3-23-2019

Data Visualization: Tips & Tricks

Carol A. Watson
University of Georgia School of Law, cwatson@uga.edu

Amy Taylor
University of Georgia Law Library, amy.taylor@uga.edu
Data visualization: Tips and Tricks
Outline of presentation

- Overview & Questions to Ask (15 min)
- Data visualizations - uses in law (10 min)
- Tableau (5 min)
- Power BI (10 min)
By visualizing information, we turn it into a landscape that you can explore with your eyes. A sort of information map. And when you’re lost in information, an information map is kind of useful. - David McCandless
Hand-drawn

W.E.B. Du Bois
Data goes in ...
Is it magic? ...

- Abracadabra!
Visualization comes out ...

20 year history of national team appearances in the FIFA World Cup

How to read:
Comparing the 80 national teams which have been present during one or more World Cup tournaments, the appearance of a country's national soccer team is shown in a square which is divided in slices each representing a tournament year ordered from bottom (1930) to top (2014).

Region
- Europe and Central Asia
- East Asia and Pacific
- North America
- Latin America and Caribbean
- South Asia
- Sub-Saharan Africa
- Other

Participating in 2018
- Champions
- Runner-ups
- Final Fillers
- Fourth place

Top 10 teams:
1. Brazil
2. Germany
3. Italy
4. Argentina
5. Spain
6. England
7. France
8. Netherlands
9. Portugal
10. Argentina

Points
- Brazil: 237
- Germany: 218
- Italy: 156
- Argentina: 140
- Spain: 99
- England: 98
- France: 96
- Netherlands: 93
- Portugal: 72
Gathering data

- Where from?
- What format?
- Cost?
- Is it ready for use?
- Is it authentic and reliable?
Big picture questions

▸ Who is this for?
▸ What do they need?
▸ What could I show?
▸ What should I show?
▸ What will I show?

Credit: Good Charts (HBR Guide)
Granular view questions

What do you have?
> Quantitative – data
> Qualitative – concept

What are you doing? (more complicated q)
> Making a statement
> Confirming a hypothesis
> Exploring

Credit: Good Charts (HBR Guide)
Abela's hierarchy

What would you like to show?

Comparison

Relationship

Composition

Distribution

Variables per Item

Many Categories

Few Categories

One Variable per Item

Among Items

Over Time

Few Data Points

Single Variable

Many Data Points

Changing Over Time

Static

Few Periods

Many Periods

Only Relative Differences Matter

Relative and Absolute Differences Matter

Relative and Absolute Differences Matter

Simple Share of Total

Accumulation or Subtraction to Total

Components of Components

Accumulation to Total and absolute difference matters

Stacked 100% Bar Chart

Stacked Bar Chart

Stacked Area 100% Chart

Stacked Area Chart

Pie Chart

Waterfall Chart

Stacked 100% Bar Chart with Subcomponents

Tree Map
Uses of Data Visualization in Law
# DataDriven and Exploratory

## Business Intelligence Dashboard

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue (Accr.)</td>
<td>$123,456</td>
<td>-6.2%</td>
</tr>
<tr>
<td>Attorney Utilization..</td>
<td></td>
<td>+6.2%</td>
</tr>
<tr>
<td>Residual Ma..</td>
<td></td>
<td>+6.2%</td>
</tr>
<tr>
<td>Daily Receipts</td>
<td>$567,456</td>
<td>+6.2%</td>
</tr>
<tr>
<td>Client Billable Hrs...</td>
<td>$234,567</td>
<td>+6.2%</td>
</tr>
<tr>
<td>Dist. Income</td>
<td>$435,343</td>
<td>-6.2%</td>
</tr>
<tr>
<td>New Matters</td>
<td>101</td>
<td>+6.2%</td>
</tr>
<tr>
<td>DRO/Turn</td>
<td></td>
<td>-6.2%</td>
</tr>
<tr>
<td>Realization</td>
<td>83%</td>
<td>+6.2%</td>
</tr>
</tbody>
</table>

Click on the metric to drill down and view detailed information.

![Data-driven vs Conceptual Graph](image-url)
Data Driven and Exploratory

The Supreme Court Mapping Project

The Supreme Court Mapping Project is an ongoing and collaborative research venture that uses original software technology to enhance teaching, learning, and scholarship about Supreme Court doctrine.

