BIA 650 A Homework#2 W&A Chapter 3, Problem 2

# Management Overview

Problem Statement:

The Objective is to find the number of parts to produce so that **Profit** is maximized, and **Labour Hour** constraints and **Maximum sales** constraints are satisfied.

Data Sources:

* + The **inputs** are identified as
    - Cost per labour hour (Assembling and Testing)
    - Labour hours required for Basic, XP and VXP models
    - Cost of Component Parts
    - Selling Price of each model.
  + The key **decision variables** are Number of Quantities produced in Basic, XP and VXP**.**
  + **Constraints** are identified as
    - Maximum sales assumptions in each category
    - Number of labour hours available for both Assembling and Testing
  + **Output** is Maximum Profit made.

Model Approach:

* + Separate the data into inputs, decision variables, constraints and output.
  + A new column is added wherever necessary to accommodate the data for the new model called **VXP**
  + The Unit profit margin is calculated by subtracting the component cost and labour cost from the selling price.
  + The Objective, changing variables and constraints are set in the solver. The unconstrained variables are made non-negative. The solving method chosen is Simplex LP
  + The Solver is run, and it suggests decimal values in two categories of products for the maximum profit. This doesn’t make sense because the number products made cannot be a decimal value. In order to avoid this an integer constraint is set for the decision variables.
  + The solver is run again to give the optimal solution.

Sensitivity Analysis:

Solver does not provide sensitivity analysis for problems with integer constraints. So SolverTable is used.

* **Labour Hours Vs Profit**

A two-way table is created using SolverTable to look at the maximum possible profits if the available labour hours for Assembly and testing are changed. The increase in labour hours allow for increased profit potential. From the graph it can be seen that increase in assembly hours contribute more to profit than Testing labour hours

* **Selling Price of VXP Vs Profit**

A one-way table is created using SolverTable for various Selling Prices of VXP versus Maximum possible profit. It can be clearly observed from the graph that the profit potential begins to increase once the selling price crosses the 530$ mark.

* **Assumed Maximum Sales for XP Vs Profit Potential**

We can clearly see from the spreadsheet that Max Sales for XP is a binding constraint. So, the change is profits for higher values is calculated using the SolverTable. There is a steady increase in potential profits except at 1206 as can be seen from the graph in the worksheet

Solution:

* + Without the integer constraint the optimal values are as follows

|  |  |  |  |
| --- | --- | --- | --- |
| Basic | XP | VXP | PROFIT |
| 514.2857 | 1200 | 28.5714 | 200,286 |

* After the integer constraint is added for decision variables, the optimal values are as follows

|  |  |  |  |
| --- | --- | --- | --- |
| Basic | XP | VXP | PROFIT |
| 514 | 1200 | 28 | $200,176 |