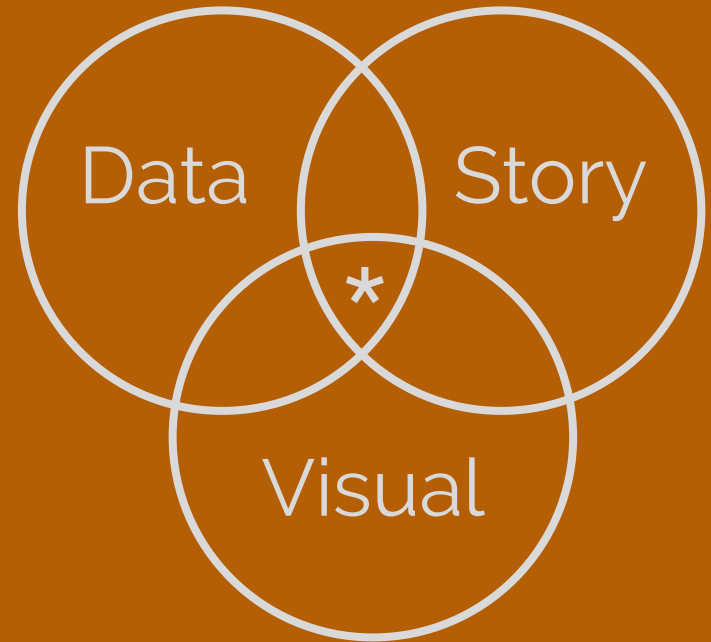


Data Visualisation

Amit Kapoor
@amitkaps

Dashboards



Dashboard

“A dashboard is a visual display of
the most important information needed to
achieve one or more objectives
that has been
consolidated on a single screen
so it can be
monitored at a glance”

Stephen Few

Analogy - Car Dashboard

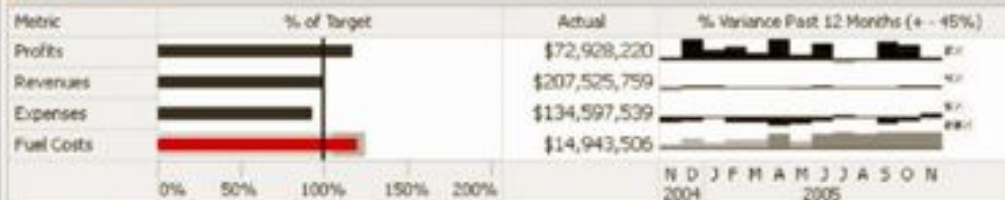


Airline Dashboard (November 15, 2005)

Legend

■ Actual ■ Warning ■ Target ■ Poor ■ Satisfactory ■ Good ■ Good Months

YTD Financials



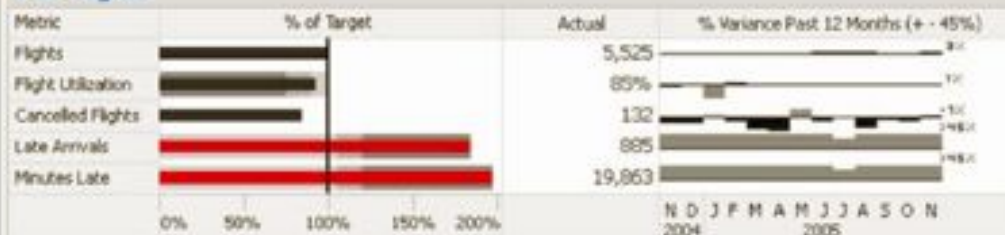
Revenues by Channel



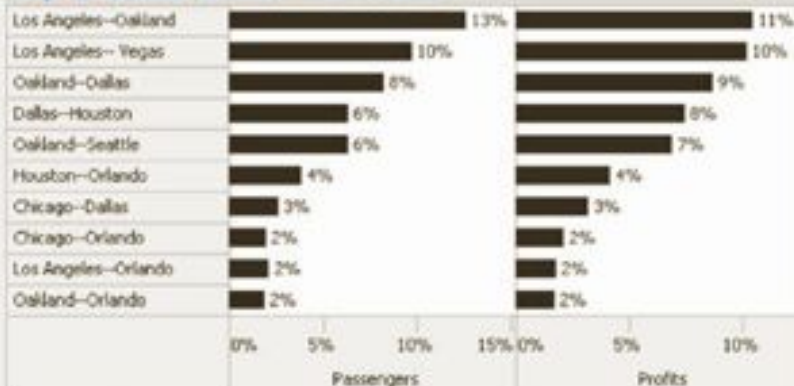
YTD Market



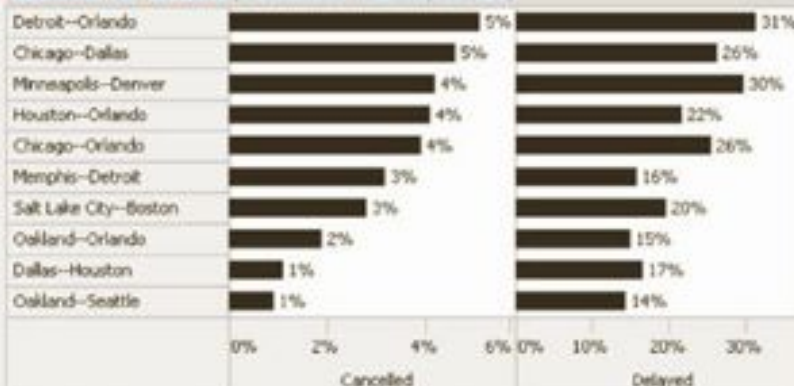
YTD Flights



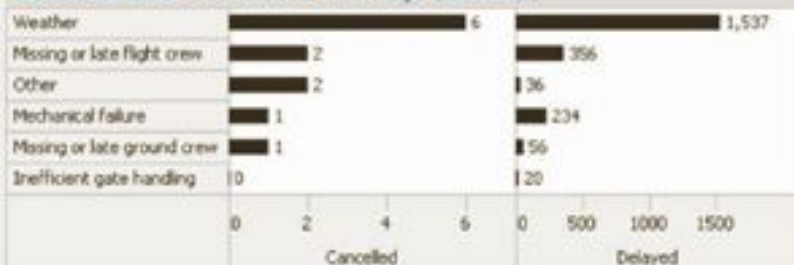
Top 10 Routes (last 30 days - ranked by profits)



Bottom 10 Routes (last 6 months - ranked by cancelled)



Reasons for Cancellations & Delays (last 30 days)



Additional Characteristics



- High-level summaries
- Small, concise, clear, and intuitive display mechanisms
- Customized
- Metrics or KPIs?

Poor Dashboard Design

1 Structural Challenges

- Exceeding the boundaries of a single screen
- Supplying inadequate context for the data
- Arranging the data poorly

2 Measure Challenges

- Displaying excessive detail or precision
- Choosing a deficient measure

3 Encoding Challenges

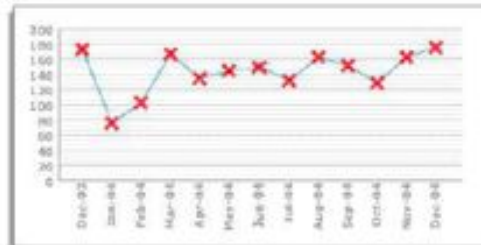
- Choosing inappropriate media of display
- Introducing meaningless variety
- Encoding quantitative data inaccurately
- Ineffectively highlighting what's important

4 Visual Design Challenges

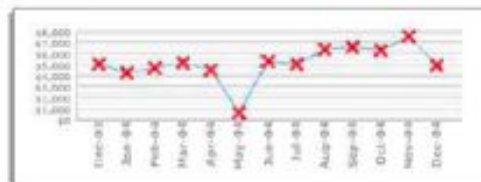
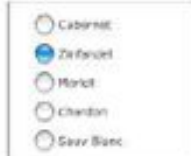
- Cluttering the screen with useless decoration
- Misusing or overusing color
- Designing an unappealing visual display

1. Structural Challenges

Monthly Performance



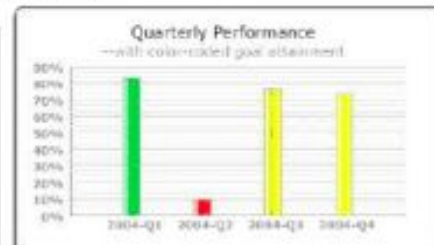
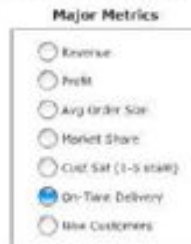
Revenue by Product



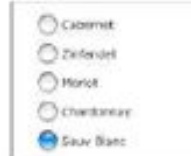
Revenue By Region



Quarterly Performance to Goal



Revenue by Product



Revenue By Region



Sales Pipeline Information

Sales Pipeline by Region for the Current Quarter to Date				
Probability of Closing this Sale				
Revenue By Region	60%	75%	90%	25%
N Amer	\$1,384	\$1,384	\$4,597	\$3,505
Europe	\$1,165	\$1,162	\$2,955	\$1,273
Asia	\$952	\$1,458	\$3,645	\$2,760
S Amer	\$159	\$295	\$555	\$501
Mid East	\$267	\$254	\$529	\$527
Total Region Pipeline	\$6,052	\$7,074	\$12,699	\$9,567

Top 10 Customers in the Pipeline	Pipeline Revenue	QTD Sales Revenue	YTD Sales Revenue	Projected Year-End Sales
The Big Wine Store	\$5,002	\$3,685	\$26,348	\$75,421
Wines 'R Us	\$4,243	\$3,645	\$62,044	\$96,837
Fruit of the Vine	\$3,972	\$3,668	\$75,157	\$170,936
Sparks of the Age	\$3,903	\$3,668	\$77,694	\$91,207
The Beverage Company	\$3,705	\$2,554	\$52,795	\$64,505
Wax and Wine	\$2,895	\$3,665	\$53,454	\$96,391
American Vineyard's Best	\$2,565	\$3,535	\$75,396	\$77,795
Barnes and Egg	\$2,176	\$932	\$40,136	\$42,718
Cherry	\$1,738	\$1,457	\$26,008	\$76,745
Happy Vine	\$1,268	\$	\$9,396	\$16,794
Total Top Ten	\$38,008	\$24,263	\$638,934	\$843,548

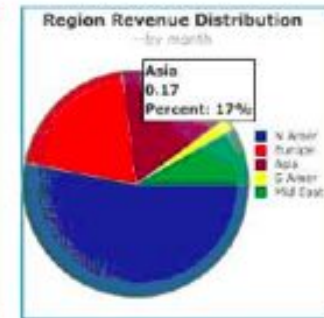
Product or Region Revenue Distribution

(Select a month from the appropriate list box.)

