# Communicating with Data



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Professor of Management and Corporate Communication

OCTOBER 23, 2024



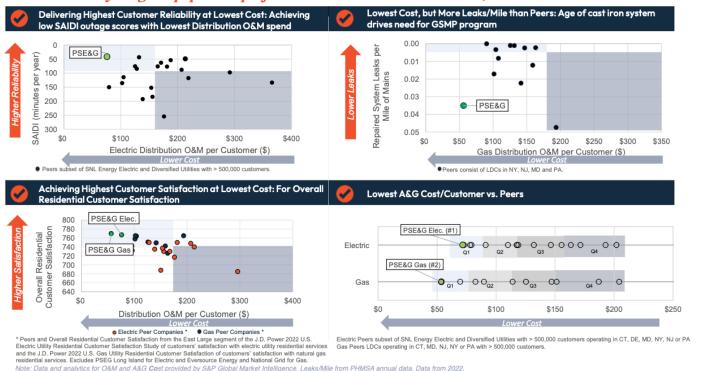




PSEG Investor Update September 2024

#### PSEG Provides Compelling Value for Our Customers

We continuously target top quartile performance to deliver better service, at lower cost



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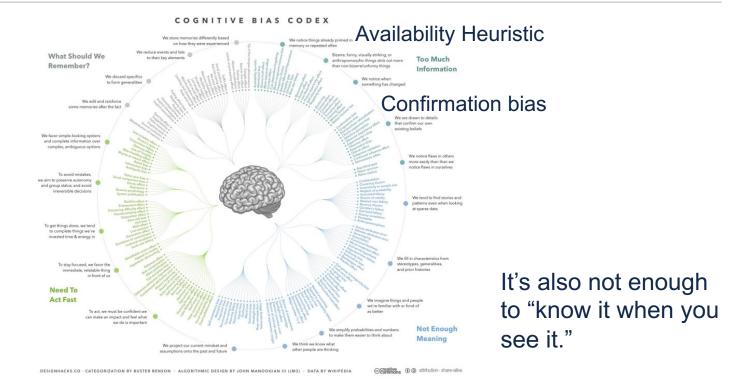
"The biggest communication problem [related to data] is empathy. We don't always know how to assemble and construct information that the other person can receive, process quickly, and be decisive on."

~Nancy Duarte, November 12, 2019

#### Session Objectives

- Understand how people process and remember things
- Identify common pitfalls that plague data-driven presentations
- Learn frameworks to help you design effective and attractive data visualizations
  - CARS
  - BLADE
- Learn strategies to bolster audience understanding and recall

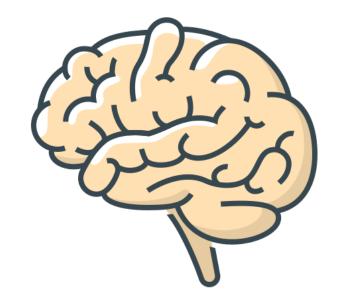
### It's NOT safe to assume that a graph "speaks for itself" or that a reader will interpret the graph in the way we intend



### Understanding how people process and remember things allows us to design better visuals

#### System 1

- Continuously Scans the environment
- Fast, but error-prone
- Automatic via shortcuts, impulses, and intuition

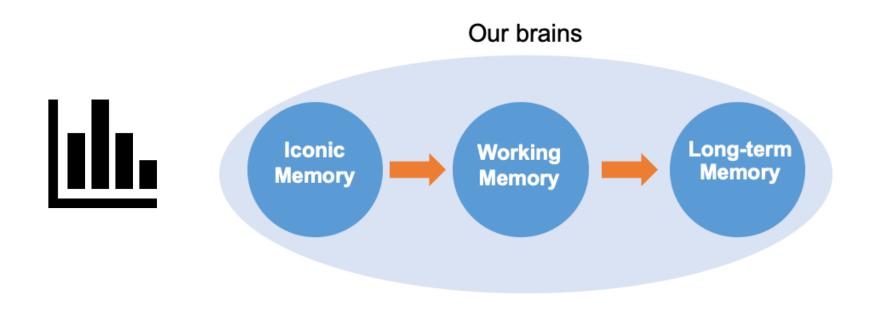


#### System 2

- Used for specific problems, only if necessary
- reason, solve complex problems, exercise self-control
- Slow, but reliable

Related: Kahneman (2013). Thinking Fast, Thinking Slow

#### Here's a quick overview of how our brains work



# Iconic memory is also called the visual sensory register

Extremely quick (~ 1 sec)

Responsible for rapid processing

Automatic and unconscious

**Preattentive Processing** 

System 1 Thinking

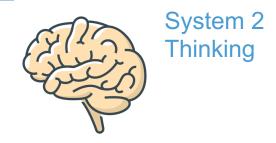


Preattentive Processing = System 1 thinking

### Working memory pulls information into meaningful chunks

- Temporary
- Limited storage (only 3 to 4 chunks can be stored at any one time)

As things are processed, they're moved into long-term memory or forgotten.



# Our <u>long-term memory</u> allows us to recognize images and detect patterns

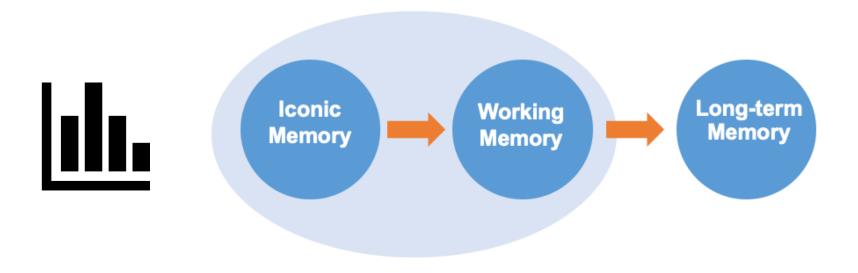
- Storage of information involves intricate network of links and cross-references
- Not very relevant for designing better visuals

Communication is critical for helping people remember and moving information into long-term memory.



System 2 Thinking

# We're going to focus on iconic memory and working memory



### How many times does the number 5 appear in the list?

987346871095639481610987324219406736352409871212198968 182736401928123775019761239824091518722098161098710986 639481610987364019281237518721098732421940098161098264 687109563948161981610987109567346871090632812377801976

### Did you guess seven?

987346871095639481610987324219406736352409871212198968 182736401928123775019761239824091518722098161098710986 639481610987364019281237518721098732421940098161098264 687109563948161981610987109567346871090632812377801976

Adjusting the intensity of the colors allowed number 5 to stand out. I activated a preattentive attribute.

