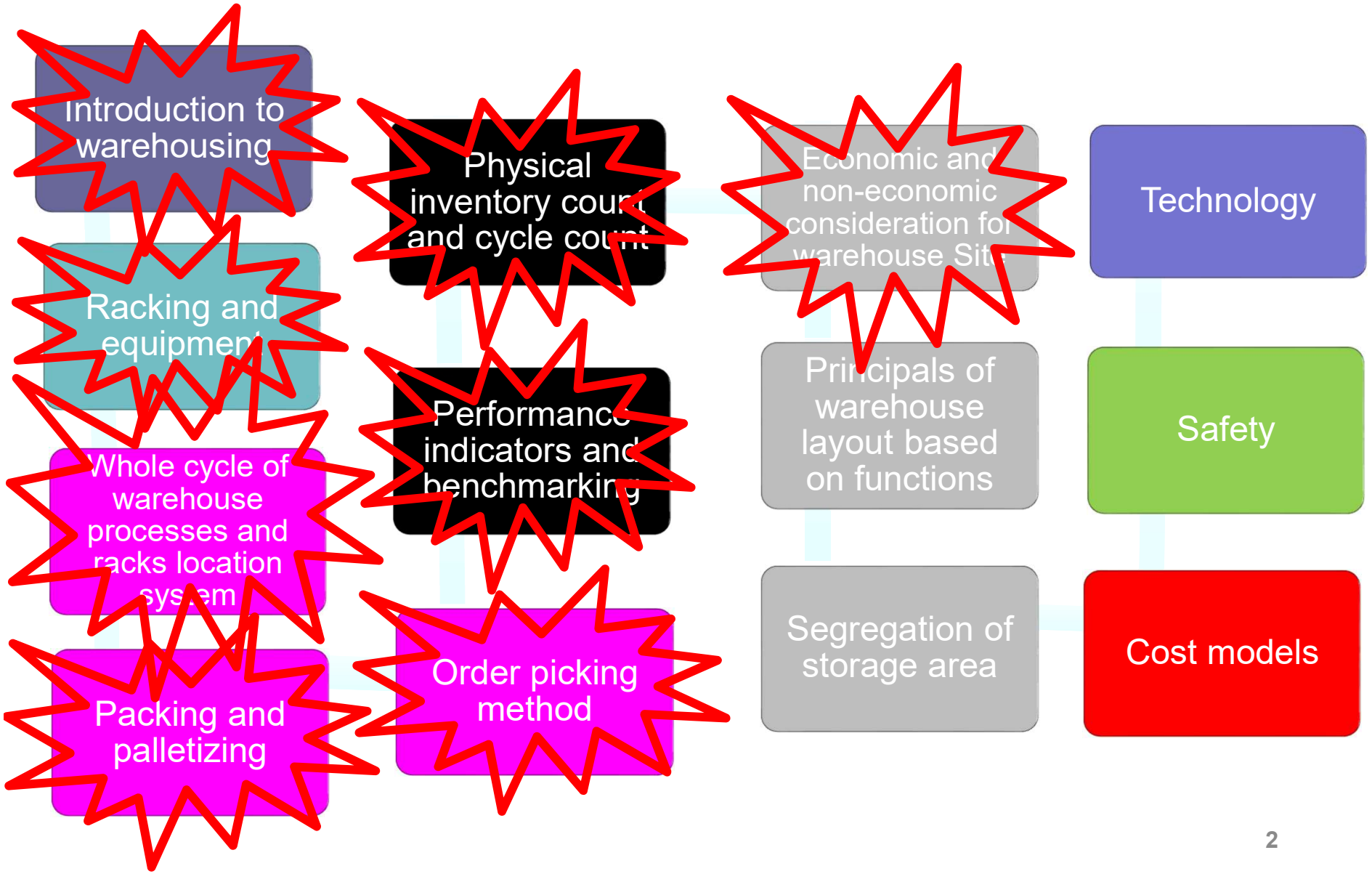
P08:

Selecting a location

SCHOOL OF ENGINEERING

E215 – Warehousing and Storage

E215 Warehousing and Storage Topic Flow



P08 – Learning Objective

- To identify and explain the site selection criteria for:
  - International site
  - Macro site
  - Micro site
- To demonstrate site selection decision with the use of selection criteria.
- To propose a location for day-to-day operations so that the company is able to:
  - Operates at the lowest cost possible
  - Provide the best customer service possible

Noneconomic Factors affecting Site Selections

Note: The following factors do not have a tangible dollar value but can have an effect on how the new operation functions.

