

Beautiful Data in the Eye of the Beholder

Data Visualization Best Practices

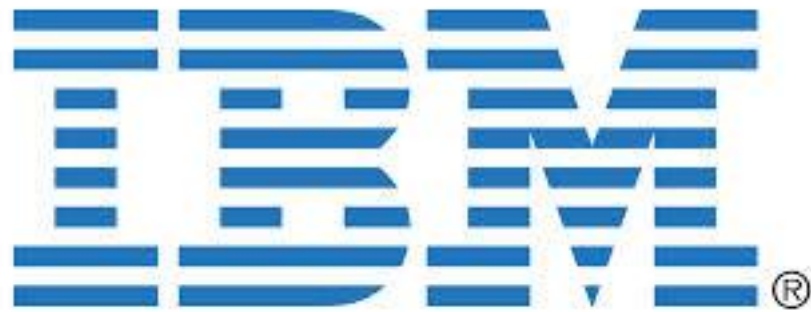
David Stodder

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May 21, 2014

Sponsor



Speakers



David Stodder
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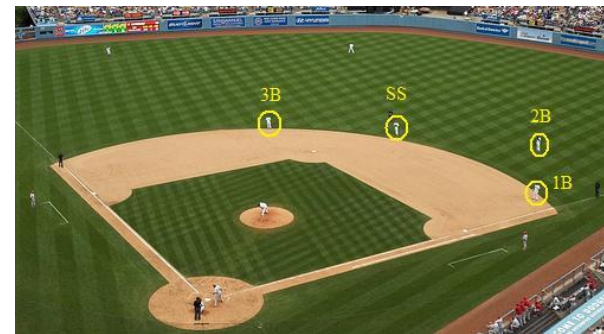
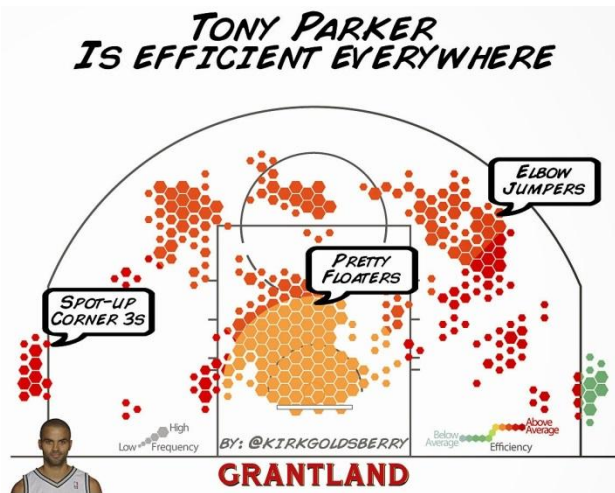
Agenda



- The exciting age of beautiful data
- Goals: why data visualization is important
- Data visualization and business intelligence
 - *How visualization furthers self-service BI/analytics*
- Who needs what: Research views of visualization use
 - *Reporting, alerting, and visual discovery analysis*
- Dashboard functionality and objectives for visualization
- Best practices and concluding recommendations

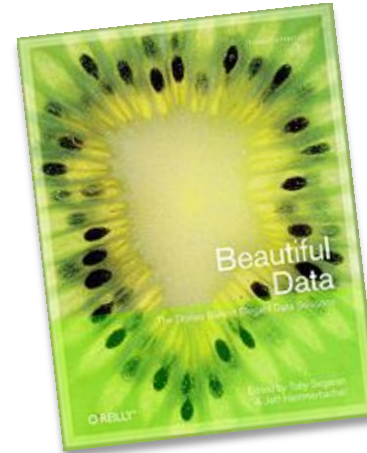
Visualization: Seeing What Data Hides

- “Graphics reveal data. Indeed graphics can be more precise and revealing than conventional statistical computations.” – *Edward Tufte*
- “The 20 billion or so neurons of the brain devoted to analyzing visual information provide a pattern-finding mechanism that is a fundamental component in much of our cognitive activity.” – *Colin Ware*



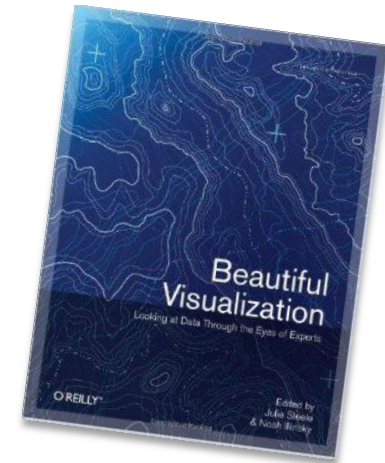
Visual Innovation and “Beautiful Data”

- “For a visual to truly be beautiful, it must go beyond merely being a conduit for information and offer some novelty.”
- “When done beautifully, successful visualizations are deceptive in their simplicity, offering the viewer insight and new understanding at a glance.”
– *J. Steele and N. Iliinsky*



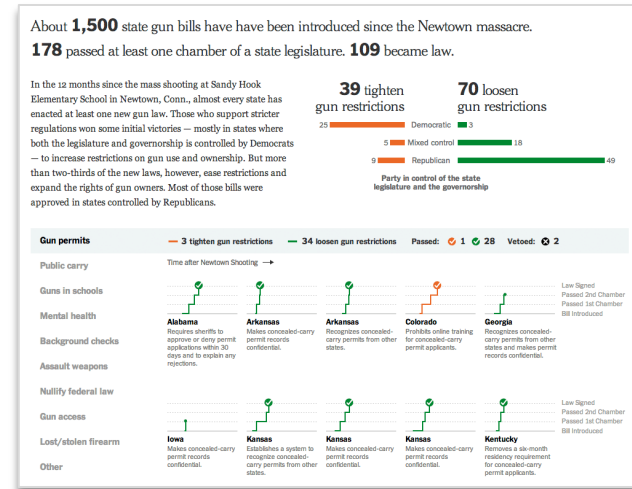
Beautiful Data: The Stories Behind Elegant Data Solutions, T. Segaran and J. Hammerbacher, O'Reilly Media, 2009

Beautiful Visualization: Looking at Data through the Eyes of Experts, J. Steele and N. Iliinsky, O'Reilly Media, 2010

