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DISTRIBUTION CENTER, WAREHOUSE, & PLANT LOCATIONS

Site Selection

- Process broken down into 3 separate focus areas
  - Macroanalysis
  - Microanalysis
  - Specific site selection
- Boeing Case Study

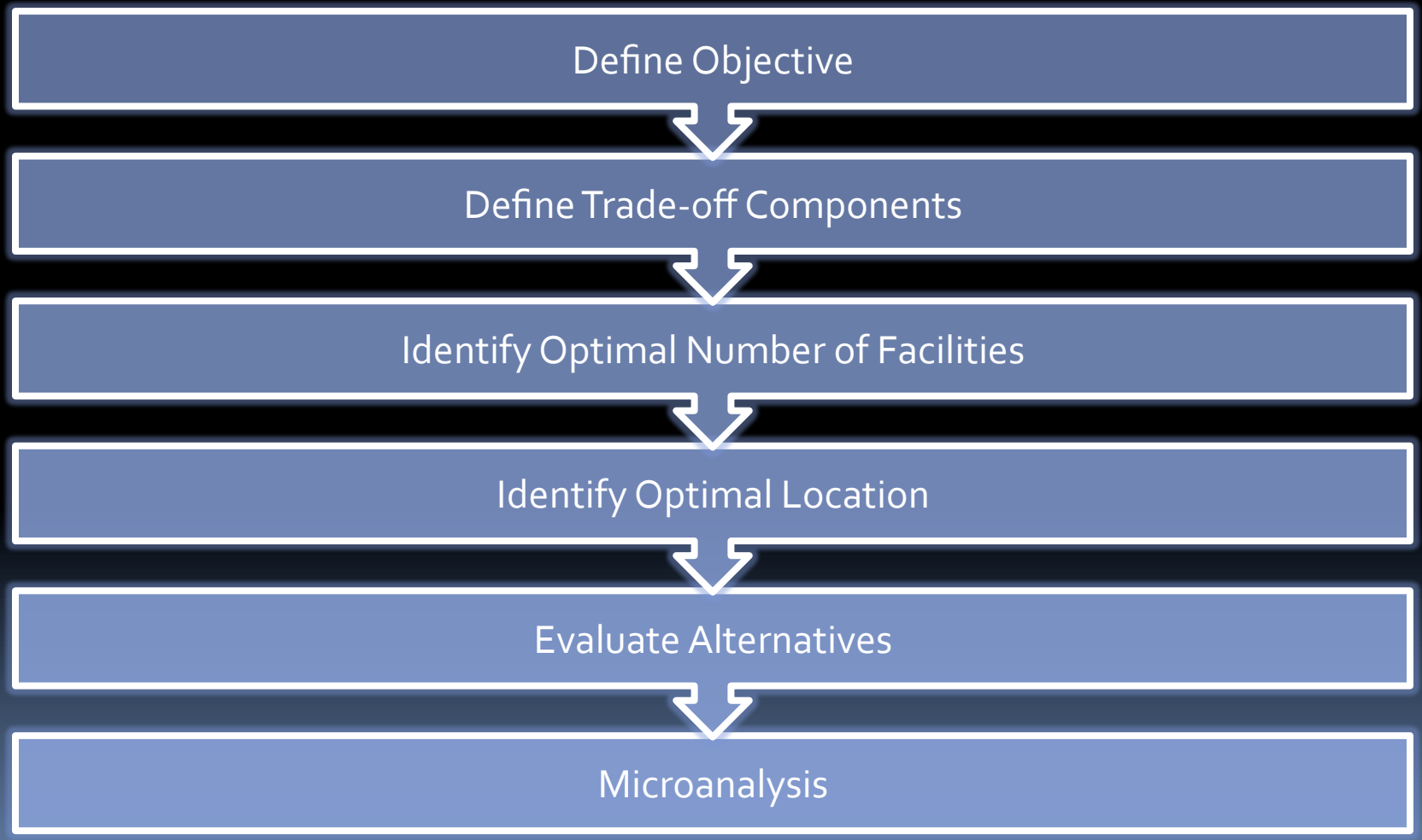
Macroanalysis

- Top level analysis
  - How many locations to choose from?
  - Where are these locations?
  - Costs?

