> “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 3

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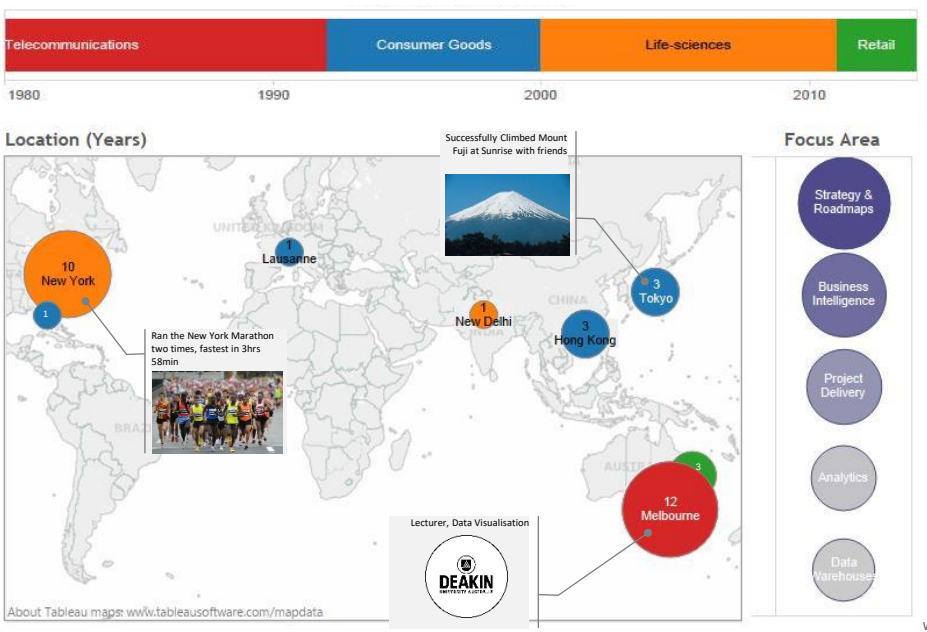
1

**Paul Hodge**
www.DataVizGuy.com

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How as my experience has brough me here? (identifying themes that transcend domains, that connect with people, and are original)

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2

3

# Brief Session 1 & 2 Recap

1. Engagement (Story | Navigation | Motivation)
2. Information (Data | Augmentation | Charts)
3. Ethics

Tutorial 2 (Sales Data)….

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Engaging

Audience Centric

"The two most engaging powers of an author are to make new things familiar, familiar things new"

**William Makepeace Thackeray**

Informative

Data Centric

"Data is a precious thing and will last longer than the systems themselves"

**Tim Berners-Lee**

Designed

Experience Centric

"It's not just what it looks like and feels like. Design is how it works."

**Steve Jobs**

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Storytelling

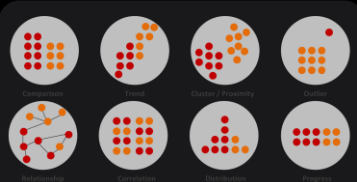
Time / Place (Context)

Characters (Focus)

Events / Insights (Evidence)

So What !!! (Conclusion)

Find Yourself



Insight Patterns vs. Charts

Cole Nussbaumer

"Audience Centric"

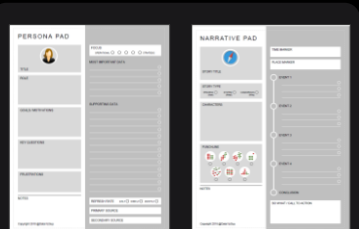
Engaging

Story | Navigation | Motivate

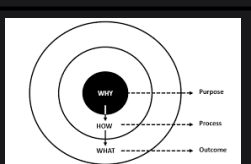
Narrative Spectrum

Undefined — Fixed

Discovery | Decision Support | Motivate / Learning




Persona | Narrative




Descriptive | Diagnostics | Predictive | Prescriptive

Simon Sinek

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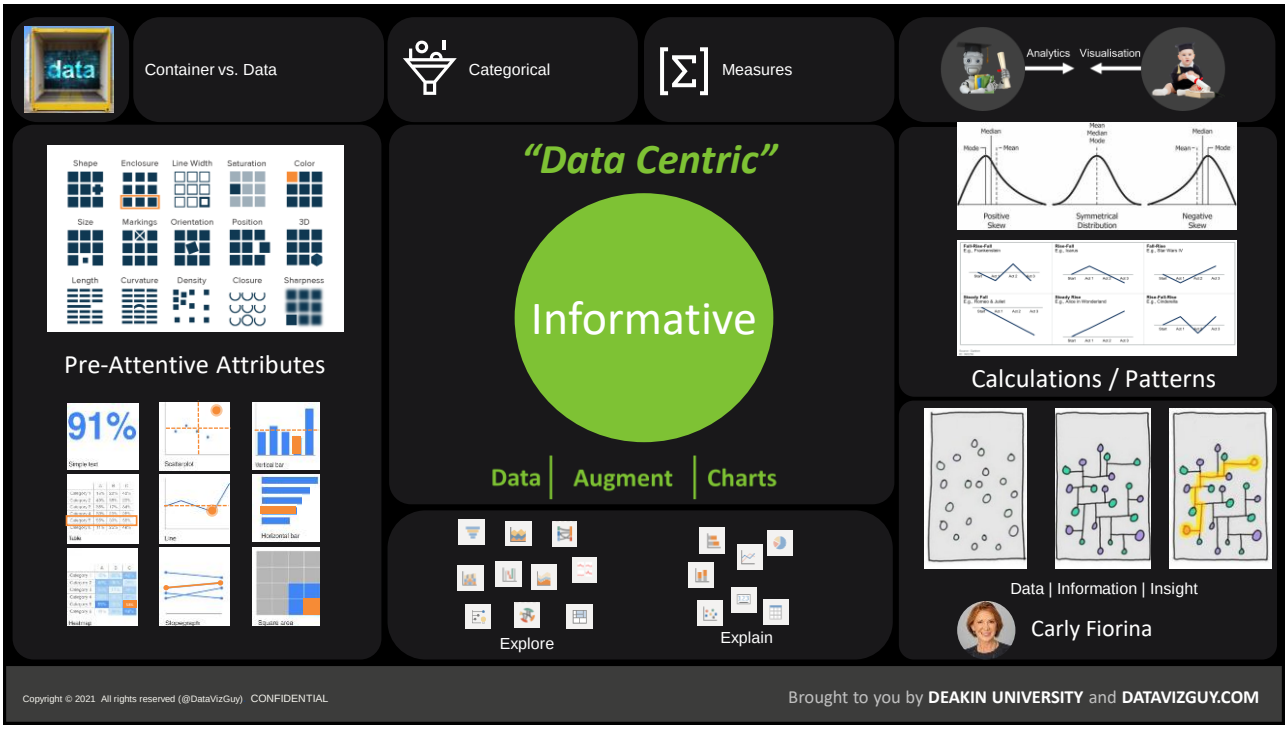
data
Container vs. Data
Categorical
[Σ] Measures
Analytics
Visualisation
Shape
Enclosure
Line Width
Saturation
Color
Size
Markings
Orientation
Position
3D
Length
Curvature
Density
Closure
Sharpness
Pre-Attentive Attributes
"Data Centric"
Informative
Data | Augment | Charts
Median
Mean
Mode
Positive Skew
Symmetrical Distribution
Negative Skew
Calculations / Patterns
91%
Explore
Explain
Data | Information | Insight
Carly Fiorina
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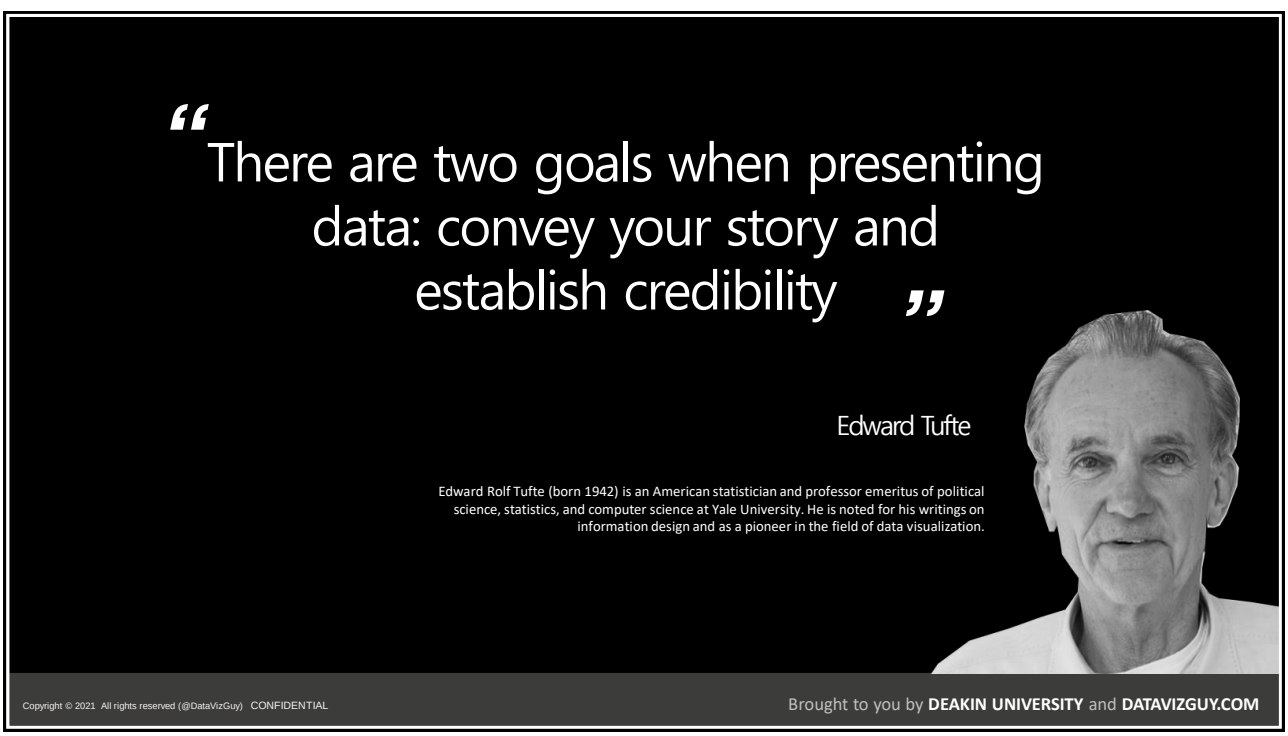
7


