

**“ The greatest value of a picture is when it forces us to notice what we never expected to see. ”**



**John W. Tukey**  
American Statistician



John Wilder Tukey (June 16, 1915 – July 26, 2000) was an American mathematician best known for development of the FFT algorithm and box plot. Born in New Bedford, Massachusetts in 1915, and obtained a B.A. in 1936 and M.Sc. in 1937, in chemistry, from Brown University, before moving to Princeton University where he received a Ph.D. in mathematics.

## MIS771 – Descriptive Analytics and Visualisation Data Visualisation Module – Week 1

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**Paul Hodge**  
[www.DataVizGuy.com](http://www.DataVizGuy.com)



**DATA  
VIZ  
GUY.**

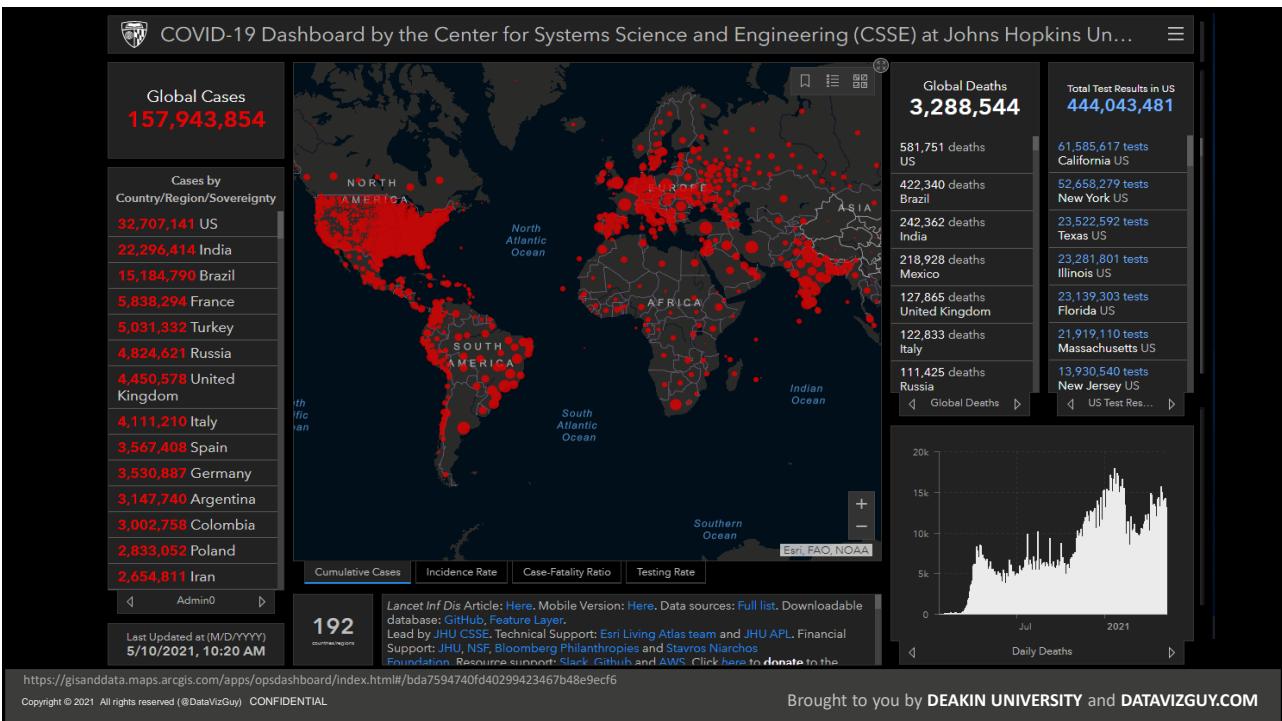
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How as my experience has brought me here? (Identifying themes that transcend domains, that connect with people, and are

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“

If an insight isn't understood and isn't compelling, no one will act on it and no change will occur ,,”

**Dr Hal R. Varian**  
(Google Chief Economist)

Hal Ronald Varian (born March 18, 1947 in Wooster, Ohio) is an economist specializing in microeconomics and information economics. He is the chief economist at Google and he holds the title of emeritus professor at the University of California, Berkeley where he was founding dean of the School of Information.



Vision: This is not just about selecting the best chart, it's about connecting with your audience, sharing insights (not just data), and while designing for Understandability.  
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What goes into a great wine: Ingredients for success: Knowledge, Practice, a splash of natural Aptitude (talent) – We will come back to this.  
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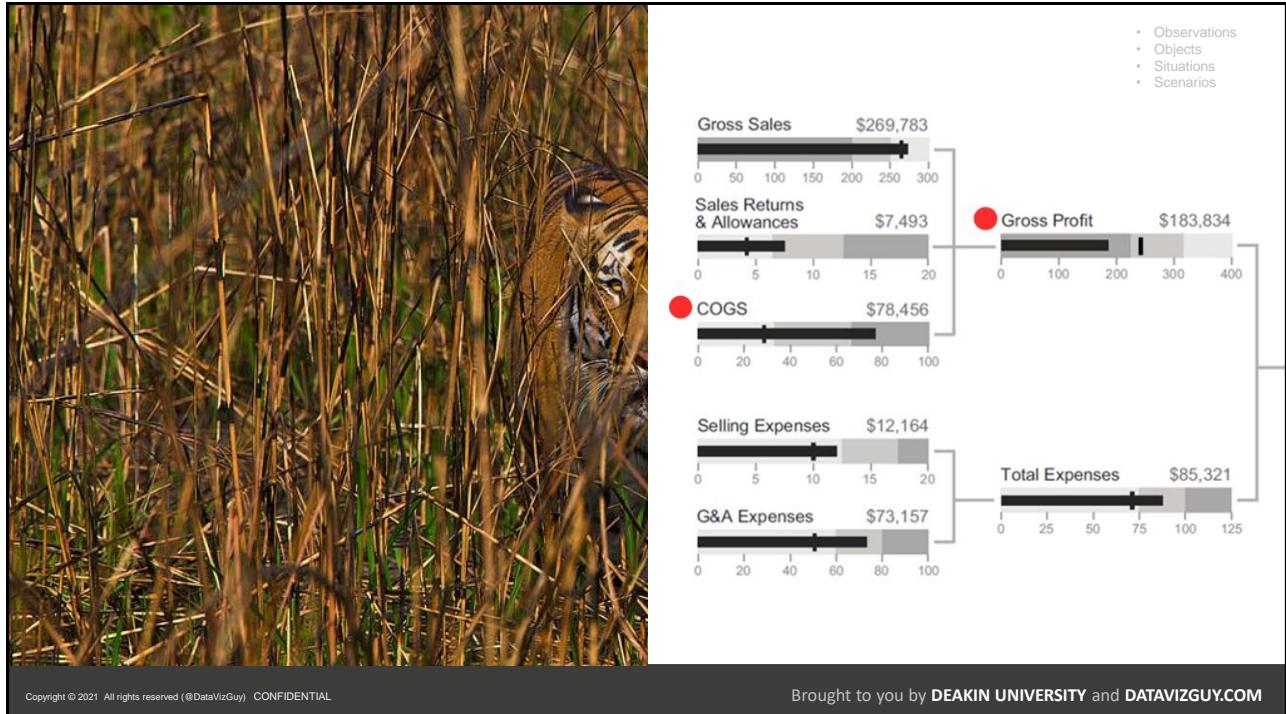
## MIS771 – Data Visualisation Module Descriptive Analytics and Visualisation

	120mins			60mins	
	Week	Session	Start Time	End Time	Activity
Week 1	Introduction & History	6pm	6:40pm	Short Break	Engagement Elements
			7pm	8:00pm	Short Break
			8:20pm	9pm	Hands-on Tutorial
Week 2	Information Elements	6pm	6:40pm	Short Break	Ethics
			7pm	8:00pm	Short Break
			8:20pm	9pm	Hands-on Tutorial
Week 3	Design Elements	6pm	6:40pm	Short Break	Future
			7pm	8:00pm	Short Break
			8:20pm	9pm	Hands-on Tutorial

**Assignment Deadline : TBA**  
Note: We will discuss more at the end of the Session

Empowerment Promise (together), Principles focused (Tool Agnostic) – We will explore some examples, establish a language, and discuss some practical tips & tricks  
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**indeed®**

**“ Our mission is to help people get jobs. We have more than 8,900 global employees passionately pursuing this purpose and improving the recruitment journey through real stories and data. ”**

**Paul Forster**  
(Indeed Founder)

Paul Forster is best known as one of the founders of Indeed, the largest job site in the world. He also has a substantial background as an Angel Investor

**Rony Kahan**  
(Indeed Founder)

Rony Kahan co-founded Indeed in 2004 and currently serves as Chairman of the Board of Indeed. In addition, Rony is a Board Director of Recruit Holdings, Indeed's parent company.

