Computer–Aided Problems

GUIDE TO THE USE OF THE COMPUTER-AIDED PROBLEMS

Computer-Aided Problem Solving

Marketing managers are problem solvers who must make many decisions. Solving problems and making good decisions usually involves analysis of marketing information. Such information is often expressed in numbers—like costs, revenues, prices, and number of customers or salespeople. Most marketing managers use a computer to keep track of the numbers and speed through calculations. The computer can also make it easier to look at a problem from many different angles—for example, to see how a change in the sales forecast might impact expected sales revenue, costs, and profit.

The computer can only take a manager so far. The manager is the one who puts it all together—and it still takes skill to decide what the information means. The computer-aided problems at the end of the chapters in this text were developed by the authors to help you develop this skill. To work on the problems, you use the computer-aided problem (CAP) software that is found on the Online Learning Centre.

The problems are short descriptions of decisions faced by marketing managers. Each description includes information to help make the decision. With each problem there are several questions for you to answer. Further, the *Learning Aid for Use with Basic Marketing* includes additional questions related to each problem.

Although you will use the computer program to do an analysis, most problems ask you to indicate what decision you would make and why. Thus, in these problems—as in the marketing manager's job—the computer is just a tool to help you make better decisions.

Each problem focuses on one or more of the marketing decision areas discussed in the corresponding chapter. The earlier problems require less marketing knowledge and are simpler in terms of the analysis involved. The later problems build on the principles already covered in the text. The problems can be used in many ways. And the same problem can be analyzed several times for different purposes. Although it is not necessary to do all of the problems or to do them in a particular order, you will probably want to start with the first problem. This practice problem is simpler than the others. In fact, you could do the calculations quite easily without a computer. But this problem will help you see how the program works and how it can help you solve the more complicated problems that come later.

Spreadsheet Analysis of Marketing Problems

Marketing managers often use spreadsheet analysis to evaluate their alternatives—and the program for the computer-aided problems does computerized spreadsheet analysis. In spreadsheet analysis, costs, revenue, and other data related to a marketing problem are organized into a data table—a spreadsheet. The spreadsheet analysis allows you to change the value of one or more of the variables in the data table—to see how each change affects the value of other variables. This is possible because the relationships among the variables are already programmed into the computer. You do not need to do any programming. Let's look at an overly simple example.

You are a marketing manager interested in the total revenue that will result from a particular marketing strategy. You are considering selling your product at $10.00 per unit. You expect to sell 100 units. In our CAP analysis, this problem might be shown in a (very simple) spreadsheet that looks like this:

Variable	Value
Selling price	$10.00
Units sold	100
Total revenue	$1,000.00

There is only one basic relationship in this spreadsheet: Total revenue is equal to the selling price multiplied by the number of units sold. If that relationship has been programmed into the computer (as it is in these problems), you can change the selling price or the number of units you expect to sell, and the program will automatically compute the new value for total revenue.

But now you can ask questions like: What if I raise the price to $10.40 and still sell 100 units? What will happen to total revenue? To get the answer, all you have to do is enter the new price in the spreadsheet, and the program will compute the total revenue for you.

You may also want to do many "what-if" analyses—for example, to see how total revenue changes over a range of prices. Spreadsheet analysis allows you to do this quickly and easily. For instance, if you want to see what happens to total revenue as you vary the price between some minimum value (say, $8.00) and a maximum value (say, $12.00), the program will provide the results table for a what-if analysis showing total revenue for 11 different prices in the range from $8.00 to $12.00.

In a problem like this—with easy numbers and a simple relationship between the variables—the spreadsheet does not do that much work for you. You could do it in your head. But with more complicated problems, the spreadsheet makes it very convenient to more carefully analyze different alternatives or situations.

Using the Program

You don't have to know about computers or using a spreadsheet to use the computer-aided problems program. It was designed to be easy to learn and use. The Help button will give you more detailed information if you need it. But it's best to just try things out to see how it works. A mistake won't hurt anything.

You're likely to find that it's quicker and easier to just use the program than it is to read the instructions. So you may want to go ahead and install the software on your own computer and try the practice problem now. It takes just a few minutes and there's nothing to it.

