The Importance of Management Science

• Management science
  – The discipline of applying advanced analytical methods to help make better decisions.
  – Devoted to solving managerial-type problems using quantitative models

• Applications of management science
  – Forecasting, capital budgeting, portfolio analysis, capacity planning, scheduling, marketing, inventory management, project management, and production planning.

Table 1-2 Successful Applications of Management Science

<table>
<thead>
<tr>
<th>Organization</th>
<th>Problem Description</th>
<th>Time Horizon</th>
<th>Savings or Added Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dell Computer</td>
<td>Inventory decision for supply chain</td>
<td>March 2001</td>
<td>Reduction in inventory by 45%</td>
</tr>
<tr>
<td>New York Hospital</td>
<td>Developing campus optimization</td>
<td>January 2004</td>
<td>$2 million per year</td>
</tr>
<tr>
<td>AT&amp;T</td>
<td>Reducing energy consumption</td>
<td>January 2005</td>
<td>$2 million per year</td>
</tr>
<tr>
<td>IBM</td>
<td>Developing customer relationship</td>
<td>January 2006</td>
<td>$3 million per year</td>
</tr>
<tr>
<td>GE Medical Research</td>
<td>Improving process efficiency</td>
<td>January 2007</td>
<td>$4 million per year</td>
</tr>
<tr>
<td>American Express</td>
<td>Improving customer service</td>
<td>January 2008</td>
<td>$5 million per year</td>
</tr>
<tr>
<td>Boeing</td>
<td>Reducing aircraft vibrations</td>
<td>January 2009</td>
<td>$6 million per year</td>
</tr>
<tr>
<td>Disney</td>
<td>Enhancing customer experience</td>
<td>January 2010</td>
<td>$7 million per year</td>
</tr>
</tbody>
</table>

Advantages of the Quantitative Approach

• Directs attention to the essence of an analysis: to solve a specific problem.
• Improves planning which helps prevent future problems
• Results in more objective decisions than purely qualitative analysis.
• Incorporates advances in computational technologies to managerial problem-solving.

Table 1-2 Successful Applications of Management Science (cont'd)

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<td>January 2010</td>
<td>$7 million per year</td>
</tr>
<tr>
<td>Intel</td>
<td>Improving computer performance</td>
<td>November 2010</td>
<td>$9 million per year</td>
</tr>
</tbody>
</table>

Problem Solving Approaches

• Managers tend to use a qualitative approach to problem solving when
  1. The problem is fairly simple.
  2. The problem is familiar.
  3. The costs involved are not great.

• Managers tend to use a quantitative approach when
  1. The problem is complex.
  2. The problem is not familiar.
  3. The costs involved are substantial.
  4. Enough time is available to analyze the problem.

Models

• A Model
  – An abstraction of reality. It is a simplified, and often idealized, representation of reality.
  • Examples: an equation, an outline, a diagram, and a map
  – By its very nature a model is incomplete.
  – Provides an alternative to working with reality

• Symbolic models
  – Use numbers and algebraic symbols

• Mathematical models
  – Decision variables
  – Uncontrollable variables
Deterministic versus Probabilistic Models

• **Deterministic models**
  – Used for problems in which information is known with a high degree of certainty.
  – Used to determine an optimal solution to the problem.

• **Probabilistic models**
  – Used when it cannot be determined precisely what values (requiring probabilities) will occur (usually in the future).

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**Figure 1–1** The Management Science Approach

**Figure 1–2** DSS Framework

**Exhibit 1–1** Excel Spreadsheet