"There are two goals when presenting data: convey your story and establish credibility"
Edward Tufte
Edward Rolf Tufte (born 1942) is an American statistician and professor emeritus of political science, statistics, and computer science at Yale University. He is noted for his writings on information design and as a pioneer in the field of data visualization.
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#SIDEBAR

## Simplified Checklist

### Do's

- ❑ Always start by defining your audience
- ❑ Understand how your data will be used to help your audience
- ❑ Think first about what you are communicating…
- ❑ Then select a chart charts (consider explain vs. explore)
- ❑ Try to show All the data (show patterns)
- ❑ High-light the exceptions and groups
- ❑ Use Axis starting at Zero
- ❑ Use sorting on Bar Charts (ranking)
- ❑ Use Labels on Data (place the legends as close to data as possible)

### Don'ts

- ❑ Don't forget the goal and the story (what are you trying to explain)
- ❑ Don't use charts with no purpose
- ❑ Try to avoid complex charts (but do experiment)
- ❑ Don't overuse Pie Charts (but they can be useful)
- ❑ Use 3D (avoid)
- ❑ Don't use Stacked Bar Charts (avoid)
- ❑ Overuse of color, instead use color to high-light (be careful of color blindness)
- ❑ Logarithmic Axis (avoid)
- ❑ Don't forget to confirm your data sources, and watch for systemic data bias

- ❑ **Don't always follow the rules**

*"Data Visualization Is Equal Parts Data Art And Data Science"*

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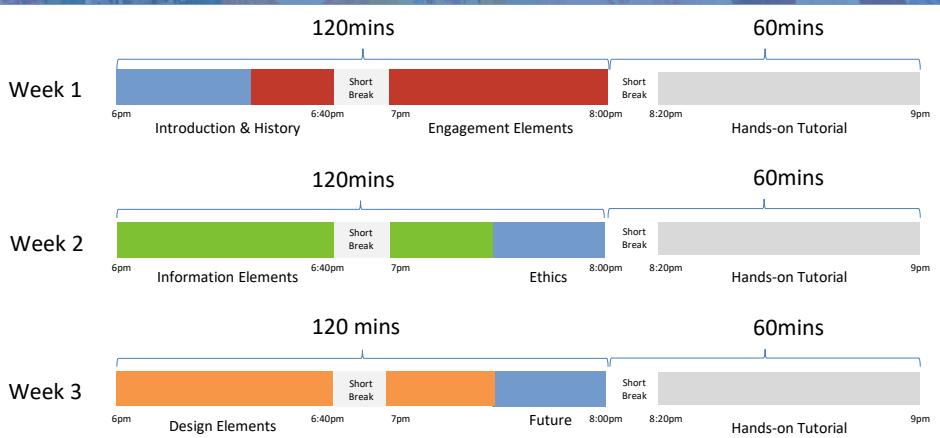
## MIS771 – Data Visualisation Module
## Descriptive Analytics and Visualisation




**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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Engaging

Audience Centric

"The two most engaging powers of an author are to make new things familiar, familiar things new"

**William Makepeace Thackeray**

Informative

Data Centric

"Data is a precious thing and will last longer than the systems themselves"

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Designed

Experience Centric

"It's not just what it looks like and feels like. Design is how it works."

**Steve Jobs**

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*"Experience Centric"*

**Unity | Variety | Hierarchy**

*"People often make the mistake of thinking design is what it looks like… Design is not decoration"*

Designed

*"Design is not just what it looks like and feels like…*

*Design is how something works."*

Steve Jobs

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# Make-over Game…..

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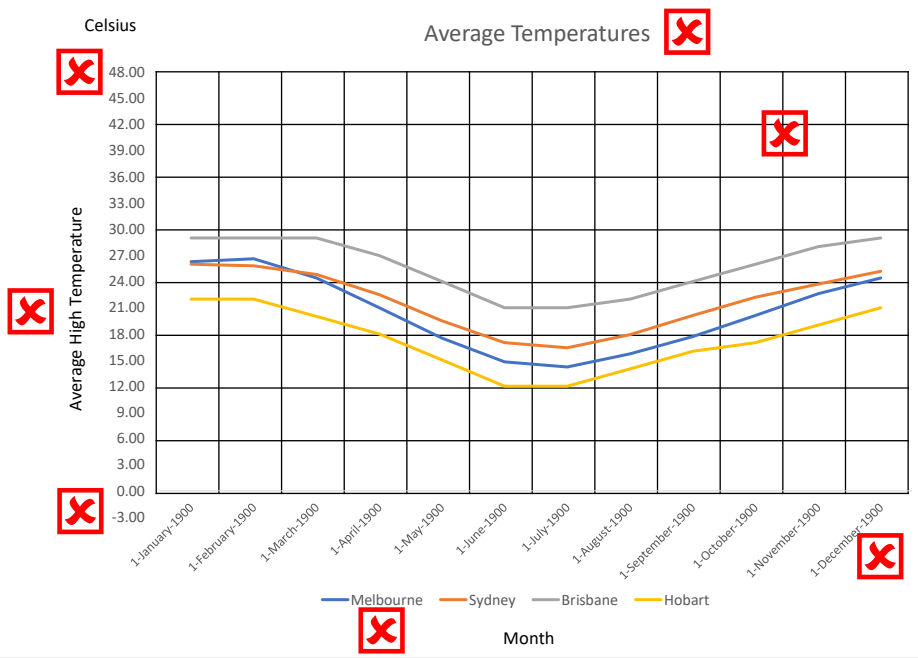