#### Can you find the single 5 in this set?

Category	Attribute
Form	Length Width Orientation Shape Size Enclosure
Color	Hue Intensity
Spatial Position	2-D position

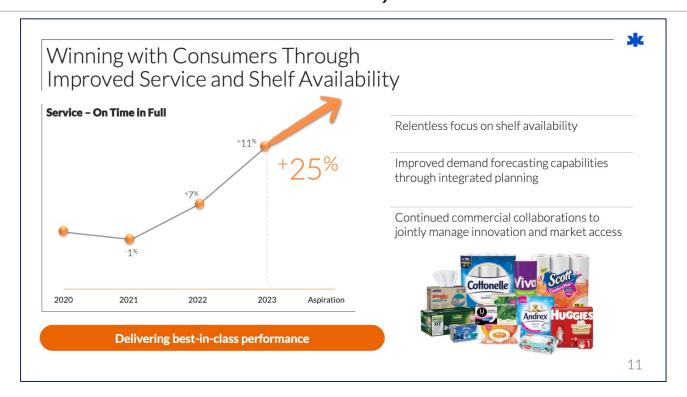
Category	Attribute	Examples
Form	Length Width Orientation Shape Size Enclosure	Length
Color	Hue Intensity	
Spatial Position	2-D position	

Category	Attribute	Examples		
Form	Length Width Orientation	Length	Width	Orientation
	Shape Size Enclosure	Shapes	Size • • • •	Enclosure
Color	Hue Intensity			
Spatial Position	2-D position			

Category	Attribute	Examples			
Form	Length Width Orientation	Length	Width		Orientation
	Shape Size Enclosure	Shapes	Size		Enclosure
Color	Hue Intensity	Hue • • • •		Intensity	
Spatial Position	2-D position		,		

Category	Attribute	Examples		
Shape Size		Length	Width	Orientation
	1	Shapes	Size • • • •	Enclosure
Color	Hue Intensity	Hue • • • •	Intensi	ty • • • • • • • • • • • • • • • • • • •
Spatial Position	2-D position	••••	•	

### Both color and size jump out on this slide (and draw the attention of the audience)



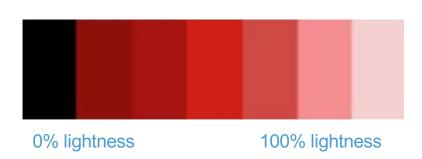
#### Let's focus on color

Category	Attribute	Examples						
Shape Size		Length	Width	Orientation				
	· ·	Shapes	Size • • • •	Enclosure				
Color	Hue Intensity	Hue • • • •	Intensity					
Spatial Position	2-D position	••••	·					

#### Color is made up of three separate attributes:

- <u>Hue</u> (the precise term for what we normally think of as color)
- Intensity
  - Saturation (measures the degree to which a color fully exhibits its essence)
  - Value (or lightness) (measures the degree to which a color appears light or dark)





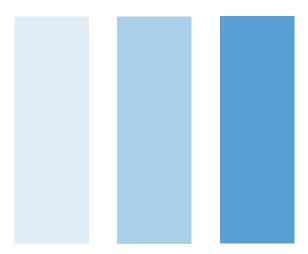
# We perceive different hues only as categorically different—not quantitatively different...

- One hue is not more or less than another.
- We just perceive them as different



# ...however, we perceive color intensity quantitatively from low to high

- Lighter items appear less important
- Darker items appear to be more important and represent a higher quantity



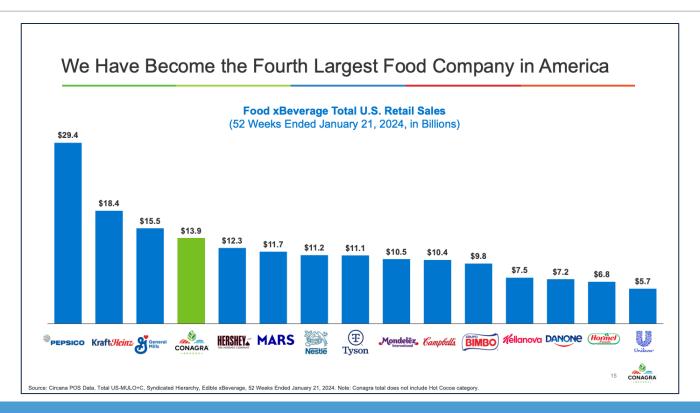
Sequential	Color is ordered from low to high							
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Sequential	Color is ordered from low to high	
Diverging	Two sequential colors with a neutral midpoint	

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Highlight	Color used to highlight something	

### For example, use a key color to highlight a bar on a bar chart to help make a point



Sequential	Color is ordered from low to high	
Diverging	Two sequential colors with a neutral midpoint	
Categorical	Contrasting colors for individual comparison	
Highlight	Color used to highlight something	
Alert	Color used to alert or warn reader	

# Red can highlight an alert, but it's tricky color for many audience members

Both green and red appear to be brown for readers who are color blind

According to the NIH, about 1 in 12 men are color blind.

NIH. (July 3, 2019). Color blindness. Available at https://www.nei.nih.gov/learn-about-eye-health/eye-conditions-and-diseases/color-blindness

#### "Bills-Jets game is complete torture for color-blind people"





Color-blind people are not enjoying the Jets-Bills game. (USATSI)

https://www.cbssports.com/nfl/news/look-bills-jets-game-is-complete-torture-for-color-blind-people/

### Red and green can be used if the information is double-encoded

	CLASS A	CLASS B	CLASS C	CLASS D	Electrical	CLASS F	
Type Extinguisher	Combustible materials (e.g. paper & wood)	Flammable liquids (e.g. paint & petrol)	Flammable gases (e.g. butane and methane)	Flammable metals (e.g. lithium & potassium)	Electrical equipment (e.g. computers & generators)	Deep fat fryers (e.g. chip pans)	Comments
Water	>	×	×	×	×	×	Do not use on liquid or electric fires
Foam	<	<b>*</b>	×	×	×	×	Not suited to domestic use
Dr <b>y</b> Powder	<		<b>*</b>	<b>\</b>		×	Can be used safely up to 1000 volts
CO2	×	<b>*</b>	×	×	<b>~</b>	×	Safe on both high and low voltage
Wet Chemical	<b>/</b>	×	×	×	×	<b>*</b>	Use on extremely high temperatures

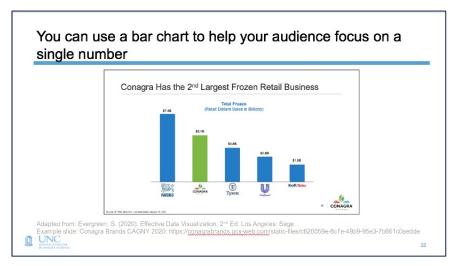
Table available at https://surreyfire.co.uk/wp-content/uploads/2015/11/which-type-of-fire-extinguisher-2.png

#### Special considerations with color

Both green and red appear to be brown for readers who are color blind

A blue and orange color palette is more color-blind friendly than a green and red color

palette



If you choose to use green, select a green that has a lot of blue in it.