The Spreadsheet Is Easy to Use

The spreadsheet software is very easy to use and specifically designed for the computer-aided problems. It follows conventions that are standard to browser programs (like Microsoft Internet Explorer or Netscape Navigator). If you have used a browser to surf the Internet, using this will be the same. Even if you have not used a browser before, using this program will make it easy for you to learn. However, if you want more general information about using Microsoft Windows software, you can review the Help file or tutorial that comes with the Windows operating system.

Let's use the first problem to illustrate how the program works.

Start by Selecting a Problem

Open the software and the computer-aided problem page will appear, and you will see a small window in the upper-left corner with the phrase "Choose a problem by clicking on the arrow." When you click the small arrow to the right of that label, a drop-down list of problems will appear. Select the problem you want to work (in this case, select the first one, "Revenue, Cost, and Profit Relationships").

Note: When you first select a problem, be patient while the program loads. It may take a minute or so. Once the program has loaded, calculations are immediate.

Once you select a problem, the problem description window appears. This is simply a convenient reminder of the problem description found in this text. (The assignment questions for each problem are in this book, so it's useful to have your book with you at the computer when you're working on a problem.)

Across the top of the box in which the problem description appears you will see buttons labeled Description, Spreadsheet, Results, Graph, and Calculator. After you've reviewed the problem description, click the Spreadsheet button.

Each spreadsheet consists of one or two columns of numbers. Each column and row is labelled. Look at the row and column labels carefully to see what variable is represented by the value (number) in the spreadsheet. Study the layout of the spreadsheet, and get a feel for how it organizes the information from the problem description. The spreadsheet displays the starting values for the problem. Keep in mind that sometimes the problem description does not provide as much detail about the starting values as is provided in the spreadsheet.

You will see that some of the values in the spreadsheet appear in a highlighted edit box. These are usually values related to the decision variables in the problem you are solving. You can change any value (number) that appears in one of these boxes. When you make a change, the rest of the values (numbers) in that column are recalculated to show how a change in the value of that one variable affects the others. Think about how the numbers relate to each other.

Making changes in values is easy. When the spreadsheet first appears your cursor appears as a free-floating arrow; however, when you pass the cursor over the box for the value that you want to change the cursor changes to the shape of an I-beam. When you click on the value in that box you can change it. Or to move the cursor to a value in a different box, just click on that box.

When you have selected the box with the value (number) you want to change, there are different ways to type in your new number. A good approach is to position the I-beam cursor before the first digit, and while depressing the mouse button drag the cursor across all of the digits in the number. This will highlight the entire number. Then simply type in the new number and the old one will be replaced. Alternatively, you can use other keys to edit the number. For example, you can use the backspace key to erase digits to the left of the I-beam cursor; similarly, you can use the Del key to erase digits to the right of the cursor. Or you can use the arrow keys to move the cursor to the point where you want to change part of a number. Then you just type in your change. You may want to experiment to see which of these editing approaches you like the best.

When you are finished typing the new number, press the Enter key and the other values in the spreadsheet will be recalculated to show the effect of your new value. Similarly, the other numbers will recalculate if you click on a different box after you have entered a number.

When you are typing numbers into the edit boxes, you'll probably find it most convenient to type the numbers and the decimal point with the keys on the main part of the keyboard (rather than those on the cursor control pad). For example, a price of one thousand dollars and 50 cents would be typed as 1000.50 or just 1000.5—using the number keys on the top row of the keyboard and the period key for the decimal point. *Do not type in the dollar sign or the commas to indicate thousands.* Be careful not to type the letters o or l (lowercase L) instead of the numbers 0 or 1.

Typing percent values is a possible point of confusion, since there are different ways to think about a percent. For example, "ten and a half" percent might be represented by 10.5 or .105. To avoid confusion, the program always expects you to enter percents using the first approach, which is the way percents are discussed in the problems. Thus, if you want to enter the value for ten and a half percent you would type 10.5.

To help prevent errors, each problem is programmed with a set of permitted values for each boxed field. After you click on a specific edit box, the range of permitted values is shown in the line at the bottom left corner of the spreadsheet window. It may be useful to explain what we mean by "permitted values." For example, if you accidentally type a letter when the computer program expects a number, the entry will turn red and what you typed will not be accepted. Further, the program won't allow you to enter a new value for a variable that is outside of a permitted range of values.

