Chapter 15: "What if" Thinking Helps: Advanced Spreadsheets for Planning

Fluency with Information Technology
Third Edition
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Designing a Spreadsheet

- When a spreadsheet is used repeatedly, it becomes a tool of planning, analysis, and decision-making
- Must be well designed and flexible to be effective

The Trip

- Driving trip to the Arctic Circle from Chicago
- Make a spreadsheet to figure out how long it will take and how much it will cost

Design Guidelines

- Focus on Form
  - Make the form logical, the layout clean, and the entries clear and understandable
  - Descriptive info should be on the top and left
  - Summary info should be on the bottom and right
    - Use different fonts, colors, separate sheet for each table
- Explain Everything
  - It should be possible to know immediately what every cell means

Initial Spreadsheet: Applying the Rules

- Focus on Form:
  - title, authors, completion date, column headings, color, clean font, data aligned
- Explain Everything:
  - comments added to cells (Insert > Comment)
Conditional Formatting

- **Cell Value Is Specifications**
  - Format > Conditional Formatting…
  - Change formatting in response to certain conditions
  - Can specify one or more conditions
  - Can use formulas in the comparison
  - Example: **bold** data greater than average of range

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**Figure 15.3** The Arctic Circle road trip spreadsheet with conditional formatting for “long days.”

<table>
<thead>
<tr>
<th>Segment</th>
<th>Time Est.</th>
<th>Miles</th>
<th>Fuel Price Report</th>
<th>Fuel Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chicago to Carrington ND</td>
<td>11:02</td>
<td>776 US Chicago</td>
<td>$3.59</td>
<td></td>
</tr>
<tr>
<td>Carrington to Beaverlodge SK</td>
<td>11:05</td>
<td>620 US Moorehead MN</td>
<td>$2.26</td>
<td></td>
</tr>
<tr>
<td>Beaverlodge to Fort St. John</td>
<td>11:06</td>
<td>640 CA Moncton Jax SK</td>
<td>$2.09</td>
<td></td>
</tr>
<tr>
<td>Fort St. John to Dawson YK</td>
<td>11:17</td>
<td>505 CA Headlamp AB</td>
<td>$1.05</td>
<td></td>
</tr>
<tr>
<td>Watson Lake to Dawson YK</td>
<td>11:55</td>
<td>601 CA HI 34 AK Hwy BC</td>
<td>$1.21</td>
<td></td>
</tr>
<tr>
<td>Dawson to Dawson via AC</td>
<td>14:00</td>
<td>484 CA HI 34 AK Hwy BC</td>
<td>$1.21</td>
<td></td>
</tr>
</tbody>
</table>
Conditional Formatting (cont)

• **Formula Is Specifications**
  – Allows comparison with cells other than the one being formatted
  
  A2 cell: IF(B2>AVERAGE(B$2:B$7), TRUE, FALSE)

Conditional Formulas (cont)

• Computing with conditional factors
  
  • Figuring the Amount Paid
    – Miles per gallon (22) vs. miles per liter (5.8)
      
      =IF(LEFT(D2,2)="US", E2*C2/22, E2*C2/5.8)

  • Cost in One Currency
    – Canadian to US currency exchange rate (0.93)
      
      =IF(Left(D2,2)="CA", F2*0.93, F2)
**Naming: Symbolic Reference**

- **Defining Names**
  - Refer to cells symbolically by name rather than literally by explicit column/row position
  - A name is a word or phrase assigned to a cell or range of cells (no spaces)
  - Name used wherever cell references are used
  - Minimizes errors when columns/rows added later
  - Insert > Name > Define
  - Insert > Name > Apply

**Naming: Symbolic Reference (cont)**

- **Applying Names**
  - IF(LEFT(D2,2)="US", fuelPrice*distance/22, fuelPrice*distance/5.8)
  - Safer, easier to read and understand
- **Make Assumptions Explicit**
  - Assign instance-specific quantities that may change to cells, give them names, and use these names in the formulas
  - mpg, mpl, exchange rate, # of travelers
  - IF(LEFT(priceSrc,2)="US", fuelPrice*distance/mpg, fuelPrice*distance/mpl)

**"What If" Analysis**

- Spreadsheets recalculate everything whenever a number is changed
- Ideal for speculating on the consequences of change
  - Make a change and notice what happens to the "bottom line"

**"What If" Analysis (cont)**

- **Direct Experimentation**
  - Potential risk of making permanent changes to data and formulas
- **Scenarios**
  - A named alternative to a spreadsheet based on different inputs
  - Aid to understanding changes in plans, like changes in gas mileage
Scenarios

- Tune-up Scenario
  - Select mpg cell, Tools > Scenarios…

  ![Figure 15.8 Dialog box sequence for adding a scenario to the Arctic Circle spreadsheet.]

Scenarios (cont)

- Traveling Companions Scenario
  - Adding buddies in the car will drop the mpg but also the cost per person

  ![Figure 15.10 The Extra Passenger scenarios and their effect on mpg/L.]

