

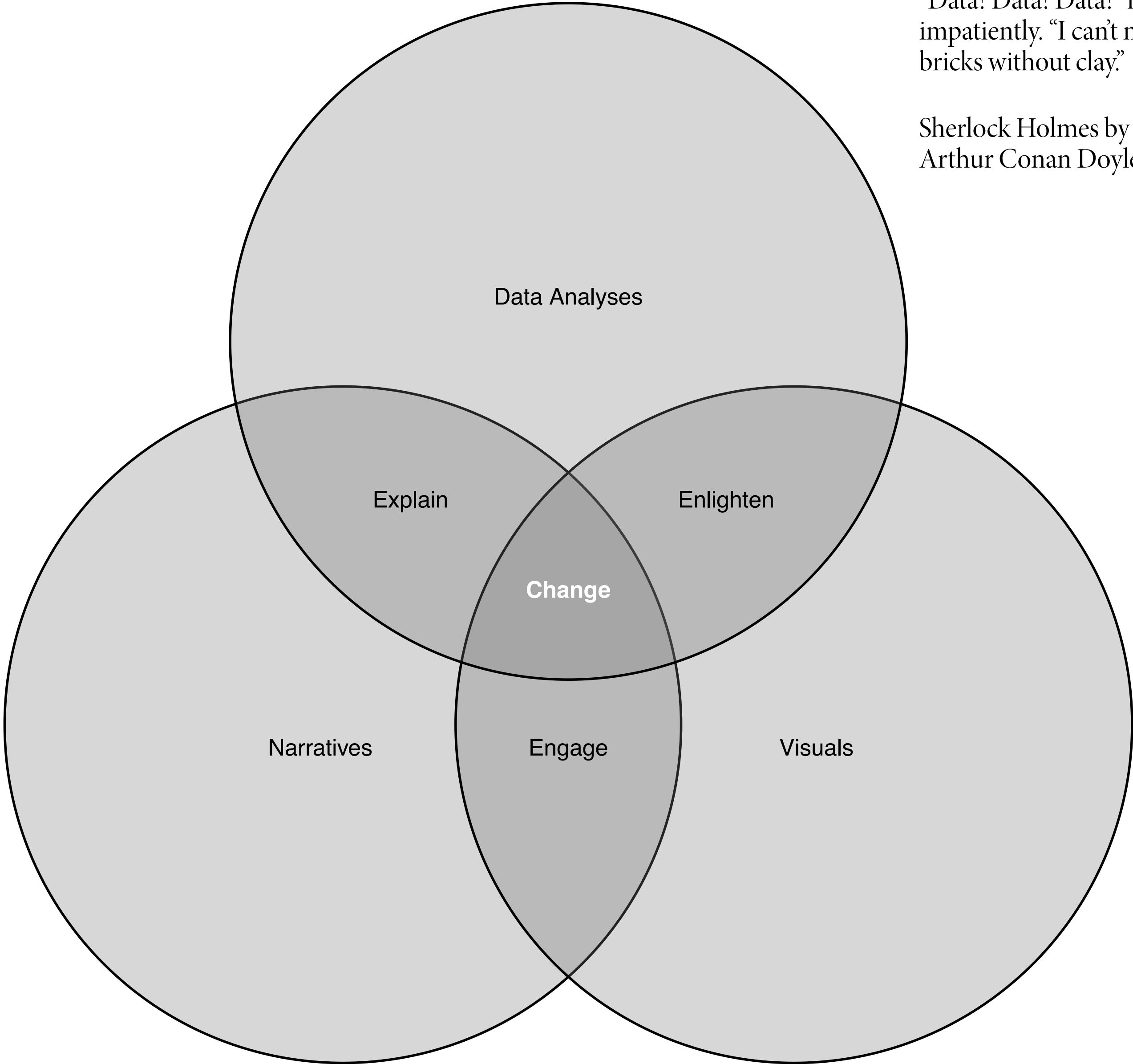
Storytelling with data

11 | Interactive documents and multimodal communications

course overview, learn to drive change using data visuals and narrative

“Data! Data! Data!” he cried impatiently. “I can’t make bricks without clay.”

Sherlock Holmes by Sir Arthur Conan Doyle, *author*



No one ever made a decision because of a number. They need a story.

Daniel Kahneman, *psychologist, behavioral economist, and author*

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

John W Tukey, *mathematician*

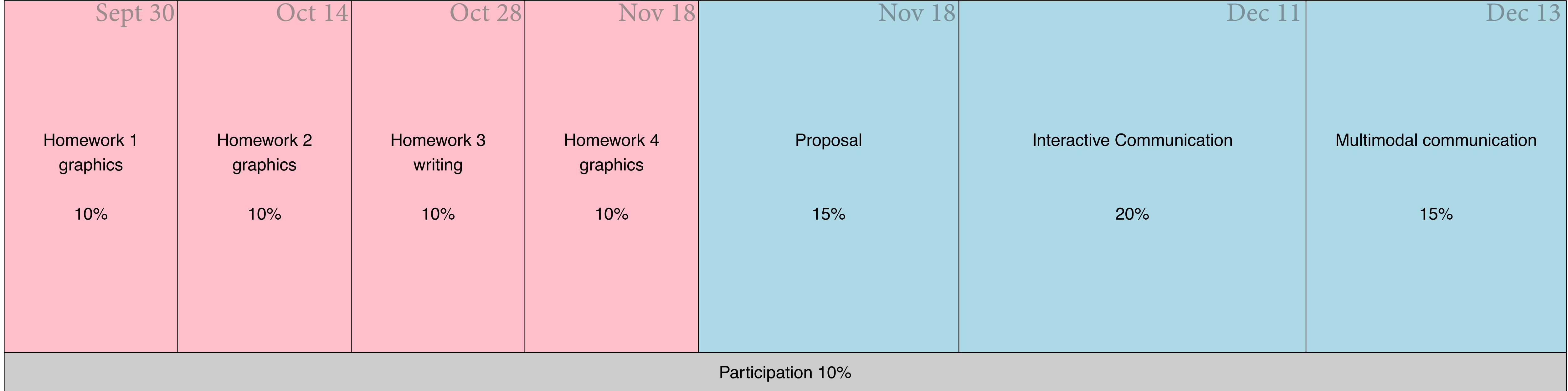
general course deliverable timeline

Individual Work

For learning data visualization and written narrative techniques

Group work

For building graphics and narrative into interactive communications



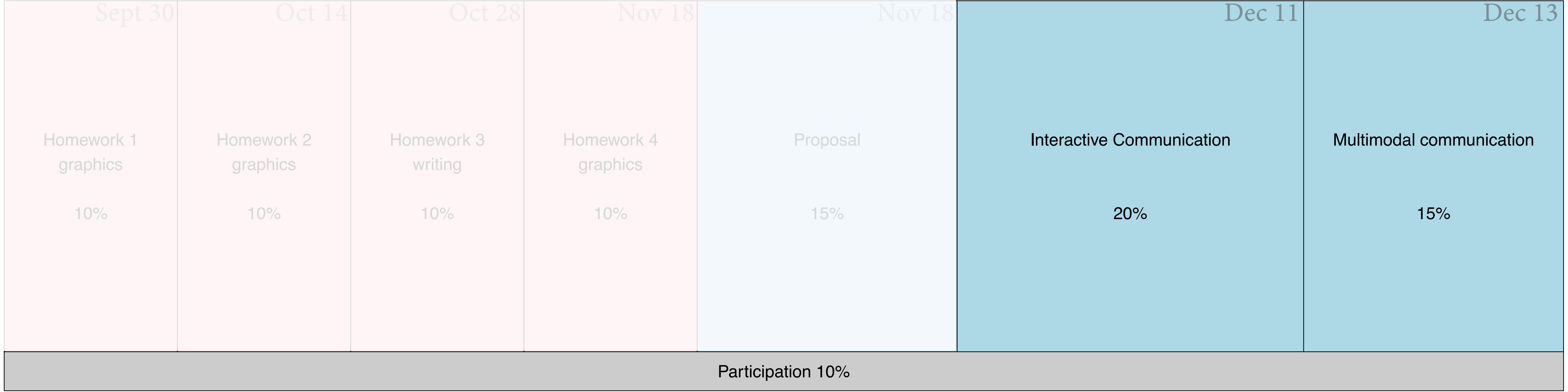
next deliverables, group interactive & multimodal communications

Individual Work

For learning data visualization and written narrative techniques

Group work

For building graphics and narrative into interactive communications



how we'll learn from this discussion

An active learner asks questions, considers alternatives, questions assumptions, and even questions the trustworthiness of the author or speaker. **An active learner tries to generalize specific examples, and devise specific examples for generalities.**

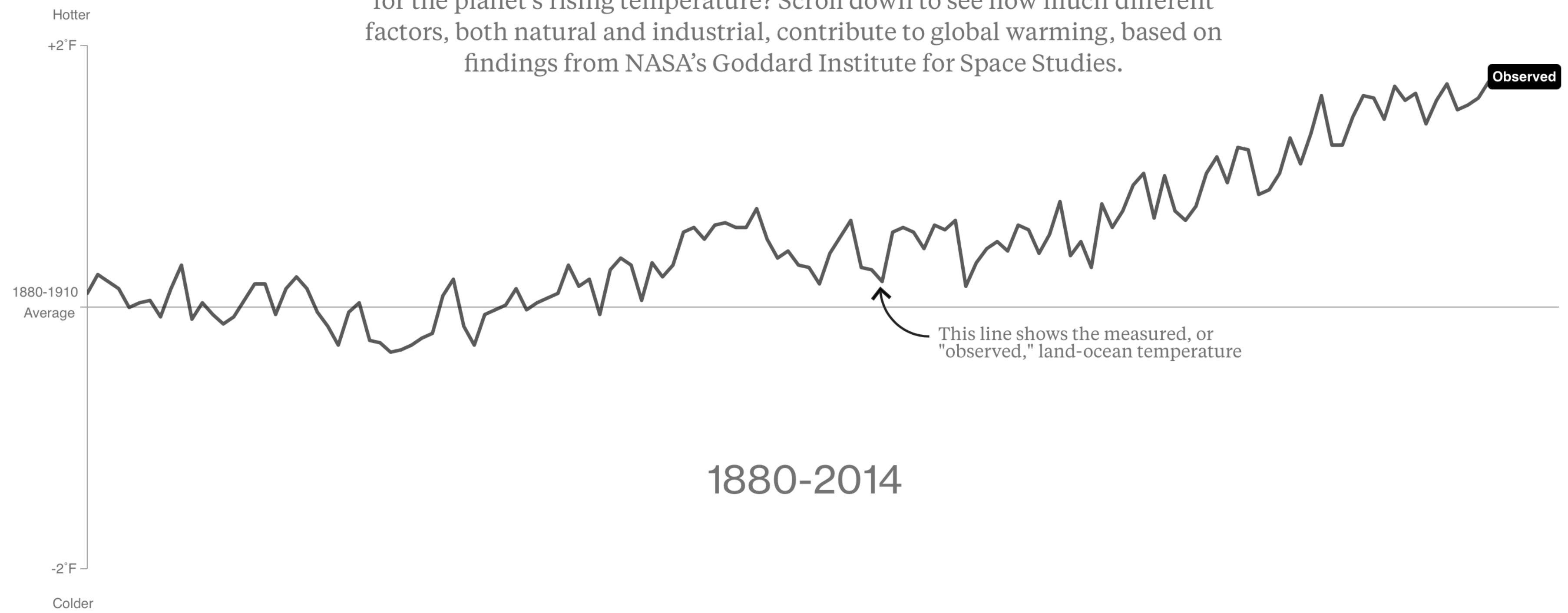
An active learner doesn't passively sponge up information — that doesn't work! — but uses the readings and lecturer's argument as a springboard for critical thought and deep understanding.

interactive communication, a “scrollytelling” layout

What's Really Warming the World?

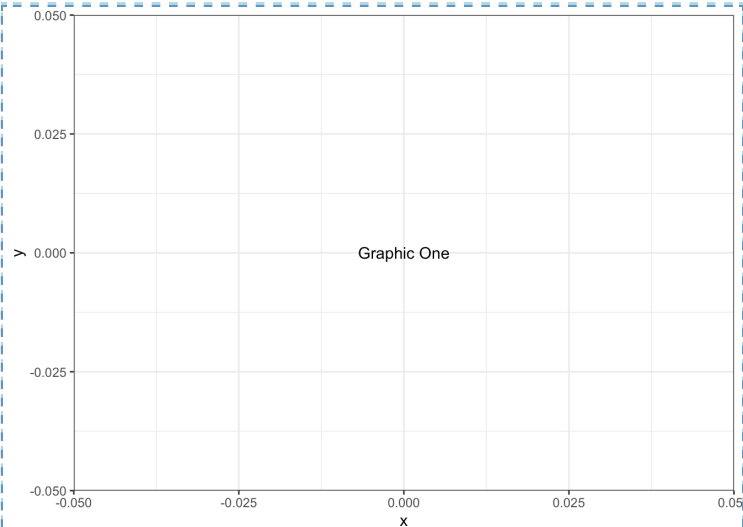
By Eric Roston and Blacki Migliozi | June 24, 2015

Skeptics of manmade climate change offer various natural causes to explain why the Earth has warmed 1.4 degrees Fahrenheit since 1880. But can these account for the planet's rising temperature? Scroll down to see how much different factors, both natural and industrial, contribute to global warming, based on findings from NASA's Goddard Institute for Space Studies.



Minimal Scrollytelling Example

This is a paragraph outside the scrollytelling sections. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Donec interdum tellus felis, at lobortis orci sollicitudin ac. Donec lobortis sapien ac posuere faucibus. Mauris lectus neque, pretium non volutpat eget, vestibulum at magna. In sollicitudin augue nunc, non bibendum augue ornare quis.



This is a first article paragraph inside the first scrollytelling section. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Donec interdum tellus felis, at lobortis orci sollicitudin ac. Donec lobortis sapien ac posuere faucibus. Mauris lectus neque, pretium non volutpat eget, vestibulum at magna. In sollicitudin augue nunc, non bibendum augue ornare quis.

This is a second article paragraph inside the first scrollytelling section. Integer accumsan interdum justo eu pretium. Aliquam maximus mi sit amet dapibus efficitur.

