SNS COLLEGE OF ENGINEERING

Kurumbapalayam(Po), Coimbatore – 641 919
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Approved by AICTE, Recognized by UGC & Affiliated to Anna University, Chennai

Department of Information Technology

III Year / V Semester

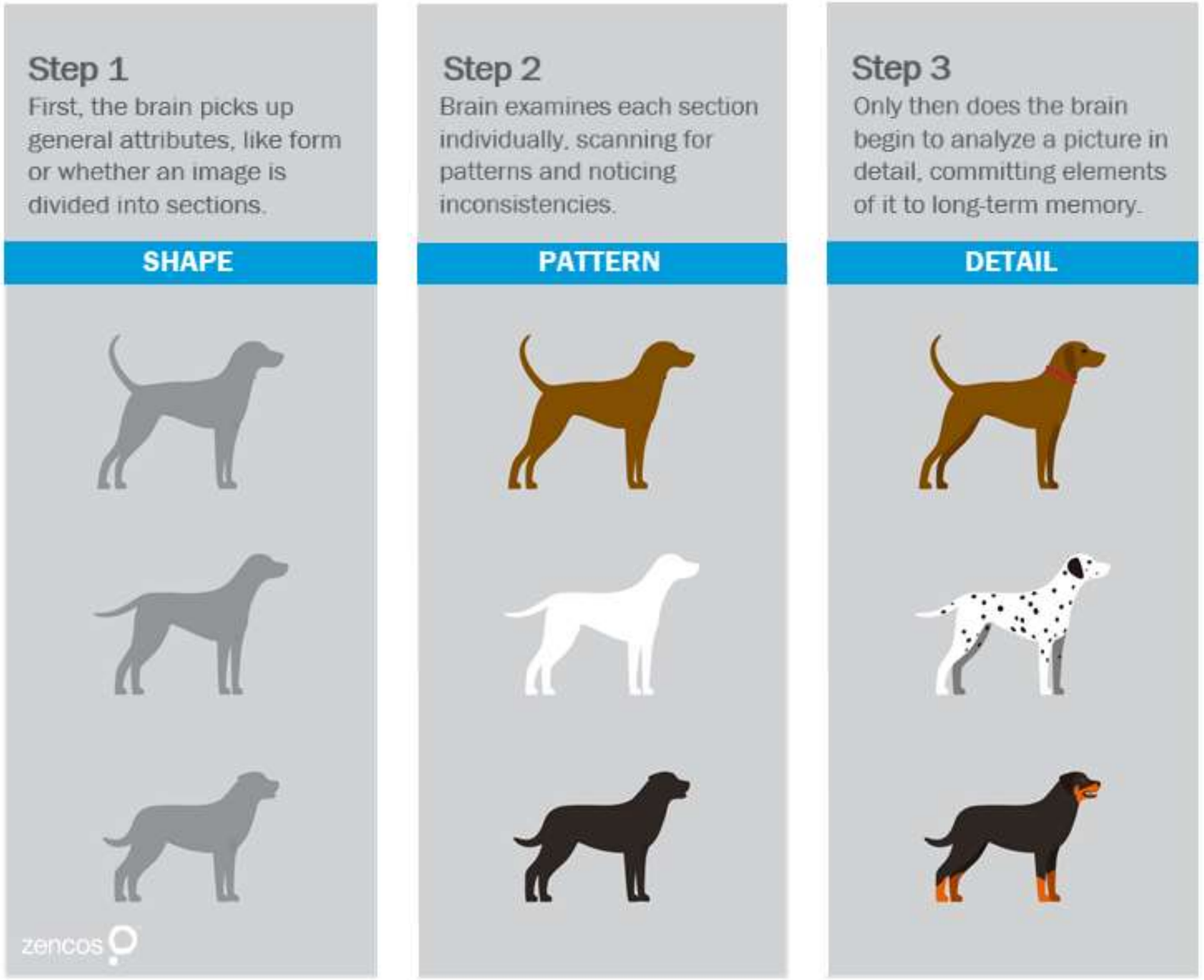
Unit 4–

Topic :Design Perceptive

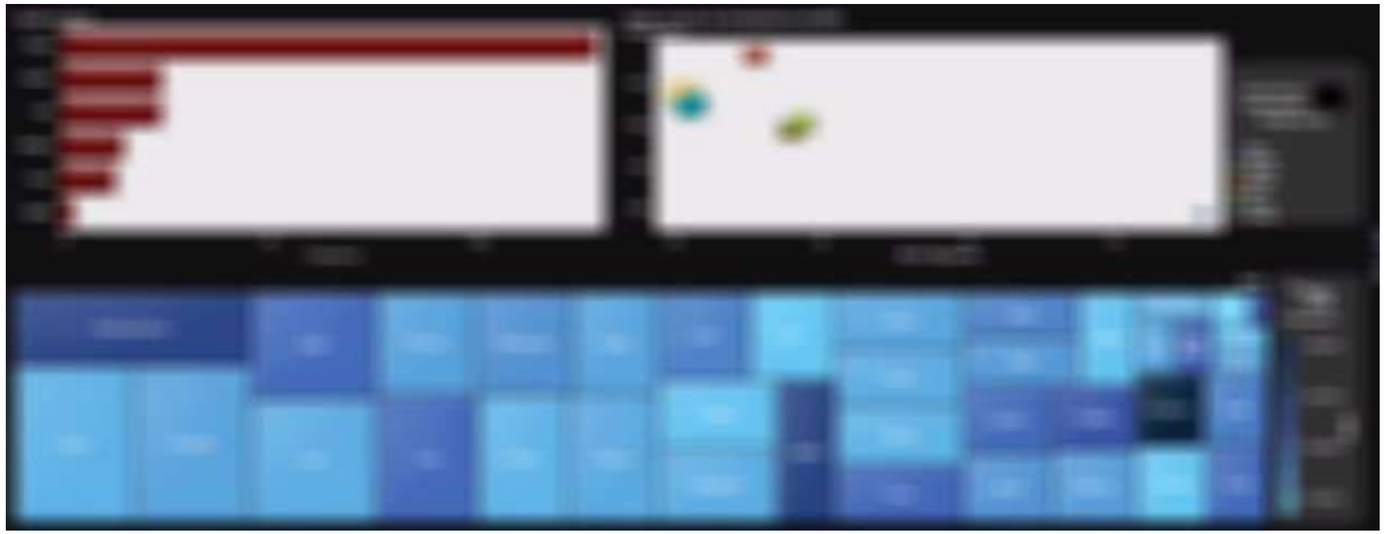
DESIGN PERCEPTIVE

Visual perception explains how people ingest diagram
s, charts, and dashboards. It is an essential skill for th
ose building reports and data visualizations.
By understanding this trait, your work will become mor
e meaningful to the viewer. You may understand why
a bar graph is better than a pie chart, but understandin
g how folks interpret the visual is essential.