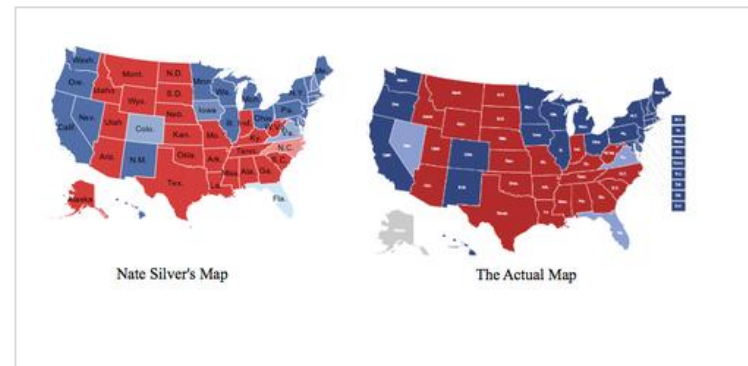


Data Visualization: A New Language

- **Infographics:** Changing role of data in news reports and public discourse
- **Data science fame:** Tracking Twitter feeds and more to discover trends, make predictions
- **Visualization:** Making big data and analytics more consumable
- **Experiment and share:** see www.manyeyes.com



© The New York Times; 2014 Peter Sullivan/Best of Show Award (print) winner, Malofiej 22nd International Infographics Awards



Data scientist Nate Silver's prediction vs. actual Electoral College outcome in 2012 U.S. Presidential election

Key Goals of Data Visualization

- **Speed to insight:** Help users avoid slogging through data and dense tabular reports
- **Actionable:** Make it easier to connect insight to action
- **Clear Context:** Enable users to see how analysis fits into business or performance strategy
- **Amazement:** Excite users with new ways of seeing data



Visual Data Interaction: An Imperative

- **Get beyond “putting pretty pictures on numbers”:** Toward a more immersive data experience
- **Drill down from within visual objects:** Being able to get deeper into the data, more easily than by writing standard BI queries
- **Explore relationships:** See connections across heterogeneous sources



Sanctum, Rogue Pictures, 2011

Encouraging Storytelling, New Forms of Collaboration

- Using visualization to narrate and provide context to the data “story” being told
- Collaboration benefit: easier to share visualizations, along with annotations and related charts to tell the whole story
- **Coming to the point:** Highlighting what is actionable for colleagues



Visualization and Self-Service BI Trends

- **Business-Driven BI & Analytics:** Subject matter experts want to more control of data access and analysis
 - *Visualization eases the path for nontechnical users*
- **Satisfying the variety of users and requirements:** “uniform” enterprise BI approaches can fall short
 - *Visualization is key to personalization of the data and analytics experience*



TDWI Research: Diverse Requirements

View of visualization usage patterns in three key areas:

Are users in your organization currently implementing or planning to implement data visualization technologies for the following activities?

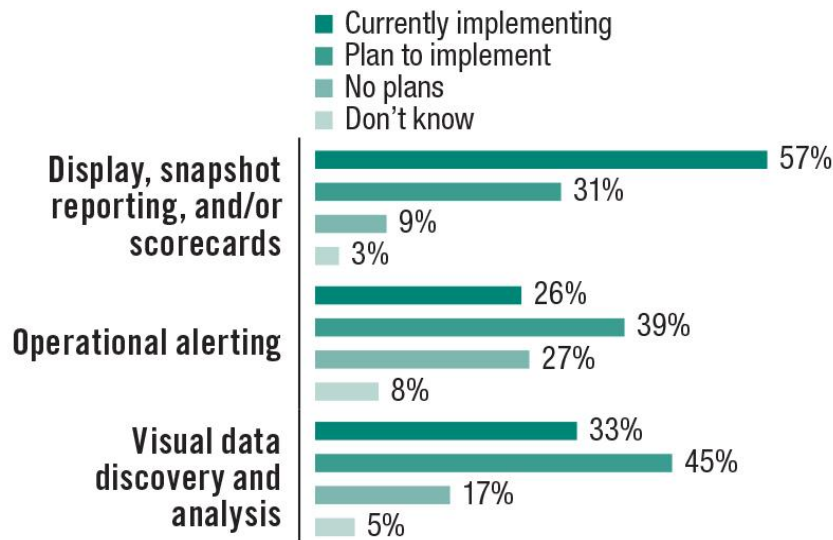


Figure 1. Based on answers from 453 respondents.

Source: "Data Visualization and Discovery for Better Business Decisions," TDWI Best Practices Report, Third Quarter 2013

Which Functions Need Which Viz Types?

For users in the following functions in your organization, which of these main data visualization activities are important? (You may choose more than one answer per row.)

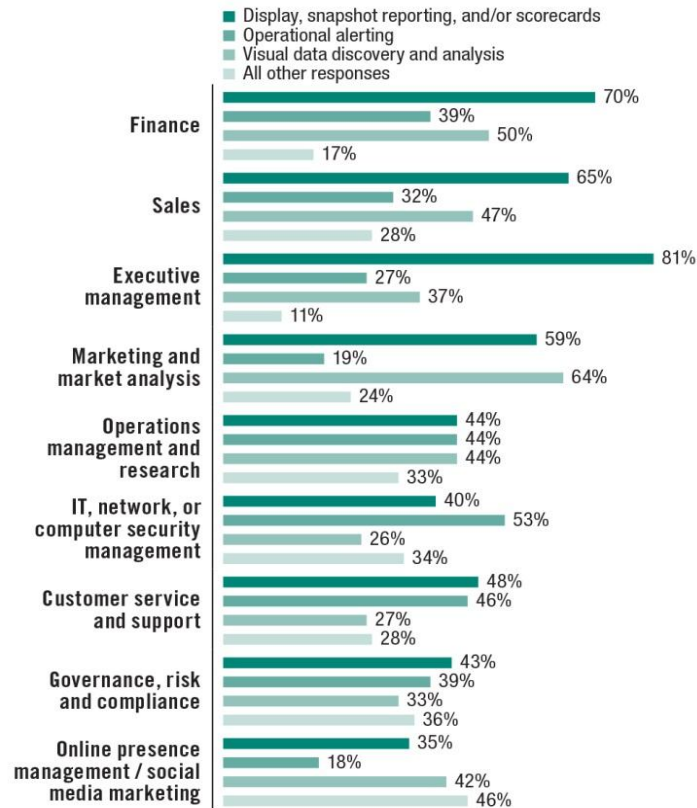
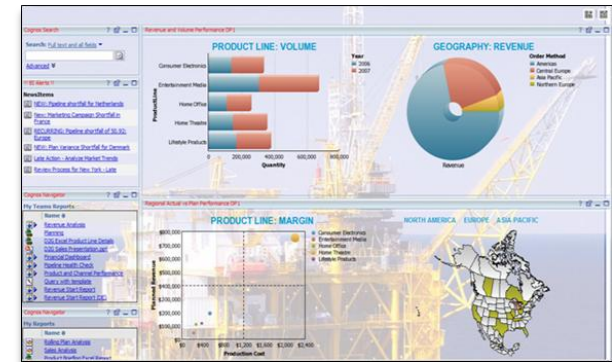


