THE GAMESMANSHIP OF PRICING: BUILDING PRICING STRATEGY SKILLS THROUGH SPREADSHEET MODELING

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INTRODUCTION

Good decision making within the context of pricing strategy, in large part, requires the consideration of fairly large amounts of data and the evaluation of a range of alternatives. For students, managing this quantity of data frequently becomes such a highly complex task that they become confused and do not adequately analyze the variables involved. Also, for any problem, there generally is more than one viable solution. It is important that students inspect each alternative strategy and attempt to anticipate the impact of each on future operations. This is a sophisticated feat as well, typically involving tedious and complicated iterations and forecasts. In short, the great majority of marketing students have not developed the skills nor have the time needed for these complex operations.

To help alleviate this situation, the author has developed a computer-assisted instructional program consisting of a variety of microcomputer based modules within an integrated spreadsheet as pedagogical tools in the teaching of topics within the functional area of pricing strategy. These topical modules were developed to assist the undergraduate marketing student in understanding concepts, issues, and problems in establishing prices for goods and/or services that are: 1) appealing to customers, 2) competitive with similar business firms, and 3) which allow for sufficient profit. This paper describes the purposes, underpinnings, and benefits of the use of the modules to both student participants and the instructor who use this computer assisted instructional technique.

Deficiencies in Teaching Pricing Strategy Skills

The major objective in designing this computer assisted instructional spreadsheet was to facilitate the overall level of student understanding of pricing concepts. This objective arose because it has been observed that in spite of diligent efforts to explain the various pricing concepts and techniques, many students were unable to correctly apply them on exams and in case studies; and faculty who taught the marketing management and strategies courses were indicating to the instructors of the basic marketing course that the students were coming into their classes with an extremely weak background in pricing. For example, if a beginning marketing student were asked, "How much should you charge for your products?" a typical response might be, "As much as you can get." But many students in a basic marketing course do not realize that if one charges too much, you lose sales; charge too <u>little</u> and you lose profits. It is important to note also that many students believe that the best pricing strategy is to set a price that will sell the most units or the price that will bring the most sales dollars. They have not internalized the central concept that the best price is the one that will maximize profits for the company. To achieve this, it is necessary that the student understand that the best price must take into consideration such factors as cost, demand, and profit.

Need for a Synthesis: Toward the Development of A Spreadsheet Model

Therefore, students need criteria and guidelines which they can apply to any group of options that would enable them to build toward the most efficacious pricing decision. The typical current classroom situation has not adequately prepared the student in this topical area. However, there exists a methodology that can be employed to improve the student's skills in this area. It is the purpose of this paper to show you this methodology in a step-by-step process which can be adopted to various teaching contexts.

We are aided greatly in this task by a pedagogical approach that appears to offer a new dimension to the educational process - computer-assisted instruction -using the microcomputer and a software program such as the revolutionary spreadsheet. The microcomputer can plow through the complicated and time-consuming analytical activities quickly, easily and correctly. In fact, with the help of the computer the student can begin to inspect a wide range of alternatives and the implications of large amounts of data almost instantaneously. By exploring these "what-ifs," the student can predict the impact of the various choices without having to tediously go through the actual activities.

The author has developed a spreadsheet model LhdL begins to take into consideration those essential factors necessary in building pricing strategy skills. The model is a computer program that helps students to analyze, evaluate and communicate the many numeric and subjective variables that are part of making pricing decisions. It is a model for evaluating a group of alternatives with the goal of choosing one for action. The spreadsheet model will enable the student to choose the mode that best suits the situation. And, it does the time-consuming work correctly translating the students evaluations into numbers and percentages used for calculating the results.

This spreadsheet model also offers the student the possibility of changing his mind about the importance of various criteria and effecting an instant recalculation of the results. For example, in deciding if a new manufacturing facility should be built for company's new product, a student might perceive he gave too much weight to the criterion of labor and not enough to the criterion of return on investment. A few quick changes to the spreadsheet model would give a revised result. This flexibility enables one to change assumptions many times with a quick view of the results.

Perhaps equally important, if not most important, with a spreadsheet model the student can see how he is making his decisions - which criteria and guidelines most strongly influence the alternative results.

THE SPREADSHEET MODEL

In teaching pricing strategies, there is no one absolutely correct formula to use in determining the best price. All pricing methodologies are subject to question and none have proven acceptable to all business situations. Therefore, it is necessary that

students obtain an understanding of the various methodologies available, and under what circumstances they may be used in setting an appropriate price. A feature of the spreadsheet model is to present many of the more frequently used approaches to pricing in a series of computer assisted instructional modules. Each module contains the following elements:

1. The lesson to be taught. This is where the computer does the actual "teaching." It teaches a specific pricing skill or concept. The "teaching" mode describes the pricing technique (why, when, and how it's used); gives the appropriate formula utilized, and presents an example of how the technique is used.