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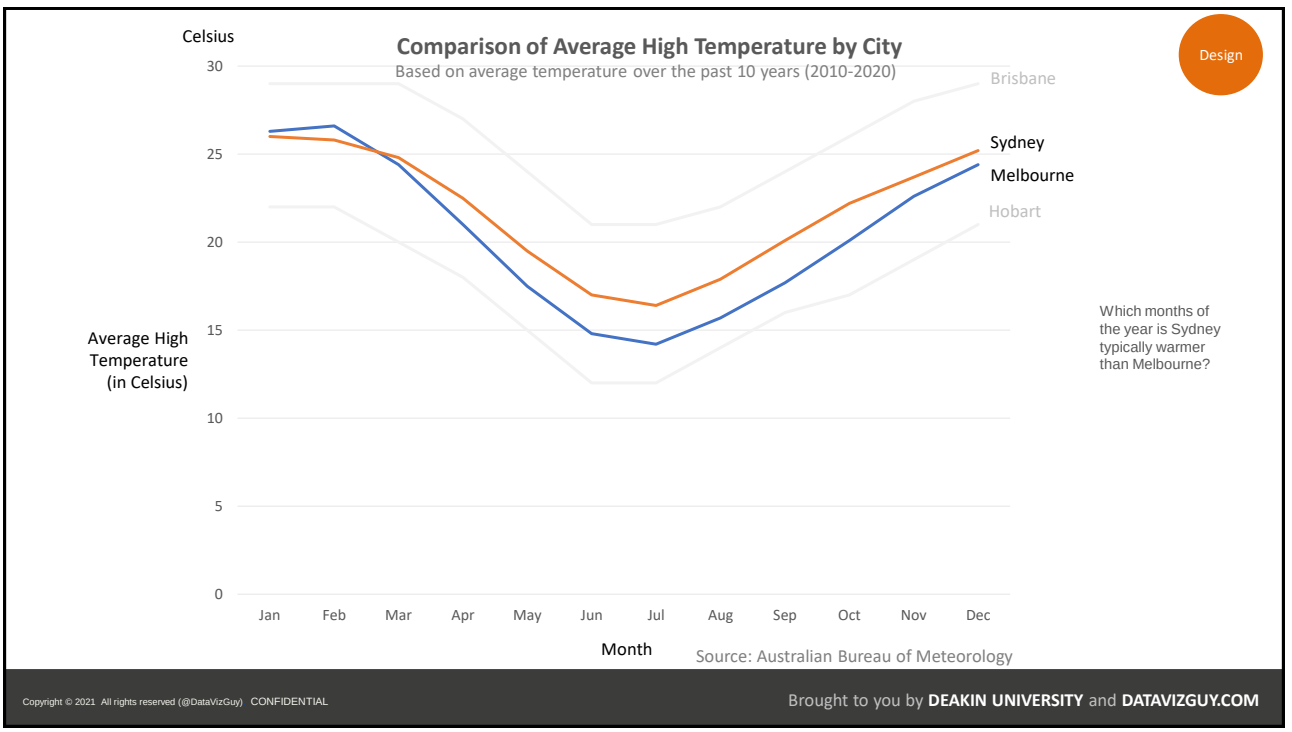
Celsius
Comparison of Average High Temperature by City
Based on average temperature over the past 10 years (2010-2020)
Design
Brisbane
Sydney
Melbourne
Hobart
Average High Temperature (in Celsius)
30
25
20
15
10
5
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month
Which months of the year is Sydney typically warmer than Melbourne?
Source: Australian Bureau of Meteorology
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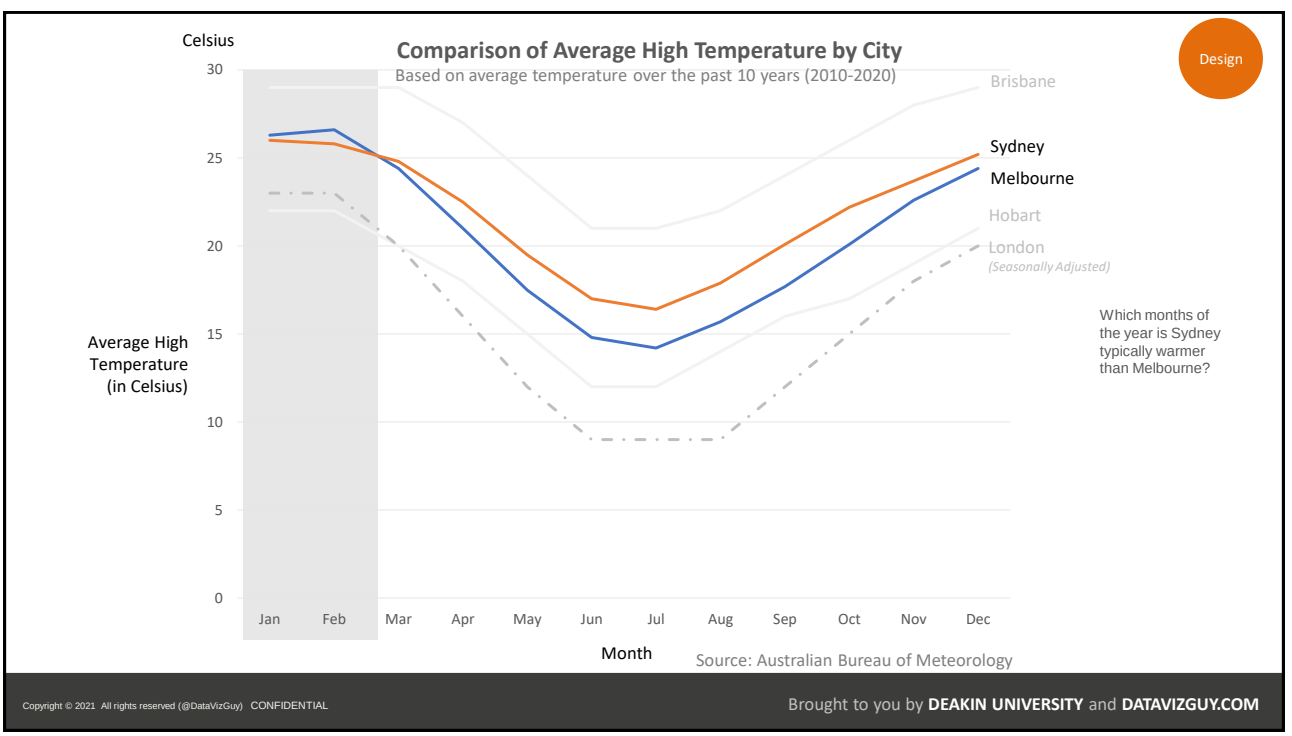
Celsius
Comparison of Average High Temperature by City
Based on average temperature over the past 10 years (2010-2020)
Design
Brisbane
Sydney
Melbourne
Hobart
London
(Seasonally Adjusted)
Average High Temperature (in Celsius)
30
25
20
15
10
5
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month
Which months of the year is Sydney typically warmer than Melbourne?
Source: Australian Bureau of Meteorology
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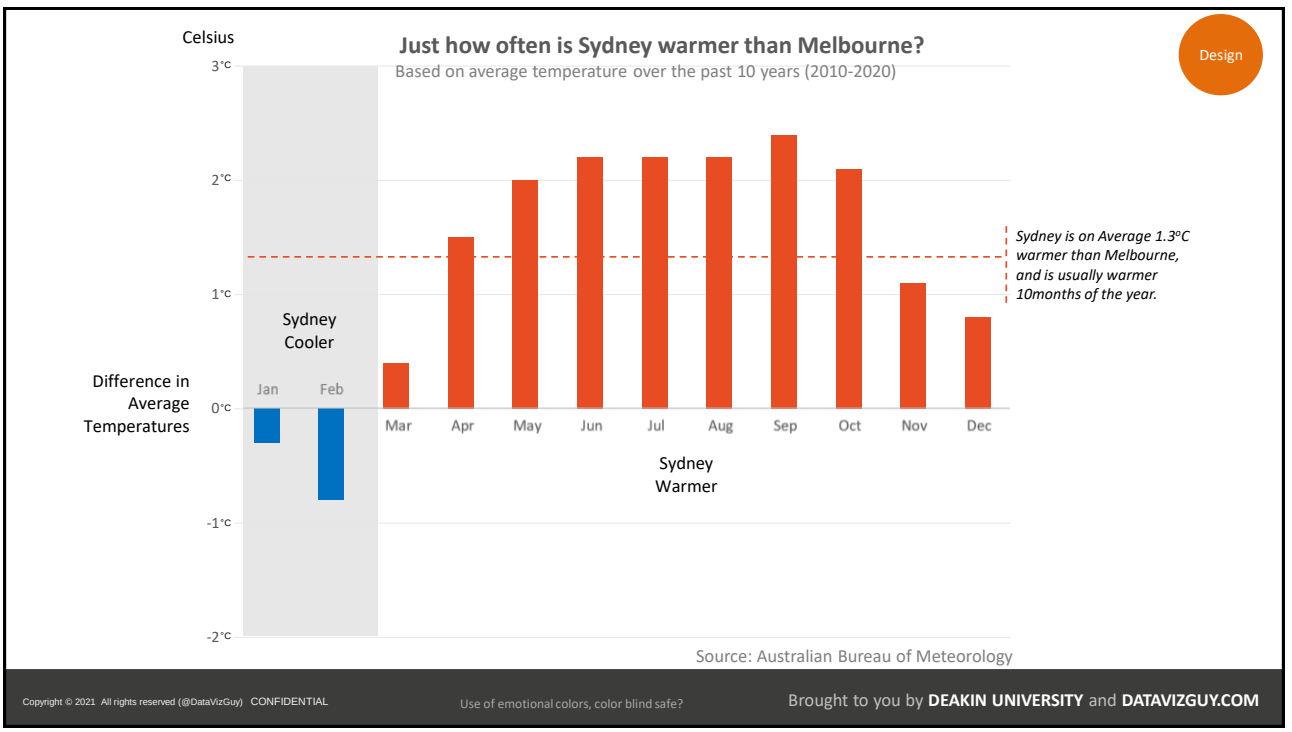


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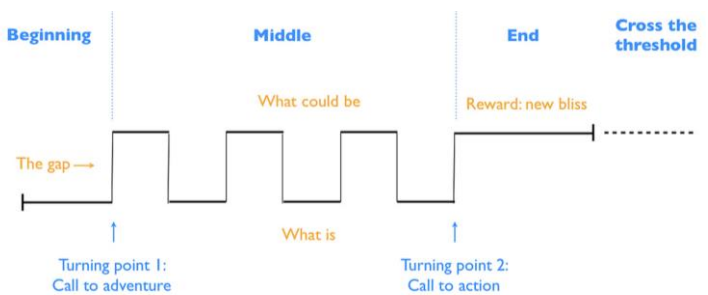
#SIDEBAR

## Provide a Meaningful Heading

*"Start with the End in Mind"*

Stephen R. Covey, The 7 Habits of Highly Effective People




Hint: Try and make the heading relate to the **Business Objective** (and not a Technical description)

Begin the story with details of importance to the reader, while postponing more essential points or facts to answer the key questions/insights.

