

# Quick Review

- What is the central element essential to creating visual displays and reports?
- What are the key elements used to spatially represent real-world features through visualization?

# Cartography

- Just a map maker?
  - Cartography evolving with automation
- Remaining viable in the information age.

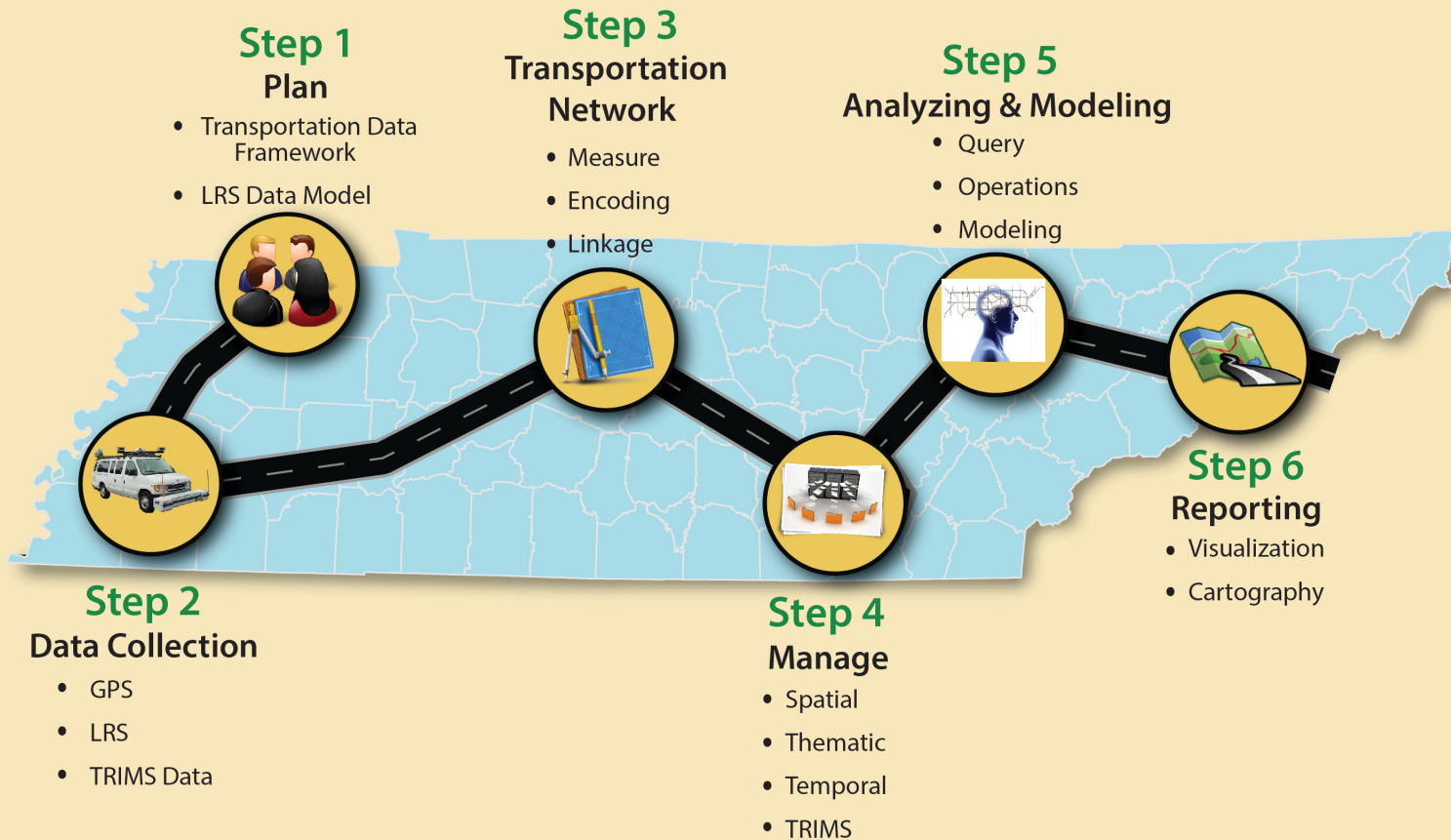
# GIS

- What is GIS?
  - Becoming more and more pervasive into business culture. (Business analytics, politics, environment, government.
- Multitude of platforms
  - ArcGIS, GeoMedia, PostGre, Map Info, Small World.
  - Concepts remain the same.

# Our unique position

- Access to many TDOT databases.
  - TRIMS, Traffic, PPRM, Safety, Eve
- Accessibility to external data increasing.
- Interacting with various departments/customers with different needs.

# GIS ROAD MAP



# Geographic Approach to GIS Analysis



# Geographic Approach to GIS Analysis

## The Five-Step GIS Analysis Process



# Step 1. Frame the Question

- This step seems straightforward because typically you're assigned a project to obtain specific information. Some projects involve answering several questions derived from a high-level question. How you frame the questions helps determine which GIS tools and methods you use for the analysis.
- Approaching a problem geographically involves framing the question from a location-based perspective.
- What is the problem you are trying to solve or analyze, and where is it located?
- When you're faced with deciding how to structure the analysis, which analytic methods to use, and how to present the results to the target audience.