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“ Choose a job you love, and you will never have to work another day in your life. ”

Example Jobs:

Senior Data Visualization – Engineer (@Netflix)



Principal Software Engineer – Visualization (@Verizon)

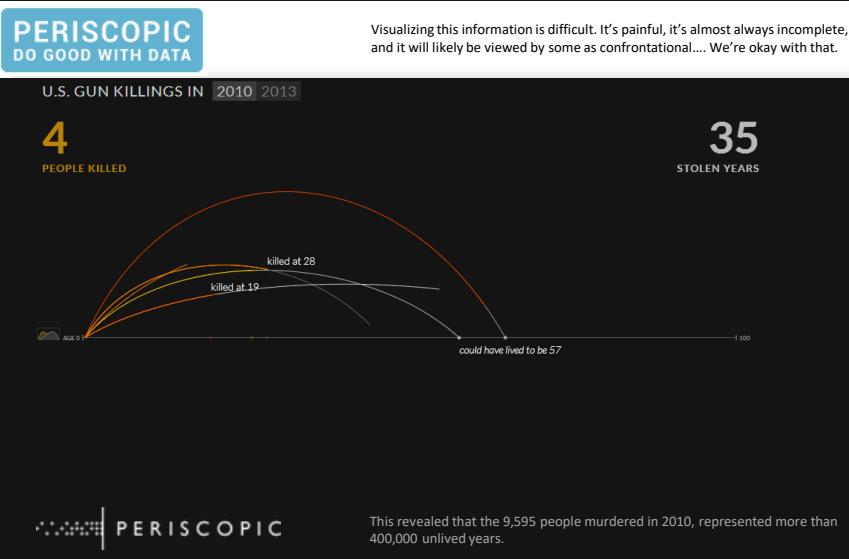
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Start with the “Why” are you here (apart from passing the class)?

- Some of you might be thinking about a job
- All of you will need to communicate information and/or insights

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**Kim Rees**

Kim Rees is an American computer scientist and data visualization professional located in New York, NY. She is currently the head of Data Visualization at Capital One. Prior to joining Capital One, Rees co-founded the data visualization firm, Perisopic and worked there for 13 years.

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**“ Graphics should not simplify messages.  
They should clarify them, highlight  
trends, uncover patterns, and reveal  
realities not visible before. ”**

- It is truthful
- It is functional
- It is beautiful
- It is insightful
- It is enlightening

<http://www.thefunctionalart.com/>

Alberto Cairo is the Knight Chair in **Visual Journalism** at the School of Communication of the University of Miami.<sup>[1]</sup> He holds a BA in Journalism (from the University of Santiago de Compostela) and a master's degree on Information Society Studies from the Universitat Oberta de Catalunya (in Barcelona)



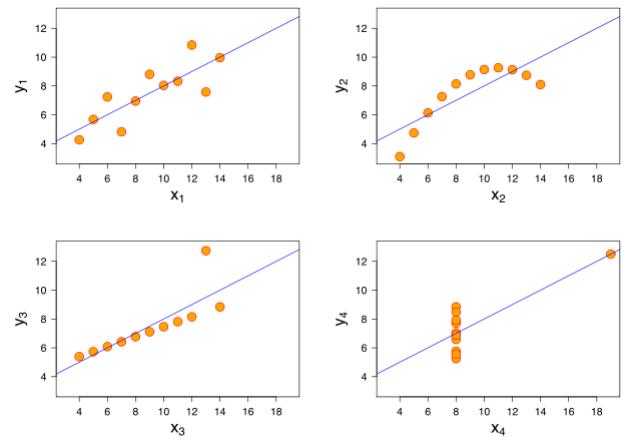
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$X_1$	$Y_1$	$X_2$	$Y_2$	$X_3$	$Y_3$	$X_4$	$Y_4$
10.0	8.04	10.0	9.14	10.0	7.46	8.0	6.58
8.0	6.95	8.0	8.14	8.0	6.77	8.0	5.76
13.0	7.58	13.0	8.74	13.0	12.74	8.0	7.71
9.0	8.81	9.0	8.77	9.0	7.11	8.0	8.84
11.0	8.33	11.0	9.26	11.0	7.81	8.0	8.47
14.0	9.96	14.0	8.10	14.0	8.84	8.0	7.04
6.0	7.24	6.0	6.13	6.0	6.08	8.0	5.25
4.0	4.26	4.0	3.10	4.0	5.39	19.0	12.50
12.0	10.84	12.0	9.13	12.0	8.15	8.0	5.56
7.0	4.82	7.0	7.26	7.0	6.42	8.0	7.91
5.0	5.68	5.0	4.74	5.0	5.73	8.0	6.89

mean(X) = 9, var(X) = 11, mean(Y) = 7.5, var(Y) = 4.12,  
 $\text{cor}(X,Y) = 0.816$ , linear regression line  $Y = 3 + 0.5*X$



### Anscombe's Quartet – Statistics vs Pictures

Francis John Anscombe (13 May 1918 – 17 October 2001) was an English statistician. Born in Hove in England, Anscombe was educated at Trinity College at Cambridge University. After serving in the Second World War, he joined Rothamsted Experimental Station for two years before returning to Cambridge as a lecturer.

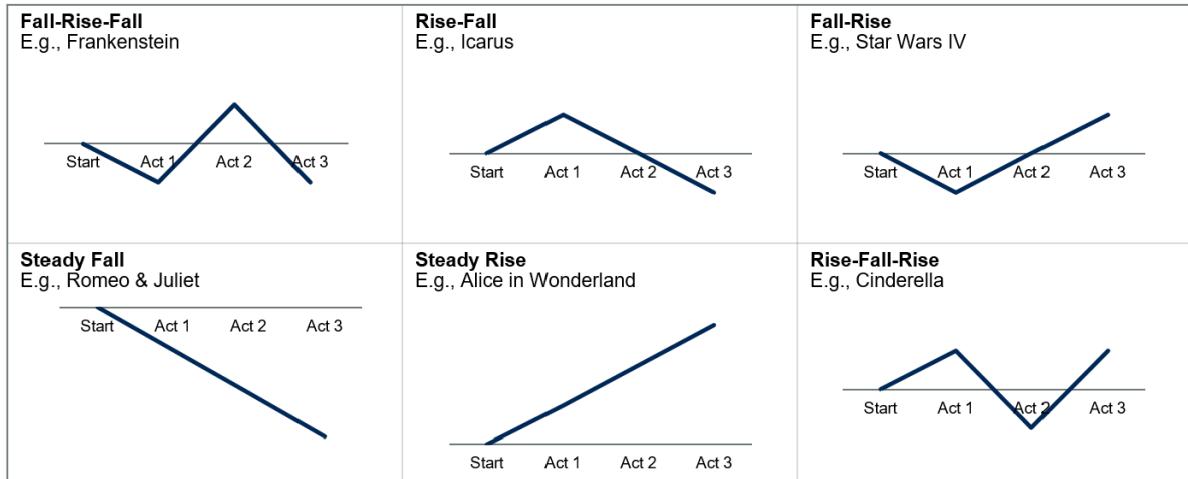
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## Finding the Stories in the Data Patterns