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Resource: https://sumo.com/stories/headline-formulas

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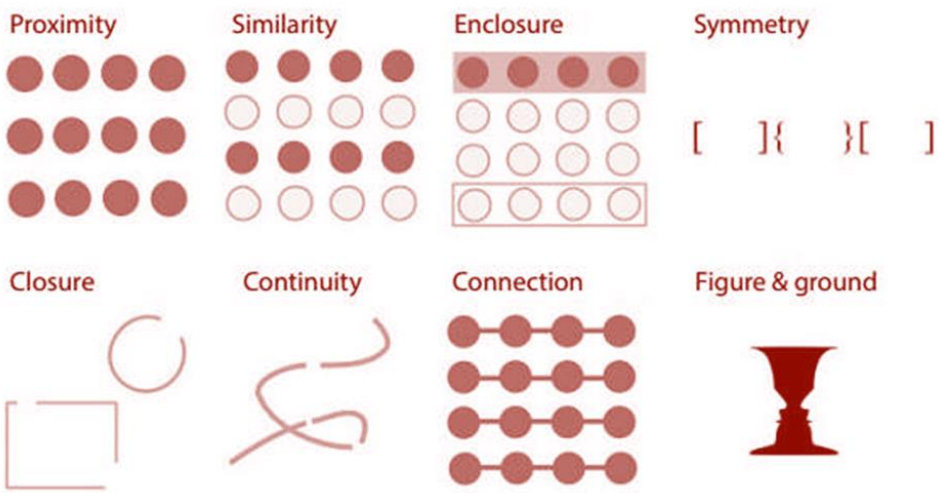
# Design Gestalt Principles (Unity)

Design

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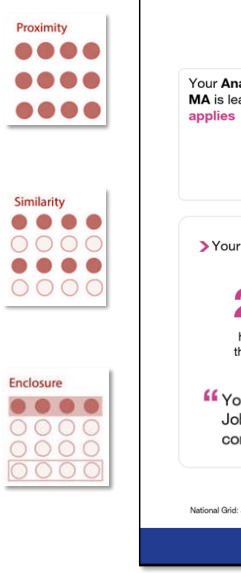



**Your apply per job performance in Massachusetts is performing 90% below the industry standard**

Your **Analyst role** in **MA** is leading with **8 applies**

Your **Data Analyst, Gas Mat & Standards** in **NY** is leading with **30 applies**

Your **Senior Analyst, Financial Services roles in MA** received **98% lower applies per job** than the industry average

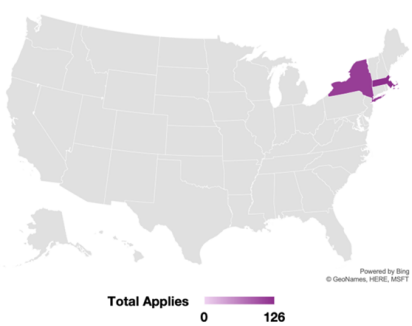
Your **analyst roles** in New York are only reaching **1% of the market**

**25%** higher CTR than industry average

**80%** less apply starts than industry average

**32%** higher CPA than industry average

"Your Analyst jobs in New York are generating interest from Job seekers, but are underperforming with applies compared to the industry average"




National Grid: January 1 – October 31, 2019

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20

# Use Color to Unify and/or High-light

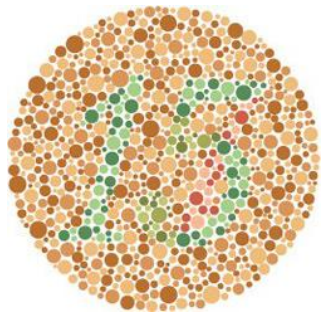
Design

Luminance — can show magnitude

Saturation — can show magnitude (measure)

Hue — can show identity / emotion (categorical)

| Sequential | Divergent | Qualitative |
|---|---|---|
| #fef0d9 | #7b3294 | #a6cee3 |
| #fdcc8a | #c2a5cf | #1f78b4 |
| #fc8d59 | #f7f7f7 | #b2df8a |
| #e34a33 | #a6dba0 | #33a02c |
| #b30000 | #008837 | #fb9a99 |



Remember: About 8% of all men are suffering from color blindness.

Color Brewer

Hint: Photo-copy or Print in B&W to validate use of Color

*Tip: Use Orange (Bad) and Blue (Good) instead or Red and Green to avoid emotional reactions.*

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21

# Use Color to Unify and/or High-light

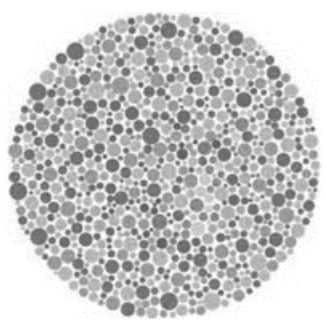
Design

Luminance — can show magnitude

Saturation — can show magnitude (measure)

Hue — can show identity / emotion (categorical)

| Sequential | Divergent | Qualitative |
|---|---|---|
| #fef0d9 | #7b3294 | #a6cee3 |
| #fdcc8a | #c2a5cf | #1f78b4 |
| #fc8d59 | #f7f7f7 | #b2df8a |
| #e34a33 | #a6dba0 | #33a02c |
| #b30000 | #008837 | #fb9a99 |



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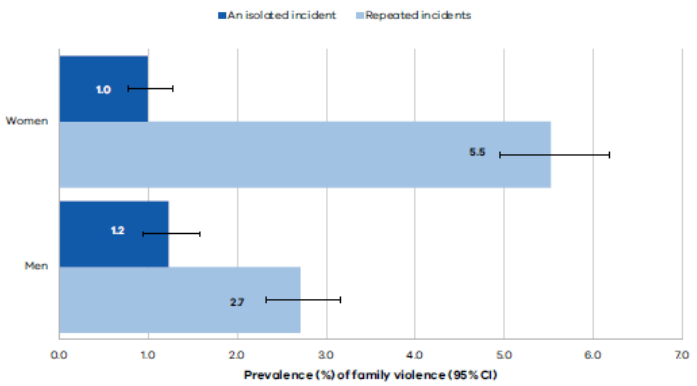
#SIDEBAR

Design

Figure 4: Prevalence of family violence in men and women stratified by frequency of occurrence, Victoria, 2017




Hint: Design is about reducing the Cognitive Load

Source: Family-violence-in-Victoria - November 2020

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## Fonts can also Reduce Cognitive Effort

Design

Before

After

Use FoNts consistently and limit the number of fonts

2017 - Faye Dunaway and Warren Beatty presented Best Picture (vs. Emma Stone)

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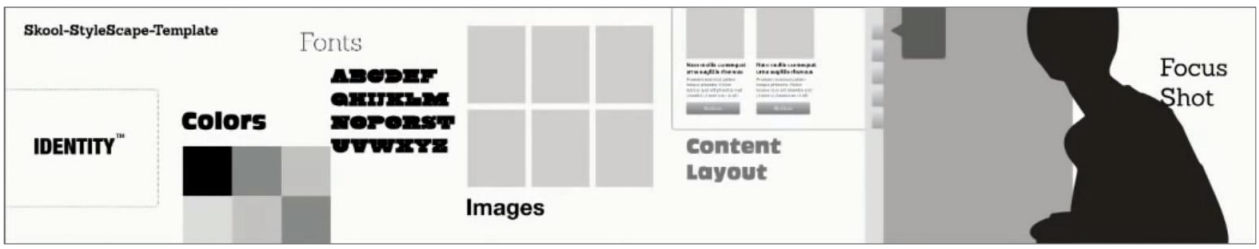
# Data Visualisation StyleScape




thefutur Source: https://thefutur.com/

***Sample Only***

Example: https://github.com/amycesal/dataviz-style-guide/blob/master/Sunlight-StyleGuide-DataViz.pdf

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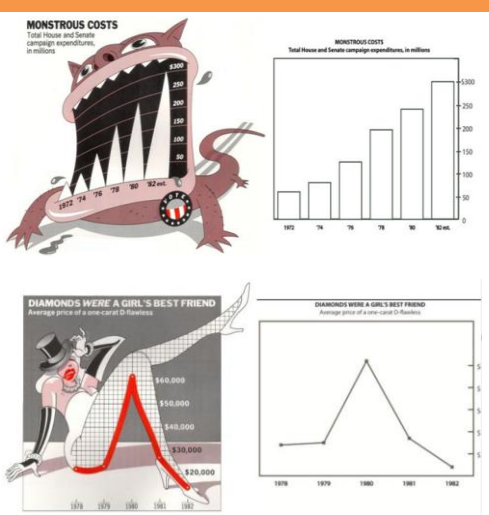
## Michelle Borkin

Michelle Borkin is currently a graduate student in Applied Physics at the Harvard School of Engineering and Applied Sciences (SEAS), working with Prof. Hanspeter Pfister and his Visual Computing Group on data visualization.

## Variety

Humanise




### Visually Memorable

http://cvcl.mit.edu/papers/Borkin_etal_MemorableVisualization_TVCG2013.pdf

**Useful Junk?** The Effects of Visual Embellishment on Comprehension and Memorability of Charts By Scott Bateman, Regan L. Mandryk, Carl Gutwin, Aaron Genest, David McDine, Christopher Brooks at the Department of Computer Science, University of Saskatchewan, Saskatoon, Saskatchewan, Canada

http://hci.usask.ca/uploads/173-pap0297-bateman.pdf

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## Visually Memorable -Shapes, Glyphs, Sprites

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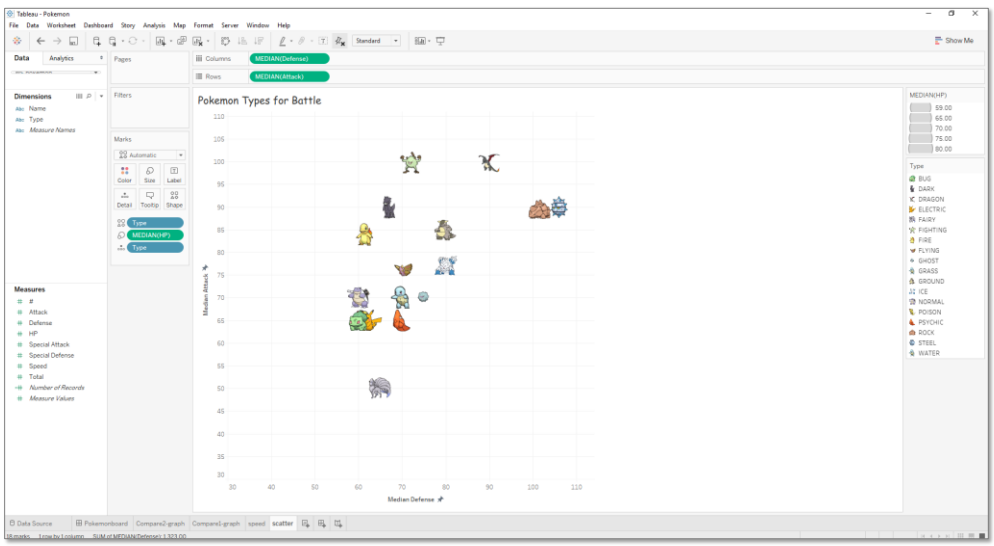
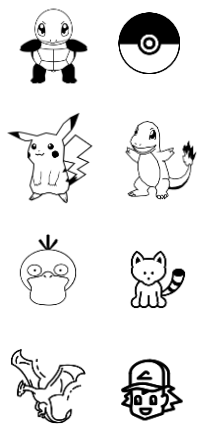