Figure 3. Based on answers from 432 respondents; respondents could select more than one answer per row. Organization functions are listed in order of most total responses.

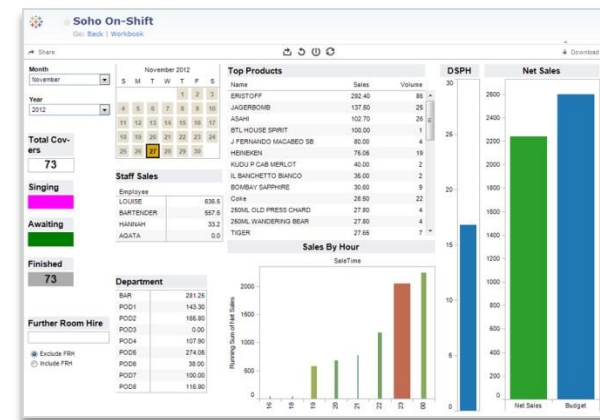
Source: "Data Visualization and Discovery for Better Business Decisions," TDWI Best Practices Report, Third Quarter 2013

Visualization & Display/Snapshot Reporting

- **Snapshots:** Scheduled rather than requested ad hoc; users want to personalize based on roles
 - *Visualizations must be accurate and consistent*
- **KPIs and scorecards:** Orienting users toward goals and objectives
 - *Can users or developers make the look more exciting using “fun” visuals?*
- **Drill down flexibility:** Critical



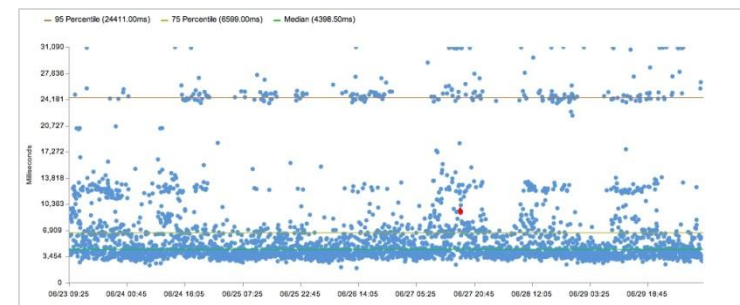
Source: IBM Cognos 10



Source: Lucky Voice on-shift dashboard, from TDWI Best Practices Report.

Operational Alerting: Avoiding Fatigue

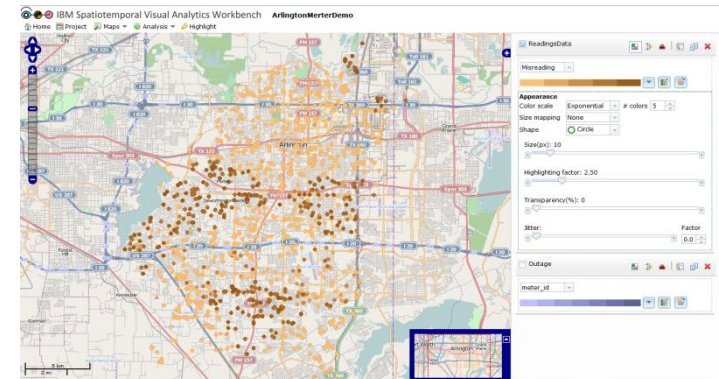
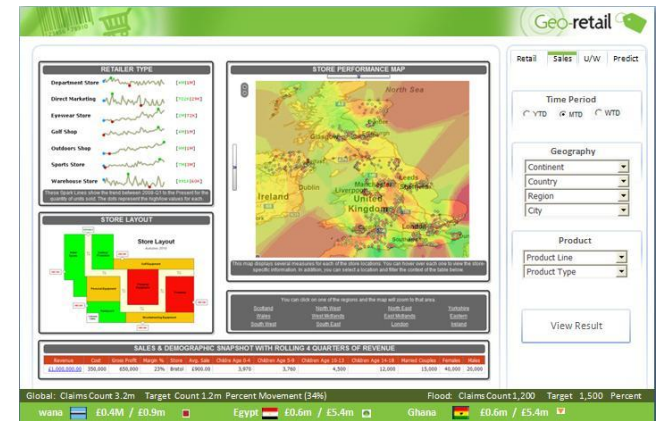
- Situations that demand immediate attention: watch out for “alert fatigue”
 - *Using color, size, animation, etc., flexible visualization can help users prioritize and recognize sources*
 - *Spotting trends and anomalies in event data streams*
- **Time is of the essence:**
Real (or near real) time vital
- **Mobile devices:** form factor a visualization concern



Credit: www.catchpoint.com

Visual Discovery and Analysis

- **Fusion:** Analytics, test-and-learn data exploration, and advanced computation matched with visualization
- **A visual path:** data interaction through filtering, comparing, and correlating visual data relationships
- **Business data laboratory:** Enabling exploration of who, what, when, why behind events and transactions