Informative



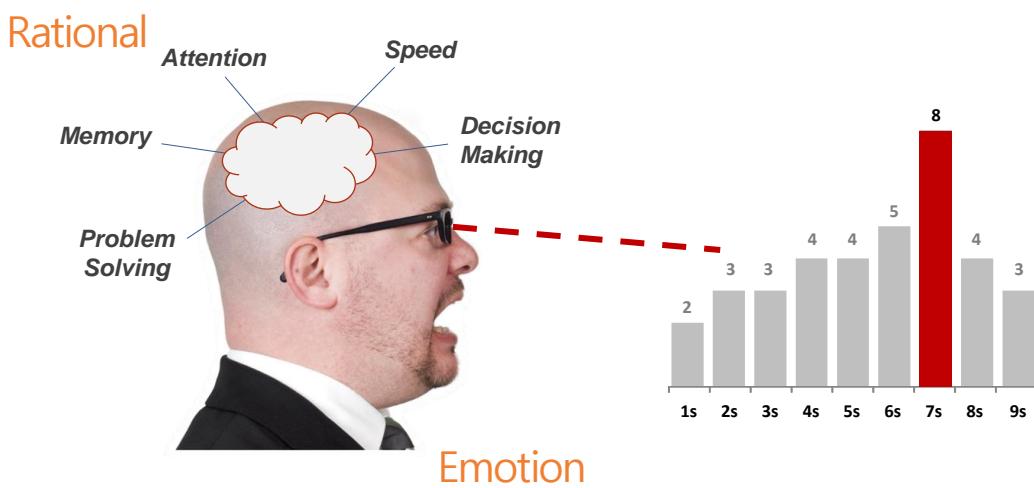
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ID: 392255

Gartner

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*"We shouldn't try to separate reason from emotion, for it's emotion that tells us what to value... and sits at the heart of wisdom"*

David Brook, author



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## Definition of Data Visualisation

*"Data visualization is the representation of information or concepts using visual elements in order to inform or entertain"*

*Art with Intent*

How do Data Visualisations help improve quality and speed of decision making....



Data Visualisations can be used to **compress** large datasets (one picture tells a thousand words)



Data Visualisations can improve the ability to **remember** data (pictures are easier to remember)



Data Visualisations can **engage** an Audiences' attention, especially when combined with Data Storytelling (visuals provide a framework for storytelling)



Well designed Data Visualisation can be used to **high-light** important/critical data (our brains crave-structure love oddballs)

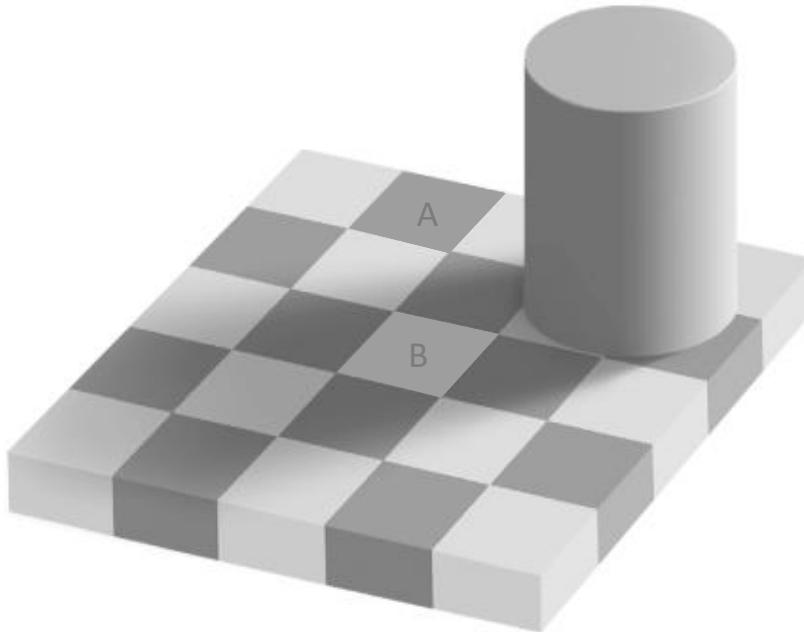


Data Visualisations can communicate **insights quickly** (especially when combined with pre-attentive design attributes).

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Your Role:  
Help make sense of  
context when presenting  
finance data.

Slide

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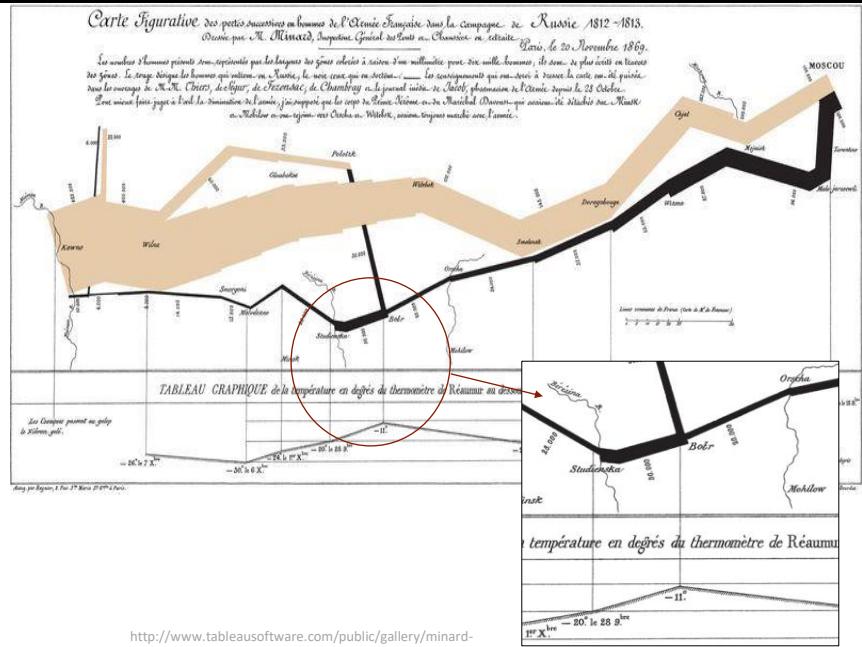
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## Charles Joseph Minard

27 March 1781 – 24 October 1870



Charles Joseph Minard (27 March 1781 – 24 October 1870 in Bordeaux) was a French civil engineer noted for his inventions in the field of information graphics.





John Snow

*15 March 1813 – 16 June 1858*



John Snow (15 March 1813 – 16 June 1858) was an English physician and a leader in the adoption of anaesthesia and medical hygiene. He is considered one of the fathers of modern epidemiology, in part because of his work in tracing the source of a cholera outbreak in Soho, London, in 1854.

<https://public.tableau.com/en-us/s/gallery/mapping-1854-cholera-outbreak>

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## Traffic Patterns



***Example Data, for  
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ONLY.***

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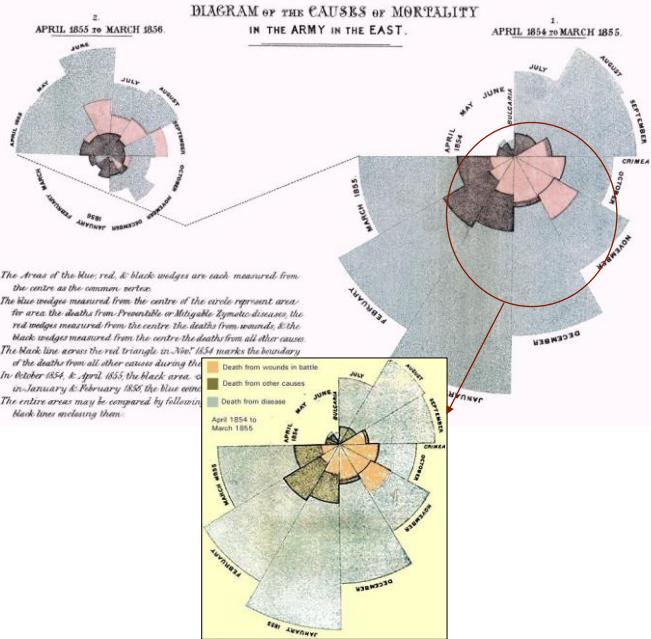
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# Florence Nightingale

*12 May 1820 – 13 August 1910*



Florence Nightingale, (12 May 1820 – 13 August 1910) was a celebrated British social reformer and statistician, and the founder of modern nursing. She came to prominence while serving as a nurse during the Crimean War, where she tended to wounded soldiers. She was known as "The Lady with the Lamp" after her habit of making rounds at night.



