



Making Paginated Reports More Accessible

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BI & analytics for 15 years
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About Me



**Accessible
Reports**

**Do you incorporate
accessibility into
your normal
paginated report
design process?**

Common response:

“No one in my audience is disabled.”

Are you sure?

**1 in 4 adults in the US
has some type of
disability.**

**There is an employment
gap of about
41 percentage points
between adults with
disabilities and those
without in the US.**

Common response:

**“But that’s not
the people I
work with.”**

**How do
you
know?**

30% of college-educated employees working full time in white-collar jobs have some kind of disability.

Common response:

**“But no one has
ever asked for an
accommodation.”**

**Why force
them to?**

**More than 1/3 of those
with disabilities have
experienced discrimination
or negative bias in the
workplace.**

39% of employees with disabilities tell their manager

24% tell their team

21% tell Human Resources



**Accessible
Reports**

You are excluding a portion of your audience if you wait for someone to request an accommodation.



**Accessible
Reports**

**What comes to
mind when I say
accessible data
visualization?**

More Than Just Color Blindness



Accessible Reports



Visual

Low vision: 30%
Color blind: < 4%



Motor

Motor
impairment: 13%



Cognitive

Cognitive
disability: 11%
AD[H]D: 9%

Important Design Attributes

 Keyboard interactivity and navigation

 Color

 Shape

 Alt Text

 Explanatory Text

 Titles



**Accessible
Reports**



**Accessible
Reports**

**Accessible design is achieved
by increasing awareness
about how people consume
information, then
incorporating small changes
into your design habits**

Accessible Design Guidelines



Web Content Accessibility Guidelines (WCAG) 2.1

Section 508 of the Rehabilitation Act (aligns with WCAG)

Requires access for both members of the public and federal employees to technologies when **developed, procured, maintained, or used** by federal agencies.

Many state agencies adhere to 508 standards!

Web Content Accessibility Guidelines



Guideline 1.4 – Distinguishable



1.4.1 Use of Color



Level A: Color is not used as the only visual means of conveying information...or distinguishing a visual element.

Current Year Sales By Product

Product	CY Sales
Dog Treats	10,250
Dog Food	8,325
Dog Toys	5,336

Current Year Sales By Product

Product	CY Sales	YoY Sales
Dog Treats	10,250	▲
Dog Food	8,325	▲
Dog Toys	5,336	▼

Example WCAG success criteria



A mechanism is available for identifying specific definitions of words or phrases used in an unusual or restricted way, including idioms and jargon

 [Glossary](#)

CY Sales By Product

Products	Rev
Trts	10,250
Fd	8,325
Toy	5,336

Current Year Sales \$ By Product

Product	Sales USD
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Cognitive Accessibility



**Cognitive
Accessibility**

**Remove distractions
and reduce the effort
it takes to consume
information from
your visuals.**

Cognitive Load

Information processing requires brain power

Working memory is limited

Be intentional about the information you present



Types of Cognitive Load



Intrinsic: complexity of the information itself

Germane: the effort a person must expend to learn a new topic

Extraneous: the way the material is presented

Perceived: How hard users think they will have to work to get information

Your data visualization design choices always affect extraneous and perceived cognitive load!

Affordances



Use **existing knowledge** and **consistent design** to make it **obvious** how users should interact with your data visualization.

Affordances in Paginated Reports:

Affordances reduce extraneous cognitive load!

Consistent color palette

Consistent formatting of text and visuals

Chart types (e.g. bar charts) that are easy to interpret

Design Attributes for Cognitive Accessibility



**Cognitive
Accessibility**

Chart titles

Text boxes and captions

Tooltips

Navigation and interactivity

Usage guides

Explanatory Text



Do not be afraid to add text boxes and captions!

Provide summary of message/findings

Explain how to use the report

Explain how to interpret a chart

Jargon and Acronyms



Replace or define jargon and acronyms within the report.

 [Glossary](#)

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Cognitive Accessibility Tips



Cognitive Accessibility

Make information obvious - avoid overly complicated graphs

Minimize distractions and provide simple, consistent user interfaces

Use clear, easy to read typeface

Avoid overly complex language, jargon, or acronyms

Avoid animation or sound that auto-plays



Screen reader tips

Screen reader tips

Alt text via tooltips

The rendering engine sets reading order by sorting Y, then X coordinates

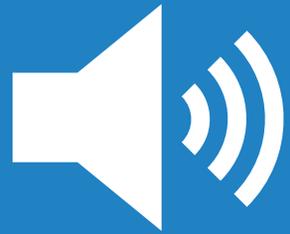
Set structure type in tables and matrixes