1. Transportation factors

- Vehicle restriction
- Access to good roads & highways
- Access to waterway
- Access to major airports, ports and rail station
- Location of existing and future customers


Noneconomic Factors affecting Site Selections

2. Land Factors

- Zoning restriction
- Insurance and local fire requirement
- Building codes
- Pollution law
- High-water mark
- Topography of land (slope)
- Shape and size of land

Building and Construction Authority

Noneconomic Factors affecting Site Selections

3. Tax and incentive factors

- **Property taxes**
- **Free trade zone status**
- **Taxes incentive and rebate**
- **Insurance rate**

Noneconomic Factors affecting Site Selections

4. Labour factors

- Availability of labour
- Educational level
- Number of workdays lost (public holidays)
- Availability of public transport
- Fuel prices
- Community resources
- MHE vendors availability
- Availability of emergence response team

Noneconomic Factors affecting Site Selections

5. Utilities and energy factors

- Availability of gas, power, water
- Sewer systems

6. Quality of life

- Crime rates
- Number of schools
- Medical care
- Religious centers

Site Selection Project

Site Selection Project Objective:

To propose a location for day-to-day operations so that the company is able to:

- Operates at the lowest cost possible
- Provide the best customer service possible

3 types site selection projects:

1. International site selection
2. Macro site selection
3. Micro site selection

1. International Site Selection

- **To determine the best *foreign country* for companies new operations**
- **International site selection includes the non-economic selection factors**
- **Also include many other unique factors. Some examples**
  - **Value and stability of host country currency**
  - **Stability of host government**
  - **Ability of getting profit out of the host country**
  - **Population attitude towards foreign companies**
  - **Import & export regulation and free trade status**
  - **Culture and customs of host country**

2. Macro Site Selection

- **To determine the best *state or major city* for companies new operations**

- **In Macro site selection, the country is first divided into different region.**
  - **For example, north, south, east, west, etc.**

2. Macro Site Selection Factors

- **Transportation cost**
  - **Identify the various potential regions**
  - **For each potential region, list the distance or delivery days between each potential region to each major city that has the company's customer.**
  - **Calculate the delivery cost based on the projected volume from each potential region to each major city with a customer.**

2. Macro Site Selection Factors

- **Census information**
  - **Obtain and review the latest census information from each potential region**
  - **This census information is about demographic (population characteristics).**
  - **This information should be in consistent format for each potential region for easy comparison.**

2. Macro Site Selection Factors

- **Local government and business development Agencies**
  - **Gather information from local government, economic development agencies and utility companies on the following information for comparison of the potential region.**
    - **Highway network**
    - **Education institutions**
    - **Industrial neighbors**
    - **High and low temperature, frequency of rain and snow**
    - **Location and names of transportation companies**
    - **Location of airports, railways and ports**

2. Macro Site Selection Factors

- **Professional associations and businesses in the area**
  - **Contact the professional associations and companies that are doing business in the potential regions.**
  - **Gather information about the most recent business experiences and current business conditions of the potential regions.**

- **Labor availability and cost**
  - **Determine the availability and average hourly wage for each warehouse job classification.**

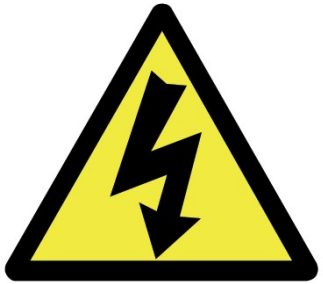
2. Macro Site Selection Factors

- **Taxes and incentives**
  - **Gather information on the following for comparison:**
    - **Income tax**
    - **Property tax**
    - **Inventory tax**
    - **Workers' compensation laws**
    - **Relocation incentives**
    - **Tax relief an rebates**

  - **Based on operational and economic projection, company tax burden can be estimated and compared among the potential regions**

