Data Analytics and Reporting (DAR) – Modular Assignment 6

Module 6: Data Reporting Tools

Duration: 4 hours

Problem Statement

Design and implement a comprehensive data reporting solution using multiple visualization tools and techniques. Create various types of graphs, charts, tables, dashboards, and interactive reports while demonstrating best practices for effective data communication.

You are required to build a complete reporting toolkit that showcases different visualization approaches, interactive features, and follows industry best practices for data presentation.

Data Sources

Use MULTIPLE datasets to demonstrate tool versatility:

Primary Business Datasets:

1. **Sales and Revenue Data**
    - Multi-year sales transactions
    - Product categories and hierarchies
    - Geographic sales distribution
    - Customer segments and demographics
    - Kaggle: Superstore, Global Sales datasets
2. **Operational Metrics**
    - Production/service delivery data
    - Quality metrics and defects
    - Resource utilization
    - Cost and efficiency measures
    - Kaggle: Manufacturing, Operations datasets
3. **Financial Performance**
    - Budget vs. actual data
    - Profitability analysis
    - Cash flow statements
    - Investment returns
    - Financial ratios and KPIs
4. **Customer Analytics**
    - Customer behavior patterns
    - Satisfaction surveys
    - Retention and churn metrics
    - Lifetime value calculations

- Support ticket analysis

Supplementary Data Sources:

- **Market Data**: Economic indicators, industry benchmarks
- **External APIs**: Weather, demographics, social media metrics
- **Time Series**: Stock prices, web traffic, IoT sensor data
- **Geospatial**: Location-based performance metrics

Assignment Requirements

Part A: Graphs and Charts Implementation (70 minutes)

Tasks: 1. **Statistical Charts** (25 minutes) - Create comprehensive chart library: - **Line Charts**: Time series trends, multiple series comparisons - **Bar Charts**: Categorical comparisons, grouped and stacked variants - **Histogram**: Distribution analysis, frequency charts - **Scatter Plots**: Correlation analysis, bubble charts for 3D data - **Box Plots**: Statistical distribution and outlier identification - Implement proper chart selection methodology - Add statistical annotations (trend lines, confidence intervals)

2. **Advanced Visualizations** (25 minutes)
    - Develop specialized charts:
        - **Heat Maps**: Correlation matrices, geographic data
        - **Tree Maps**: Hierarchical data representation
        - **Sankey Diagrams**: Flow and process visualization
        - **Radar Charts**: Multi-dimensional comparisons
        - **Waterfall Charts**: Sequential value changes
    - Create composite visualizations
    - Implement custom chart types for specific business needs
3. **Interactive Chart Features** (20 minutes)
    - Add interactivity elements:
        - Zoom and pan capabilities
        - Hover tooltips with detailed information
        - Click-through navigation
        - Dynamic filtering and brushing
        - Animation for temporal data
    - Implement responsive design for different screen sizes
    - Create chart export and sharing functionality

Expected Deliverables: - Comprehensive chart library with 15+ chart types - Interactive visualization examples - Chart selection methodology guide - Best practices documentation for each chart type

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Part B: Tables and Data Presentation (45 minutes)

Tasks: 1. **Advanced Table Design** (25 minutes) - Create multiple table variants: - **Summary Tables**: Aggregated metrics with subtotals - **Detailed Tables**: Transaction-level data with pagination - **Comparison Tables**: Side-by-side analysis - **Cross-tabulation**:

Pivot tables with multiple dimensions - **Conditional Formatting**: Heat maps, data bars, icons - Implement table sorting, filtering, and search - Add calculated columns and formulas

2. **Data Grid Enhancements** (20 minutes)
    - Develop interactive table features:
        - In-line editing capabilities
        - Expandable rows for detail views
        - Column grouping and freezing
        - Export to multiple formats (CSV, Excel, PDF)
        - Print-optimized layouts
    - Create responsive table designs
    - Implement accessibility features

Expected Deliverables: - Advanced table implementations with multiple styles - Interactive data grid with full functionality - Table design guidelines and accessibility standards - Export and print optimization examples

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Part C: Dashboards and Drill-Down Reports (90 minutes)

Tasks: 1. **Executive Dashboard Creation** (40 minutes) - Build comprehensive executive dashboard: - **KPI Summary Cards**: Key metrics with trend indicators - **Performance Gauges**: Progress toward targets - **Geographic Visualizations**: Maps with performance overlays - **Time-based Analysis**: Trend charts and seasonality - **Exception Reporting**: Automated alerts and notifications - Implement real-time data refresh - Create mobile-responsive layout

2. **Operational Dashboards** (30 minutes)
    - Design role-specific dashboards:
        - **Sales Dashboard**: Pipeline, forecasts, team performance
        - **Operations Dashboard**: Efficiency, quality, resource utilization
        - **Financial Dashboard**: Revenue, costs, profitability analysis
        - **Marketing Dashboard**: Campaign performance, ROI, attribution
    - Add user customization capabilities
    - Implement dashboard personalization
3. **Drill-Down Report System** (20 minutes)
    - Create hierarchical navigation:
        - Summary to detail progression
        - Cross-functional drill-through
        - Historical trend analysis
        - Comparative views across dimensions
    - Implement breadcrumb navigation
    - Add bookmarking and sharing features

Expected Deliverables: - Multiple dashboard types with full functionality - Drill-down report system with navigation - Mobile-responsive design implementations - User customization and personalization features

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Part D: Interactive Reports and Advanced Features (60 minutes)