#### Special considerations with color

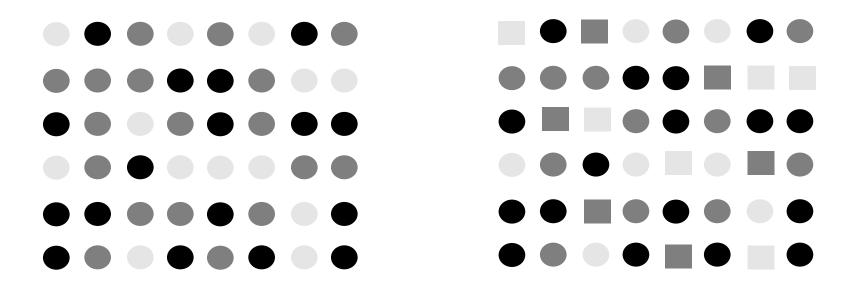
- Both green and red appear to be brown for readers who are color blind
- A blue and orange color palette is more color-blind friendly than a green and red color palette
- If you use color to encode data—and readers must distinguish between colors to understand the viz—use a color-blind friendly palette

Useful blog post on the subject:

https://www.tableau.com/about/blog/2016/4/examining-data-viz-rules-dont-use-red-green-together-53463

Adobe color palette tool: <a href="https://color.adobe.com/create/color-wheel">https://color.adobe.com/create/color-wheel</a>

### Our ability to distinguish visual attributes diminishes as the number of alternatives increases



Adapted from: Ware, C. (2013). Information Visualization: Perception for Design, 3rd. Ed. Boston: Elsevier Press.

## How many times does the number 9 appear in the list?

987346871095639481610987324219406736352409871212198968 182736401928123775019761239824091518722098161098710986 639481610987364019281237518721098732421940098161098264 687109563948161981610987109567346871090632812377801976

Adapted from: Few, S. (2012). Show Me the Numbers: Designing Tables and Graphs to Enlighten. Analytics Press.

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Adapted from: Wexler, S., Shaffer, J., Cotgreave. (2017). The Big Book of Dashboards: Visualizing Your Data Using Real-World Business Scenarios. Wiley

# Only some preattentive attributes can be perceived quantitatively—with accuracy...

Category	Attribute	Examples		
Form  Length Width Orientation Shape Size Enclosure	Width	Length	Width	Orientation
	Shapes	Size • • • •	Enclosure	
Color	Hue Intensity	Hue • • • •	Intensity	
Spatial Position	2-D position	••••		

<sup>\*</sup>Width, size, and intensity can be perceived quantitatively, but it's limited.

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# Only some preattentive attributes can be perceived quantitatively—with accuracy...

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Color	Hue Intensity	Hue • • • •	Intensity	
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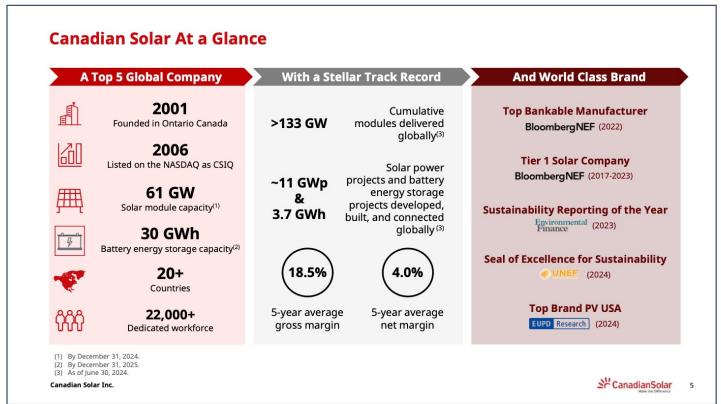
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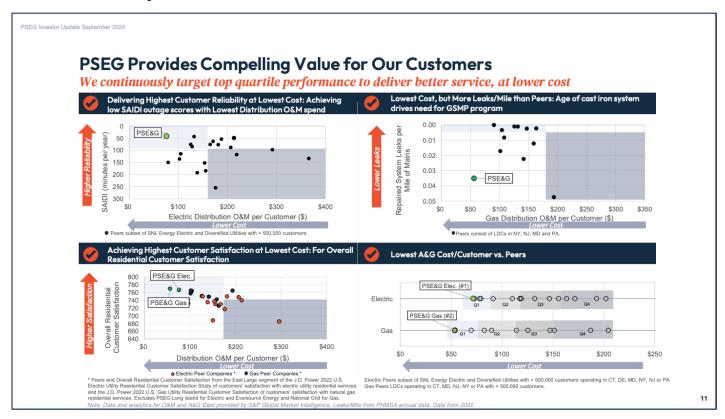
## This understanding of our audience will ground the rest of our conversation

- ✓ Understand how people process and remember things
- Identify common pitfalls that plague data-driven presentations
- Learn frameworks to help you design effective and attractive data visualizations
  - CARS
  - BLADE
- Learn strategies to bolster audience understanding and recall

