07. Running A Spatial Project

GE3238 GIS Design and Practices
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Learning Objectives

- Understand basic spatial project management considerations

- Within these considerations, appreciate the role of spatial thinking that affects your choice of data/tools

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TOC of *The Design and Implementation of GIS*

- Needs assessment and requirements analysis
- Designing the GIS database schema
- Designing spatial data and attribute data
- Remotely sensed data as background layers and data sources
- Implementation: data development and conversion
- Implementation: hardware and software
- Designing the organization for GIS
- Management concerns

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In GE3238
- Week 2-3 Network data model
- Week 4 GIServices
- Week 5 VGI
- Week 6 Automation or customization

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Needs Assessment

- What applications?
  - What exists at or near a particular location?
  - Where are all the places where this exists?
  - What geographic areas meet the following criteria?
  - What has changed in this area or region over time?
  - What spatial patterns exist?
  - If we were to do this, what would the result be?

- Key point
  - A development is always connected to a set of specified applications

- Quote from 1989
  - There is no theory-neutral GIS

https://geospatialworld.net/consulting/reports/evolving-role-of-national-mapping-agencies/2024/

Translating needs assessment to your projects

- Define the scope of your project
  - Using spatial thinking/terms

  - Associating with a domain question – what is your domain of interest

  - Intended audience

Data and "know thy data"

- Data take 80% of the "budget"
- What data do you need to address the question
  - E.g. network dataset for spatial optimization
- Purpose: Viewing or analyzing?
- Available or accessible?
  - What format?
  - Ready to use or require further processing?

Data – Fitness for use

- GPT-4o model said the following
  - The degree to which data, a product, or a service meets the specific needs and requirements of its users or consumers

  - This concept is often applied in the context of **data quality**, product design, and service delivery to ensure that the end result is both effective and satisfactory for its **intended purpose**

Choosing the Appropriate (Mix of) Data Model(s)

- Fundamental: vector and raster
  - What exactly do vector/raster tell you?
    - Discrete versus continuous
- Those built on top of the fundamental
  - Transportation network was introduced; relations are important
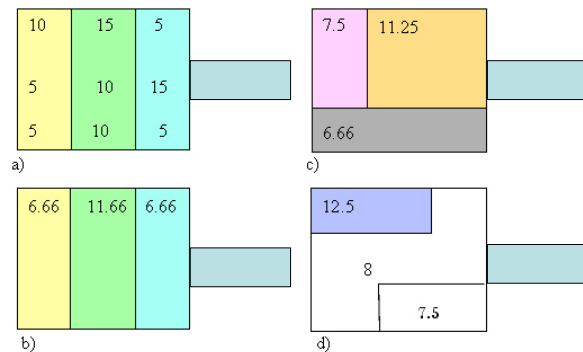 - But what about bus route?
  - Vector and raster together?

  Database schema

  (we will have 2-3 more lectures on data models)

Data Attributes

- Are they readily available?
- Are they really what you want? Be aware of idiosyncrasies in
  - Definition
  - Granularity
- Can they be enriched via VGI?

10	15	5
5	10	15
5	10	5

a)

7.5	11.25
6.66	

c)

6.66	11.66	6.66

b)

12.5	
8	
	7.5

d)

Remote Sensing Data as Background Layers Only?

- Background layer – see Esri's Living Atlas
  - WMTS (Web Map Tile Service)
- The answer is of course NO. It provides data on, e.g.,
  - Land use/land cover
  - Urban functional zone
  - …
  - But you need skills from GE4214 Remote Sensing of Environment

Expectation of the Final Deliverables

- Do not wait until the last minute!
- Final deliverables
  - Static map versus interactive map
  - Storymap – "map that tell a story"
    - https://search.nlb.gov.sg/spatialdiscovery/storymaps/mapbox/index.html
    - Sensitivity of the output (crucial if you work as an intern)

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How many considerations go into the four steps to design geodatabases below?