Set heading type in text boxes

Export accessible PDFs

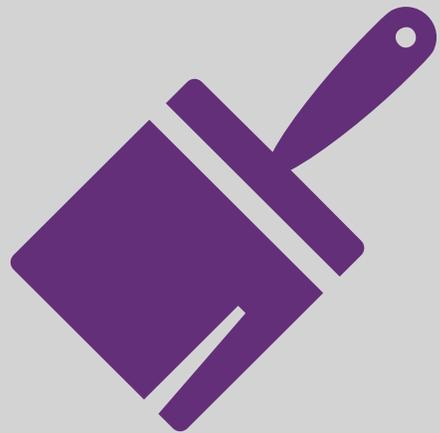


**Screen
reader
tips**



**Screen
reader
tips**

Demo: Narrator



Use of Color

Color contrast

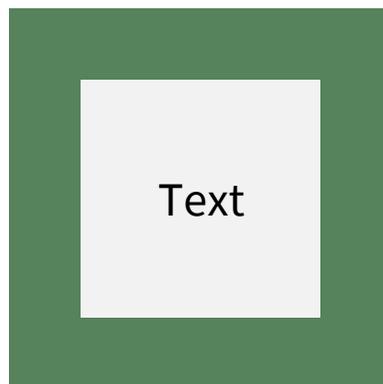
WCAG color contrast is based upon relative luminance

Luminance is the relative brightness in a color space normalized to 0 for black and 1 for white.

Different criteria for text vs non-text objects and different sizes



Color



Color Contrast in Text



Here is some text

Here is more text

Can you read this?

How about this?

