

Assignment 3

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Effectively Communicating Numbers: Selecting the Best Means and Manner of Display

Executive Summary

- Ability to display data graphically is not intuitive
 - Requires set of visual design skills(* Quantitative information: the numbers that measure performance, identify opportunities, forecast the future)

Introduction

- Six fundamental skills:
 - Skills 3 - 6 are for if one or more graphs are needed
 - * 1. Determine your message and identify the data necessary to communicate it
 - * 2. Determine if a table, graph, or combination of both is needed to communicate your message
 - * 3. Determine the best means to encode the values
 - * 4. Determine where to display each variable
 - * 5. Determine the best design for the remaining objects
 - * 6. Determine if particular data should be featured above the rest, and if so, how

General Concepts and Practices

Tables Versus Graphs

- Table:
 - Data are expressed in the form of text
 - Data are arranged in columns and rows
 - Best: to look up individual values or quantitative values must be precise
- Graph:
 - Data are expressed graphically (as picture)
 - Data are displayed in relation to one or more axes along which run scales that assign meaning to the values
 - Best: message to communicate resides in the shape of the data (patterns, trends, exceptions)

Quantitative Versus Categorical Data

- Quantitative information: consists of numbers and data that identifies what the numbers mean
 - Quantitative Data: the numbers
 - Categorical Data: the labels that tells us what the numbers measure
- Three Types of Categorical Scales
 - Nominal
 - * Discrete items that belong to a common category, but don't relate to one another in any particular way
 - * Items have no particular order
 - * Items do NOT represent quantitative values
 - Ordinal
 - * Items have an intrinsic order
 - * Items do NOT represent quantitative values
 - Interval
 - * Items have an intrinsic order
 - * Items represent quantitative values

The Seven Common Relationships in Quantitative Business Data

- Number become meaningful only when compared to related numbers
- Seven Relationship Types:
 - Time-Series Relationships
 - Series of measures taken across equal intervals of time
 - * Most common relationship in quantitative business data
 - * Time can be divided into varying intervals of varying duration (years, quarters, months, weeks, days, hours)
 - * Reveals trends and patterns to make informed decisions
 - Ranking Relationships
 - Values are sequenced by size, large to small or small to large (Performance of sales, expense of departments)
 - * Easier to compare values by placing those that are most similar near one another
 - Part-to-Whole Relationships
 - Reveal the portion that each value represents to some whole
 - * Useful to see how something is divided into parts; percentage of each part to the whole
 - Deviation Relationships
 - Displayed to feature how one or more set of values differ from some reference set of values
 - * Business: how some actuals deviate from predefined target
 - Distribution Relationships
 - * How values are spread across their entire range
 - * Learn the shape of the distribution (normal, skewed, gaps, concentrations)
 - Correlation Relationships
 - * Pairs of values, each measuring something different about an entity are displayed to reveal if there is significant relationship between them
 - * Help predict, take advantage of, or avoid particular behaviors
 - Nominal Comparison Relationships
 - * Displays nothing but a nominal comparisons

The Best Means to Encode Quantitative Data in Graphs

- Two-dimensional graphs work well:
 - Line lengths
 - 2-D position
- Four types of objects that work best for encoding quantitative values:
 - Points
 - * Smallest of the objects
 - * Shape: dots, squares, triangles, Xs, dashes
 - * Strengths: (1) used to encode values along two quantitative scales simultaneously , (2) can be used when the quantitative scales do not begin at zero
 - * Emphasize individual values
 - Lines
 - * Connect individual values in a series, emphasizing the shape of the data
 - * Trends, patterns, and exceptions
 - * Only use lines to encode data along an interval scale
 - Bars
 - * Encode data that emphasizes individual values powerfully
 - * (1) 2-D position of the bar's endpoint in relation to quantitative scale
 - * (2) length of the bar
 - * Quantitative scale MUST include zero
 - Boxes
 - * Both ends encode quantitative values
 - * Box-And-Whisker Plot

The Best Practices for Formatting Graphs to Remove Distractions

- Anything that does NOT contribute in an essential way to the meaning of a graph is a distraction that harms communication
 - Solution: remove it

A Step-By-Step Graph Selection and Design Process

- Order of steps doesn't have to followed strictly

Determine Your Message and Identify Your Data

- Determine what you want to say first
- Before you can communicate data, must know what the data means and know what's important based on the needs of the audience

Determine If a Table, Graph, or Both is Needed to Communicate Your Message

- Look up and compare values: table
- Message in shape: graph

Determine the Best Means to Encode the Values

- Nominal Comparison: bars, points
- Time-Series: lines, bars, points
- Ranking: bars, points
- Part-To-Whole: bars, stacked bars
- Deviation: lines, points connected with lines
- Frequently Distribution: bars, lines
- Correlation: points and trend line

Determine Where to Display Each Variable

- Categorical Scales: X-axis
- Quantitative Scales: Y-axis
- Horizontal Bars when these two conditions exist:
 - Text labels are associated with that bars are long
 - There are many bars
- Using small multiples to support an additional variable

Determine the Best Design for the Remaining Objects

- Determine the Range of the Quantitative Scale
 - Bars MUST start at zero
 - Others may have a narrow scale (little below lowest data value and little above highest)
 - * Make obvious that you narrowed the scale
- If a Legend is Required, Determine Where to Place It
 - Best: label data directly
- For Each Axis, Determine If Tick Marks Are Required and How Many
 - Tick marks are only necessary on quantitative scales
 - * No real purpose on categorical scales
 - * Too many = clutter
 - * Too few = not enough detail to interpret data values
- Determine the Best Location for the Quantitative Scale
 - Y-Axis: left side, right side, or both sides of graph
 - X-Axis: top, bottom, or both
 - Places scale nearest to the values you wish to emphasize
- Determine If Grid Lines are Required
 - Gridlines are useful when:
 - * Values cannot be interpreted with the necessary degree of accuracy
 - * Subset of points in multiple related scatter plots must be compared
 - Make grid lines barely visible
- Determine What Descriptive Text is Needed
 - Text often needed:
 - * Descriptive title
 - * Axis titles
 - Include notes to describe the graph, what should be observed, how to read the graph

Determine If Particular Data Should Be Featured, and If So, How

- Highlighting particular data if it is more important than the rest:
 - Encode these items using bright or dark colors
 - Bars: place border around desired bar
 - Lines: makes lines thicker
 - Points: larger points or stand-alone color

Conclusion

- Order to communicate information:
 1. Determine your message and identify the data necessary to communicate it
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