



Facility Planning & Layout

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CHAPTER 1 FUNDAMENTAL CONCEPTS

Facility Location I

Fundamental Concepts

We will address the following issues

- ① What is facility location?
- ② Causes that originate Location decision problems
- ③ Importance of Location Decisions
- ④ Difficulties of making facility location decisions
- ⑤ What factors should we consider?
- ⑥ Trends & Future Strategies

What Is Facility Location?

Facility Location problem (where?)

It involves the placement of a facility in such a way that it will satisfy specified requirements.

Some types of facilities

- **Heavy manufacturing:** automobile plants, steel mills, and oil refineries.
- **Light industry:** furniture, consumer electronics, home appliances, and pharmaceutical firms.
- **Warehouses and distribution centers:** intermediate point in the supply chain where products are held for distribution.
- **Retail and service:** hospitals, universities, company headquarters, groceries, department stores, restaurants, banks, hotels.

Causes that originate Location decision problems

- An expanding market.
 - It will require the addition of more capacity at a certain geographic point, either in an existent facility or in a new one.
- Introduction of new products or services.
- A contracting demand, or changes in the location of the demand.
 - It may require the shut down and/or relocation of operations.
- The exhaustion of raw materials in a certain area.
 - Example: Extraction companies.

Causes that originate Location decision problems

- Obsolescence of a manufacturing facility due to the appearance of new technologies.
 - It means the creation of a new modern plant somewhere else.
- The pressure of the competition.
 - To increase the level of service, it can force the company to increase capacity of certain plants or relocate some of them.
- Change in other resources, like labor conditions or subcontracted components, or change in the political or economic environment in a certain region.
- Mergers and acquisitions.
 - Some facilities may appear as redundants, or bad located with respect to others.

Location Alternatives

- Expansion of an existent facility.

- Only possible if exists enough space.
- Attractive alternative when the current facility location is good enough for the company.
- Lower costs than other options

- Start a new facility in a new area.

- Sometimes is a more advantageous option than the previous one (if there are problems related to lose of focus on the company's objectives).

- Shut down of a facility and (or not) starting of a new one somewhere else.

- Moving production from one plant to other.

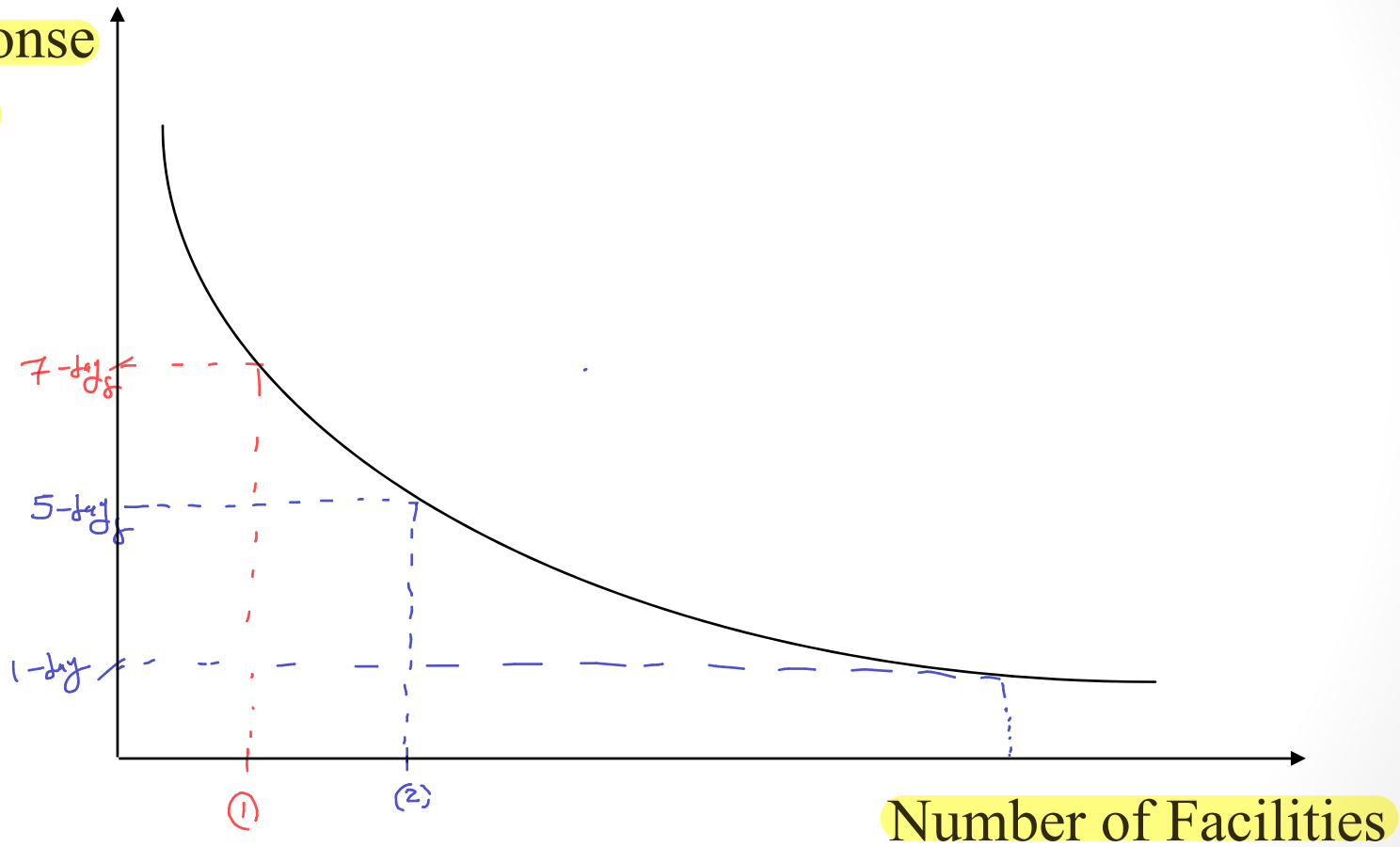
Importance of Location Decisions

Significant impact on the firm's competitiveness:

- Impact on major organization's costs (revenues)
- construction costs
- operating costs
- distribution costs
- customer service / market area
- etc.