Macroanalysis Issues

- Service Requirements
- Transportation
- Materials Handling
- Fixed Costs
- Inventory Costs
- Number & Location of Facilities

Macroanalysis Approach

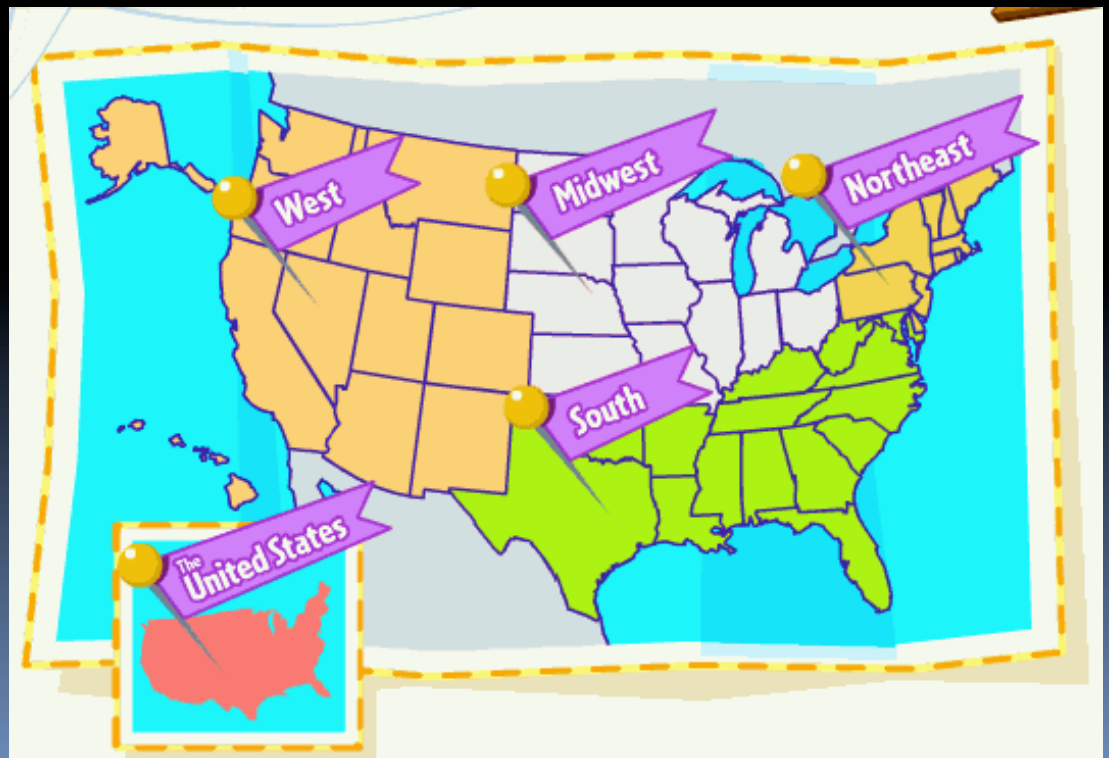


Macroanalysis Modeling

- Three major types of modeling used
  - Computer spreadsheet models
    - Uses various programs for the input of data and manipulation, to provide quick results
    - Spreadsheets allow for the view and compilation of volumes of data
  - Mathematical models
    - Everything is placed into a mathematical formula for solving
  - Network simulation models
    - Solves various models automatically to provide a listing of all potential sites and which is best

Macroanalysis Results

- The macroanalysis may yield an answer such as “the mid-western” region or “southeast” region