#### Missing slide title/anchor



#### Lack of information hierarchy

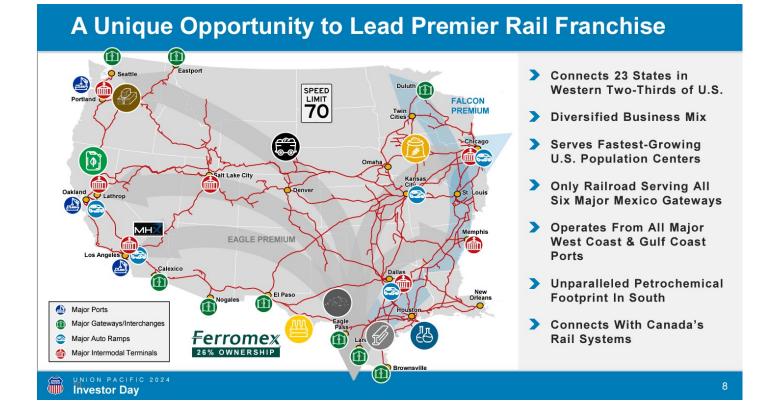


#### Too much information on one slide

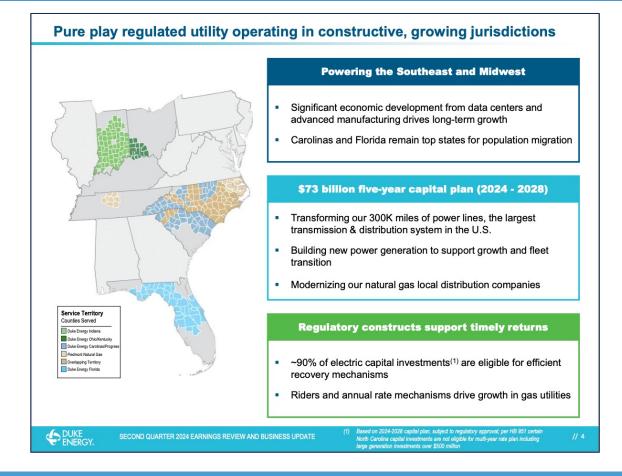


People | Pitfalls | Frameworks | Strategies

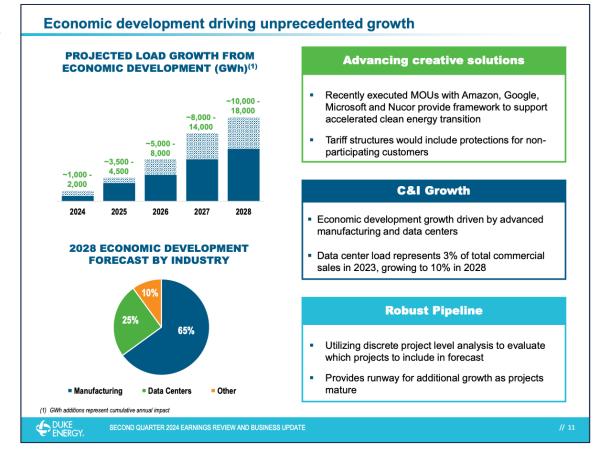
#### Too much information on one slide



## Competing content on one slide



## Competing content on one slide



Nonparallel structure in lists

### Let's move into the frameworks

- ✓ Understand how people process and remember things
- ✓ Identify common pitfalls that plague data-driven presentations
- Learn frameworks to help you design effective and attractive data visualizations
  - CARS
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## The CARS framework operationalizes a broad field of research related to:

- Cognitive psychology
- Readability
- Design
- Visual Rhetoric
- User Testing



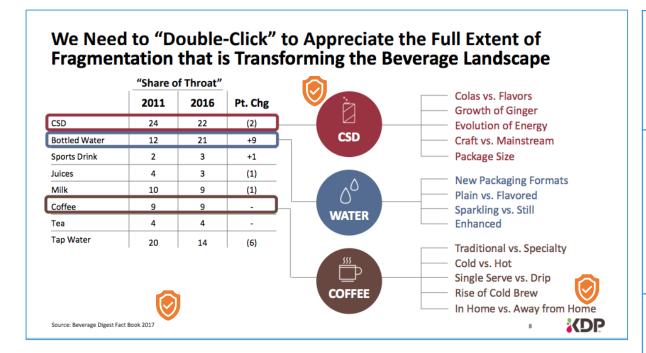
...that helps users design audience-centered data visualizations and slides.

С	Credible	Establishing credibility with the audience
A	Audience- centered	
R	Readable	
S	Strategic	

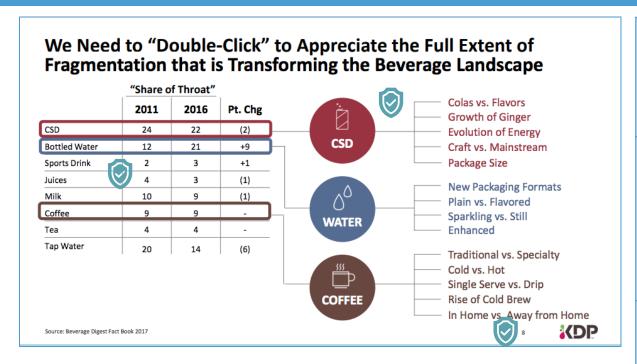
С	Credible	Establishing credibility with the audience
A	Audience- centered	Choosing the right information for the target audience and helping them process the information on the visual
R	Readable	
S	Strategic	

С	Credible	Establishing credibility with the audience
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R	Readable	Developing visuals that are legible and highly readable
S	Strategic	

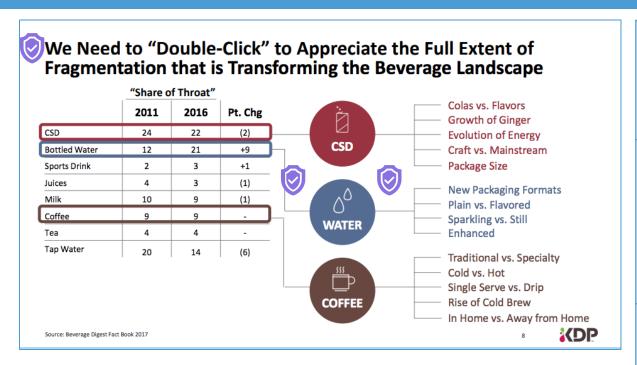
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R	Readable	Developing visuals that are legible and highly readable
S	Strategic	Incorporating strategic elements into the visuals to help the audience better understand the information and to foster a more effective delivery



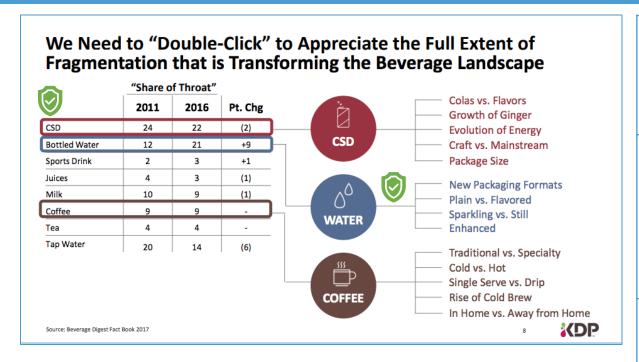
Credible	Company logo, company colors, carefully designed and edited, citation to source of data
Audience- centered	Use of coordinated colors to highlight key features on the slide, concrete numbers to support claims, well-selected information
Readable	Sans serif font, wise use of white space
Strategic	Highlighting(boxes and gray lines) supports main point of the slide