Your Visual Perception Process



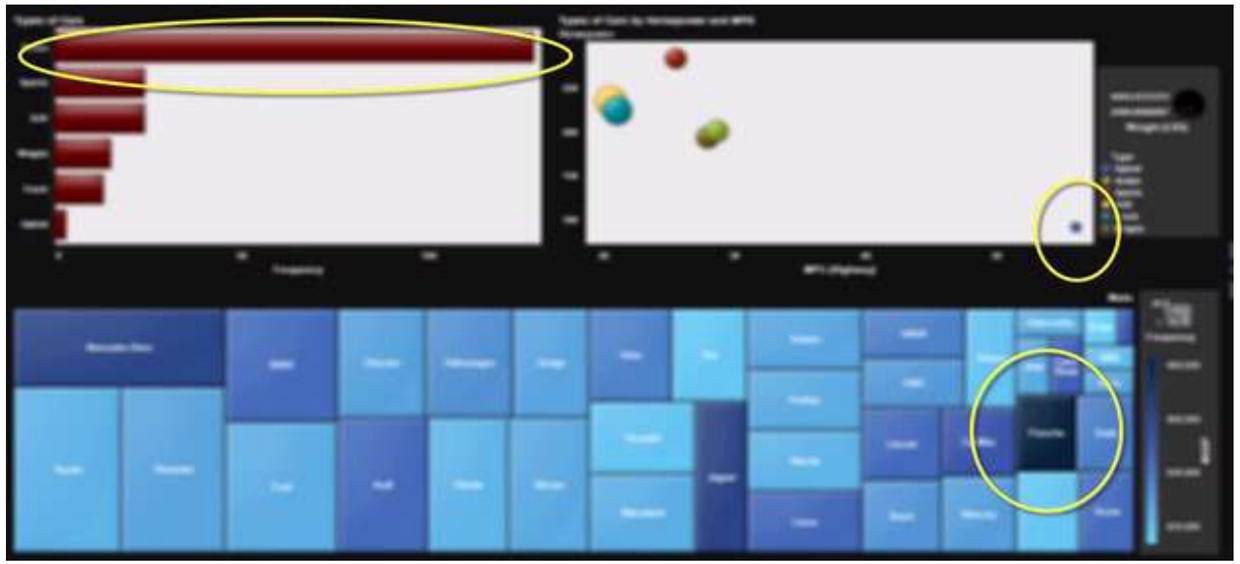
Step 1: Scanning the Dashboard Layout Structure



In the first step, unconsciously our eyes and brain quickly scan through the dashboard. Here the neurons in the brain pick up the pre-attentive attributes of the charts, such as form, color, position, and motion.
The brain is looking for form constancy. It wants to classify the visual information presented. Is it a text document, is it a dashboard, is it a useful infographic.

After the initial scan, the brain takes a high-level l ook view of the dashboard. Since the first step br oke out the structure, the second step looks at gr aphics individually to search for patterns and ano malies. This step is where your brain acknowledg es oddities in the data visualizations.

Example



In the following dashboard, the brain is scanning for differences. Why is one bar so much bigger, why does the bubble chart have a smaller and further away, and what i s making that box in the treemap a darker blue?

Step 3: Inspecting Charts for Meaningful Details

Step 3: Inspecting Charts for Meaningful Details

When looking at a table of data, this fact mean s that the brain can only keep a few data fact. Even if they are calculated items in a dataset, t he user is still only skimming a fraction of what is available. Your data communication must be clear to be effective.

By creating reports, those few items turn into c onclusions that come from consuming large a mounts of data graphically displayed.

What are affordances?

The term affordance was coined by James Gibson (1977, 1978) and con cept originates from ecological psychology. Gibson viewed affordance a s action possibilities offered by the environment to the animal.

A common example for affordance is what action is possible on a door? Pu sh or Pull or Slide? Sometimes we can tell by looking at the door. But some times we need a nudge, a signifier.

What are Signifiers?

Signifiers communicate where the action shoul d take place. A signifier is a perceivable indicat or.

A door handle or a sign that says ‘slide the do or’ is an example of a signifier.

. In static visualization, signifiers tell our readers wher e they should focus and what action should they take ?

Important signifiers in visualization

- Highlight
  - Bold
  - Color
  - Size
- Title
- Sub-title
- Annotation

Highlight

Highlighting in visualization hel ps us direct our reader’s attenti on to the most important aspect s of the graph. However, it is es sential to remember that over h ighlighting dilutes the effect of h ighlight.

Highlight

Bold

Bold text means more important. Bolding a text adds minimal visual noise and indicates tha t the text is important.

Color

The color is one of the most powerful preattentive attributes and when used wisely, it can d rive our reader’s attention to where we want them to focus on. Again, too much color can di lute the effect of color and leave the reader confused.

Size

Size is another way to highlight and signal importance. A bigger font size indicates that the message is important.

Title

The title is one of the first things that a reader sees in a grap h. A good title clearly communicates the message of a visual .

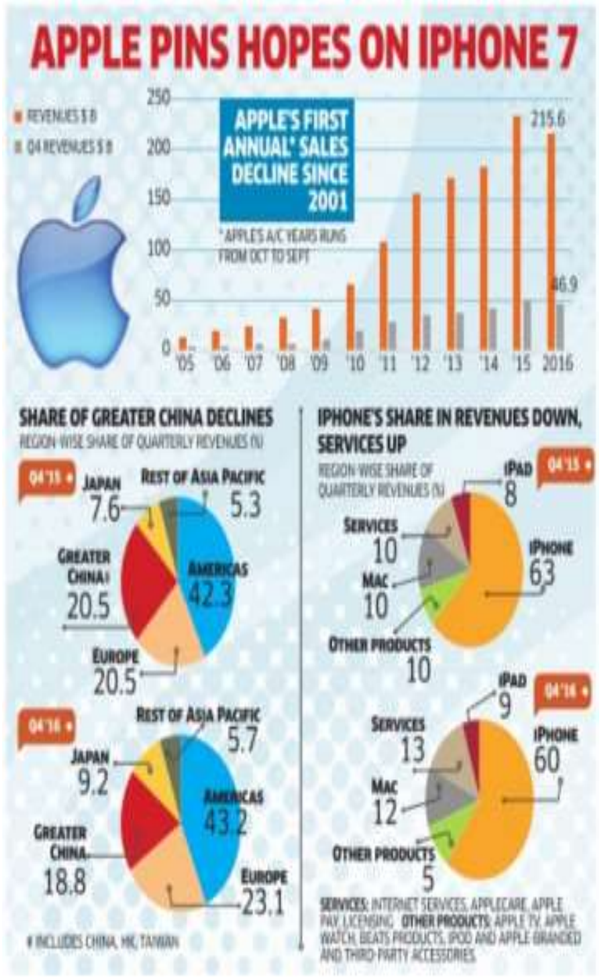
Sub-title

A subtitle can provide additional helpful information to the reader and allow them to understand the visualization better and in turn, draw conclusions. For example, a subtitle could be “Our new product launch in Q3 was a hug e success with a $173 million in sales for the quarter”

