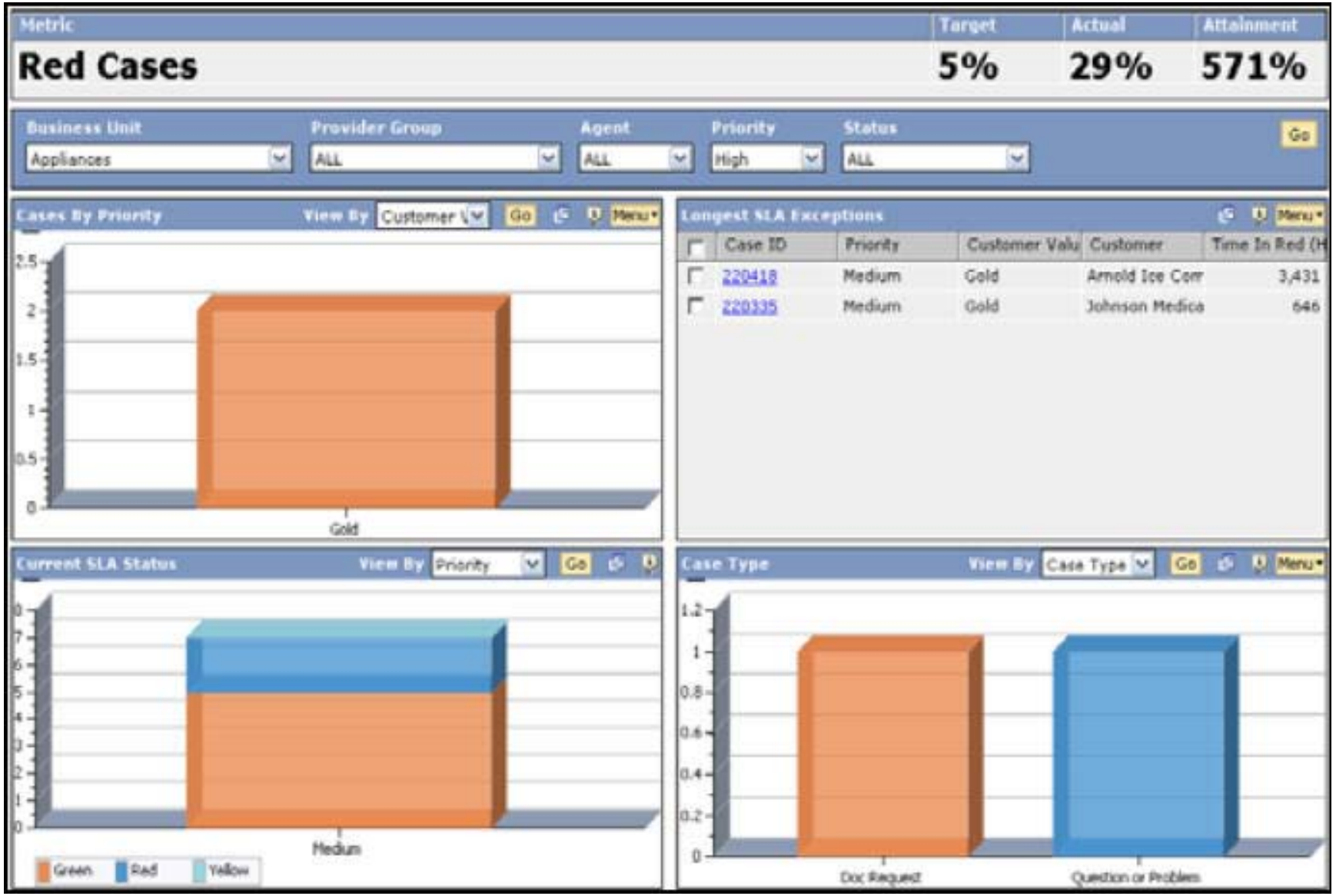
Copyright © 2009 Freakalytics, LLC,

Poor Dashboard- Oracle Contact Center ★

www.PerceptualEdge.com (Stephen Few)

Copyright © 2009 Freakalytics, LLC

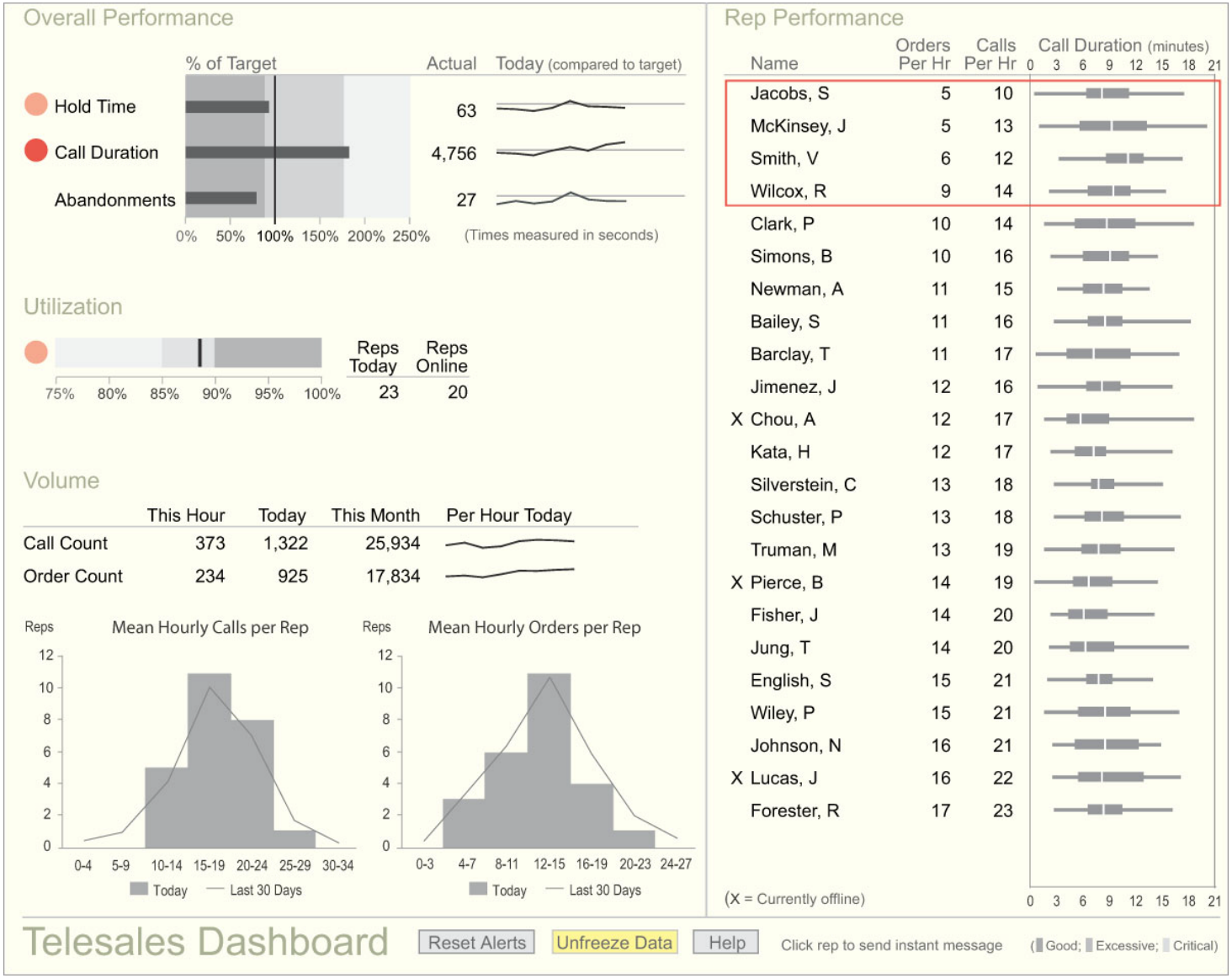
Poor Dashboard- Oracle Contact Center



www.PerceptualEdge.com (Stephen Few)

Copyright © 2009 Freakalytics, LLC

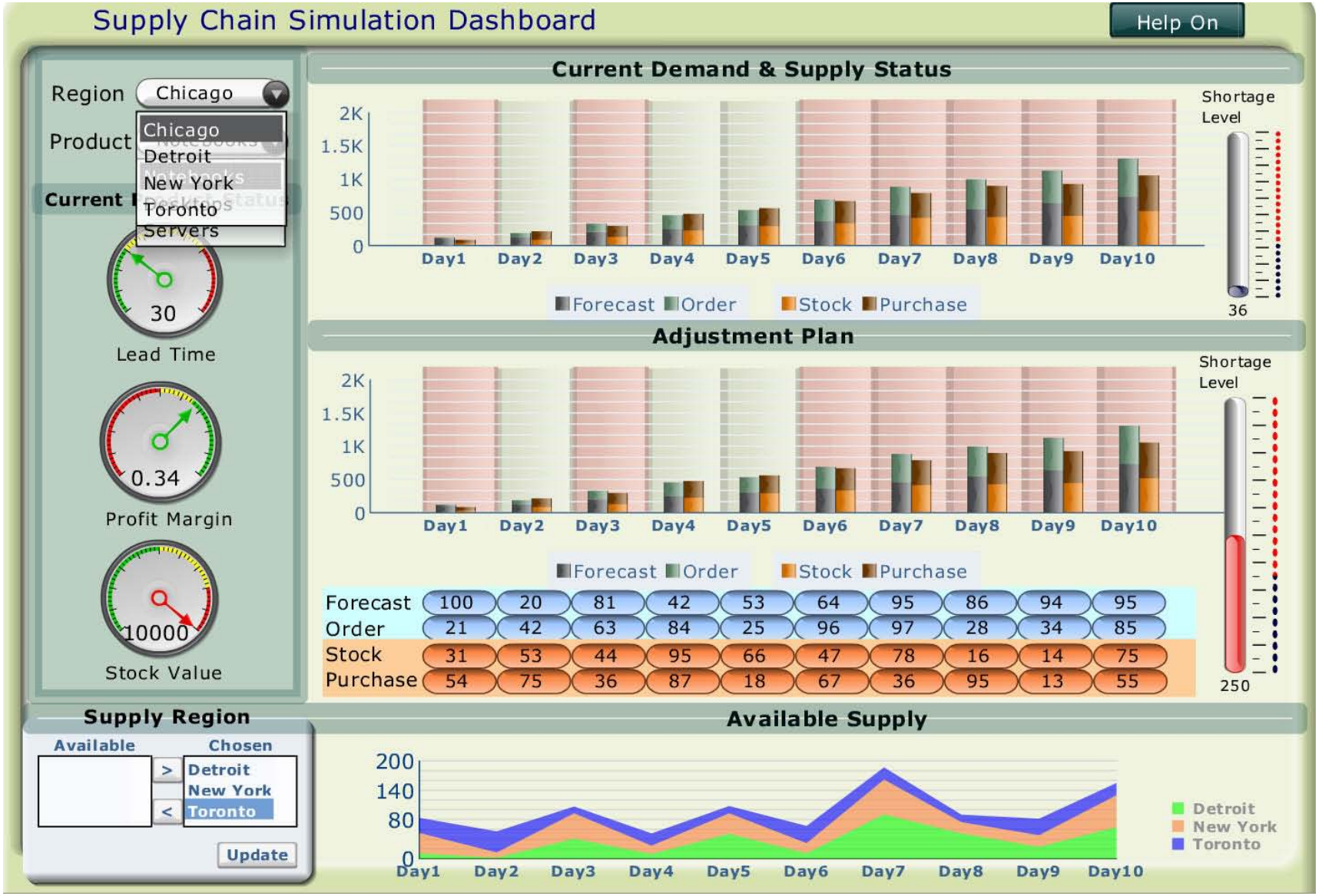
Dashboard 1 Revised- Contact Center



www.PerceptualEdge.com (Stephen Few)