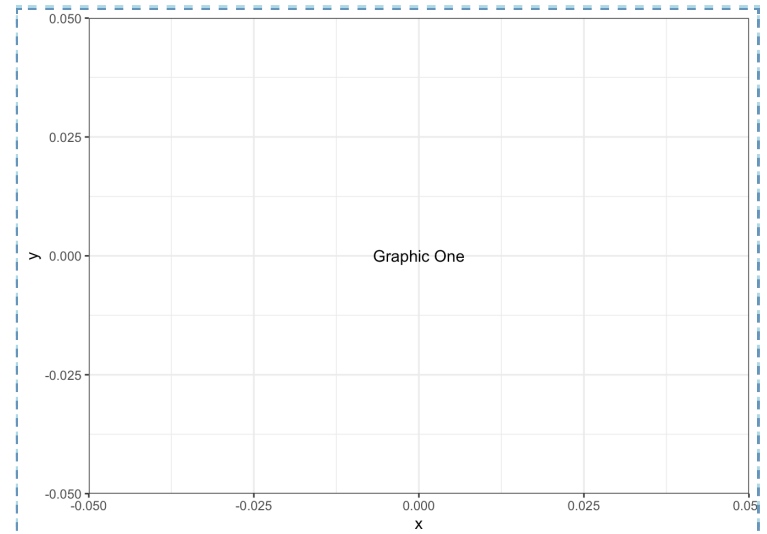
This is a third article paragraph inside the first scrollytelling section. Sed condimentum lacus sit amet turpis aliquam varius nec a lacus. In facilisis convallis ante sit amet consequat. Aenean a lorem mollis, bibendum nibh nec, maximus orci. Nulla facilisi.

scrollytelling, minimal code in an r markdown to scroll explainers past stay-in-place data graphics

```
html
<h1>...</h1>
<p>...</p>
<section>
  <figure>
    ```{r, echo=FALSE}
 # graphics go here
    ```
  </figure>
  <article>
    <p>...</p>
  </article>
</section>
```

Minimal Scrollytelling Example

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scrollytelling, minimal code in an r markdown to scroll explainers past stay-in-place data graphics

```

<style>
  section {
    display: flex;
    flex-direction: row;
    margin-top: 1rem;
    margin-bottom: 5rem;
  }

  section > * {
    flex: 1;
  }

  article {
    padding: 0 1rem;
  }

  article p {
    font-size: 0.8rem;
    line-height: 1.4;
  }

  article p:not(:last-of-type) {
    min-height: 20vh;
  }

  article p:last-of-type {
    min-height: 50vh;
  }

  figure {
    display: flex;
    align-items: start;
    justify-content: center;
    height: 30rem;
    top: 5rem;
    position: sticky;
  }

  figure * {
    max-width: 100%;
    object-fit: contain;
  }
</style>

```

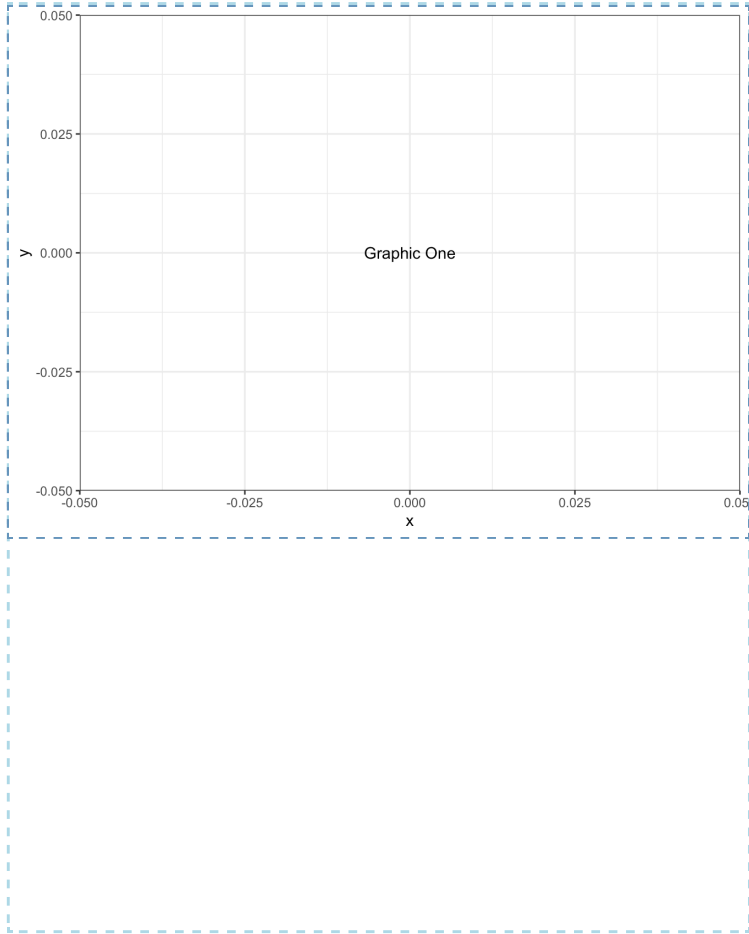
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</section>

```

Minimal Scrollytelling Example

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article p:last-of-type {
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}

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  justify-content: center;
  height: 30rem;
  top: 5rem;
  position: sticky;
}

figure * {
  max-width: 100%;
  object-fit: contain;
}
</style>

```

Of note: Apply any text formatting you want to `<h1>`, `<p>`, and `<article><p>`

Place code chunks for **interactive graphics** here.

Write your **explainers** that scroll past the **figures** here.

Specify white space for *between article paragraphs*, and for *after the last article paragraph* here. **20vh** means 20 percent of the viewfinder height. Experiment.

When **scrolling**, the `<figure>` element stops — **sticks** — its **top** at **5rem** (near the top of the viewfinder, adjust where you like). It will stay there until pushed up or down by its outer scrolling `<section>` element. Unlike the `figure`, the `article paragraphs` keep scrolling.