Annotations

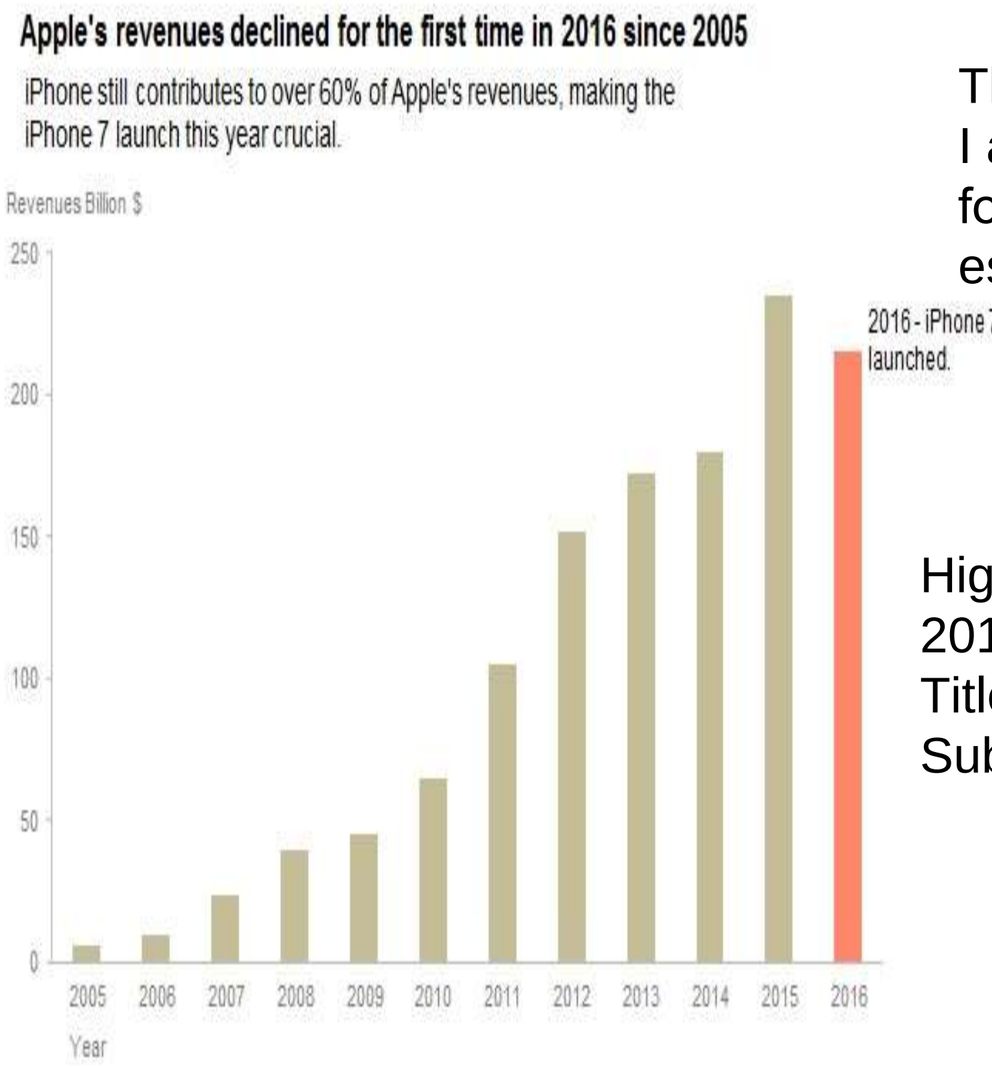
Use annotations to call out attention to specific parts of the graph. A good practice is to keep them short and only provide important information.

An Example



Truth be told, it is very confusing. The colorful pie charts fight for our attention. The bar chart is almost non-existent and the apple logo definitely catches our attention.

An Example

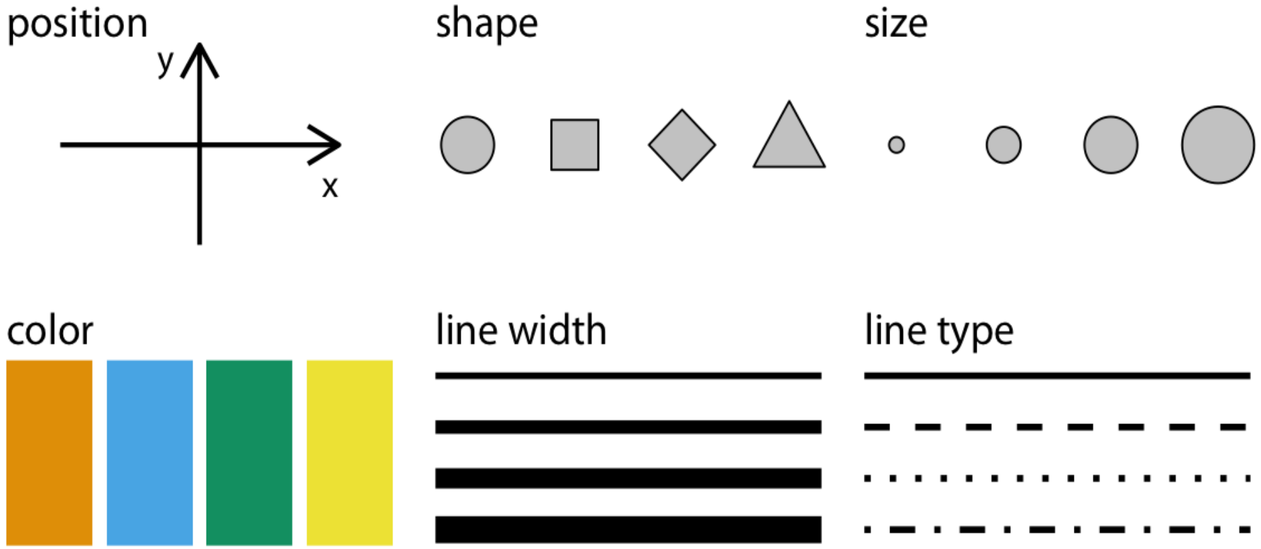


The title and the red bar stand out in the graph.
I am being asked to focus on the decline in Apple revenues for the first time and Apple's dependence on the iPhone sal es.

Highlight – Bold and bigger title text, Red color of the bar for 2016
Title text
Subtitle text

Aesthetics

Aesthetics describe every aspect of a given graphical element. A few examples are provided i n Figure A critical component of every graphical element is of course its position, which descri bes where the element is located.



Commonly used aesthetics in data vis ualization: position, shape, size, color , line width, line type. Some of these aesthetics can represent both continu ous and discrete data (position, size, l ine width, color) while others can usu ally only represent discrete data (sha pe, line type).