Copyright © 2009 Freakalytics, LLC

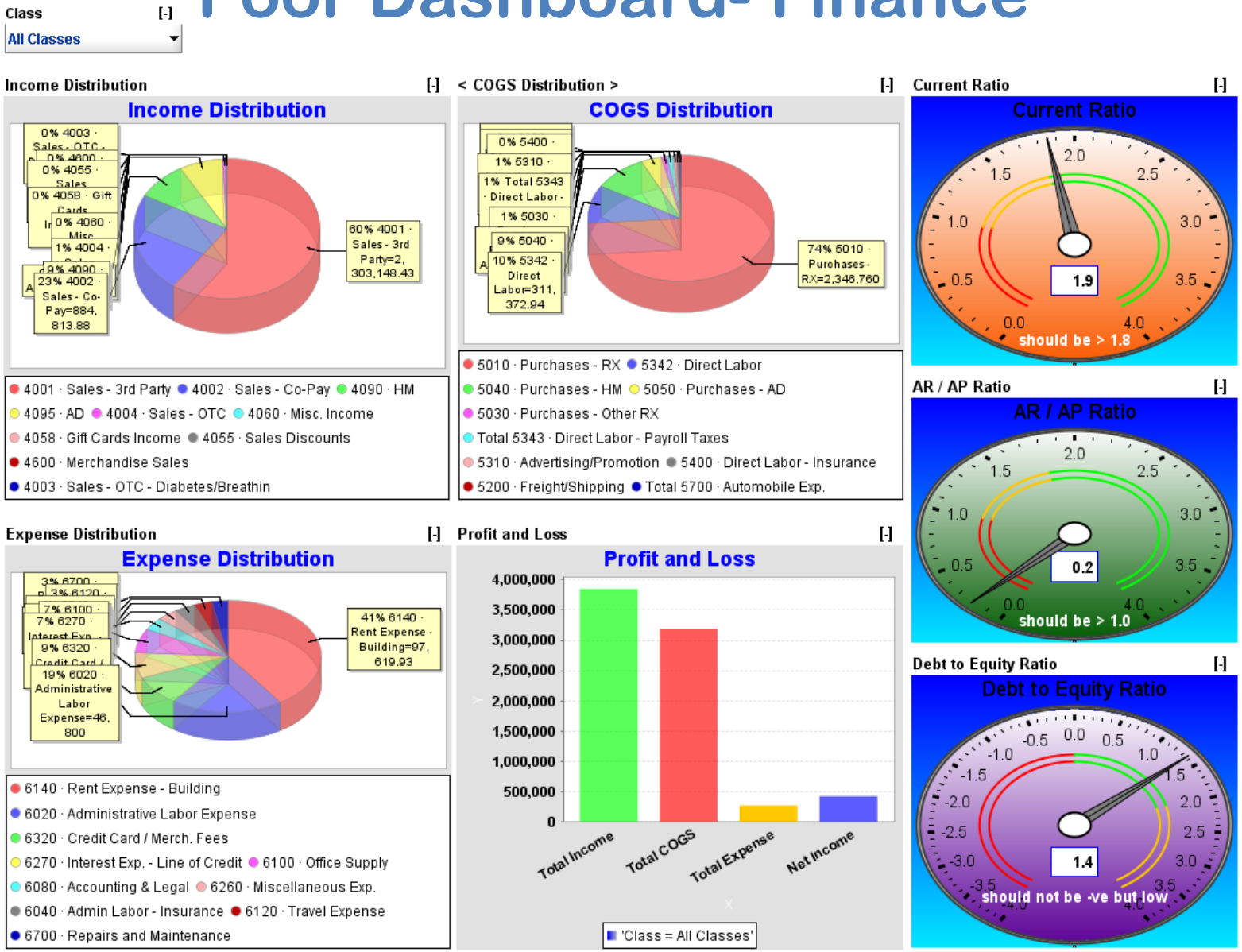
Poor Dashboard- Supply Chain



www.PerceptualEdge.com (Stephen Few)

Copyright © 2009 Freakalytics, LLC

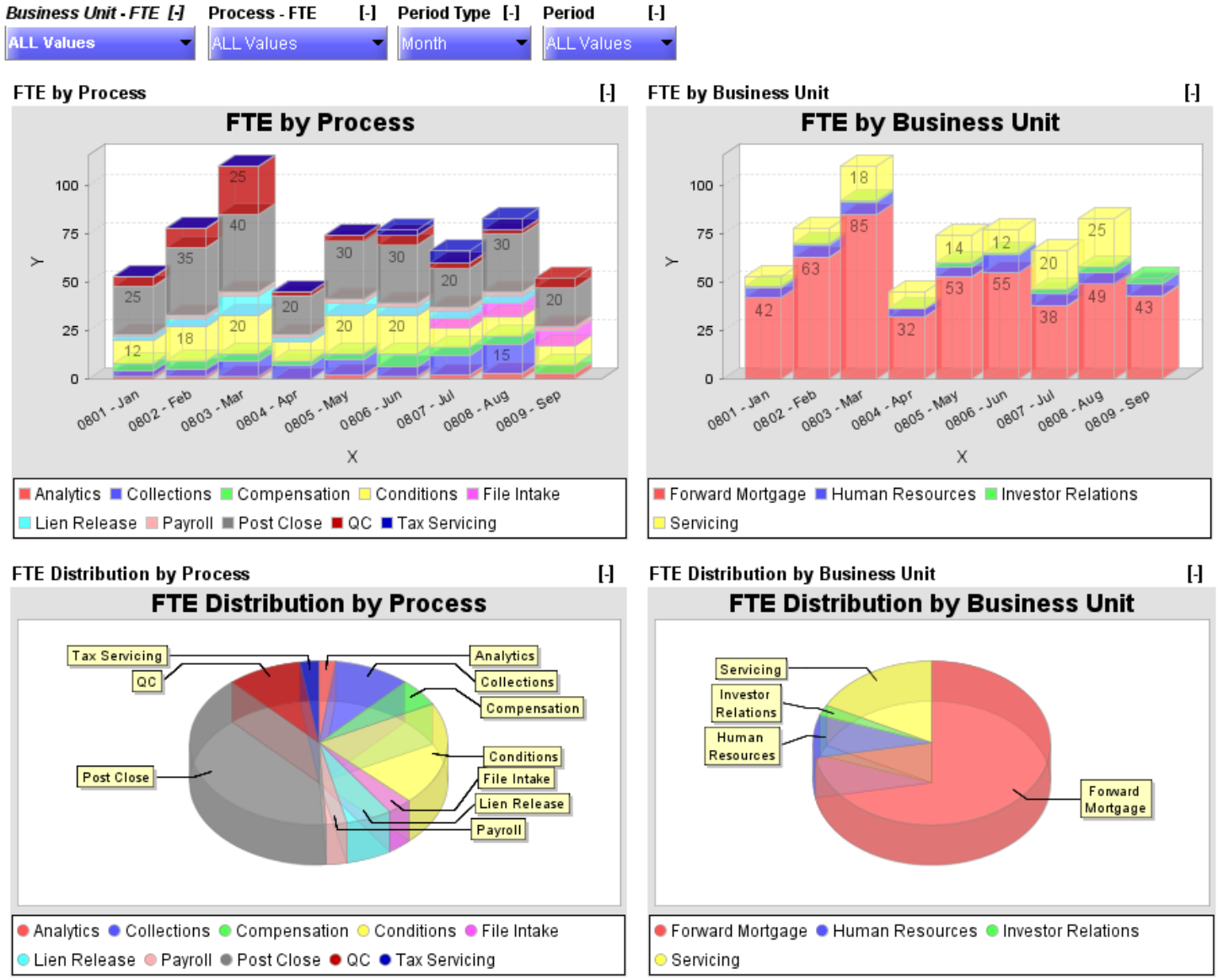
Poor Dashboard- Finance



http://www.infocaptor.com/ (vendor site)

Copyright © 2009 Freakalytics, LLC

Poor Dashboard- Human Resources



http://www.infocaptor.com/ (vendor site)

Copyright © 2009 Freakalytics, LLC

Real-world dashboard challenges

- Data management often requires 50-70% of project time
- Dashboards unused if the audience is not considered
  - Lacking useful information
  - Confusing / overloaded presentation
- Traditional dashboard tools required weeks of expert programming

Copyright © 2010 Freakalytics, LLC

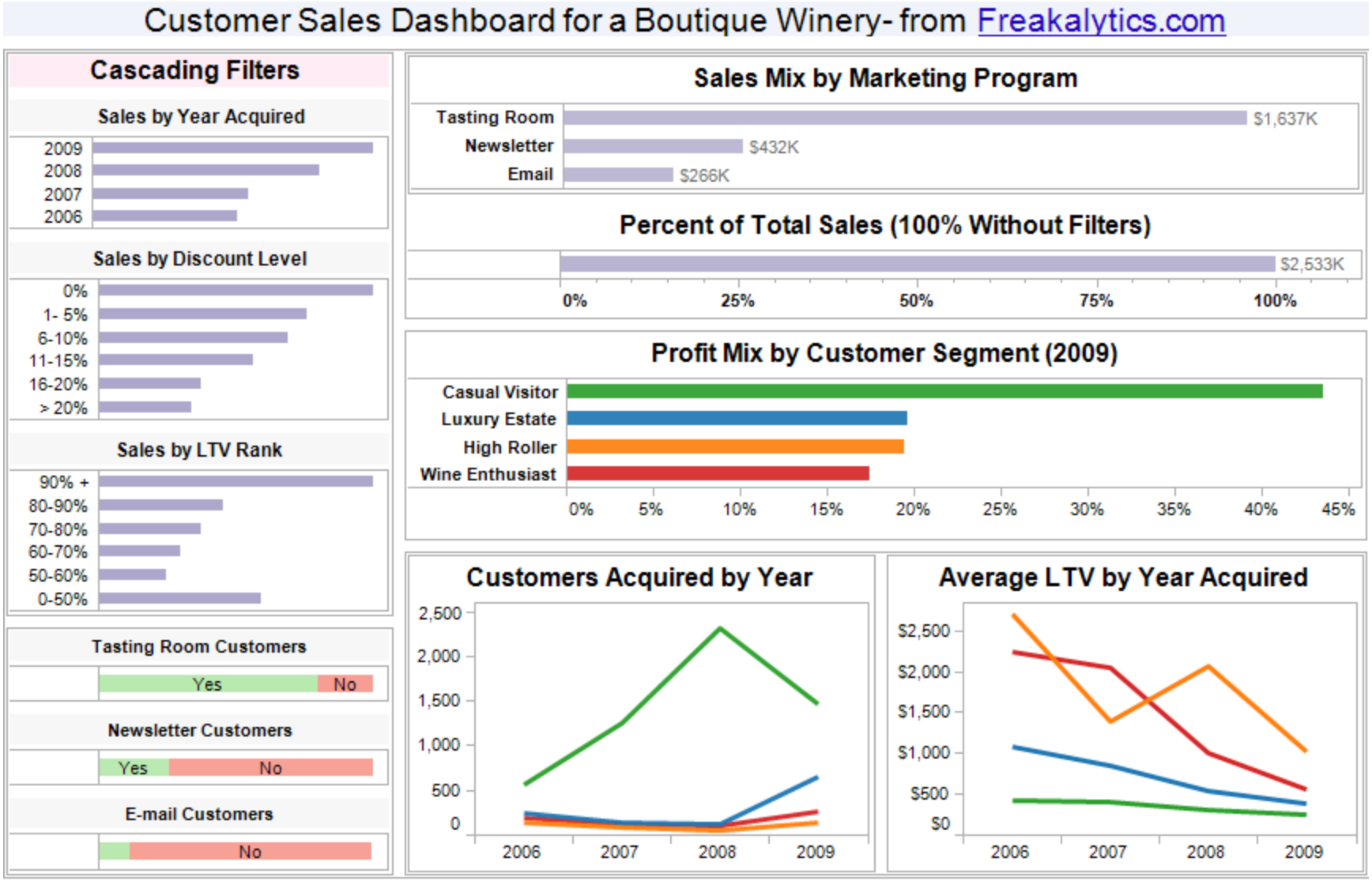
Real-world dashboard challenges

- A working knowledge of good data presentation and dashboard design principles is rare