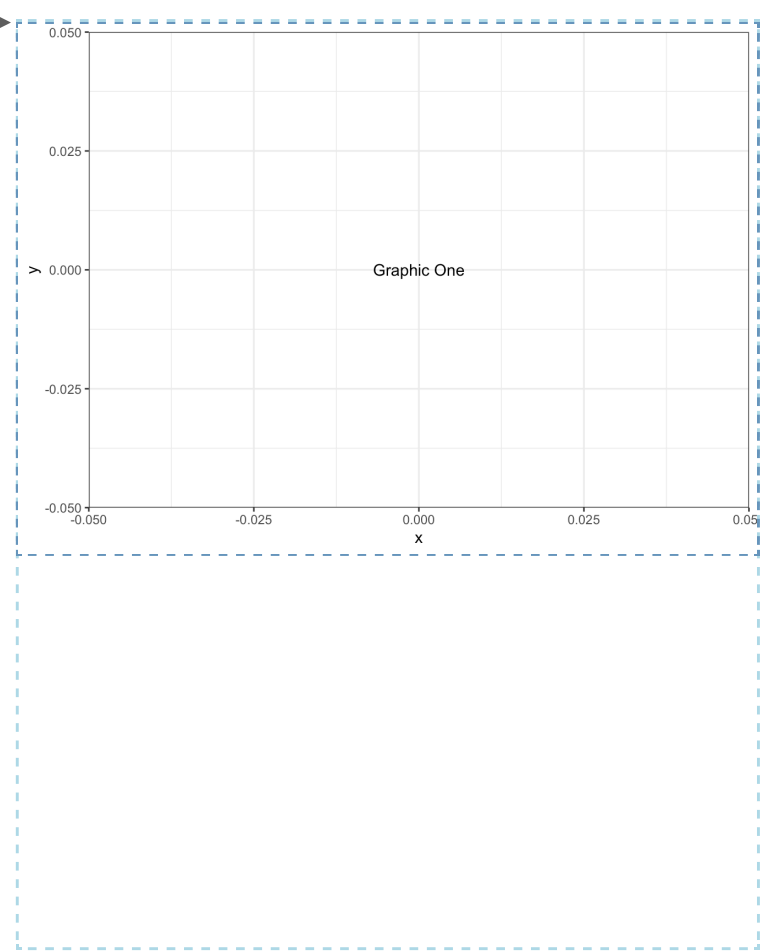
```

<h1>...</h1>
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<section>
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    ````{r, echo=FALSE}
 # graphics go here
    ````
  </figure>
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  </article>
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Minimal Scrollytelling Example

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Sticky location of `<figure>`

Empty space inside `<section>` allows `<figure>` to stay put until its bottom contacts scrolling `<section>` bottom.

The `<article>` vertically fills entire `<section>`, so it always scrolls with `<section>`.

verbal with the visual — *limitations and advantages*

PowerPoint, compared to other common presentation tools, **reduces the analytical quality** of serious presentations of evidence.

This is especially the case for the PowerPoint **ready-made templates**, which **corrupt statistical reasoning**, and often **weaken verbal and spatial thinking**.

— Tufte, 2006



verbal with the visual, limitations of presentations

Powerpoint can have low resolution and it

verbal with the visual, **limitations of presentations**

encourages

verbal with the visual, limitations of presentations



verbal with the visual, **limitations of presentations**

not

verbal with the visual, **limitations of presentations**

spatial
spatial spatial spatial

verbal with the visual, **limitations of presentations**

review.

Information separated. in. time. makes it difficult
to understand context and evaluate relationships.

verbal with the visual, addressing limitations

show comparisons
adjacent in space



Thing 1



Thing 2

verbal with the visual, addressing limitations

show comparisons
adjacent in space

increase data-ink on
slides too, within reason

verbal with the visual, addressing limitations

show comparisons
adjacent in space

one alternate approach,
document & discussion

increase data-ink on
slides too, within reason

verbal with the visual, advantages of presentations

show comparisons
adjacent in space

one alternate approach,
document & discussion

increase data-ink on
slides too, within reason

consider advantages of
sequential presentation

verbal with the visual, advantages of presentations

show comparisons
adjacent in space

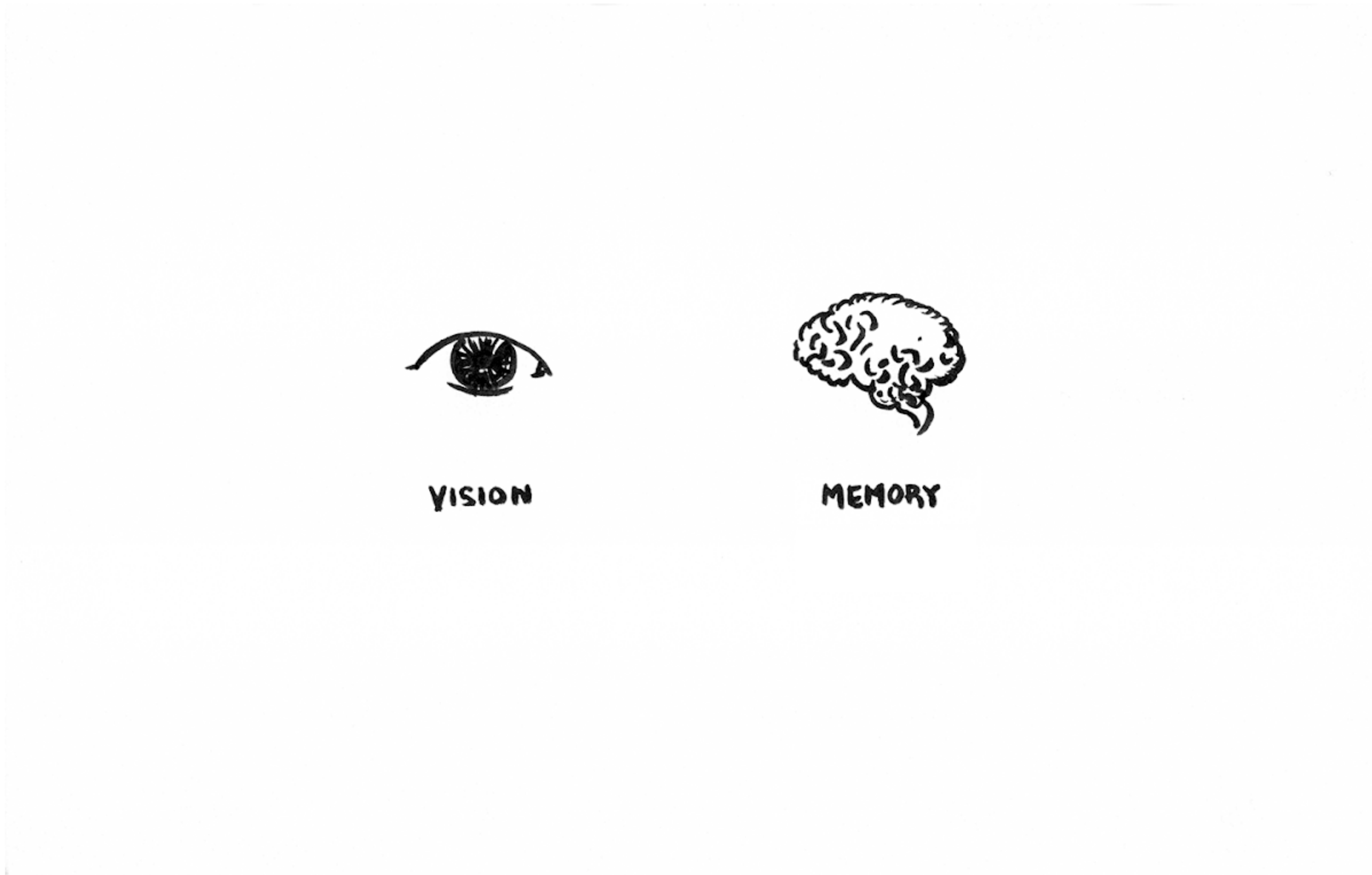
one alternate approach,
document & discussion

increase data-ink on
slides too, within reason

consider advantages of
sequential presentation

*We control **when** our audience receives information!*

verbal with the visual, advantages of presentations



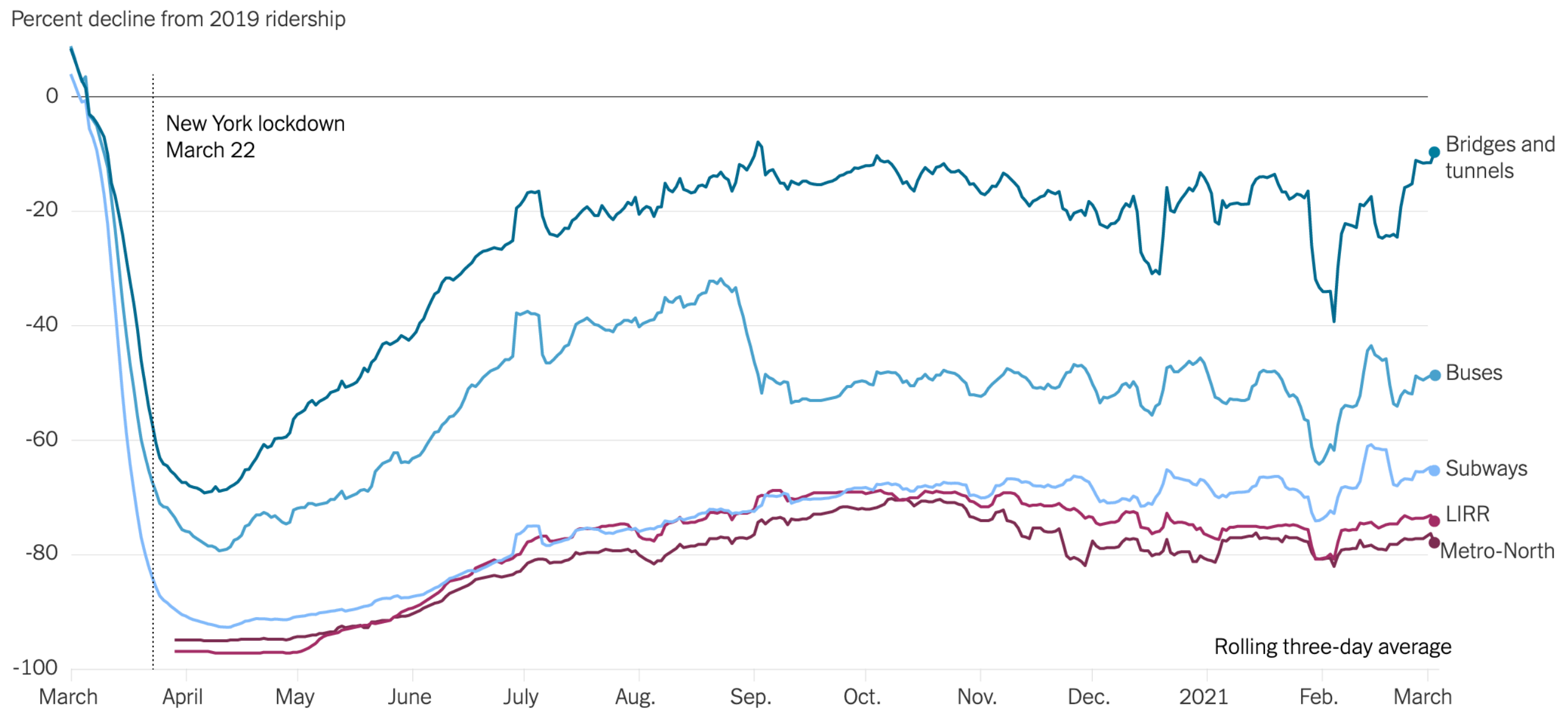
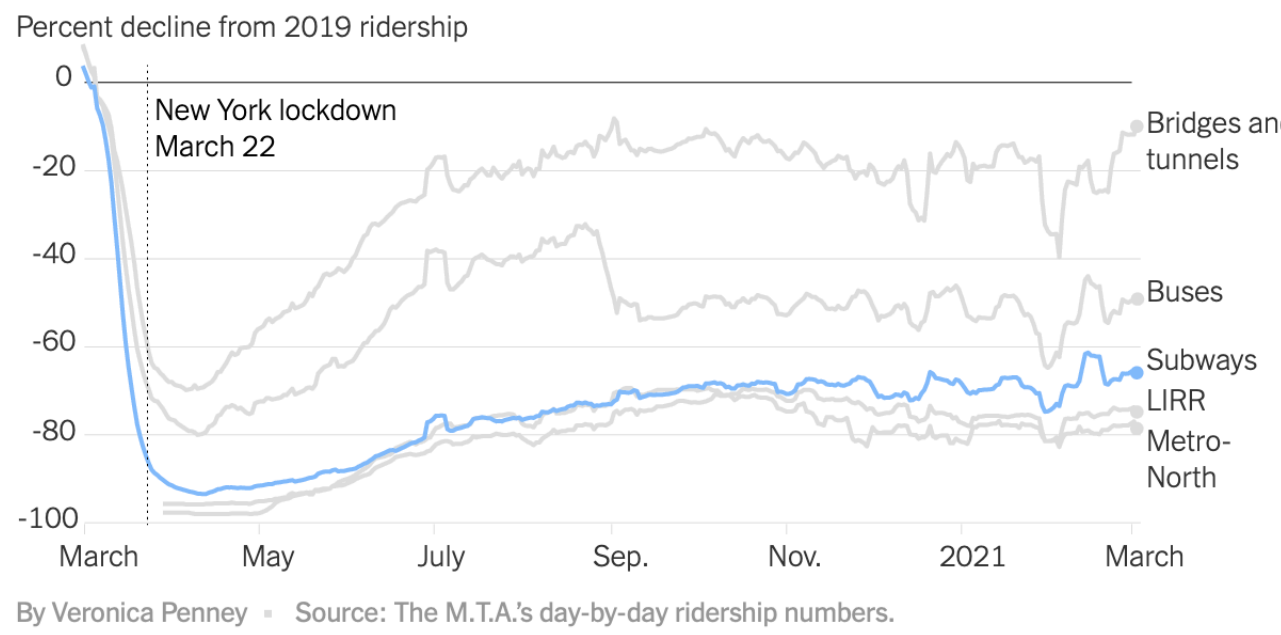
GRAPHIC DESIGN
IS THE USE OF SPACE
TO CONTROL TIME

— Barbara de Wilde

pacing for attention

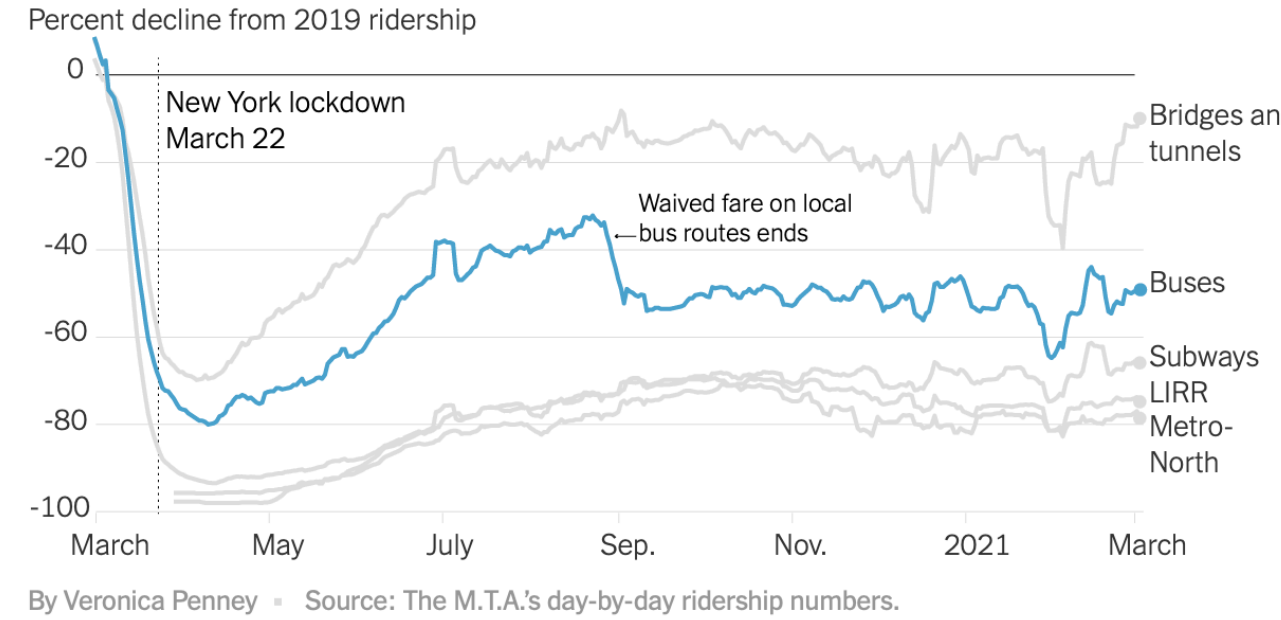
spacing for attention, you can focus on consecutive layers of a graphic *spatially (multiples)*

Subway Ridership Is Slow to Recover

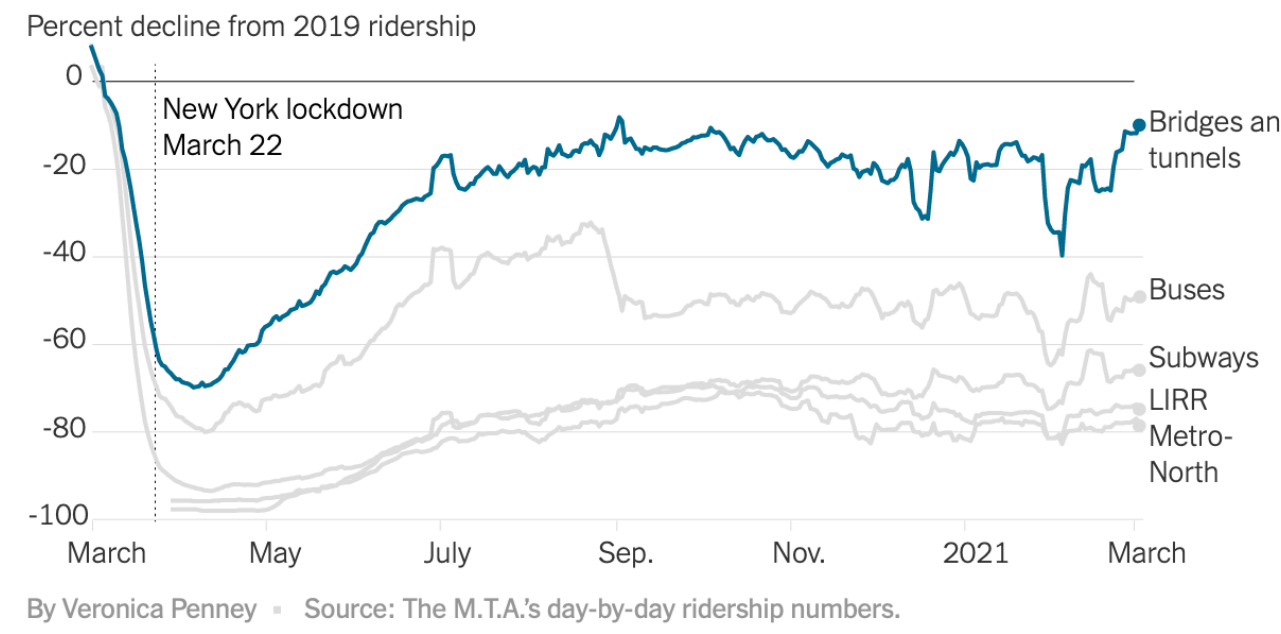


By Veronica Penney - Source: The M.T.A.'s day-by-day ridership numbers. | Note: Percent change is calculated as a comparison to the preceding-year equivalent day, with the exception of the commuter rail systems, which are compared to the 2019 monthly weekday/Saturday/Sunday average.

The Pandemic Cut Bus Ridership by Half



Car Travel Is Near Pre-Pandemic Levels



Penney, Veronica. "How Coronavirus Has Changed New York City Transit, in One Chart" New York Times, March 8, 2021, Climate sec. <https://www.nytimes.com/interactive/2021/03/08/climate/nyc-transit-covid.html>.



A Grammar of Animated Graphics

gganimate 1.0.5.9000 [Getting Started](#) [Reference](#) [Talks](#) [News](#)

Build up a plot, layer by layer

Source: [R/transition-layers.R](#)

This transition gradually adds layers to the plot in the order they have been defined. By default prior layers are kept for the remainder of the animation, but they can also be set to be removed as the next layer enters.

