Managing Customer Relationships

Problem Description

Companies are concerned about managing customer relationships, as it is vital for their wellbeing. Using the sales force, companies keep contact with the customers, inform the customers about new products, get feedbacks about existing products, etc. A number of studies have shown that there is a positive relationship between the revenues generated by a company and the efforts of the sales force. Companies use a number of decision support tools to decide about the size of the sales force. Syntex Labs (Winston and Albright, 2002) has estimated about a $1 million increase in profitability per year since they started using a non-linear programming (NLP) model to allocate the sales force among the company's seven main drugs.

The main objective of this project is to build a decision support system that will enable companies to manage customer relationships. Below we present a mathematical model that can be used in making decisions about the size and allocation of the sales force to products.

Mathematical Model

The relationship between the size of the sales force and the sales revenues generated is described by the following equation

$$R = a + \frac{(b-a)S^c}{d + S^c} \quad (1)$$

Where, a, b, c, and d are constants, R presents the revenues generated from sales, and S presents the sales force efforts. This relationship has the property of diminishing returns; therefore, each extra unit of S contributes less and less to R. The curve that presents the relationship between S and R has an S-shape (starts out flat, gets steep, and then flattens out).

In order to estimate the sales response function, the managers estimate the revenues that would be generated under the following scenarios: no sales effort is assigned to the final product; sales efforts assigned are cut in half; sales efforts stay at the current level; sales efforts are increased by 50%; sales force efforts saturate the market; etc. For each scenario, the corresponding predicted sales revenues are calculated using equation (1). In order to calculate the predicted sales revenues, initially, we assign values to the constants, a, b, c, and d. We calculate the error (the difference) between the actual and predicted sales. The goal-seek feature of Excel is then used to find the values of constants a, b, c, and d that minimize the sum squared error. To learn more about the sales force allocation problem and S-shape curves, we refer the students to Winston and Albright (2002).

Sensitivity Analysis

The sales response function estimates revenues as a function of the size of the sales force. Increasing the sales force increases the total revenues generated at a diminishing rate. On the other hand, increasing the sales force increases the salary expenses. The profits are calculated by subtracting from the sales revenues the production costs and the annual salary expenses. The objective of the sensitivity analysis is to identify the sensitivity of the profits generated to the size of the sales force.

Spreadsheets

1. Build a spreadsheet that presents the annual salary and other related data about the sales persons.

2. Build a spreadsheet that presents the following data about each product: identification number, name, average annual revenues, price, production unit cost, descriptions, etc.

3. Build a spreadsheet that keeps record of sales. The spreadsheet presents the following data about each sale: the date of the sale, the product sold, and the revenues generated.

4. Build a spreadsheet that presents historical data about the contacts of sales persons with customers. This spreadsheet includes the following: the date of the contact, the identification number of the customer contacted, the name of the sales person, the length of the conversations, descriptions, etc.

5. Build a spreadsheet that keeps data about the customers. This data consists of the following: identification number, name, address, description of the business, etc.

User Interface

1. Build a welcome form.

2. Build a form titled "Add/Delete/Update Data." The form includes five option buttons. The option buttons allow the user to open one of the spreadsheets described above. Upon selection, another frame opens that has three option buttons to allow the user to choose whether to add, delete or update the data in the selected spreadsheet.

   a. If the user chose to add data, a form opens that consists of a number of text boxes and a command button. The user enters the data in the text boxes and clicks on the command button to submit the information.

   b. If the user chose to delete data, a search form opens that allows the user to identify the data that should be deleted. The form has a combo box that allows the user to choose a field of the spreadsheet, a text box for the user to type in a key word, and a command button. A search for the key word on the selected field is performed and the results are presented to the user. The user clicks on the command button to delete the selected information from the spreadsheet.

   c. If the user chose to update data, a search form opens that enables the user to identify the data that should be updated. The form has a combo box that allows the user to choose a field of the spreadsheet, a text box to type in a key word, and a command button. A search for the key word on the selected field is performed and the results are presented to the user. The user updates the information and clicks on the command button to submit the updated information.

3. Build a form titled "Analyze the Data." The form includes a number of option buttons and a command button. The option buttons enable the user to choose to calculate one of the following statistics:

   a. The average number of times a customer was contacted during the last month.

   b. The total number of customer contacts per day during the last month.

   c. The total number of customer contacts during the last month per sales person.

   d. The average contact time per customer during the last month.

    e.   The total number of customers who will be contacted next week. This number can be identified using historical data from the previous week/month/ year.

    f.   The total revenues generated per day per product during the last month.

    g.   The average cost per customer call.

    h.   For each product, calculate the total number of calls, revenues generated, and sizes of the sales force assigned.

This frame includes a command button. When the user clicks on the command button, the statistic(s) selected are calculated and presented.

4.   Build a form titled "Estimate the Sales Response Function." The form includes n option buttons (n is the total number of products) that allow the user to select one or more products to estimate the corresponding sales response function. Include a command button that, when clicked on, uses the minimum sum of squared errors method to estimate the sales response function and displays the corresponding results. The user is prompted to type in the initial values for parameters a, b, c, and d. Note that historical data about the number of calls, revenues, and work force per product will help to identify the sales response function.

5.   Build a form titled "Estimate Profits." The form includes n text boxes and a command button. When the user clicks on the command button, the annual profits per product are presented in the text boxes. To calculate the profits per product, one should subtract from the total revenues generated the total production costs and salaries of sales persons assigned to that product.

6.   Build a form titled "Sensitivity Analysis." The form includes three text boxes, a combo box, and a command button. The user types in the text boxes the minimum and maximum size of the sales force and the step size. The combo box allows the user to select a product. When the user clicks on the command button, the profits from the selected product for different sizes of the sales force are calculated and presented.

7.   Build a form titled "Reports." This form allows the user to open one of the reports presented below.

Design a logo for this project. Insert this logo in the forms created above. Pick a background color and a font color for the forms created. Include the following in the forms created: record navigation command buttons, record operations command buttons, and form operations command buttons as needed.

Reports

1.   Report the following:

    a.   The total number of times each customer was contacted during the last month.

    b.   The total number of customers contacted per day during the last month.

    c.   The total number of customer contacts per sales person during the last month.

    d.   The average contact time per customer during the last month.

    e.   The number of customers who should be contacted next week.

    f.   The total revenues generated per day per product during the last month.

    g.   The average cost per customer call.

     h.   For each product, report the total number of calls, revenues generated, and sizes of the sales force assigned.

2.   Graph the sales response function. Present the estimates for the constants *a*, *b*, *c*, and *d*.

3.   Report the total annual revenues, production costs, sales force salary, and profits during the current year.

4.   Report the results from the sensitivity analysis. These results allow the managers to identify the optimal size of the sales force.

Reference

Winston, W. L., Albright, S.C. "Practical Management Science: Spreadsheet Modeling and Applications Update." 2nd Ed., *Duxbury Press*, 2002.