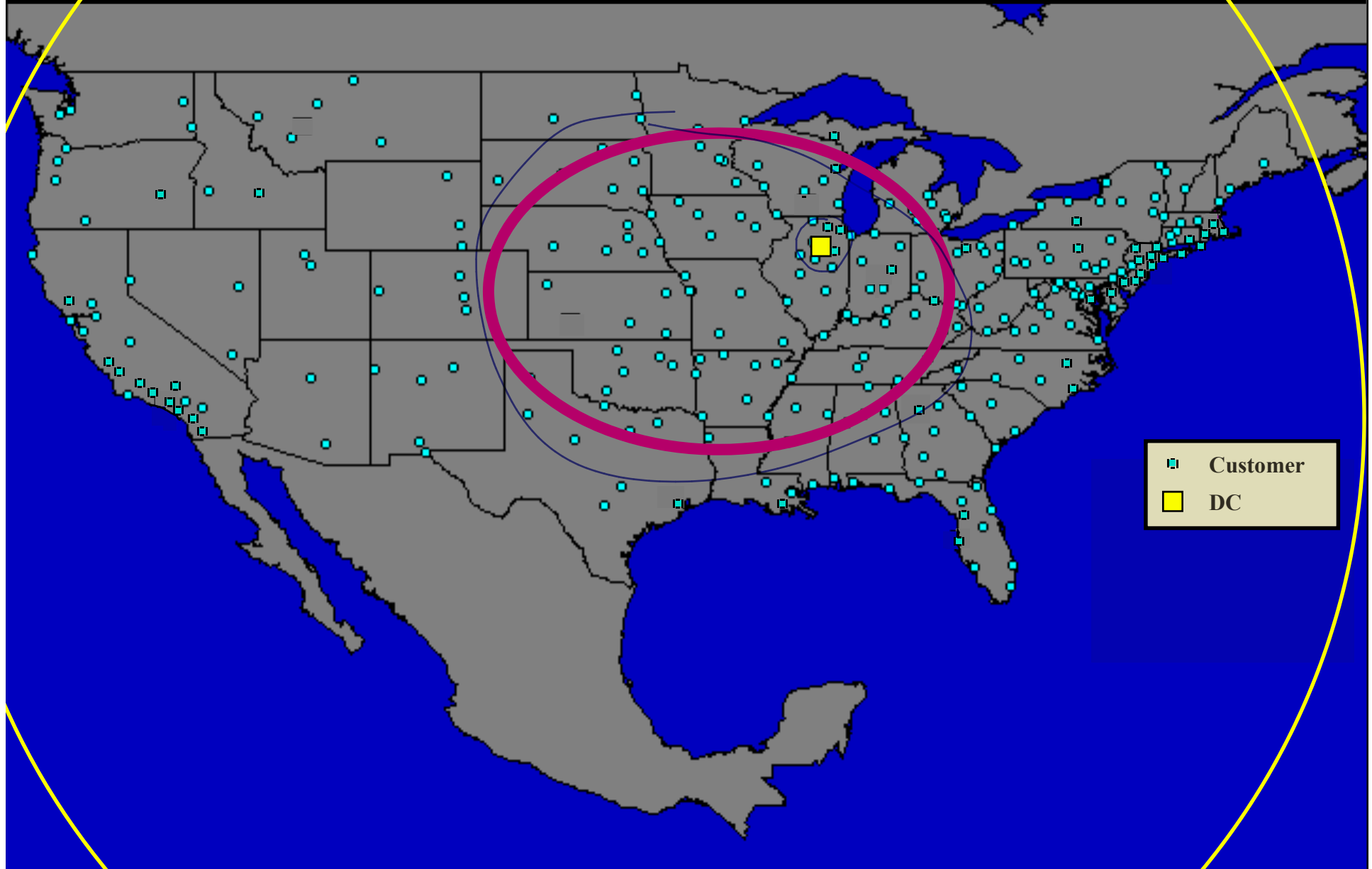
Service and Number of Facilities

Response
Time

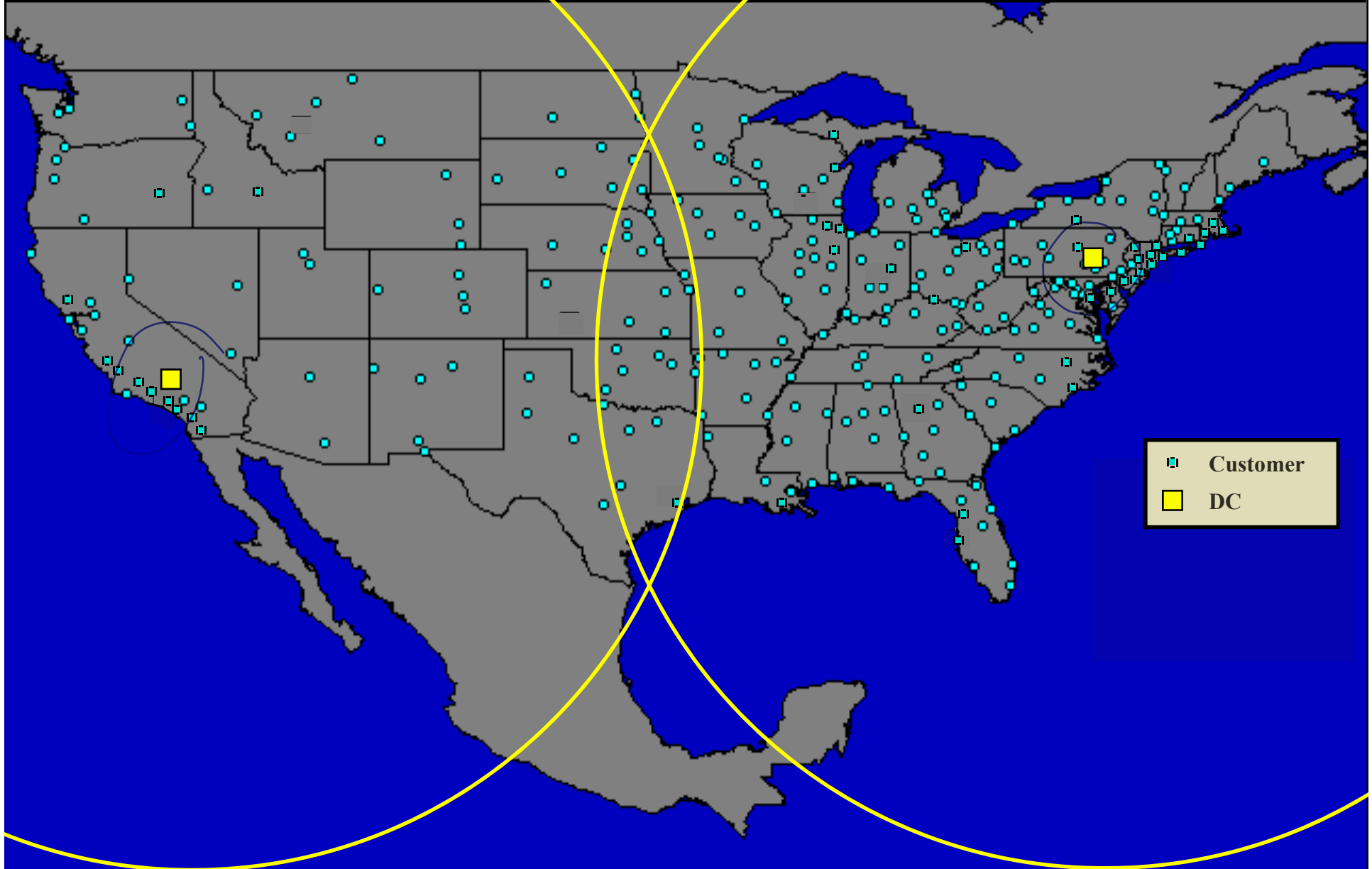


Number of Facilities