**Fun Icons**



Source: https://public.tableau.com/profile/mahesh.ramkumar#!/vizhome/Pokemon_66/Pokemonboard

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## Visually Memorable -Shapes, Glyphs, Sprites

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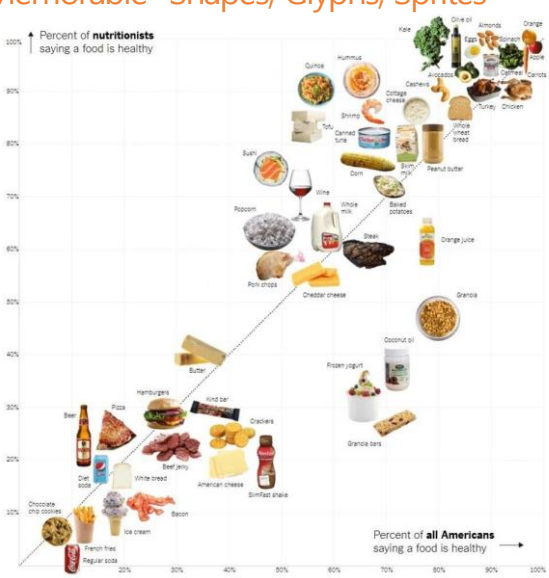


**Fun Icons**

Source https://www.nytimes.com/interactive/2016/07/05/upshot/is-sushi-healthy-what-about-granola-where-americans-and-nutritionists-disagree.html

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# Meaningful Variety (Reduce clutter by having a Focus)

Design

1. MOMENT-TO-MOMENT

2. ACTION-TO-ACTION

3. SUBJECT-TO-SUBJECT

4. SCENE-TO-SCENE

5. ASPECT-TO-ASPECT

6. NON-SEQUITUR

**Scott McCloud – Book: Understanding Comics**

Scott McCloud (born Scott McLeod on June 10, 1960) is an American cartoonist and comics theorist. He is best known for his non-fiction books about comics: Understanding Comics (1993), Reinventing Comics (2000), and Making Comics (2006), all of which also use the medium of comics.

*How to Introduce Variety*

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Introduce controlled/Logical variety



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# Real Estate Game…..

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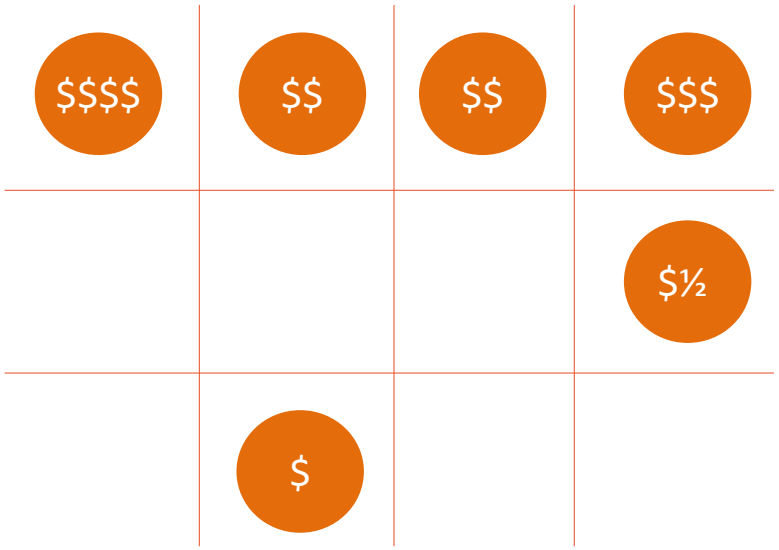
Design

Use a grid to allocate space on the page




*"The three most important things when Buying Real-estate are **Location, Location, Location**" - Unknown*

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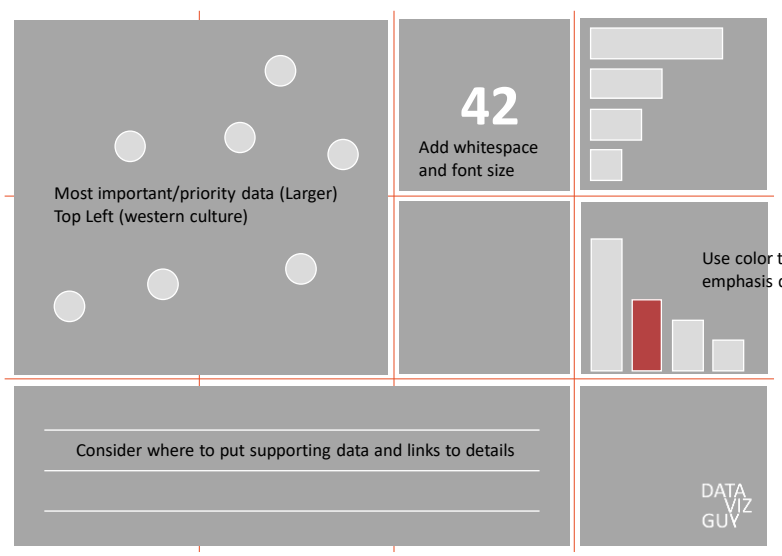
Design

Use a grid to allocate space on the page




*"When everything has emphasis, **nothing does**" - Unknown*

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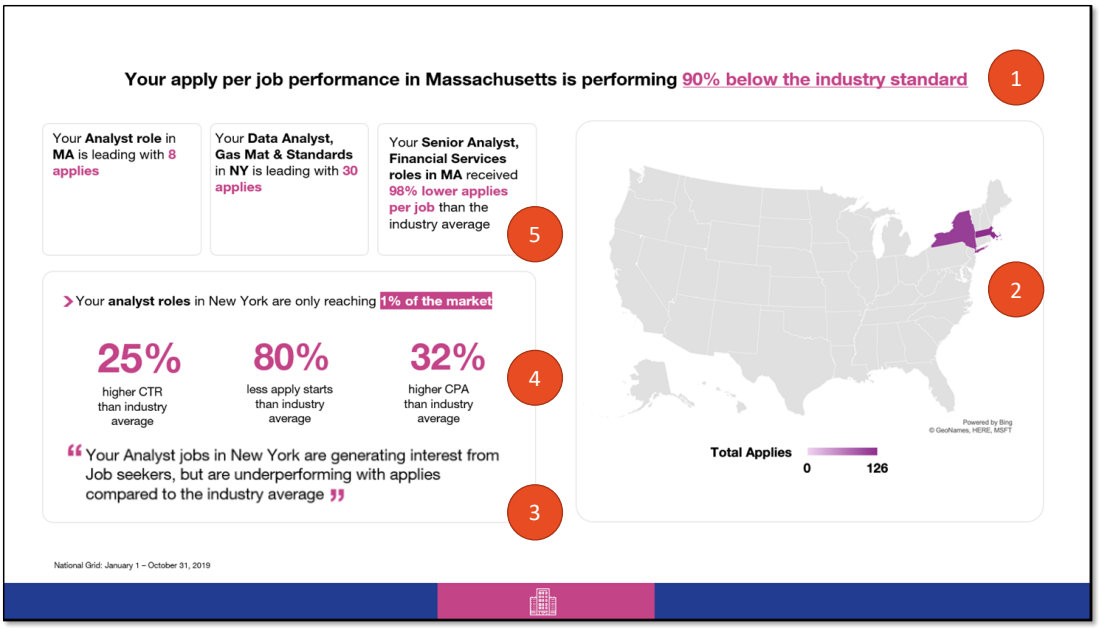


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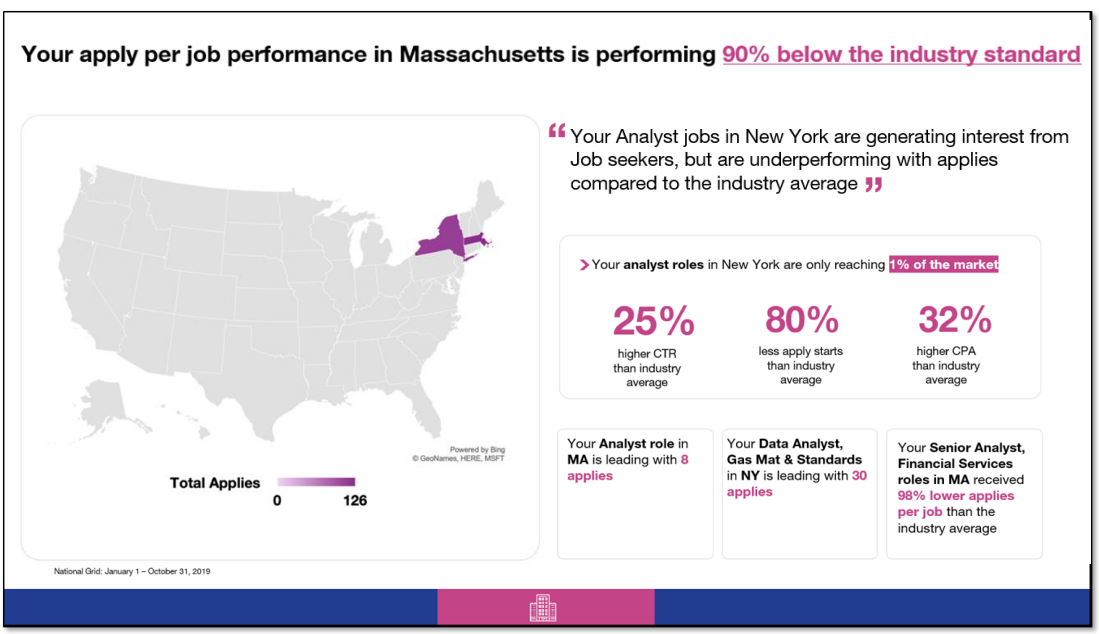


