## University of Dayton
## School of Business Administration
*MBA 660*
*Information Technology and Systems*
*Building a DSS in Excel*

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The following assignment is intended to be a brief introduction to how a spreadsheet package (Microsoft Excel) may be used as a Decision Support System. One of the classic DSS applications is "what if?" analysis, or the analysis of outcomes that may occur as a result of changing conditions in the business environment. To introduce you to this area, I am providing you with an assignment that will allow you to model a business. You will identify relevant variables to put in your model, build the model in Excel, then perform a series of analyses to see what the outcomes would be under a variety of conditions in that business environment. You should follow the instructions and submit the assignment **as individuals**.

### The Situation

A Company is producing and selling several products for gross sales (income) of 2.15 million dollars (in 2008). Returns and allowances are 3 percent of gross sales, reducing the income to net sales. Marketing, expenses, management and general (MM&G) are figured to be 20 percent of the net sales. Cost of goods sold is the sum of labor ($325,000), materials ($600,000) and overhead. Overhead is figured to be variable overhead (30 percent of the combined cost of labor and materials) plus fixed overhead ($70,000).

Gross profit is the difference between net sales and cost of goods sold. To figure the profit before tax, MM&G expenses need to be subtracted from the gross profit. Finally, there is a 28 percent Federal tax and 7 percent state tax that needs to be considered, but these are only assessed if there is indeed a profit (hint: you may need to use the IF spreadsheet function here).

### The Assignment

1. You are provided with inputs to the problem (independent variables) and the intermediate and target variables (both of these are dependent variables).
2. You are also provided with formulas for each intermediate and target variables.  You simply have to input these into the spreadsheet.
3. Use a spreadsheet (Excel) to prepare a pro-forma income statement showing the taxes and profit after tax for 2008.
4. Use this spreadsheet to answer the following questions. Return to the original assumptions before answering each question.
   a. What will be the profit after tax if gross sales decline to $ 1.9 million?
   b. What is the amount of Federal Tax paid if that rate changes to 32 percent?
   c. What gross sales are needed to generate an after tax profit of $1,000,000?
   d. Assume that the federal tax rate is 50%, and first year sales total $5,000,000. What will the net profit be?
   e. What if the materials could be reduced to $500,000? What would after tax profit be?

f. What if fixed overhead is doubled? What would the profit after tax be?
g. What if state taxes triple? What will be the after tax profit?
h. Assuming everything else to be the same, what would the profit (or loss) be if sales dropped to 500,000, and Fixed Overhead was to increase to 120,000?
i. Assume that the returns and allowances increase to 8% (at which point you would fire your quality control person). What would the profit after tax be?
j. Assume that every percentage increases by 5%, and Fixed Overhead is $100,000. What will be the profit after tax?
k. To what amount would Gross Sales have to fall in order for the company to show a loss of **1 dollar**? (keep all other assumptions from the original sheet).
l. What will state and federal taxes be if profit before tax is zero? (Thought you could use a little comic relief about now) ☺ .

The independent variables (highlighted in gray in the sample spreadsheet) are obviously changed manually, however, the spreadsheet should be designed so that the variables that are not independent should change whenever an independent variable changes (i.e. without any other intervention on your part--you should use formulas to calculate). Your spreadsheet, if built correctly, should return correct answers to the questions above. All numbers used in calculations should be rounded to *2* significant digits (hint: use the rounding function of Excel).

Here are some rules and inputs for your spreadsheet.  The following values should be **altered from the "independent variables" section**.  That is to say, when you change the value in this section, these changes should be reflected in the intermediate variables, dependent variables, and the income statement.

- Gross Sales
- Return Fraction
- Labor Cost
- Materials Cost
- Fixed Overhead
- Overhead Fraction
- MM&G Fraction
- Federal Tax Fraction
- State Tax Fraction

**Some formulas that will be handy (some you'll have to figure out on your own).**

- Returns and allowances = Gross Sales * Return Fraction
- Cost of goods sold = Labor Cost + Materials Cost + Overhead
- Overhead = Fixed Overhead + Variable Overhead
- Variable Overhead = (Labor Cost + Materials Cost) * Overhead Fraction
- MM&G = Net Sales * MM&G Fraction
- Federal Tax = Profit Before Tax * Federal Tax Fraction (note: this number should not go negative)
- State Tax = Profit Before Tax * State Tax Fraction (note: this number should not go negative)
- Profit After Tax = Profit Before Tax - Federal Tax - State Tax
- Profit Before Tax = Gross Profit - MM&G
- Net Sales = Gross Sales - Returns and Allowances

The balance of the spreadsheet should change whenever an independent variable changes (i.e. without any other intervention on your part). All numbers used in calculations should be rounded to **2** significant digits.

Your effort will be judged based on the following:

- The extent to which you correctly identify the relevant variables.
- The extent to which your DSS correctly models the situation, and generates the appropriate responses to my inquiries.
- The extent to which your DSS is built in such a way as to be relatively easy to use for a manager (you are welcome to document your DSS with some instructions if you wish), and as well the output from your system is relatively easy to interpret. In other words, if you were using this tool, where would you like things to be so you could find them?

Your deliverables are as follows: You should submit one the spreadsheet, completed and with the original assumptions on it (this may be done electronically via email). Additionally, you should submit a write-up where you will answer each of the questions above on paper. Please note that your paper submission should have a title page, with your name, the course and section, and submission date. This information should be centered both vertically and horizontally on the page.

A final note: I don't expect this assignment to be particularly easy, but I also don't want you to flail about madly and get frustrated. Feel free to visit the office often (and send lots of email if you don't catch me in).

The assignment is due on the date noted in the syllabus at the start of class. Good luck. Aloha.

To make your life a bit easier, here's the layout you can use for your spreadsheet in Excel.  You don't have to match perfectly the rows/column spacing I have – this is just to help you visualize what you're building.

| A Company, Incorporated | |
| --- | --- |
| Pro Forma Income Statement | |
| | |
| | |
| | |
| | |
| **Independent Variables** | **2008** |
| Gross Sales | $ 2,150,000 |
| Return Fraction | 3.00% |
| Labor Cost | $ 325,000 |
| Materials Cost | $ 600,000 |
| Fixed Overhead | $ 70,000 |
| Overhead Fraction | 30% |
| MMandG Fraction | 20% |
| Federal Tax Fraction | 28% |
| State Tax Fraction | 7% |
| | |
| **Intermediate variables** | |
| Returns and Allowances | $ 64,500 |
| Cost of Goods Sold | $ 1,272,500 |
| Overhead | $ 347,500 |
| Variable Overhead | $ 277,500 |
| MMandG | $ 417,100 |
| FederalTax | $ 110,852 |
| StateTax | $ 27,713 |
| | |
| **Target Variables** | |
| Net Sales | $ 2,085,000 |
| Gross Profit | $ 813,000 |
| Profit Before Tax | $ 395,000 |
| Profit After Tax | $ 257,335 |