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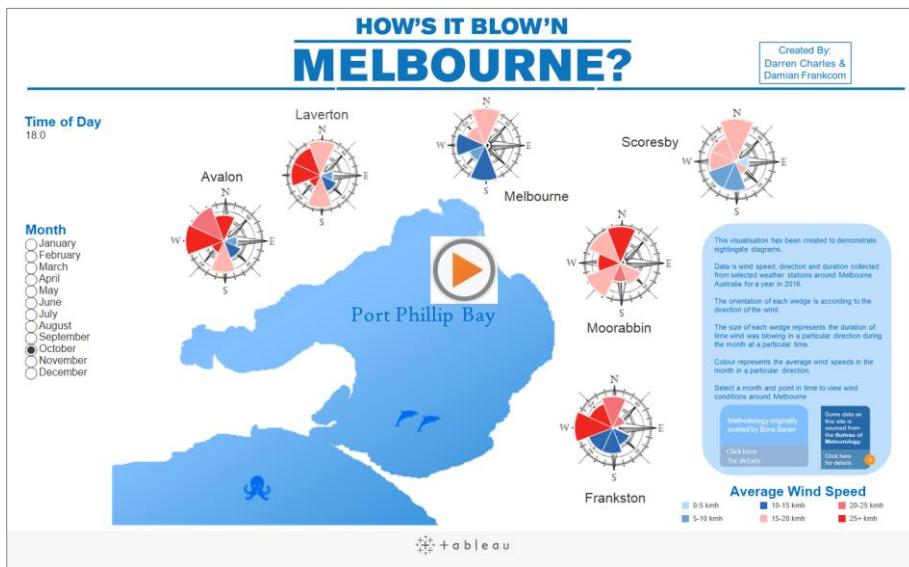
<https://boraberan.wordpress.com/2014/03/30/creating-coxcomb-charts-in-tableau/>

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# Wind Directions

*Example Data, for  
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<https://public.tableau.com/profile/damian.frankcom#!vizhome/NightingaleChartExample/HowsitblowNMelbourne> Brought to you by

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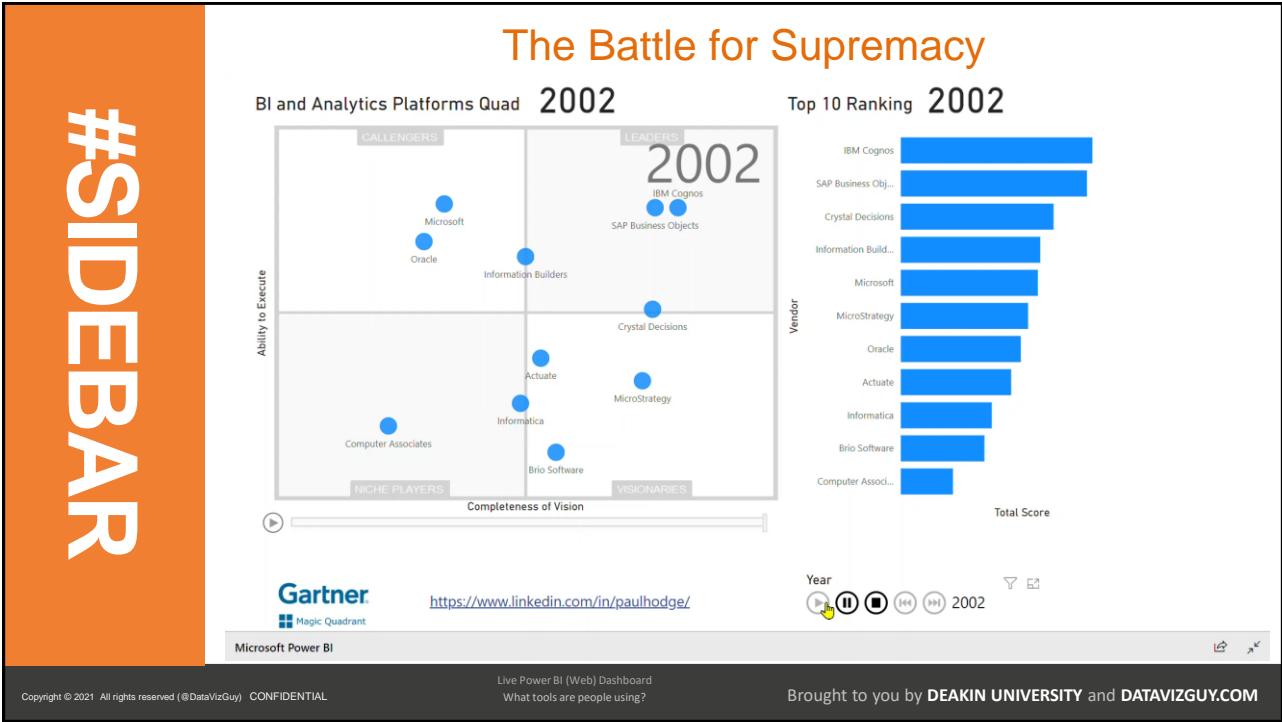
22



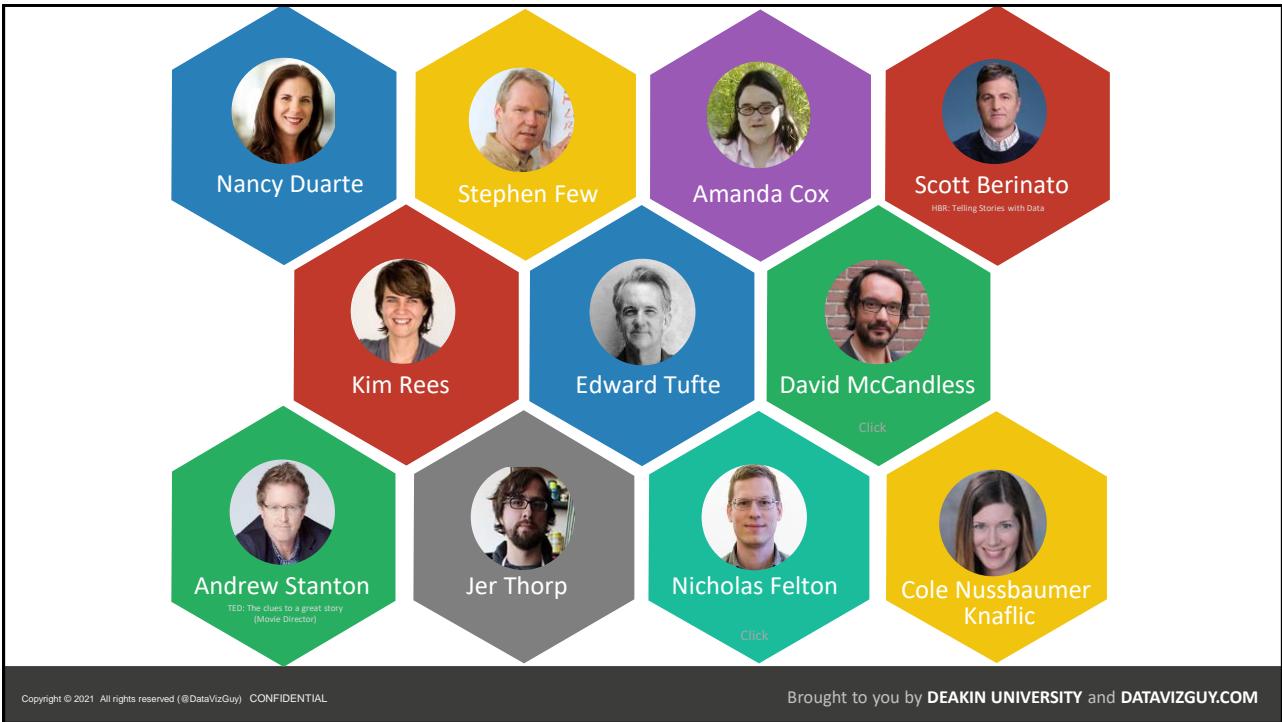
<http://youtu.be/jhkSRLYSojo>  
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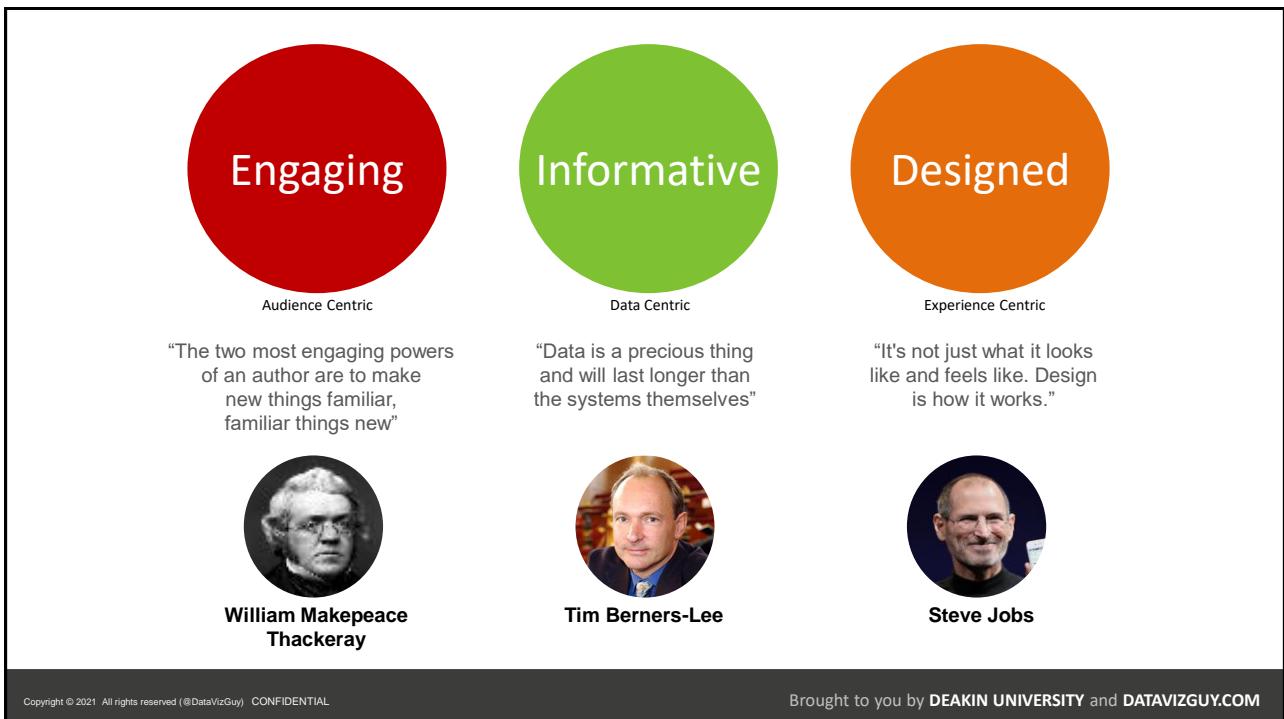


