Marketing – Analytic Foundations

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SECTION 1: INTRODUCTION

This note provides definitions, formulas, and examples for some key quantitative analyses in marketing planning. This note also provides a common core of materials that we can all rely on in the marketing core course and beyond. Your goal should not be to memorize this material, but to understand the logic and concepts behind the calculations.

Although quantitative analysis and modeling in marketing can be very sophisticated, in their day-to-day work, managers mainly use simple arithmetic. Yet, actually applying these ideas is not always straightforward because of three challenges: (i) gathering relevant and reliable data, (ii) knowing when to use which calculation and why, and (iii) knowing what to conclude from the results.

Inputs for Calculations

Mindful of the Garbage In, Garbage Out (GIGO) problem, good analysts and managers are always mindful of the quality of the inputs in their quantitative calculations analyses. When it comes to issues of validity and reliability, one can distinguish four types of inputs:

- Hard numbers
- Company/Industry averages
- Educated guesses
- Wishful thinking

When analyzing a marketing situation, you should look for data inputs in the order given above.

Hard Numbers

These inputs are costs, margins, market shares, size of customer bases, and other data that are reliably measured. Other hard numbers can result from a combination of marketing research, econometric modeling, and managerial judgment. An example is an estimate of price elasticity obtained from a well-crafted test market that has been validated by other methods, and is consistent with industry and the firm's experience.

Even hard data must be carefully scrutinized. For example, market research may report that "40 percent of our consumers are satisfied." That information can be considered *hard* in that it comes from quantitative market research based on a representative sample. But what does that number actually mean? Satisfied compared to what? Satisfied with what? Did the researchers and the customers define satisfaction in the same way? As an example, 40 percent of the customers may say they were satisfied with their last United Airlines flight, but what they were really indicating was that the flight was miserable—just no more or less so than flights on other airlines. A very different percentage would have been obtained if the question was asked differently, and satisfaction was defined in terms of what customers desired to have on an ideal flight.

Company/Industry Averages

These inputs are well-established averages that are typical for the company or the industry. These numbers are useful, but should be adjusted to fit the current product and situation whenever possible. For example, studies reporting average elasticities (percentage change in an outcome for a given percent change in an input) of sales with respect to price or advertising are just that—averages that may, but need not, apply to the specific situation you are facing.

Here are some very general U.S. industry benchmarks. Assumptions that diverge from these broad reference points can be quite valid but require stronger justification.

- Channel Margin …… 25% to 50% of End-User Price
- Unit Profit Margin …… 20% to 40% of Unit Price
- Marketing Expenditures ……... 10% to 20% of Sales Revenue
- Advertising Expenditures ……. 5% of Sales Revenue; typically lower (1% to 3%) for Business-to-business and higher (7% to 15%) for Consumer Packaged Goods (CPGs)
- Sales Force Expenditures ……. 5% of Sales Revenue; for Business-to-business, typically 5 to 6 times the Advertising/Sales ratio
- Trade Promotions ……. 5% to 10% of Sales Revenue

Educated Guesses

These inputs are based on common beliefs or professional experience. They may be based on experience with a specific product or market, but typically come from more general experience. In the latter case, they may appear plausible for most business situations, but they need not apply to the specific situation you face. For example, conventional wisdom based on some research suggests that (i) it takes one to three advertising exposures to break into a consumer's conscious awareness, (ii) true impact on beliefs, attitudes, and purchase behavior results from a couple of additional exposures, and (iii) decreasing returns start after five or six exposures. Obviously, this rule of thumb needs to be carefully evaluated in the context of a specific product, target market segment, and the advertising campaign (e.g., media used, message themes, executions, etc.). *Educated guesses* should be *used only as a last resort* to supplement hard data.

Wishful Thinking

Wishful thinking and other unsubstantiated inputs should not be used except in sensitivity analyses. Inputs that have no basis in reality are often used to make marketing objectives look achievable, regardless of their true merit. For example, a manager for a milk cooperative in the U.S. fired up his audience by saying that "… if only every American child would drink one more glass of milk each day... " and then went on to quote exciting numbers resulting from increased sales of milk. This is pure wishful thinking! Conversely, a marketing plan may boast an aggressive sales objective but against a market size estimate that is far too conservative. The objective may make the manager look good, but, if the market is in fact much larger, the aggressive objective is actually quite easy to obtain. You should be particularly wary of such analyses in situations where managers are expected to rotate out of their current job in the next two years or where firms are being purchased or taken over.

A Word of Advice

In reporting the results of quantitative analyses, the sources of input data should be explicitly cited, and any assumptions that were used to generate or adjust the inputs should be explicitly stated and justified. The latter is especially important.

SECTION 2: WHEN TO USE WHICH CALCULATIONS AND WHY

This note describes six types of calculations: margin analysis, break-even analysis, chain models of segment value, customer lifetime value, economic value to the customer, and weighted cost-per-thousand. This section describes briefly when each type of calculation is useful.

Margin Analysis

When? Always.