```
transition_layers(  
  layer_length = 1,  
  transition_length = 1,  
  keep_layers = TRUE,  
  from_blank = TRUE,  
  layer_order = NULL,  
  layer_names = NULL  
)
```

Contents

- Arguments
- Label variables
- Object permanence
- See also
- Examples

Arguments

layer_length The proportional time to pause at each layer before a new one enters

transition_length The proportional time to use for the entrance of a new layer

keep_layers Either an integer indicating for how many following layers the layers should stay on screen or a logical. In the case of the later, `TRUE` will mean keep the layer for the remainder of the animation (equivalent to setting it to `Inf`) and `FALSE` will mean to transition the layer out as the next layer enters.

from_blank Should the first layer transition in or be present on the onset of the animation

layer_order An alternative order the layers should appear in (default to using the stacking order). All other arguments that references the layers index in some way refers to this order.

layer_names A character vector of names for each layers, to be used when interpreting label literals

Label variables

`transition_layers` makes the following variables available for string literal interpretation, in addition to the general ones provided by `animate()`:

- **transitioning** is a boolean indicating whether the frame is part of the transitioning phase
- **previous_layer** The name of the last layer the animation was showing
- **closest_layer** The name of the layer the animation is closest to showing
- **next_layer** The name of the next layer the animation will show
- **nlayers** The total number of layers

Object permanence

`transition_layer` does not link rows across data to the same graphic element, so elements will be defined uniquely by each row and the enter and exit of the layer it belongs to.

data
verbal with the ✓ visual

temporal layering of spatial comparisons

verbal with the (data) visual, temporal layering of spatial comparisons

example

verbal with the (data) visual, example — temporal layering of spatial comparisons

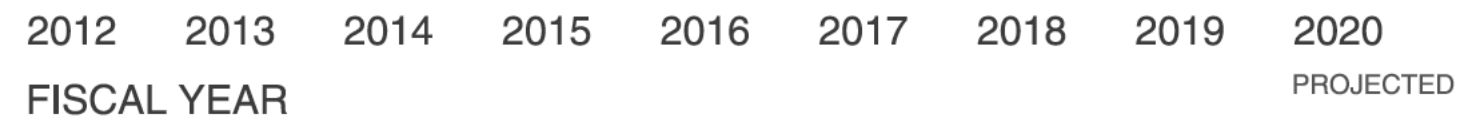
Total units sold



verbal with the (data) visual, example — temporal layering of spatial comparisons

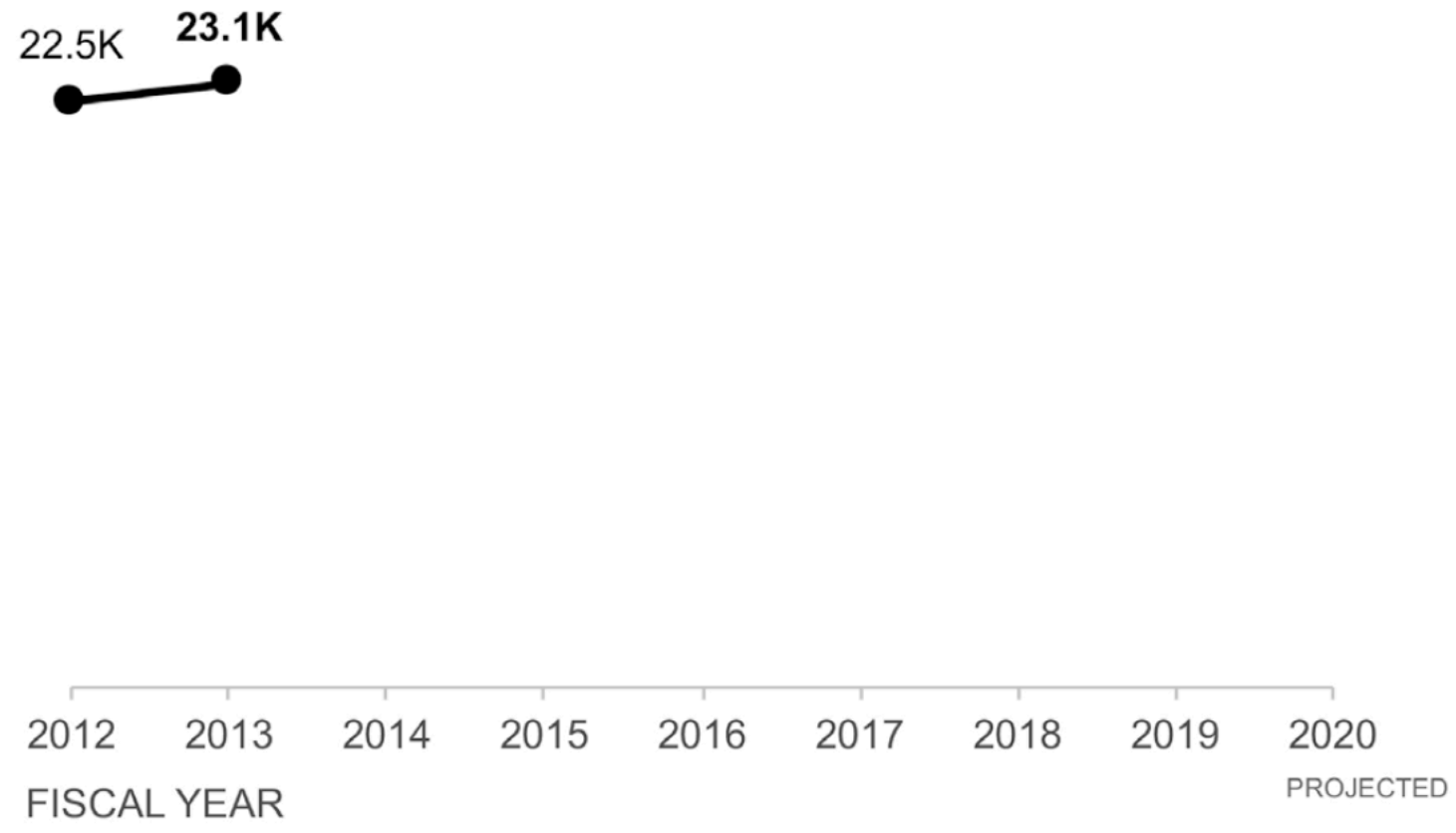
Total units sold

22.5K

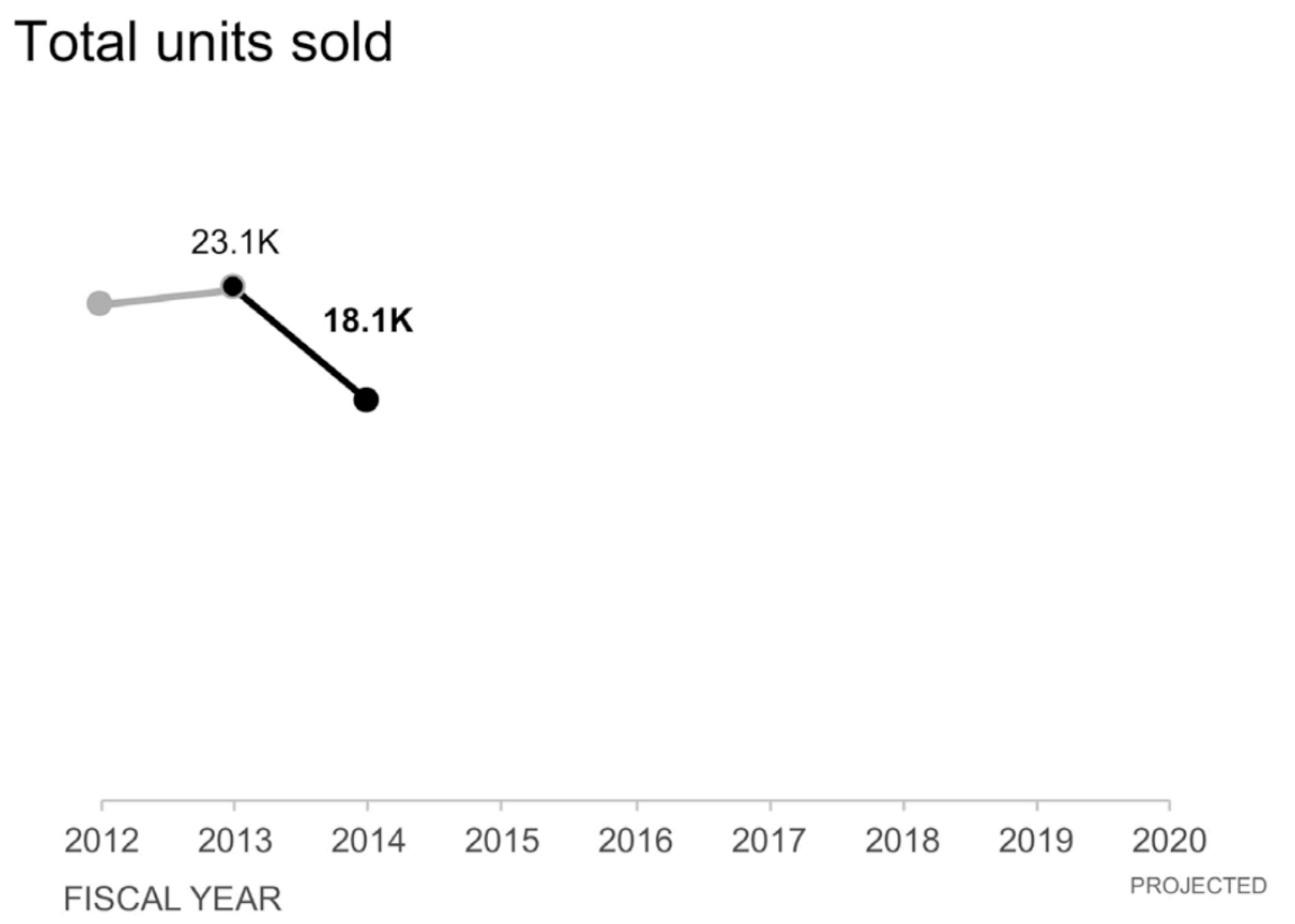


verbal with the (data) visual, example — temporal layering of spatial comparisons

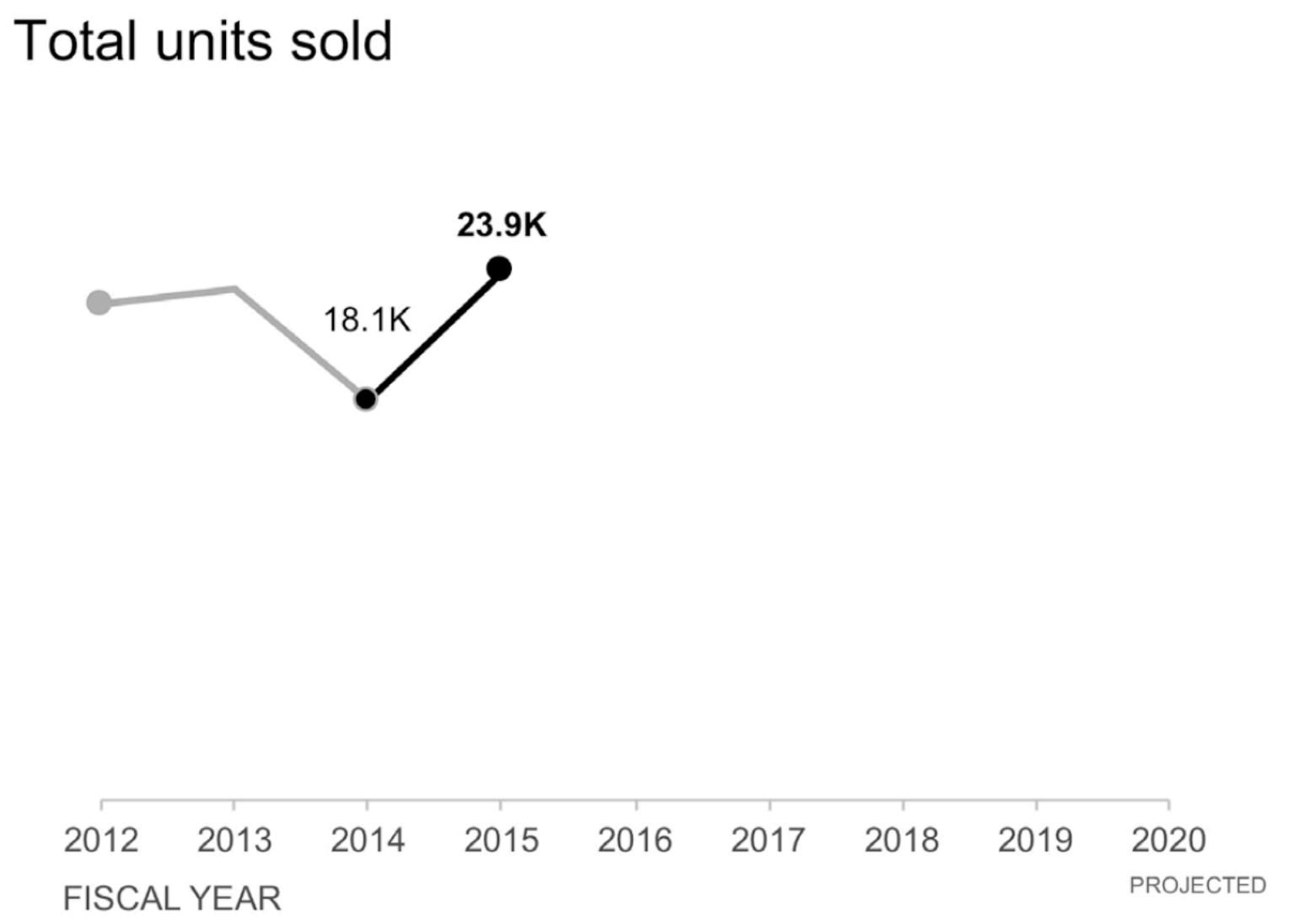
Total units sold



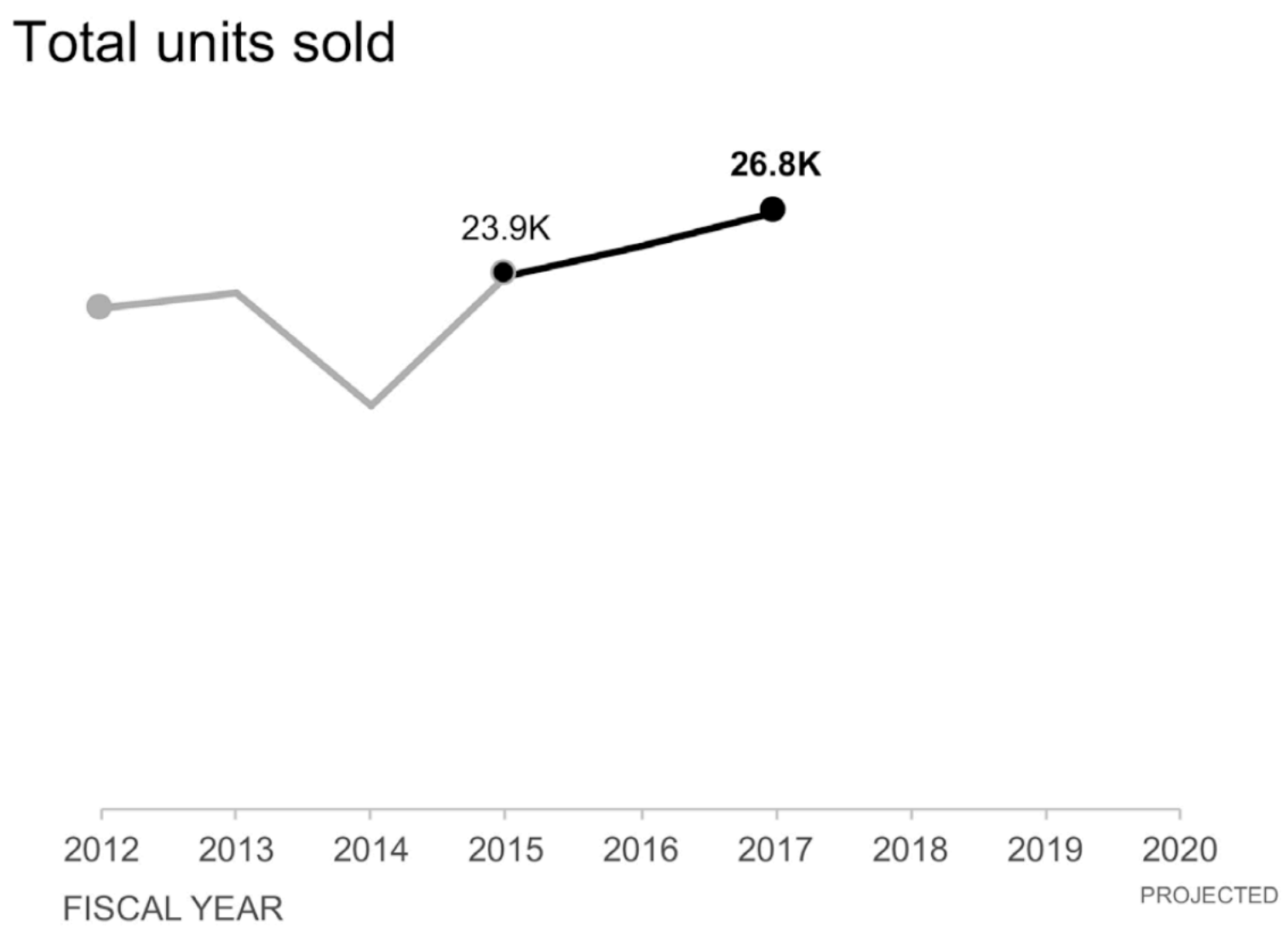
