Using Microsoft Excel for Decision Making

Pivot Tables:

Originally released in 1985, Microsoft Excel has become the most-used spreadsheet program in the world. Excel can perform formula-based calculations, mathematical functions, and data analytics, specifically via pivot tables. Because of its utility, Excel has become a staple in many organizations.

An important benefit of the pivot table is summarizing data in a quick and easy manner. The pivot table helps make a concise summary out of thousands of rows and columns of unorganized data. With the help of these tables you can summarize large amounts of information into a small space.

Analyzing data is much easier using pivot tables, where users will have the convenience of handling a large amount of data and analyzing the data faster. Pivot tables let you take a huge amount of data and work on it in such a manner that you need only to view a small number of data fields. This will is a big help in the easy analysis of a large data sets.

In addition, data analysis experience is made more interesting with pivot tables, as using pivot tables has become more interactive. The tables allow a user to drag and drop data with easiness and the data table becomes interactive.

Solver Add-in:

Solver uses a computer's fast processing power to subject any mathematical scenario to rapid data analysis for purposes of finding an optimal solution to complicated formulas. A key advantage of Solver is the ability to quickly process scenarios involving multiple unknown variables. This is often regarded as "linear algebra."

Whereas more conventional Excel formulas process straightforward calculations, Solver takes Excel's math engine much further and runs advanced problem-solving algorithms to discover results for multiple variables simultaneously. This is particularly useful when there are many unknowns, or many different sets of equations, each with its own set of unknown variables. Solver saves hours of manual algebra calculations in these circumstances.

Optimization is a key purpose of Solver as used in the corporate world. As with linear algebra, many product development cycles are influenced by multiple factors, each of which can significantly change profit margins or product quality. If the relationship between these factors and a company's desired goals can be expressed mathematically, Solver can quickly identify the value of these factors to meet those goals.

Deliverables:

- **A screen shot for each solution of the pivot table scenarios.**
- **A screen shot for each solution of the Solver scenarios.**
- **Place all screen shots into a MS Word document and save it as a PDF for uploading via the Tutorial Three upload link assignment.**

Pivot Table Exercise:

1) Use the HMIS_Tutorial_Three.xlsx workbook from the Week 04 Module. Note: Add a column (attribute) in the workbook named Count and place the value of 1 in each row of Count.

2) Create the following pivot tables in separate worksheets from HMIS:
   a. List the count of HMIS applications by city for hospitals in Massachusetts (MA).
   b. List the count of HMIS applications in hospitals by state for the application status 'Not Automated.'
   c. List the count of HMIS applications by hospital in Massachusetts for the application status 'Live and Operational.'

Solver Add-in Exercise:

1) Follow the directions in Classwork 4.3 to install the Solver Add-in (e.g., page 5).

2) Set up the **Z function** algorithm to either maximize (i.e., revenue or profit) or minimize (i.e., cost or expense) is the first step in any linear programming scenario.
{max or min $\mathbf{Z = (A_1)(X_1) + (A_2)(X_2) + \ldots + (A_n)(X_n);}$ where A_n is a constant and X_n is an unknown variable}

3) The next step is identifying the resources and how the resources are depleted or *constrained*. { *max cups <= 500; max premium cups <= 350; max mocha cups <= 125*}

4) The Pony Expresso scenario (i.e., Classwork 4.3 page 5) would have the following **Z function** and *constraints*:

Maximize Revenue $\mathbf{Z = (\$1.25)(X_1) + (\$2.00)(X_2) + (\$2.25)(X_3)}$

Subject To Constraints:

$$X_1 + X_2 + X_3 <= 500$$
$$X_2 + X_3 <= 350$$
$$X_3 <= 125$$

5) Load the Solver worksheet with the **Z function** and *constraints,* then run Solver:

Pony Expresso

Price of regular coffee	$ 1.25	Total Revenue	$ 918.75	x1 = # of cups of regular coffee per day	
Cups needed to sell	150			x2 = # of cups of premium latte per day	
Subtotal	$ 187.50	Regular cups	150	x3 = # of cups of premium mocha per day	
		Premium cups	350		
Price of premium latte	$ 2.00	Total cups	500	Max Z = 1.25(x1) + 2.00(x2) + 2.25(x3)	
Cups needed to sell	225				
Subtotal	$ 450.00	Constraints		Subject To Constraints:	
		Max cups	500	Cups of coffee per day <= 500	x1 + x2 + x3 <= 500
Price of premium mocha	$ 2.25	Max premium	350	Cups of premium coffee per day <= 350	x2 + x3 <= 350
Cups needed to sell	125	Max mocha	125	Cups of mocha per day <= 125	x3 <= 125
Subtotal	$ 281.25				
				x1 >= 0, x2 >= 0, and x3 >= 0	

6) Set up the **Z function**, *constraints*, and the Solver worksheet for the following scenarios.

7) **Bicycle Scenario**: (**maximize the profit Z function using two variables X_1 and X_2**)

A bicycle company produces two types of mountain bikes, the deluxe and the professional. **The deluxe has a profit margin of $10, while the professional has a profit margin of $15**. *Each deluxe frame takes 2 pounds of aluminum alloy and 3 pounds of steel alloy, while each professional frame takes 4 pounds of aluminum alloy and 2 pounds of steel alloy. The bicycle company has vendor contracts to supply 100 pounds of aluminum alloy per week and 80 pounds of steel alloy per week*. Given these *constraints*, what production level of deluxe and professional bicycles would yield a maximum profit?

8) **Advertising Mix Scenario**: (**maximize the advertising reach Z function using three variables X_1 , X_2, and X_3**)

A Chamber of Commerce needs public service announcements to reach its constituents across a multi-county area. **TV advertising reaches 100,000 people per advertisement, radio advertising reaches 18,000 people per advertisement, and newspaper advertising reaches 40,000 people per advertisement** . *The Chamber's advertising budget is limited to $18,200. TV advertisements cost $2,000 each, radio advertisements cost $3,000 each, and newspaper advertisements cost $600 each. The total number of radio advertisements are limited to at most 50% of the total advertisements (e.g., TV, radio, and newspaper), while TV advertisements must be at least 10% of the total advertisements*. Advertising spots are limited to 10 for TV, 20 for radio, and 10 for newspaper media. Given these *constraints*, what number of TV, radio, and/or newspaper advertisements would reach the most people (i.e., constituents)?

9) **Transportation Scenario**: (**minimize the transportation cost Z function using six variables X_1 , X_2, X_3, X_4 , X_5, and X_6**)

A niche retailer needs its goods produced at two locations (e.g., Louisville, KY and Kansas City, KS) shipped to three regional distribution centers (e.g., Region 1, 2, and 3). **Transportation costs per unit from Kansas City to Region 1 cost $2.10, Kansas City to Region 2 cost $2.25, and Kansas City to Region 3 cost $3.00. Transportation costs per unit from Lexington to Region 1 cost $2.00, Lexington to Region 2 cost $2.40, and Lexington to Region 3 cost $2.80** . *The production quotas for the Kansas City and Lexington locations equals 350 and 400 units per week, respectively. Region 1 demand requires shipments of 200 units per week, Region 2 demand requires shipments of 250 units per week, and Region 3 demand requires shipments of 300 units per week.* Given these *constraints*, what number units should be shipped each week from the Kansas City and Lexington locations to each of the three regional distribution centers to meet demand while minimizing transportation costs?