Why? To locate the profit pools in the product line and understand the incentives of competitors and collaborators. A margin analysis simply tracks prices, variable costs, and profit margins through the value chain for every relevant product within the firm's product line and across competitors. Knowing your own margins provides inputs for break-even analyses, calculations of segment value, Customer Lifetime Value (CLV), and Economic Value to the Customer (EVC). Knowing profit margins for channel members and competitors helps predict their responses to actions the firm may take. For example, channel partners often provide a great deal of marketing effort in support of high margin products. When channel margins are not aligned with the firm's margins across the product line, conflict can arise because the products that are most profitable for the firm are not the same as the most profitable products for the reseller. Similarly, knowing the profit margins of competing products helps predict how much marketing support they will receive and how much room there is for their price to be cut.

Total Break-Even Unit Volume (TBEV)

When? When proposing or evaluating a marketing plan.

Why? To assess whether a plan is profitable given its expected sales volume. Total break-even analysis is most useful when good estimates of sales volume are not available, but managers feel comfortable assessing whether a particular sales volume is attainable or not. It is especially valued by entrepreneurs and new venture managers facing great uncertainty about demand.

Incremental Break-Even Unit Volume (IBEV)

When? When considering a marketing action or change in policy.

Why? To show that the action will generate sales and margins that are sufficient to cover the cost of the action. The objective is to calculate the number of units that must be sold for a new marketing action or a change in policy to be profitable. The logic is identical to that of a total break-even analysis. The only difference is that the focus is on the change in sales that is required for the action to be profit-neutral if that action entails a change in the margin and/or the fixed costs.

Break-Even Cannibalization Rate (BECR)

When? When introducing a new product that is less profitable into an existing product line. Cannibalization occurs when a new product steals sales away from existing products in the line.

Why? To show that the profitability of the product line as a whole will not suffer as a result of the proposed action. It is necessary to know how many units of the new product must be sold by stealing market share from competitors or by expanding the market in order to compensate for the cannibalization of existing products. The BECR is the highest acceptable cannibalization rate. Introducing the new product is supported to the extent that there is evidence that the actual cannibalization rate will be lower than the BECR.

Chain Models of Segment Value

When? When making decisions about which market to target.

Why? To understand the size and financial value of market segments. Marketers must decide what market segments to target (i.e., what customers to provide products or services for), and how to price, promote, and distribute the offerings. Evaluating and selecting segments is an important input for other analyses, such as planning media strategies, evaluating channels of distribution, and estimating the required size of a sales force.

Customer Lifetime Value (CLV)

When? Whenever single transactions do not represent the value of customers to the firm (e.g., when there is a possibility for repeat business from an individual customer).

Standard analyses assume that single transactions are the unit of analysis and that each transaction is more or less independent of the next. However, customers often buy the same products repeatedly over time, make multiple interrelated purchases (e.g., razors and blades), and generate customer support and other costs that are not specifically related to any specific transaction. CLV analysis is valuable when one or more of the following factors are present:

- An initial purchase often leads to subsequent purchases with less selling effort (e.g., repeat purchases or purchases of complementary products offered by the same firm).
- The cost of acquiring a customer (generating a first purchase) is larger than the profit provided by the initial purchase.
- There are customer costs that are relatively unaffected by purchase activity (i.e., retention costs such as billing, customer service, and salesperson contacts).
- There is evidence of customer attrition (i.e., churn due to dissatisfaction, competitive activity, changes in customer needs, etc.).

Why? To estimate the present value of a customer who will generate a stream of revenue and costs over a relatively long period of time. A positive CLV means that marketing actions will more than break-even over the lifetime of the customer. For instance, CLV analysis answers the question: "How much can we spend to acquire this type of customer and remain profitable?" CLV analysis provides a basis for deciding which segments to target based on long-term rather than short-term profitability. It can also help determine whether it is more profitable to acquire

new customers or to better serve current customers. Finally, CLV forces the manager to think about how sales are generated as well as maintained.

Economic Value to the Customer (EVC)

When? Whenever a major benefit of the product is to save the customer money in the *long-run* even though the initial price of the product may be higher than that of a competitor. The basic idea is to capture how much value the product provides to the buyer over its lifetime compared to the value provided by competitive offerings. For example, a firm's offering may provide cost savings in installation, personnel training, fuel consumption, maintenance and repairs, disposal fees, etc. Like CLV, EVC requires an understanding of customer behavior over a relatively long time period.

Why? EVC is used to determine a given customer's willingness to pay, and to quantify economic or financial reasons for that customer to buy the product. The former sets a ceiling for the price, and the latter is useful for developing messages in sales pitches, advertisements, and other marketing communications.

The EVC is the price at which the value of a firm's product to the customer is exactly *equal* to the value of a specific competitive product. Thus, to get the customer's business, the actual price must be *lower* than the EVC.