2. An application worksheet. This mode permits the student to apply the pricing technique.

PRICE ANALYSIS Application System Overview

There are three pricing technique modules in the PRICE ANALYSIS system, as well as an introduction module. The four modules are:

INTRO   The introduction module will familiarize the user with the structure and operations of the PRICE ANALYSIS applications system. It also presents background information for a continuing example of an application in order to demonstrate the various pricing techniques.

COST   This module presents 1) cost-plus pricing, 2) standard mark-up pricing, and 3) traditional breakeven analysis.

DEMAND   This module presents 1) the concept of price elasticity of demand, 2) demand-backward pricing, 3) chain-markup pricing, and 4) modified break-even analysis.

PROFIT   This module presents 1) target profit pricing, 2) target return-on-sales, and 3) target return-on-investment.

All of the program modules have a library of macros to automate the functions of moving: 1) from one module to another, 2) around each module, and 3) managing the spreadsheet functions of quitting and saving files.

How to Begin Execution of a Module

If you have a two-drive floppy-disk microcomputer, put the spreadsheet program disk (Lotus 1-2-3 or VP Planner) in the A drive and the PRICE ANALYSIS Application Systems disk in drive B. The first program that should be run is the INTRO module. To run this module, type/fr INTRO [enter]. If these instructions do not conform to your spreadsheet commands, follow the instructions for retrieving a file in drive B for your particular spreadsheet. From INTRO you can select any of the modules by using the following macro commands:

```
[Alt]C     To run COST
[Alt]D     To run DEMAND
[Alt]P     To run PROFIT
```

AN EXAMPLE OF THE "COST" MODULE

The following displays a sample of one of the modules,

```
Cost-Based Pricing Techniques

Macro          [Alt]K (Cost-plus pricing)
Library        [Alt]M (Standard mark-up pricing)
               [Alt]B (Traditional breakeven analysis)

To run different
modules:
[Alt]D To run DEMAND
[Alt]P To run PROFIT
[Alt]I To run INTRO
=================================================
In cost-based methods the price better stresses the
supply or the cost side of the pricing problem, not
the demand side.  Price is set by examining expenses,
overhead, and profit.

From the micro library above, select the cost-based
pricing technique you wish to use.
```

COST, indicating the various screens - its "teaching" sections and worksheet input areas.

Cost-Plus Pricing

With cost-plus pricing, prices are determined by adding a predetermined profit to costs.

In general, the steps for computing cost-plus pricing are to estimate the number of units to be produced, 25 calculate fixed and variable costs, and add a predetermined profit to costs. The formula for cost-plus 26 pricing is:

$$\text{Price} = \frac{\text{Total fixed costs} + \text{Total variable costs} + \text{Projected profit}}{\text{Units produced}}$$

As an illustration, if 300 Whirlwind scooters are produced and the company desires a profit of $50,000, and its cost structure is $175,000 for total fixed costs and &780,000 for its total variable costs, then its per unit selling price to retailers would be…

```
COST ESTIMATE WORKSHEET            ENTER THE FOLLOWING IN CELL H:

TOTAL FIXED COSTS:     175000      TOTAL FIXED COSTS:        0
TOTAL VARIABLE COSTS: 780000      TOTAL VARIABLE COSTS:     0
PROJECTED PROFIT:       50000      PROJECTED PROFIT:         0
UNITS PRODUCED:           300      UNITS PRODUCED:           0


                    SOLUTION
-------------------------------------------------------

         1005000                                     0
Price =  -------                      Price =       ---
           300                                       0

Price =  $3,350                        Price =      ERR

-------------------------------------------------------

PRESS:  [HOME] to return to COST menu.
        [Alt]Q to quit.
        [Alt]D for DEMAND menu.
        [Alt]P for PROFIT menu.
```

Standard Mark-up Pricing

In mark-up pricing the firm sets prices by calculating per unit merchandise costs and then determining the mark-up percentages that are needed to cover selling costs and profit. The formula for mark-up is:

$$\text{Price} = \frac{\text{Merchandise cost}}{(100 - \text{MARK-UP PER CENT})/100}$$