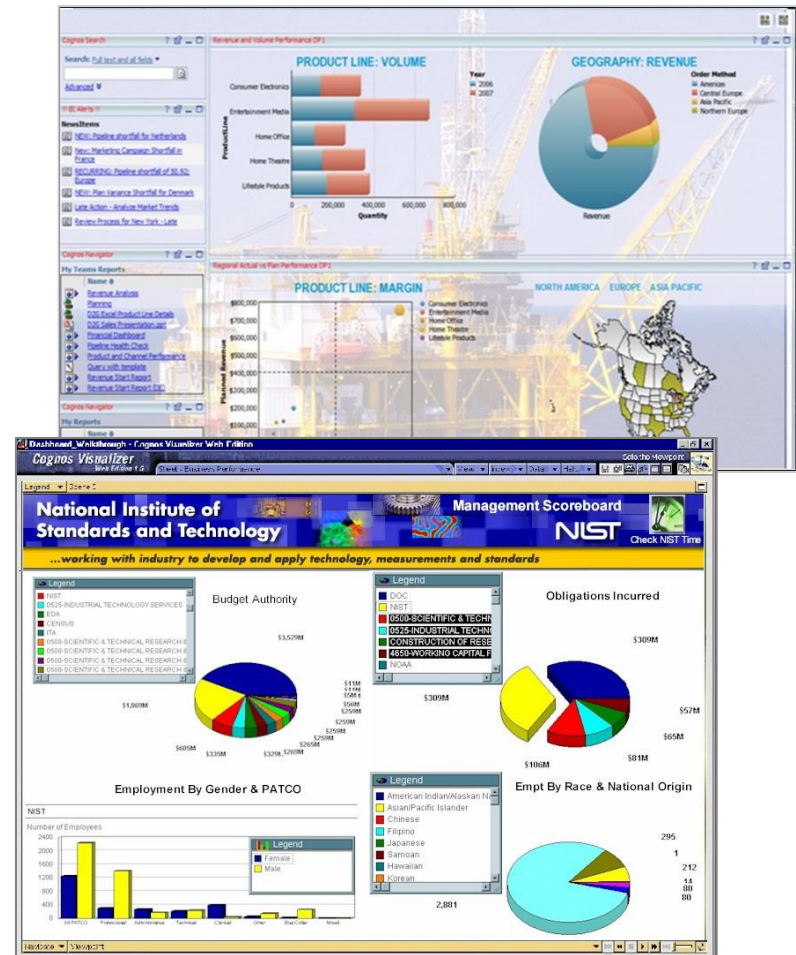


Visual Discovery Best Practices

- **Guidance is necessary:** Self-service and freedom are important, but most users need guidance
 - *A “blank slate” with too many visual options can be intimidating*
- **Metadata matters:** Common models, hierarchies, dependency mapping, etc., enable users relate different data sources and metrics
- **Big data access is often important:** visualization helps users cope with data tsunamis
 - *Access to social data, raw data, use of “late binding” queries to seek insights*
- **Performance:** Ensure data management support
 - *In-memory and in-database processing are attractive for visual discovery to relieve data movement pressures*

Dashboards: Bringing It All Together

- Visual, role-based view of actionable information
- Nexus of self-service BI and analytics
- Performance mgmt: visibility via access to data-driven, outcomes-oriented metrics
- Integration at the glass: internal and external data, metrics, content
- Many types of dashboards – and often many dashboards



Old and New Visions of Dashboards

Initial Dashboards

- Tabular reports with few and only simple charts
- Limited number, variety of data sources
- Limited methods of finding, interacting w/data
- Dependent on IT developers to create and modify
- Tied to single tool or application

Where They Are Going

- Libraries of chart types; drag-and-drop selection
- Role-based, single view of data from multiple sources
- Integration of search, advanced analytics tools
- Self-service creation, preferably managed or guided by IT expertise
- Integrated view; seamless experience on mobile

Dashboard, Visual Analysis Functionality

Which of the following types of functionality are currently deployed or are planned to be deployed in your organization's dashboards or visual analysis applications?