SECTION 3: MARGIN ANALYSIS

A margin analysis is a table that tracks prices, variable costs, and profit margins through the value chain for every relevant product within the firm's product line and across competitors. These margins are inputs for break-even, segment value, CLV, and EVC analyses. Knowing profit margins for channel members and competitors helps predict their response to actions the firm may take. Definitions for the components of a margin analyses are:

- *Retail Price* or *End-User Price* is the price paid by the end-user to the channel member from which the product is purchased.
- *Wholesale Price* or *Manufacturer's Unit Price* is the price paid to the firm.
- *Channel Margin* is the difference between the Retail Price that the reseller gets from the end-user and the Wholesale Price that it pays to the manufacturer.
- *Unit Variable Cost* is the sum of all variable costs incurred by the firm that can be directly assigned to the product on a per unit basis.
- *Unit Contribution* is the difference between the Unit Price and the Unit Variable Cost. It is also called Unit Margin or Unit Profit Margin.

Example

The ZYX Company makes a product that costs $3 to produce, is sold to retailers for $5, and has a Manufacturer's Suggested Retail Price (MSRP) of $10. The PQR Company makes a product that costs $2.50 to produce, is sold to retailers for $4, and has a MSRP of $8. The ZYX Company is considering the introduction of a second product. This product will have a Unit Price of $4.50, will cost $2.50 to produce, and will have a MSRP of $8.25.

	ZYX Product 1	ZYX Product 2	PQR Product
Retail Price (i.e., End-User Price)	$10.00	$8.25	$8.00
Retailer's Unit Contribution (i.e., Channel Margin)	5.00	3.75	4.00
Manufacturer's Unit Price	5.00	4.50	4.00
Manufacturer's Unit Variable Cost	3.00	2.50	2.50
Manufacturer's Unit Contribution	2.00	2.00	1.50

Note the implications from this table. ZYX will not care whether end-users buy Product 1 or Product 2 (in the short-run) because they make $2 per unit either way. However, the retailer will not be excited about Product 2 because it would rather sell the PQR product than Product 2 to customers who find Product 1 too expensive.

SECTION 4: BREAK-EVEN ANALYSIS

Break-even analysis is probably the most commonly used quantitative concept for supporting marketing decisions. The idea is to identify what level of sales is necessary for you to just recover your costs and break-even profitwise. Hence, break-even analysis is a very simple tool to separate the potential winners from the definite losers and manage risk when developing marketing plans.

Break-even analysis is a first step in the evaluation of an action or plan—not the sole criterion for a decision. Sometimes there are good, long-run reasons to take an action that is likely to lose money in the short-term (e.g., to learn about customers or competitors, to signal information to customers and competitors, or because of social or ethical considerations). However, most of the time a marketing plan or action should pay its own way. Ideally, of course, it should do better than simply break-even and generate profits.

We distinguish between two main types of break-even analysis. A *total* break-even analysis of a marketing plan helps you identify what minimum level of sales is necessary for the plan to be profit-neutral. An *incremental* break-even analysis is used when considering changing an existing marketing strategy. It identifies the change (increment or decrement) in sales that is required for the action to be profit-neutral if that action entails a change in the margin and/or the fixed costs. In addition to these two main types of break-even analysis, we also consider the break-even cannibalization rate (BECR), which is an application of the general break-even logic when considering adding a new product into an existing product line.

Total Break-Even Unit Volume (TBEV)

Frequently, the concept of breaking even is applied to an entire business or marketing plan. The Total Break-Even Unit Volume (TBEV) is the point at which Total Profit is exactly zero.

Total Profit
- = Total Revenue - Total Cost
- = (Unit Volume × Unit Price) - (Unit Volume × Unit Variable Cost + Total Fixed Cost)
- = [Unit Volume × (Unit Price - Unit Variable Cost)] - Total Fixed Cost
- = Unit Volume × Unit Contribution - Total Fixed Cost
- = Total Contribution - Total Fixed Cost

Where:

Unit Volume is the sales volume for a given product for the time period of the analysis,
Unit Price is the price paid to the firm (i.e., *Unit Price = End-User Price - Channel Margin*),
Unit Variable Cost is the sum of all variable costs incurred by the firm that can be directly assigned to the product on a per transaction basis,
Total Fixed Cost is the sum of all costs incurred by the firm that are required to produce and deliver the product, but cannot be assigned to the product on a *marginal* or incremental basis,
Unit Contribution is equal to Unit Price - Unit Variable Cost.

Note that a zero Total Profit implies that Unit Volume × Unit Contribution = Total Fixed Cost. This implies the following expression for TBEV:

Equation 1a: TBEV

$$TBEV = \frac{\text{Total Fixed Cost}}{\text{Unit Contribution}}$$

Application 1a
The ZYX Company makes a product that has a MSRP of $10. The actual street price, however, is $9 and gives retailers a $4 profit margin. The unit variable cost is $3. Fixed costs include $17,000,000 for consumer advertising, $5,000,000 for consumer promotion, $12,000,000 for trade promotion, a $20,000,000 sales force budget, and $6,000,000 for general and administrative expenses.

$$TBEV = \frac{\text{Total Fixed Cost}}{\text{Unit Contribution}} = \frac{\$60{,}000{,}000}{\$2} = 30{,}000{,}000 \text{ units}$$

Where:

Total Fixed Cost is:

Advertising	$17,000,000
Consumer & Trade Promotion	17,000,000
Sales Force	20,000,000
General & Administrative	6,000,000
Total Fixed Marketing Cost for Film	$60,000,000,

Unit Price = End-User Price - Channel Margin = $9 - $4 = $5 and

Unit Contribution = Unit Price - Unit Variable Cost = $5 - $3 = $2.