Product



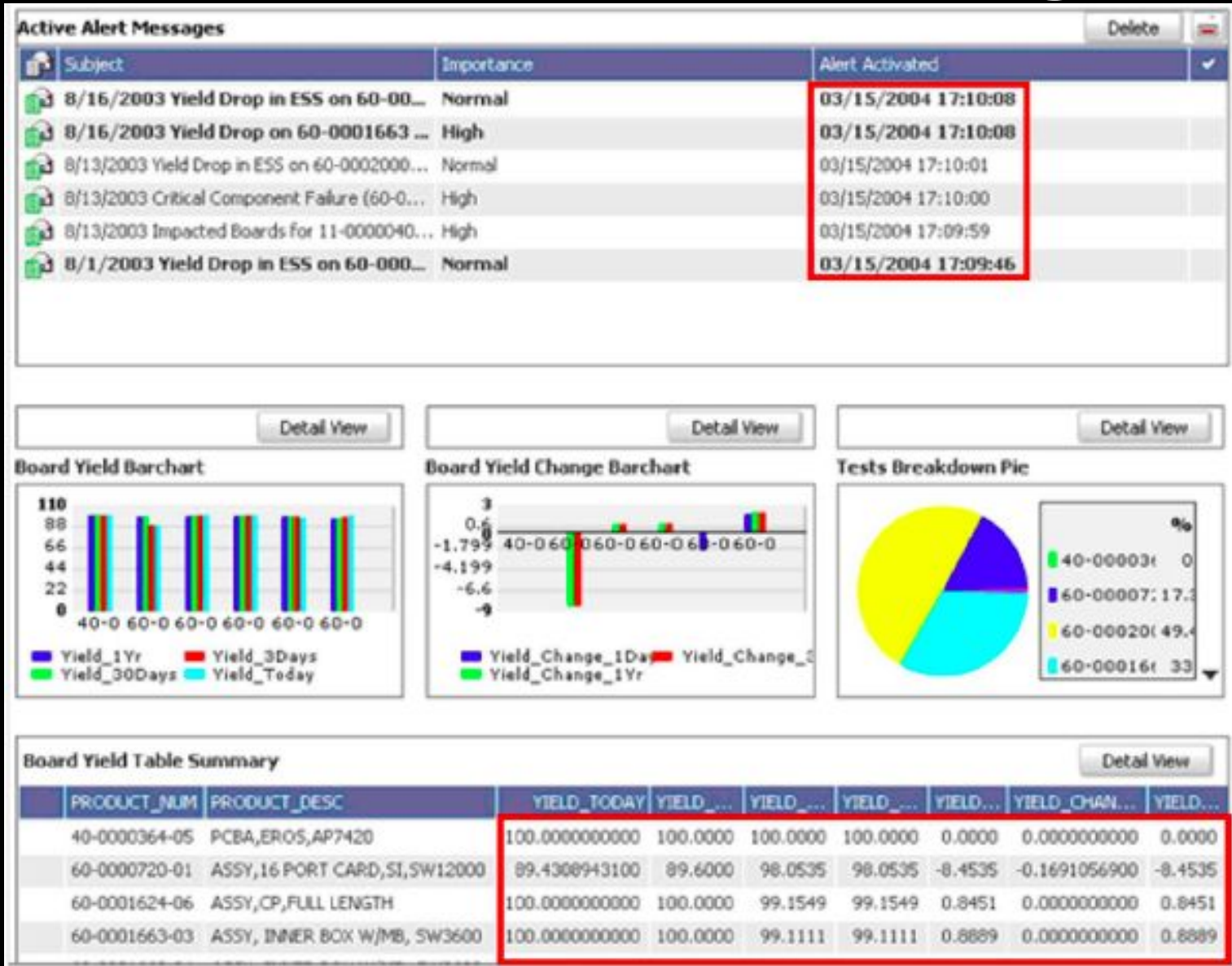
Region



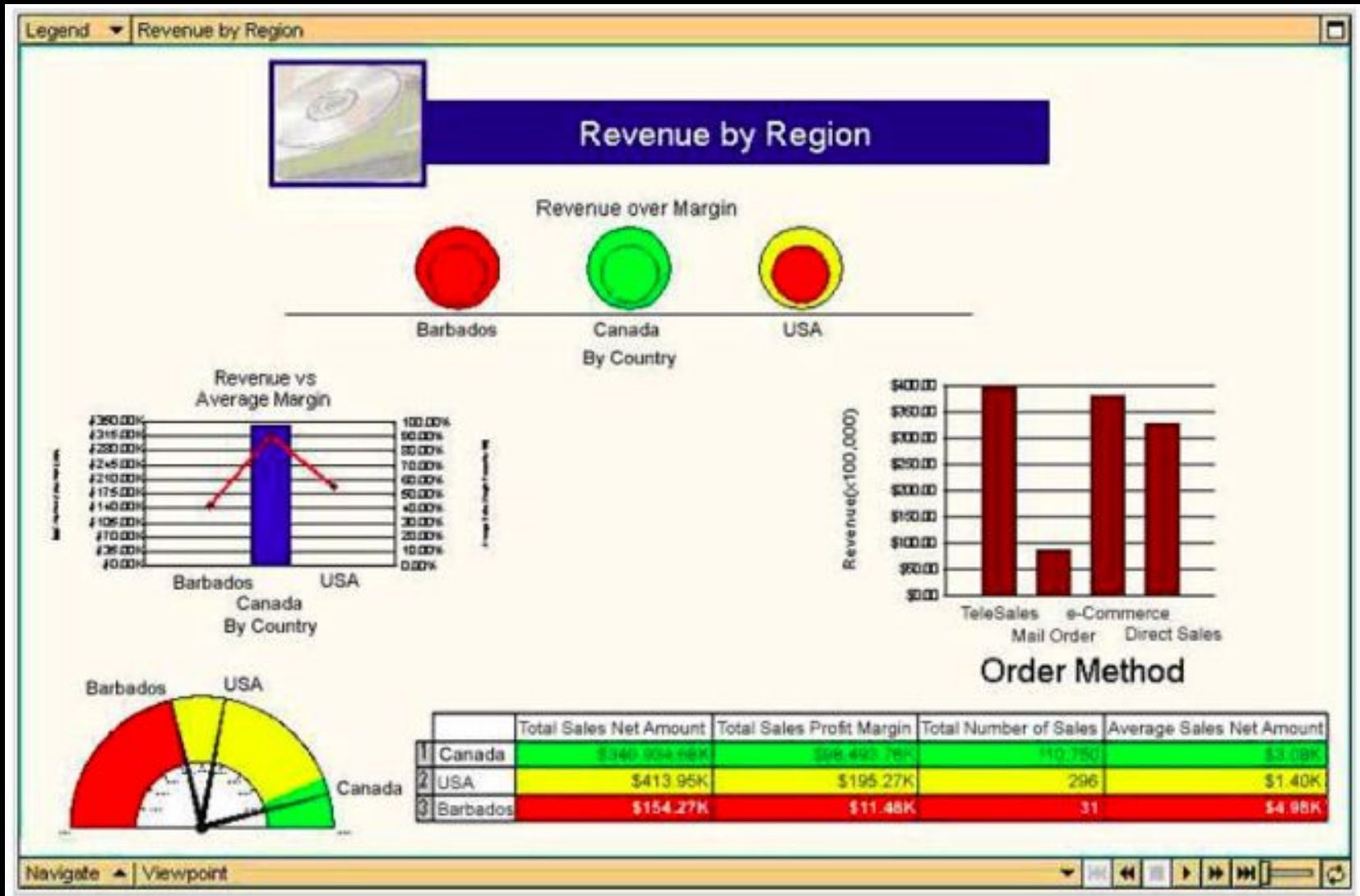
1. Structural Challenges



2. Measure Challenges



3. Encoding Challenges



3. Encoding Challenges



October Units

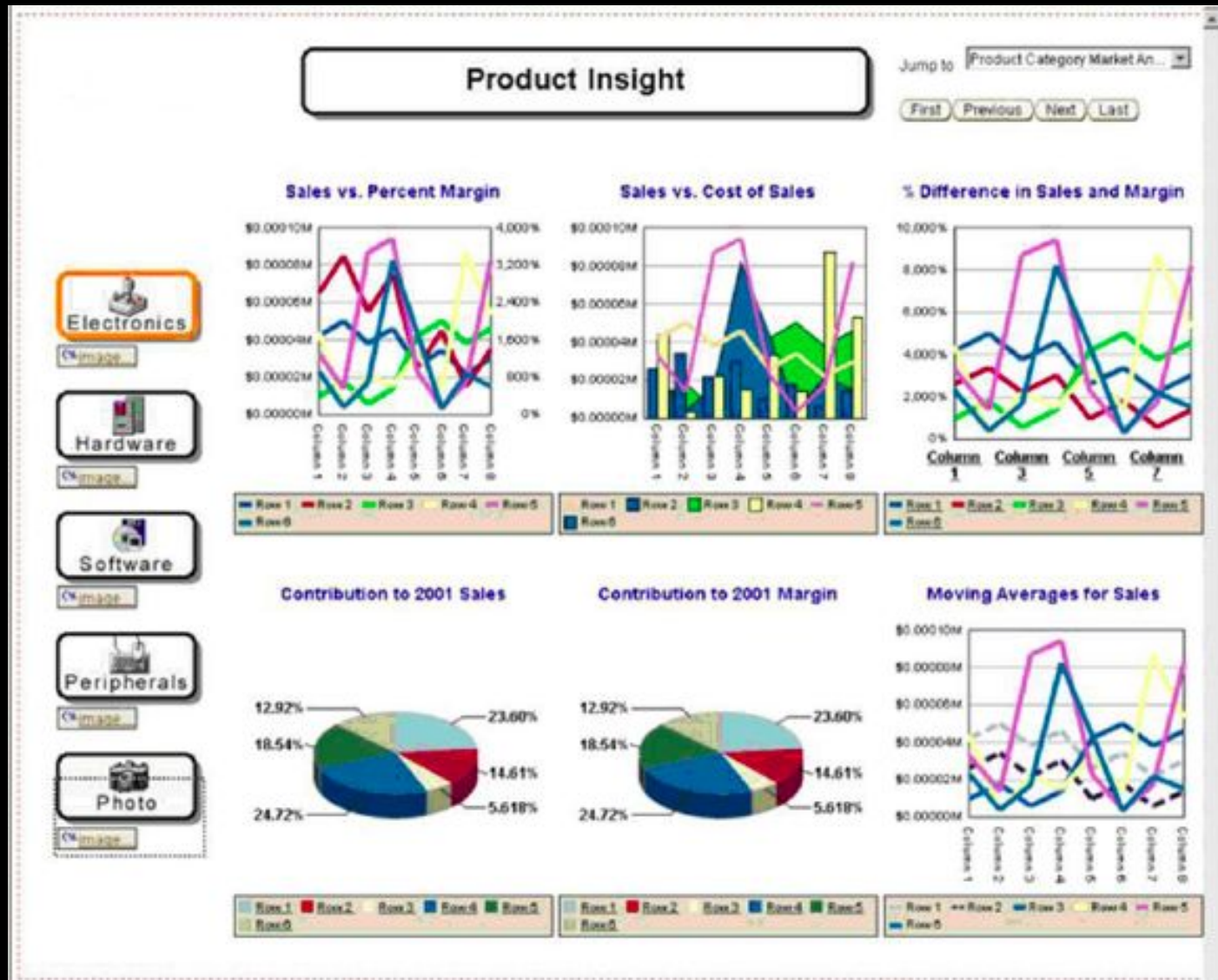


YTD Units



Returns Rate

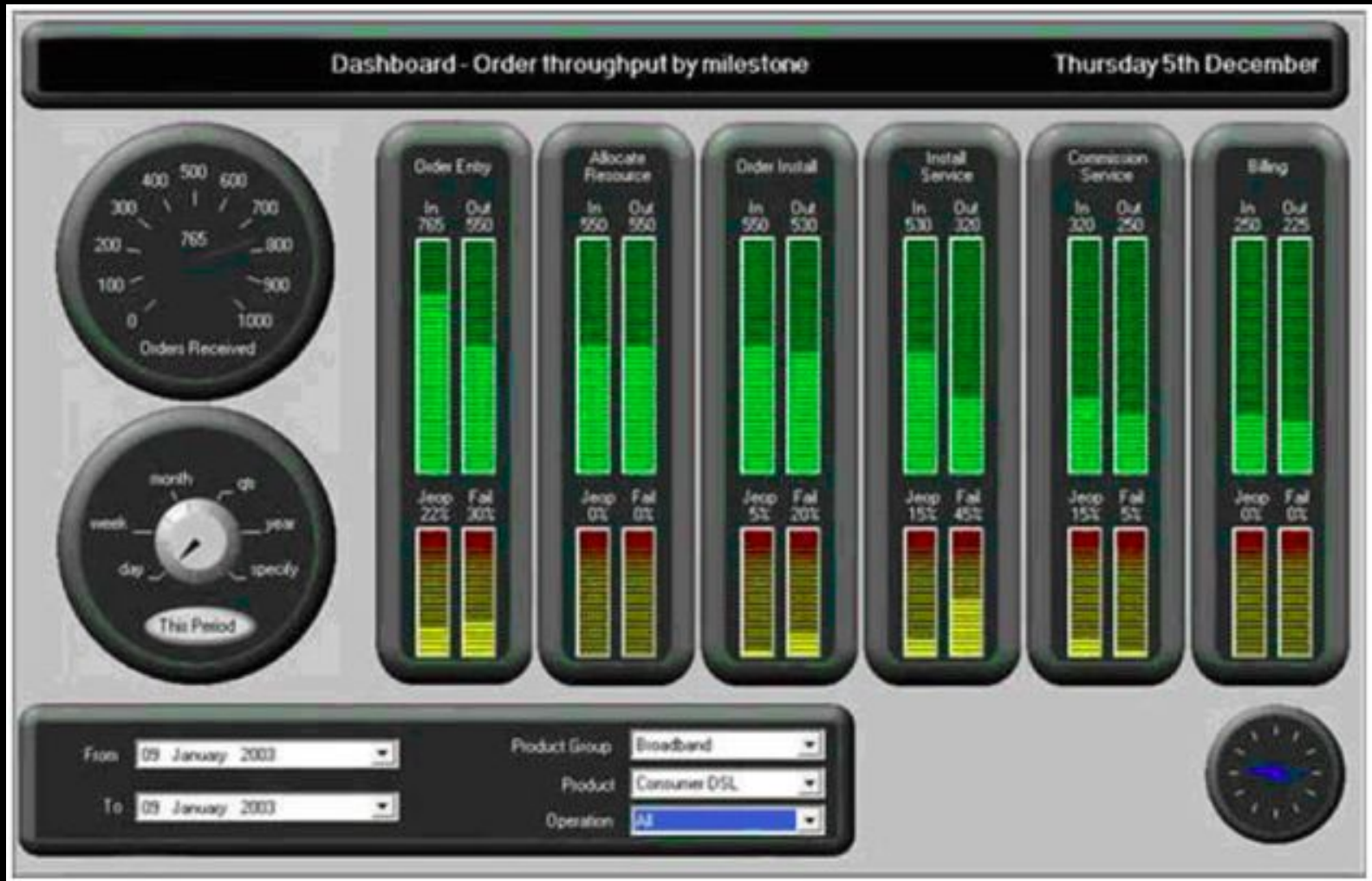
3. Encoding Challenges



4. Visual Design Challenges



4. Visual Design Challenges



Who is the Audience?

Role of the Audience

- What decision to they make?
- What questions do they need to make?

Fit in Workflow

- In what context will they be reviewing it?
- What data are they using daily?
- How much time do they have to review?

Data Comfort and Expertise

- How sophisticated are the users?
- Familiarity with tools and KPIs

Value of Dashboard

Direction

- Set Goals and Expectations
- Specific Action

Tracking

- Exceptions and Alerts
- Performance Tracking

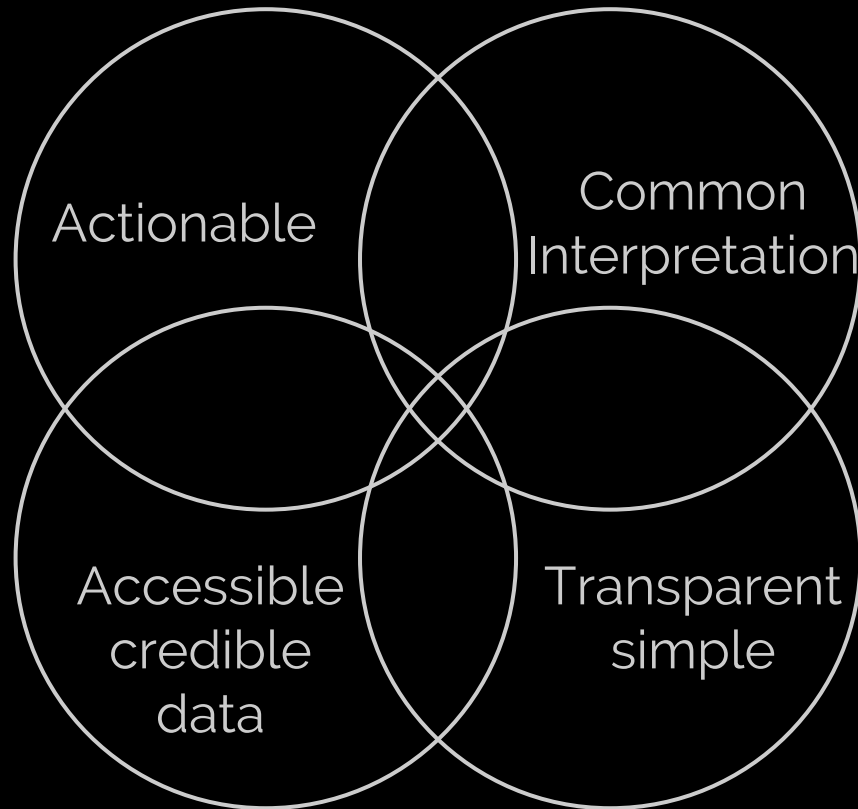
Communicate

- Common Interface
- Educate and Inform
- Progress and Success

Type of Dashboard

Scope	<input type="checkbox"/> Broad: Displaying information about the entire organization	<input type="checkbox"/> Specific: Focusing on a specific function, process, product, etc.
Business role	<input type="checkbox"/> Strategic: Provides a high-level, broad, and long-term view of performance	<input type="checkbox"/> Operational: Provides a focused, near-term, and tactical view of performance
Time horizon	<input type="checkbox"/> Historical: Looking backwards to track trends <input type="checkbox"/> Snapshot: Showing performance at a single point in time	<input type="checkbox"/> Real-time: Monitoring activity as it happens <input type="checkbox"/> Predictive: Using past performance to predict future performance
Customization	<input type="checkbox"/> One-size-fits-all: Presented as a single view for all users	<input type="checkbox"/> Customizable: Functionality to let users create a view that reflects their needs
Level of detail	<input type="checkbox"/> High: Presenting only the most critical top-level numbers	<input type="checkbox"/> Drill-able: Providing the ability to drill drill down to detailed numbers to gain more context
Point of view	<input type="checkbox"/> Prescriptive: The dashboard explicitly tells the user what the data means and what to do about it	<input type="checkbox"/> Exploratory: User has latitude to interpret the results as they see fit