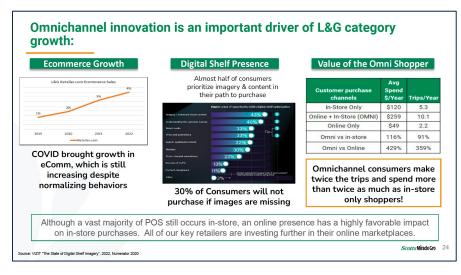
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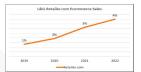
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#### **Ecommerce Growth**



COVID brought growth in eComm, which is still increasing despite normalizing behaviors

#### Digital Shelf Presence

Almost half of consumers prioritize imagery & content in their path to purchase

regary / enhanced visual content		43%	
		40%	
	33	3%	no.J
	33	3%	770-1
	32	% 🔘	
	309	60	
	23%	)	
	13%		
	11%		nor rest of text backets
	3%→	ting saturban as sook	es second union,

30% of Consumers will not purchase if images are missing

#### Value of the Omni Shopper

Customer purchase channels	Avg Spend \$/Year	Trips/Year
In-Store Only	\$120	5.3
Online + In-Store (OMNI)	\$259	10.1
Online Only	\$49	2.2
Omni vs in-store	116%	91%
Omni vs Online	429%	359%

Omnichannel consumers make twice the trips and spend more than twice as much as in-store only shoppers!

Although a vast majority of POS still occurs in-store, an online presence has a highly favorable impact on in-store purchases. All of our key retailers are investing further in their online marketplaces.

Source: VIZIT "The State of Digital Shelf Imagery", 2022, Numerator 2020

ScottsMiradeGro 24





## BLADE annotation strategies: Move a graph to a chart

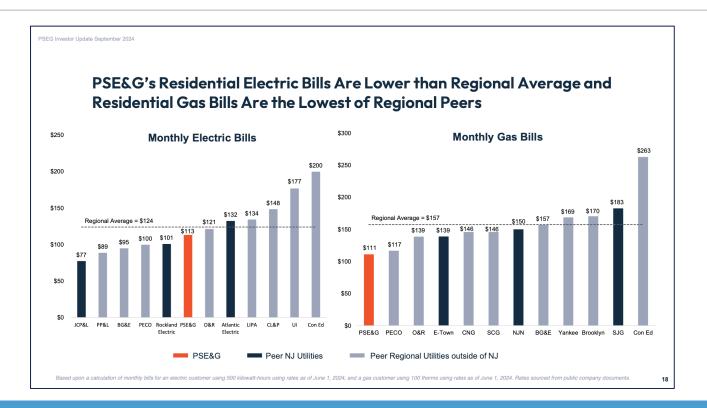
С	Credible	Establishing credibility with your audience	]		
A	Audience-	Choosing the right information for the target		В	Bracket
	centered	audience and helping them process the information on the visual		L	Label
R	Readable  Strategic	Developing visuals that are legible and highly readable Incorporating strategic elements into your visuals		Α	Accentuate
3	Strategic	to help your audience better understand the information and to foster a more effective delivery		D	Delineate
			L	E	Explode

BLADE acronym adapted from Duarte, N. (October 5, 2020). *Make your data insights visually consumable*. MIT Sloan Management Review. https://sloanreview.mit.edu/article/make-your-data-insights-visually-consumable/

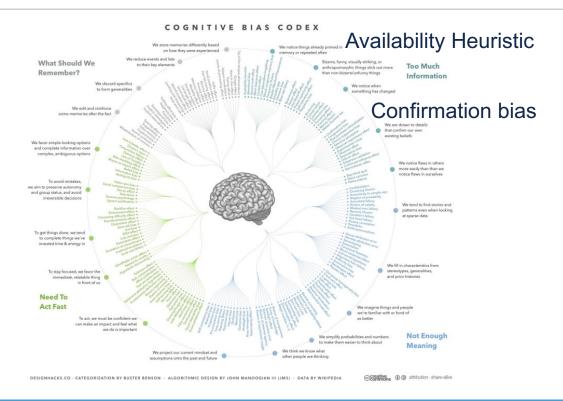
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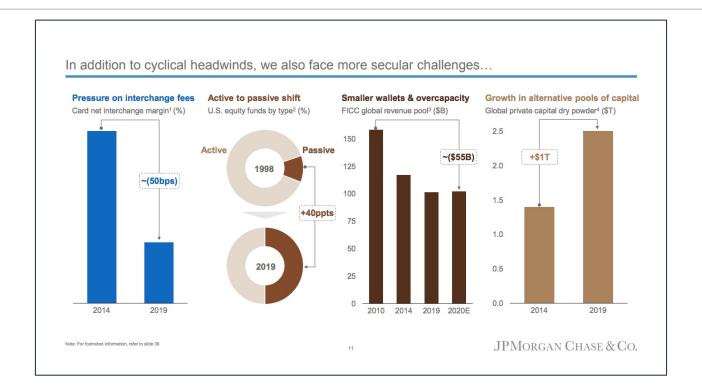
### BLADE annotation strategies: Direct attention to key points



## BLADE annotation strategies: Guide the audience to System 2 thinking

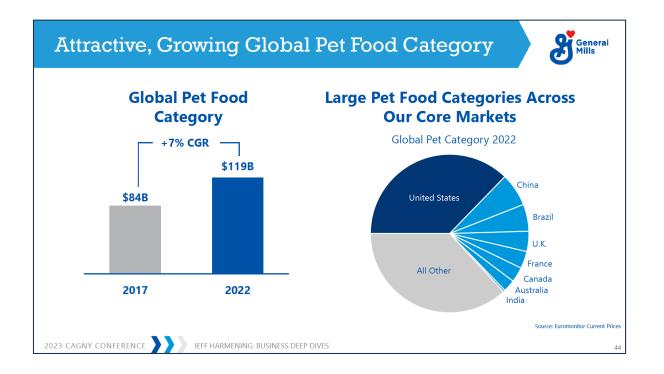


## Overlay brackets over graphs to help the audience make connections and to show the math



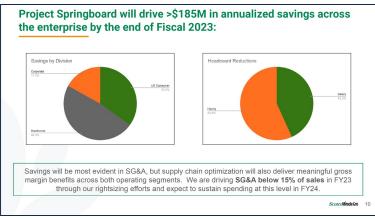


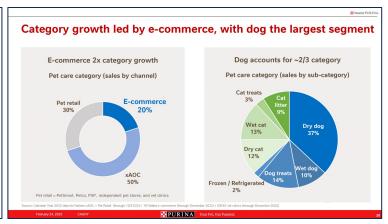
## Brackets provide a strategy for showing both numbers and percentages in one figure