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# Consider the Canvas Size (designing for other Form factors)

Design

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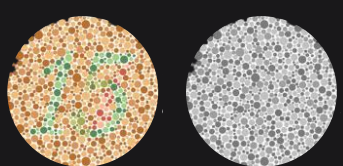
*"Design is not just what it looks like and feels like... Design is how something works."*

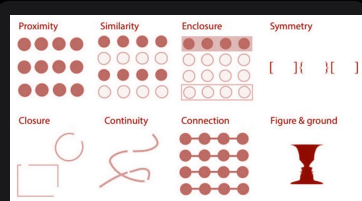


Accessibility

## "Experience Centric"

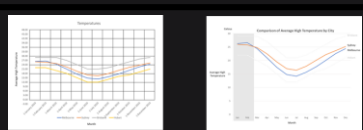
Designed

Unity | Variety | Hierarchy




Design Gestalt Principles

*"When everything has emphasis, **nothing does**"*



Audience should drive Design

Consider New Form-factors

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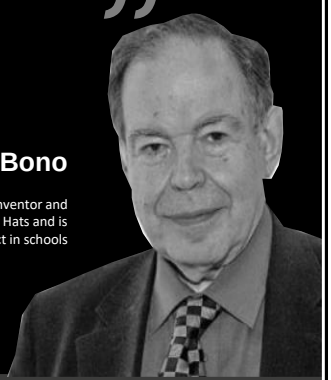
> “It is better to have enough ideas for some of them to be wrong, than to be always right by having no ideas at all”



**Edward de Bono**

Edward de Bono (born 19 May 1933) is a Maltese physician, author, inventor and consultant. He originated the term lateral thinking, wrote the book Six Thinking Hats and is a proponent of the deliberate teaching of thinking as a subject in schools

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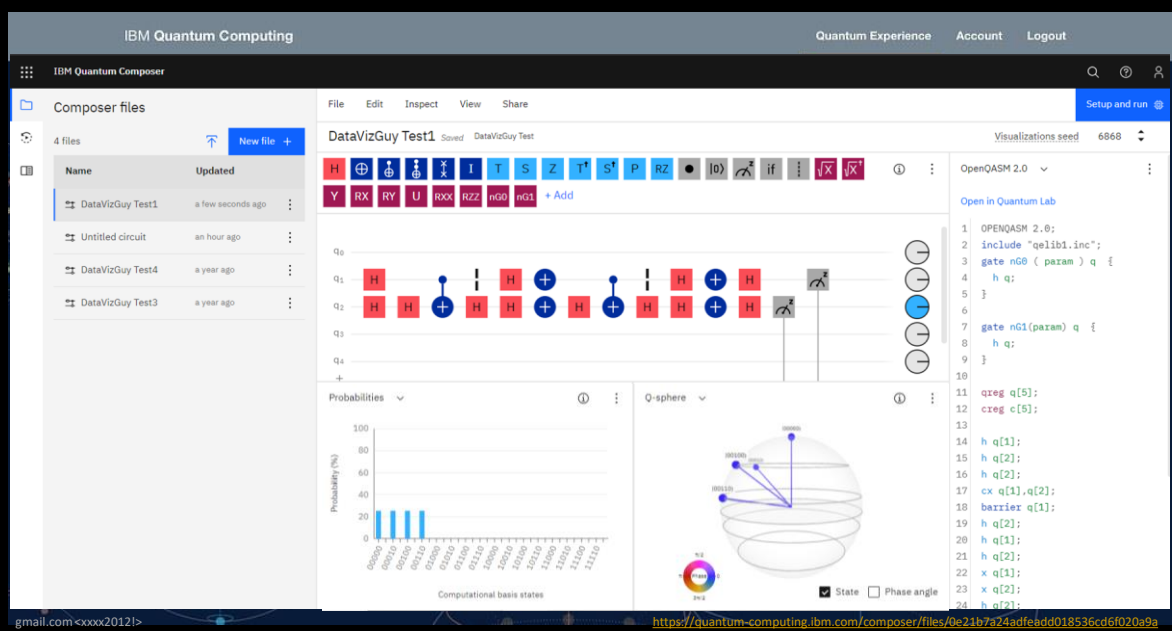



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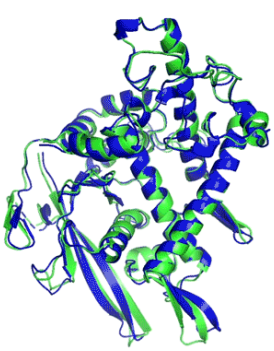
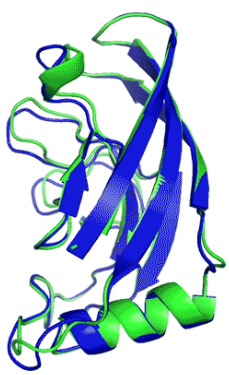
DeepMind

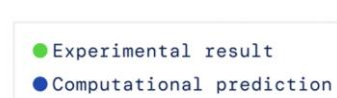
# AlphaFold 2



**T1037 / 6vr4**
90.7 GDT
(RNA polymerase domain)



**T1049 / 6y4f**
93.3 GDT
(adhesin tip)





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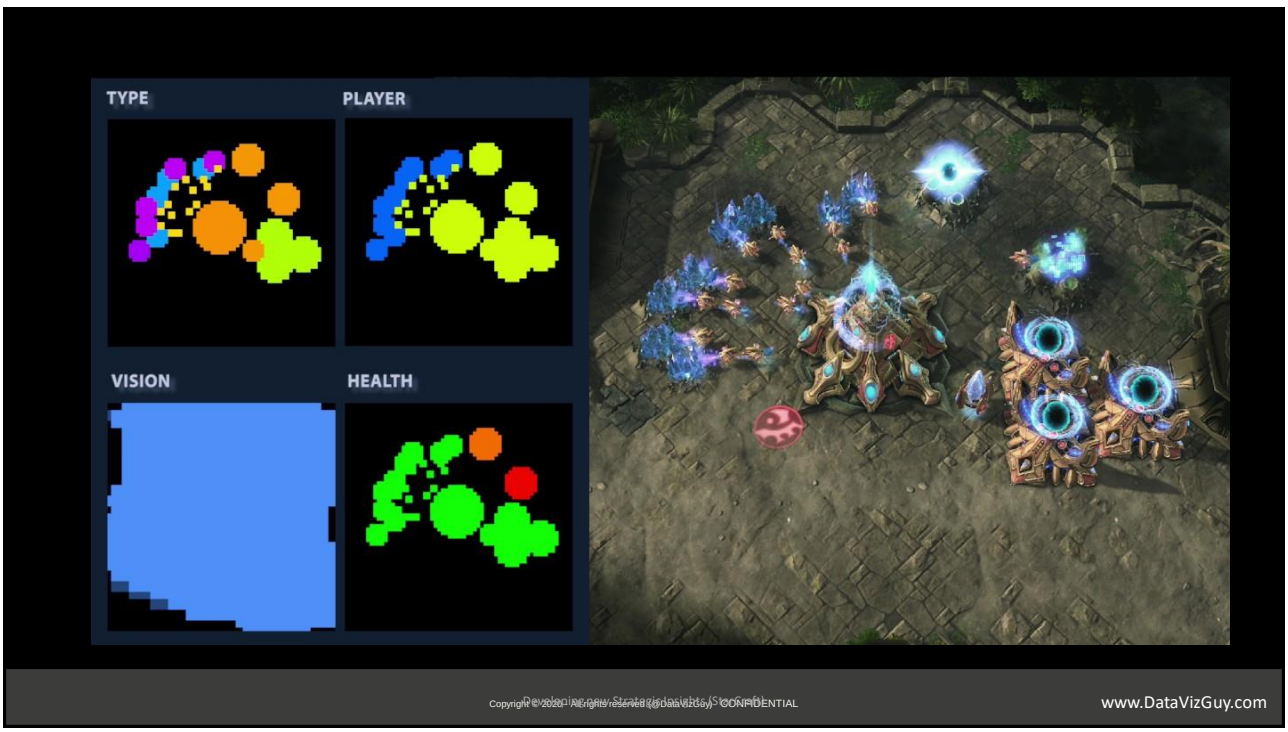


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Collaboration Exercise with basic interfaces.