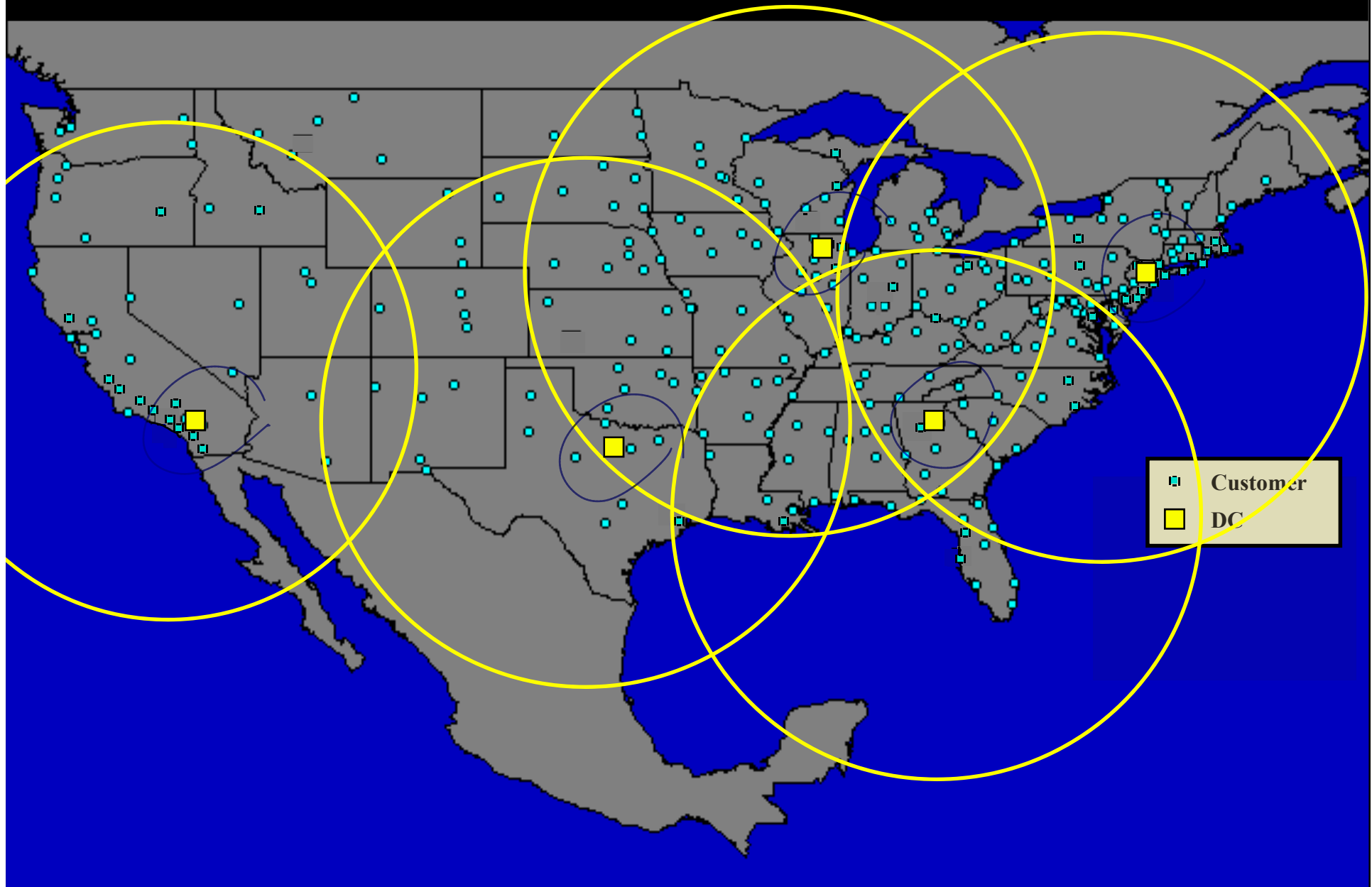
**Where inventory needs to be for a one week order response time -
typical results --> 1 DC**