verbal with the (data) visual, example — temporal layering of spatial comparisons



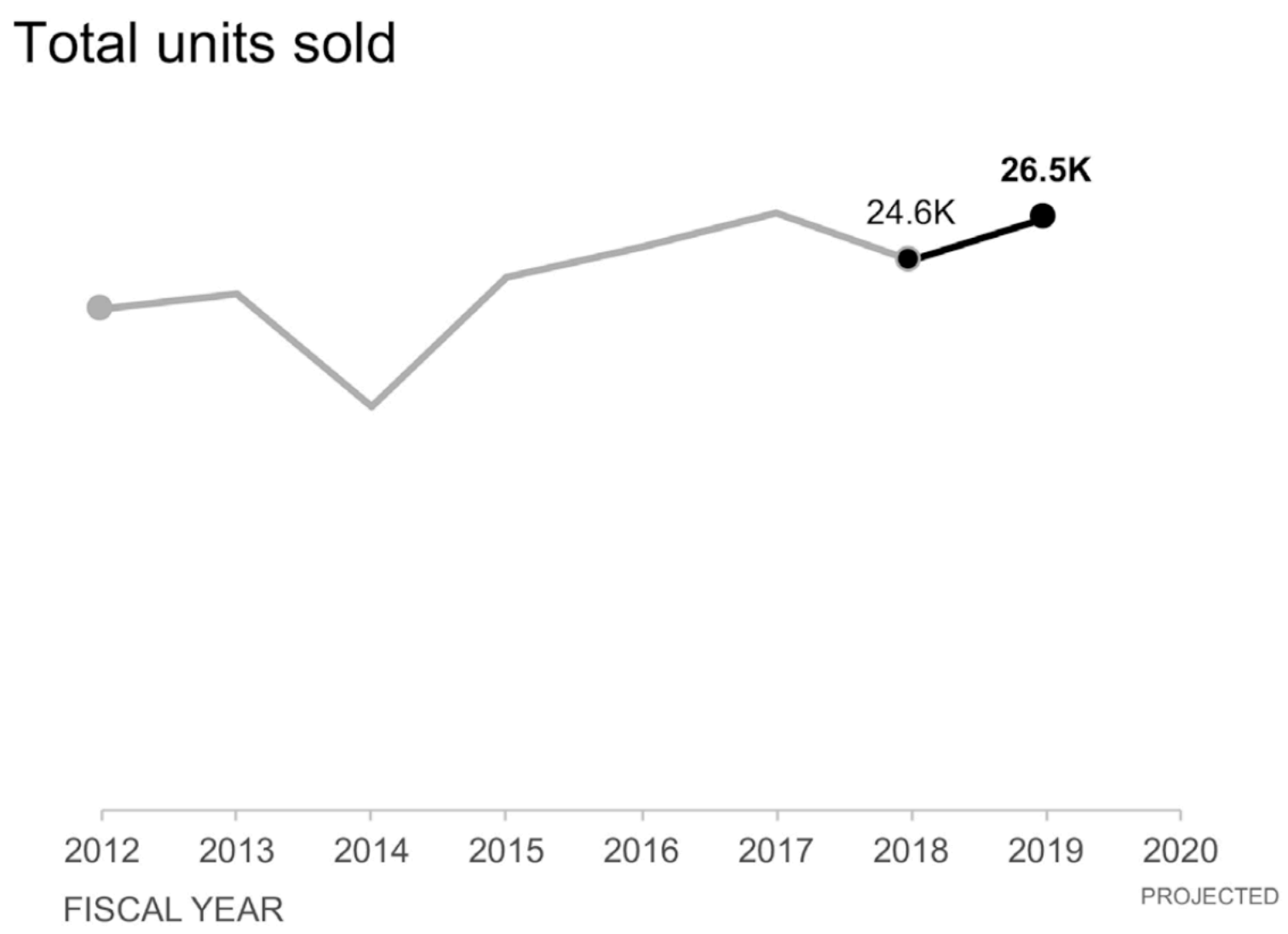
verbal with the (data) visual, example — temporal layering of spatial comparisons



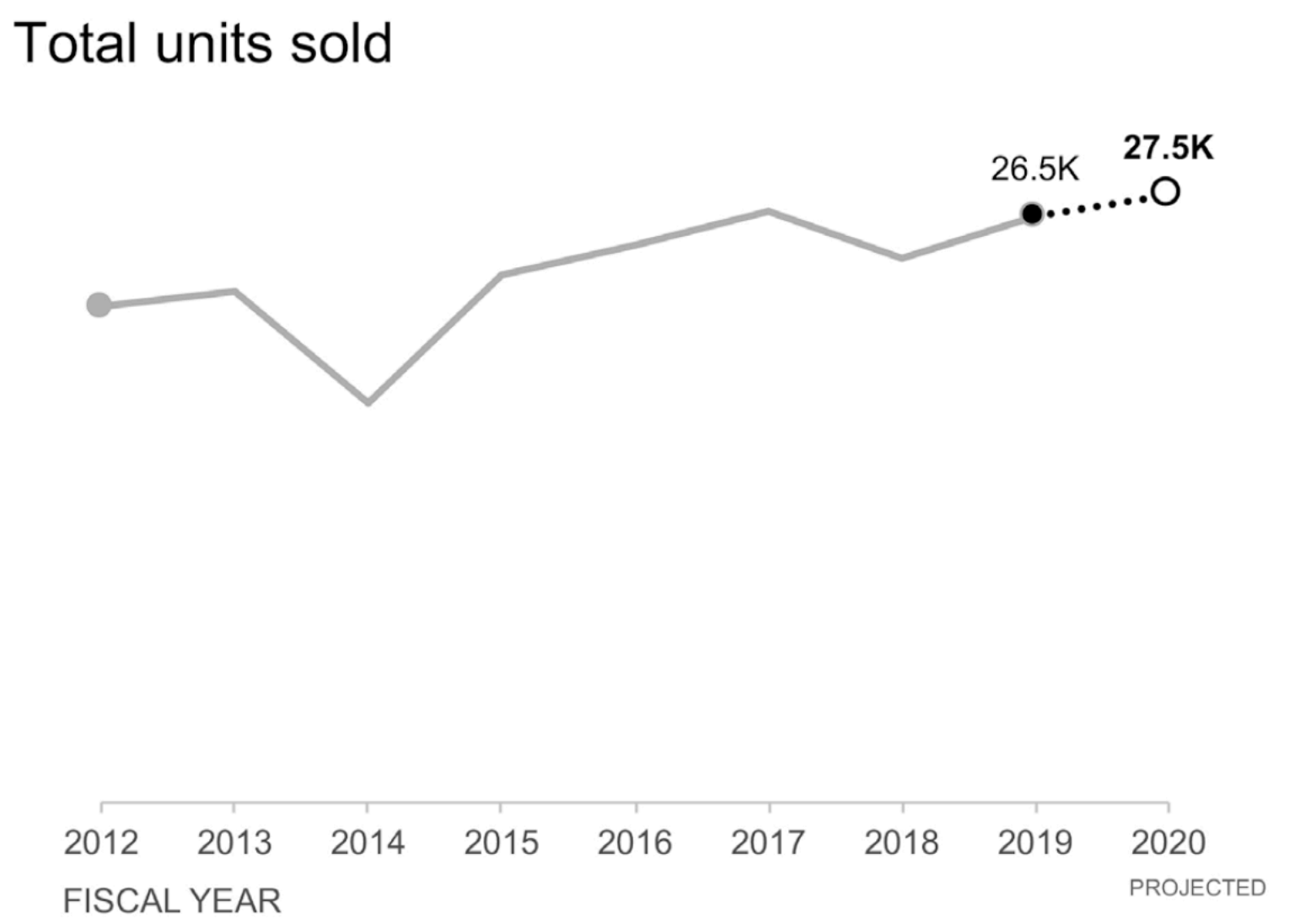
verbal with the (data) visual, example — temporal layering of spatial comparisons



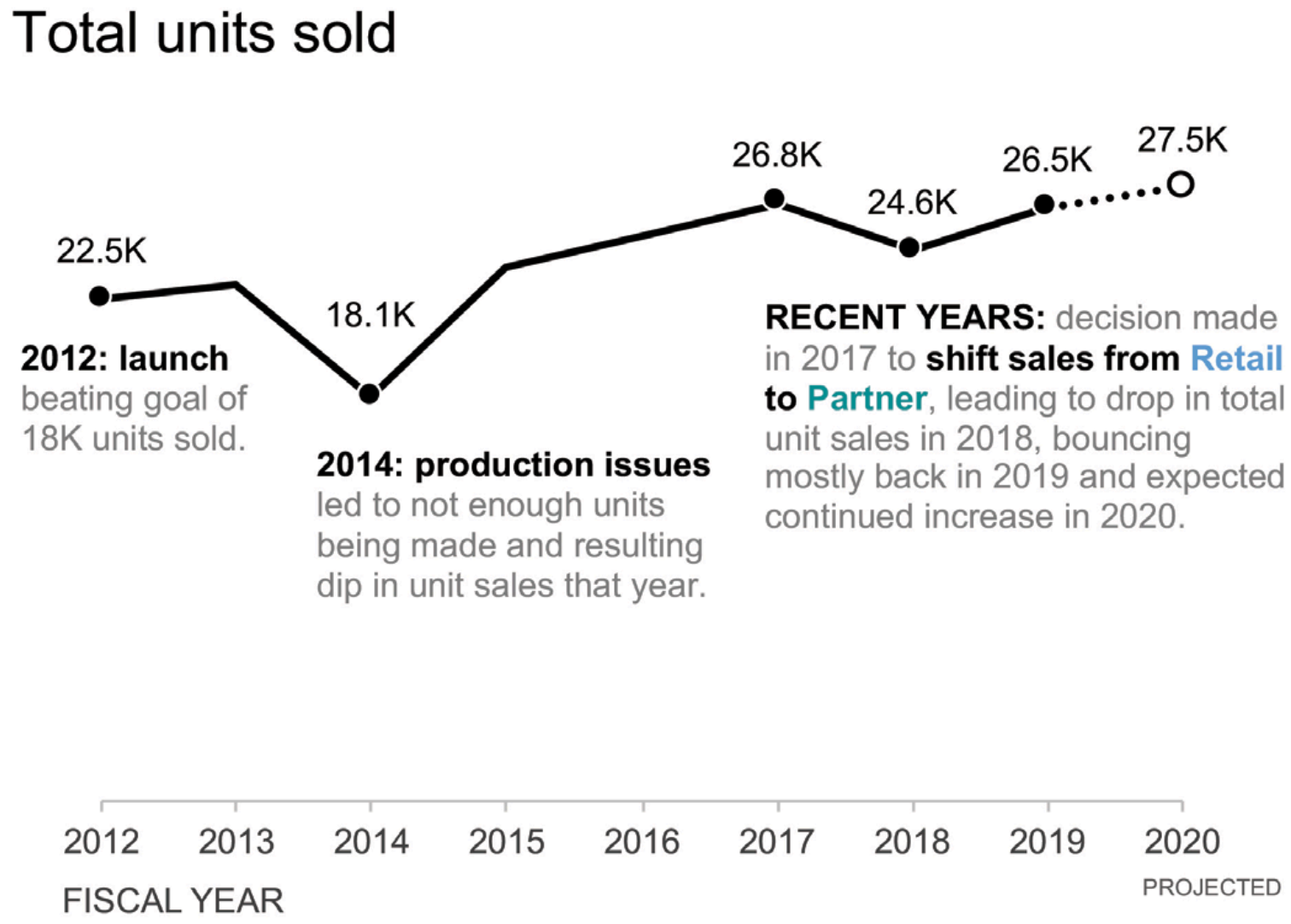
verbal with the (data) visual, example — temporal layering of spatial comparisons



verbal with the (data) visual, example — temporal layering of spatial comparisons



verbal with the (data) visual, example — possible stand-alone version



verbal with the (data) visual, recall, comparisons convey meaning

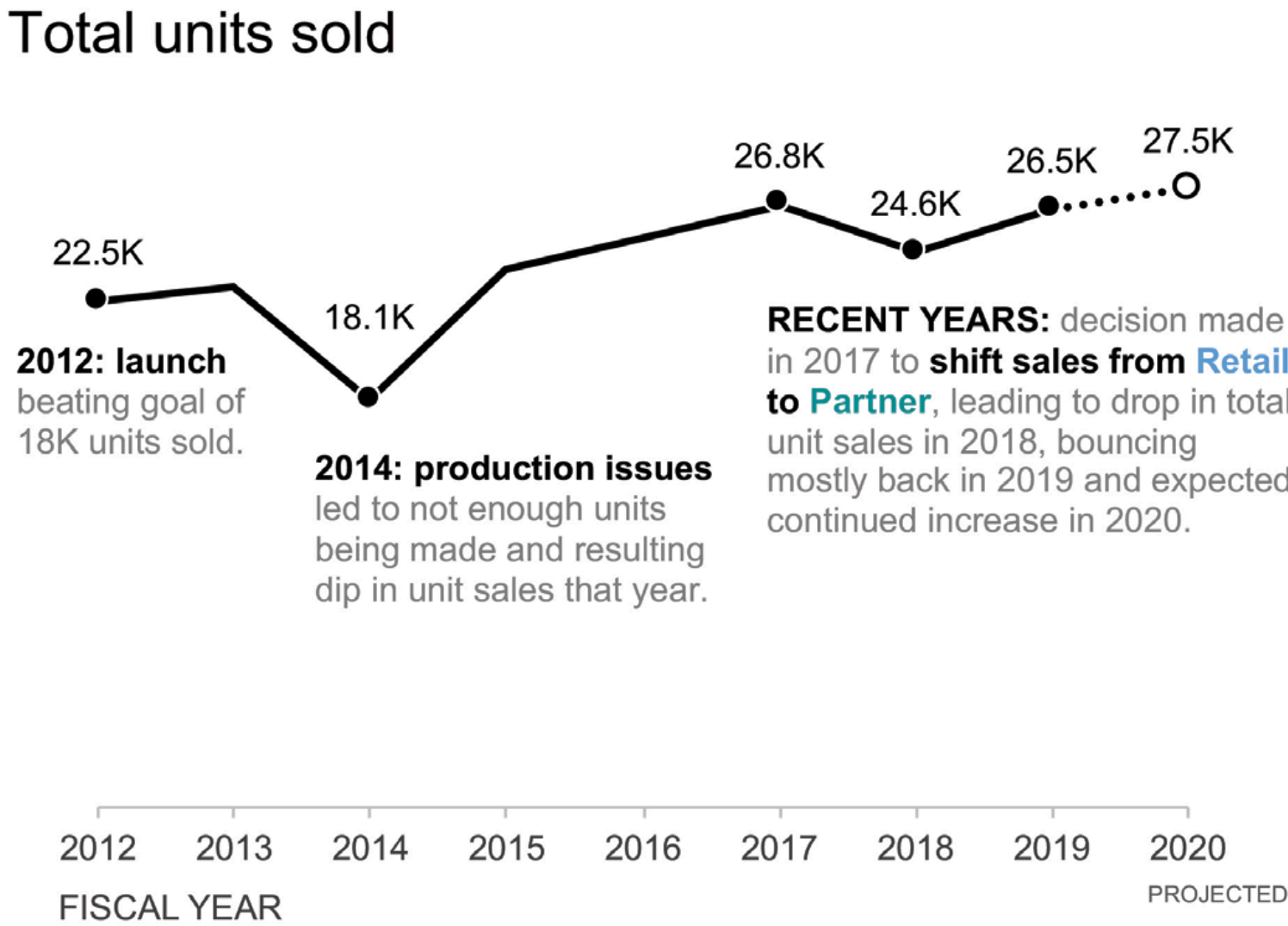
The idea of comparison is crucial. To make a point that is at all meaningful, statistical presentations must refer to differences between observation and expectation, or differences among observations.

— Abelson, Robert, *Statistician, Professor*

The fundamental analytical act in statistical reasoning is to answer the question ‘Compared with what?’

— Tufte, Edward, *Statistician, Professor, Data Visualization Expert*

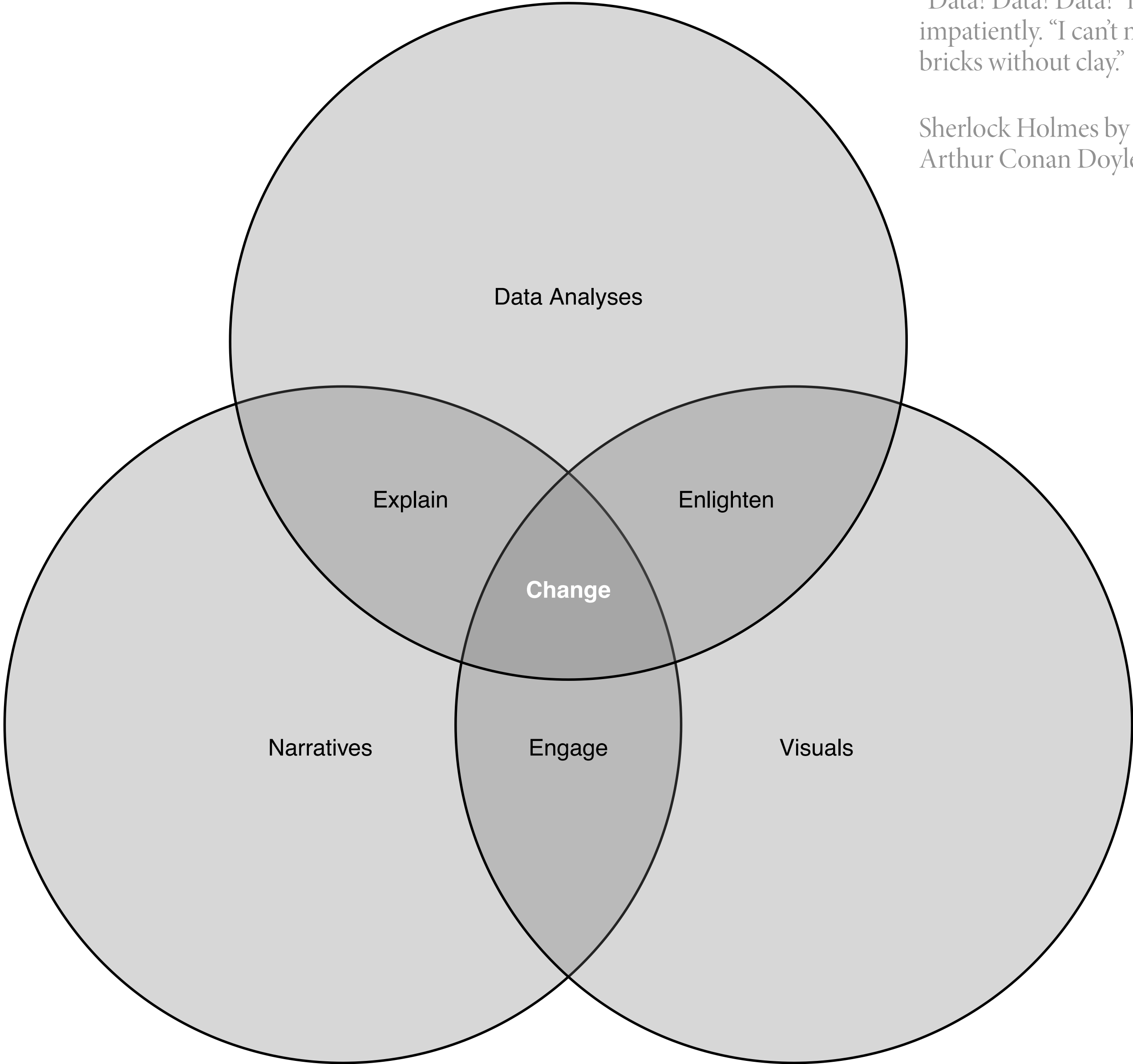
verbal with the (data) visual, time is just one example of layering into a data graphic comparisons between things