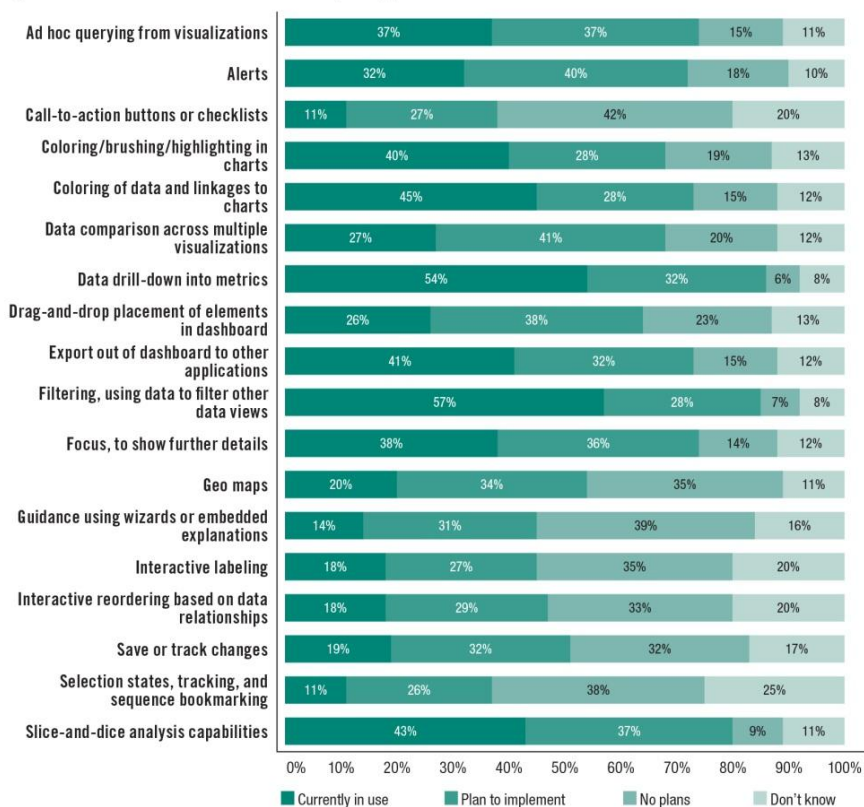


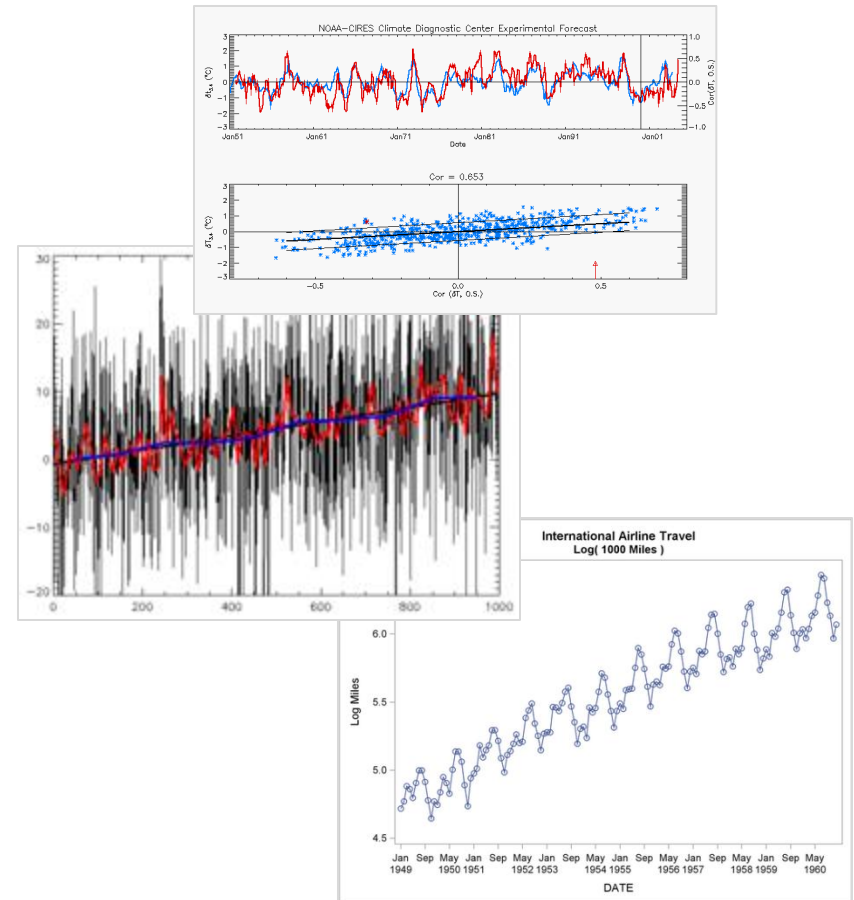
Figure 10. Based on answers from 356 respondents; respondents could select one answer per row.

Source: "Data Visualization and Discovery for Better Business Decisions," TDWI Best Practices Report, Third Quarter 2013

- Filtering and using data to filter other views highest in current use (57%)
- 45% color-coding data and linkages to charts
- Highest "plan to implement": Data comparison across multiple visualizations (41%), alerts (40%), and drag-and-drop elements (38%)
- Highest "no plans": call-to-action buttons (42%)

Time Series Analysis: Demand Driver for Visualization

- Users need to analyze data changes over time
- 39% currently implementing visualization for time series
- Getting beyond basic line charts to bring in more data views: scatterplots, 3D
- Developing complementary visualizations for historical time series analysis, real-time views, and predictive analytics



Justifying Projects: Benefits Sought

Using visualization to reduce time to insight has benefits for all types of users in many different scenarios

Which of the following are the most important business benefits that your organization seeks to gain from deploying data visualization and visual analysis technologies? (Please select all that apply.)

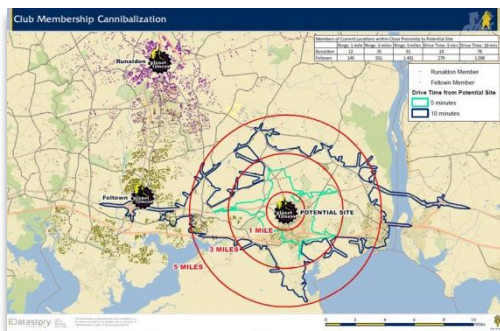


Figure 4. Based on answers from 424 respondents; respondents could select more than one answer.

Source: "Data Visualization and Discovery for Better Business Decisions," TDWI Best Practices Report, Third Quarter 2013

To Start: Begin with the Data

- “All of this comes together to paint you a picture of a story that is in fact already there in the data – but if you don’t have the right lens to see it, you can’t see it.” – *Matt Felton, Datastory Consulting*
- “Most visualization stories begin with some kind of question that orients the viewer to the topic and context within which the data is most meaningful.” – *Steele and Iliinsky*
 - *What data are we looking at?*
 - *In what time frame does the data exist?*
 - *What notable events or variables influenced the data?*



Geospatial analysis of potential for Planet Fitness club membership cannibalization. From TDWI Best Practices Report

Choosing Visualizations: Best Practices

- ✓ Avoid clutter; no “eye candy”
- ✓ Consider the audience: executive? A team?
- ✓ Pay attention to context; emphasize what matters
- ✓ Aim for relevance; don’t mislead or confuse
- ✓ Step beyond convention – but do so with purpose

Which of the following visualization types are currently being implemented by users in your organization?
(Please select all that apply.)

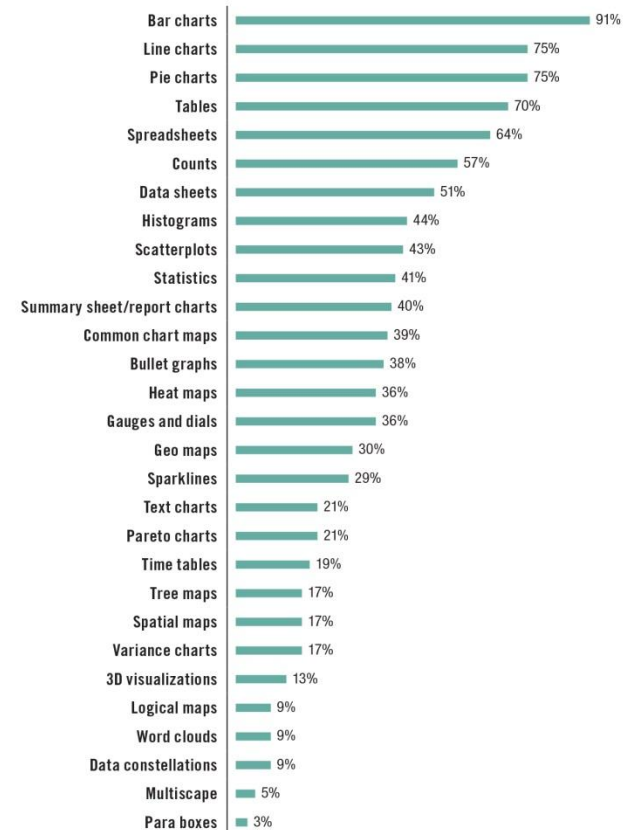


Figure 11. Based on answers from 352 respondents; respondents could select more than one answer.