Knowledge – Let's establish a common language / framework  
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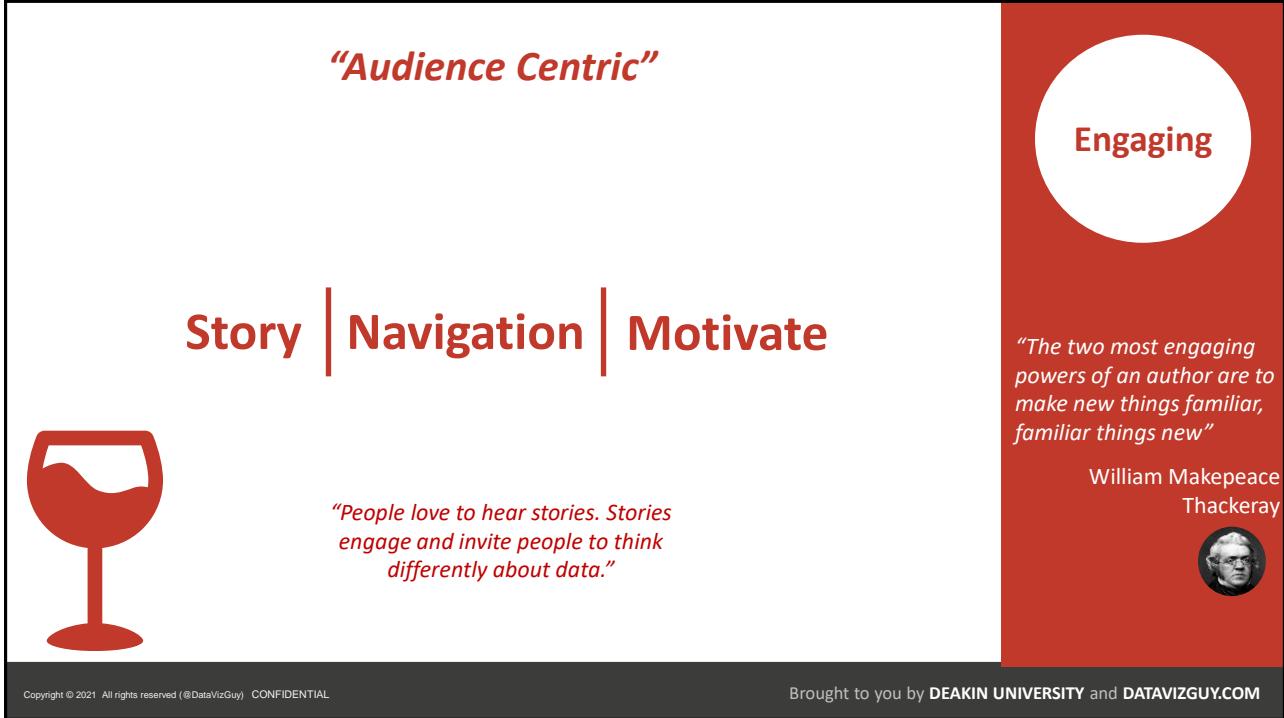
- How to use visualisations to influence decision makers (influence)
- How to help teams work to generate the better outcomes (collaborate)
- How to use visualisation techniques to reveal new insights (discover)

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“

The audience does not need to tune themselves to you - you need to tune your message to them. ,,

**Nancy Duarte**  
American writer, speaker, and CEO

Nancy Duarte is an American writer, speaker, and CEO. Duarte worked with Al Gore on the documentary slide show known as An Inconvenient Truth and is the author of several books, including slide:ology: The Art and Science of Creating Great Presentations (2008), Resonate: Present Visual Stories that Transform Audiences (2010), the HBR Guide to Persuasive Presentations (2012).



## Observation Game.....

## Engaging Narrative framework



### 1. Time marker / Place marker

*engage the audience / establish a reference and setup the Goal  
(establish a **Context** by getting everyone on the same page / agreement)*



### 2. Characters / Cast of Characters

*identify key dimensions of data (**Focus** on data that matters)*



### 3. Sequence of Events / Insights

*share a series of insights / conflicts (provide supporting **Evidence** that are useful for your audience)*



### 4. Don't forget get the "So What!"

*always come back to the why!! – Are you at least supporting a Decision / Action (ideally reward the audience with a **Conclusion**)*



**Hint:** Begin by first defining the Audience (persona),  
keep the Story clear and simple (narrative)

## Storytelling

Story vs. Narrative



**Pixar**

Pixar began in 1979 as the Graphics Group, part of the Lucasfilm computer division, before its spin-out as a corporation in 1986, with funding by Apple Inc. co-founder Steve Jobs

Difference between Story vs. Narrative  
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## The New York Times

Usain Bolt's 9.63 set an Olympic record in the 100 meter. So how far ahead of every Olympic medalist is he?

Engaging

All the Medalists: Men's 100-Meter Sprint

### One Race, Every Medalist Ever

Usain Bolt's 9.63 set an Olympic record in the 100.  
So how far ahead of every Olympic medalist is he?