Analyzing a Model

- Formulating a Model
  - Account for all foreseeable costs
- The Model
  - Table summarizing the per person expenses
- Reusing Scenarios
  - Rerun scenarios to see how the total cost changes as the number of travelers increases
Analyzing a Model

- **A Change in Plans**
  - Stay in Hostels vs. camping

<table>
<thead>
<tr>
<th>Scenario Summary</th>
<th>Current</th>
<th>2 Bedroom</th>
<th>2 Bedroom</th>
<th>Deluxe</th>
<th>Deluxe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parking</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Transfer</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Upgrade</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

- **Travel Log spreadsheet**
  - Can use a filter to access subsets of information (selecting only certain rows from a list) to create a customized version of a spreadsheet
  - **Auto Filtering Technique**
    - Data > Filter > AutoFilter
    - Options for filtering the list based on data in each column
    - Turn off AutoFilter by selecting it again (toggle)

- **Advanced Filtering Technique**
  - More refined analysis with precise filtering criteria
  - **Advanced Filtering Setup**
    - Add a new column with the same heading as the column containing the date to be filtered
    - Enter a criterion to indicate that values in the other column by the same name should be filtered with that criterion

- **Executing an Advanced Filter**
  - Select a cell in the column to be filtered
  - Data > Filtering > Advanced Search...
    - **List range**: dimension of the list to be filtered
    - **Criteria range**: range covering the heading and the criterion of the setup column
    - **Copy to**: specifies a new place on the spreadsheet to place the filtered result (optional)
  - Restore original table: Data > Filtering > Show All
Advanced Filtering Technique (cont)

- Filtering on Multiple Criteria
  - Define multiple setup columns with criteria
  - Criteria range in Advanced Filter window is enlarged to cover all criteria in the setup columns

<table>
<thead>
<tr>
<th>Route</th>
<th>Distance</th>
<th>Travel Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chicago to Carrington, ND</td>
<td>778 miles</td>
<td>12 hrs, 2 minutes</td>
</tr>
<tr>
<td>Carrington to Battleford, SK</td>
<td>620 miles</td>
<td>11 hrs, 6 minutes</td>
</tr>
<tr>
<td>Battleford to Fort St. John, BC</td>
<td>648 miles</td>
<td>11 hrs, 26 minutes</td>
</tr>
<tr>
<td>Fort St. John to Watson Lake, BC</td>
<td>596 miles</td>
<td>10 hrs, 17 minutes</td>
</tr>
<tr>
<td>Watson Lake to Dawson, YK</td>
<td>601 miles</td>
<td>11 hrs, 56 minutes</td>
</tr>
<tr>
<td>Round-trip Dawson to Arctic Circle</td>
<td>484 miles</td>
<td>14 hours</td>
</tr>
<tr>
<td>Seq. No</td>
<td>When</td>
<td>Reason</td>
</tr>
<tr>
<td>--------</td>
<td>----------</td>
<td>------------</td>
</tr>
<tr>
<td>1</td>
<td>8/4/07 5:45</td>
<td>Last pick-up</td>
</tr>
<tr>
<td>2</td>
<td>8/4/07 5:46</td>
<td>Last pick-up</td>
</tr>
<tr>
<td>3</td>
<td>8/4/07 5:47</td>
<td>Last pick-up</td>
</tr>
<tr>
<td>4</td>
<td>8/4/07 5:48</td>
<td>Last pick-up</td>
</tr>
<tr>
<td>5</td>
<td>8/4/07 5:49</td>
<td>Last pick-up</td>
</tr>
<tr>
<td>6</td>
<td>8/4/07 5:50</td>
<td>Last pick-up</td>
</tr>
<tr>
<td>7</td>
<td>8/4/07 5:51</td>
<td>Last pick-up</td>
</tr>
<tr>
<td>8</td>
<td>8/4/07 5:52</td>
<td>Last pick-up</td>
</tr>
<tr>
<td>9</td>
<td>8/4/07 5:53</td>
<td>Last pick-up</td>
</tr>
<tr>
<td>10</td>
<td>8/4/07 5:54</td>
<td>Last pick-up</td>
</tr>
<tr>
<td>11</td>
<td>8/4/07 5:55</td>
<td>Last pick-up</td>
</tr>
<tr>
<td>12</td>
<td>8/4/07 5:56</td>
<td>Last pick-up</td>
</tr>
<tr>
<td>13</td>
<td>8/4/07 5:57</td>
<td>Last pick-up</td>
</tr>
<tr>
<td>14</td>
<td>8/4/07 5:58</td>
<td>Last pick-up</td>
</tr>
<tr>
<td>15</td>
<td>8/4/07 5:59</td>
<td>Last pick-up</td>
</tr>
<tr>
<td>16</td>
<td>8/4/07 6:00</td>
<td>Last pick-up</td>
</tr>
</tbody>
</table>

Advanced Filter Properties:

- **Action**: Filter the list, in-place
- **Copy to another location**: Yes
- **Copy to**: SA57 5127
- **Unique records only**: Yes
- **List range**: SA57 5127
- **Criteria range**: SA57 5127
<table>
<thead>
<tr>
<th>When</th>
<th>Seq</th>
<th>To</th>
<th>From</th>
<th>Reason</th>
<th>Reg</th>
<th>Amt</th>
<th>PO</th>
<th>MI</th>
<th>HH</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/4/07 16:55</td>
<td>J Forget Folk PIN</td>
<td>Gas &amp; Go</td>
<td>Gas</td>
<td>F</td>
<td>29.32</td>
<td>205</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>