- Marketing-specific challenges include
  - Inadequate metrics
  - Program- and vendor-centric data “silos”
  - Multiple cloud data sources that are overly simplistic and hard to combine

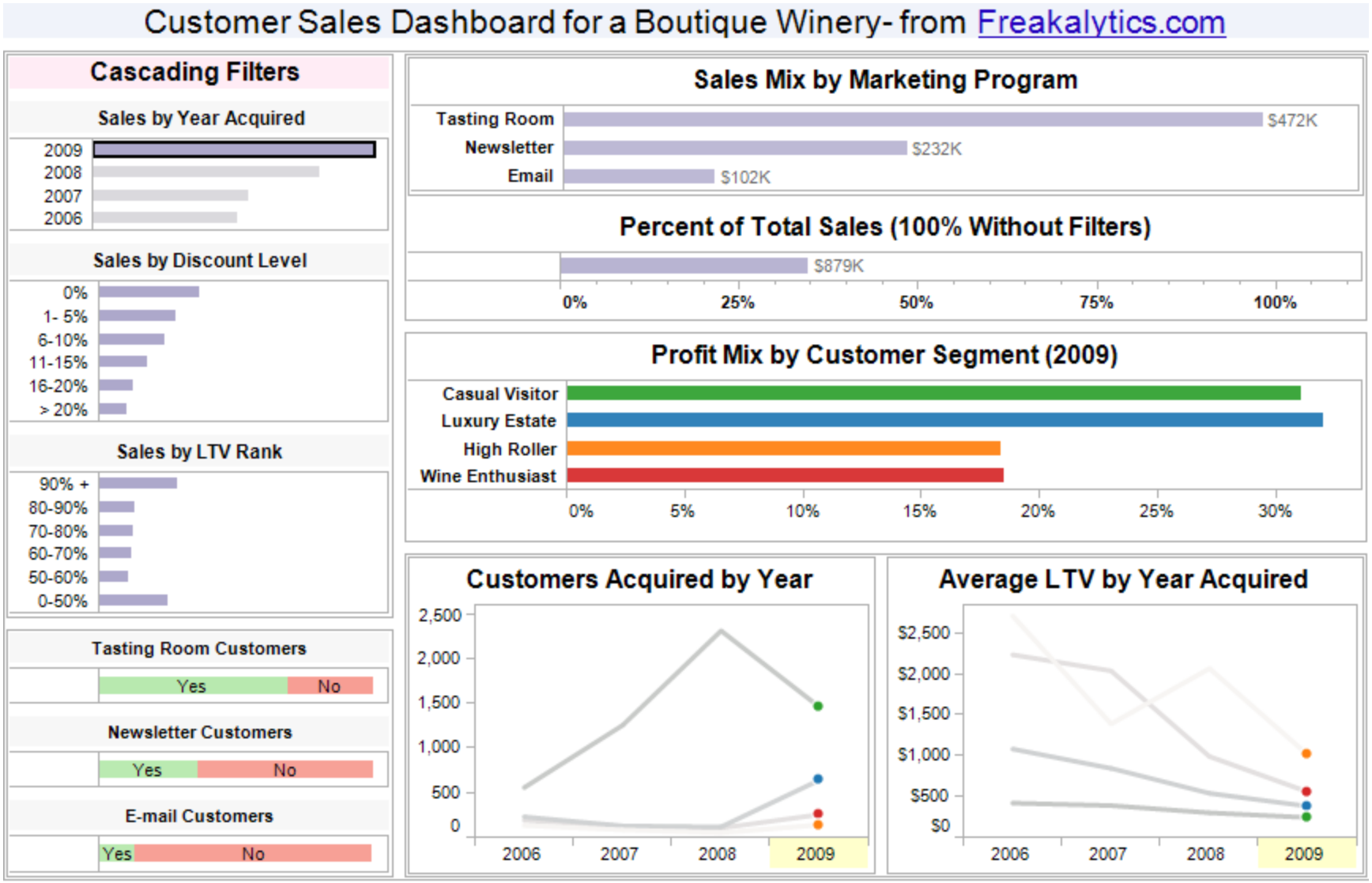
Copyright © 2010 Freakalytics, LLC

Strategic sales dashboard



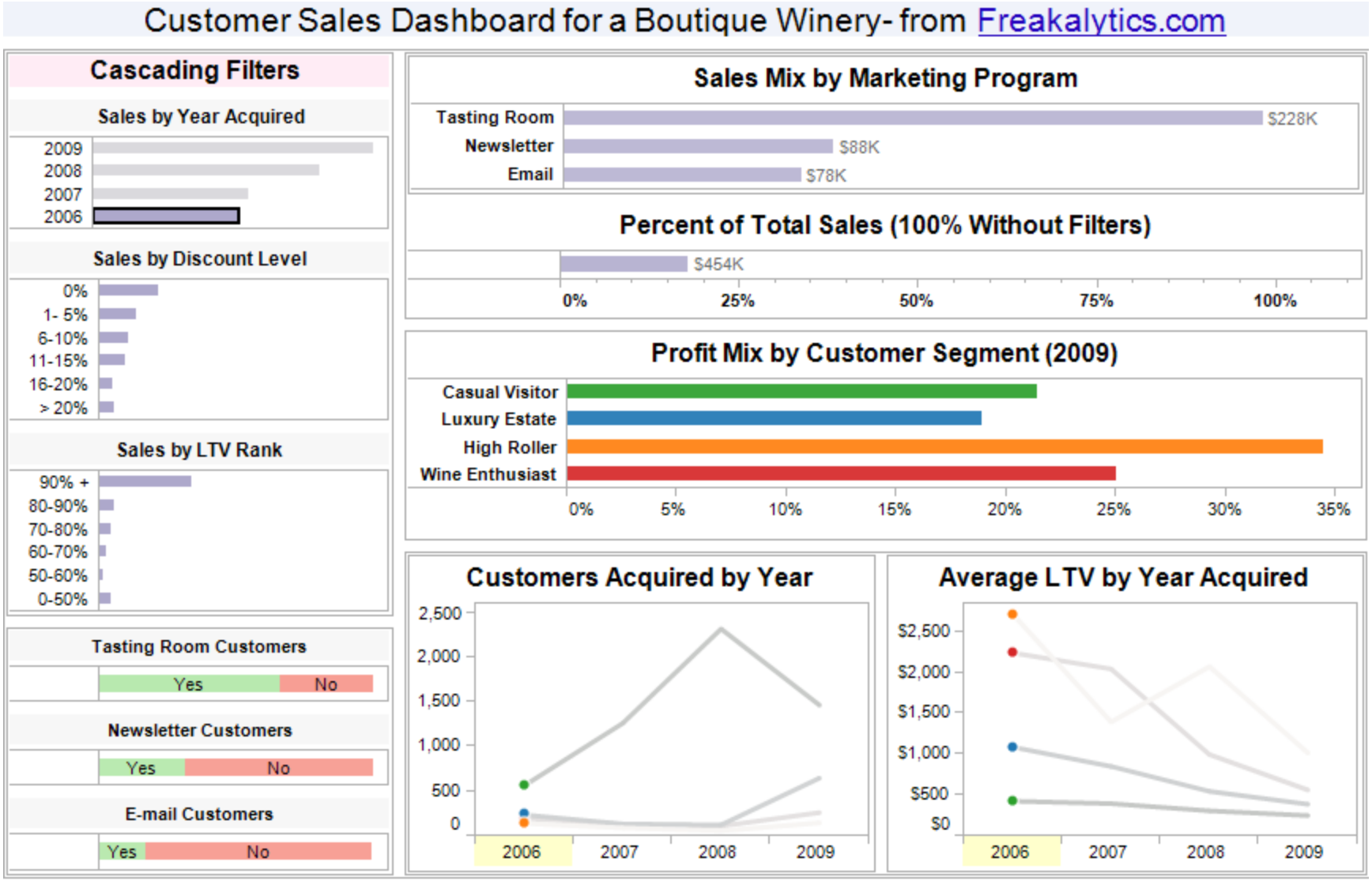
Copyright © 2010 Freakalytics, LLC

Newer customers



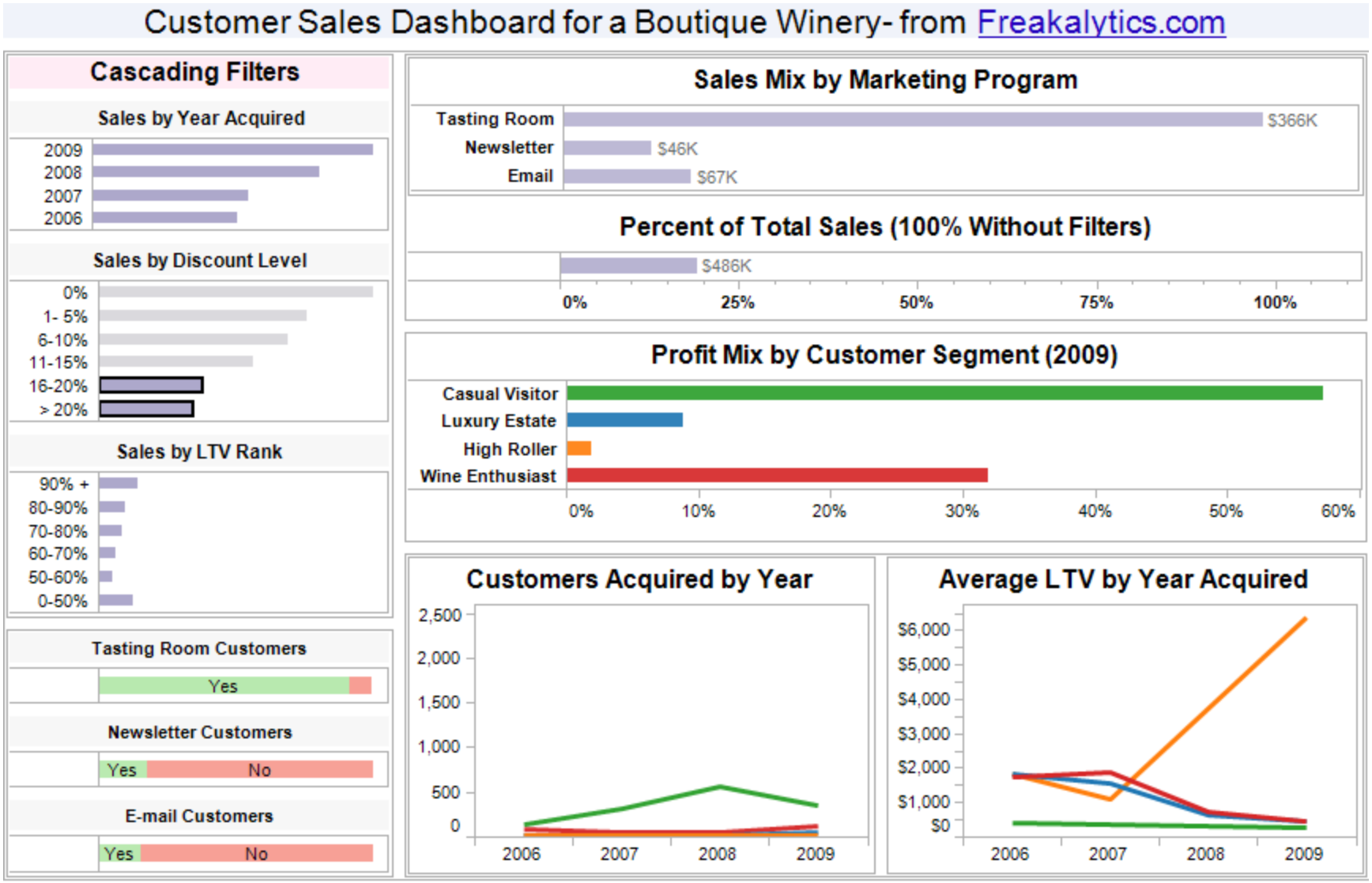