The SCOTUS Mapping Project has two components:
VISUALIZING THE US CODE - PART 1: LAW EXPLORER

US Code Explorer: Title 35 (Click to Use)
Data Driven and Exploratory

Right to Environment in National Constitutions

Amendment Categories

1. State duties and obligations
2. State objectives
3. Right to information about the environment
4. Right to a healthy environment
5. Concern for future generations
6. Individual duty to respect and conserve

This visualization depicts 147 countries whose constitutions include environmental protection provisions. Of the constitutions of these 147 countries, 92 specifically cite a human right to a healthy environment (category 4). Other provisions indicate state duties and obligations (category 1), state objectives or goals (category 2), citizens' right to information about the status and health of the environment (category 3), concern for future generations or sustainable development (category 5), and individual duty of citizens to respect and conserve the environment (category 6).

Use the slider in upper left corner to navigate across time. Specific countries or categories can be viewed on the map by making selections in the appropriate boxes.

The shade of the circle corresponds to the age of the amendment (i.e. the darker the shade, the more recent the amendment). The size of the circle indicates the relative strength of a country's constitutional environmental provisions, as calculated by summing across the six categories. Thus, the larger the circle, the greater the number of categories covered by constitutional provisions.
DataDrive and Declarative

Jones v. Home Depot

2000 - Present

2001 - Present

Gait disturbance since 2001

2002

2003

2004

2005

2006

2007

2008

2009

2010

2011

2012

Problem begins w/ L.E.'s walking

2004

2005

Dril w/nervous system

Significant fall while traveling left meniscal tear

Gait worsens; desirable gait will return to normal due to length of time spinous cord has been compressed

Lower back problems

Move to a single bed home

Fall at Home Depot

Subsequent surgery: left femur fracture

2006

1 Fall/month

1 Fall/month

1 Fall/month

1 Fall/month

1-2 Falls/month

1 Fall/month

1 Fall/month

5/30/07: "Series of falls in last 2 years"

5/30/07: Loss of balance worsening over last 2 years

10/29/08: Fall in Bathroom

3/29/09: Fall at home due to chronic leg weakness

8/9/09: Fall onto back while shopping with walker, walker caught under a door

6/7/10: Fall backward and hit head against door

Fall 8/11/10: Fall and hits left elbow on ground

Fall 9/7/10: Mechanical fall from standing position (loss balance while washing dishes)

5/30/07: Reports several falls not related to the use of 4-wheeled walker

11/19/11: Right knee buckles and falls back onto toes

1/15/12: Falls standing next to thermostat at home

1/9/12: Fall last week getting up from a seated position

8/25/12: Falls getting out of bed, injures left pinky/thumb

8/29/12: Falls out of bed, reaching for alarm clock

Number of Falls

"3-5 significant falls"
6. Guarantees

In order to guarantee the performance of Supplier’s obligations hereunder the Supplier shall deliver at his sole expense to the Purchaser the following unconditional and irrevocable guarantees that are payable upon demand from a banking institution acceptable to the Purchaser:

6.1 Advance Payment Guarantee

The Supplier shall provide a guarantee in accordance with Appendix 5, as a security for the amount of the advance payments made by the Purchaser (i.e. payments number 1-2 specified in clause 5 “Payment Terms” above.), equal to 30% of the Purchase Price. The guarantee shall remain valid until three (3) months after the date of Provisional Acceptance. The delivery of this advance payment guarantee is a precondition for all the advance payments (as described above).

6.2 Warranty Period Guarantee

The Supplier shall provide, in accordance with Appendix 5, a guarantee on the performance of the Supplier’s remaining work and warranty obligations, equal to 10% of the Total Purchase Price. The guarantee shall remain valid until three (3) months after the end of the Warranty Period of the Equipment. The delivery of this warranty period guarantee is a precondition for the payment of the third installment specified in clause 5 “Payment Terms” above. If the Supplier has not fulfilled its obligations of the Warranty Period at the expiry of the validity of the said guarantee bond, the Supplier shall extend its validity for the duration of the performance of its unfilled obligations.