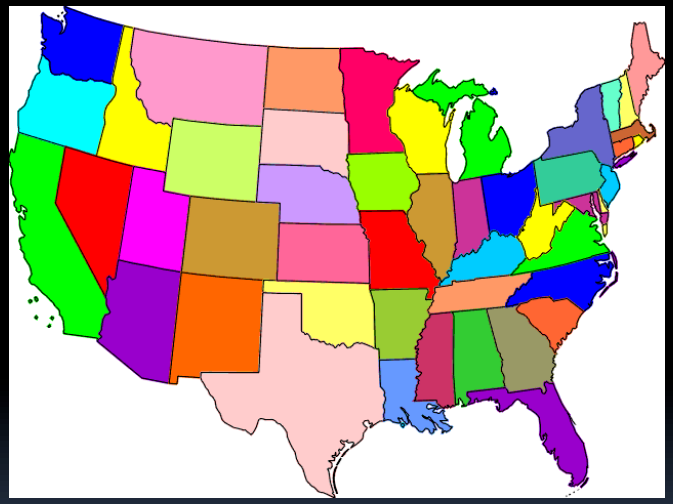


Microanalysis

- Identifies a particular sector, district or area located in a geographic region identified in the previous *Macroanalysis*.

Microanalysis – Points of Focus

- Availability of existing sites locations
- Population: Labor availability
- Taxes and Subsidies
- Competitive Climate.
- Suppliers availability
- Local Utilities
- Potential as a distribution hub
- Highway access
- Business activity
- Quality of Life considerations
- Weather threats.
- Proximity to Airports and seaports.



Tools for Microanalysis: (Grid Systems)

- Analysis of spatial relationships using Mathematical Tools.
  - Center of Gravity
  - Weighted Center of Gravity

Center of Gravity (C-O-G) Approach

- Patterns are set on a map.
- Grid: horizontal-axis refers to miles east and vertical axis are set to miles north.
- Points are assigned to the different locations.
- Average distances east-west (x displacement) and north-south are found (y-displacement)
- The average is divided by the number of existing facilities.
- The best location is one with the coordinates of the above averages (x,y)

Weighted Center-of-Gravity Approach: Similar to C-O-G

- Takes into account the volume a particular facility receives.
- The location is multiplied by the monthly volume received.
- The average is calculated.
- The Weighted center of gravity is determined for the location.

Results of Macroanalysis

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Potential Facility Locations

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Collect Information

- Labor
- Tax
- Locations
- Business Activities
- Utilities
- Competitors
- Support Services

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Comparative Analysis

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Recommendation

Microanalysis

- Key issues
  - Socioeconomic area
  - Government services
  - Transportation
  - Highway congestion
  - Proximity to air, rail, sea
  - Availability of labor
  - Unemployment rate
  - Land Value
  - Competitive climate

Site Selection

- Common Elements
- Construction Site Considerations
- Existing Facility Considerations

Common Elements

- Labor Pool
  - skill level distribution
  - Competition, Present and Future
  - Neighborhoods and Surrounding Areas
  - Union Presence
- Utilities and Communications
  - Potential limitations
  - Long lead time for hook ups
  - Service Interruptions
  - Potential development that can restrain resources

Common Elements

- Surrounding Neighbors and Tenants
  - Principle use of area surrounding site
  - Availability of support services and labor
  - Absence or dominance of similar facilities
- Local Support Services
  - Absence of services causes higher cost for self sufficiency and downtime
  - Examples: waste disposal, computer equipment service, fire protection, and sanitation
- Transportation Pick Up Services
  - Examples: parcel deliveries, proximity to parts and air freight terminals, local cartage