For example, if you try to type −10.00 as the price of a product, the entry will turn red. (It doesn't make sense to set the price as a negative number!) If you make an error, check what range of values is permitted—and then retype a new number that is in the permitted range, and press the Enter key to recompute the spreadsheet. When you have entered a permitted value, the value will no longer appear in red.

Remember that a value on the spreadsheet stays changed until you change it again. Some of the questions that accompany the problems ask you to evaluate results associated with different sets of values. It's good practice to check that you have entered all the correct values on a spreadsheet before interpreting the results.

In addition to changing values (numbers) on the spreadsheet itself, there are other options on the spreadsheet menu bar. Click the Description button to go back and review the problem description—or you can use the drop-down list again to select another problem. If you click the Results button, a new window will appear that shows the results table for a what-if analysis. We'll discuss what-if analysis after we cover printing.

Adding Your Comments and Printing

After you have done an analysis, you may want to print a copy of your results (especially if you are expected to hand in your answers to the questions that accompany the computer-aided problem). In fact, the print feature gives you the opportunity to type your name and answers right on the sheet that is printed. To use this feature, just click the printer icon while the spreadsheet is displayed with the results you want to print. A new window will open with a printable version of your analysis. You will also see an edit box area where you can type in your comments. Each comment can be up to 500 characters, and that should be plenty of space for you to type your answers to a question. Sometimes you will want to print more than one spreadsheet (each with its own comments) to answer the different questions.

Once you are satisfied with any comments you have added, you are ready to print your results. Of course, to be able to print you will need to have a printer properly hooked up to your computer and configured for Windows. *Before you select the Print button, make sure that the printer is turned on and loaded with paper!*

Results of a What-if Analysis

The Results button makes it easy for you to study in more detail the effect of changing the value of a particular variable. It systematically changes the value of one variable (which you select) and displays the effect that variable has

on two other variables. You could do the same thing manually at the spreadsheet—by entering a value for a variable, checking the effect on other variables, and then repeating the process over and over again. But the manual approach is time-consuming and requires you to keep track of the results after each change. A what-if analysis does all this very quickly and presents the results table summary; you can also print or graph the results table if you wish.

Now let's take a step-by-step look at how you can get the exact what-if analysis that you want. The first step is to decide what variable (value) you want to vary and what result values you want to see in the results table.

You select the variables for your analysis by simply clicking the circle ("radio button") beside the number of interest. Click the radio button beside the value of the variable in an edit box that you want to vary. The radio button for the selected value is filled in. You can only select one variable to vary at a time. So if you want to vary some other variable, simply click on your new selection.

When you select a value to vary, the program computes a default "suggested" minimum value and maximum value for the range over which that variable may vary. The minimum value is usually 20 percent smaller than the value shown on the spreadsheet, and the maximum value is 20 percent larger. These default values are used as the minimum and maximum values to compute the results table for a what-if analysis (when you click the Results button).

You can also select the two variables that you want to display in the results table of the what-if analysis. Typically, you will want to display the results (computed values) for variables that will be affected by the variable you select to vary. Remember the example we used earlier. If you had specified that price was going to vary, you might want to display total revenue—to see how it changes at different price levels.

You select a variable to display in the same way that you select the variable you are going to vary. Simply click on the radio button beside a number on the spreadsheet that is not in an edit box. Then use this approach to select a second variable to be displayed in the results table. If you change your mind, you can click on the radio button for another variable. When you have completed this step, you will see a solid radio button next to the variable you chose to vary and solid radio buttons next to the two variables that you want to display.

Now you can let the computer take over. On the button bar at the top of the spreadsheet window, click the Results button and the results table for the what-if analysis will appear. Each row in the first column of the results table will show a different value for the variable you wanted to vary. The minimum value will be in the first row. The maximum value will be in the bottom row. Evenly spaced values between the minimum and maximum will be in the middle rows. The other columns show the calculated results for the values you selected to display. Each column of values is labeled at the top to identify the column and row from the spreadsheet. The row portion of the label is a short version of the label from the spreadsheet. The results are based on the values that were in the spreadsheet when you selected the Results button, except for the value you selected to vary.