Scales map data values onto aesthetics

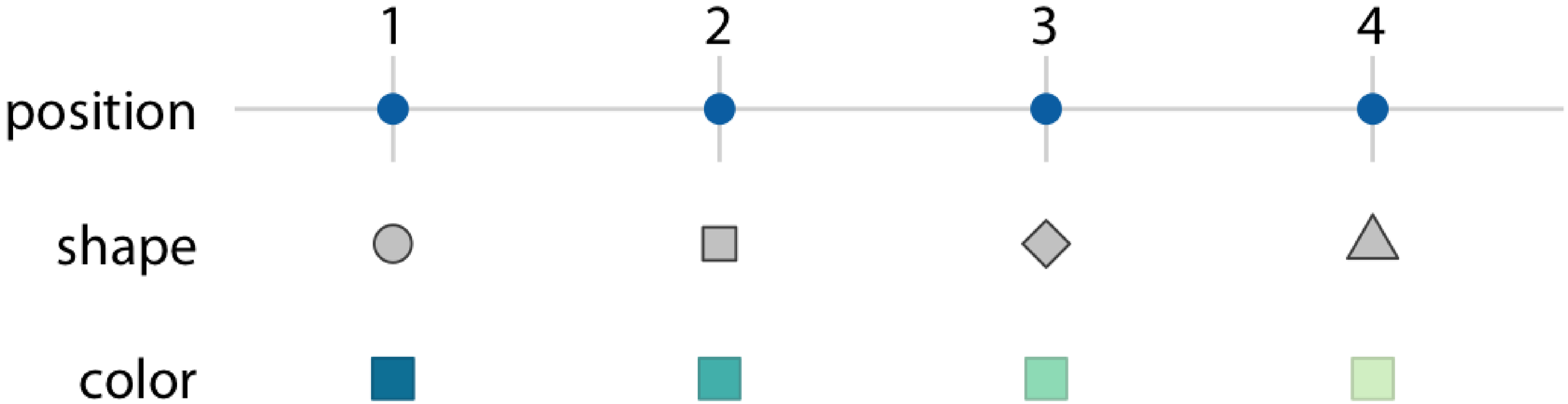
To map data values onto aesthetics, we need to specify which data va lues correspond to which specific aesthetics values. For example, if o ur graphic has an x axis, then we need to specify which data values fa ll onto particular positions along this axis. Similarly, we may need to s pecify which data values are represented by particular shapes or color s. This mapping between data values and aesthetics values is created via scales. A scale defines a unique mapping between data and aesth etics (Figure 2.2). Importantly, a scale must be one-to-one, such that f or each specific data value there is exactly one aesthetics value and vi ce versa. If a scale isn’t one-to-one, then the data visualization becom es ambiguous.

Example

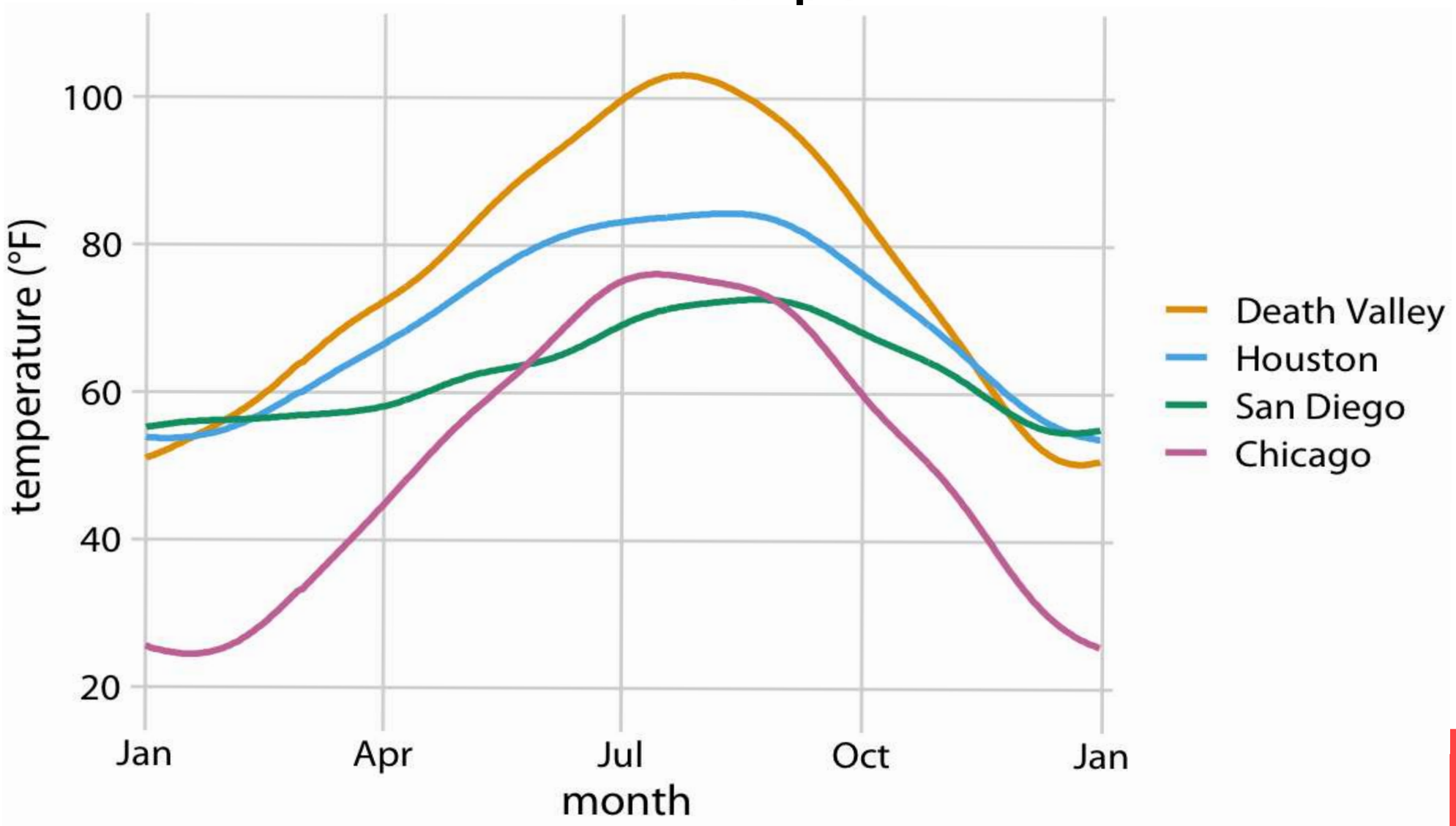
Table 2.2: First 12 rows of a dataset listing daily temperature normals for four weather stations. Data source: NOAA.

Month	Day	Location	Station ID	Temperature
Jan	1	Chicago	USW00014819	25.6
Jan	1	San Diego	USW00093107	55.2
Jan	1	Houston	USW00012918	53.9
Jan	1	Death Valley	USC00042319	51.0
Jan	2	Chicago	USW00014819	25.5
Jan	2	San Diego	USW00093107	55.3
Jan	2	Houston	USW00012918	53.8
Jan	2	Death Valley	USC00042319	51.2
Jan	3	Chicago	USW00014819	25.3
Jan	3	San Diego	USW00093107	55.3
Jan	3	Death Valley	USC00042319	51.3
Jan	3	Houston	USW00012918	53.8