Deciding KPIs



Quantitative Measure

Category	Measures
Sales	Bookings,Billings, Sales pipeline (anticipated sales) Number of orders, Order amounts, Selling prices
Marketing	Market share, Campaign success, Customer demographics
Finance	Revenues, Expenses, Profits
Technical Support	Number of support calls, Resolved cases, Customer satisfaction, Call durations
Fulfillment	Number of days to ship, Backlog, Inventory levels
Manufacturing	Number of units manufactured, Manufacturing times Number of defects
Human Resources	Employee satisfaction, Employee turnover Count of open positions, Count of late performance reviews
Information Technology	Network downtime, System usage Fixed application bugs
Web Services	Number of visitors, Number of page hits, Visit durations

What to do with measures

Variation in timing

e.g. This year/quarter/month/week to date

Enrichment through comparison

e.g. budget vs. actual, typical range

Enrichment through evaluation

e.g. alerts, good/bad signals

Add qualitative data

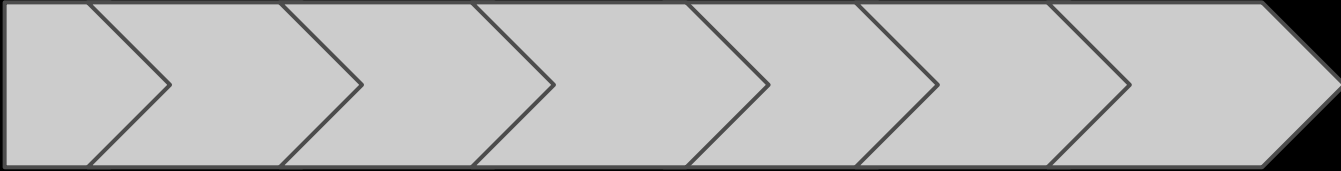
e.g. top 10 customer, issues to investigate

Format for Dashboard

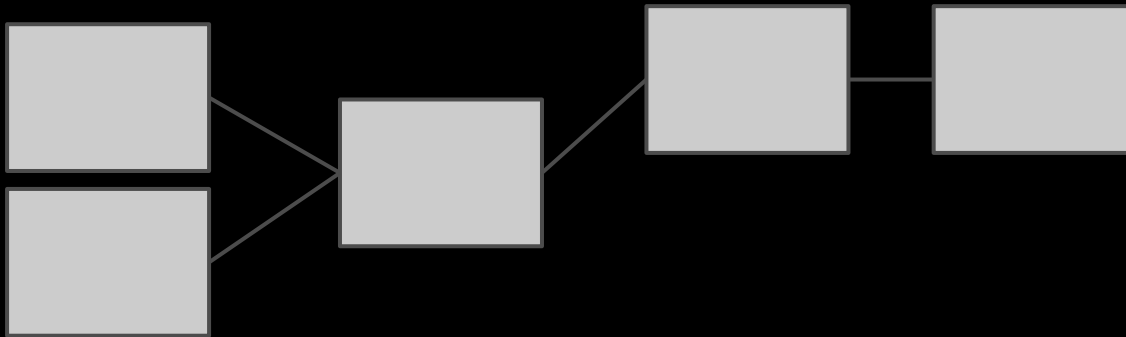
	Paper One-pager	Paper Presentation	Excel	Online app	E-mail / text message	Large screen
Timeliness	-	-	+	+	+	+
Aesthetic	+	+		+	-	+
Mobility	+				+	-
Connectivity	-	-		+	+	+
Data detail	-	+	+	+	-	
Data density	+	+			-	
Interactivity	-	-		+	-	-
Collaboration					+	-