storytelling with data, from where we began

“Data! Data! Data!” he cried impatiently. “I can’t make bricks without clay.”

Sherlock Holmes by Sir Arthur Conan Doyle, *author*



No one ever made a decision because of a number. They need a story.

Daniel Kahneman, *psychologist, behavioral economist, and author*

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

John W Tukey, *mathematician*

resources

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supplemental

verbal with the (data) visual, temporal layering of spatial comparisons

example two

Back-to-school shopping survey results

STORE OFFERS...	% FAVORABLE	
	Our store	All stores
The store is well-organized.	40%	38%
Fast and easy checkout.	33%	34%
Friendly and helpful employees.	45%	50%
Good promotions.	45%	65%
I can find what I'm looking for.	46%	55%
I can find the size I need.	39%	49%
A nice atmosphere.	80%	70%
Latest technology for easy shopping.	35%	34%
Lowest sales prices.	40%	60%
A wide selection.	49%	47%
Items I can't find elsewhere.	74%	54%
The latest styles.	65%	55%

Let's **invest** in employee training to
improve the in-store customer experience

Back-to-school shopping accounts for

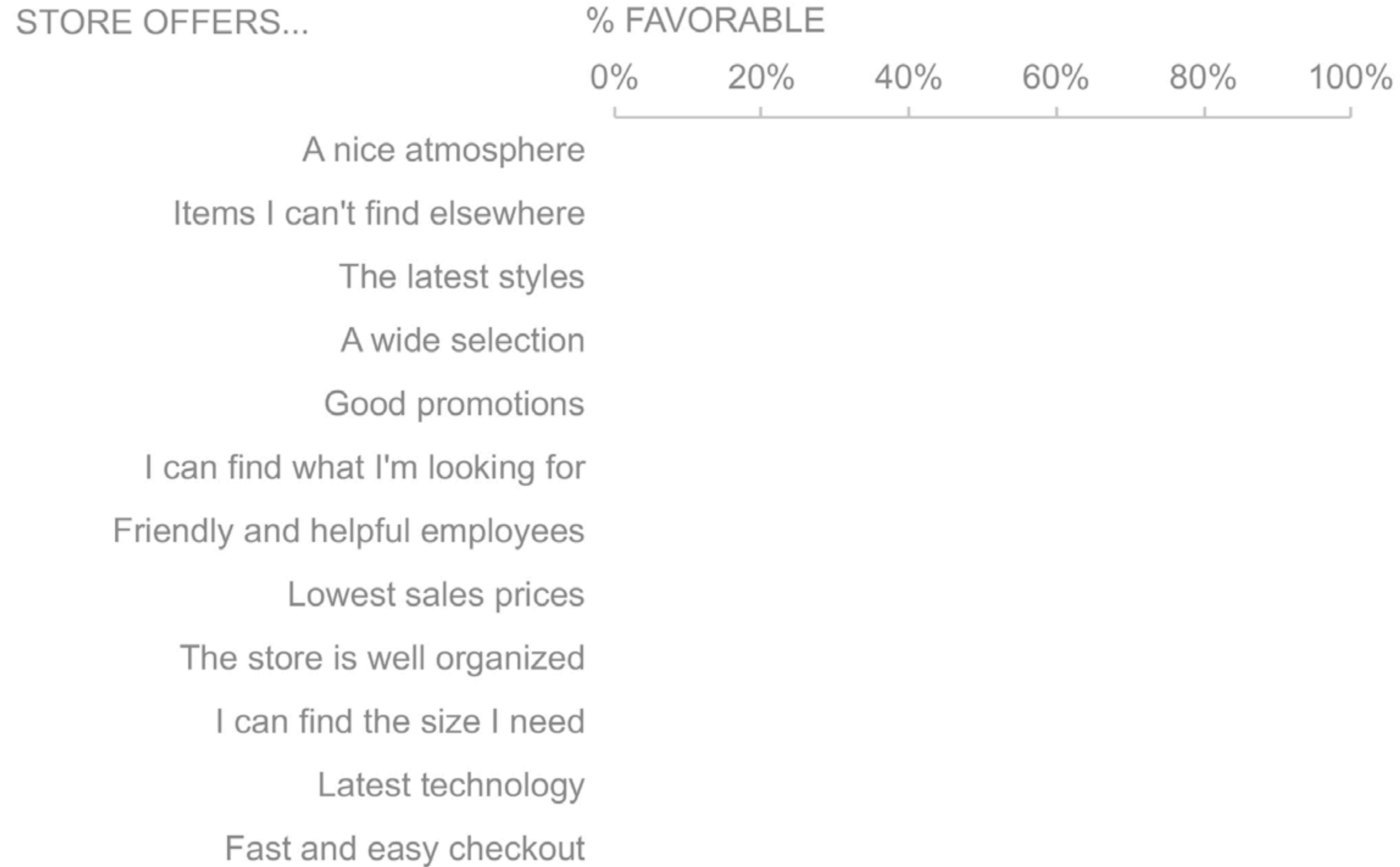
30%

of our annual revenue. Because of this, it is a huge driver of our overall annual success.