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## Augmented Reality…

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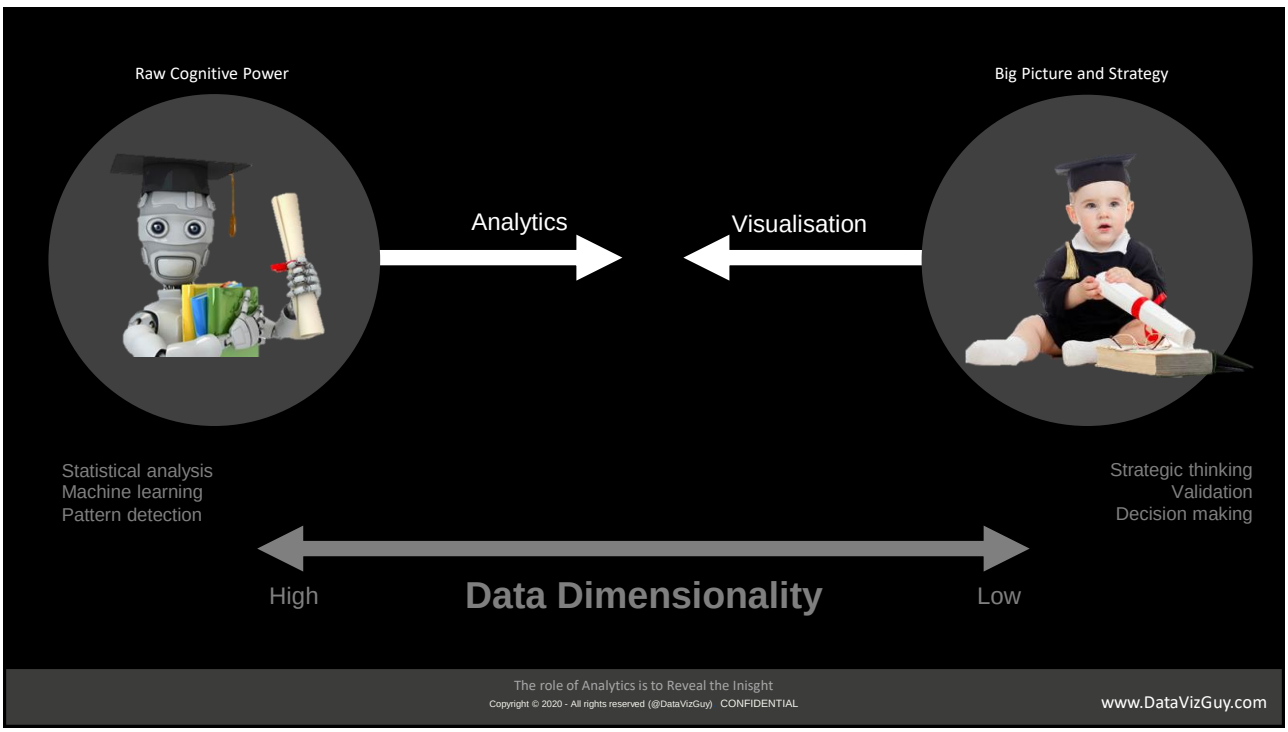
Raw Cognitive Power
Big Picture and Strategy
Analytics
Visualisation
Statistical analysis
Machine learning
Pattern detection
Strategic thinking
Validation
Decision making
High
Data Dimensionality
Low
The role of Analytics is to Reveal the Inisght
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What goes into a great wine: Ingredients for success: Knowledge, Practice, natural Aptitude (talent)
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Engaging

Audience Centric

"The two most engaging powers of an author are to make new things familiar, familiar things new"

**William Makepeace Thackeray**

Informative

Data Centric

"Data is a precious thing and will last longer than the systems themselves"

**Tim Berners-Lee**

Designed

Experience Centric

"It's not just what it looks like and feels like. Design is how it works."

**Steve Jobs**

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Storytelling

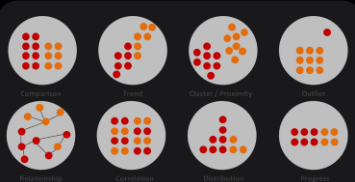
Time / Place (Context)

Characters (Focus)

Events / Insights (Evidence)

So What !!! (Conclusion)

Find Yourself



Insight Patterns vs. Charts

Cole Nussbaumer

"Audience Centric"

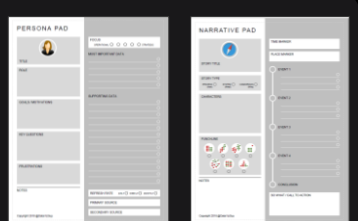
Engaging

Story | Navigation | Motivate

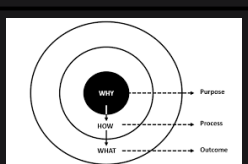
Narrative Spectrum

Undefined — Fixed

Discovery | Decision Support | Motivate / Learning




Persona Narrative




Descriptive | Diagnostics | Predictive | Prescriptive

Simon Sinek

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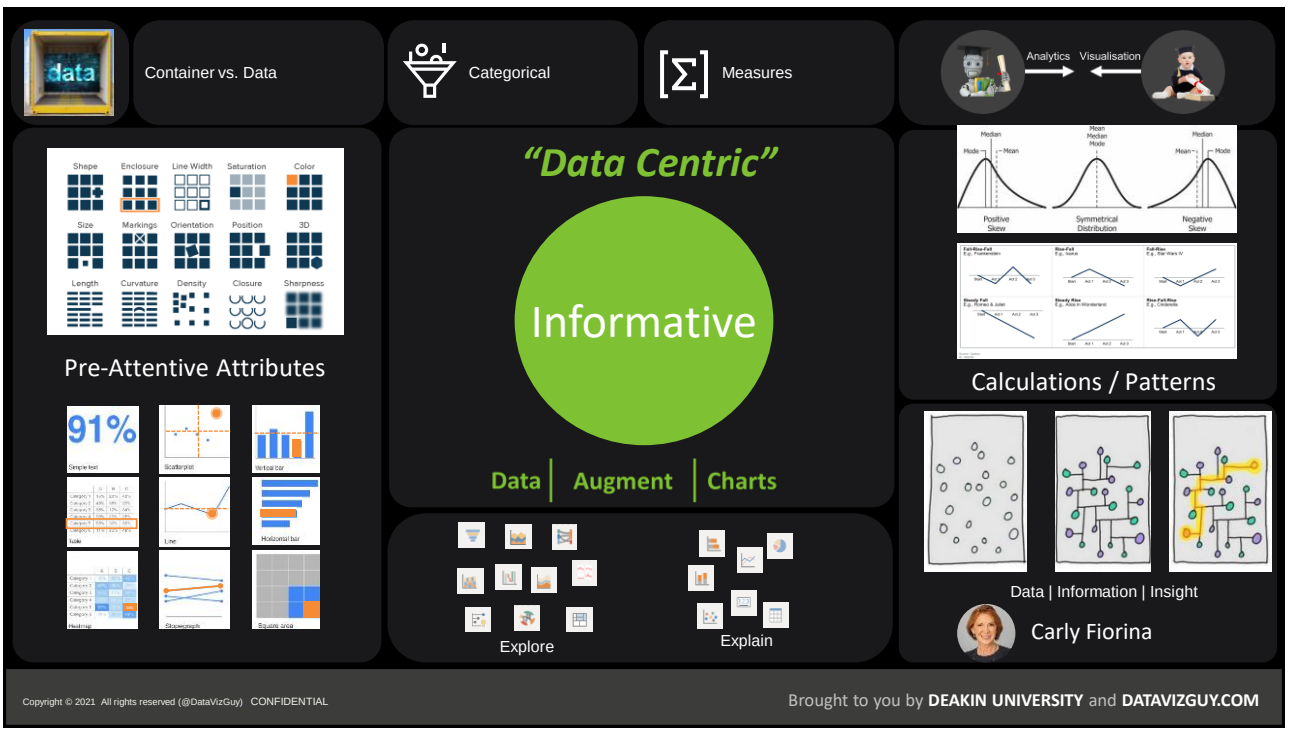
Container vs. Data
Categorical
Measures
Analytics
Visualisation
"Data Centric"
Informative
Data | Augment | Charts
Pre-Attentive Attributes
Calculations / Patterns
Explore
Explain
Data | Information | Insight
Carly Fiorina
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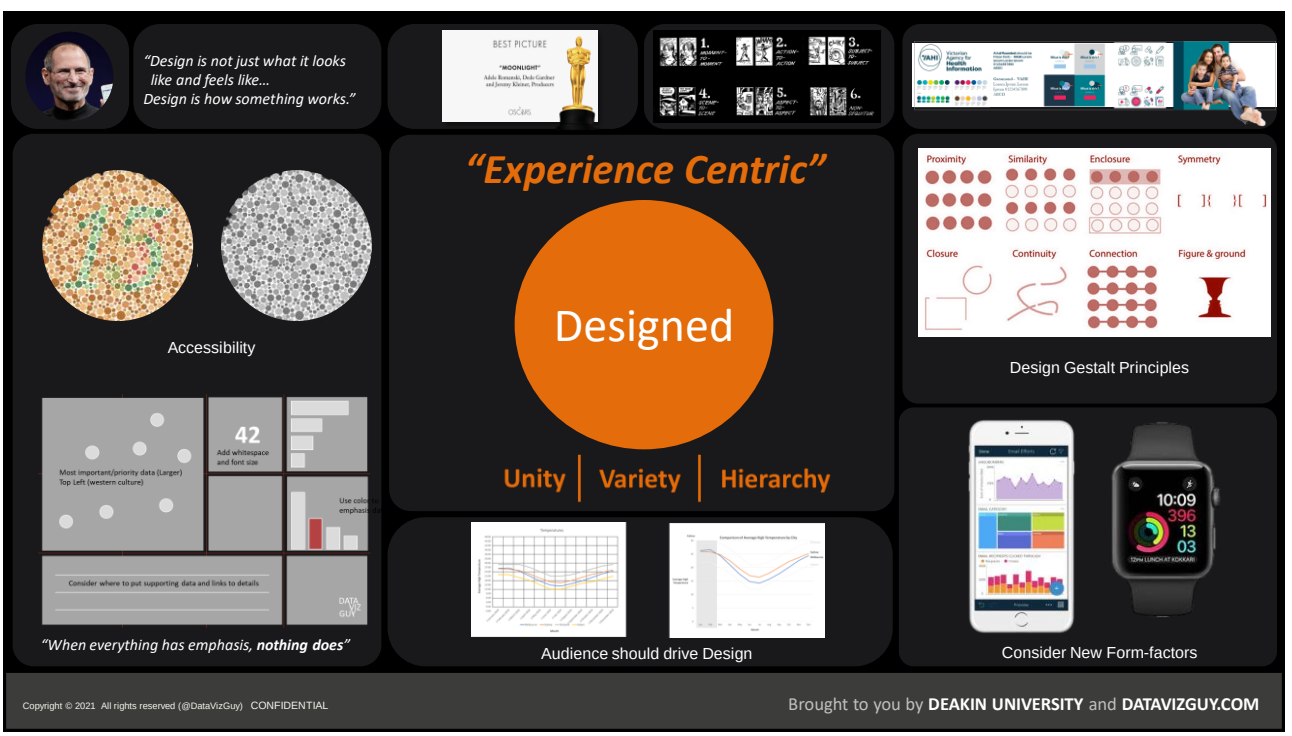
"Design is not just what it looks like and feels like... Design is how something works."
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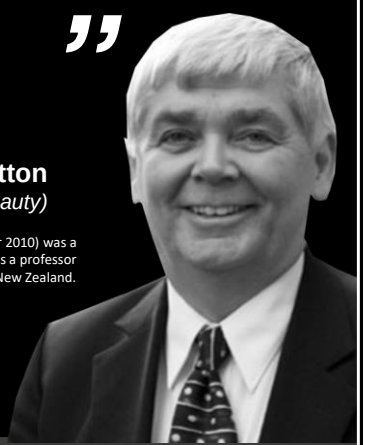
"Ultimately we find beauty in something done well..."