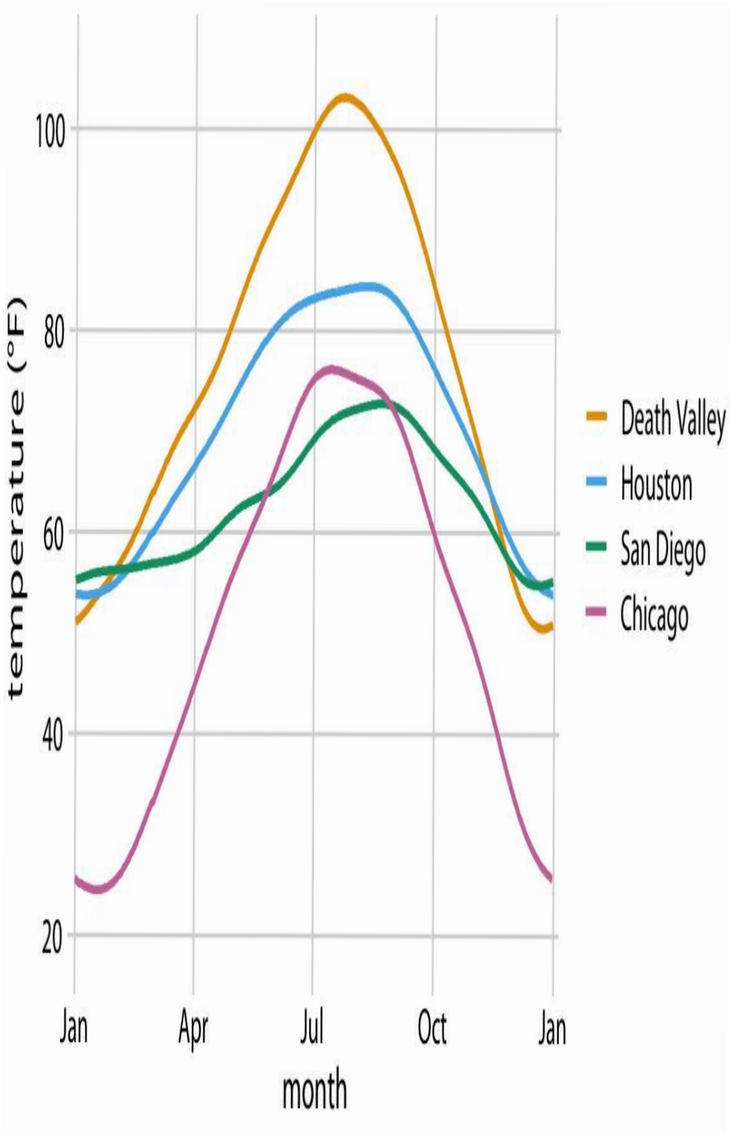
Example



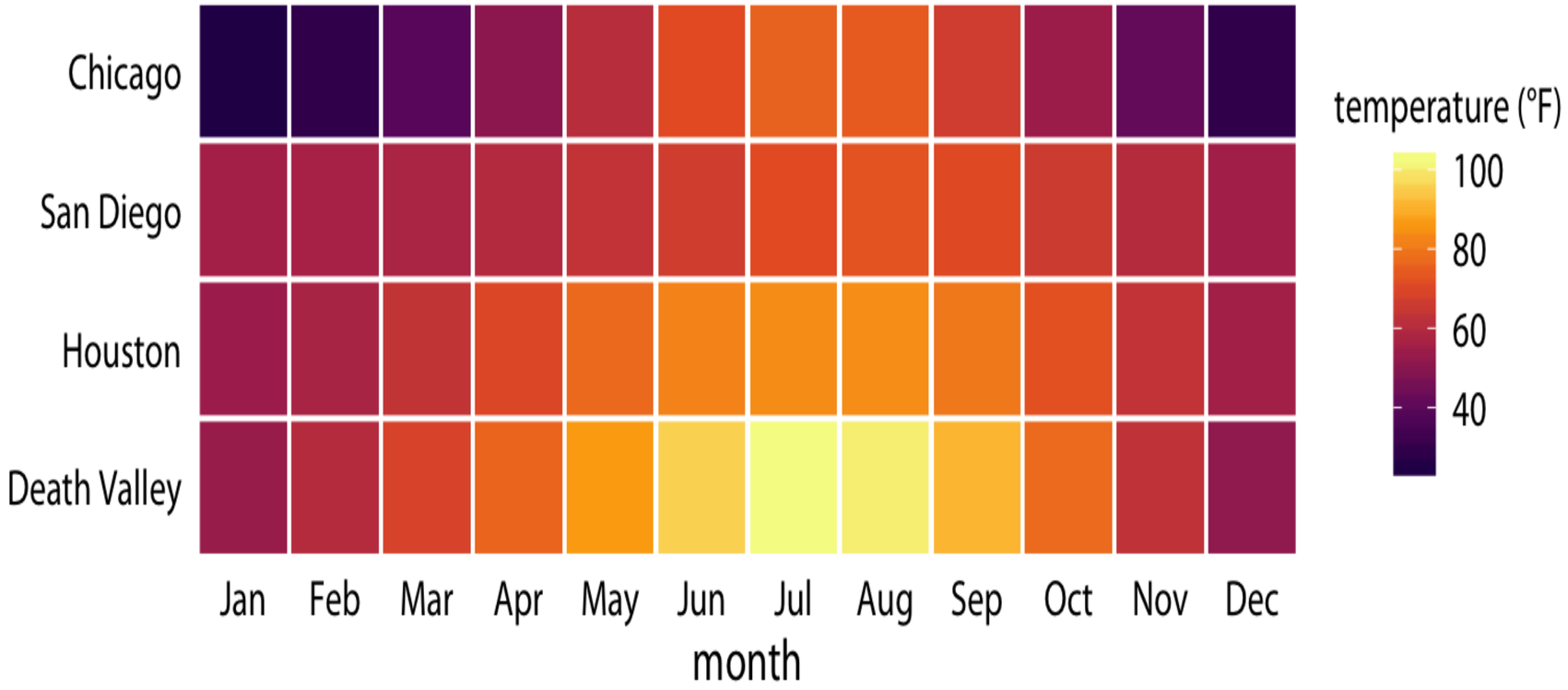
Example


100
80
60
40
20
temperature (°F)
Jan
Apr
Jul
Oct
Jan
month
Death Valley
Houston
San Diego
Chicago

Example



map temperature onto the y axis, day of the year onto the x axis, location on to color, and visualize these aesthetic s with solid lines. The result is a stand ard line plot showing the temperature normals at the four locations as they c hange during the year


Chicago
San Diego
Houston
Death Valley
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
month
temperature (°F)
100
80
60
40

