

DESIGN STANDARDS & BEST PRACTICES GUIDE

Data Visualization and Dashboard Design



Project: DAR Assignment 6

Date: December 30, 2024

Purpose: Establish visualization standards and best practices

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1. Introduction

This guide documents the design standards and best practices applied throughout the data reporting solution. It serves as a reference for maintaining consistency and quality in future visualization projects.

1.1 Objectives

- Ensure visual consistency across all reports
- Improve data comprehension and insights
- Maintain accessibility standards
- Optimize user experience
- Enable efficient dashboard development

1.2 Scope

This guide covers:

- Color theory and palettes
- Typography standards
- Layout principles
- Chart selection methodology
- Accessibility requirements
- Performance optimization

2. Color Theory and Palette

2.1 Primary Color Palette

Business Intelligence Colors:

- Primary Blue: #3498db (used for main metrics, sales data)
- Success Green: #2ecc71 (positive indicators, profit)
- Warning Orange: #f39c12 (alerts, attention items)
- Danger Red: #e74c3c (negative indicators, losses)
- Neutral Gray: #95a5a6 (supporting information)

Rationale: These colors provide clear visual distinction while maintaining professional appearance. Blue conveys trust and stability, green indicates positive performance, orange draws attention without alarm, and red signals critical issues.

2.2 Secondary Colors

Supporting Palette:

- Light Blue: #5dade2
- Dark Blue: #2874a6
- Light Green: #58d68d
- Dark Green: #229954
- Light Gray: #bdc3c7
- Dark Gray: #566573

Usage: Secondary colors provide variation within charts while maintaining color family consistency.

2.3 Color Application Rules

Data Visualization:

- Use blue for quantitative measures (sales, revenue)
- Use green for profit and positive metrics
- Use red-green diverging for comparison (avoid for accessibility)
- Limit to 5-7 colors per visualization
- Maintain sufficient contrast ratios

Dashboard Background:

- Primary: White (#ffffff)
- Secondary: Light gray (#f8f9fa)
- Card backgrounds: #f0f2f6
- Borders: #dee2e6

2.4 Accessibility Compliance

WCAG 2.1 AA Standards:

- Minimum contrast ratio 4.5:1 for text
- Never rely solely on color to convey information
- Provide patterns or labels in addition to colors
- Test with colorblind simulation tools
- Include alternative text for charts

Colorblind-Safe Palettes:

- Primary: Blue-Orange (deutanopia safe)
- Alternative: Purple-Green (protanopia safe)
- Avoid: Red-Green combinations for critical data

3. Typography Standards

3.1 Font Families

Primary Font: Arial, Helvetica, sans-serif

- Clean, professional appearance
- Excellent readability across devices
- Universally available

Alternative: Segoe UI (Windows), San Francisco (Mac)

- System fonts for native appearance
- Optimal performance

Monospace: Courier New (for data tables and numbers)

- Aligns numerical data properly
- Clear distinction of individual characters

3.2 Font Sizes

Hierarchy:

- Dashboard Title: 24-28px, Bold
- Section Headers: 18-20px, Semi-Bold
- Chart Titles: 16-18px, Bold
- Axis Labels: 12-14px, Regular
- Data Labels: 11-13px, Regular
- Tooltips: 10-12px, Regular
- Footer Text: 10px, Regular

Rationale: Clear hierarchy guides user attention and improves scanability.

3.3 Text Formatting

Rules:

- Use sentence case for titles (not ALL CAPS)
- Bold for emphasis, not underline
- Italic for supporting information
- Consistent alignment (left for text, right for numbers)
- Adequate line spacing (1.4-1.6 for body text)

Number Formatting:

- Currency: \$1,234.56
- Large numbers: \$1.2M or \$1,234K

- Percentages: 12.5%
- Dates: Dec 30, 2024 or 2024-12-30
- Time: 24-hour format or AM/PM with clarity

4. Layout and Composition

4.1 Dashboard Grid System

Structure:

- 12-column grid for flexibility
- Consistent gutters (15-20px)
- Responsive breakpoints for different screen sizes
- Vertical rhythm for element spacing

Page Layout:

- Header: 60-80px height
- Sidebar: 250-300px width (if used)
- Content area: Flexible
- Footer: 40-60px height
- Margins: 20-40px on all sides

4.2 Visual Hierarchy

Priority Order:

1. Key Performance Indicators (KPIs) at top
2. Primary visualizations in central area
3. Supporting charts below or on sides
4. Detailed tables at bottom
5. Filters and controls in sidebar or top

Information Density:

- Avoid cramming too many elements
- White space is valuable (30-40% of layout)
- Group related information
- Maintain consistent spacing between elements

4.3 Chart Sizing Guidelines

KPI Cards:

- Height: 100-150px
- Width: 200-300px
- Display 1-2 metrics per card

Standard Charts:

- Minimum height: 300px

- Optimal height: 400-500px
- Width: Full column or half-width
- Maintain aspect ratio for readability

Tables:

- Maximum visible rows: 15-20 without scrolling
- Column width: Auto-adjust to content
- Fixed headers for long tables