2. Macro Site Selection Factors

- **Availability and cost of energy and utilities**
  - **Gather information on energy and utilities of the potential sites.**
  - **Cost of electricity, water, gas, sewage, communication and etc.**
  - **Based on operational projections, this cost can be then estimated for comparison.**



2. Macro Site Selection Factors

Building and land requirements and cost

- Relationship between land and building
  - Size, shape and quality of the land influence the building design
  - The building design affects the land size
- Need to estimate the building size of the facility. This is needed to estimate the building cost. Some factors that affect building size
  - Inventory quantity
  - MHE selected
  - Type of operation (storage, cross dock, etc.)
  - Type of product handled, average and peak daily volume
  - Number of employees
  - Size of office and administration area
- Need to estimate the land size required. This is needed to estimate the land cost. Some factors that affect land size
  - Building size
  - Number of loading/unloading bays
  - Sprinkler and water-holding requirements
  - Desired expansion
  - Number of parking lots
  - Local codes for green areas

3. Micro Site Selection

- **This site is to serve customers in a *small geographic area* usually within 240 to 320km radius.**
- **In micro site, it is usually within the same geographic region, thus *labor rates, taxes and utilities rates are the same*.**
- **There are 4 basic methods:**
    i. **Random site selection**
    ii. **Serve-a- cluster-of-customers site selection**
    iii. **Center of gravity site selection**
    iv. **Systematic site selection**

3. Micro Site Selection Factors

i. Random site selection

- It is not based on any specific customer order or delivery criteria or methodology
- It is like throwing dart on a map to decide where should the warehouse be located.
- The result is totally ***by chance***.
- Advantages
  - It is a easy and quick method
- Disadvantages
  - There might not be any potential sites in the selected area
  - This method does not take transport cost into consideration.

3. Micro Site Selection Factors

ii. Serve-a-Cluster-of-Customers site selection

- Choosing a site that is reasonably close to most of the customers
- Ideally, the chosen site is *at the center* of the cluster of customers.
- **Advantages**
  - This method reduces the travelling distance and time to customers within the cluster.
  - It is quick and easy to use
- **Disadvantages**
  - The actual site location is subjected to real estate availability
  - Transportation cost are *not fine-tuned* between proposed site and present and future customers.

3. Micro Site Selection Factors

iii. Centre of gravity site selection

- This is a systematic and detailed site selection method.
- This method is covered in module *E216 -Distribution and Transportation*
- Using grid square of each customer and the frequency of delivery to determine where the warehouse should be.
- **Advantages**
  - Identifies the theoretical optimum map location for a new warehouse.
  - It is easy to calculate and gives quick results
  - Consider the frequency of truck deliveries
  - Consider distance from warehouse to customers.
- **Disadvantages**
  - The actual site location is subjected to real estate availability
  - The actual customer may be beyond the trucks delivery mileage or driving parameters.
  - Does not consider actual travelling time.

3. Micro Site Selection Factors

iv. Systematic site selection

- Locate and shortlist actual real estate sites that satisfy the building requirements and optimize the transportation and land cost.
- The systematic site selection identifies the preferred site from the shortlisted group of sites.
- The selected site provides the best service to the customers
- The preferred site is the site with the lowest total cost which includes:
  - ✓ **Labor cost**
  - ✓ **Land cost**
  - ✓ **Transportation cost**
  - ✓ **Energy cost**
  - ✓ **Utility cost**

3. Micro Site Selection Factors

It is a four-part process:

1. List all proposed real estate location within the area
2. Determine the number of truck deliveries to present and future customers
3. Calculate annual transportation cost
4. Estimate the truck cost per km

It entails the following steps:

1. Determine the number of trucks required
2. Develop a store location map
3. Develop a grid sheet to overlay the map
4. Identify the location of each proposed site on the map
5. Determine the distance travelled by the trucks on existing road from each proposed site to each customer
6. Multiply the distance by the frequency by cost per km.

To identify the preferred site, total the transportation cost, energy and utility cost, taxes, labor cost and land cost. Choose the lowest total cost to your company. Present your proposal with a vendor location map to your top management.