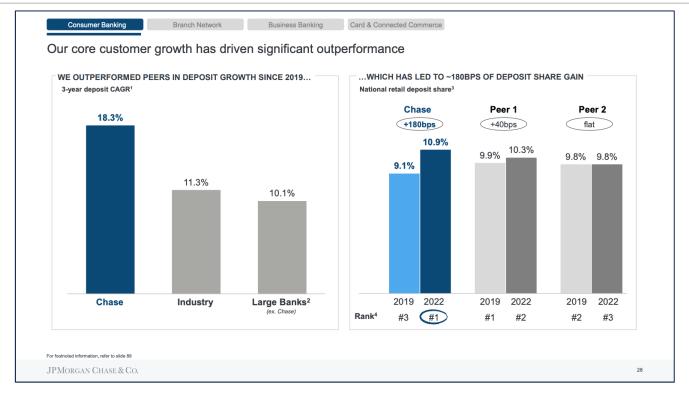
## Labels can highlight elements on a chart...and they must be large enough to see





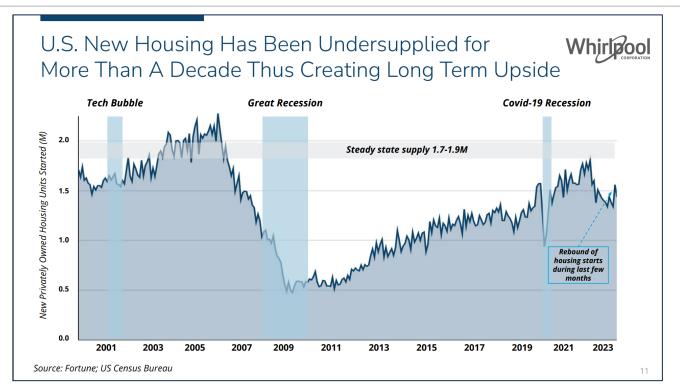


## Labels can highlight elements on a chart...or explain the story the data is telling



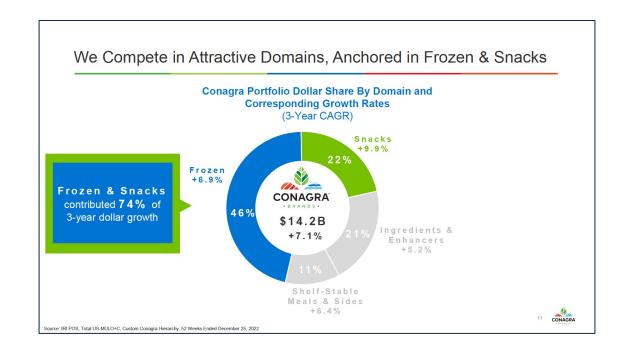


## The labels should help tell the story the data represents



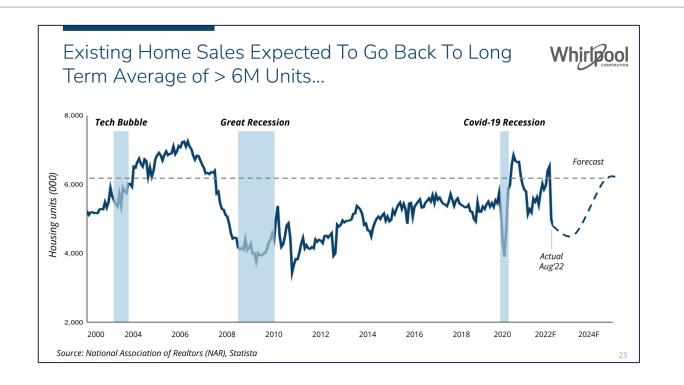


## Draw attention by accentuating elements strategically



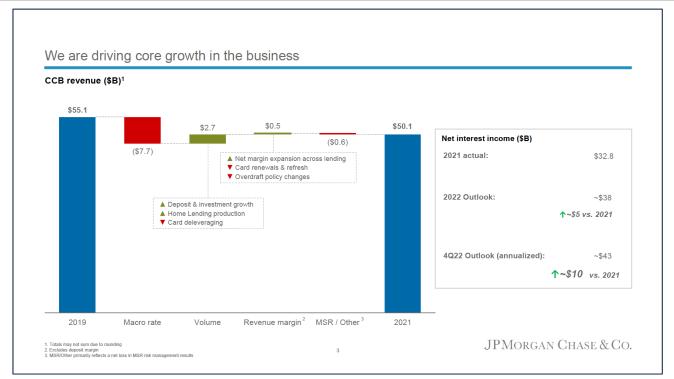


## Shading works well to accentuate key points on a line graph



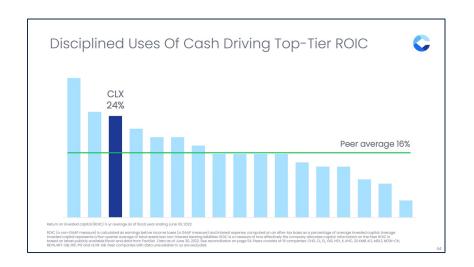


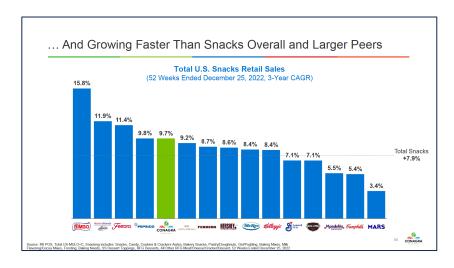
## Draw attention to key points by providing specific numerical details