4.4 Responsive Design

Breakpoints:

- Desktop: 1200px and above
- Tablet: 768px to 1199px
- Mobile: Below 768px

Adaptations:

- Stack columns vertically on mobile
- Reduce chart heights on smaller screens
- Simplify visualizations for mobile
- Collapsible sections for space saving

5. Chart Selection Methodology

5.1 Chart Type Decision Tree

Comparison:

- Few items (2-7): Bar chart
- Many items (8+): Horizontal bar chart
- Multiple categories: Grouped or stacked bar
- Part-to-whole: Pie chart or treemap

Distribution:

- Single variable: Histogram
- Multiple variables: Box plot
- Correlation: Scatter plot
- Three variables: Bubble chart

Trend Over Time:

- Single series: Line chart
- Multiple series: Multi-line or area chart
- Composition over time: Stacked area chart
- Discrete periods: Bar chart

Relationship:

- Two variables: Scatter plot
- Many variables: Correlation matrix heatmap
- Hierarchical: Treemap or sunburst

Flow/Process:

- Linear process: Waterfall chart
- Complex flows: Sankey diagram
- Network: Network diagram

5.2 Chart Best Practices

General Rules:

- Start axes at zero (for bar charts)
- Use appropriate scales (linear, logarithmic)
- Remove chartjunk (unnecessary decorations)
- Direct labeling preferred over legends when possible
- Sort data logically (by value, alphabetically, or chronologically)

Line Charts:

- Maximum 5-7 lines for clarity
- Use different line styles (solid, dashed) if colors insufficient
- Highlight the most important line
- Show data points for small datasets

Bar Charts:

- Consistent bar widths
- Gaps between bars: 20-30% of bar width
- Horizontal bars for long labels
- Sort by value unless time series

Pie Charts:

- Limit to 5-6 slices maximum
- Start at 12 o'clock position
- Order slices from largest to smallest
- Consider alternatives (bar chart often better)

Tables:

- Right-align numbers
- Left-align text
- Use thousand separators
- Highlight key values
- Zebra striping for long tables

6. Interaction Design

6.1 Interactive Elements

Hover Effects:

- Tooltips appear within 200ms
- Include relevant context (metric name, value, date)
- Format numbers appropriately
- Avoid cluttered tooltips

Click Actions:

- Provide visual feedback (highlighting)
- Clear indication of clickable elements
- Consistent behavior across dashboard
- Breadcrumbs for navigation

Filters:

- Visible and accessible placement
- Clear labels and instructions
- Multi-select with checkboxes
- Apply/Reset buttons for complex filters
- Show current filter state

6.2 User Feedback

Loading States:

- Show loading indicators for operations over 1 second
- Progress bars for long operations
- Disable interactive elements during loading

Error Handling:

- Clear error messages
- Suggested actions for resolution
- Graceful degradation when possible

Success Confirmation:

- Subtle feedback for successful actions
- Avoid intrusive notifications
- Auto-dismiss after 3-5 seconds

7. Performance Optimization

7.1 Data Optimization

Aggregation:

- Pre-aggregate data at source when possible
- Use appropriate granularity for visualization
- Avoid loading unnecessary columns
- Implement pagination for large tables

Caching:

- Cache static or slowly-changing data
- Implement cache expiration policies
- Use browser caching for web dashboards

7.2 Rendering Optimization

Best Practices:

- Limit data points displayed (1000-2000 max per chart)
- Use sampling for very large datasets
- Implement virtualization for long lists
- Lazy load below-the-fold content
- Optimize image sizes and formats

Target Performance:

- Initial page load: Under 3 seconds
- Interaction response: Under 1 second
- Chart rendering: Under 2 seconds
- Filter application: Instant to 1 second

8. Accessibility Standards

8.1 Visual Accessibility

Requirements:

- Text contrast: Minimum 4.5:1 (AA) or 7:1 (AAA)
- Interactive elements: Minimum 44x44px touch target
- Focus indicators: Clear and visible
- Resizable text: Up to 200% without breaking layout

8.2 Keyboard Navigation

Implementation:

- All interactive elements keyboard accessible
- Logical tab order
- Skip links for long pages
- Keyboard shortcuts documented

8.3 Screen Reader Support

Guidelines:

- Alternative text for charts
- Descriptive link text
- ARIA labels for custom controls
- Semantic HTML structure
- Data tables with proper headers

9. Documentation Standards

9.1 Chart Annotations

Required Elements:

- Descriptive title
- Axis labels with units
- Legend (if needed)
- Data source
- Last updated date

9.2 Dashboard Documentation

Include:

- Purpose and audience
- Data sources and refresh frequency
- Filter descriptions
- Metric definitions
- Known limitations

11. Conclusion

These design standards provide a foundation for creating effective, accessible, and professional data visualizations. Consistent application of these principles ensures quality and usability across all reporting solutions.

Key Takeaways:

- Consistency builds trust and improves usability
- Accessibility is mandatory, not optional
- Performance directly impacts user satisfaction
- Simple, clear designs communicate better than complex ones
- User needs should drive all design decisions

THANK YOU



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