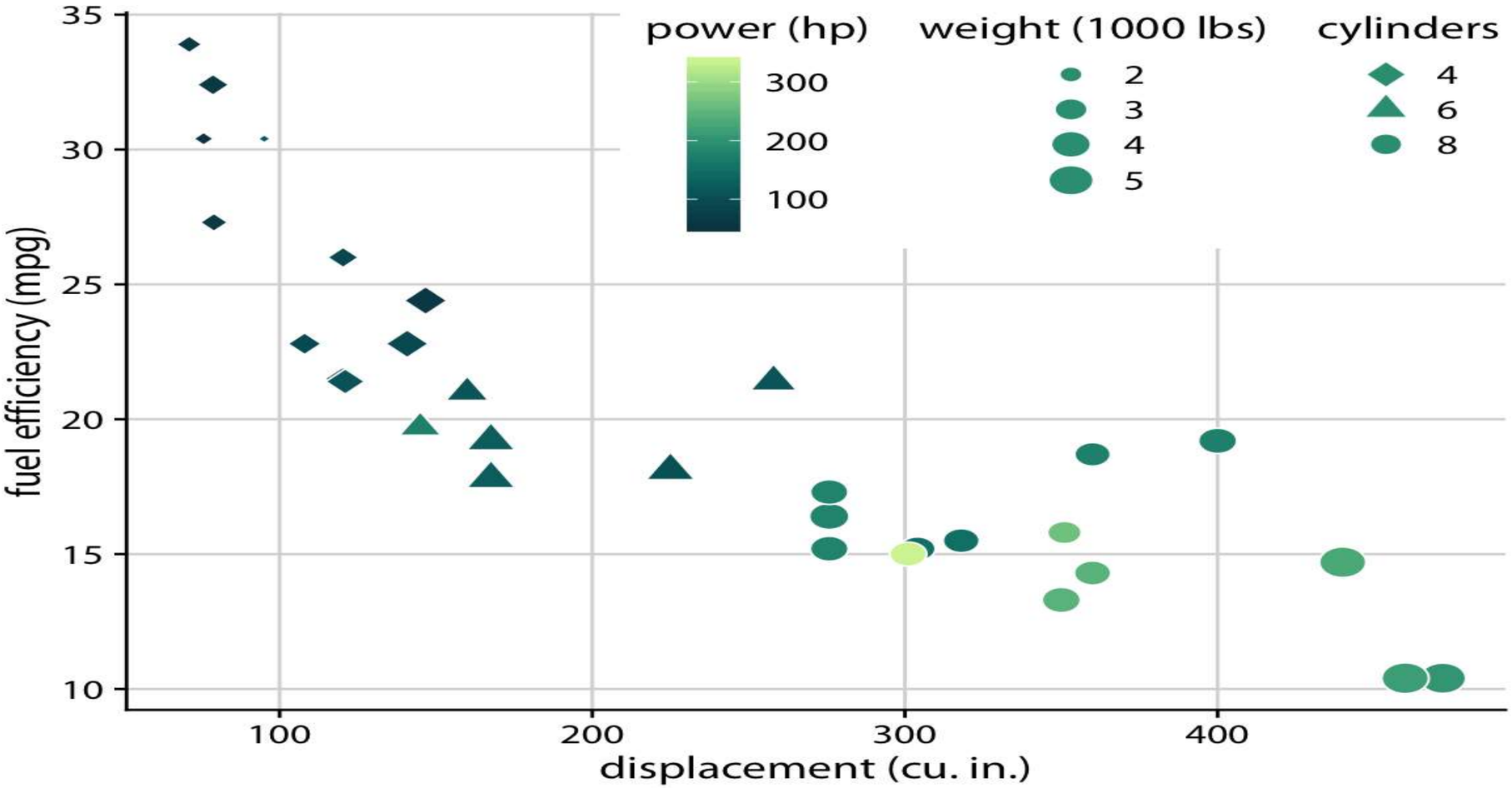
now the key variable of interest (temperature) is shown as color, we need to show sufficient ly large colored areas for the color to convey useful information

Month is an ordered factor with 12 levels and location is an unordered factor with four l evels. Therefore, the two position scales are both discrete. For discrete position scales , we generally place the different levels of the factor at an equal spacing along the axis . If the factor is ordered (as is here the case for month), then the levels need to placed in the appropriate order. If the factor is unordered (as is here the case for location), the n the order is arbitrary, and we can choose any order we want. I have ordered the loca tions from overall coldest (Chicago) to overall hottest (Death Valley) to generate a plea sant staggering of colors. However, I could have chosen any other order and the figure would have been equally valid.

Example

uses five scales, two position scales, one color scale, one size scale, a
nd one shape scale, and all scales represent a different variable from t
he dataset.

Example


power (hp)
300
200
100
weight (1000 lbs)
2
3
4
5
cylinders
4
6
8
fuel efficiency (mpg)
35
30
25
20
15
10
100
200
300
400
displacement (cu. in.)

Example

Fuel efficiency versus displacement, for 32 cars (1973–74 models). This figure uses five separate scales to represen t data: (i) the x axis (displacement); (ii) the y axis (fuel effic iency); (iii) the color of the data points (power); (iv) the siz e of the data points (weight); and (v) the shape of the data points (number of cylinders). Four of the five variables dis played (displacement, fuel efficiency, power, and weight) are numerical continuous. The remaining one (number of cylinders) can be considered to be either numerical discre te or qualitative ordered.

Accessibility

Accessibility in data visualization goes well beyond considerations for color blindness.

Inclusive design principles and accessibility are important to take into consideration when designi ng data visualization because they help a broader audience understand your graphic. Designing with accessibility in mind can even help make your visualizations easier to understand for people without disabilities.

	Permanent	Temporary	Situational
Touch	 One arm	 Arm injury	 New parent
See	 Blind	 Cataract	 Distracted driver
Hear	 Deaf	 Ear infection	 Bartender
Speak	 Non-verbal	 Laryngitis	 Heavy accent

Accessibility

Being clear with text, distinctive labeling, and adding multiple w ays to identify the point to your visuals will make it easier for pe ople with impairments and those without to interpret your graph s. There are easy ways to add the principles of accessibility int o your visual communications.