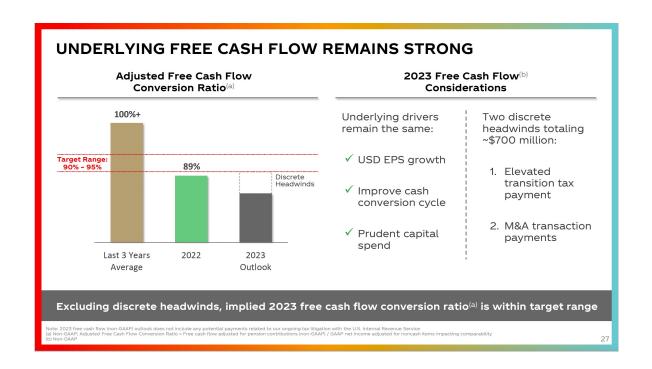


## Include lines to draw attention to performance relative to peers



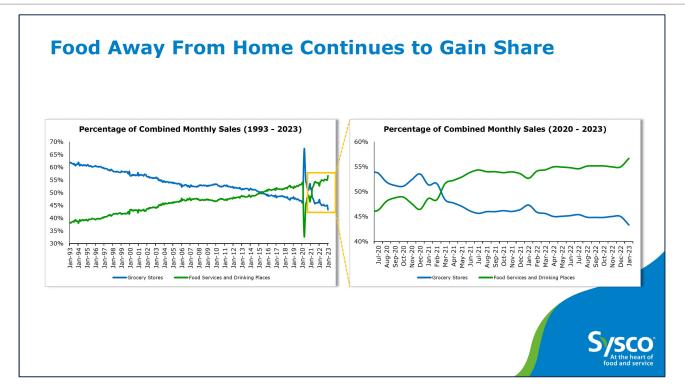


## Overlay lines to show goals or target ranges

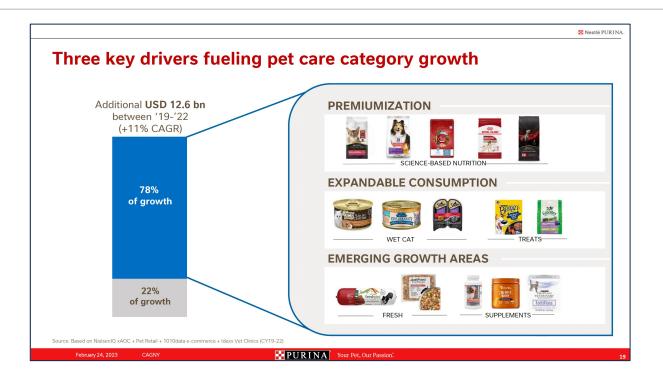




#### "Explode" an element of a graph to show more details



#### The explode strategy can also show the "nouns" behind the data

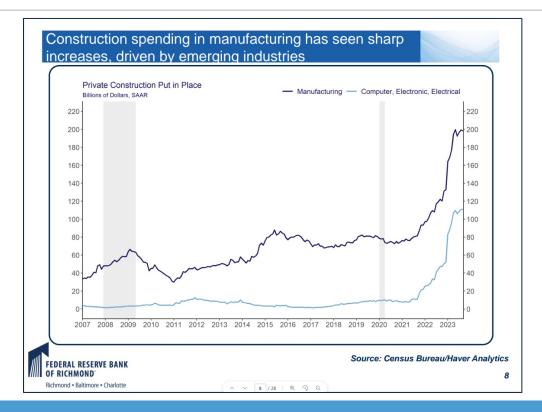




#### Let's talk strategy

- ✓ Understand how people process and remember things
- ✓ Identify common pitfalls that plague data-driven presentations
- ✓ Learn frameworks to help you design effective and attractive data visualizations
  - √ CARS
  - ✓ BLADE
- Learn strategies to bolster audience understanding and recall

### Strategy: Lean into full sentence slide titles that make an assertion



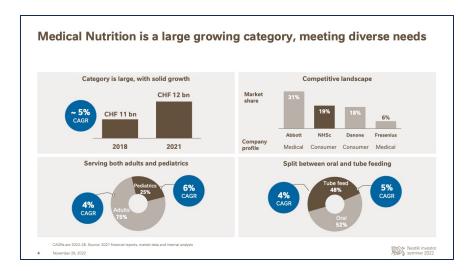
#### Strong slide titles provide an important narrative anchor for the audience—and the presenter

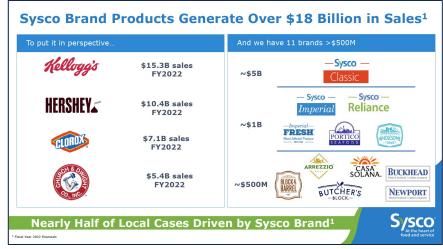
- Incorporate full-sentence slide titles that provide the "so what" of the slide
- Use active voice where possible
- Use 28 pt. to 32 pt. for slide titles
- Limit titles to no more than two lines.

Avoid using questions as slide titles unless you want to foster discussion.

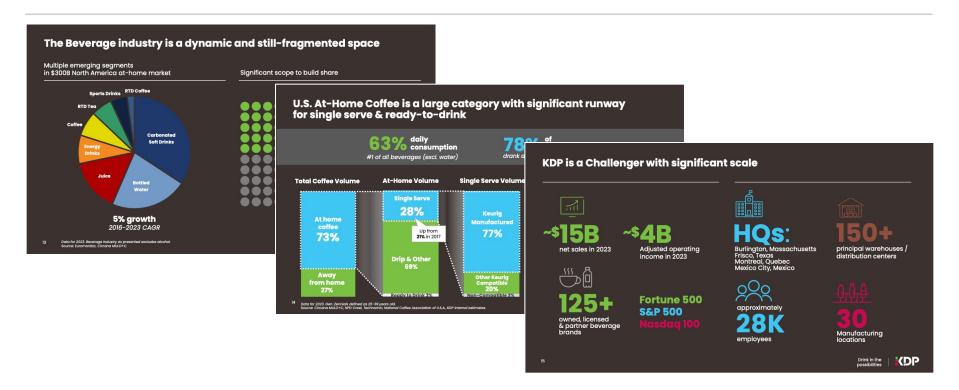
Nathans-Kelly, T. & Nicometo, C. (2014). Slide Rules: Design, Build, and Archive Presentations in the Engineering & Technical Fields. Wiley.