Structure for Dashboard

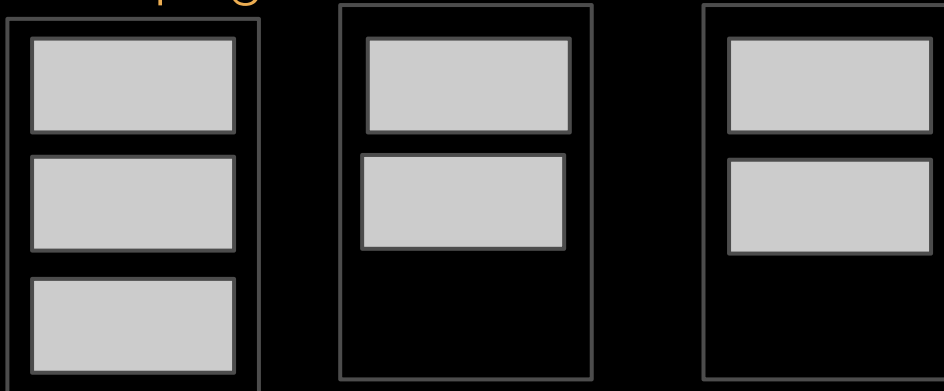
Flow



Relationships



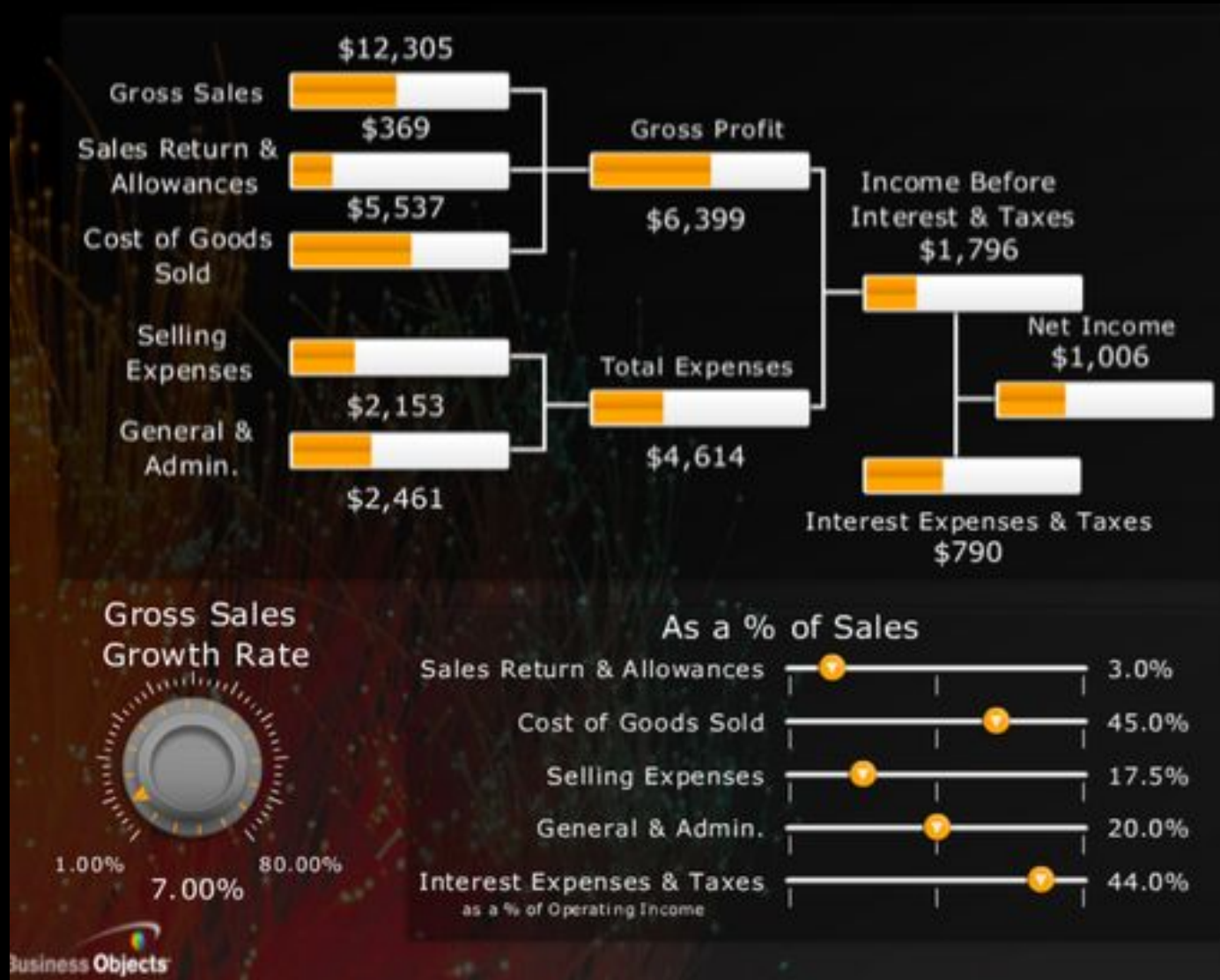
Grouping



Structure - Flow



Structure - Relationship



Structure - Grouping

HISTORICAL CHART FINANCIALS TABLE

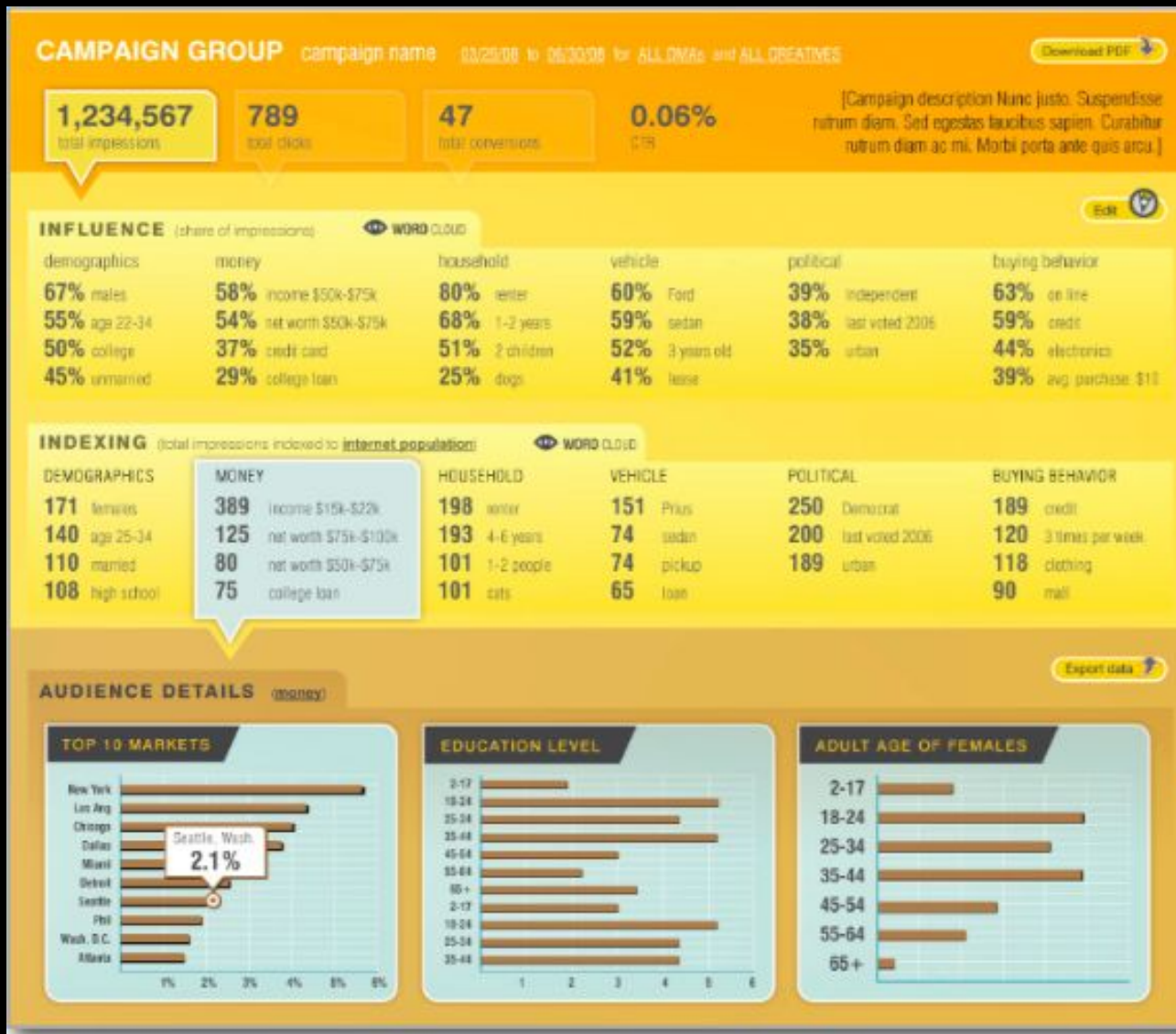
Google Inc.
GOOG: Nasdaq

Change

Fundamentals | [Income Statement](#) | [Cash Flow](#) | [Balance Sheet](#) | [SEC Filings](#)

Size		Per Share Data		Ratios	
Market capitalization	146.0B	Earnings per share	\$14.41	Gross margin	61.51%
Enterprise value	126.7B	Revenue per share	\$70.13	Return on equity	15.93%
Revenues	22.3B	Cash flow per share	\$19.28	Price/Sales	6.6x
Net income	4.6B	Dividends per share	\$0.00	Price/Earnings	32.0x
No. of employees	19,786	Book value per share (MRQ)	\$99.85	Price/Book (MRQ)	4.6x
All data trailing twelve months.		All data trailing twelve months except where noted.		All data trailing twelve months except where noted.	
Enterprise value - Market cap plus debt, minority interest and preferred shares, minus cash and cash equivalents.		MRQ - Most recent quarter		MRQ - Most recent quarter	

Dashboard Characteristics



*Compactness/
Modularity*

Gradual Reveal

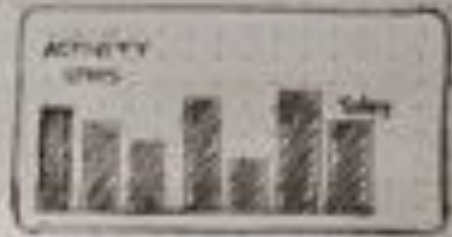
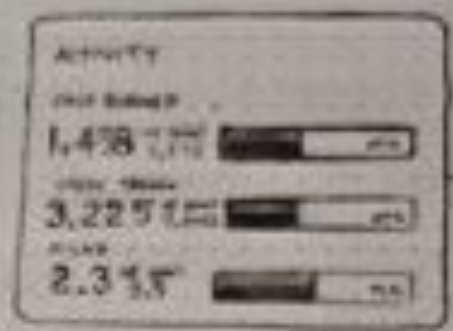
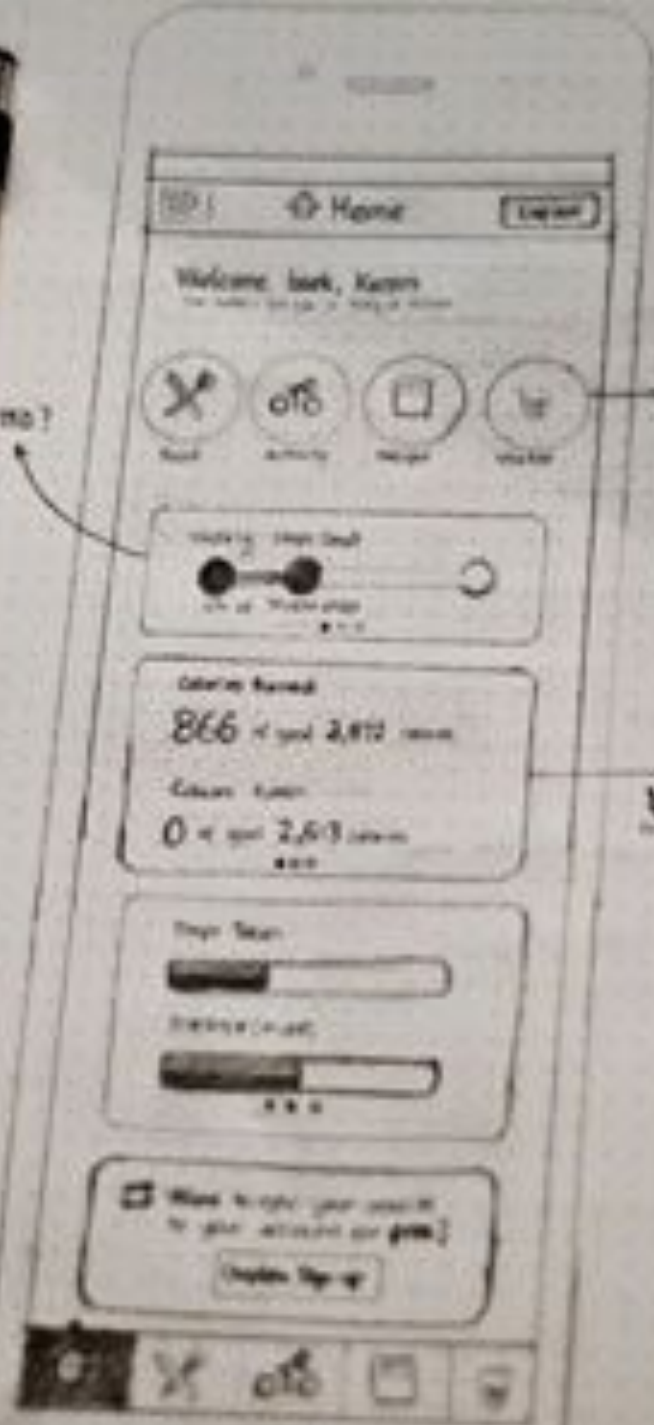
Guide Attention

Focus & Guide

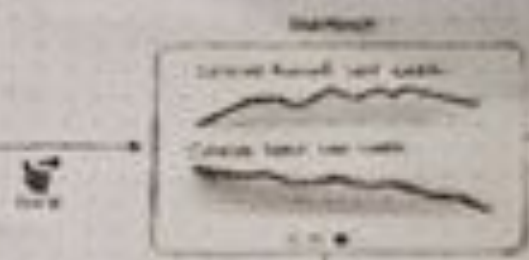
Attention

Wireframe your Dashboard

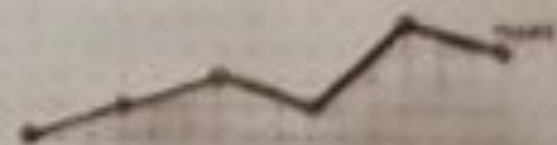




Shows past 7 days



Trend chart of Step Count



Focus your Attention

Emphasized	Neither emphasized nor de-emphasized
Neither emphasized nor de-emphasized	De-emphasized

Graphs - Sparklines

Sales By Department
(sales in millions)

	Current
All Departments	\$ 159.6
Women's Apparel	\$ 32.6
Patio & Garden	\$ 16.2
Toys	\$ 15.7
Electronics	\$ 14.9
Baby Apparel	\$ 14.2
Men's Apparel	\$ 13.5
Kid's Apparel	\$ 12.6
Furniture	\$ 11.4
Bed & Bath	\$ 11.1
Kitchen	\$ 9.9
Home	\$ 7.5

	Current	1- Year
All Departments	\$159.6	
Women's Apparel	\$ 32.6	
Patio & Garden	\$ 16.2	
Toys	\$ 15.7	
Electronics	\$ 14.9	
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Kid's Apparel	\$ 12.6	
Furniture	\$ 11.4	
Bed & Bath	\$ 11.1	
Kitchen	\$ 9.9	
Home	\$ 7.5	