5 easy ways to make your data visualization more accessible

1.. Add Alt text

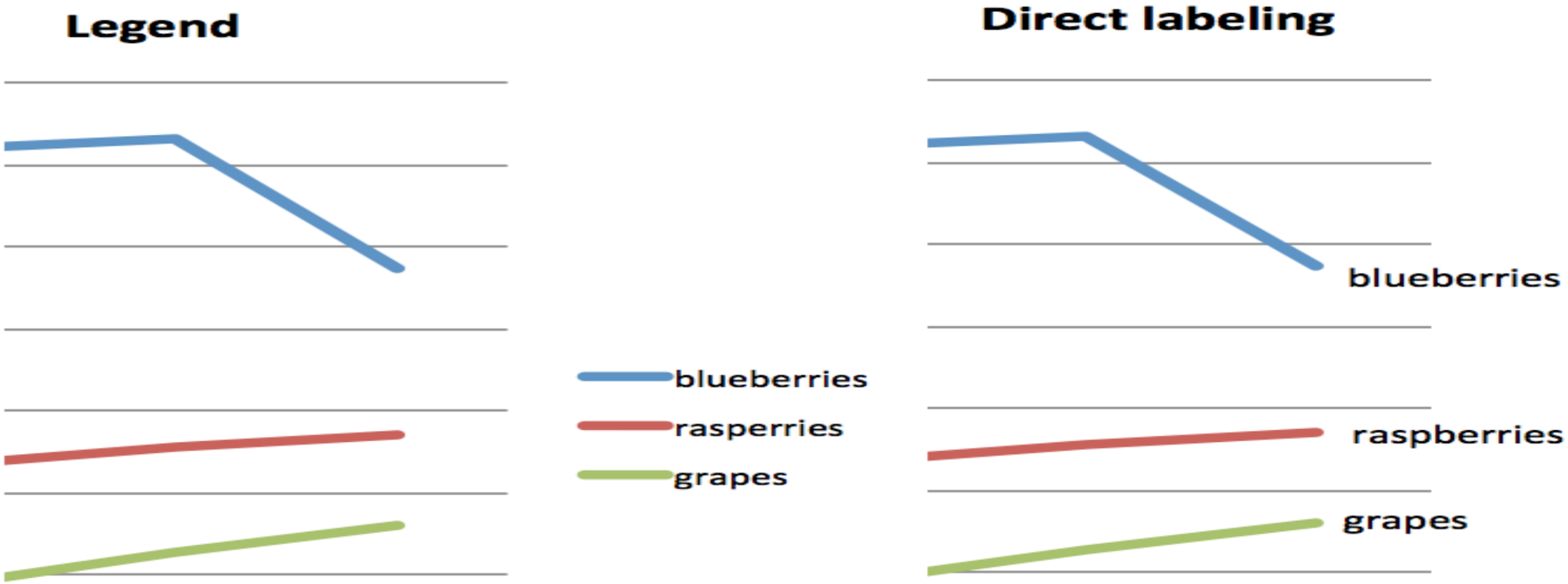
2. Employ a takeaway title

3. Label data directly

4. Check type and color contrast

5. Use white space

3. Label data directly

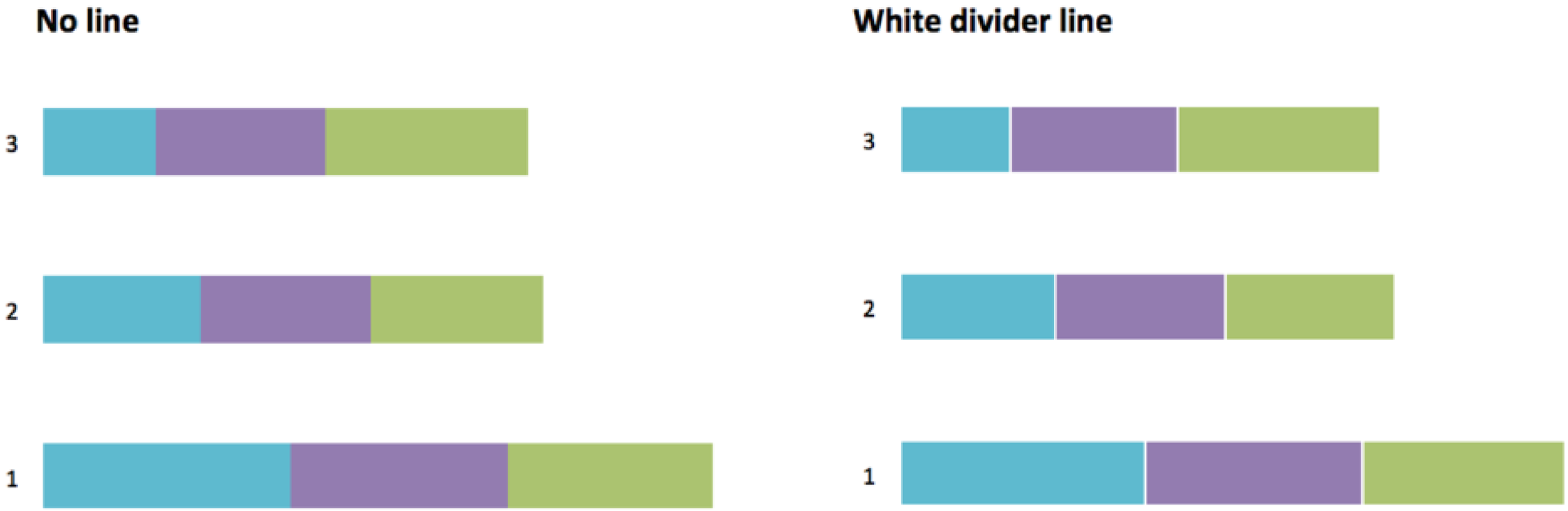


4. Check type and color contrast

Small Non-Bold Text (less than 18pt, or approximately 1.5em rendered) for FFFFFF

Color Code	Sample Text	Sample Text (inverted)	Pass or Fail	Ratio (pass>=4.5)
0072CE	Lorem ipsum	Lorem ipsum	PASS	4.89
4497DC	Lorem ipsum	Lorem ipsum	FAIL	3.13

5. Use white space



Visualising Qualitative Data

Qualitative data (sometimes referred to as unstructured data) is virtu ally any information that can be captured that is not numerical in natu re. Qualitative data includes electronic journal articles, audio from int erviews, video from focus groups, open ended question responses fr om online surveys, social media posts, and much more.

Visualizing qualitative data is useful for providing clarity during analysi s and helps to communicate information clearly and efficiently to other s. Representing data visually is useful during analysis for identifying c onnections and patterns which would otherwise be difficult to discern. Using visualization techniques is a continual analysis process, rather t han being included at the end of data collection.

Visualizations that are regularly used

56% Coding Stripes which are colored bars displayed alongside content that allows visual scannin g of sections of content to assist in seeing patterns and co-occurrence of themes, sentiment, or cas es.

31% Word Clouds which reflect the language within the data by emphasizing the most commonly o ccurring words in the context of other frequently occurring words by using font size to indicate the n umber of times a word occurs.

28% Charts which are used to explore and present aggregated data such as the makeup of theme s for content or which content makes up a theme.

Visualizations that are regularly used

25% Word Trees which display a key word with context displayed as branches that grow based on frequency; they assist in finding recurring themes or phrases that surround the key word by using b ranch size to indicate the number of times a sentence occurs.

17% Concept Maps which are used to map out connections to present ideas, interpretations, or the ories; these are typically a free-form visualization made up of different shapes and connectors to ar ticulate links such as this causes, this requires, or this contributes to.

15% Mind Maps which are a brainstorming tool that starts with a central topic or main idea; they ca n be used to map theoretical groups of concepts sorted into themes.

Visualizations that are regularly used

14% Hierarchical Charts which visualize a hierarchy to see patterns in thema tic structures or view demographics of cases and content; they use size to co nvey meaning and use color to show additional information.

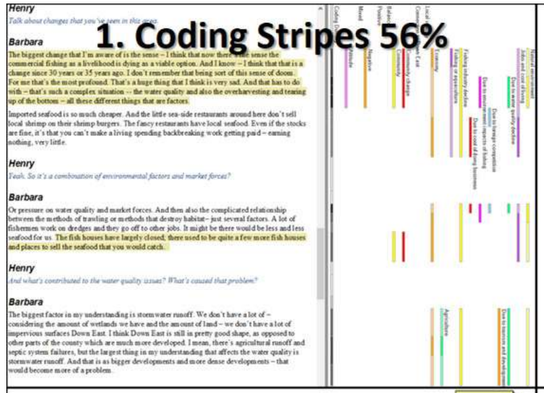
13% Explore Diagrams which focus on a single item, showing all the other ite ms connected to it, allowing the user to step forward and back through the dif ferent connections between items.

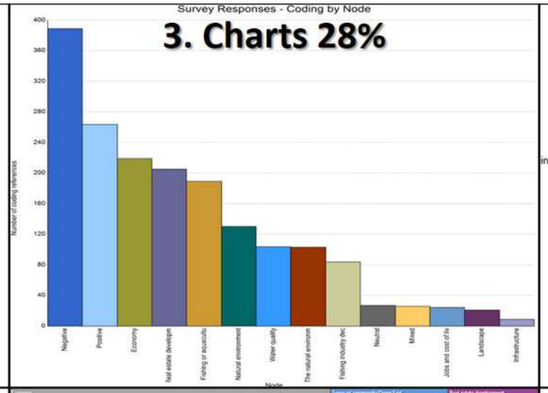
10% Comparison Diagrams which show what two items have in common and how they differ; they can be used to compare content, themes, or cases – to see their similarities and differences.