5. Payment term

The Purchaser shall pay the Purchase Price specified above in accordance with the following payment schedule (hereinafter “Payment Schedule”) and against the Supplier’s invoice. The right to invoice arises on the fulfilment of the terms of payment stated below:

1) 10% of the Purchase Price, fifty thousand (50 000) euro as an advance payment when this Agreement has been signed, provided that the advance payment guarantee (as described in clause 6 “Guarantees”) have been delivered to the Purchaser;

2) 20% of the Purchase Price, hundred thousand (100 000) euro when partial detail engineering documentation by the Supplier have been delivered and approved by the Purchaser;

3) 60% of the Purchase Price, three hundred thousand (300 000) euro when the commissioning of the equipment and final documentation concerning the Equipment has been completed and accepted by the Purchaser;

4) 10% of the Purchase Price, fifty thousand (50 000) euro when the warranty period guarantee and performance guarantee have been delivered to the Purchaser, and the Provisional Acceptance Certificate has been signed according to clause 13 “Provisional Acceptance”.

---

<table>
<thead>
<tr>
<th>Preconditions for Invoicing</th>
<th>Payment 1</th>
<th>Payment 2</th>
<th>Payment 3</th>
<th>Payment 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agreement is signed</td>
<td></td>
<td>10% of the total purchase price</td>
<td>20% of the total purchase price</td>
<td>50% of the total purchase price</td>
</tr>
<tr>
<td>Advance payment guarantee delivered to the Purchaser</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Detailed engineering delivered to the Purchaser (Final Foundation Drawings and Equipment design)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commissioning is successfully completed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final documentation is accepted by the Purchaser</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Warranty period guarantee delivered to the Purchaser</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provisional Acceptance Certificate has been signed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Ways to a Better Vendor World

In New York, street vending has always attracted ambitious, hard-working men and women with limited economic options. Successive waves of immigrants — Jewish and Italian in a previous era, now Chinese, Bangladeshi, Afghan, and Senegalese — have used vending to gain a foothold in their new country. Its low start-up costs, independence, and flexibility make vending a traditional first step for small business entrepreneurs.

But vending isn’t an easy way to get ahead. Throughout New York City’s history, merchants essential to “untold” competition have joined forces with city officials concerned with congestion, modernization, and “quality of life” to bar vendors from streets and regulate them excessively. These complex and shifting laws force vendors back and forth across the border between the formal and informal economies, making it difficult for vendors to serve the public and make a decent and honest living.

Here are four basic ways the City can make vending laws work better for vendors, their customers, and everyone else.

1. Lift the Caps

It’s virtually impossible to get a vending license in New York City because of strict caps, or limits, placed on the number of vendors in the 1970s and 80s. The estimated wait for a general vending license is several decades. By setting the caps far below vendor supply and public demand, the City unintentionally creates a thriving and exploitative black market for permits and licenses. Legal vendors have to buy licenses from illegal middlemen at exorbitant prices. Other vendors are driven underground, where they’re unlicensed and unregulated. To bring vendors into the legal mainstream, the City should raise the caps to realistic levels and crack down on the black market in licenses and permits.

21
DataDrive and Declarative - Trend Analysis

Record-Breaking Year For U.S. Law Firm Mergers

There were 102 law firm combinations involving U.S. firms in 2017 — the highest annual total recorded in the 11 years Altman Weil MergerLine has been compiling data. The largest merger combined 500-lawyer Womble Carlyle with 580-lawyer UK firm Bond Dickinson, creating a new transatlantic law firm, Womble Bond Dickinson.
# DataDrive and Declarative - Trend Analysis

## Statistical Trends for Connecticut Public Libraries, 2001 - 2018

Click thru the different panels below to see a variety of library statistical measures

<table>
<thead>
<tr>
<th>Circulation Per Capita</th>
<th>Book and Non-Print Circulation Per Capita</th>
<th>Children's Circulation Per Capita</th>
<th>BorrowIT CT Circulation Per Capita</th>
<th>Program Attendance Per Capita</th>
<th>Library Visits Per Capita</th>
<th>Number of Public Access Computers</th>
<th>Interlibrary Loans Filled</th>
<th>Reference Transactions Per Capita</th>
<th>Full-Time Equivalent Employees</th>
<th>Full-Time Equivalent Masters Degree Employees</th>
</tr>
</thead>
</table>

### Circulation Per Capita

A reliable measure of library use, libraries are used as much now as they have ever been, though not all this use is reflected in the traditional borrowing of library materials. Circulation has declined in the last six years after spiking upward during the recent recession. A decline in circulation is typical after recessions, not so much because libraries are less popular but because recessions usually reduce library material budgets so much that the choices for borrowing new library materials become more limited.