"data-intense, design-simple, word-sized graphic" - Edward Tufte

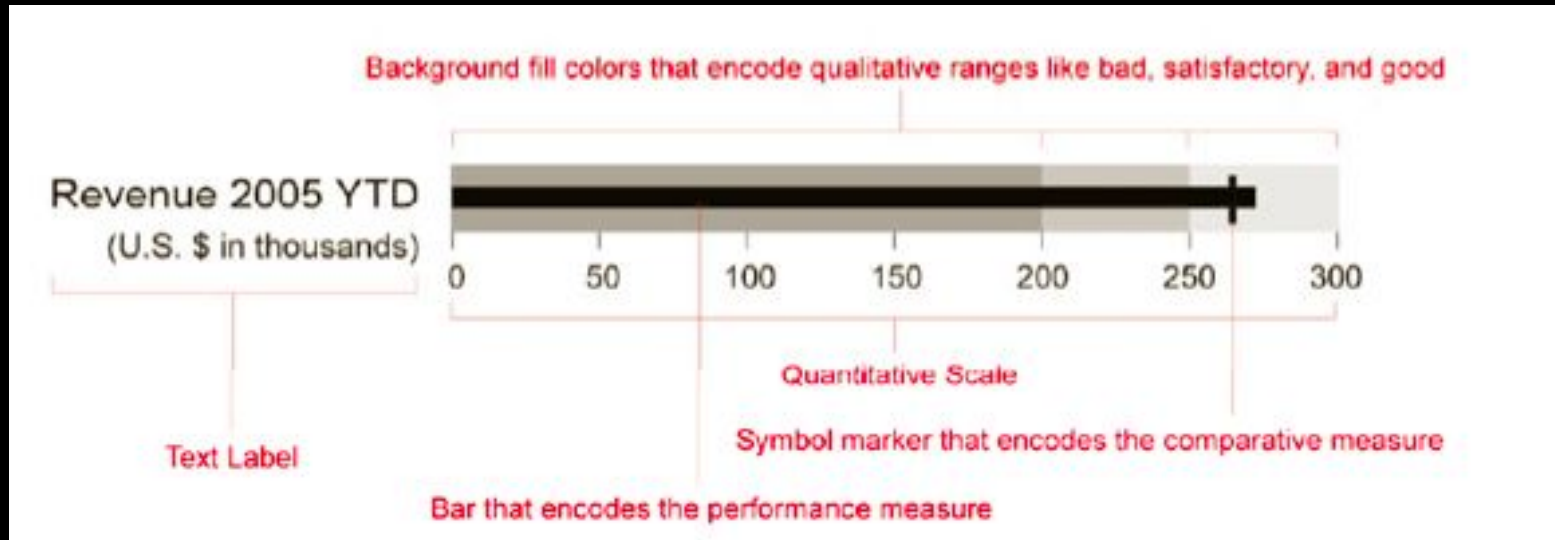
- Provide a quick sense of historical perspective
- No quantitative scale – intentional
- Ideal for dashboards

League Standings

Team	W	L	Percent
QPB Ballers	9	1	90%
B&N Rockets	8	2	80%
Amazon Bats	8	2	80%
Brusing Borders	5	5	50%
Power Powell's	2	8	20%
Half Price Bases	2	8	20%
Comic Cruisers	1	9	10%

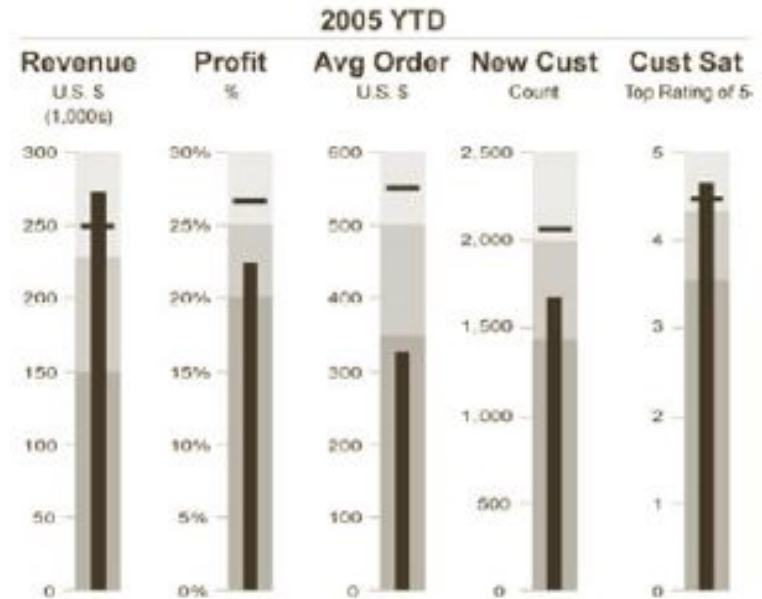
Team	W	L	History	Percent
QPB Ballers	9	1		90%
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Amazon Bats	8	2		80%
Brusing Borders	5	5		50%
Power Powell's	2	8		20%
Half Price Bases	2	8		20%
Comic Cruisers	1	9		10%

Bullet Graphs



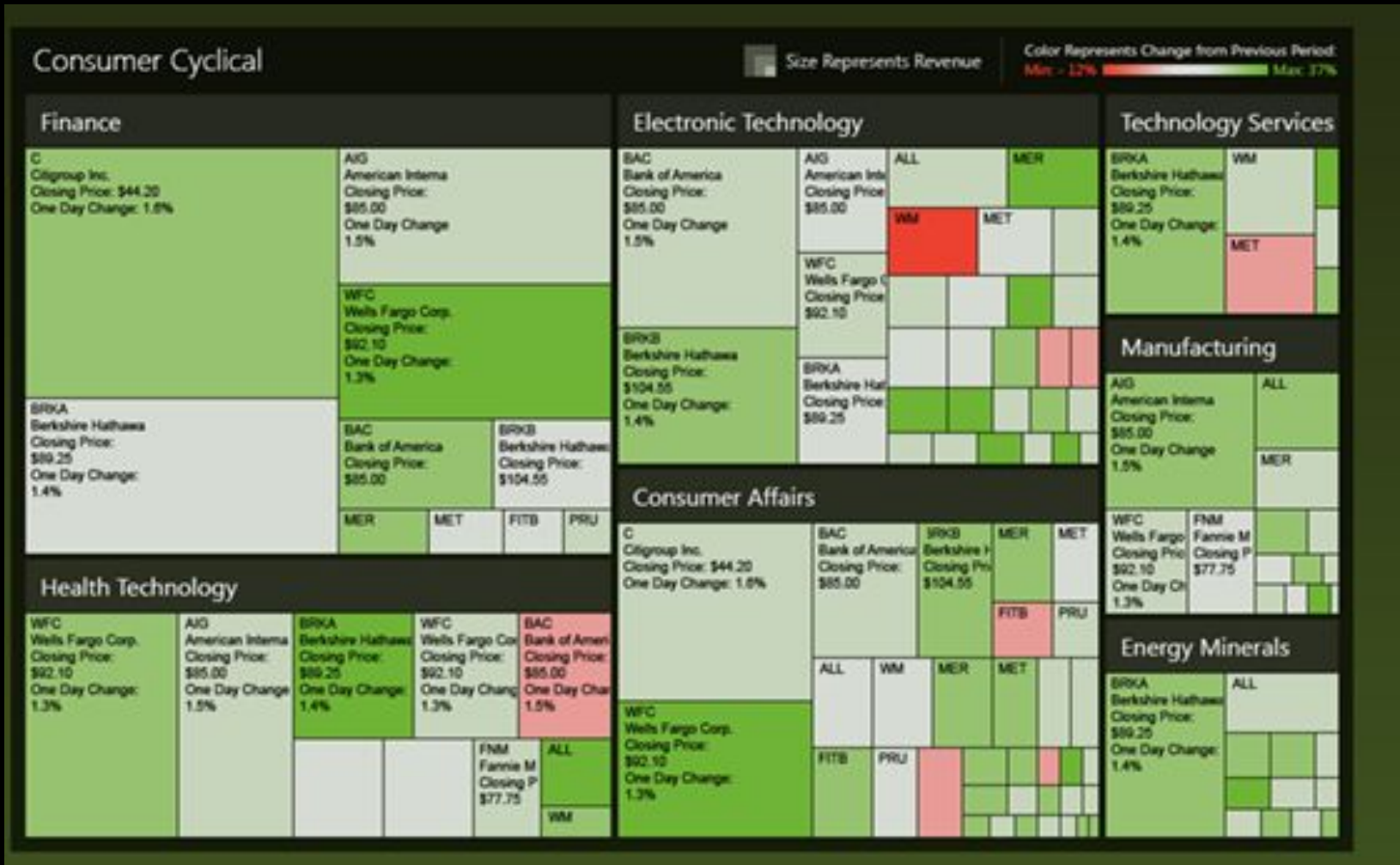
- Developed by Stephen Few to replace meters and gauges in dashboards
- Dense display in a small space
- Support comparison of featured measure to one or more related measures
- Example a target, or same measure a year ago
- Relate featured measure to definitive quantitative ranges (example: good, satisfactory or poor)

Bullet Graphs

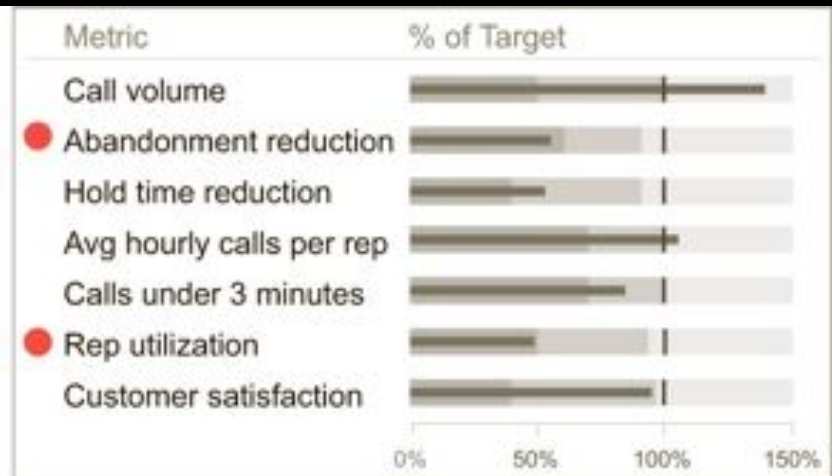


Two examples of multiple bullet graphs: one arranged horizontally and one vertically

Treemaps



Use color carefully



Sample Dashboard

Sales Dashboard

(Data as of December 19, 2004)

(All currency is expressed in U.S. dollars.)