For example, If a retailer pays $3,350 for a Whirlwind scooter and needs a 40 percent, mark-up to cover 72 selling costs and profits, the final selling price would be....

```
MARKUP PER CENT WORKSHEET        ENTER THE FOLLOWING IN CELL H:
MARKUP PER CENT:          40     MARKUP PER CENT:             0
MERCHANDISE COSTS:      3350     MERCHANDISE COSTS:           0


                        SOLUTION

            3350                                          0
Price  =   -------              Price  =                 ---
             .6                                            1


Price  =  $5,583.33            Price  =  $0


PRESS:   [HOME] to return to COST menu.    [Alt]D for DEMAND menu.
         [Alt]Q to quit.                   [Alt]P for PROFIT menu.
                                           [Alt]I for INTRO menu.
```

Traditional Break-Even Analysis

Traditional break-even analysis examines the relationship among costs, revenues, and profits. It determines the sales quantity in units or dollars that is necessary for total revenues (price * units sold) to equal total costs (fixed and variable) at a given price. When the sales exceed the break-even quantity, the firm earns a profit. When sales are less than the break-even quantity, the firm loses money. The break-even point can be computed in terms of units or sales dollars:

$$\text{Break-even point (units)} = \frac{\text{Total fixed costs}}{\text{Price} - \text{Variable costs (per unit)}}$$

$$\text{Break-even point (sales dollars)} = \frac{\text{Total fixed costs}}{1 - \text{Variable costs (per unit)}/\text{Price}}$$

To illustrate, assume management is considering a selling price of $2950 to retailers for their whirlwind scooter. The total fixed costs defines the key concepts needed in this analysis.

Note that several important cost relationships can be drawn from the table:

1. Total fixed costs remain constant over the entire range of production. Average fixed costs fall as the quantity produced increases, because overhead costs are spread over more units.
2. Total variable costs rise over the entire range of production. Average costs remain constant per unit produced.
3. Total costs rise over the entire production range, since total fixed costs are constant and total variable costs increase. Average total costs decline, because average fixed drop and average fixed costs are constant, as production grows.
4. The marginal costs of producing additional scooters are $2,600 (average variable costs) over the entire range of production, because fixed costs are constant throughout.

```
BREAK-EVEN ANALYSIS WORKSHEET           ENTER THE FOLLOWING IN CELL H:
TOTAL FIXED COSTS:         175000       TOTAL FIXED COSTS:           0
VARIABLE COSTS (PER UNIT):   2600       VAR. COSTS/UNIT:             0
PRICE:                       2950       PRICE:                       0
```

COMPUTING KEY COST CONCEPTS FOR WHIRLWIND SCOOTERS (multiples of 100 units)

QUANTITY PRODUCED (UNITS) COL. 1	TOTAL FIXED COSTS COL. 2	TOTAL VARIABLE COSTS COL. 3	AVERAGE TOTAL COSTS COL. 2+3	AVERAGE FIXED COSTS COL. 2/1	AVERAGE VARIABLE COSTS COL. 3/1	TOTAL COSTS COL. 5+6	MARGINAL COSTS (UNITS)
100	175000	260000	435000	1750.00	2600	4350.00	2600
200	175000	520000	695000	875.00	2600	3475.00	2600
300	175000	780000	955000	583.33	2600	3183.33	2600
400	175000	1040000	1215000	437.50	2600	3037.50	2600
500	175000	1300000	1475000	350.00	2600	2950.00	2600
600	175000	1560000	1735000	291.67	2600	2891.67	2600
700	175000	1820000	1995000	250.00	2600	2850.00	2600
800	175000	2080000	2255000	218.75	2600	2818.75	2600
900	175000	2340000	2515000	194.44	2600	2794.44	2600
1000	175000	2600000	2775000	175.00	2600	2775.00	2600

```
                             SOLUTION
--------------------------------------------------------------------
B-E POINT (units)   =  500          B-E POINT (units)   =  ERR

B-E POINT (dollars) =  1475000      B-E POINT (dollars) =  ERR
--------------------------------------------------------------------
```

Table 2 shows the costs, revenues, and profits for Whirlwind scooters priced at $2,950 to retailers.