Source: “Data Visualization and Discovery for Better Business Decisions,” TDWI Best Practices Report, Third Quarter 2013

Concluding Recommendations



- Improve data visualization and visual analysis for nontechnical users
 - *“Nontechnical” users struggle to interact effectively with data*
 - *Visualization can give them easier and more powerful interaction*
- Match visualization capabilities to users’ types of activities
 - *Display, snapshot reporting, or scorecards?*
 - *Operational alerting?*
 - *Visual data discovery and analysis?*
- Consolidate interfaces and use dashboards for single view
 - *Dashboards can provide a complete and consolidated interface*
 - *As self-service BI/analytics expands, data views can proliferate; organizations should seek to reduce chaos and complexity*

Concluding Recommendations



- Increase data interactivity with broader visualization functionality
 - *But rather than give users a blank slate, ensure that they have guidance, either through the software or from IT developer assistance*
- Ensure you have data management and performance strategy for visual discovery and analytics
 - *In-memory and in-database computing can be a valuable components of a data architecture to support complex, compute-intensive analytics with less data movement*
- Create “beautiful” data visualizations by reducing clutter and increasing speed to insight
 - *Experiment with visualization libraries to discovery what will best express insights and make them actionable*

Thank You!



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Imagine if you could delight end users...



GUIDED creation with recommendation on best visualization for your data
ENGAGING with a focus on end user interactivity and LOB consumption appeal
EVERYWHERE with ability to interact with your visualization anytime anywhere
FLEXIBLE with ability to incorporate new and compelling visualizations as needed



IBM Solution

RAPIDLY ADAPTIVE VISUALIZATION ENGINE

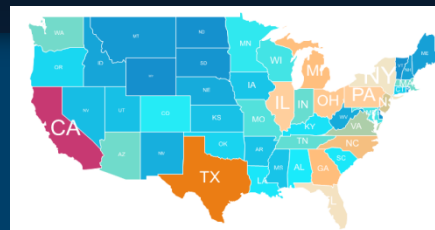
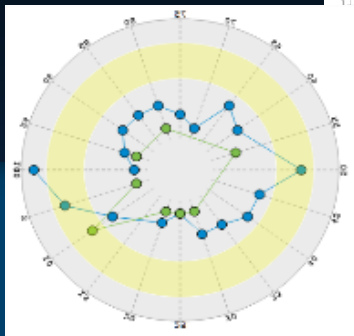
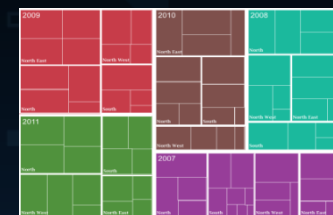
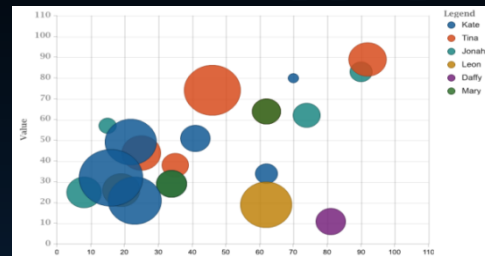
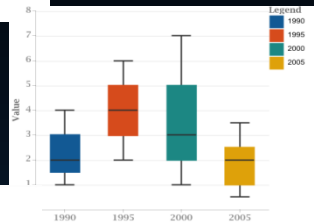
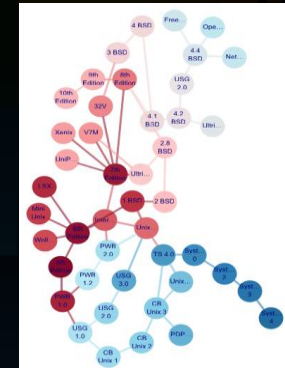
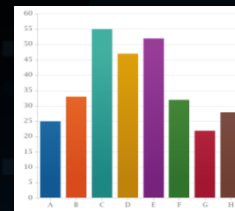
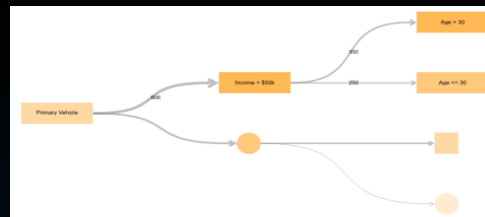
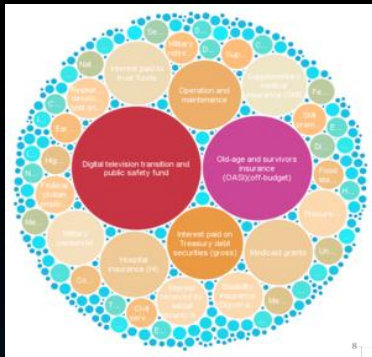


- A simple descriptive language to describe a chart
- Flexible enough to describe all known charts and extensible to describe new and innovative visualizations