Help

Key Metrics YTD

(■ Actual; | Target; ■ Poor, ■ Satisfactory, ■ Good)

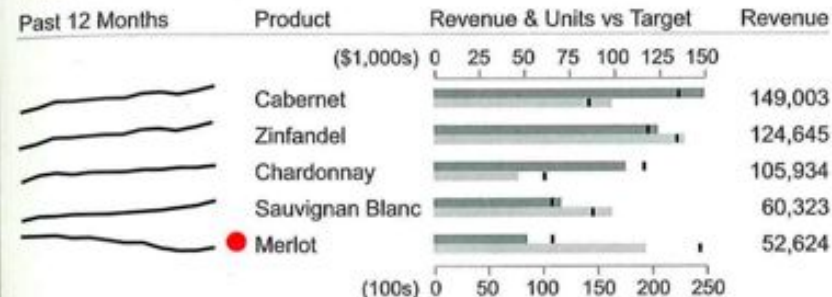


Top 8 Customers This Quarter (■ Actual; Pipeline: ■)

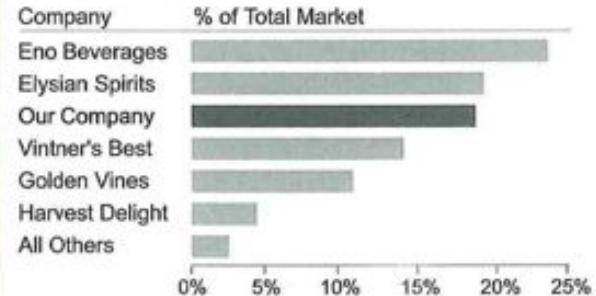


Product Sales YTD

(■ Revenue; ■ Units; ■ Target)

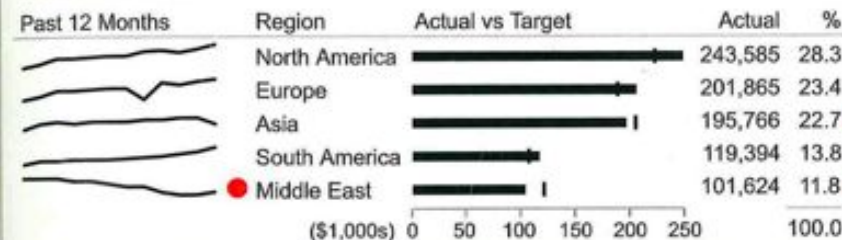


Market Share



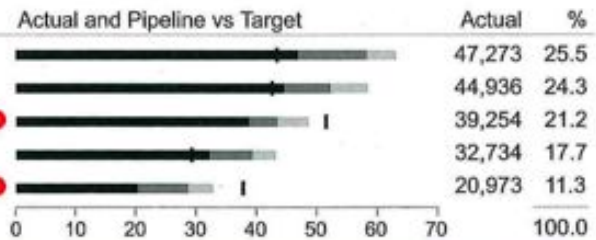
Revenue YTD

(■ Actual; | Target)

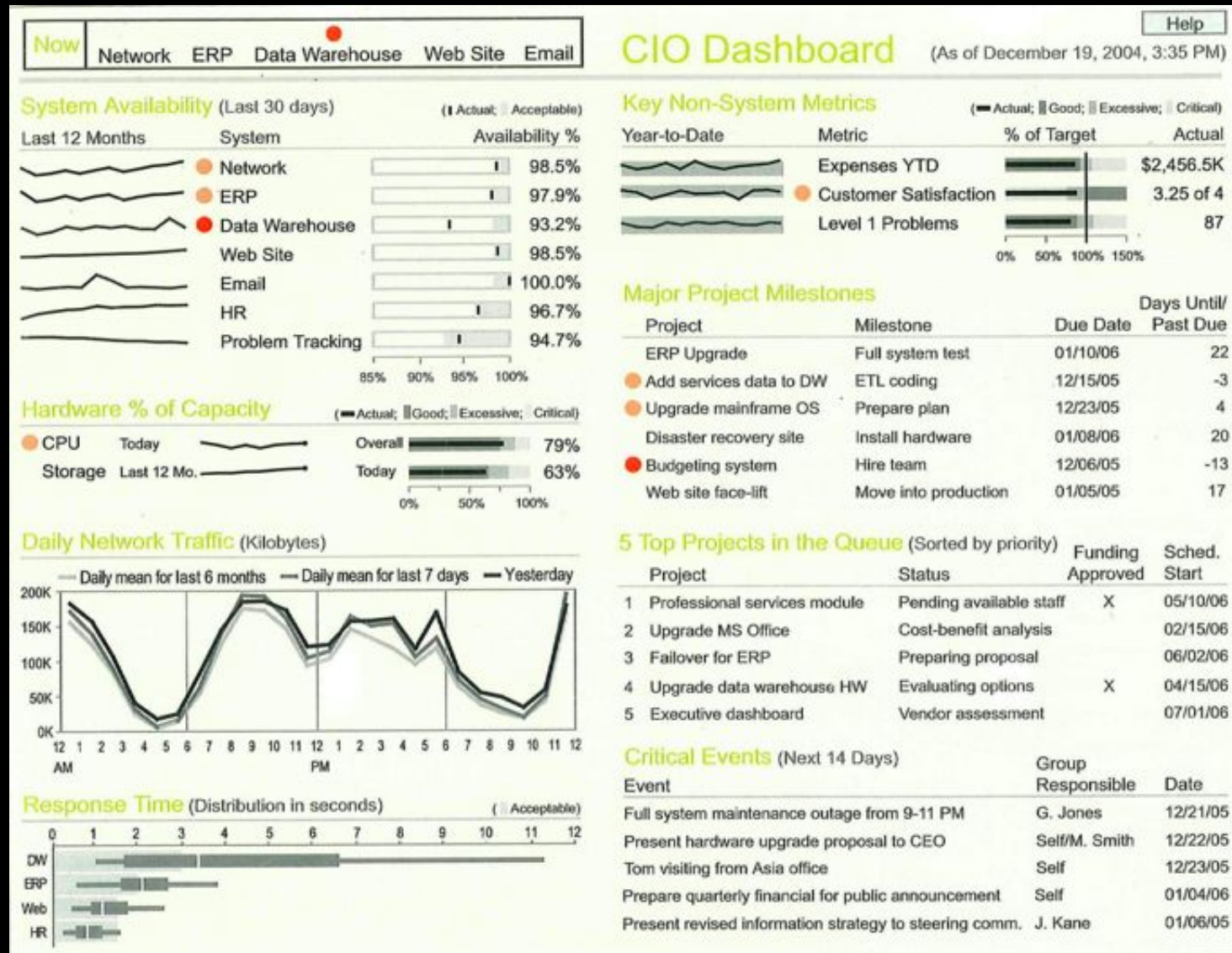


Revenue QTD

(■ Actual; Pipeline: ■ 90%, ■ 75%; | Target)



Sample Dashboard



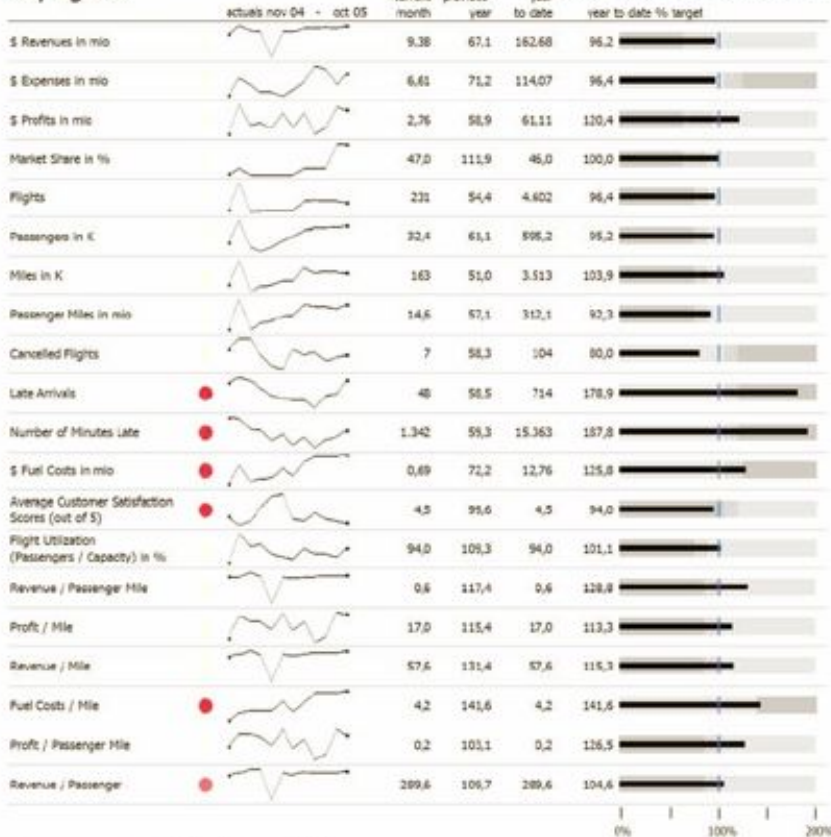
Sample Dashboard

executive dashboard

this data is as of november 13, 2005

Help

key figures



top 10 routes (last 30 days)

#	from	to	passengers info	profit in %
1	Los Angeles	Oakland	12.6	10.6
2	Los Angeles	Vegas	9.7	10.1
3	Oakland	Dallas	8.2	8.7
4	Dallas	Houston	6.3	7.5
5	Oakland	Seattle	6.3	6.9
6	Houston	Orlando	3.9	4.2
7	Chicago	Dallas	2.6	3.2
8	Chicago	Orlando	2.0	2.1
9	Los Angeles	Orlando	2.1	1.8
10	Oakland	Orlando	1.9	1.7

worse 10 routes (last 6 months)

#	from	to	cancelled info	delayed info
1	Detroit	Orlando	5.1	31.4
2	Chicago	Dallas	4.6	26.3
3	Minneapolis	Denver	4.2	29.7
4	Houston	Orlando	4.1	21.7
5	Chicago	Orlando	3.9	25.6
6	Memphis	Detroit	3.2	15.8
7	Salt Lake City	Boston	2.8	19.7
8	Oakland	Orlando	1.9	14.9
9	Dallas	Houston	1.1	16.7
10	Oakland	Seattle	0.9	14.3