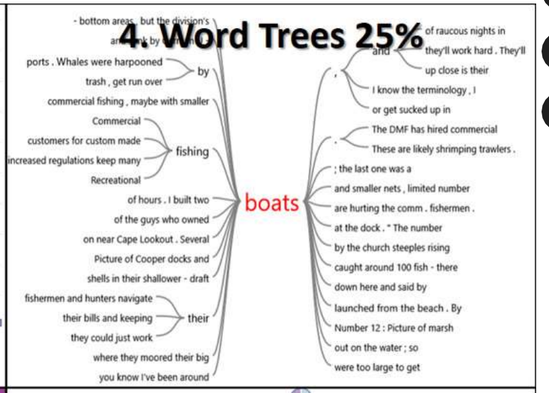
Visualizations that are regularly used

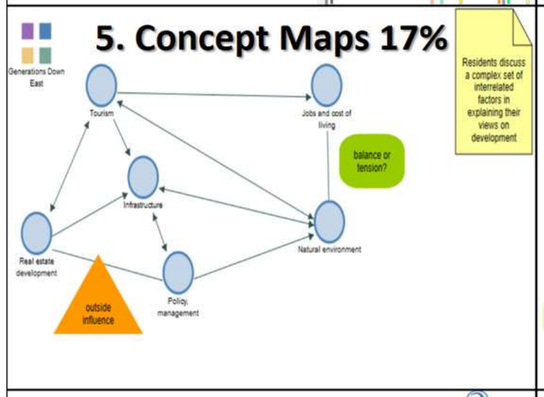
9% Project Maps which are a way of visually exploring and presenting differe nt items and connections within a research project; they can be used to identi fy emerging patterns, theories and explanations.
8% Sociograms which are a graphic representation of social links that a pers on has; it plots the structure of interpersonal relations in a group and can assi st in performing social network analysis on a population of cases and their rel ationships.
5% Geovisualizations which refers to a set of tools and techniques supportin g the analysis of geospatial data through interactive visualization; they provid e deeper understanding of location groupings and is particularly useful with d emographic information.

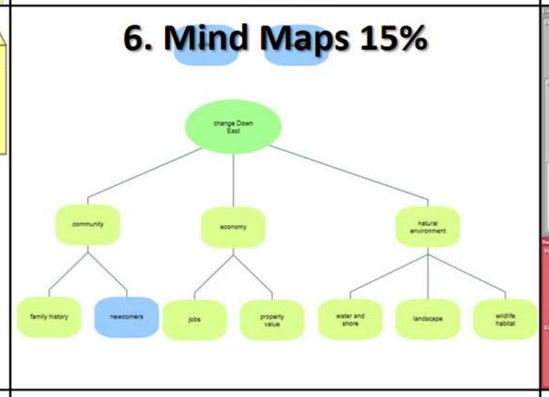
Visualizations that are regularly used

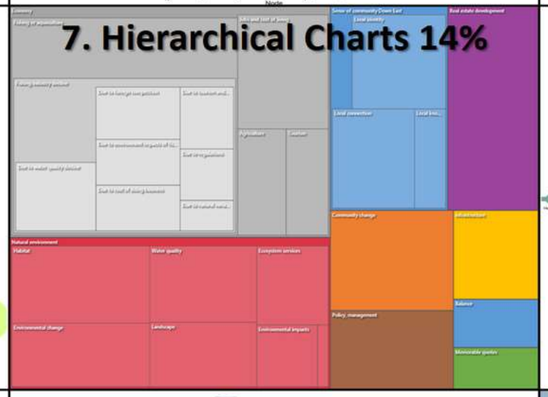


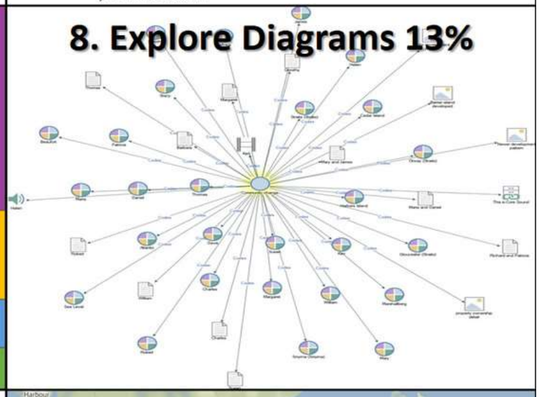


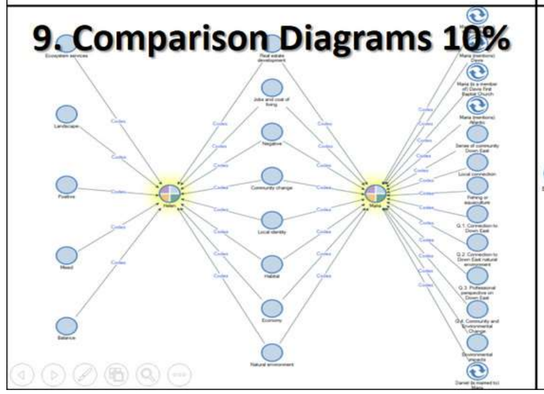


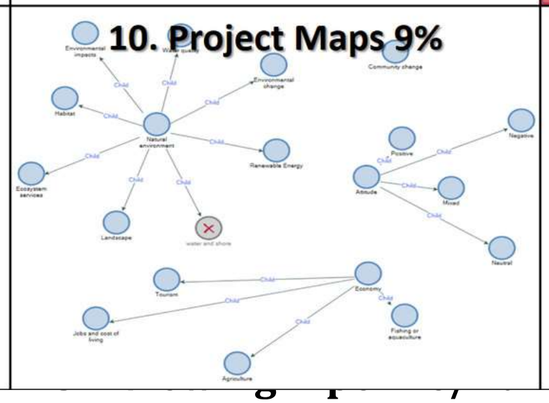


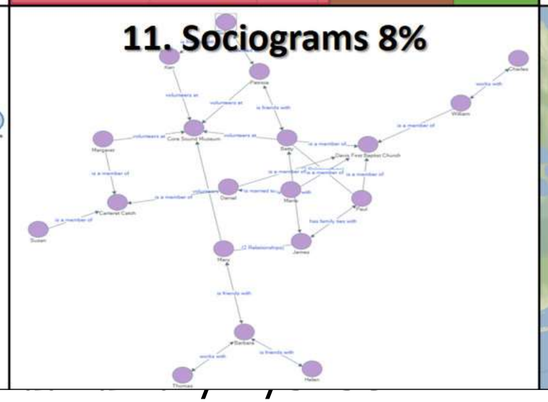


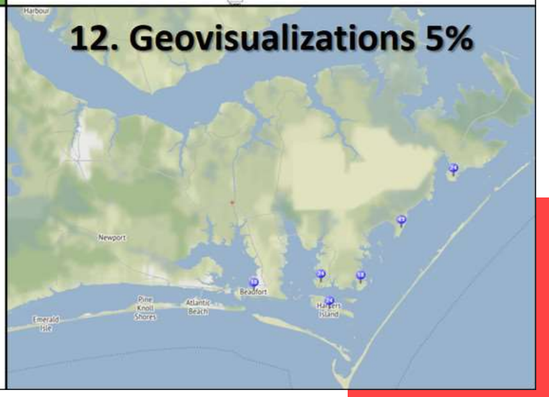












THANK YOU

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