Common Elements

- Local Taxes
  - All taxes may not be reflected in real estate appraisal
  - Could add sufficient cost to operating budget
  - Personal taxes may require a higher wage to offset
  - Examples: corporate, local, regional, personal, property, inventory, fees, licenses
- Fire Codes and Protection
  - Interpretation of codes may vary in different jurisdictions which can impact insurance
  - Type of protection provided – volunteer, professional
- Union Activity
  - Avoidance or alliance
  - Avoid locations know for unions with militant activity, work interruptions, or excessive grievance filing

New Construction Versus Existing Facility

- Availability of existing facility
- Make vs. buy financial analysis
- Sufficient lead time to construct and occupy facility
- Customization requirement s of existing facility
- Do not limit to one or the other

Evaluation of Potential Construction Sites

- 3 step approach
  - Inventory sites for construction (list of sites meeting minimum requirements)
    - Acreage
    - Zoning
    - Support Services
  - Familiarization with local building practices and preparation procedures
    - Land preparation
    - Weather effects
    - Regional roof requirements
    - Local construction practice and cost
    - Construction methods
    - Building Codes
  - Specific Site Evaluations

Specific Evaluation for Constructed or Existing Sites

- Zoning and zone appeal process
- Construction permits, code requirements, exceptions, and appeal process
- Building site restrictions
- Environmental Impact
- Topographical maps
- Incentives

Existing Facilities Consideration

- First sites must meet minimum requirements in terms of square footage, land use, and other non-correctable physical characteristics
- Second a list of recently sold or leased properties in the same geographical areas should be reviewed

Existing Facilities Consideration

- Third the physical characteristics of the properties should be included
  - Total square footage
  - Type of construction
  - Additions
  - Number of dock doors
  - Space on site for expansion
  - Sprinkler systems
  - Ceiling Height
  - Date of Construction
  - Square footage of office space
  - Paved yard area
  - Presence or availability of rail connections
  - Building occupancy and use zoning

Existing Facilities Consideration

- Final research of potential sites includes
  - Sprinkler systems
  - Safety requirements
  - Situation of building on property
  - Building appearance
  - Previous tenants and building history
  - Building's original construction design and intended use
  - Expansion capabilities
  - Building modification requirements
  - Building maintenance
  - Physical examination (walls, floors, roofs, paved areas)
  - Insulation
  - Docks, doors, and dock levelers
  - Lighting
  - Skylights
  - HVAC
  - Office space
  - Trailer parking
  - Sanitation

Case Study: Boeing 787 Facility

- Selection Criteria:
  - Transportation
    - Suitable runway provisions
    - Proximity to a port capable of around-the-clock operations
    - Continuous availability of heavy traffic ways between plant site and port
    - Proximity to railways, interstate highways
  - Facilities
    - Available land, buildings, related infrastructure to accommodate 787 final assembly

Case Study: Boeing 787 Facility

- Cost of Doing Business - $1 bill/US
  - Cost of land, buildings
  - Construction cost
  - Site preparation cost
  - Support services (fire, police, emergency and medical services)
  - Taxes, utilities, insurance, other recurring, non-recurring costs
- Work Force – 3800 employees
  - Training infrastructure, partnering opportunities with local agencies or governments
  - Absenteeism. turnover rates for other local companies
  - Available labor pool
  - Quality of local public schools

Case Study: Boeing 787 Facility

- Environmental Considerations
  - Local flying weather
  - Possible extreme temperature impact on manufacturing,
  - Susceptibility to natural disasters (earthquakes, tornadoes, hurricanes, flooding)
- Community Support
  - Local community, governmental support for manufacturing businesses
  - Support of local, county, state governments for Boeing, its suppliers
  - Environmental regulations, permitting process
  - Likelihood of long-term community support
  - Ability to expand or modify facilities, infrastructure
  - Quality of life that supports employee recruitment

Case Study: Boeing 787 Facility

- Infrastructure Issues
  - Relative cargo, freight costs
  - Availability of utilities including water, sewer, power, waste, telecommunications
  - Transportation enhancements that support schedule, requirements

Final Selection: North Charleston, SC

The SC Facility