# Step 2: Explore and Prepare Data

- This step can be the most time-consuming.
- After clearly defining the problem, it is necessary to determine the data needed to complete your analysis and ascertain where that data can be found or generated.
- The type of data and the geographic scope of your project will help direct your methods of collecting data and conducting the analysis. If the method of analysis requires detailed and/or high-level information, it may be necessary to create or calculate the new data.
- Creating new data may simply mean calculating new values in the data table or obtaining new map layers or attributes but may also require geoprocessing. Sometimes you might have to consider using surrogate measures, which allows data creation through indirect means. For example, an economic indicator can be used as a surrogate for income. However, because of the limits in collecting accurate data in this way, it is necessary to indicate in your results the manner in which the data was collected.

# Step 2A: Explore Data

- To start, you need to decide what data format to use. Project data doesn't have to be all in the same format, but it can make things easier. The important thing is to verify that the analysis tools you need accept your data format; also consider whether you will be distributing the data created by the analysis.
- Questions to ask about the data include:
  - What is the data format?
  - When was the data collected (how current is it)?
  - How detailed is the data—at what scale was it collected?
  - What coordinate system does the data use? Is the data projected?
  - Best practice is to project all datasets into a common coordinate system before doing analysis.
  - Does the feature geometry (i.e., point, line, polygon) work for the analysis?
  - Does the data have the attributes you need?
  - Does the data have any access or use constraints?

# Step 2B: Prepare Data

- Organizing data into a project folder can simplify analysis tasks (you can specify a default input workspace) and facilitate sharing your work with others.
- Extracting data to have the same extent as the study area helps speed up processing time and enhances data visualization
- Preparing for Analysis:
  - Geo-processing toolboxes
  - Geo-processing tools
  - Environment settings

# Step 3: Choose Analysis Methods and Tools (Examine)

- Step To choose the appropriate methods and tools for an analysis project, consider the questions framed in Step 1 and document the methods and tools that will answer each one.
- It's very helpful at this step to diagram the analysis. The diagram doesn't have to be anything fancy (although it can be if you like that sort of thing). An easy thing is to quickly draw on paper or a whiteboard like the example below.
- You will not know for certain whether the data you have acquired is appropriate for your study until you thoroughly examine it.
  - Visual inspection
  - Investigating how the data is organized
  - How well the data corresponds to other datasets and the rules of the physical world (its topology).
  - The story of where the data came from (its metadata)

# Step 4: Perform the Analysis

- If you've diagrammed the process in step 3, then in this step, you simply follow the diagram, completing each task in sequence. For complicated analyses, you may want to create a model in ModelBuilder to automate the process. A model also allows you to quickly change a parameter and run the model again to explore different scenarios.
- The data is processed and analyzed based on the method of examination or analysis you choose, which is dependent on the results you hope to achieve.

# Step 5: Examine and Refine Results (Act)

- The results and presentation of the analysis are important parts of The Geographic Approach.
- The results can be shared through reports, maps, tables, and charts and delivered in printed form or digitally over a network or on the Web.
- You can compare the results from different analyses and see which method presents the information most accurately.
- You need to decide on the best means for presenting your analysis. You can compare the results from different analyses and see which method presents the information most accurately.

# The Geographic Approach

- The Geographic Approach provides the necessary framework for GIS analysis and helps ensure accurate, verifiable results. By carefully documenting, archiving, and sharing your results and methodology, other researchers receive the opportunity to verify your findings. This practice, called full disclosure, also allows statistical measures of the reliability of this data to be established.
- Using a methodology such as The Geographic Approach formalizes the analytic process with GIS, which allows a clearer understanding of the results and promotes a response that can be supported by the data. By applying The Geographic Approach to help us solve complex problems, we can make better decisions, conserve resources, and improve the way we work.



# How to Design a GIS Project

## The Five Step Design Process

# Step 1: Research Question and Project Goals

- **Research question and project goals.** What is the purpose of the project? What is the research question? What is the spatial extent (total area) and grain size (ground resolution) of the study? Identify the information needs: What type of spatial data do you need to achieve your goals? What are the sources?

# Step 2: Methodology

- **Methodology.** Constructing a logical spatial analysis flow chart that details the project steps will make the success of the analysis more likely. What types of analyses will you perform? Overlays? Multivariate regressions? Spatial interpolations? The spatial analysis flow diagram should include:
  - An outline of the procedures required for the data
  - A logical sequence of procedures to be performed
  - A list of all the data required for each step

# Step 3: Data

- **Data.** Before you embark on your project, you should do an inventory of the data requirements and sources of information. Even with the widespread availability of digital data on the Internet, many GIS projects are mired in data collection, input, and integration. Check if the data are already in digital format. Will you have to scan in paper maps or input data from statistical yearbooks?

# Step 4: Analysis and Accuracy Assessment

- **Analysis and accuracy assessment.** Often you will find that once you start the project, there is a need to revise the procedures originally intended. Once the analysis is complete, you should evaluate the accuracy and validity of the results. Fieldwork may be required.

# Step 5: Presentation

- **Presentation.** The results will have to be presented in a format suitable for the audience, and this can include a poster-sized map, journal paper, PowerPoint presentation, etc.