Incremental Break-Even Unit Volume (IBEV)

The incremental break-even unit volume (IBEV) is a workhorse concept in marketing analyses because it can be applied to many decisions. We present separate formulas for cases where the change in policy generates changes in the fixed costs (e.g., advertising or sales force sizing) and for cases where it generates a change in margins (e.g., a price decrease or an increase in sales commissions).

IBEV for Fixed Cost Actions

Typical fixed cost actions include advertising expenditures, investments in production capacity, and training and salaries for the sales force. Assuming that the fixed costs change but the unit contribution does not, the break-even requirement that Total Profit does not change implies that Change in Unit Volume × Unit Contribution = Change in Fixed Cost. The change in sales volume necessary for the profits to remain the same is then identified as:

Equation 1b: IBEV for Fixed Cost Actions

$$\text{IBEV} = \frac{\text{Change in Expenditures}}{\text{Unit Contribution}}$$

Where:

Change in Expenditures is the change in fixed costs and

Unit Contribution = Unit Price - Unit Variable Cost.

Application 1b

The ZYX Company is considering a $15,000,000 increase in its advertising budget.

$$\text{IBEV} = \frac{\text{Incremental Expenditures}}{\text{Unit Contribution}} = \frac{\$15{,}000{,}000}{\$2} = 7{,}500{,}000 \text{ units}$$

Where:

Incremental Expenditures are $15,000,000 and

Unit Contribution is $2, as computed for the TBEV in Application 1a.

Comment

The incremental break-even volume in Application 1b must be achieved by additional sales that result from increased advertising. Thus, a complete analysis would include some discussion of why and when the advertising would lead to increased sales.

IBEV for Actions that Change Unit Contribution

Typical actions that change unit contributions include price cuts, price increases, and product reformulations generating higher or lower variable costs. Assuming that fixed costs do not change, the break-even requirement that Total Profit does not change implies that Change in Unit Volume × New Unit Contribution = Old Unit Volume × Change in Unit Contribution ($[Volume_{After} - Volume_{Before}] \times Contribution_{After} = Volume_{Before} \times [Contribution_{Before} - Contribution_{After}]$).

Equation 1c: IBEV for Actions that Change Unit Contribution

$$IBEV = \frac{\text{Old Unit Volume} \times \text{Change in Unit Contribution}}{\text{New Unit Contribution}}$$

Where:

Old Unit Volume is the expected number of sales transactions during the planning period under the assumption that the marketing action under scrutiny *is not* taken,
New Unit Contribution = New Unit Price - New Unit Variable Cost (i.e., Unit Contribution under the assumption that the marketing action under scrutiny *is* taken),
Old Unit Contribution = Old Unit Price - Old Unit Variable Cost. (i.e., Unit Contribution under the assumption that the marketing action under scrutiny *is not* taken), and
Change in Unit Contribution = Old Unit Contribution - New Unit Contribution.

Application 1c

Assume that the ZYX Company normally sells 90,000,000 units and is considering a $.50 price cut (i.e., $4.50 instead of $5.00).

$$IBEV = \frac{\text{Old Unit Volume} \times \text{Change in Unit Contribution}}{\text{New Unit Contribution}}$$

$$= \frac{(90{,}000{,}000 \times \$.50)}{\$1.50}$$

$$= \frac{\$45{,}000{,}000}{\$1.50} = 30{,}000{,}000 \text{ units}$$

Where:

Old Unit Volume is 90,000,000,
Change in Unit Contribution is the Unit Price reduction ($.50), and
New Unit Contribution = New Unit Price - New Unit Variable Cost = $4.50 - $3.00 = $1.50.

Comment

Enough of the price cut must be passed on to consumers by the retailer for unit sales to increase from 90,000,000 to 120,000,000. Otherwise, the price cut is unprofitable.

IBEV for Actions that Change Both Fixed Costs and Unit Contribution

Equations 1b & 1c Combined: IBEV for Complex Actions

$$\text{IBEV} = \frac{\text{Change in Expenditures} + [\text{Old Unit Volume} \times \text{Change in Unit Contribution}]}{\text{New Unit Contribution}}$$

Application 1b/c

The ZYX Company increases advertising by $15,000,000 and reduces price by $.50.

$$\text{IBEV} = \frac{\text{Incremental Expenditures} + \text{Old Unit Volume} \times \text{Unit Contribution Loss}}{\text{New Unit Contribution}}$$

$$= \frac{\$15{,}000{,}000 + (90{,}000{,}000 \times \$.50)}{\$1.50}$$

$$= \frac{\$15{,}000{,}000 + \$45{,}000{,}000}{\$1.50} = 40{,}000{,}000 \text{ units}$$

Where:

Incremental Expenditures are $15,000,000 (as in Application 1b),
Unit Contribution Loss is $.50 (as in Application 1c),
Old Unit Volume is 90,000,000 (as in Application 1c), and
New Unit Contribution is $1.50 (as in Application 1c).