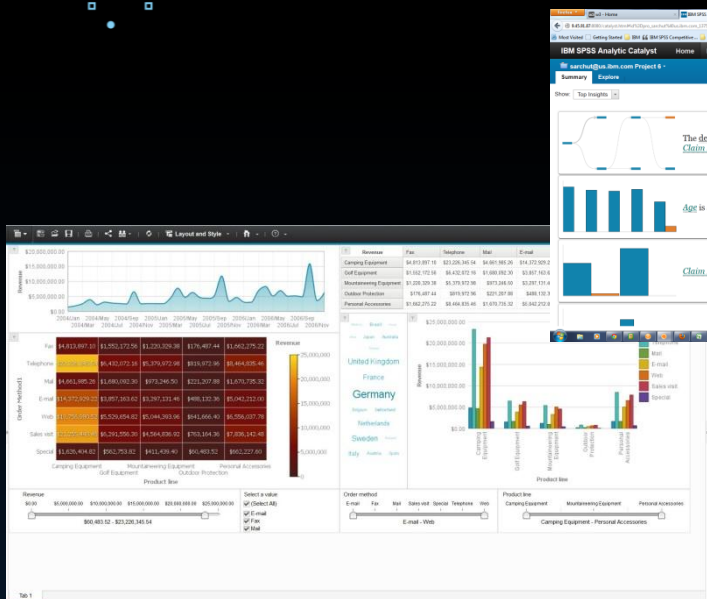
IBM Solution

RAPIDLY ADAPTIVE VISUALIZATION ENGINE

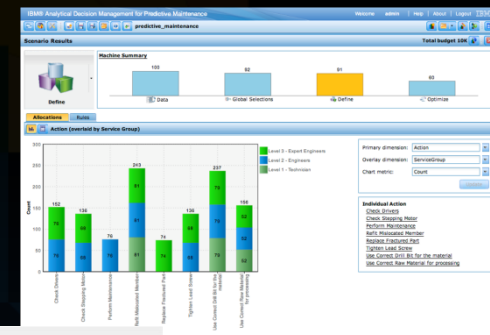




RAVE THE ENGINE DRIVING IBM VISUALIZATIONS



SPSS Analytic Catalyst



Analytical Decision Management



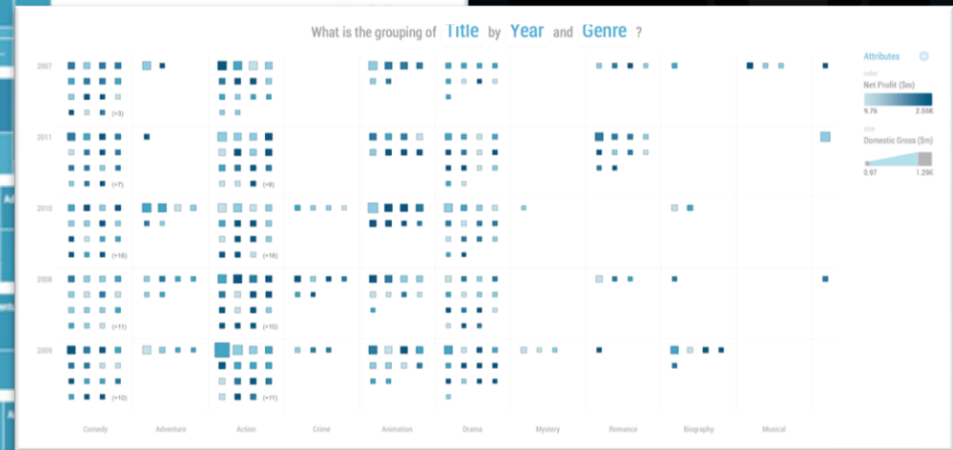
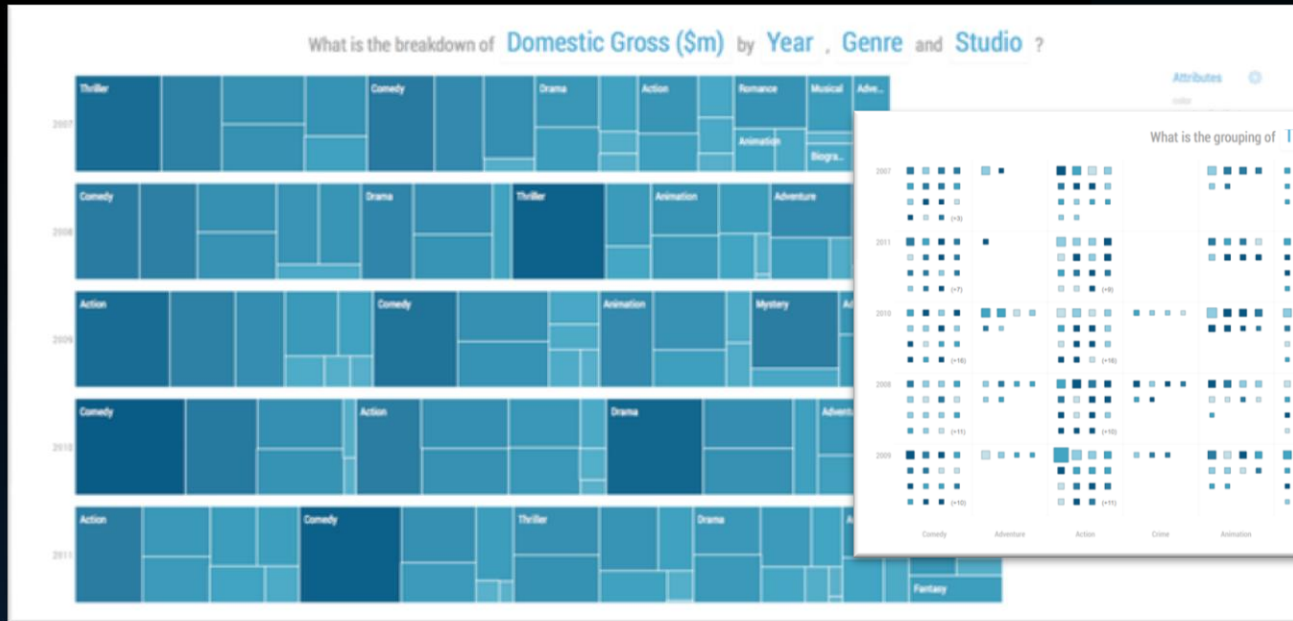
Cognos Insight

Cognos Business Intelligence



IBM Watson Analytics

NEXT GENERATION OF DATA DISCOVERY





IBM Cognos VISUALIZATION CUSTOMIZER



The screenshot displays the 'RAVE | Chart Type Definition' window. On the left, a JSON configuration defines a 'linksDataSet' with 'parentNode' and 'childNodes' (all labeled 'abc') and a 'rows' array of numerical values. On the right, a network diagram visualizes these nodes and their connections.

```
1 {
2   "copyright": "(C) Copyright IBM Corp. 2011",
3   "data":
4   [
5     {
6       "id": "linksDataSet",
7       "fields":
8       [
9         {
10          "id": "parentNode",
11          "label": "abc"
12        },
13        {
14          "id": "childNodes",
15          "label": "abc"
16        }
17      ],
18      "rows":
19      [
20        [
21          0,
22          10100
23        ],
24        [
25          10100,
26          10125
27        ],
28        [
29          10100,
30          10444
31        ],
32        [
33          10100,
34          10145
35        ],
36        [
37          10100,
38          10191
39        ],
40        [
41          10100,
42          10147
43        ]
44      ]
45    }
46  ]
47 }
```

The screenshot shows the IBM Marketplace page for the Visualization Customizer. The page includes a navigation bar with 'Home', 'Communities', 'Blogs', and 'Marketplace'. The main content area features the product title 'Visualization Customizer by IBM', a 'Download' button, and a description of the tool's capabilities. A 'COMMERCIAL TERMS' box is visible on the right side.