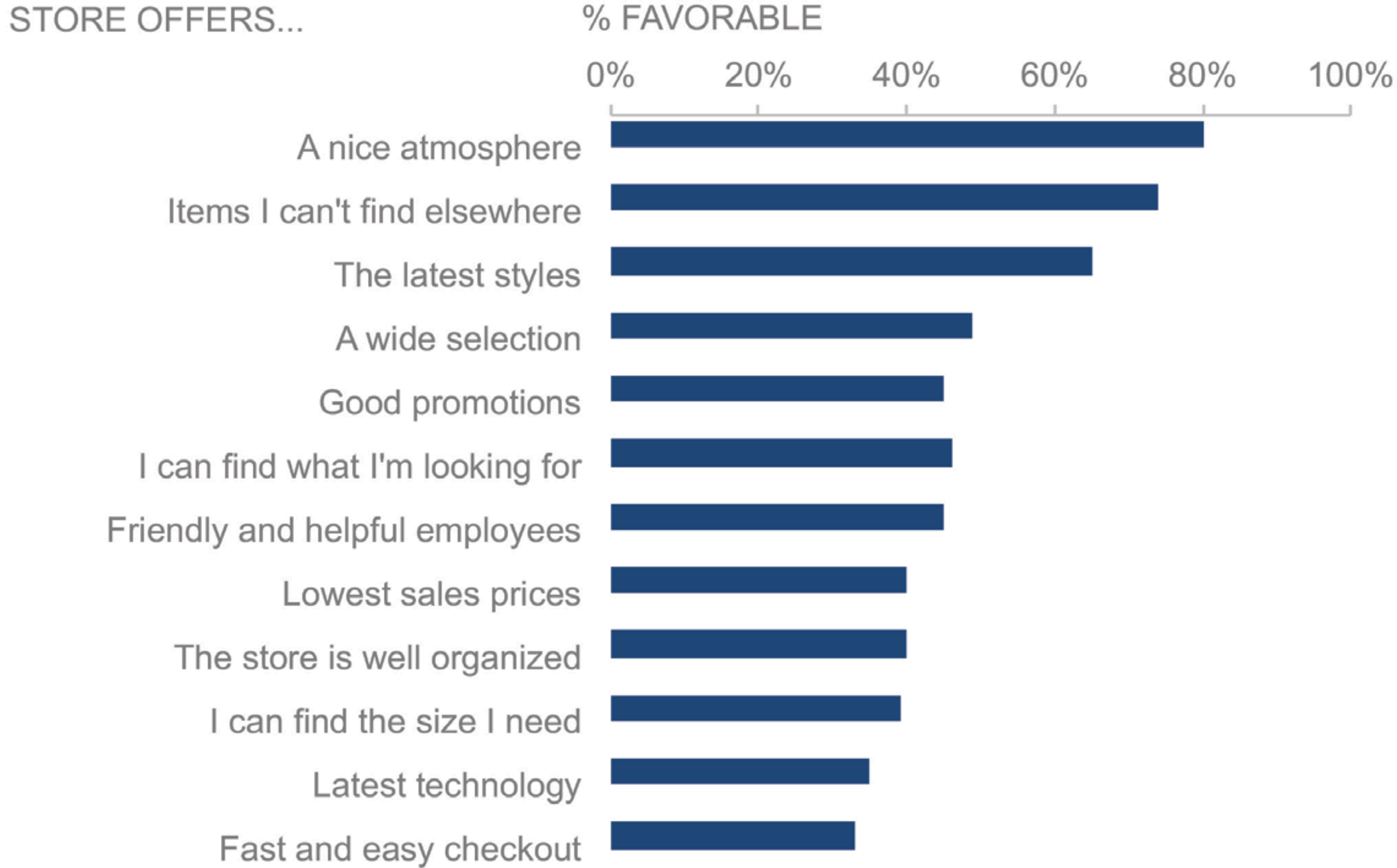
What we'll cover today

- 1 Discuss what we've learned**
from our survey analysis¹ and
- 2 Suggest specific recommendations**
on changes to make for the upcoming back-to-school shopping season to improve customer satisfaction and increase sales.

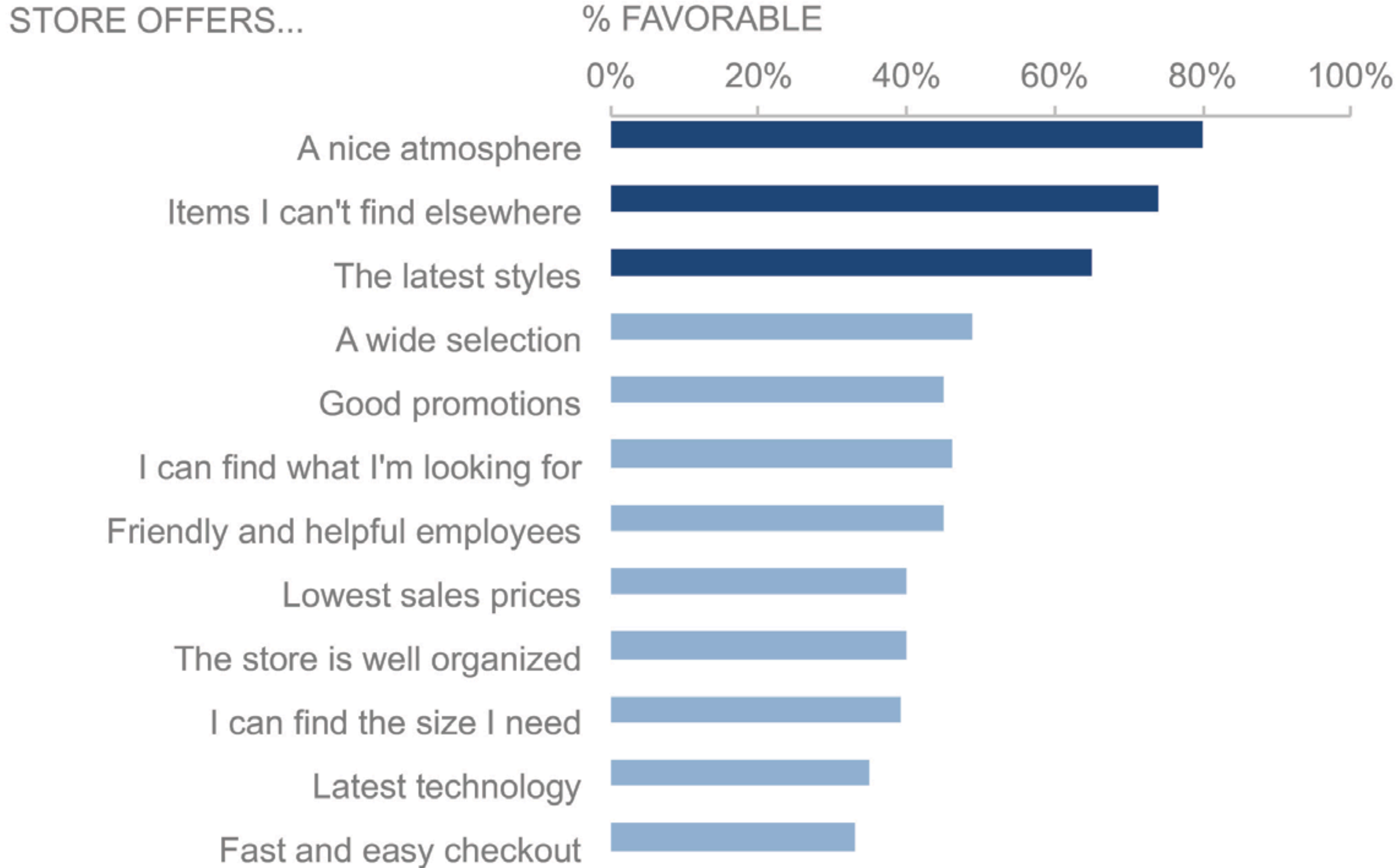
Back-to-school shopping: **consumer sentiment**



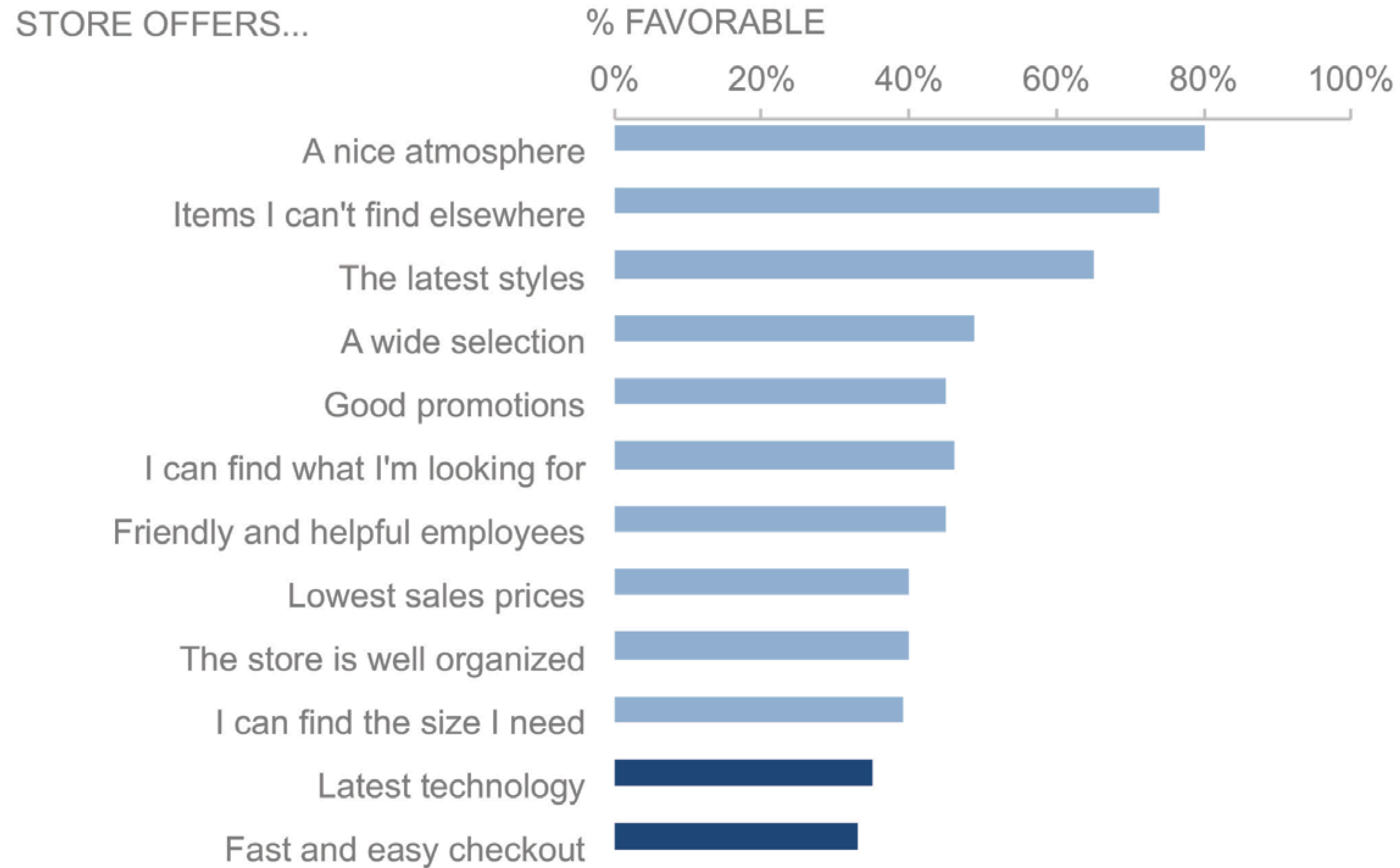
Back-to-school shopping: **consumer sentiment**



Back-to-school shopping: **consumer sentiment**



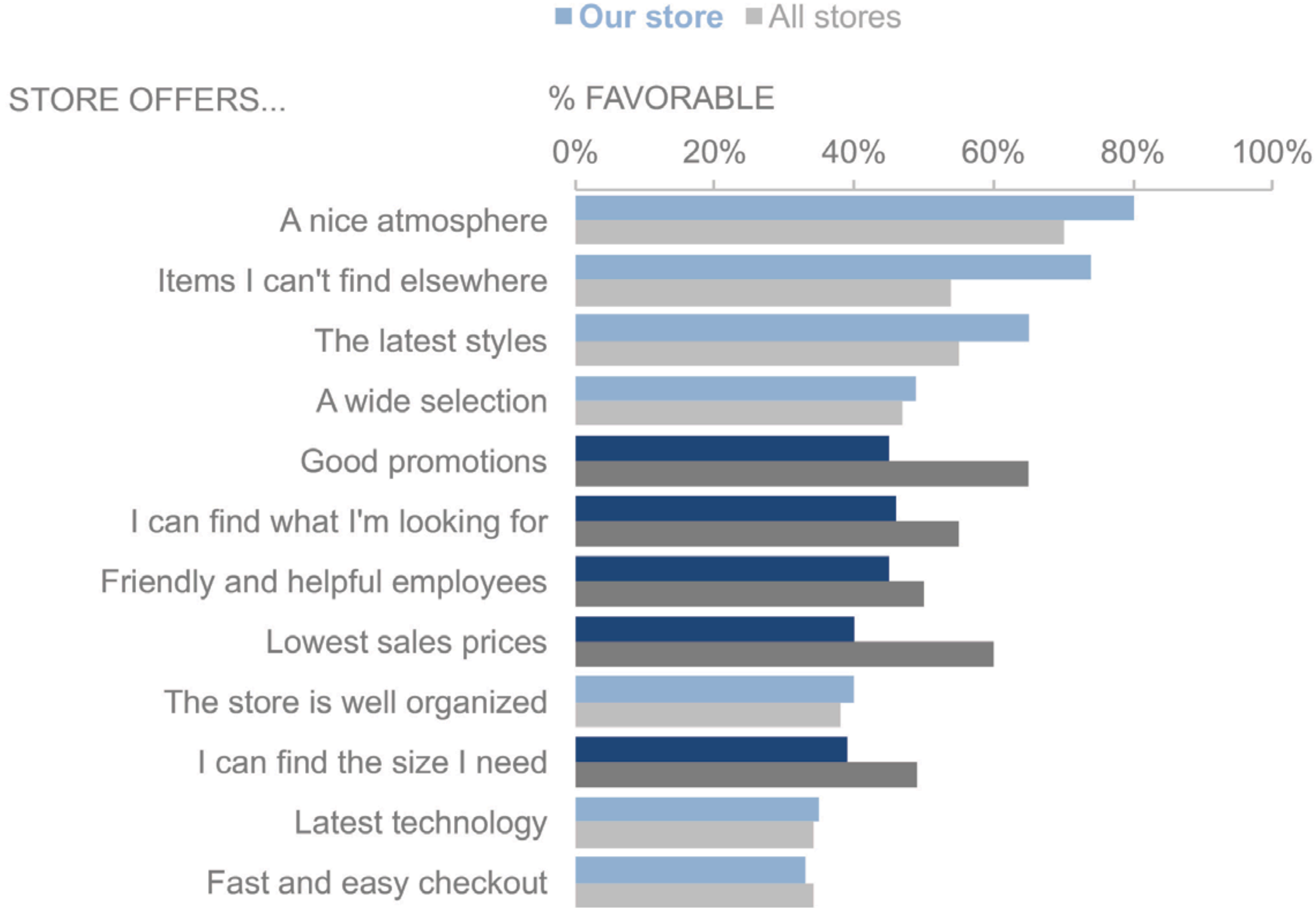
Back-to-school shopping: consumer sentiment



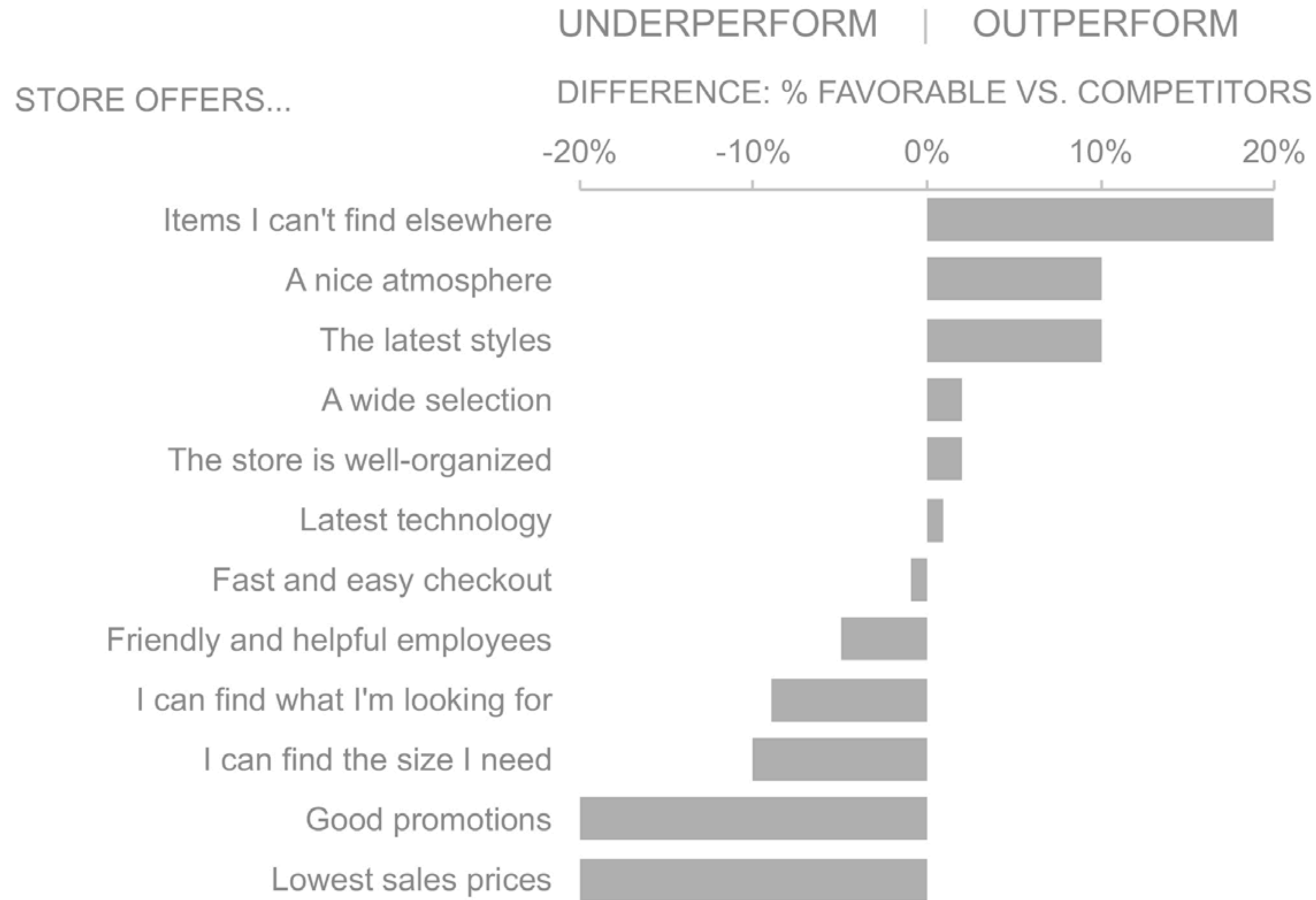
Back-to-school shopping: **consumer sentiment**



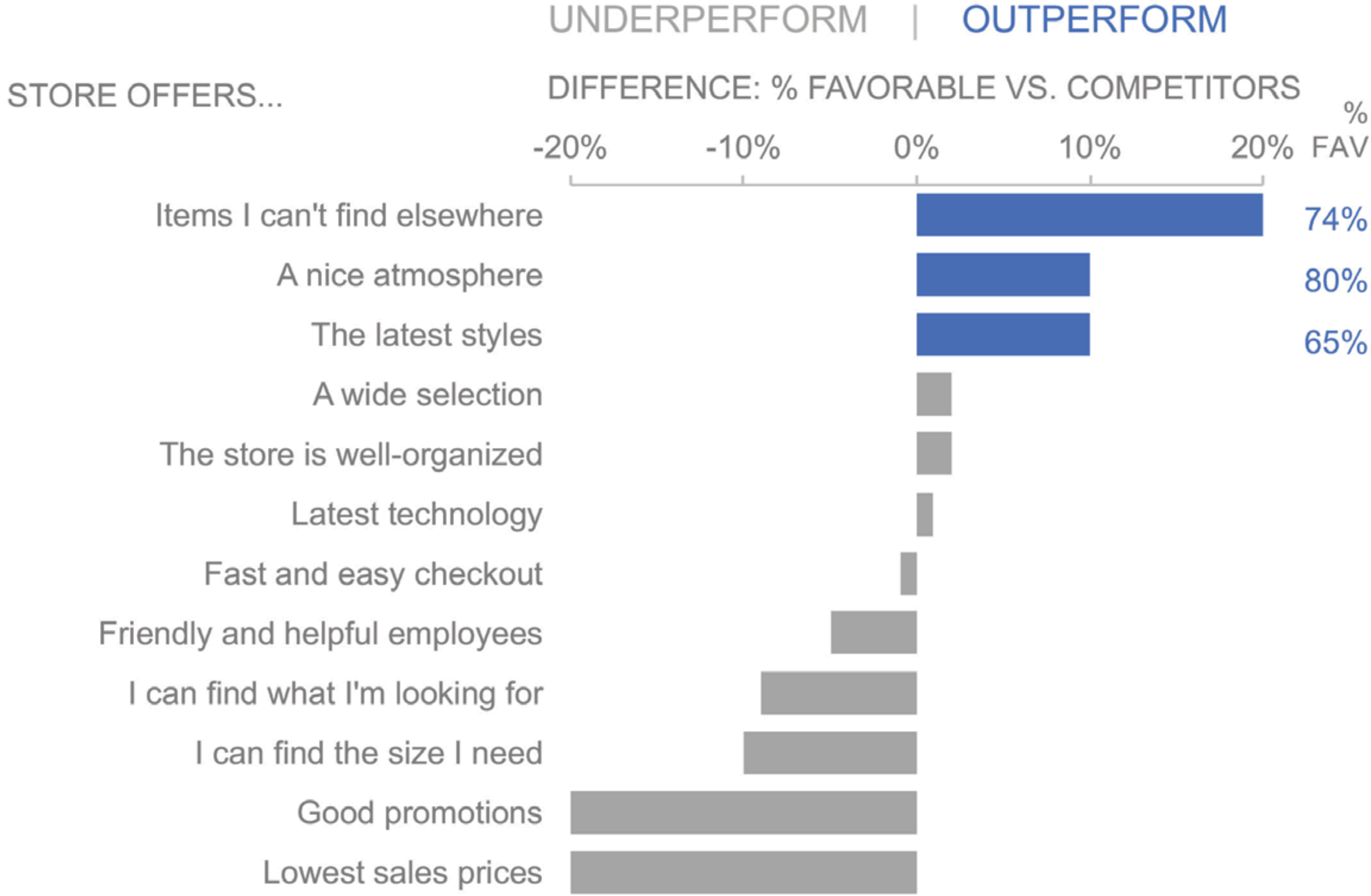
Back-to-school shopping: **consumer sentiment**



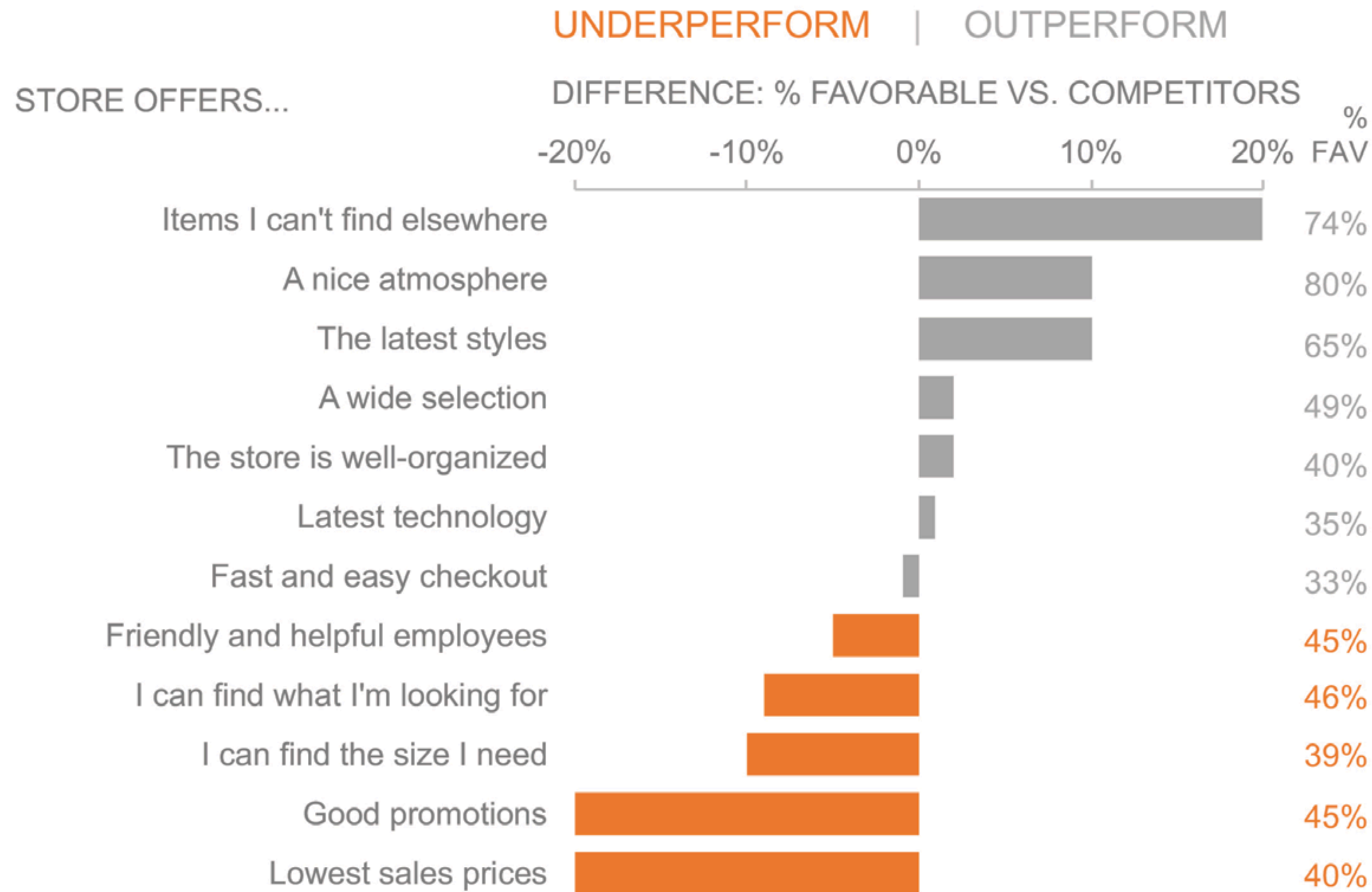
Back-to-school shopping: **consumer sentiment**



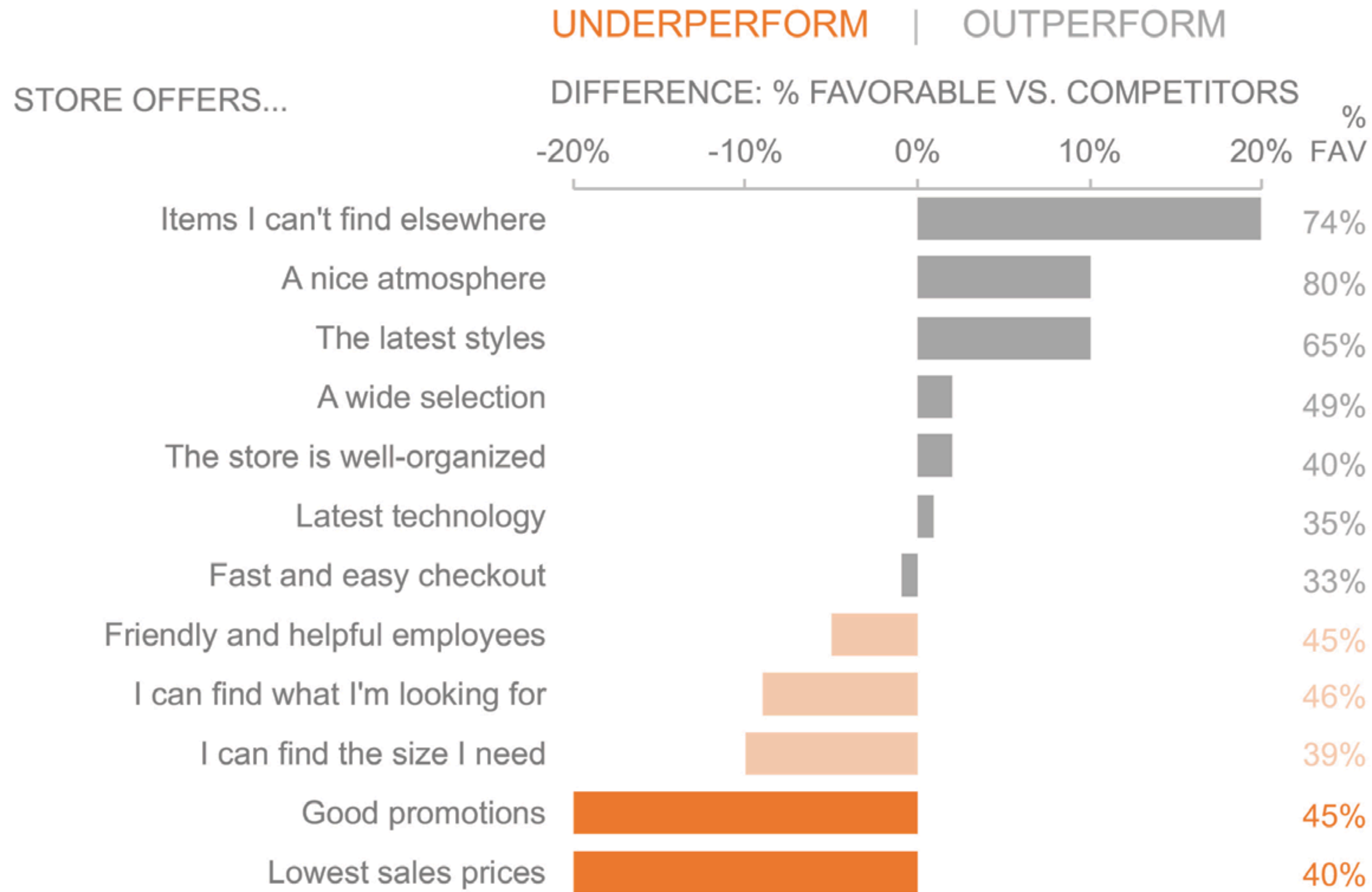
Back-to-school shopping: consumer sentiment



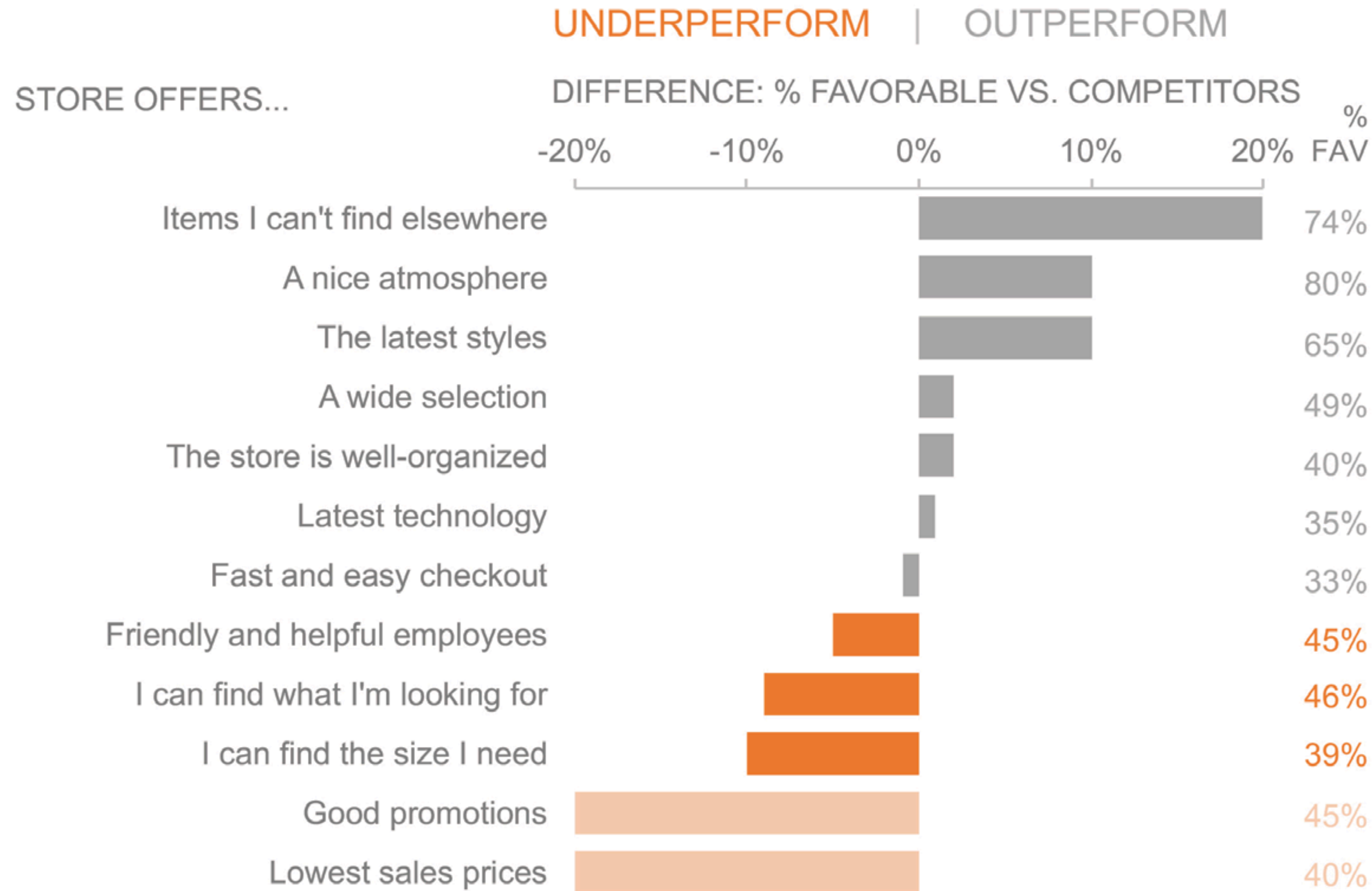
Back-to-school shopping: **consumer sentiment**



Back-to-school shopping: consumer sentiment



Back-to-school shopping: consumer sentiment



Let's **invest** in employee training to
improve the in-store customer experience