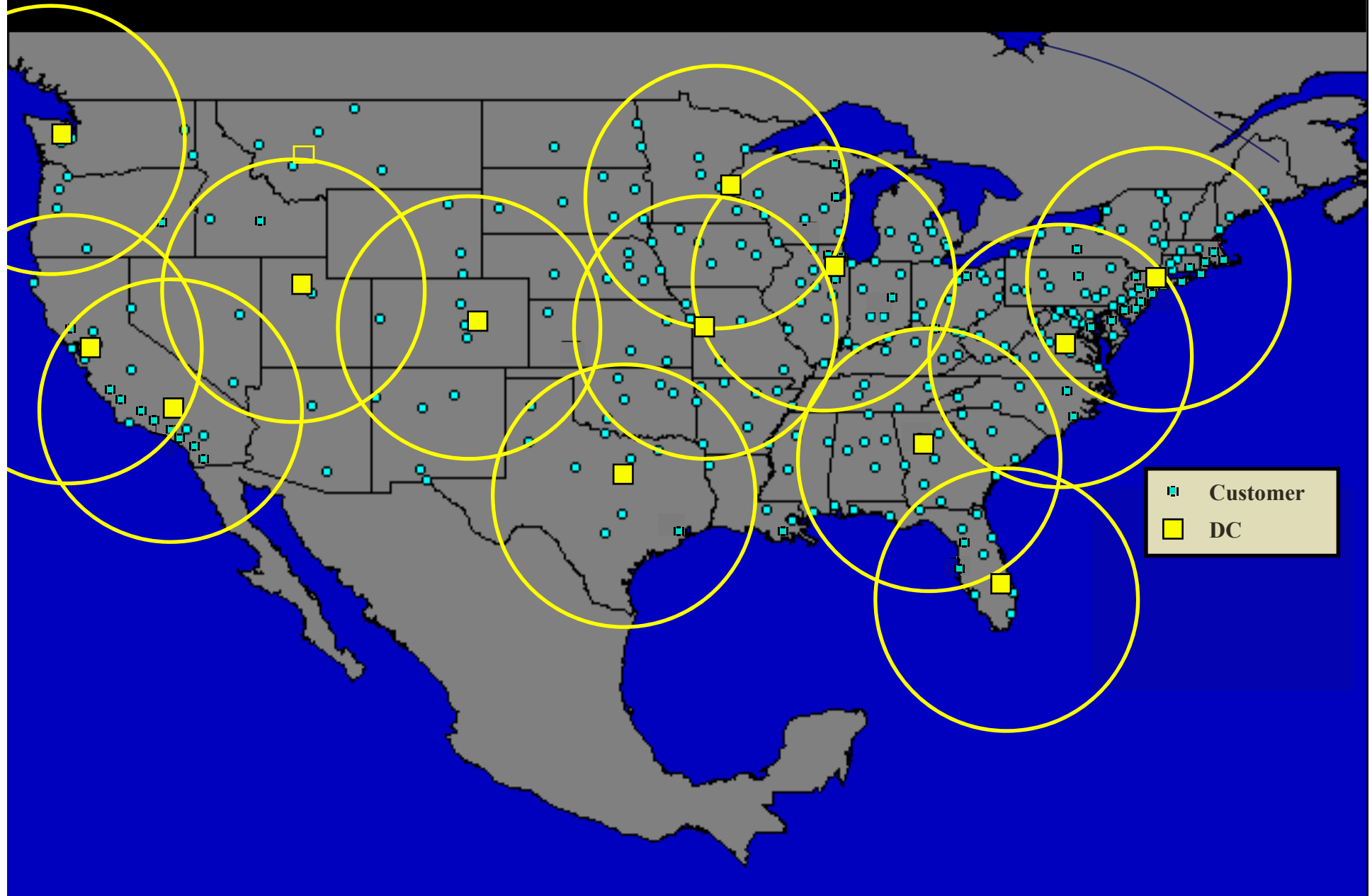
Where inventory needs to be for a 5 day order response time -
typical results --> 2 DCs



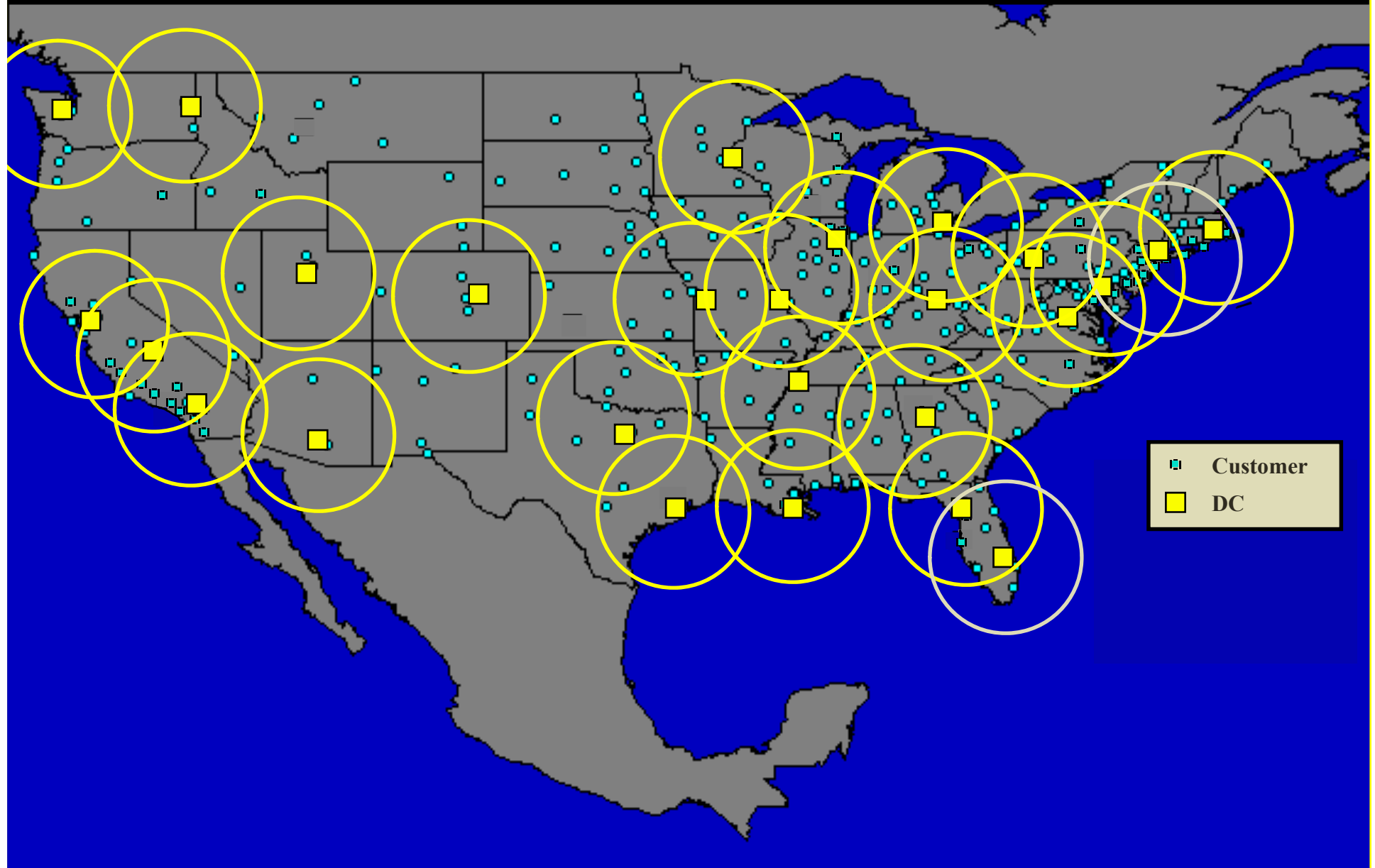
Where inventory needs to be for a 3 day order response time - typical results --> 5 DCs