Marketplace - In Beta

AnalyticsZone the leading community on Business Analytics.

Welcome, Mike Saucedo ([Logout](#))

Downloads and Trials

Home Communities Blogs Marketplace

Visualization Customizer

by IBM

UTILITY Business Intelligence

Download

DESCRIPTION

The IBM Cognos Visualization Customizer brings a new level of flexibility to the visualizations available through IBM Business Analytics offerings. This no-charge, 'as is' tool provides an accessible user experience to edit and customize the JSON description of IBM Rapidly Adaptive Visualization Engine (RAVE) based visualizations. A spectrum of changes can be made to visualizations ranging from customizing visualization color palettes, to fonts and labels to adding or changing chart icons. Questions about the IBM Visualization Customizer can be posted to the visualization forum within IBM Analytics Zone where both community members and IBM visualization experts participate in active conversations.

DOCUMENTATION

[Getting Started](#) (Last updated: 11/08/2011) [Documentation](#) (Last updated: 10/01/2011)

COMMERCIAL TERMS

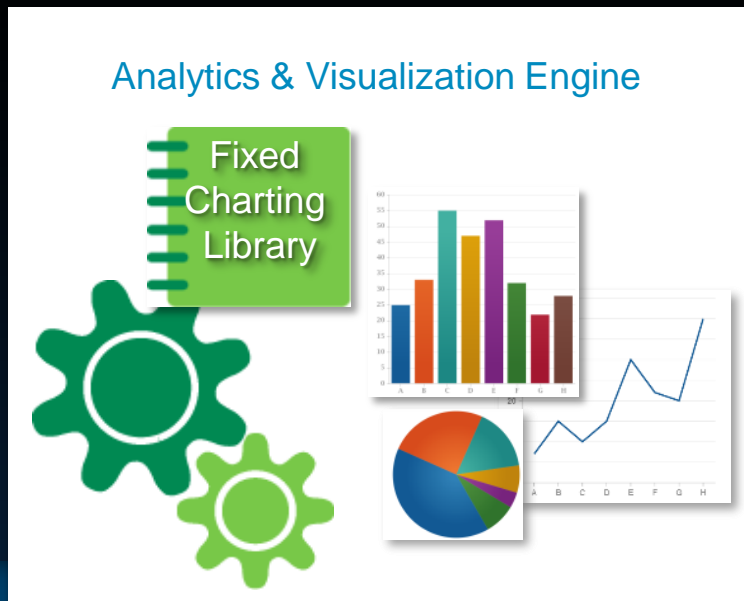
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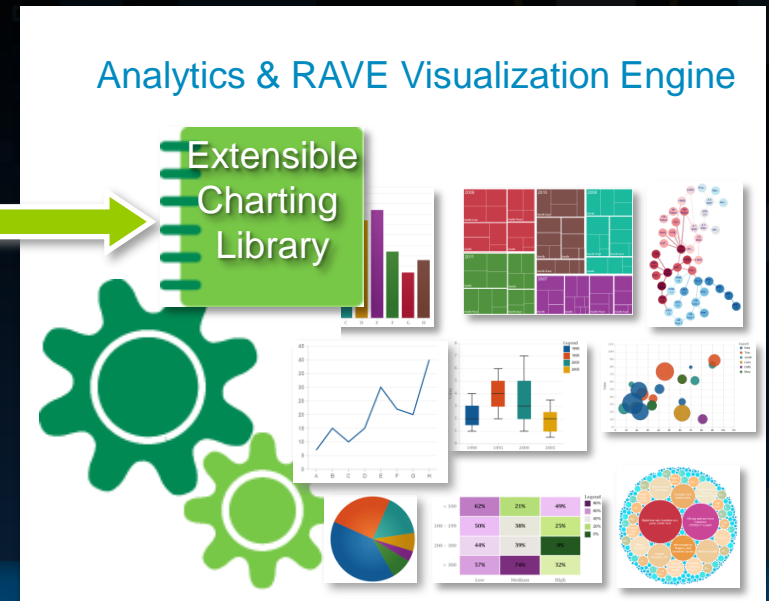
RAVE

CREATING NEW VISUALIZATIONS FOR THE MARKETPLACE

The old way...



The new way...





Enabled by an unmatched analytics portfolio...



IBM Business Analytics

Product Segments



Business Intelligence & Predictive Analytics



Performance Management



Risk Analytics

Core Capabilities

REPORT

Forecast

ANALYZE

Visualize
Mine

MODEL

Score

PLAN

Simulate

COLLABORATE

Govern

Decide

Key Enablers

Utilize and combine data to derive a complete picture

Operationalize analytics to drive decisions

Enable forward looking Business Intelligence

Transform systems of engagement

Span finance, sales and operations

Infuse scenarios and predictive intelligence

Deliver trusted risk intelligence across the organization

Optimize risk and reward for the business

Support smarter, risk-aware decisions

Business Imperative





The IBM Difference



Create rapid, more innovative visualizations
Watson Analytics
IBM Center for Advanced Visualization

IBM Software > Business Analytics >

Advanced visualization

Visualize your data. Discover answers

Data Innovation Answers Discover
Analytics Visualization
Research Ecosystem Technology Advanced

Overview Conversations Luminaries

Join **Many Eyes**

Let's get visual
Read a white paper that explains properties for effective visualizations.

Download new visualizations
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Boston, MA | July 20-25, 2014

<http://www.tdwi.org/BOS2014>

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Boston, MA | July 21-23, 2014

<http://www.tdwi.org/BOS2014/ES>

Contact Information

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