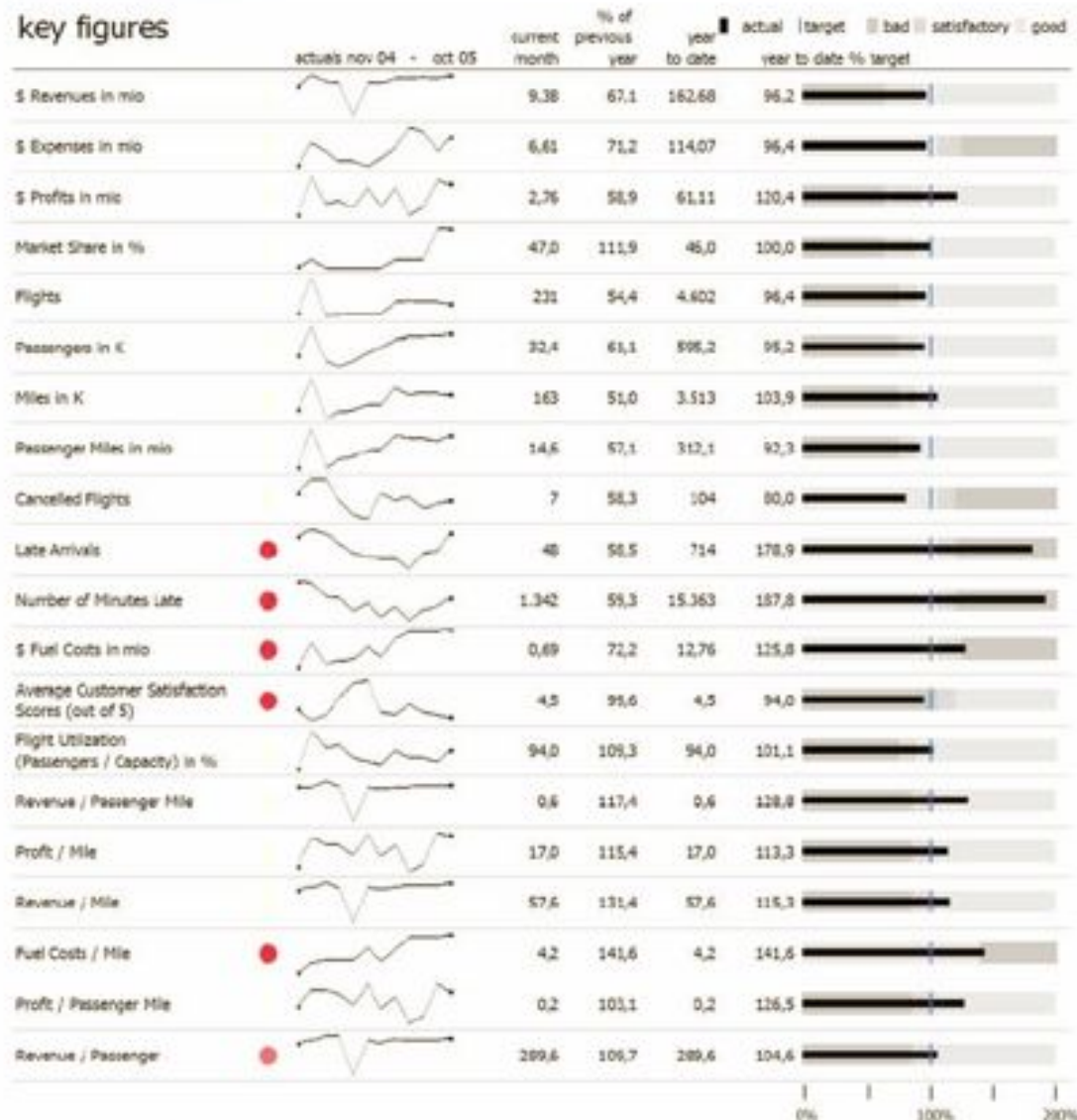
cancel./delays by reason (last 30 days)

#	reason	cancelled	delayed
1	Weather	6	76
2	Missing or late flight crew	2	17
3	Mechanical failure	1	15
4	Missing or late ground crew	1	4
5	Inefficient gate handling	0	2
6	Other	2	3

revenues per sales channel %



key figures



revenues per sales channel %



top 10 routes (last 30 days)

#	from	to	passengers in%	profit in %
1	Los Angeles	Oakland	12.6	10.5
2	Los Angeles	Vegas	9.7	10.2
3	Oakland	Dallas	8.2	8.7
4	Dallas	Houston	6.3	7.5
5	Oakland	Seattle	6.3	6.9
6	Houston	Orlando	3.9	4.2
7	Chicago	Dallas	2.6	3.2
8	Chicago	Orlando	2.0	2.1
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4	Missing or late ground crew	1	4
5	Inefficient gate handling	0	2
6	Other	2	3



Customer Service



Closed Cases (Wk)

122

TTC (Avg)

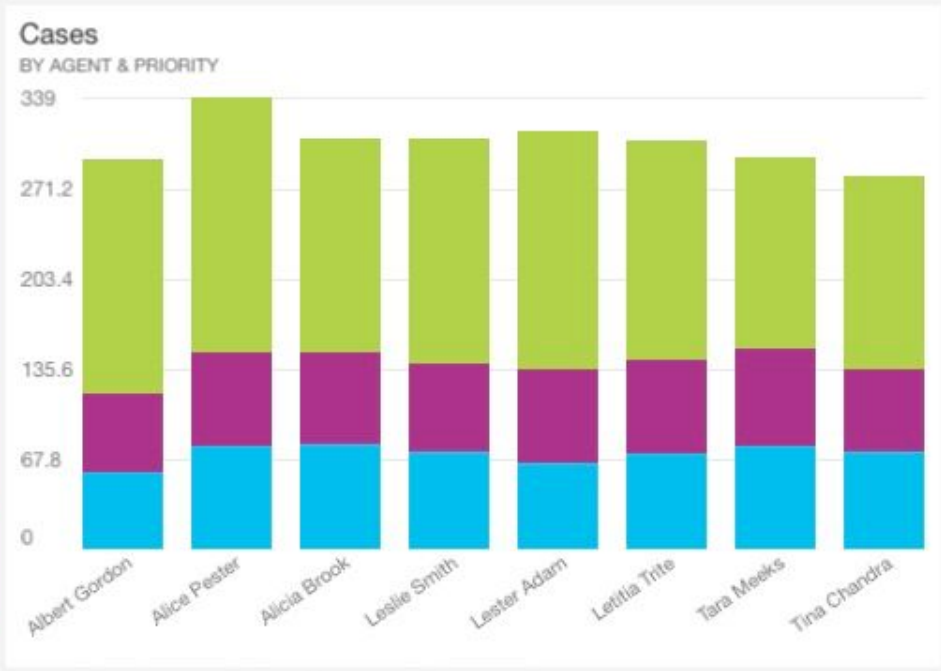
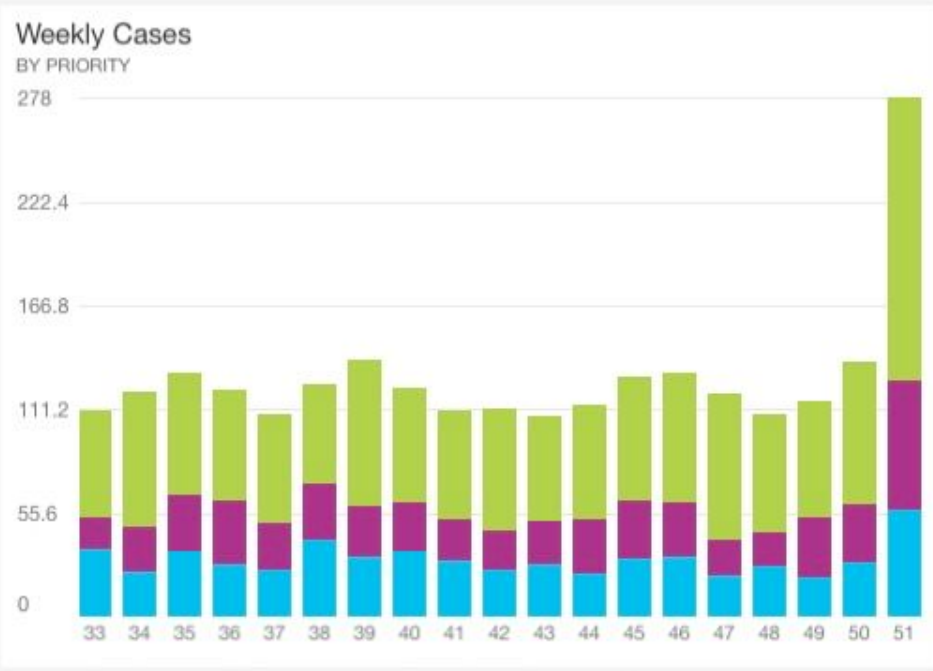
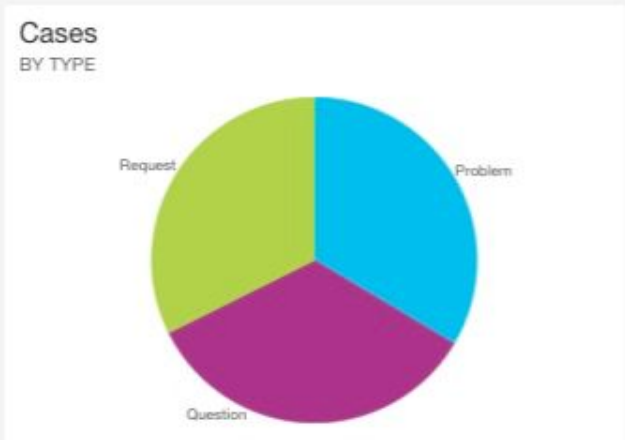
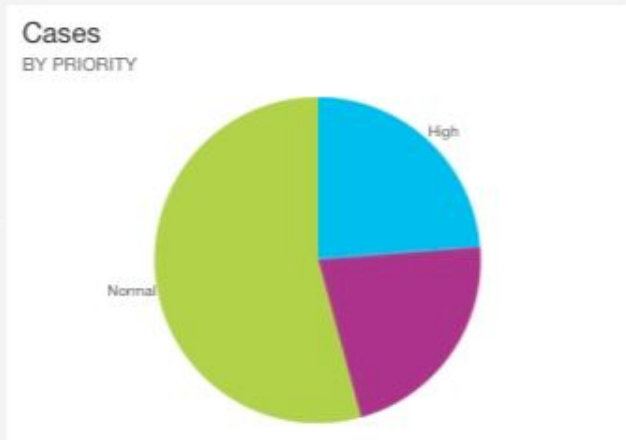
6

New Cases (Avg/Wk)

129

Escalated (Avg/Wk)

10



Amit Kapoor
@amitkaps

amitkaps.com