Copyright © 2010 Freakalytics, LLC

Traditional customers



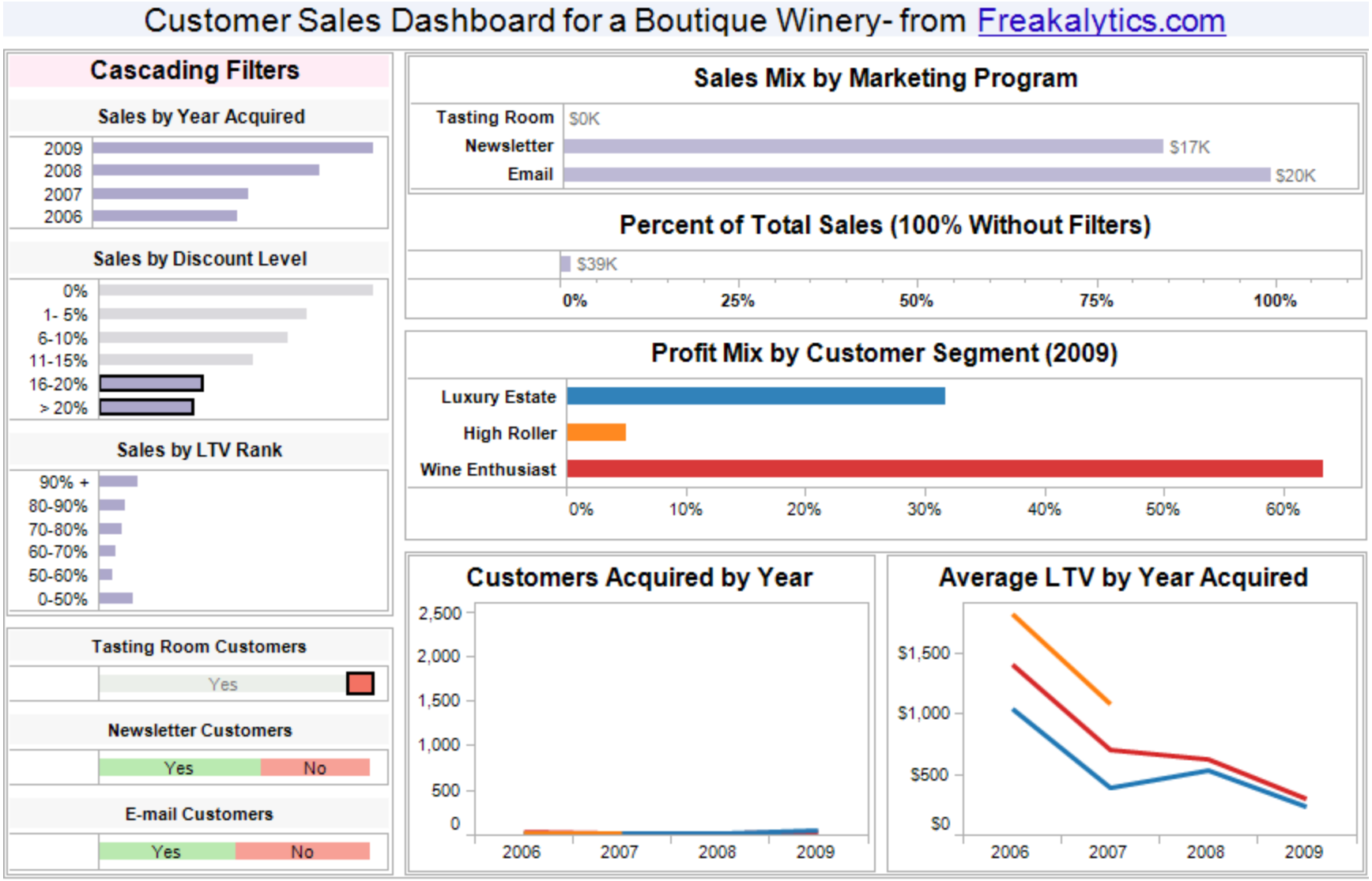
Copyright © 2010 Freakalytics, LLC

High-discount customers



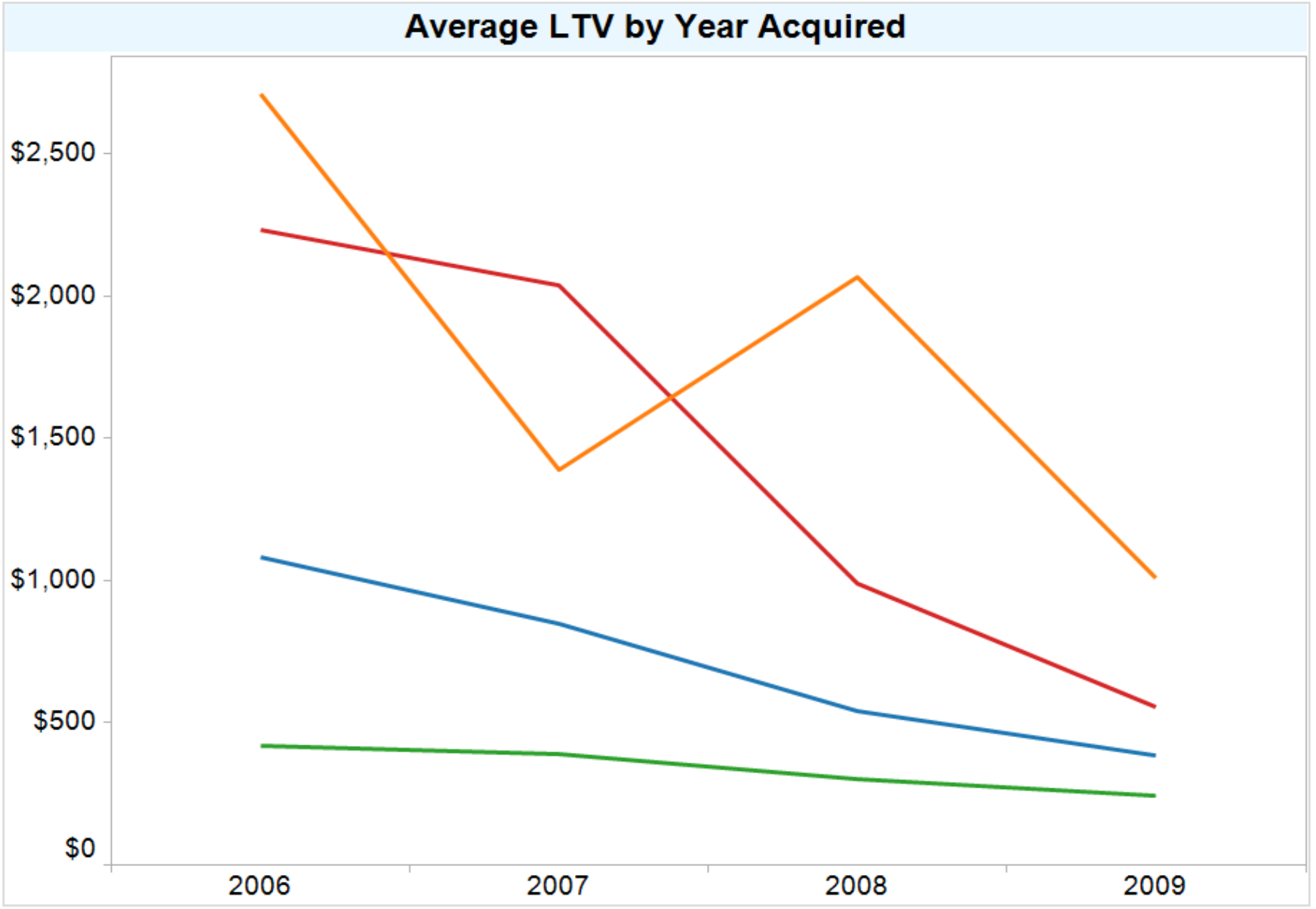
Copyright © 2010 Freakalytics, LLC

High-discount and no tasting room visit



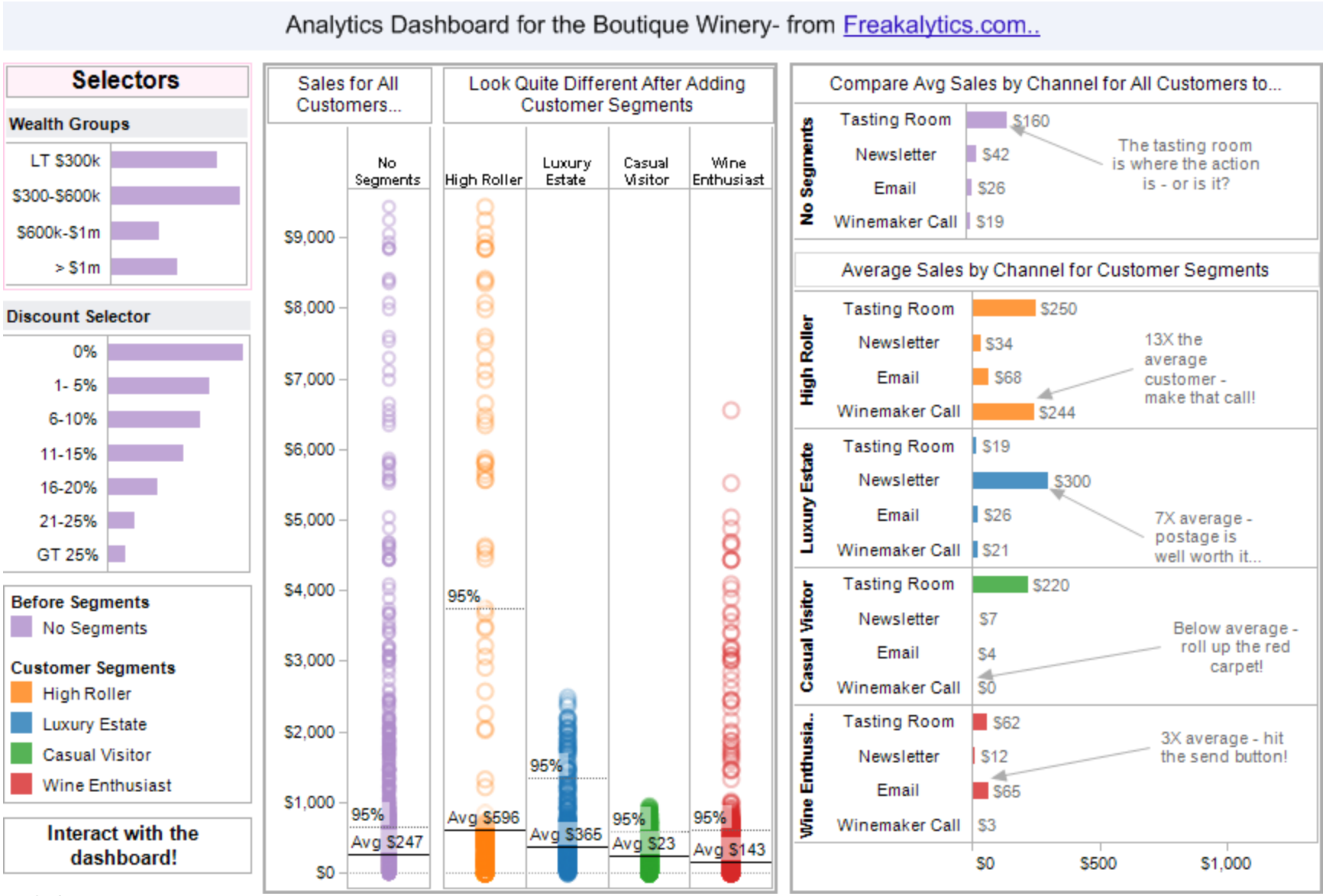
Copyright © 2010 Freakalytics, LLC

Of great concern… declining LTV???