Comment

Note how the IBEV of the combined action in Application 1b/c is higher than the sum of the IBEVs of the separate actions in Applications 1b and 1c: 40,000,000 > 37,500,000 = 7,500,000 + 30,000,000. The reason is that, contrasting Application 1b/c with 1b, a smaller New Unit Contribution must pay for the increased advertising expense. This illustrates how one marketing action (e.g., a price cut) can affect another (e.g., increase in advertising) from a financial perspective.

Break-Even Cannibalization Rate (BECR)

Whenever a marketing action for one product in the product line may steal sales away from other products in the line (rather than only competitors' products) cannibalization must be considered. The cannibalization rate is the fraction of sales of the new product that is stolen from the old product. The equation below calculates the BECR for a new product given that the existing product line consists of a single old product. The same logic can be applied to other actions and to larger product lines.[1]

Equation 1d: BECR

$$\text{BECR} = \frac{\text{New Product Unit Contribution}}{\text{Old Product Unit Contribution}}$$

Where:

New Product refers to a planned addition to the product line,
Old Product refers to the product that will lose sales to the *New Product* (if several old products are affected then an average profit margin can be used as an approximation), and
Cannibalization Rate refers to the percentage of *New Product Unit Volume* which are sales that would have gone to the *Old Product* had the *New Product* not been introduced.

Note that a large BECR is good. The actual cannibalization rate must be *lower* than the BECR in order for the new product introduction to be profitable. When the new unit contribution is larger than the old unit contribution, the BECR is greater than 100 percent, so there is no problem.

Comment

For the new product introduction to be profitable, the new product must have a positive unit contribution after adjusting for cannibalization. If the cannibalization rate can be estimated empirically, then *Adjusted Unit Contribution = New Product Unit Contribution* - (*Estimated Cannibalization Rate* × *Old Product Unit Contribution*). This unit contribution can then be used directly in Equations 1a, 1b, and 1c to evaluate the new product.

Application 1d

The ZYX Company is considering the introduction of a second product. This new product will not require additional promotional expenditures (fixed costs). It will have a Unit Price of $4.00 and cost $2.50 to produce.

$$\text{BECR} = \frac{\text{New Product Unit Contribution}}{\text{Old Product Unit Contribution}} = \$1.50 / \$2.00 = 75\%$$

[1] This formula assumes that the total fixed costs do not change and is derived from the fact that, at break-even, *New Unit Volume* × *New Unit Contribution* = *Old Unit Volume Cannibalized* × *Old Unit Contribution* (i.e., at break-even, profit from sales of the new product is equal to the profits stolen from the old product). For other variable actions, like a price cut, the *old product* should be an average across the *entire product line* including the product under consideration.

Where:

Old Product Unit Contribution is $2.00 (as before) and
New Product Unit Contribution is $4.00 - $2.50 = $1.50.

A different way to think about this

A good way to think about it is, for every lost sale of the old more profitable product, how many sales of the new less profitable product need to be generated (from market expansion or stealing share from competition)?

Take the reciprocal of the BECR: $2.00/$1.50 = 1.33. In other words, ZYX must sell 1.33 units of the new product at $1.50 contribution for every lost unit of the old product at $2.00 contribution (where 1 of the 1.33 units is cannibalized, and .33 unit is incremental sales needed to make the same profit as with the old product). This suggests that to be profitable, .33 additional sales of the new product need to come from the a competitor or category expansion to make up for each lost old sale.

The reciprocal tells you the increase in sales needed assuming switches, but you still don't know how many people/units WILL switch. The rate tells you for EACH unit that switches, how many additional units of the new you will need. If 100 switched, we'd still need 33 additional units.

As noted BECR (or its inverse) are useful when the new product has a lower margin. If the new product has a higher margin, you would be happy with anyone (or everyone) switching as you make more.

SECTION 5: CHAIN MODELS OF SEGMENT VALUE

The basic idea of chain models is to estimate the number of customers by starting with the most general population and reducing it according to segment characteristics (i.e., determining the percentage of the population that fits the segment description). This yields the potential segment size. To compute the actual segment size, current penetration rates are applied—how many consumers use the product or a competitor's product now.[2] Because most marketing plans and budgets have a one-year time horizon, annual figures are most commonly used when sizing and valuing segments.

Equation 2: Chain Model of Segment Value

Segment Value = Number of Customers × Value per Customer

Where (for example):

Number of Customers = Population × Segment Size (%) × Segment Penetration (%),
Value per Customer = Usage Rate × Unit Price ($) × Unit Contribution (%),
Segment Size is the percentage of the population that could potentially purchase the product,
Segment Penetration is the percentage of the segment that actually makes at least one purchase of the product during the planning period,
Usage Rate is the average number of purchases per customer during the planning period, and
Unit Contribution (%) = (Unit Price - Unit Cost) / Unit Price.