By KEVIN QUEALY and GRAHAM ROBERTS



**Kevin Quealy and Graham Roberts**

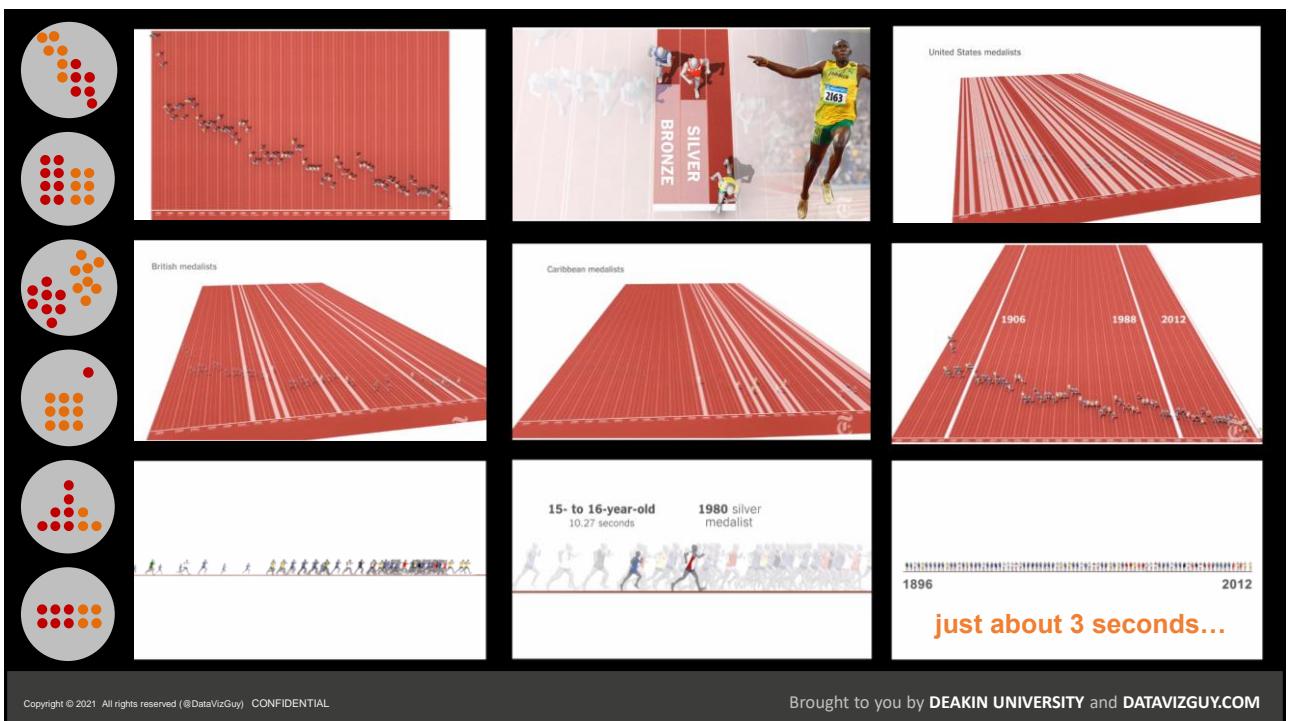
Sources: "The Complete Book of the Olympics" by David Wallechinsky and Jaime Loucky, International Olympic Committee; Amateur Athletic Association; Photographs: Chang W. Lee/The New York Times, Getty Images, International Olympic Committee

Spot the Charts

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## Establishing a Narrative Rhythm

Author Nancy Duarte talks about how audiences are screaming "make it clear" not "cram more in" - with the storyteller 'making edits on behalf of the audience', which I think is a helpful way to think about filtering data like Jobs does here

**Storytelling**

**Nancy Duarte**

Nancy Duarte is an American writer, speaker, and CEO. She is well known for her three best-selling books, which include Resonate: Present Visual Stories that Transform Audiences, and slide:ology.

Nancy also worked with Al Gore on the famous documentary slide show known as An Inconvenient Truth.

DUARTE Source: [www.duarte.com](http://www.duarte.com)

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Engaging

<p><b>PERSONA PAD</b></p>  <p>TITLE ROLE GOALS / MOTIVATIONS KEY QUESTIONS FRUSTRATIONS</p> <p>NOTES</p> <p>Copyright 2018 @DataVizGuy</p>	<p>FOCUS OPERATIONAL <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> STRATEGIC <input type="radio"/></p> <p>MOST IMPORTANT DATA</p> <p>SUPPORTING DATA</p> <p>REFRESH RATE <input type="radio"/> DAILY <input checked="" type="radio"/> WEEKLY <input type="radio"/> MONTHLY</p> <p>PRIMARY SOURCE SECONDARY SOURCE</p>	<p><b>NARRATIVE PAD</b></p>  <p>STORY TITLE</p> <p>STORY TYPE PROCESS (How) <input type="radio"/> SYSTEM (What) <input type="radio"/> COMPARISON (Why) <input type="radio"/></p> <p>CHARACTERS</p> <p>PUNCHLINE</p> <p>NOTES</p> <p>Copyright 2018 @DataVizGuy</p>
		<p>TIME MARKER PLACE MARKER</p> <p>EVENT 1 EVENT 2 EVENT 3 EVENT 4 CONCLUSION</p> <p>SO WHAT / CALL TO ACTION</p>

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## Word Association Game.....

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1

## Matching Language

important **91%**

**Simple text**

closer / further

**Scatterplot**

higher / lower

Engaging

**Table**

details / facts

	A	B	C
Category 1	15%	22%	42%
Category 2	40%	36%	20%
Category 3	35%	17%	34%
Category 4	30%	29%	26%
Category 5	55%	30%	58%
Category 6	11%	25%	49%

**Line**

increasing / decreasing

**Horizontal bar**

first / last

**Heatmap**

hotter / colder

	A	B	C
Category 1	15%	22%	42%
Category 2	40%	36%	20%
Category 3	35%	17%	34%
Category 4	30%	29%	26%
Category 5	55%	30%	58%
Category 6	11%	25%	49%

**Slopegraph**

better / worse

**Square area**

bigger / smaller



**Cole Nussbaumer**

Cole Nussbaumer Knaflic is the author of Storytelling with Data: A Data Visualization Guide for Business Professionals and writes the popular blog [storytellingwithdata.com](#). She's worked at and with some of the most data-driven companies on the planet, including Google, Adobe, Genentech, JPMC, Target, and the World Bank.

Does your visualisation matching your language?  
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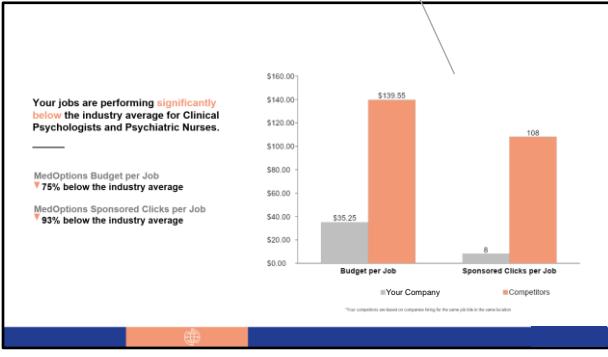
## How Chart choice can change the Narrative

*A Bar chart is used to compare value with each other (which is bigger)*

*A Scatterplot highlights distance between sets of data points (how far apart)*

Your jobs are performing significantly below the industry average for Clinical Psychologists and Psychiatric Nurses.

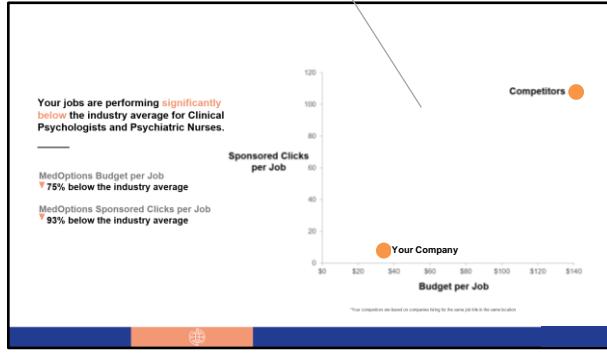
MedOptions Budget per Job **75% below the industry average**  
MedOptions Sponsored Clicks per Job **93% below the industry average**



\*Your competitors are based on companies having the same job title in the same location.

Your jobs are performing significantly below the industry average for Clinical Psychologists and Psychiatric Nurses.