After the results table is displayed, you have the option to type in your own minimum value and maximum value in the edit boxes below the results table. To do that, just use the same approach you used to enter new values in the spreadsheet. When you enter a new minimum or maximum, the results table will be updated based on the new range of values between the minimum and maximum you entered.

At this point you will want to study the results of your analysis. You can also print a copy of the results table by clicking the Print button. The button bar also shows other possibilities. For example, if you select the Spreadsheet button, the spreadsheet will reappear. The radio buttons will still show the values you selected in the previous analysis. From there you can make additional changes in the values in the spreadsheet, check the results table for a new what-if analysis, or select another problem to work. Or you can look at (and print) a graph of values in the results table for the what-if analysis.

Viewing a Graph of Your Results

You can create a graph of values in the results table by clicking the Graph button. The horizontal axis for the graph will be the variable in the first column of the display. The vertical axis on the left side is based on the first variable you selected to display in the results table. The vertical axis on the right side of the graph is for the second variable. There will be a line on the graph that corresponds to each axis.

What to Do Next

The next section gives additional tips on the program. You will probably want to look through it after you have done some work with the practice problem. For now, however, you're probably tired of reading instructions. So work a problem or two. It's easier and faster to use the program than to read about it. Give it a try, and don't be afraid to experiment. If you have problems, remember that the Help button is available when you need it.

Some Tips on Using the CAP Program

Resetting the Spreadsheet to the Initial Values

The initial spreadsheet for each problem gives the "starting values" for the problem. While working a problem, you will often change one or more of the starting values to a new number. A changed value stays in effect, unless you change it again. This is a handy feature. But after you make several changes, you may not be able to remember the starting values. There is a simple solution—you can click the button to return to the home page, then click the CAPs label again, and reselect the problem you want. The spreadsheet will appear with the original set of starting values.

Checking the Computer's Calculations

Some values appear in the spreadsheet as whole numbers, and others appear with one or more digits to the right of a

decimal point. For example, dollar values usually have two digits to the right of the decimal point, indicating how many cents are involved. A value indicating, say, number of customers, however, will appear as a whole number.

When you are doing arithmetic by hand, or with a calculator, you sometimes have to make decisions about how much detail is necessary. For example, if you divide 13 by 3 the answer is 4.33, 4.333, 4.3333, or perhaps 4.33333, depending on how important it is to be precise. Usually we round off the number to keep things manageable. Similarly, computers usually display results after rounding off the numbers. This has the potential to create confusion and seeming inaccuracy when many calculations are involved. If the computer uses a lot of detail in its calculations and then displays intermediate results after rounding off, the numbers may appear to be inconsistent. To illustrate this, let's extend the example. If you multiply 4.33 times 2640, you get 11431.20. But if you multiply 4.333 by 2640, you get 11439.12. To make it easier for you to check relationships between the values on a spreadsheet, the CAP software does not use a lot of hidden detail in calculations. If it rounds off a number to display it in the spreadsheet, the rounded number is used in subsequent calculations. It would be easy for the computer to keep track of all of the detail in its calculations—but that would make it harder for you to check the results yourself. If you check the results on a spreadsheet (perhaps with the calculator provided) and find that your numbers are close but do not match exactly, it is probably because you are making different decisions about rounding than were programmed into the spreadsheet.

The software was designed and tested to be easy to use and error free. In fact, it is programmed to help prevent the user from making typing errors. But it is impossible to anticipate every possible combination of numbers you might enter—and some combinations of numbers can cause problems. For example, a certain combination of numbers might result in an instruction for the computer to divide a number by zero, which is a mathematical impossibility. When a problem of this sort occurs, the word ERROR will appear in the spreadsheet (or in the results table for the what-if analysis) instead of a number. If this happens, you should recheck the numbers in the spreadsheet and redo the analysis—to make certain that the numbers you typed in were what you intended. That should straighten out the problem in almost every case. Yet with any computer program there can be a hidden bug that only surfaces in unusual situations or on certain computers. Thus, if you think you have found a bug, we would like to know so that we can track down the source of the difficulty.