[2] Obviously, things are more complicated for a totally new product (i.e., when there is no market penetration). In these cases, it is helpful to consider functionally equivalent products currently being used by consumers in conjunction with other criteria and characteristics a manager believes are useful to identify market potential. For example, the diffusion curve for residential kitchen trash compactors after they were introduced was found to strongly resemble the diffusion curve for electric dishwashers when they were introduced some years earlier.

Application 2

The target market for the ZYX Company is *baby boom* adults in the U.S. population (i.e., individuals born between 1946 and 1964 comprising approximately 24 percent of the population). There are approximately 300 million people in the U.S. population. Eighty percent of baby boomers consume at least one unit/year in ZYX's product category, and, among these, the average usage rate is five units/year. ZYX currently has a 40 percent market share in this segment.

Segment Value	=	Number of Customers × Value Per Customer
	=	57,600,000 × $10
	=	$576,000,000

Where:

Number of Customers	=	300,000,000 × .24 × .8	=	57,600,000,
Value per Customer	=	5 × $2.00	=	$10,

Population is 300,000,000, *Segment Size* is 24%, and *Segment Penetration* is 80%,

Usage Rate for the product category is 5/year, and

Unit Contribution is $2.00 [as before, note that Unit Contribution ($) = Unit Price ($) × Unit Contribution (%)].

Comment

The calculation in Application 2 is the segment value for the entire product category. The actual segment value for ZYX is 40 percent of this value or $230,400,000.

SECTION 6: CUSTOMER LIFETIME VALUE (CLV)

While some purchases occur only once in a lifetime or very infrequently, customers often purchase repeatedly at various time intervals. In many markets, from consulting services to razor blades to mp3 music files, customers vary in their repeat purchase rate, and in the extent to which they buy from the same vendor or from competitors. Increasingly, marketing strategies focus on the financial value that customers provide over time for three important reasons. First, the increasing focus on customer-oriented, market-driven business strategies demands a longer term perspective. Second, advances in marketing research and information technology have allowed managers to micro-market and data mine at the level of very small segments or even individual customers. Third, increasing emphasis on making marketing more accountable has stimulated marketers to justify investments of the value of customers over time in order to demonstrate their contribution to profitability.

Experience with CLV calculations is most advanced in industries where purchases are reasonably frequent, input data is readily available, and important marketing decisions are based on individual customer's expenditures over time. Analyses of the differences between the cost of acquiring new customers and the cost of keeping (and/or selling more to) current customers can drive strategies that lose money in the first year, but are very profitable in subsequent years. Internet start-ups, in particular, rely on this logic in developing business plans and attracting investors, albeit with inconsistent results because forecasts of revenues in years subsequent to launch are often exaggerated (the eyeballs are not as sticky or monetized as easily as assumed).

Calculating the CLV enables a marketer to predict the profitability of a customer over time. The calculation can be used to:

1. Devise marketing programs that are tailored to preferences and behaviors of target customers. For example, Harrah's Entertainment Inc. uses a loyalty card to track play preferences, betting patterns, lodging and restaurant preferences, and other data to devise targeted promotions for customers at the firm's casinos.
2. Assess the *present value* of a customer over some time frame. This is a financial metric that measures the value of a customer based on revenues generated over time, discounting those revenues to take into account the cost of capital—the fact that the value of money today declines over time due to inflation or because funds could be invested in some vehicle to generate capital.
3. Assess costs to generate revenues from customers over time. This is because calculating CLV requires the marketer to specify costs to acquire and retain customers. The CLV calculation might signal that either or both of these costs are too high. Alternatively, the marketer could conclude that the CLV is high enough to warrant even more expenditures to acquire and/or retain customers.
4. Assess brand loyalty, since another measure required to calculate CLV is the *retention rate*—that is, what proportion of our customers continue to buy our product from year to year. Of course, at least some customers will cease buying—they move, change their habits, prefer another brand, or pass away. New customers enter the market, but the CLV calculation follows a *cohort* of buyers over time.

Equation 3a: CLV

$$\text{CLV} = \sum_t \text{Cumulative Retention Rate}_t \times \text{Net Customer Contribution}_t$$

Where:

t indexes the time periods in the customer's *lifetime*,

Cumulative Retention Rate$_t$ is the probability that the average customer will still be active at time *t*. This is called the cumulative retention rate because it represents the cumulative effects of the single period retention rates over time [e.g., if the percentage of customers retained in each period is *r*, then, after *t* time periods, the *Cumulative Retention Rate* is r^{t-1} (assuming that retention in the first time period is 100%)],

Net Customer Contribution$_t$ is the gross contribution of the average customer at time *t* less any direct costs associated with the customer. These are typically separated into acquisition and retention costs. Acquisition costs typically occur only in the first time period; for products with long sales cycles, such as complex technologies and large IT consulting projects, they may also occur well before the first period of revenue generation. Retention costs typically occur only in subsequent time periods. That is,

Net Customer Contribution$_t$ = (Usage Rate$_t$ × Unit Contribution$_t$) – Customer Cost$_t$ and

Customer Cost$_t$ = Acquisition Cost$_t$ + Retention Cost$_t$.