Connecticut currently ranks 20th in the U.S. in circulation per capita.

![Circulation Per Capita Chart](chart.png)

Based on the annual "Connecticut Public Libraries: a Statistical Profile" which compiles statistics from the Annual Report and Application for State Aid that public libraries complete each fall. Connecticut State Library, Division of Library Development.
Data Drive and Declarative - Trend Analysis

Great Library Print Collection Costs

- Replacement Copies
- Rebinding
- Annual Volumes
- Periodicals
- Government Documents
- Monographs
- Supplements
- Law Reports
- Looseleafs

Costs from 2003 to 2013.
Conceptual and Declarative
Conceptual and Exploratory
Data Visualization Tools
...an intuitive, interactive, visual-based exploration experience that enables users to analyze and present findings in their data without technical skills or coding.
Tableau

- **Tableau Desktop**: Individual use
- **Tableau Server**: Organization use
- **Tableau Online**: Cloud solution
- **Tableau Reader**: Read Tableau files
- **Tableau Public**: For journalists or anyone to publish interactive data online
Brooklyn Public Library saves time, money, and headcount with Tableau
White & Black

A history of interracial marriage laws in the United States

In 1619, the first enslaved African people were brought to what is now the United States. 70 years later, the Commonwealth of Virginia outlawed interracial marriage. The first territory to do so.

By the time that the Founding Fathers declared that "all men are created equal, that they are endowed by their Creator with certain unalienable Rights," 10 territories had passed laws banning interracial marriage.

At the onset of the Civil War, of the 34 states that existed at the time, 25 of them had laws banning interracial marriage. When the Great Depression came back from World War II, 30 of the 48 states had laws on interracial marriage.

In 1967, the Supreme Court ruled in Loving v. Virginia that interracial marriage bans were unconstitutional. The legal hurdle had been cleared, but as Dr. King noted, legally did not mean acceptance.

"Marriage is one of the 'basic civil rights of man', fundamental to our very existence and survival. ... Under our Constitution, the freedom to marry, or not marry, a person of another race resides with the individual and cannot be infringed by the State..." - Chief Justice Earl Warren

Gallup Poll Approval
% Americans approving of interracial marriage

Click on state above to highlight timeline

Hover on data for more details
Connect, model, and then explore your data with visual reports that you can collaborate, publish, and share.
Microsoft Power BI

**Power BI Desktop:** Individual use

**Power BI Pro:** Organization use

**BI Reader:** not available

---

**See the full picture**
All of your on-premises and cloud information resides in one central location. You can also use pre-packaged content and built-in connectors to quickly import your data from solutions such as Marketo, Salesforce, Google Analytics, and many more.

**Bring details to life**
Power BI lets you share dashboards and reports with whomever you want, wherever you go. Stay informed with the Power BI app for Windows, iOS, and Android. Alerts notify you about any changes in your data, so you can work with your team to take immediate action.

**Transform data into decisions**
Data should empower, not overwhelm. With Power BI, you can easily interact with your data, using simple drag-and-drop gestures to discover trends and natural language queries to get lightning-fast answers.
Worldrecord Messi: # Goals in one year: 91 in 2012, for Barcelona and Argentina


91 Total Goals
46 Total Matches
The Associated Press and Microsoft deliver up-to-the-minute election results

The world relies on The Associated Press (AP) to deliver up-to-the-minute election results. For the 2017 Virginia gubernatorial primary, AP and Microsoft used Power BI to create visualizations of election data. AP offered member news outlets these visualizations, which included an interactive map showing results by county and party, to provide audiences with near-real-time results.
United States electricity production

Electricity Production by source (% of total)
THANKS!

Any questions?