### The slide title provides the narrative anchor for the individual slide...

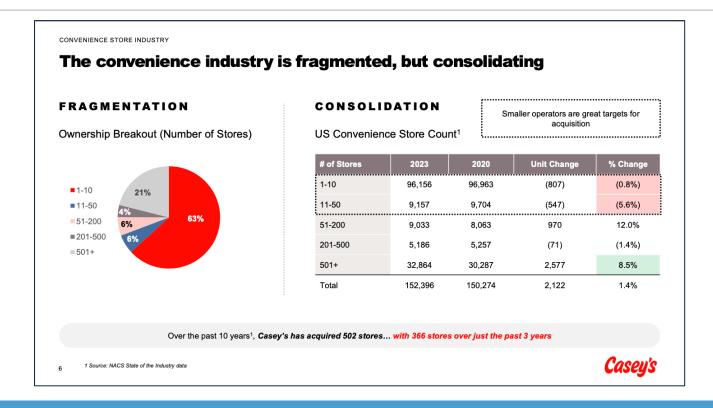




### ...and helps support a strong narrative across an entire deck

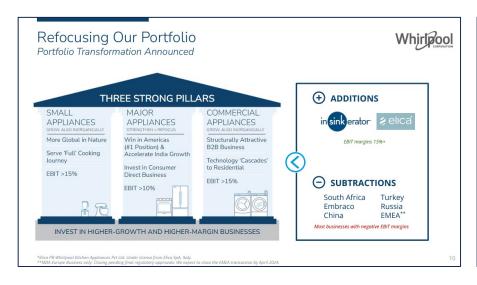


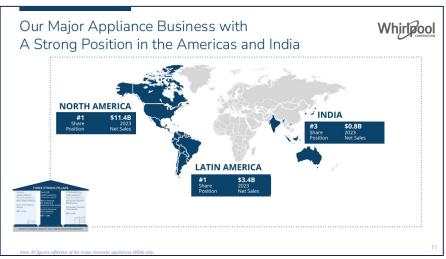
# Strategy: Include annotations versus blocks of text on slides



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# Strategy: Divide content over multiple slides where possible

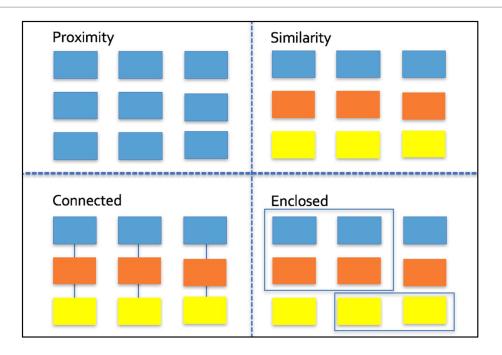




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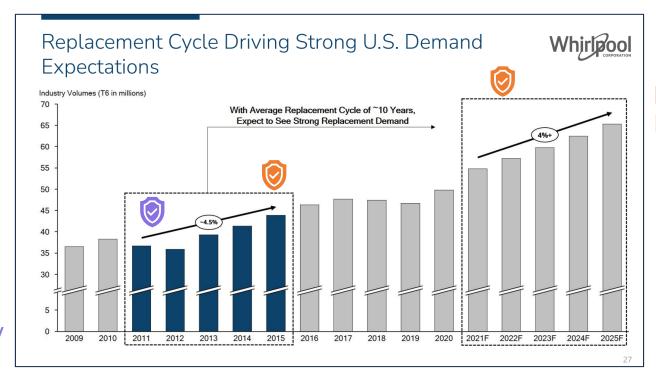
# Strategy: Use grouping strategies to help the audience manage a heavier cognitive load

**Gestalt Principles** 



Adapted from Gabrielle, B. (2010). Speaking PowerPoint: The new language of business. Insights Publishing.com

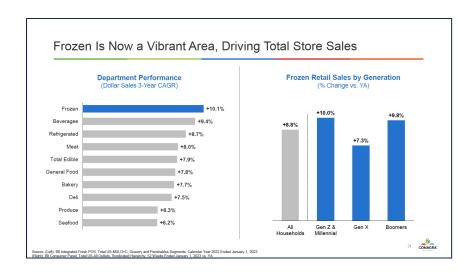
### Grouping strategies (with annotation) help create a strong narrative arc for a slide or chart

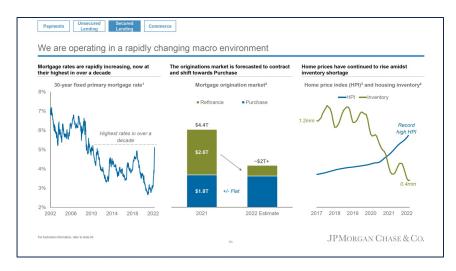


Law of Enclosure

Law of Similarity

# Strategic use of lines and white space can group the content for the audience (1/2)



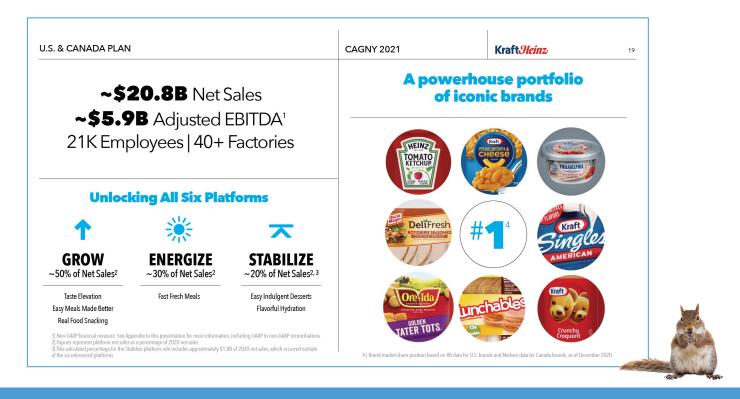


### Strategic use of lines and white space can group the content for the audience (2/2)

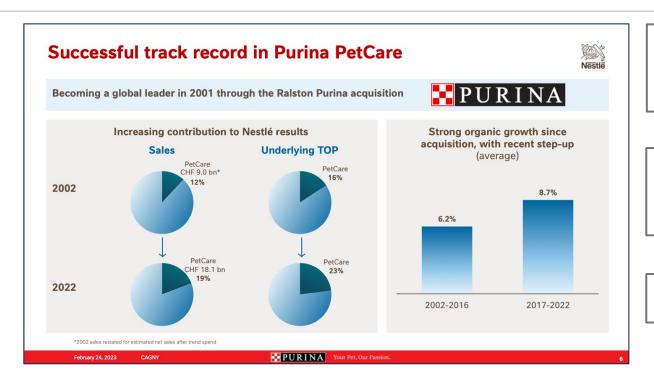




#### However, lines and white space can only help so much...



# Strategy: Showcase information hierarchy through strategic design choices



Font size & location

Dark vs. light elements

Shading

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# Conclusion: Remember the needs of your audience and design your data-rich slides accordingly

- ✓ Lean into full sentence slide titles that make an assertion
- ✓ Include annotations versus blocks of text on slides
- ✓ Divide content over multiple slides if possible
- ✓ Use grouping strategies to help the audience manage a heavier cognitive load.
- ✓ Showcase information hierarchy through strategic design choices





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