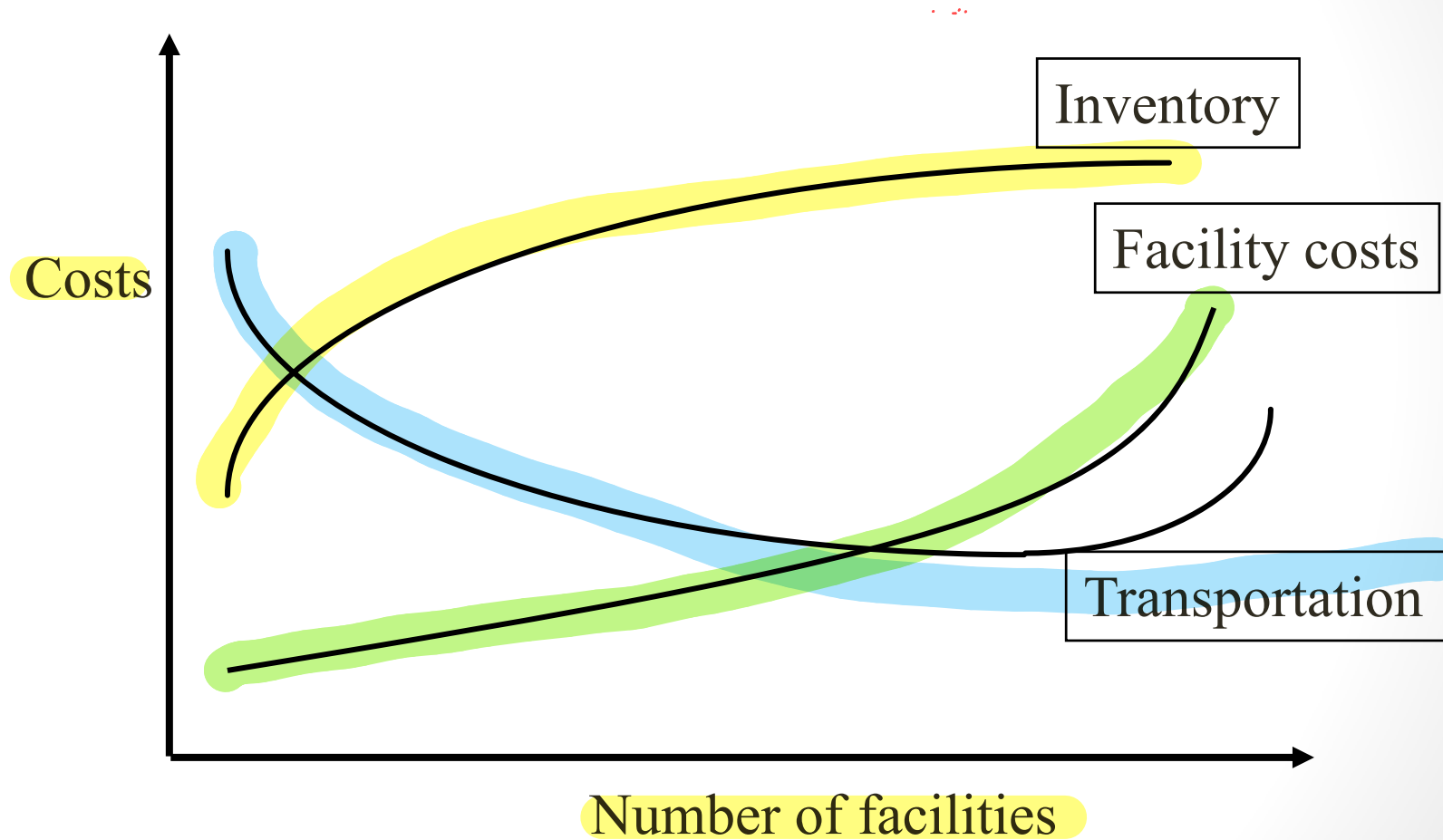
**Where inventory needs to be for a next day order response time -
typical results --> 13 DCs**



Where inventory needs to be for a same day / next day order response time - typical results --> 26 DCs



Costs and Number of Facilities



Difficulties of Making Facility Location Decisions

- Location decisions are strategic decisions (long-term decisions/made infrequently): not easy to reverse.
- When locating a new facility, there are too many alternatives / possible sites from which to choose.
- Many tangible and intangible factors are not quantifiable. e.g. customer service, politics, labor relations. A manager must *subjectively* trade off these factors when analyzing different sites.
- Difficulties to forecast future costs / future business climate.

What factors should we consider?

✓ Market:

- Proximity ✓
- Growth/ size ✓

✓ Raw material and supplies:

- Need for proximity ✓
- Availability ✓

✓ Transportation Infrastructure and Services:

- Availability/cost
- Highway, waterway, railroad, airport

• Manpower:

- Availability ✓
- Quality/skills ✓

What factors should we consider?

- Utilities:

- availability and dependability of power / fuel / gas
- water and waste treatment capacity

- Site alternatives:

- land and construction costs
- regulation and tax structure

- Community attitude/services:

- incentives
- cost of living / housing / taxes

Note that the importance of each factor is closely related to the facility's type.

Factors affecting the facility location decision : Example

Factor Affecting The Location Decision	Heavy Manuf	Light Manuf	Warehousing	Government services	Retailing
Nearness to customers	C	C	B	A	A
Labor availability and costs	B	A	B	A	B
Construction and land costs	A	B	B	B	B
Proximity to raw materials and supply	A	A or B	C	C	C
Nearness to transport facilities	A	B	A	C	B