B-E ANALYSIS FOR WHIRLWIND SCOOTERS PRICED AT $2,950 EACH TO RETAILERS

QUANTITY PRODUCED (UNITS)	TOTAL FIXED COSTS	TOTAL VARIABLE COSTS	TOTAL COSTS COL. 2+3	PRICE PER UNIT	TOTAL REVENUE COL. 1*5	TOTAL PROFIT COL. 6-4	
100	175000	260000	435000	2950	295000	-140000	LOSS
200	175000	520000	695000	2950	590000	-105000	LOSS
300	175000	780000	955000	2950	885000	-70000	LOSS
400	175000	1040000	1215000	2950	1180000	-35000	LOSS
500	175000	1300000	1475000	2950	1475000	0	B-E POINT
600	175000	1560000	1735000	2950	1770000	35000	PROFIT
700	175000	1820000	1995000	2950	2065000	70000	PROFIT
800	175000	2080000	2255000	2950	2360000	105000	PROFIT
900	175000	2340000	2515000	2950	2655000	140000	PROFIT
1000	175000	2600000	2775000	2950	2950000	175000	PROFIT

Benefits

The basic benefit of this teaching procedure is that the student is encouraged to develop a more comprehensive understanding of pricing strategy with a variety of scenarios than was feasible when the work was done without computer and spreadsheet software.

A second benefit is that the student is encouraged to develop a basic familiarity and skill in the use of a spreadsheet in preparation for a professional career that will follow.

Benefits accruing to the instructor include covering a variety of pricing decision concepts and techniques with a minimum of class time, and provides practical examples of applications of pricing strategy techniques.

SUMMARY

The computer-assisted instructional spreadsheet modeling system presented in this paper is a relatively new approach continuously under development and revision. It is early to gauge its effectiveness at this time. During the upcoming months it will be

class tested using the measurement instrument in Exhibit 1.

Although PRICE ANALYSIS represents only an initial attempt at building pricing strategy skills through the use of spreadsheet modeling, modifications can be made which will make the exercise more realistic. These could include the addition of other variables and other pricing models. However, this computer-assisted instructional program should provide the marketing student with considerably more than just the basics of pricing strategy.

EXHIBIT 1
COMPUTER APPLICATIONS EVALUATION

To help evaluate the use of computer applications in this course, would you please circle the number that mostly represents your degree of agreement to disagreement to the statements below:

	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
1) The computer exercises helped me to understand the basic principles of pricing strategy	5	4	3	2	1
2) The computer exercises took more time than they were worth	5	4	3	2	1
3) The computer exercises added a lot of realism to the class	5	4	3	2	1
4) The computer exercises were more entertaining than they were educational	5	4	3	2	1
5) Performance in the computer exercises is a good way for a student to tell how well he/she is learning the subject	5	4	3	2	1
6) Using computer exercises is an inefficient way to study a subject	5	4	3	2	1
7) The computer exercises helped me to develop my analytical and decision making skills	5	4	3	2	1
8) The computer exercises were rather confusing and hard to understand when I first began	5	4	3	2	1
9) I enjoyed working with the computer	5	4	3	2	1
10) The computer exercises have provided a good illustration of the usefulness of computers to solve problems	5	4	3	2	1
11) The computer exercises have helped me to better understand how decisions should be made	5	4	3	2	1
12) The computer exercises have been a valuable educational tool	5	4	3	2	1
13) Compared to the typical "case", the computer exercises are more interesting	5	4	3	2	1
14) We should keep the computer exercises in this course	5	4	3	2	1

Which computer exercises, if any, did you feel were not worth your time solving? (CHECK ALL THAT APPLY)
_____ Cost plus pricing
_____ Standard markup pricing
_____ Traditional breakeven analysis
_____ Price elasticity of demand
_____ Demand-backward pricing
_____ Chain-markup pricing
_____ Modified breakeven analysis
_____ Target profit pricing
_____ Target return on sales
_____ Target return on investment

Explain why.

If the above statements did not cover certain aspects of the use of the computer application exercises that you believe should be brought to the instructor's attention, would you please take the time to add your additional comments:

STUDENT BACKGROUND INFORMATION

1. This course was required.   ___ Yes   ___ No

2. Gender of student   ___ Male   ___ Female

3. What is your overall GPA?
   _____ 2.29 or less   _____ 3.0 - 3.9
   _____ 2.3 - 2.59   _____ 3.5 - 4.0
   _____ 2.6 - 2.99

4. What is your current class standing?
   _____ Freshman   _____ Senior
   _____ Sophomore   _____ Graduate/Post
   _____ Junior   Baccalaureate

5. What is your major?
   _____ Accounting   _____ Marketing
   _____ Economics   _____ Management
   _____ Finance   _____ Gen. Bus. Adm.
   _____ Hospitality Mgt.
   _____ Other, please specify _____

6. How many hours a week did you devote to this course?
   _____ 0 - 2   _____ 9 - 11
   _____ 3 - 5   _____ 12 or more
   _____ 6 - 8