3. Micro Site Selection Factors

- **Advantages**
  - **Identifies the optimum existing site from a group of proposed sites.**
  - **Calculate annual transportation cost**
  - **Considered the 5 site selection economic factors**
  - **All current and future customer sites are considered.**
  - **Considered delivery frequencies and truck travelling time.**

Suggested Solution

Type of site selections

- Easy Electronics decided to expand the market in Vietnam. Hence the project is not to select an international site;
- There will be ONE warehouse in a metropolitan area – centralized Distribution Centre (DC);
- The metropolitan area has been decided as indicated by the information provided, therefore our project is not to select a macro site;
- By analyzing the information given, we know that we are doing a Micro site selection project today!
- Bear in mind, in your presentation to Easy Electronics, you still need to discuss about the details of International site and Macro site selections as it proves that you are capable of speaking the same language as the management team.

Method for Micro site selection

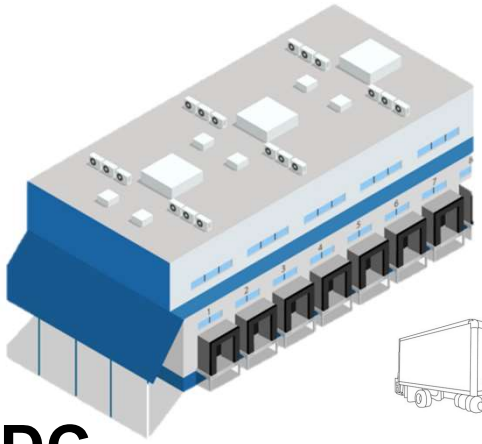
- We have 3 sites to decide (As in the Problem Statement)
- “Random site selection” & “Serve-a- cluster-of-customers site selection” are not precise enough by considering the amount of data available for our decision making
- Looking at the data available, “Systematic site selection” is more suitable than “Centre of gravity site selection” for today’s problem
- **Hence, use the systematic site selection method.**
  - **Three plots of sites have been identified**
  - **Data to compute the total cost are available:**
    - *Distance for proposed site to customers*
    - *Cost per km distance travelled*
    - *Delivery frequency*
    - *Land cost*
    - *Utility cost*

Distance for proposed site to customers

	Dist A	Dist B	Dist C	Dist D	Dist E	Dist F	Dist G	Dist H	Dist I	Dist J
Trips per year	24	85	33	82	14	20	60	86	54	59

Table 2: Projected number of to-and-fro trips to each store per year

To and fro trip



DC

Dealer

Suggested Solution

- **The formula:**

$$C_{i,\ Total} = C_{i,\ utility} + C_{i,\ tax} + C_{i,\ Labour} + C_{i,\ Land} + \sum D_{ij} N_{ij} C_{ij}$$

Where 'i' is the proposed site and 'j' is the customer.

	Transport cost ($)
Site 1	28,404.00
Site 2	38,212.00
Site 3	32,769.00

Projected annual transportation cost

Site 1	163,828.80
Site 2	144,266.64
Site 3	166,320.00

Projected annual rental cost

Water ($)	
Site 1	35,280
Site 2	36,288
Site 3	34,272

Projected annual water cost

Electricity cost ($)	
Site 1	302,400.00
Site 2	312,336.00
Site 3	304,992.00

Projected annual electricity cost

Suggested Solution

- **Tax and labour cost is removed from the equation because the assumption is the tax and labour cost are the same.**
- **Therefore the total projected annual cost is**

$$C_{i,\ Total} = C_{i,\ utility} + C_{i,\ Land} + \sum D_{ij} N_{ij} C_{ij}$$

Projected total annual cost

	Total cost ($)
Site 1	529,912.80
Site 2	531,102.64
Site 3	538,353.00

← Recommended site

Suggested Solution

Caution: Do NOT forget those noneconomic factors that do not have a tangible dollar value but can have an effect on how the new operation functions.

Site	Transportation	Educational level	Quality of life
1	Access to major airports, ports and rail station	Mostly secondary education	Crime rates lowest in the city
2	Access to waterway	Mostly secondary education	public transport is not easily available
3	Vehicle restriction	Mostly tertiary education	Medical care is within 2km

Table 1: Characteristic of Site

The nature of the business will determines the importance of each factor listed in Table 1. In this case, Easy Electronics may place high importance to crime rate and access to major ports, and hence Site 1 is recommended.

Learning Outcome

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