Tasks: 1. **Self-Service Analytics Interface** (30 minutes) - Build user-friendly report builder: - Drag-and-drop interface for chart creation - Dynamic field selection and aggregation - Filter and parameter controls - Real-time preview capabilities - Create guided analytics workflows - Implement collaboration features (comments, annotations)

2. **Advanced Interactivity** (30 minutes)
    - Develop sophisticated interactive features:
        - **Cross-filtering**: Charts that interact with each other
        - **Parameter Controls**: Sliders, dropdowns, date pickers
        - **What-if Analysis**: Scenario modeling capabilities
        - **Storytelling**: Guided narrative through data
        - **Embedded Analytics**: Reports within business applications
    - Implement real-time collaboration
    - Create automated report distribution

Expected Deliverables: - Self-service analytics platform - Advanced interactive report examples - Collaboration and sharing functionality - Embedded analytics demonstrations

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Part E: Best Practices and Case Studies (35 minutes)

Tasks: 1. **Design Standards Implementation** (20 minutes) - Apply data visualization best practices: - Color theory and accessibility compliance - Typography and information hierarchy - Layout principles and white space usage - Cognitive load reduction techniques - Create corporate design standards - Implement consistent branding across reports

2. **Performance Optimization** (10 minutes)
    - Optimize report performance:
        - Data aggregation strategies
        - Caching and refresh mechanisms
        - Progressive loading techniques
        - Memory usage optimization
    - Document performance benchmarks
3. **Case Study Analysis** (5 minutes)
    - Analyze successful reporting implementations
    - Document lessons learned and recommendations
    - Create improvement roadmap

Expected Deliverables: - Design standards and style guide - Performance optimization documentation - Case study analysis and recommendations - Best practices implementation examples

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Evaluation Rubrics

1. Charts and Graphs Implementation (30 points)

- **Excellent (27-30)**: Comprehensive chart library with advanced features and interactivity

- **Good (21-26)**: Good variety of charts with basic interactivity
- **Satisfactory (15-20)**: Basic chart types implemented correctly
- **Needs Improvement (0-14)**: Limited chart variety or poor implementation

2. Tables and Data Presentation (20 points)

- **Excellent (18-20)**: Advanced table features with excellent usability
- **Good (14-17)**: Good table implementations with adequate features
- **Satisfactory (10-13)**: Basic tables with limited functionality
- **Needs Improvement (0-9)**: Poor table design or missing features

3. Dashboards and Drill-Down (30 points)

- **Excellent (27-30)**: Sophisticated dashboards with seamless drill-down navigation
- **Good (21-26)**: Good dashboard design with functional drill-down
- **Satisfactory (15-20)**: Basic dashboards with limited navigation
- **Needs Improvement (0-14)**: Poor dashboard design or missing drill-down

4. Interactive Features (15 points)

- **Excellent (14-15)**: Advanced interactivity with excellent user experience
- **Good (11-13)**: Good interactive features with minor limitations
- **Satisfactory (8-10)**: Basic interactivity implemented
- **Needs Improvement (0-7)**: Limited or poor interactive features

5. Best Practices and Design (5 points)

- **Excellent (5)**: Exemplary design standards with comprehensive best practices
- **Good (4)**: Good design with most best practices applied
- **Satisfactory (3)**: Basic design standards followed
- **Needs Improvement (0-2)**: Poor design or missing best practices

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Technical Requirements

Required Tools (Choose minimum 2):

- **Business Intelligence**: Tableau, Power BI, QlikView
- **Programming**: Python (Plotly, Dash, Streamlit), R (Shiny, ggplot2)
- **Web Technologies**: D3.js, Chart.js, HTML/CSS/JavaScript
- **Specialized Tools**: Excel with advanced features, Google Data Studio

Submission Format:

1. **Complete Reporting Solution** - All components functional
2. **Tool Comparison Report** (PDF) - Strengths and limitations analysis
3. **Design Standards Guide** (PDF) - Best practices documentation
4. **User Manual** (PDF) - End-user guide with screenshots
5. **Technical Documentation** (PDF) - Implementation details
6. **Demo Video** (10-15 minutes) - Comprehensive walkthrough

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Time Management Guidelines

Task	Allocated Time	Key Focus Areas
Charts and Graphs	70 minutes	Comprehensive visualization library
Tables and Data Presentation	45 minutes	Advanced table features and formatting
Dashboards and Drill-Down	90 minutes	Complete dashboard solution
Interactive Features	60 minutes	Advanced interactivity and self-service
Best Practices	35 minutes	Design standards and optimization

Success Criteria

To pass this assignment, students must: - Create comprehensive chart library with 15+ visualization types - Implement advanced table features with interactivity - Build multiple dashboard types with drill-down navigation - Demonstrate advanced interactive features and self-service capabilities - Apply data visualization best practices consistently - Provide comprehensive documentation and user guides

Bonus Points Available: - Custom visualization development (+5 points) - Advanced animation and storytelling (+5 points) - Machine learning integration (+5 points) - Accessibility compliance (WCAG 2.1) (+5 points)

Additional Resources

Documentation References:

- Tableau Public: https://public.tableau.com/
- Power BI Learning: https://docs.microsoft.com/en-us/power-bi/
- Plotly Python: https://plotly.com/python/
- D3.js: https://d3js.org/

Design Resources:

- Edward Tufte’s visualization principles
- Stephen Few’s dashboard design guidelines
- Cole Nussbaumer Knaflic’s storytelling with data
- Colorbrewer for color schemes

Best Practices References:

- Data visualization accessibility guidelines
- Mobile-first design principles

- Performance optimization techniques
- User experience design for analytics

Sample Inspiration:

- Tableau Public gallery
- Power BI community showcases
- D3.js example gallery
- Observable visualization notebooks