Equation 3a ignores the opportunity cost of money and assumes a discount rate of zero. If a discount rate of *d* is applied beginning in period 2, then

$$\text{Net Present CLV} = \sum_t \text{Cumulative Retention Rate}_t \times \text{Net Customer Contribution}_t / (1+d)^{t-1}.$$

If one assumes that the rate of retention *r*, and, hence, the rate of attrition $a = 1 - r$ remains constant over time, it is possible to mathematically combine the customer attrition rate *a* with the discount rate *d* to form a net discount rate which can then be used in the traditional computation of the Present Value of the Net Customer Contributions only. The formula for this net discount rate (d_{net}) is $(d + a)/(1 - a)$, where *d* is the discount rate and *a* is the attrition rate.

Application 3a

Marketing research revealed that direct mailing of a product sample is very effective in creating loyal ZYX customers. In addition to the unit cost of the sample (i.e., $3, see Application 1a), there is a $1 shipping and handling cost associated with the mail-out. One in four recipients of the sample is expected to become a loyal ZYX customer. ZYX plans to send a $1 coupon to these customers each year to maintain loyalty (postage and handling for the coupon is $.50). Research further revealed that these customers purchase 6 units of ZYX product each year and do not buy competing products. However, each year 10 percent switch to a competitor's product and then purchase only that competitor's product.

CLV for a 5-year time horizon (no discounting):

$$= \sum_t \text{Cumulative Retention Rate}_t \times \text{Net Customer Contribution}_t,$$

$$= 1.0 \times (-\$4) + .9 \times \$10.50 + .81 \times \$10.50 + .729 \times \$10.50 + .656 \times \$10.50,$$

$$= \$28.50$$

Where:

t indexes years (for a 5-year planning horizon),

Cumulative Retention Rate$_t$ is computed assuming that the percentage of customers retained in each period is 90%, and, after t time periods, the *Cumulative Retention Rate* is $.9^{t-1}$,

Net Customer Contribution$_t$ in the first year is -$4, assuming that each new customer purchases 6 units, which provides a $12 gross contribution (i.e., 6 × $2) at an acquisition cost of $16 (i.e., it takes 4 mail-outs to get 1 new customer at a cost of $4 per mail-out), and

Net Customer Contribution$_t$ in subsequent years is $10.50 (i.e., $12 gross contribution from 6 purchases minus a retention cost of $1.50).

Finally, when assuming that both the Customer Contribution Margin and the retention rate remain constant, one can apply the following *quick* formula that does not require any summation over time.

Equation 3b: Quick CLV

$$\text{Quick CLV} = (\text{Multiplier} \times \text{Average Customer Contribution}) - \text{Customer Acquisition Cost} + \text{Customer Retention Cost}$$

Where:

the *Average Customer Contribution* is the annual profit contribution per customer less annual retention cost per customer. For the *Quick* CLV, these values are assumed to be constant over time,

the *Multiplier* is a constant value (given in the tables below) that is determined by the retention rate, the discount rate, and the time horizon, and

the *Customer Retention Cost* is the annual cost incurred to keep the customer.[3]

Multiplier Table for a *Quick* CLV with a Five-Year Time Horizon

	Customer Retention Rate									
Discount Rate	99%	90%	80%	70%	60%	50%	40%	30%	20%	10%
0%	4.90	4.10	3.36	2.77	2.31	1.94	1.65	1.43	1.25	1.11
5%	4.46	3.76	3.12	2.60	2.19	1.86	1.60	1.40	1.23	1.11
10%	4.10	3.48	2.92	2.46	2.09	1.80	1.56	1.37	1.22	1.10
15%	3.79	3.25	2.75	2.34	2.01	1.74	1.53	1.35	1.21	1.10
25%	3.31	2.88	2.48	2.15	1.87	1.65	1.47	1.31	1.19	1.09

Multiplier Table for a *Quick* CLV with an Infinite Time Horizon

	Customer Retention Rate									
Discount Rate	99%	90%	80%	70%	60%	50%	40%	30%	20%	10%
0%	100.00	10.00	5.00	3.33	2.50	2.00	1.67	1.43	1.25	1.11
5%	17.50	7.00	4.20	3.00	2.33	1.91	1.62	1.40	1.24	1.11
10%	10.00	5.50	3.67	2.75	2.20	1.83	1.57	1.38	1.22	1.10
15%	7.19	4.60	3.29	2.56	2.09	1.77	1.53	1.35	1.21	1.10
25%	4.81	3.57	2.78	2.27	1.92	1.67	1.47	1.32	1.19	1.09

Note that the entries in the two tables differ from each other mainly when retention rates are high and the discount rate is low. In all other cases, ignoring cash flows generated further than five years into the future does not affect the Net Present Value (NPV) calculations used to compute the CLV much.

