Logistics Management
Supplier Selection

Özgür Kabak, Ph.D.
Supplier Selection and Evaluation
Supplier Selection and Evaluation

- Supplier evaluation and selection are complicated by the need for decision makers to consider various criteria.
- The selection process mainly involves the evaluation of different criteria and various supplier attributes.
- This selection process can essentially be considered a multiple criteria decision making problem, which is affected by different tangible and intangible criteria.
Supplier Selection Criteria for Selection

- Price (cost)
- Product quality
- On-time delivery
- Warranty and claims
- After sales service
- Technical support/expertise
- Attitude
- Total service quality
- Training aids
- Performance history
- Financial stability
- Location

- Labor relations
- Relationship closeness
- Management and organization
- Conflict/problem solving capability
- Communication system
- Response to customer request
- Technical capability
- Production capability
- Packaging capability

- Operational controls
- Amount of past business
- Reputation and position in industry
- Reciprocal arrangements
- Impression
- Business attempt
- Maintainability
- Size
Supplier Selection Process

- Determine goods / services to be purchased
- Specify possible suppliers for the good / service
- Identifying the important criteria
- Qualify suppliers according to criteria
- Select a method to analyze suppliers
- Suggest one or more suppliers to problem owners
Multiple Attribute Decision Making - MADM

- MADM is
  - making preference decisions such as selecting, ranking, screening, prioritization, and classification
  - over the available finite number of alternatives
  - that are characterized by multiple attributes that are usually conflicting, weighted, and incommensurable
MADM
Common Characteristics

- Alternatives
  - “option”, “policy”, “action”, or “candidate”
- Multiple attributes
  - “goals” or “criteria”
- Incommensurable units
  - Each attribute has different units of measurements
- Attribute weights
  - The relative importance of attributes
- Decision matrix
  - A matrix format, where columns indicate attributes considered in a given problem and rows list competing alternatives.
    - A typical element $x_{ij}$ of the matrix indicates the performance rating of the $i^{th}$ alternative, $A_i$, with respect to the $j^{th}$ attribute $X_j$.
- Finite number of alternatives, from several to thousands, are screened, prioritized, selected, and/or ranked

Suppliers

Criteria for selection & evaluation
Multi Attribute Decision Making Methods

- Elementary Methods
- Value Based Methods
  - Simple Additive Weighting
  - TOPSIS
- Outranking Methods
- AHP/ANP Methods
Supplier Selection Example

The company Formosa Watch Co., Ltd. (FWCL) is a large, well known manufacturer that sells watches in its own chain stores in Asia.

For developing new products, its board of directors wishes to select material suppliers to purchase key components in order to achieve the competitive advantage in the market.

A decision committee has been formed to select a supplier from four qualified suppliers (S1; S2; S3; S4). From a complete set of criteria, FWCL chooses five supplier selection criteria for the present case:

- Relationship closeness (C1)
- Quality of product (C2)
- Delivery capabilities (C3)
- Warranty level (C4)
- Average price (C5)
Supplier Selection Example
Decision Matrix for Selection

<table>
<thead>
<tr>
<th></th>
<th>C1</th>
<th>C2</th>
<th>C3</th>
<th>C4</th>
<th>C5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>S1</strong></td>
<td>9.62</td>
<td>2.78</td>
<td>3.30</td>
<td>3.05</td>
<td>16.50</td>
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<tr>
<td><strong>S2</strong></td>
<td>0.54</td>
<td>8.86</td>
<td>6.23</td>
<td>1.75</td>
<td>18.22</td>
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<td><strong>S3</strong></td>
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<td>3.65</td>
<td>4.20</td>
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<td>2.70</td>
<td>8.76</td>
<td>4.07</td>
<td>25.12</td>
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</tbody>
</table>

weights of criteria | high | low | medium | High | very high

Relationship closeness (C1). 0-10 scale; 0: the worst, 10: the best
Quality of product (C2). 0-10 scale; 0: the worst, 10: the best
Delivery capabilities (C3). 0-10 scale; 0: the worst, 10: the best
Warranty level (C4). 0-10 scale; 0: the worst, 10: the best
Average price (C5). US Dollars $

Weight of the criteria in a 5-term scale
1: very low, 2: low, 3: medium, 4: high, and 5: very high
Supplier Selection Example
Simple Additive Weighting Method

- Normalize Decision Matrix
  - Linear Normalization

\[ r_{ij} = \frac{x_{ij}}{x_j^*} \quad \text{for benefit attributes} \]
\[ r_{ij} = \frac{x_j^*}{x_{ij}} \quad \text{for cost attributes} \]

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<thead>
<tr>
<th></th>
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<th>C2</th>
<th>C3</th>
<th>C4</th>
<th>C5</th>
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<tbody>
<tr>
<td>S1</td>
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<td>0.377</td>
<td>0.749</td>
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<tr>
<td>S2</td>
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<td>1.000</td>
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<tr>
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</tr>
<tr>
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<td>0.305</td>
<td>1.000</td>
<td>1.000</td>
<td>0.657</td>
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</table>

<table>
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<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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</thead>
</table>
Supplier Selection Example
Simple Additive Weighting Method

- Find an aggregate score of alternatives
  - by Simple Additive Weighting Method

\[
V_i = \sum_{j=1}^{n} w_j r_{ij}
\]

<table>
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<th>C3</th>
<th>C4</th>
<th>C5</th>
<th>Agg. Score</th>
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<td>0.802</td>
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weights of criteria: 0.222 0.111 0.167 0.222 0.278