MedOptions Budget per Job **75% below the industry average**  
MedOptions Sponsored Clicks per Job **93% below the industry average**



\*Your competitors are based on companies having the same job title in the same location.

"Look how do we Compare" vs "Look how far apart we are"



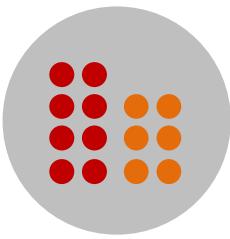

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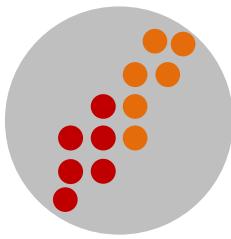
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## Insight Patterns to support Key Decisions

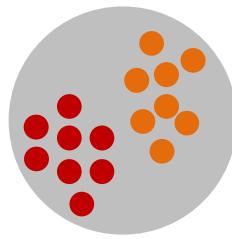
Engaging



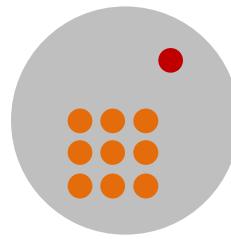
Comparison



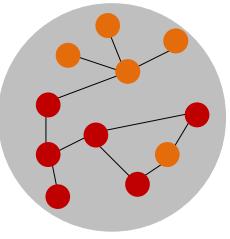
Trend



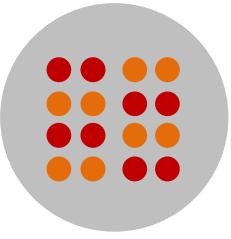
Cluster / Proximity



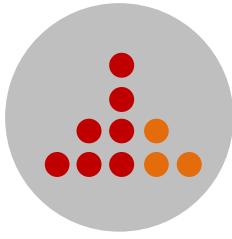
Outlier



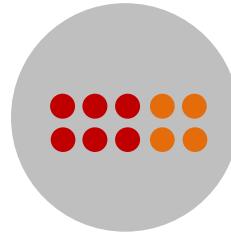
Relationship



Correlation



Distribution



Progress

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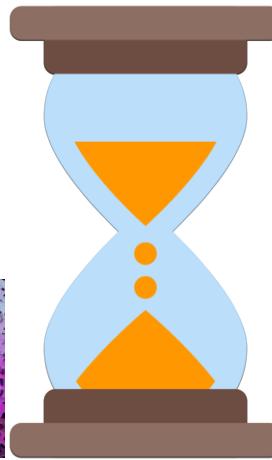
## Information Navigation

Engaging

Source: Ben Shneiderman from University of Maryland College

Start with Big Picture

Zoom &amp; Filter

Drill to Details  
(could be supporting details)

Investigate Detail

Find Similar

Explore New Population

Source: John Stasko, Carsten Görg from Georgia Institute of Technology

**Ben Shneiderman**

Professor Ben Shneiderman, is a founding director of the Human Computer Interaction Lab at the University of Maryland (1983-2000), Professor, Department of Computer Science Member, Institute for Advanced Computer Studies

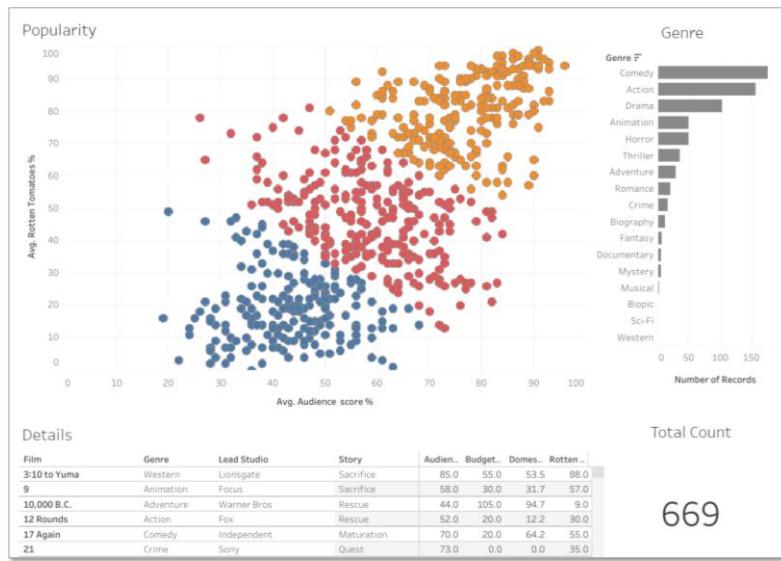
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## Visual Navigation (Curated)

Engaging



Workshop Opportunity – Let's Practice, while exploring an example (what are the Navigation concepts).  
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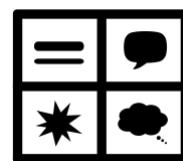
## Information Navigation - Styles



Stage Show



Scroll Story



Cartoon Strip



Video/Animation

**Stage**  
<https://gisanddata.maps.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd40299423467b48e9ecf6>

**Scroll + Stage**  
<https://projects.two-n.com/world-gender/>  
<https://covid-tracker.mckinsey.com/emotion-archive>

**Cartoon Strip**  
<http://archive.nytimes.com/www.nytimes.com/interactive/2011/10/23/sunday-review/an-overview-of-the-euro-crisis.html>

**Scroll + Stage**  
<https://www.nytimes.com/interactive/2018/08/30/climate/how-much-hotter-is-your-hometown.html>

## Narrative Spectrum



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## Visual Navigation (Exploration)

Engaging



Source: <https://pair-code.github.io/facets/>

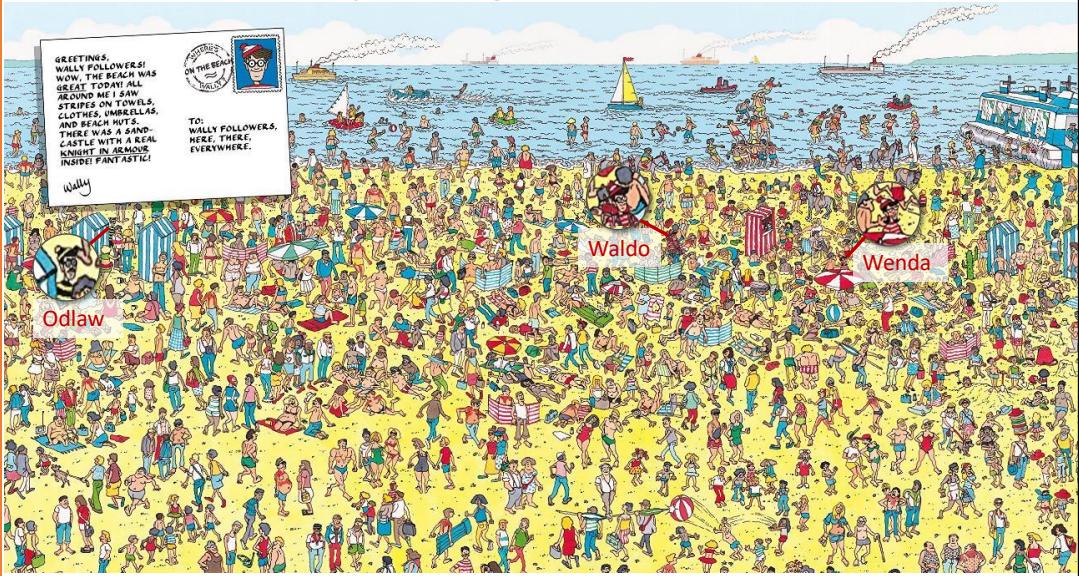
Workshop Opportunity – Let's Practice, while exploring an example (what are the Navigation concepts).  
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#SIDEBAR

Tip: Start by finding “Yourself” in the data?



Hint: Put yourself in the "Audience Shoes" and imaging what they are looking for and what they will see?  
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## Motivation

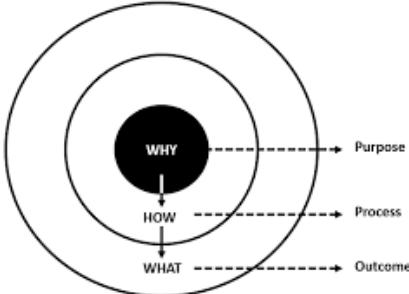


**Simon Sinek**

Simon Oliver Sinek (born October 9, 1973) is a British-American author, motivational speaker and organizational consultant. He is the author of five books, including Start With Why (2009).