[3] Note how one must add the annual retention cost to obtain the correct Quick CLV. The reason is that the company does not incur any retention cost at the beginning of the first year, so the average customer contribution underrepresents the true customer contribution in the first year by exactly the retention cost.

This quick method requires assumptions that may only be a rough approximation, neglecting many of the details of both customer behavior and discounted cash flow. Most importantly, it assumes that both the contribution margin and retention rate are constant over time. Also, the multiplier values in the tables assume that the customer's first purchase occurs soon after acquisition expenses are incurred. If there is a substantial delay between paying the acquisition costs and receiving the first payment from the customer (e.g., more than six months), then subtract one from each multiplier in the tables.

Application 3b
Given the same information as in Application 3a and ignoring a discount rate (i.e., 0%),

Quick CLV

= (Multiplier × Average Customer Contribution)

– Customer Acquisition Cost + Customer Retention Cost

= $4.10 \times \$10.50 - \$16 + \$1.50 = \$28.50.$

The quick and regular methods give the same estimate because, in this example, the customer contributions and retention costs are the same in every year (and a five-year horizon is used in both calculations). The regular method should be used when customer behavior changes over time (e.g., contribution increases and retention costs decrease), and the quick method should be used only when customer behavior is relatively constant.

SECTION 7: ECONOMIC VALUE TO THE CUSTOMER (EVC)

Just as forward-looking firms consider the lifetime value of their customers, customers often examine the lifetime value of the goods and services that they consider purchasing. For example, some customers are willing to pay a higher price for a car because they believe it provides more economic value over its lifetime than a cheaper car does due to less frequent repairs and higher residual (i.e., trade-in) value. Similarly, the high purchase price of energy-saving light bulbs and windows is justified only if one considers the cost savings realized well beyond the time of purchase. Therefore, in marketing products that are designed to reduce the customer's costs or to add value over a long time period, it is important to quantify lifetime value to the customer. The EVC captures how much a customer, aware of all the long-term economic benefits, is willing to pay for your product. In terms of economic theory, EVC is a way to calculate the customer's reservation price, and the difference between the EVC and the price actually charged is the consumer surplus which provides the customer a reason to prefer your product over those of competitors.[4] How close one can set the price to the EVC (i.e., how little surplus inducement one must give to the customer depends on what the customer perceives to be *real* cost savings, how low competitors can set their own price to keep the customer's business, and whether or not some of the cost savings come at the expense of a channel partner).

Equation 4

$$
\begin{aligned}
EVC = \quad & \text{Competitor's Lifecycle Cost} \\
& - \text{Our Start-up Cost} \\
& - \text{Our Post-Purchase Cost} \\
& + \text{Our Incremental Value}
\end{aligned}
$$

Where:

Competitor's Lifecycle Cost is the total lifecycle cost to the customer of the benchmark competitor's product, including price, start-up cost, post-purchase cost, and reduced by the competitor's incremental value,

Our Start-up Cost is the customer's immediate, one-time cost of switching from the competitor's product to the firm's product,

Our Post-Purchase Cost is the customer's total cost of using and maintaining the firm's product until it is replaced, and

Our Incremental Value is estimated as the dollar value to the customer of any benefits provided by the firm's product that are not provided by the competitor's product.

[4] EVC is conceptually also very similar to the Total Cost of Ownership (TCO) concept used in engineering and purchasing, except that TCO comparisons typically consider only differences in post-purchase costs and benefits. In essence, your product's EVC is the sum of your competitor's price, and the difference of the TCOs of your product and that of your competitor's.

Application 4

The ZYX Company currently manufactures its product in an antiquated factory in Anytown, USA. It spends $2 million per year in machine repair and another $500,000 in overtime labor due to repair-related downtime. The ABC company offers a three-year service contract for factory machinery that it claims will cut these costs by one-half. It also claims that the improved performance of well-maintained machines will result in a 1 percent reduction in variable costs. Its maintenance program requires that machine operators complete a one week training course that will cost $1 million in operator wages alone. This training is required at the beginning of each three-year contract period. ABC estimates that it will cost them $3 million to service the contract and wonders if ZYX will be willing to pay $4.5 million.

EVC = Competitor's Lifecycle Cost

– Our Start-up Cost

– Our Post-Purchase Cost

+ Our Incremental Value

= $7,500,000 - $1,000,000 - $3,750,000 + $2,700,000

= $5,450,000.

Where:

Competitor's Lifecycle Cost is the current repair and overtime cost of $2.5 million (note that the competitor is ZYX's current self-maintenance) over the three-year term of the contract—this is $7.5 million,

Our Start-up Cost is the $1 million training expense (note that proving the training itself is included in the service contract and is provided to the customer *free* after purchase),

Our Post-Purchase Cost is 50% of current repair and overtime, or $3,750,000, and

Our Incremental Value is the 1% reduction in variable costs which is .01 x $3 × 90,000,000 = $2,700,000 (using inputs from Applications 1a and 1c).

Because the EVC ($5,450,000) is higher than the purchase price ($4,500,000), ZYX should be willing to buy the service contract.