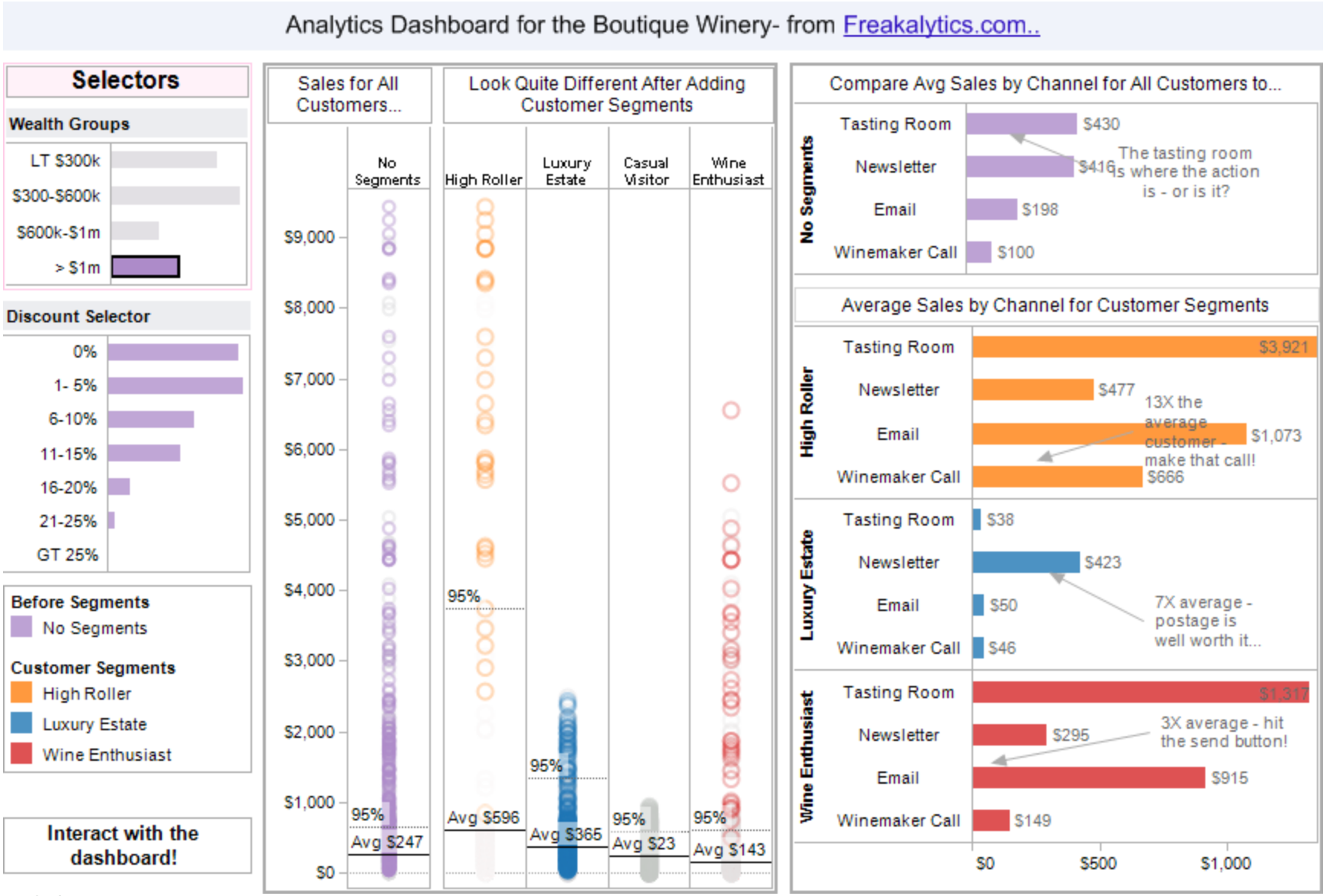
Copyright © 2010 Freakalytics, LLC

Analyst dashboard



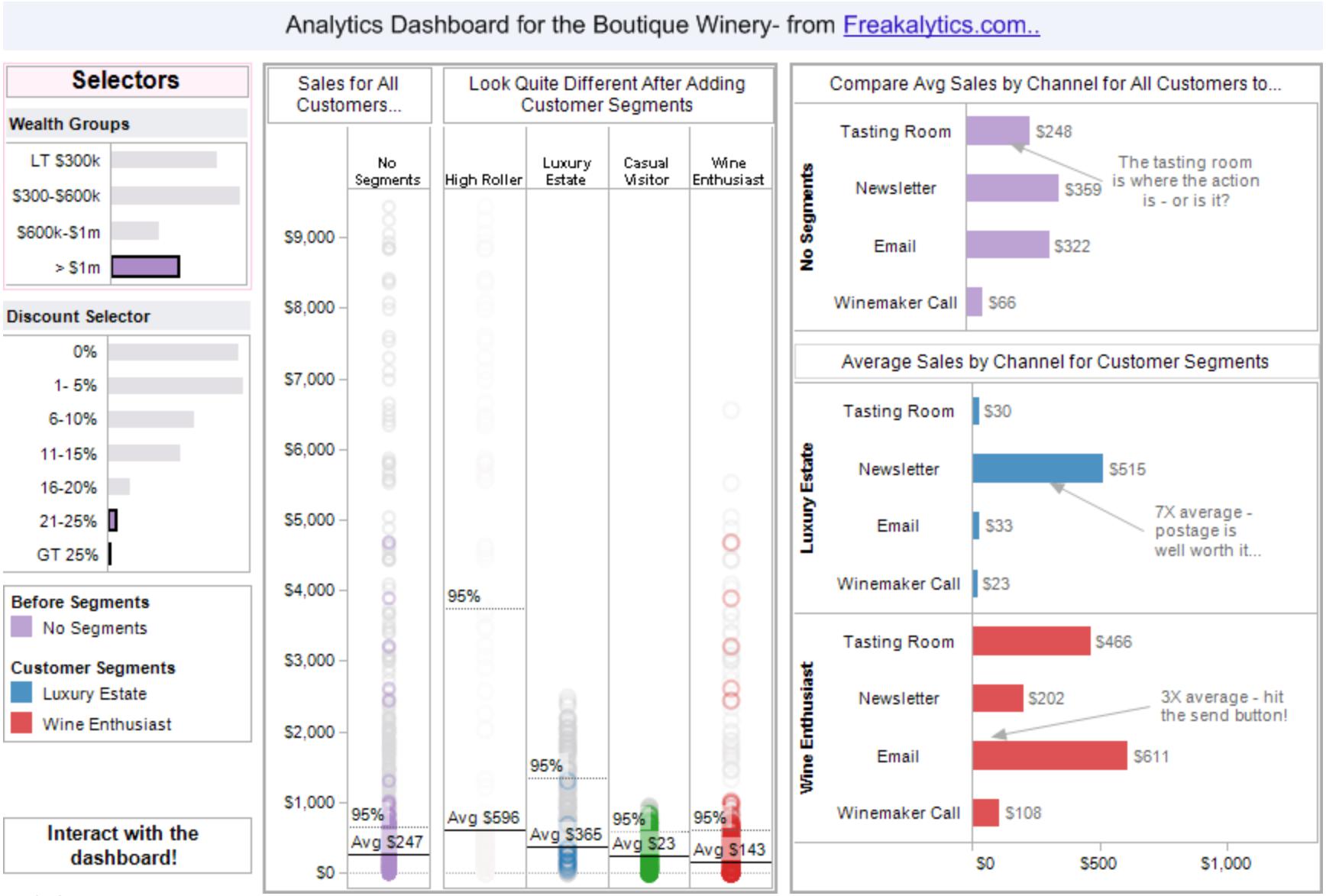
Copyright © 2010 Freakalytics, LLC

Wealthy customers



Copyright © 2010 Freakalytics, LLC

Wealthy customers, high discounts



Copyright © 2010 Freakalytics, LLC

End of section

Data Exploration and Dashboard Design with Tableau Software

Data Exploration Concepts
Adapted from "*Now You See It*"
Stephen Few and from Freakalytics.com

Stephen McDaniel

Co-founder and Principal Analyst
Freakalytics, LLC
http://www.Freakalytics.com

Copyright © 2009 Freakalytics, LLC

Seven habits of effective analysts – adapted from Freakalytics.com

1. **Collect, discuss and understand the questions that matter for your customers and business owners**
2. Collect and clean the best available data for the identified questions
3. Explore the data sources to understand high level trends and exceptions
4. Understand key interactions, trends, sources of effect & possible causes
5. Communicate the right amount of information and conclusions in the language of the audience
6. Collaborate with the business to act on the findings
7. Continue to learn from and listen to the business!

Copyright © 2009 Freakalytics, LLC

Seven habits of effective analysts – adapted from Freakalytics.com

1. Collect, discuss and understand the questions that matter for your customers and business owners
2. **Collect and clean the best available data for the identified questions**
3. Explore the data sources to understand high level trends and exceptions
4. Understand key interactions, trends, sources of effect & possible causes
5. Communicate the right amount of information and conclusions in the language of the audience
6. Collaborate with the business to act on the findings
7. Continue to learn from and listen to the business!

Copyright © 2009 Freakalytics, LLC

Seven habits of effective analysts – adapted from Freakalytics.com

1. Collect, discuss and understand the questions that matter for your customers and business owners
2. Collect and clean the best available data for the identified questions
3. **Explore the data sources to understand high level trends and exceptions**
4. Understand key interactions, trends, sources of effect & possible causes
5. Communicate the right amount of information and conclusions in the language of the audience
6. Collaborate with the business to act on the findings
7. Continue to learn from and listen to the business!

Copyright © 2009 Freakalytics, LLC

Seven habits of effective analysts – adapted from Freakalytics.com

1. Collect, discuss and understand the questions that matter for your customers and business owners
2. Collect and clean the best available data for the identified questions
3. Explore the data sources to understand high level trends and exceptions
4. **Understand key interactions, trends, sources of effect & possible causes**
5. Communicate the right amount of information and conclusions in the language of the audience
6. Collaborate with the business to act on the findings
7. Continue to learn from and listen to the business!

Copyright © 2009 Freakalytics, LLC

Seven habits of effective analysts – adapted from Freakalytics.com

1. Collect, discuss and understand the questions that matter for your customers and business owners
2. Collect and clean the best available data for the identified questions
3. Explore the data sources to understand high level trends and exceptions
4. Understand key interactions, trends, sources of effect & possible causes
5. **Communicate the right amount of information and conclusions in the language of the audience**
6. Collaborate with the business to act on the findings
7. Continue to learn from and listen to the business!

Copyright © 2009 Freakalytics, LLC

Seven habits of effective analysts – adapted from Freakalytics.com

1. Collect, discuss and understand the questions that matter for your customers and business owners
2. Collect and clean the best available data for the identified questions
3. Explore the data sources to understand high level trends and exceptions
4. Understand key interactions, trends, sources of effect & possible causes
5. Communicate the right amount of information and conclusions in the language of the audience
6. **Collaborate with the business to act on the findings**
7. Continue to learn from and listen to the business!