### Always bring it back to the WHY!

*Data Visualisations are intended to help improve quality and speed of decision making*



- **Descriptive Analytics** tells you what happened in the past.
- **Diagnostic Analytics** helps you understand why something happened in the past.
- **Predictive Analytics** predicts what is most likely to happen in the future.
- **Prescriptive Analytics** recommends actions you can take to affect those outcomes.

 Hint: Support specific Decision Windows based on Time of Day, Day of Week, Day of Month 

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Consider both *Why* and *When* is the insight is required (when does action need to be taken)?

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Engaging

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**Storytelling**  


**Time / Place (Context)**  


**Characters (Focus)**  


**Events / Insights (Evidence)**  


**So What !! (Conclusion)**  


**Find Yourself**  


**Insight Patterns vs. Charts**

 Correlation	 Cluster/Churn	 Distribution	 Progress
 Relationship	 Correlation	 Distribution	 Progress

**"Audience Centric"**



**Engaging**

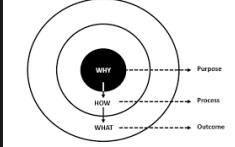
**Story | Navigation | Motivate**

**Narrative Spectrum**



Discovery      Decision Support      Motivate / Learning

**Descriptive | Diagnostics | Predictive | Prescriptive**





**Cole Nussbaumer**



**Simon Sinek**

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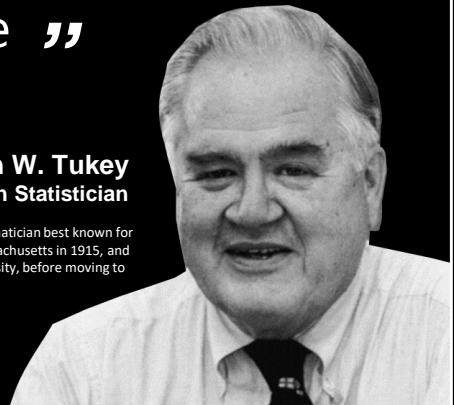
23

“

The greatest value of a picture is  
when it forces us to notice what we  
never expected to see ”

**John W. Tukey**  
American Statistician

John Wilder Tukey (June 16, 1915 – July 26, 2000) was an American mathematician best known for development of the FFT algorithm and box plot. Born in New Bedford, Massachusetts in 1915, and obtained a B.A. in 1936 and M.Sc. in 1937, in chemistry, from Brown University, before moving to Princeton University where he received a Ph.D. in mathematics.



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What goes into a great wine: Ingredients for success: Knowledge, Practice, natural Aptitude (talent)

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**MIS771 – Data Visualisation  
Final Assignment**

\* Note: Data will change from previous Trimester



**Submitted via Wordpress**

**1** **Describe your project**  
**Review Assessment Data:**

- Select the Attributes you'd might like to build a story around
- Add your own analysis and/or supporting data

**2** **Answer a range of questions related to:**

- Information
- Design
- Engagement

**3** **Capture Screenshots of an interactive Dashboard, plus embedded Link to Live Dashboard, with Explanations of work and Interactions (provide link to on-line Tableau dashboard)**



Hints: Review the Scoring Rubric for details on how the assignment will be scored. Students should also consider the professional appearance and presentation in order to be scored well (e.g. Tables of contents, page numbers, Citations, etc). Finally keep in mind that the Dashboard design in the assignment should be designed for your Audience, not to simply support your analysis.

**Assignment Deadline: TBA**

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**Tutorial**



*"Data visualization is the representation of information or concepts using visual elements in order to inform or entertain"*

*Art with Intent*



**May-2021**

Here is a new key for your class (for your use only):

Landing Page: <http://www.tableau.com/tft/activation>

Desktop Key: **TCNG-C734-B8C0-A4D2-951B**

**Instructions: Click on the link above and select Get Started. On the form, enter your university email address for "Business email"; and under "Organization", please input the name of your school.**

Valid Through: 4-Jul-2021

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7:50p

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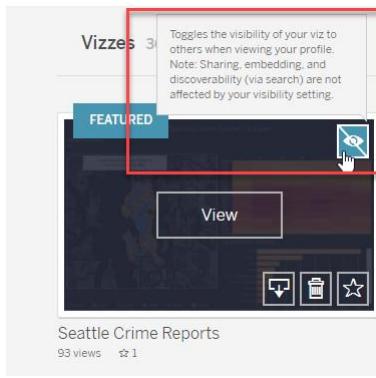
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**Tutorial**



*"Data visualization is the representation of information or concepts using visual elements in order to inform or entertain"*

*Art with Intent*

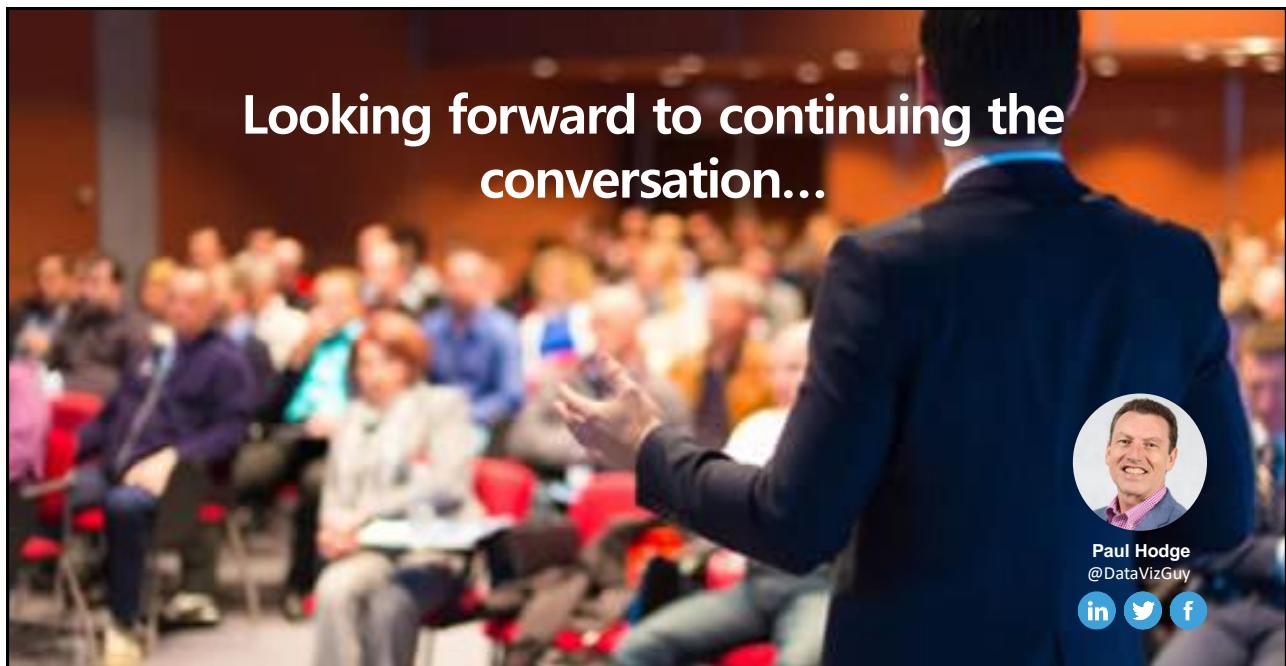


**IMPORTANT**

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**Looking forward to continuing the conversation...**



**Paul Hodge**  
@DataVizGuy



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**“ The greatest value of a picture is when it forces us to notice what we never expected to see. ”**



**John W. Tukey**  
American Statistician



John Wilder Tukey (June 16, 1915 – July 26, 2000) was an American mathematician best known for development of the FFT algorithm and box plot. Born in New Bedford, Massachusetts in 1915, and obtained a B.A. in 1936 and M.Sc. in 1937, in chemistry, from Brown University, before moving to Princeton University where he received a Ph.D. in mathematics.

## MIS771 – Descriptive Analytics and Visualisation Data Visualisation Module – Week 1

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