Dark text on light background

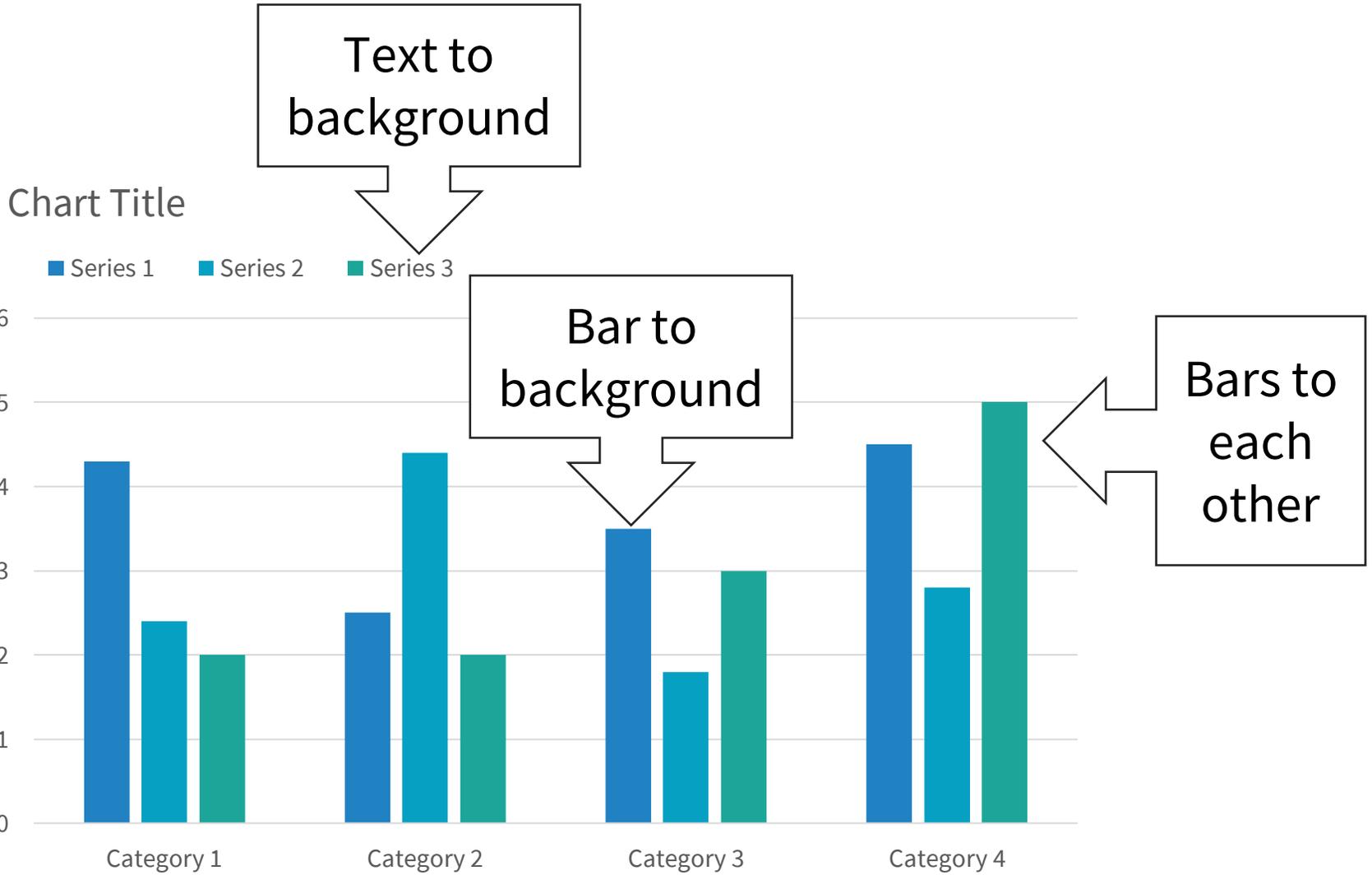
Light text on dark background

Purple/white background: 9.5:1

Blue/gray background: 2.3:1

Black text/white background: 21:1

Charts Color Contrast



WCAG Color Contrast



Text smaller than 18 pt or 14 pt bold: 4.5:1

Text 18 pt/14 pt bold or larger: 3:1

Graphical objects and UI components: 3:1

A mathematical formula is used by tools to calculate contrast

Color Contrast Calculators



My text color is #56835B at 18 px and regular weight

My background color is #F2F2F2

My design must be AA compliant

Fails AA

Required contrast ratio: 4.5

Your contrast ratio: 3.91

Lorem ipsum dolor sit
amet, consectetur
adipiscing elit, sed do...

Passes AA

if you change background
color to #0A0A0A

New contrast ratio: 4.52

Lorem ipsum dolor sit
amet, consectetur
adipiscing elit, sed do...

or

Passes AA

if you change text color to
#4F7854

New contrast ratio: 4.52

Lorem ipsum dolor sit
amet, consectetur
adipiscing elit, sed do...

Contrast Analyzers



Desktop tools:

[Accessibility Insights](#)

[TPGi Colour Contrast Analyser](#)

Web tools:

<https://accessible-colors.com/>

<https://whocanuse.com/>

Color contrast analyzer

This color contrast analyzer checks for color contrast ratios and measures them against the WCAG AA guidelines. [Learn more about analyzing color contrast.](#)

Auto detect contrast ratio Off
Auto-detection allows you to evaluate color contrast ratios by hovering over an element or setting the keyboard focus on it.

Color 1 #939393

Color 2 #FFFFFF

Ratio
3.072:1

Result	Element
! Fail	Regular text Requires a ratio of at least 4.5:1 (WCAG 1.4.3) <div style="display: flex; justify-content: space-around;">The quick brown foxThe quick brown fox</div>
✓ Pass	Large text (14 pt. bold or 18 pt. regular) Requires a ratio of at least 3:1 (WCAG 1.4.3) <div style="display: flex; justify-content: space-around;">The quick brown foxThe quick brown fox</div> <div style="display: flex; justify-content: space-around;">The quick brown foxThe quick brown fox</div>
✓ Pass	Graphical objects and UI components Requires a ratio of at least 3:1 (WCAG 1.4.11) New for WCAG 2.1 <div style="display: flex; justify-content: space-around;">✓<input type="checkbox"/><input type="checkbox"/></div>



Color

Demo: Accessibility Insights



Color

Demo: Chrome Developer Tools

Colorblindness

More properly termed color vision deficiency (CVD)

Inability to distinguish red, green, or blue light

Affects around 1 in 12 men and 1 in 200 women worldwide



Color



Problematic Color Combinations



Green & Red

Light Green & Yellow

Green & Brown

Blue & Grey

Blue & Purple

Green & Grey

Green & Blue

Green & Black

Simulating Colorblindness



Planning colors:

[Adobe Color](#)

[ColorHexa](#)

Checking after creation:

[Edge/Chrome developer tools](#)

[Coblis](#)

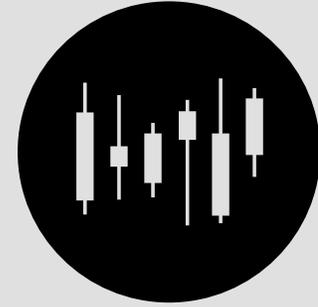


Color

Demo: Chrome Developer Tools

Meagan Longoria

**Thanks for
learning
about
accessible
paginated
reports**



**Data
Savvy**



DataSavvy.me



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