Copyright © 2009 Freakalytics, LLC

Seven habits of effective analysts – adapted from Freakalytics.com

1. Collect, discuss and understand the questions that matter for your customers and business owners
2. Collect and clean the best available data for the identified questions
3. Explore the data sources to understand high level trends and exceptions
4. Understand key interactions, trends, sources of effect & possible causes
5. Communicate the right amount of information and conclusions in the language of the audience
6. Collaborate with the business to act on the findings
7. **Continue to learn from and listen to the business!**

Copyright © 2009 Freakalytics, LLC

Two primary analysis approaches

1. **Directed – start with a specific question that we hope to answer – this is the traditional approach to analysis**

   Many analysis tools, disparate data sources and "dirty data" have long constricted the analyst to undertaking this approach

   Many technical and statistical classes have long stressed this mode of thinking

   Many managers/executives have been schooled in working with analysts in this mode

Copyright © 2009 Freakalytics, LLC

Two primary analysis approaches

1. **Directed** – start with a specific question that we hope to answer – this is the traditional approach to analysis

   Many analysis tools, disparate data sources and "dirty data" have long constricted the analyst to undertaking this approach

   Many technical and statistical classes have long stressed this mode of thinking

   Many managers/executives have been schooled in working with analysts in this mode

Copyright © 2009 Freakalytics, LLC

Two primary analysis approaches

2. **Exploratory – take a fresh look at some data to see what might be interesting**

   This is a new area for many people

   Being successful with exploratory analysis requires additional context (beyond the data) about the subject at hand

   A clear and open mind also helps

   You are exploring for unexpected outcomes (against "conventional wisdom" or outliers/unusual shapes and patterns)

Copyright © 2009 Freakalytics, LLC

Two primary analysis approaches

2. **Exploratory** – take a fresh look at some data to see what might be interesting

   This is a new area for many people

   Being successful with exploratory analysis requires additional context (beyond the data) about the subject at hand

   A clear and open mind also helps

   You are exploring for unexpected outcomes (against "conventional wisdom" or outliers/unusual shapes and patterns)

Copyright © 2009 Freakalytics, LLC

Sub-conscious image processing- why graphs are so powerful

- **Conscious processing- how many 4's are there?**

209387056796387682736401735867389672897563095679822659065068
548609732937659865789638907566958038873326689058895709462098
907098651252134698089623213238789789708953785647878763256678
231320987093698809215226338900010163324387262893722098791903

Copyright © 2009 Freakalytics, LLC

Sub-conscious image processing- why graphs are so powerful

- Conscious processing- how many 4's are there?

20938705679638768273640173586738967289756309567982265906506854860973293765986578963890756695803887332668905889570946209890709865125213469808962321323878978970895378564787876325667823132098709369880921522633890001016332438726289372209879190

- **Subconscious or preattentive processing- how many 4's are there?**

20938705679638768273**4**0173586738967289756309567982265906506854**4**860973293765986578963890756695803887332668905889570**4**62098907098651252134698089623213238789789708953785**4**787876325667823132098709369880921522633890001016332**4**38726289372209879190

Copyright © 2009 Freakalytics, LLC

Leverage pre-attentive processing with graph attributes

Perceived Precision	Attribute	Example	Description
High	Length		Longer = greater
High	2-D Position		Higher or farther to right = greater
Low	Width		Wider = greater
Low	2-D Position		Bigger = greater
Low	Intensity		Darker = greater
Low	Shape		More jagged = more important

Copyright © 2009 Freakalytics, LLC

Leverage pre-attentive processing with graph attributes

Perceived Precision	Attribute	Example	Description
High	Length		Longer = greater
High	2-D Position		Higher or farther to right = greater
Low	Width		Wider = greater
Low	2-D Position		Bigger = greater
Low	Intensity		Darker = greater
Low	Shape		More jagged = more important

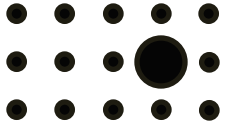
Copyright © 2009 Freakalytics, LLC

Leverage pre-attentive processing with graph attributes

Perceived Precision	Attribute	Example	Description
High	Length		Longer = greater
High	2-D Position		Higher or farther to right = greater
Low	Width		Wider = greater
Low	2-D Position		Bigger = greater
Low	Intensity		Darker = greater
Low	Shape		More jagged = more important

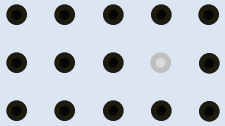
Copyright © 2009 Freakalytics, LLC

Leverage pre-attentive processing with graph attributes

Perceived Precision	Attribute	Example	Description
High	Length		Longer = greater
High	2-D Position		Higher or farther to right = greater
Low	Width		Wider = greater
Low	2-D Position		Bigger = greater
Low	Intensity		Darker = greater
Low	Shape		More jagged = more important

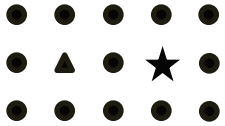
Copyright © 2009 Freakalytics, LLC

Leverage pre-attentive processing with graph attributes

Perceived Precision	Attribute	Example	Description
High	Length		Longer = greater
High	2-D Position		Higher or farther to right = greater
Low	Width		Wider = greater
Low	2-D Position		Bigger = greater
Low	Intensity		Darker = greater
Low	Shape		More jagged = more important

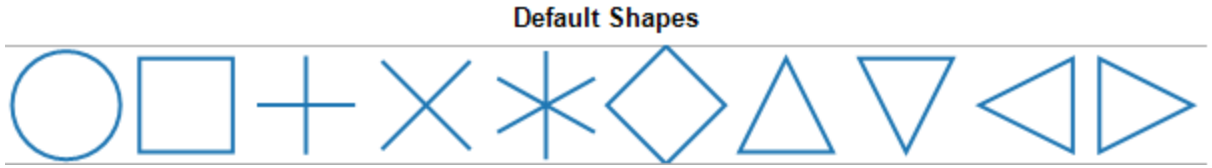
Copyright © 2009 Freakalytics, LLC

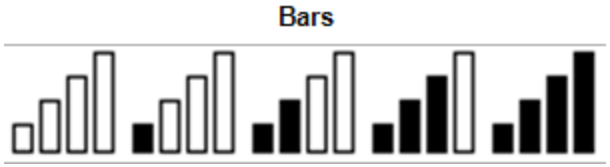
Leverage pre-attentive processing with graph attributes

Perceived Precision	Attribute	Example	Description
High	Length		Longer = greater
High	2-D Position		Higher or farther to right = greater
Low	Width		Wider = greater
Low	2-D Position		Bigger = greater
Low	Intensity		Darker = greater
Low	Shape		More jagged = more important

Copyright © 2009 Freakalytics, LLC

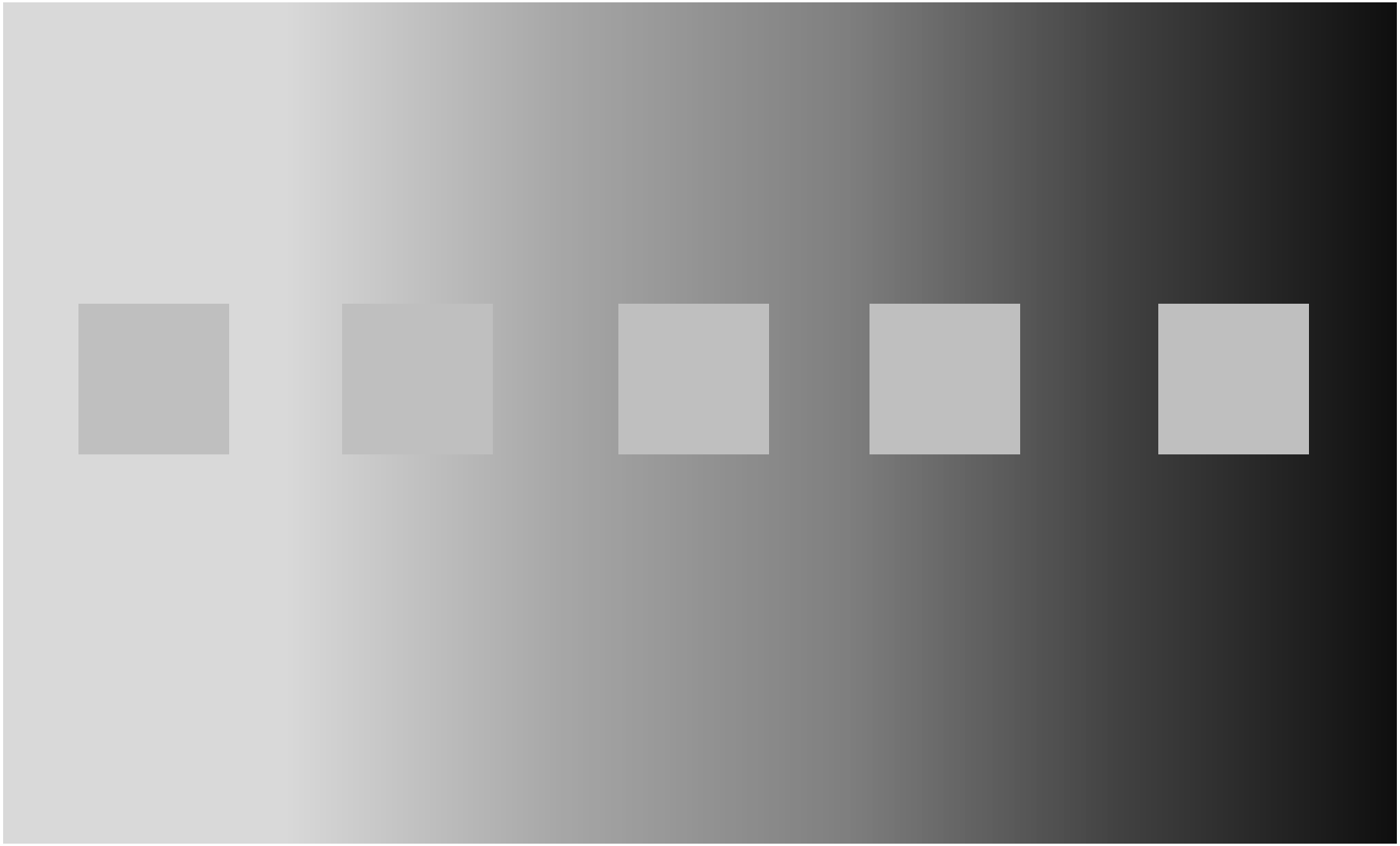
Tableau shapes- pros and cons of each?





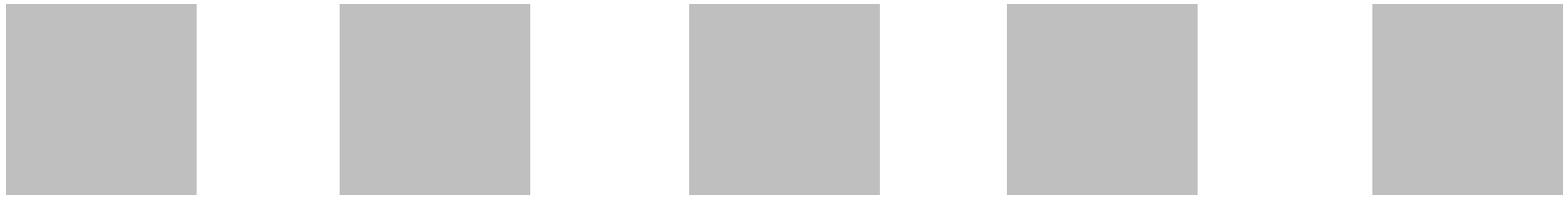
Copyright © 2009 Freakalytics, LLC

Color coding and perception
which square is lightest?