A: Very important, B: Important, C: Less important

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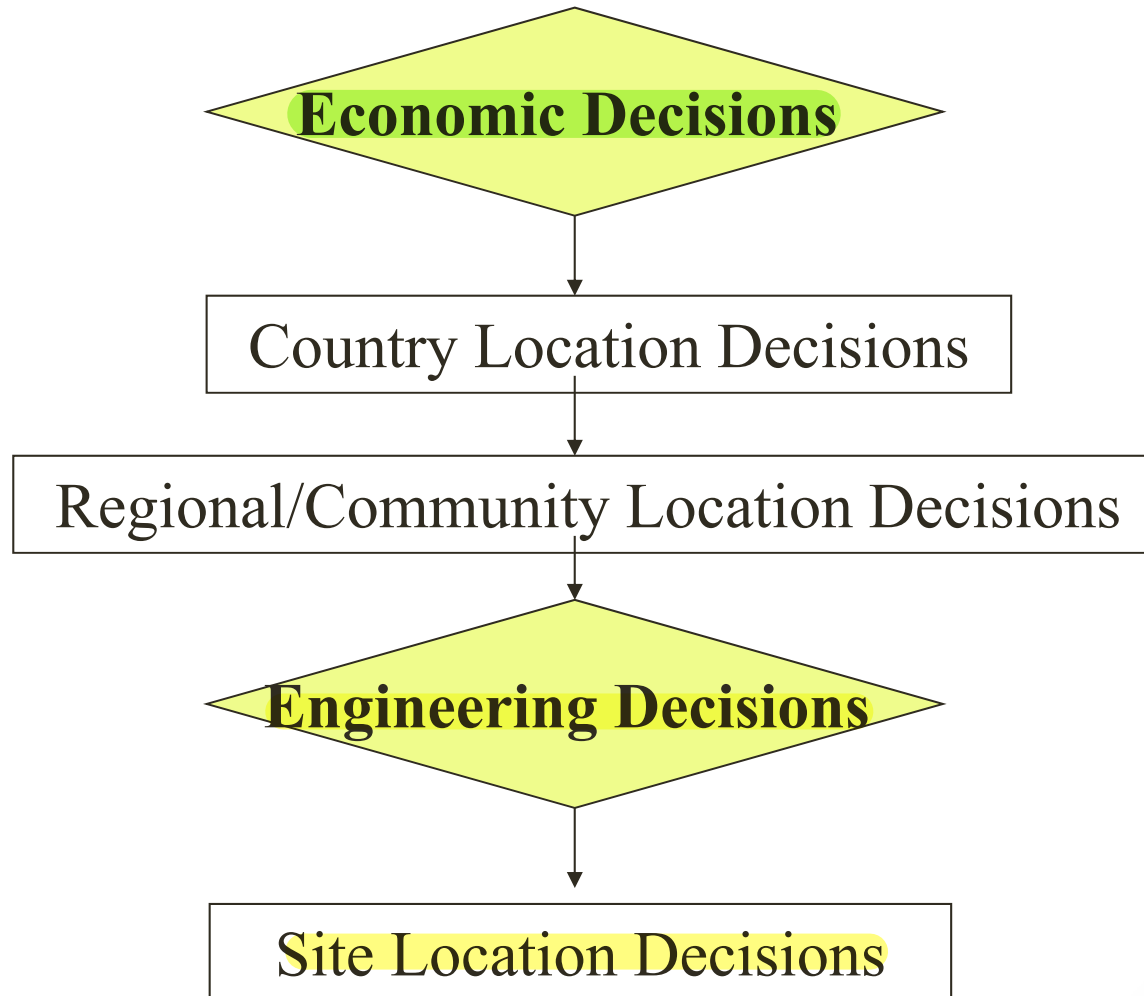
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Construction and land costs	A	B	B	B	B
Proximity to raw materials and supply	A	B	C	C	C
Nearness to transport facilities	A	B	A	C	B

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Single Facility Location

- Location decisions are usually achieved in two phases,
 - (1) **Economic Decisions**: The general territory selection phase, and
 - (2) **Engineering Decisions**: The exact site selection phase.