**Denis Dutton**
*(A Darwinian theory of beauty)*

Denis Laurence Dutton (9 February 1944 – 28 December 2010) was a philosopher of art, web entrepreneur and media activist. He was a professor of philosophy at the University of Canterbury in Christchurch, New Zealand.

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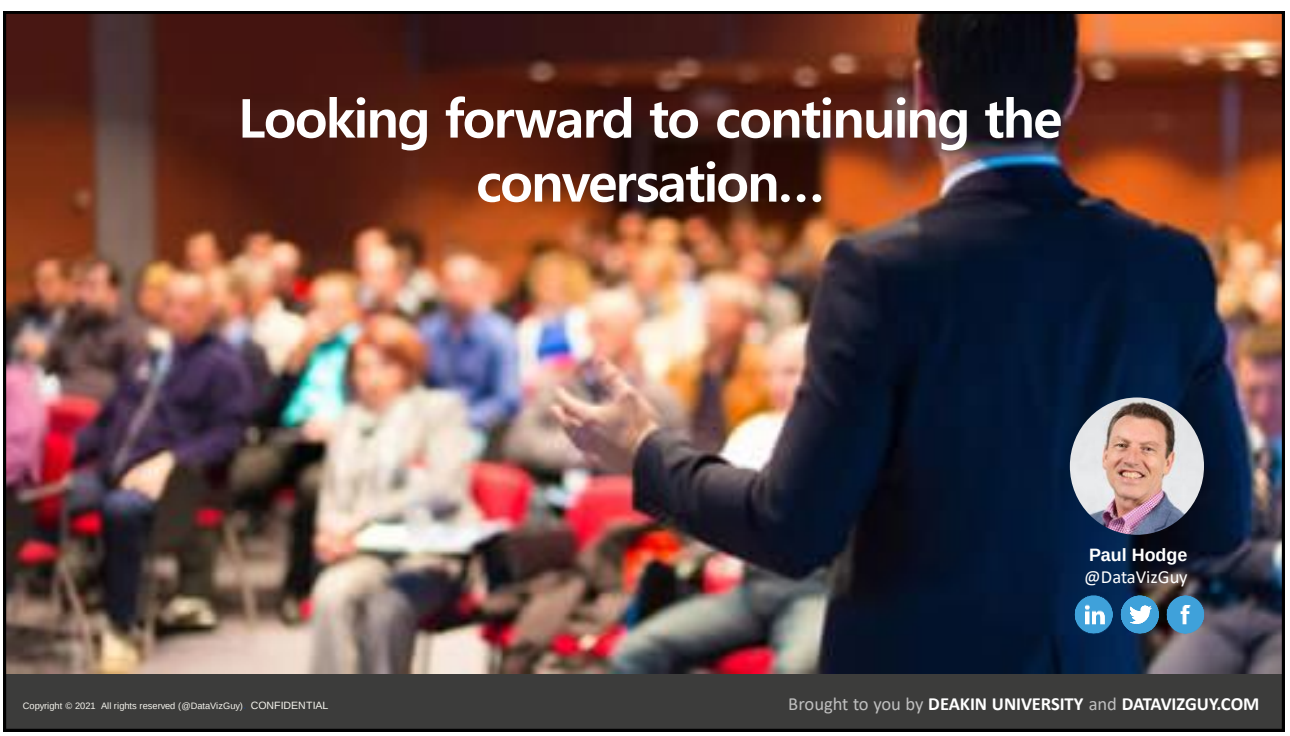


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# MIS771 – Data Visualisation Final Assignment

* 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 (eg. 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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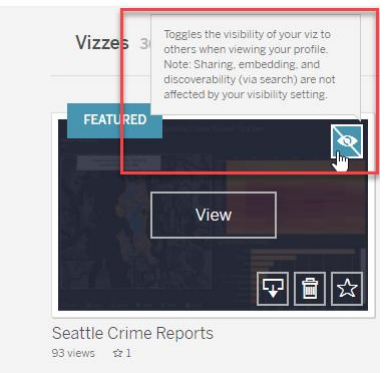
## Tutorial

DEAKIN UNIVERSITY AUSTRALIA Worldly

*"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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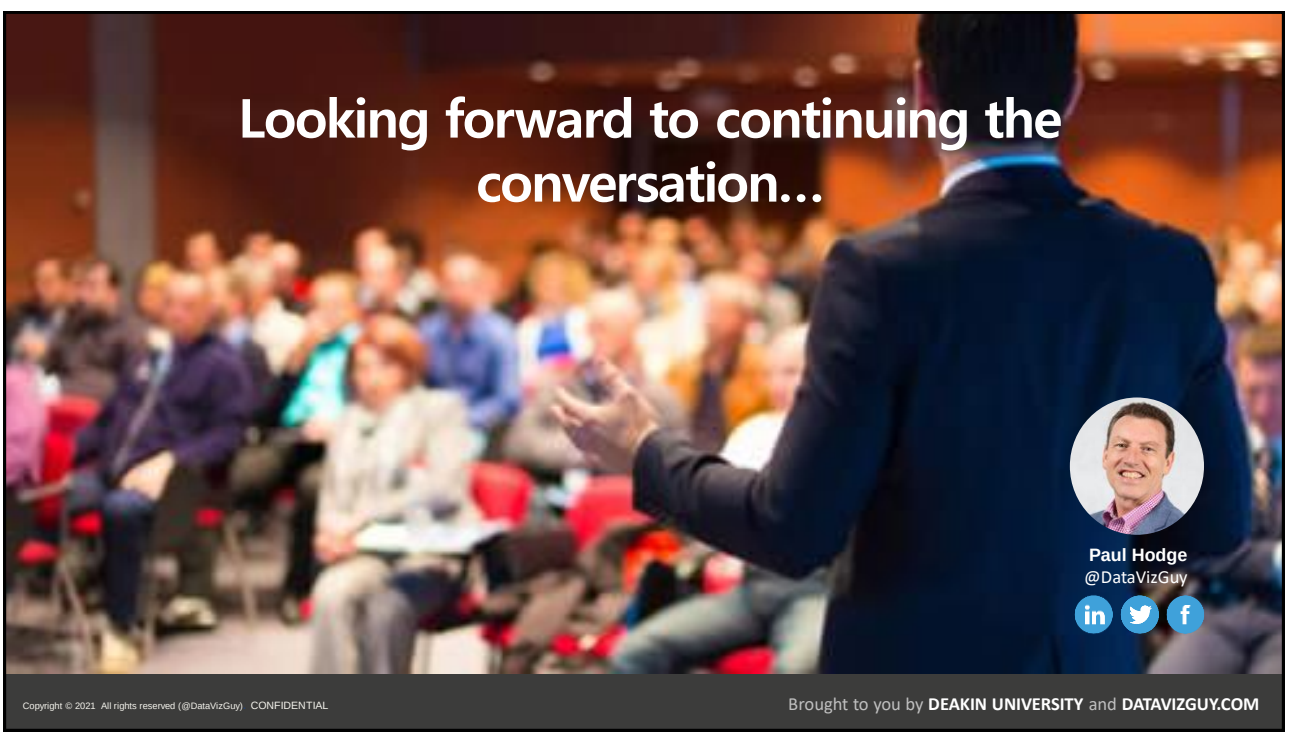


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