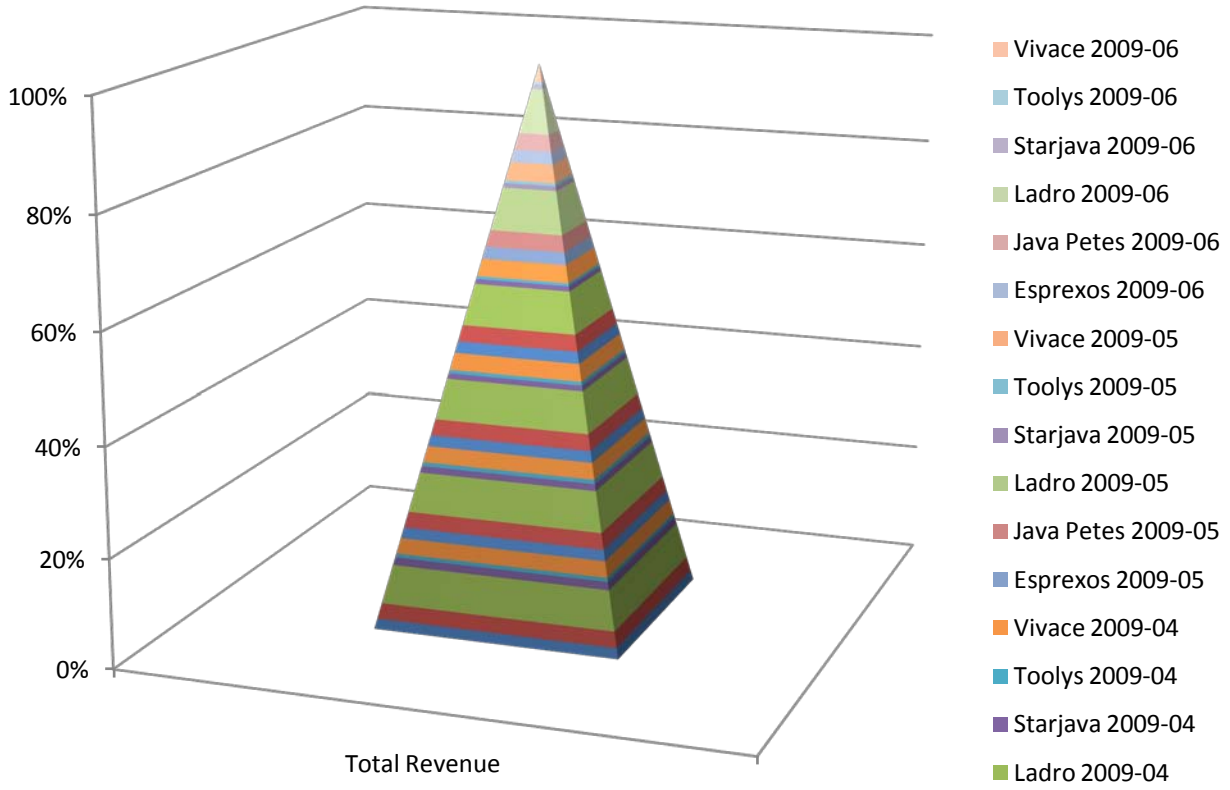
Copyright © 2009 Freakalytics, LLC

Color coding and perception
which square is lightest?



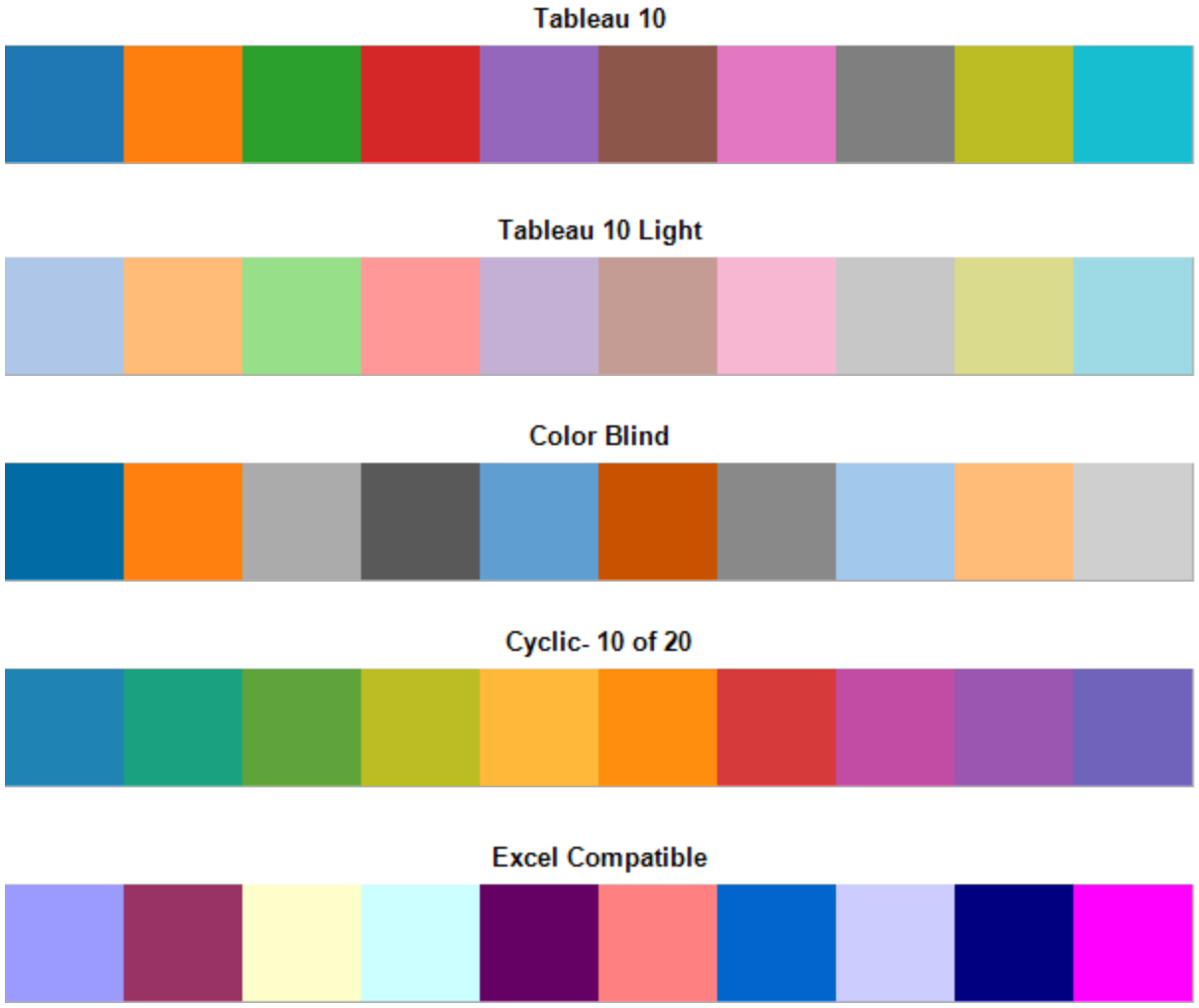
Copyright © 2009 Freakalytics, LLC

Poor defaults lead to poor comprehension and insights



Copyright © 2009 Freakalytics, LLC

Color coding- Tableau 10 is the default, when would you use other palettes?



Copyright © 2009 Freakalytics, LLC

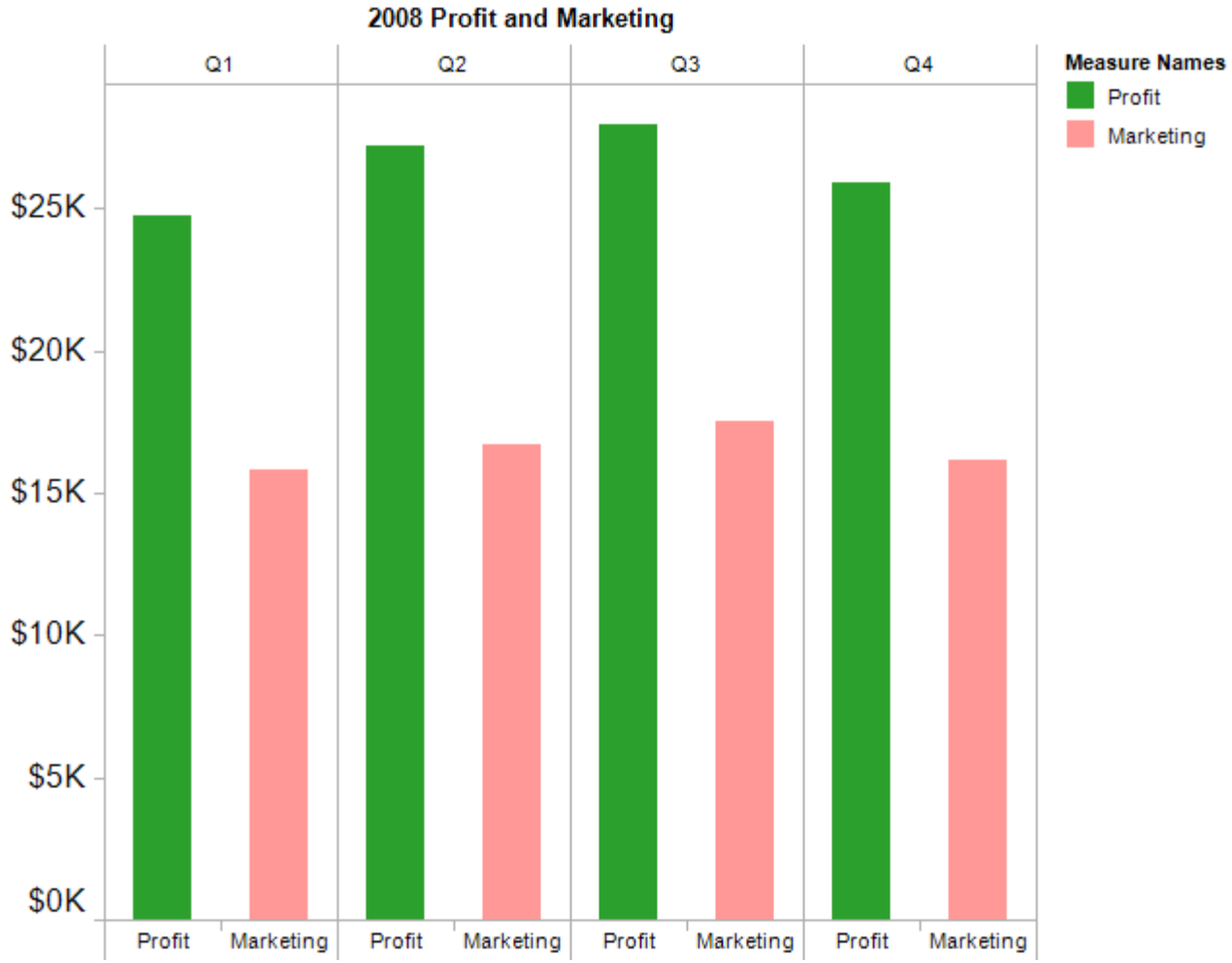
If you remember just one part of this presentation!