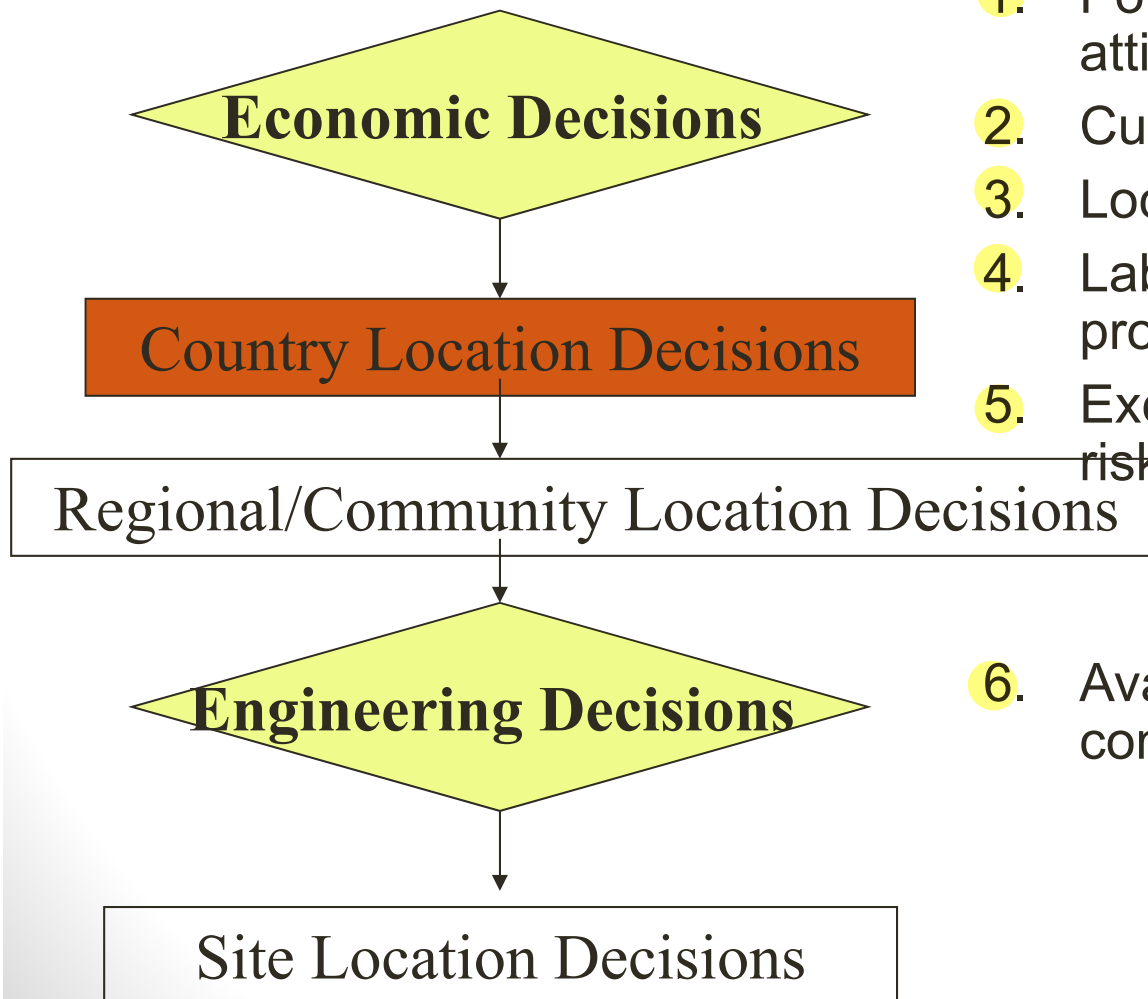
Single Facility Location



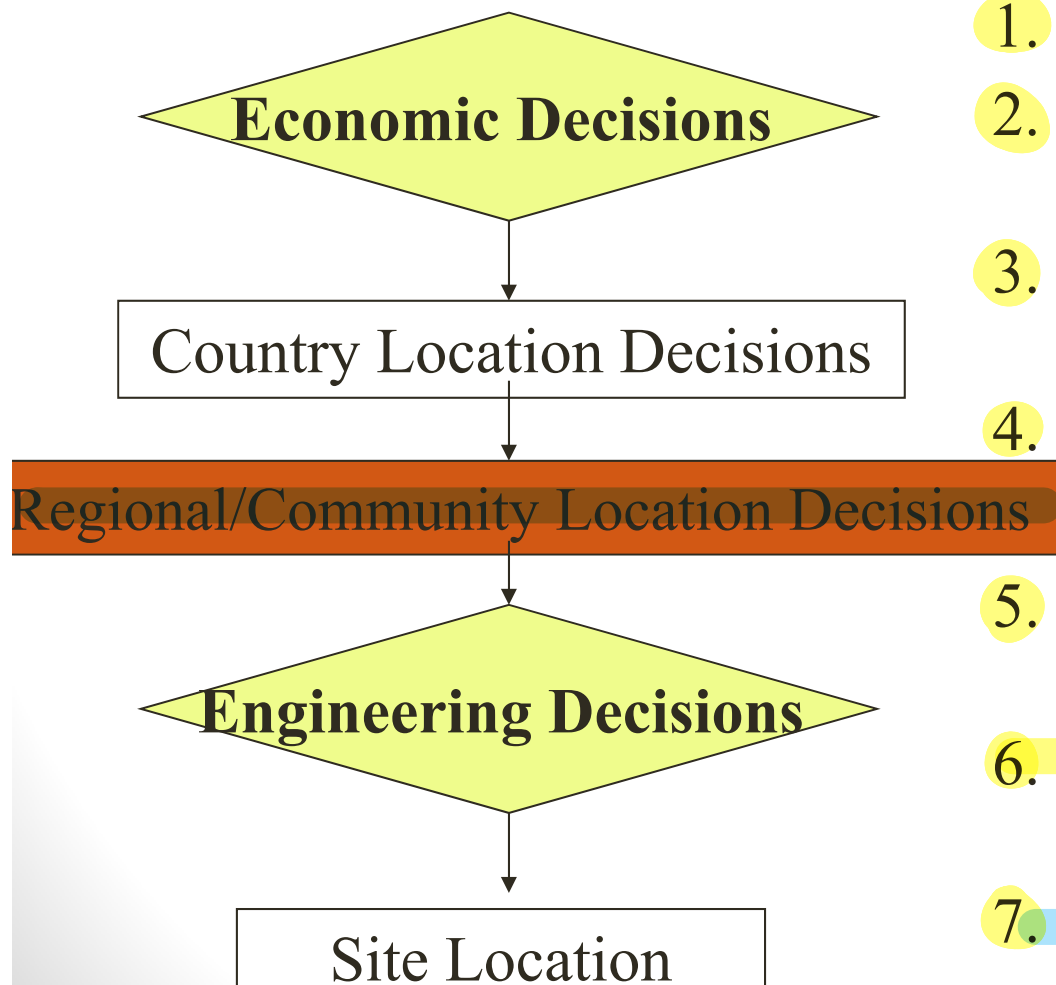
Single Facility Location

Critical Success Factors

1. Political risks, government rules, attitudes, incentives
2. Cultural and economic issues
3. Location of markets
4. Labor availability, attitudes, productivity, costs
5. Exchange rates and currency risks
6. Availability of supplies, communications, energy



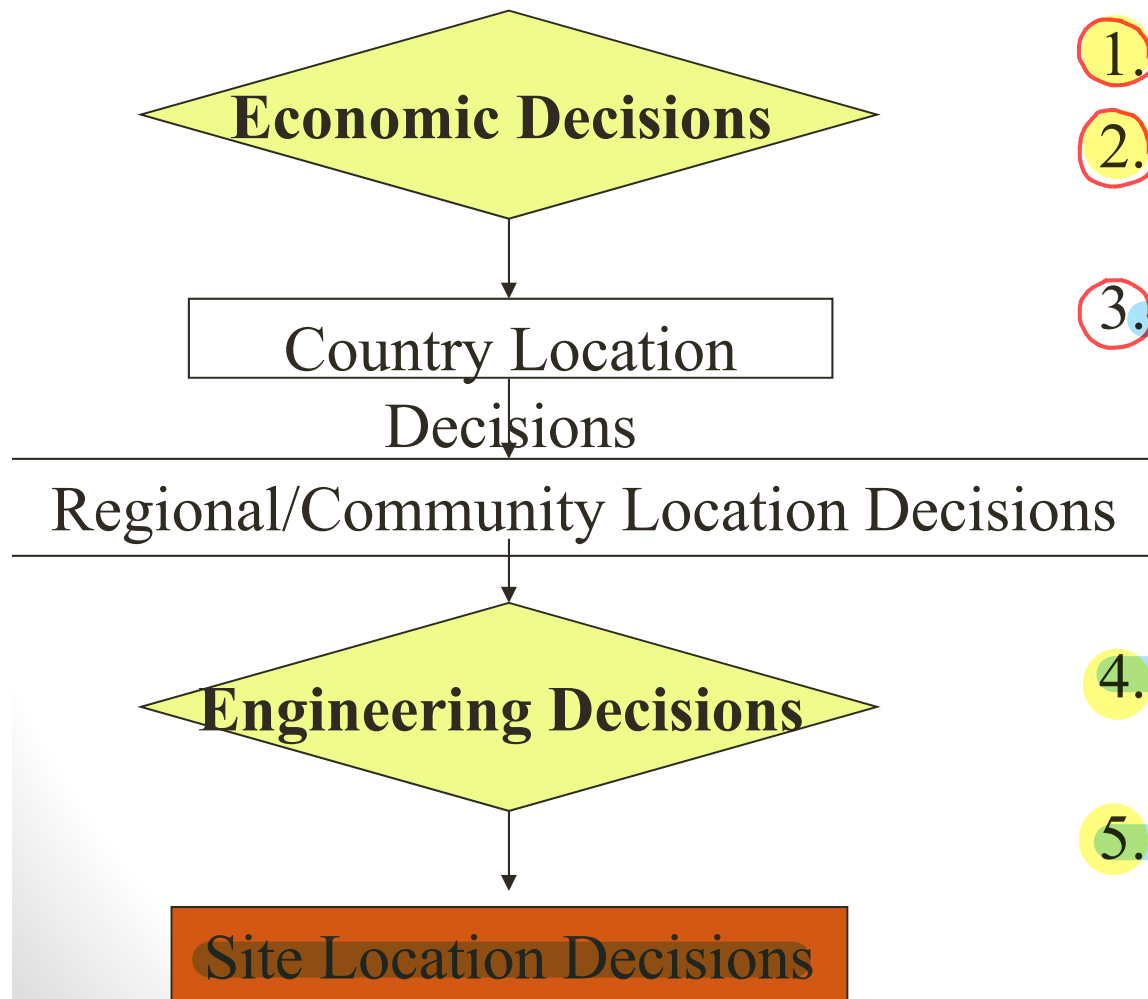
Single Facility Location



Critical Success Factors

1. Attractiveness of region
2. Labor availability, costs, attitudes towards unions
3. Costs and availability of utilities
4. Environmental regulations
5. Government incentives and fiscal policies
6. Proximity to raw materials and customers
7. Land/construction costs