1 *Identify the information products that will be produced with your GIS.*
Inventory map products, analytical models, database reports, Web access, data flows, and enterprise requirements.

2 *Identify the key thematic layers based on your information requirements.*
Specify the map use, data source, spatial representation, map scale and accuracy, and symbology and annotation.

3 *Specify the scale ranges and spatial representations for each thematic layer.*
GIS data is compiled for specific scale use; feature representation often changes between points, lines, and polygons at larger scales. Rasters are sampled to include multiresolution pyramids.

4 *Group representations into datasets.*
Discrete features are modeled with feature datasets, feature classes, relationship classes, rules, and domains. Continuous data is modeled with raster datasets. Measurement data is modeled with survey datasets. Surface data is modeled with raster and feature datasets.

5 *Define the tabular database structure and behavior for de...*
Identify attribute fields, specify valid values and ranges, apply...

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Data are always simplifications of reality…

- Do your data capture key spatial information within the scope of your project?
- Is it at the right level of detail (e.g., scales and resolutions)?
- Is the temporal coverage correct?

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(Geo-)processing Tools to Use

- They are often linked to the data model(s) used
- Often you need to "glue" multiple geoprocessing tools
  - ModelBuilder or Python can help
- Know the underpinning spatial concepts
  - Usually based on distance
  - Tools that sound similar may serve different purposes (see the next slide)

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An Example: Hotspot and density map

- Difference?

Symbology and Visual Variables

- Demonstrated in Lab03
- Effective symbology connects with
  - geographic phenomena
  - Scale of measurement

Communication

- "When it comes to working in the GIS industry, clear communication is often as necessary" https://www.esri.com/about/newsroom/arcnews/managing-gis-workflows/
- How data / information were obtained
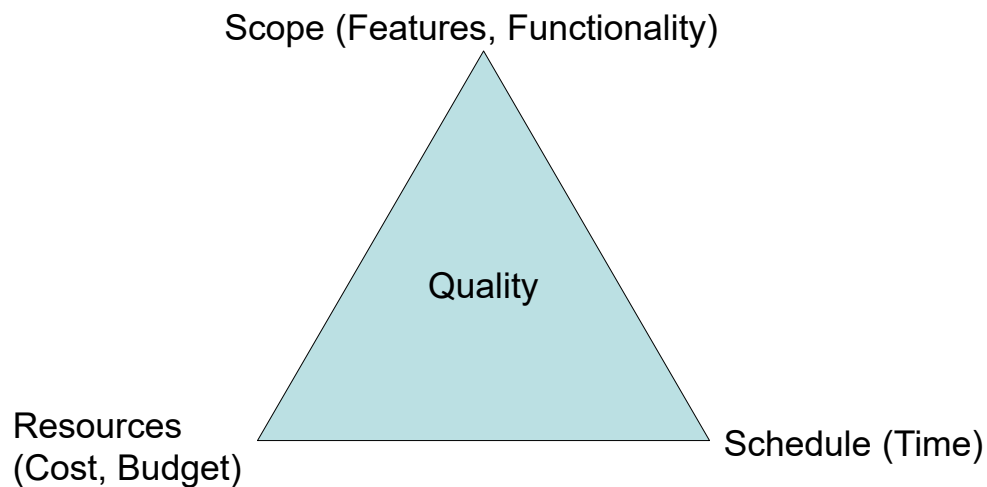- This is where metadata (data about data) is important

Archiving Project

- Essentially project submission
- Are metadata available?
- Tidiness
- Completeness
- Share function on ArcGIS Pro?

Iron Triangle of Project Management

Scope (Features, Functionality)

Quality

Resources
(Cost, Budget)

Schedule (Time)

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Final Thoughts

- Often a necessary evil: trial and error
- A real project often involves Gantt or pert charts
  - Collaborative tools are often involved, e.g. kanban style tools
- We emphasize spatial thinking and data model, but visualization is equally important, if not more important
- Cost is of critical importance
  - Open source does is not necessarily cheaper

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