- Show the data- let the **message** dominate
- Show the data- the **shape** should be clear
- Show the data- **eliminate clutter**

- Highlight the data that matters
- Reduce intensity of supporting data
- Avoid unintentional deception through poor choice of graph, symbols, color or perspective

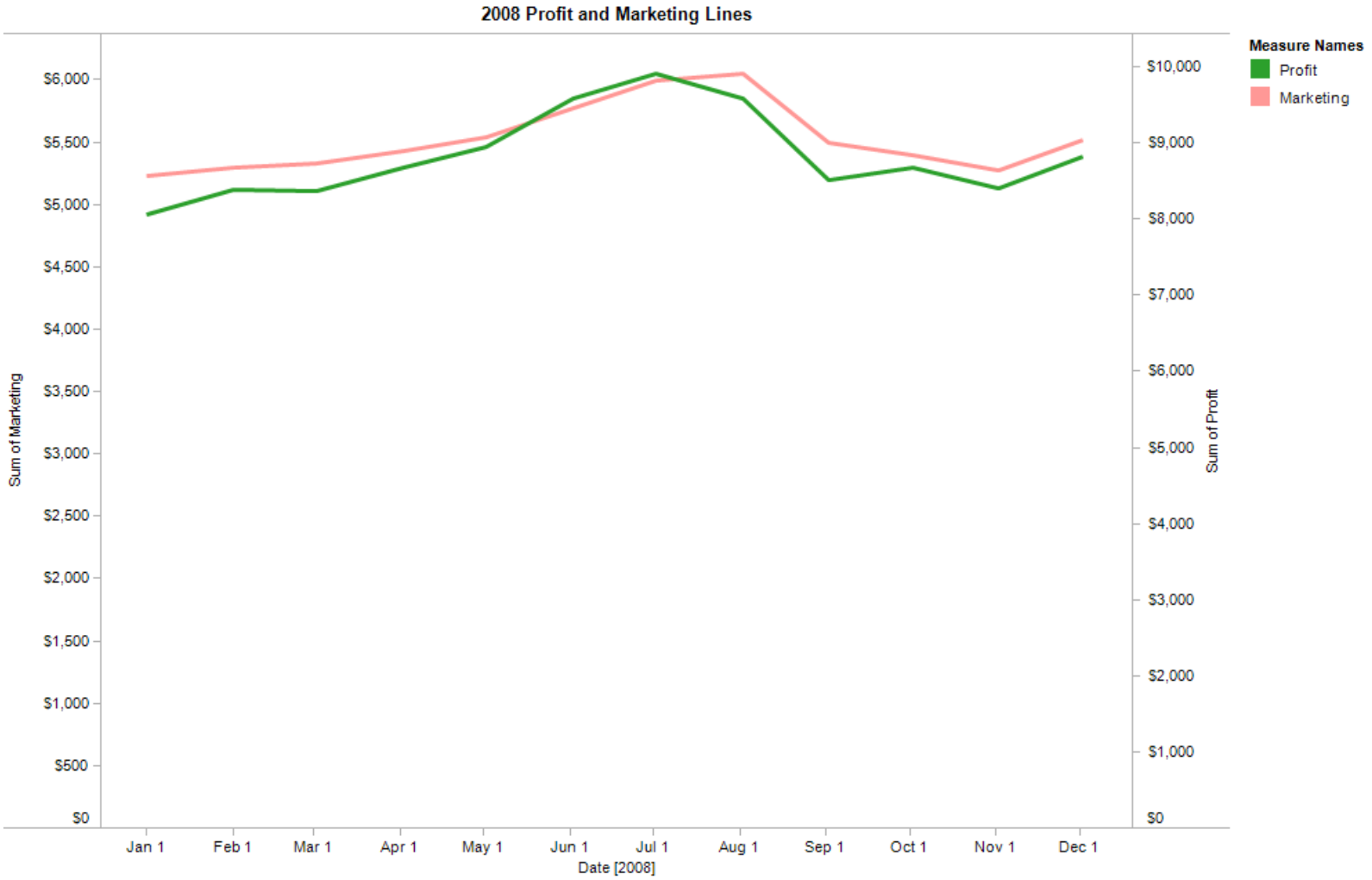
Copyright © 2009 Freakalytics, LLC

Emphasis on *Profit* versus *Marketing* quarterly results



Copyright © 2009 Freakalytics, LLC

Emphasis on shape of data through the year

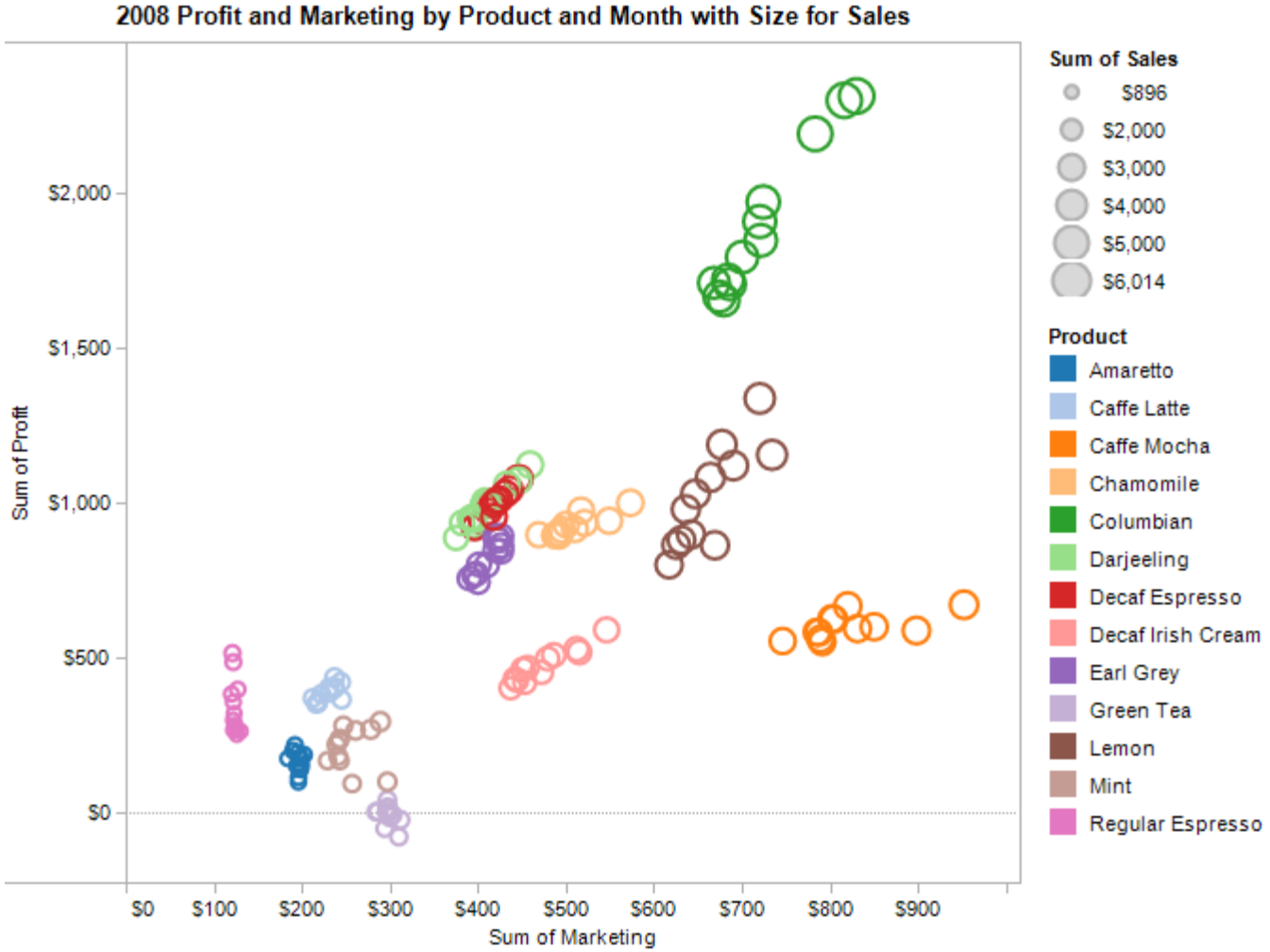


Copyright © 2009 Freakalytics, LLC

Emphasis on a product that lags on *Profit* relative to *Marketing*

Copyright © 2009 Freakalytics, LLC

Understanding *Sales* relative to *Profit* and *Marketing*

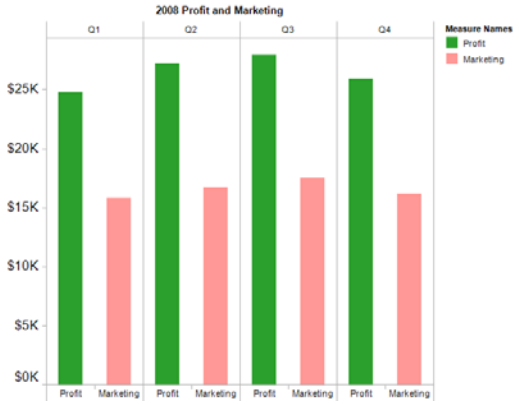


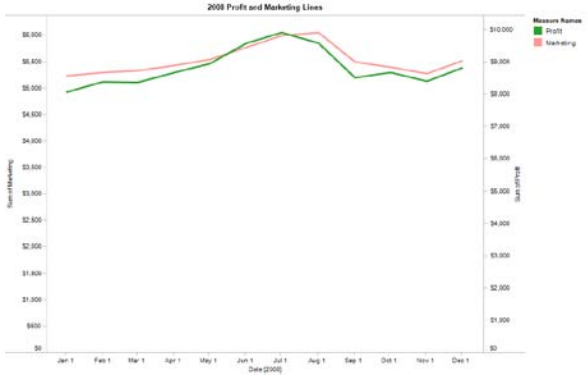
Copyright © 2009 Freakalytics, LLC

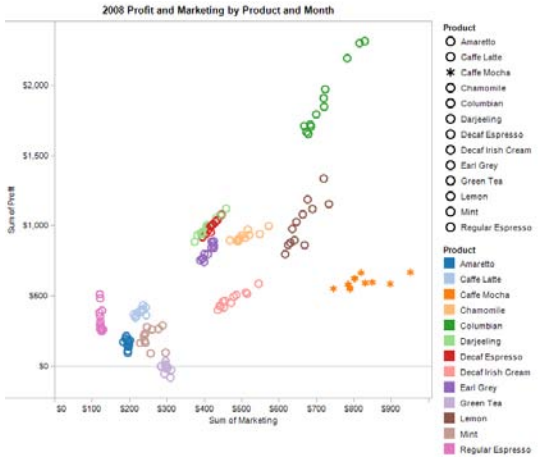
Emphasis on *Path* of *Profit* vs. *Marketing* through the *Quarters* of the year

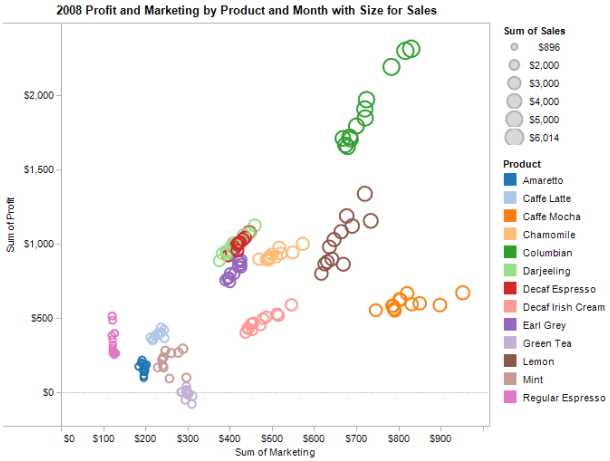
Copyright © 2009 Freakalytics, LLC

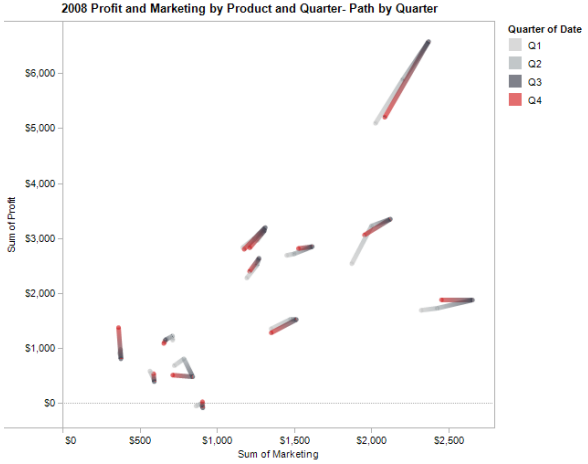
The power of graph types, symbols, color and size- convey very different insights











Copyright © 2009 Freakalytics, LLC

End of section