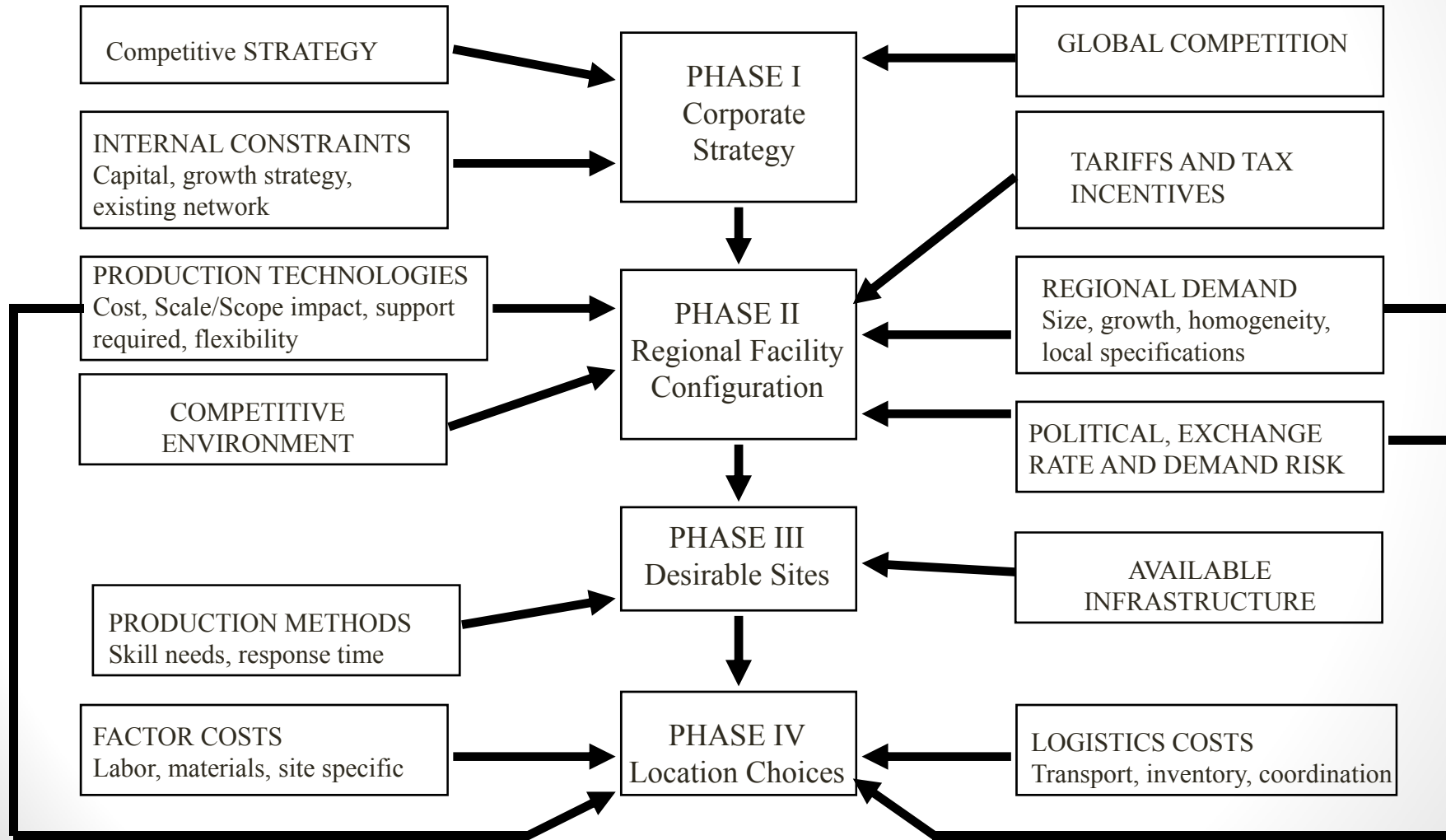
Single Facility Location



Critical Success Factors

1. Site size and cost
2. Air, rail, highway, and waterway systems
3. Zoning restrictions
4. Nearness of services/ supplies needed
5. Environmental impact issues

A Framework for Global Site Location



Trends & Future Strategies

- Most of the Facility Location factors vary with time:
 - The accelerated changes in the economic environment are impacting the frequency of Facility Location decisions.
- Changes in the economic environment:
 - International level competition among companies.
 - Location in countries different than the origin of the company are a common situation for big companies.
 - Appearance of new markets and unification of others.
 - Increase of competition pressure.
 - Logistics factors are more important and complex.
 - Companies are reviewing their facility locations in order not to lose competitiveness.

Trends & Future Strategies

- Changes in the economic environment:
 - Industry processes automation.
 - Labor costs become less important: countries with lower labor costs become less attractive.
 - Labor qualification, flexibility and mobility become more important factors.
 - However, labor costs are still a main factor in some industries and in certain manufacturing processes of others: Relocation to Mexico, India, China, etc.

Trends & Future Strategies

- Changes in the economic environment:
 - Transportation and IT development.
 - Helps in the internationalization of the operations: higher geographical diversity in location decisions.
 - Tendency to localize close to the markets: emphasis in customer service, direct customer contact, fast development of new products, fast delivery...
 - Due to flexible technologies, companies have the possibility of starting up more plants at a smaller size.
 - J.I.T. Systems.
 - Some industries are forcing their suppliers and customers to locate their facilities in a close area to reduce transportation costs and supply at a higher frequency.

Questions

Describe for each of the following facilities what are the site selection considerations:

1. Fire station
2. Cinema
3. University library
4. Department store
5. Airport

Site Selection Considerations for Service Facilities

1. Access:

Convenient ring roads and motorways
Served by public transportation

2. Visibility:

Set back from street
Sign placement

3. Traffic:

Traffic volume on street that may indicate potential impulse buying
Traffic congestion that could be a hindrance (e.g., fire stations)

4. Parking:

Adequate off-street parking

5. Expansion:

Room for expansion

6. Environment:

Immediate surroundings should complement the service

7. Competition:

Location of competitors

8. Government:

Zoning restrictions
Taxes



Thank you for your attention...

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