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## Customer Profitability and Lifetime Value

The digital revolution has given rise to a host of technologies that are transforming marketing practices. Powerful databases and electronic data networks are allowing companies to collect concise information about customers and their buying patterns more effectively and efficiently than ever before. The Internet, in particular, has increased the ability of firms to track the behavior of individual consumers as they visit numerous Web pages.

While these capabilities challenge companies to manage vast amounts of information, they offer marketers exciting new opportunities to dynamically manage their customer bases. Beyond the traditional focus on mass advertising, firms can now more accurately recognize and monitor individual customers to whom tailored communications and offers can be made. Marketing activity is becoming more interactive and engaging. For many companies, particularly large or multinational corporations, this was altogether infeasible or prohibitively costly in the past.

In order to reap the benefits of detailed customer knowledge, firms need to systematically estimate the profitability associated with its use. The ultimate goal is to develop highly committed customers who not only make repeat purchases and generate continual revenue streams, but also require minimal maintenance along the way. It is entirely possible that while some customers do not bring profits with their initial purchases, the margins from their future expected transactions paint a different picture. As a result, firms need to track initial acquisition costs and compare them to the profits to be generated over the customer's expected relationship with the company. The above activities allow marketers to decide which customers to go after, how to change the promotional mix as a function of past and recent transactions and, if necessary, which specific customers to discontinue serving. Indeed, many practitioners and scholars are expressing the view that marketing is rapidly becoming "the science and art of finding, retaining, and growing profitable customers."<sup>1</sup>

The initial step in determining customer profitability is to have a clear sense of the relevant characteristics of customer activity. To this end, analysis of historical data can be very powerful in providing firms with information on the buying patterns of both new and existing customers (these may or may not be correlated with certain demographics). Using this information, the firm may choose to distinguish between segments of customers that exhibit similar characteristics and are hence expected to respond similarly to a given level of communication/promotion. Taking into account the

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<sup>1</sup> Philip Kotler and Gary Armstrong, *Principles of Marketing* (Upper Saddle River, NJ: Prentice Hall, 2001).

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responsiveness of particular customers to certain offerings, the cost of making these offerings, and the probability a customer is expected to keep generating revenue for the firm enables the calculation of customer profitability and lifetime value. These ideas are made clearer through the following example.

## Example: The Catalog Retailer

### *Part I – Customer Acquisition Costs*

A direct catalog retailer of fashion goods is contemplating whether or not to attract new customers using names purchased from a list broker or by randomly sending out catalogs. The cost of sending a catalog (which includes production and mailing) is \$0.5. From experience, the company anticipates the response rate (the percentage of individuals who receive the catalog and purchase from it, hence becoming “current customers”) from a random mailing to be 1%. By analyzing the buying behavior and demographics of current customers, the retailer estimates it can rent names selectively from the broker to achieve a response rate of 4%. The list broker has set a price of \$0.2 for each name. The direct retailer wishes to calculate the acquisition costs associated with each source of potential customers.

To determine acquisition costs, the retailer needs to use the response rate and cost of sending a catalog to each prospect.<sup>2</sup> A response rate of 1% (or 0.01) means that of 100 catalogs sent, only one recipient is expected to respond. Similarly, a response rate of 4% means that out of 25 catalogs sent, one recipient is expected to respond with a purchase. The cost of acquiring a customer can then be calculated using the following:

$$\text{Acquisition Cost} = (\# \text{ of catalogs needed to get 1 customer}) * (\text{cost of sending a catalog}) =$$

$$\frac{\text{cost of sending a catalog}}{\text{response rate}}$$

Thus, the acquisition cost using the random mailing approach is:  $0.5 / .01 = \$50$ , and the cost of acquiring a customer from the rented list is:  $0.7 / 0.04 = \$17.5$ . The retailer concludes that even though each rented name increases the effective cost of sending out each catalog by 40%, the improvement in targetability makes this a worthwhile avenue to pursue.

#### Additional Comments:

- a. In some instances, the response rate is not given directly but can be calculated using other pieces of information. For example, direct marketers often refer to subsets of customers by the “demand per book” they generate. Demand per book is the expected revenue from one mailed catalog. If the average order size (in dollars) is known, the response rate can be calculated by dividing these two quantities, that is,  $\text{response rate} = (\text{demand per book}) / (\text{average order size})$ .
- b. As any rented list of names includes a finite number of prospects that meet certain criteria, the retailer must also take into account that at some point all relevant names will be exhausted. At this point, to acquire new customers, the retailer can either move on to names expected to yield lower rates of return (but that are still profitable), or attempt to find new sources of names that were not on the previous broker’s list.

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<sup>2</sup> The marketing effort to acquire new customers from a pool of potential individuals is often called “prospecting.”

- c. The above calculation of acquisition costs can be generalized to other industry contexts. To do so, one needs to recognize the instruments used to generate a response (such as a visit by a salesperson, a call from a telemarketer, mailing of an informational brochure, free samples, or special discount coupons) and the likelihood of obtaining a response.

### Part II – Customer Break-Even Analysis

Now that we have determined the cost of acquiring a customer, we can use this information to establish how many purchases or years it will take for each customer to realize profits for the firm.

In our example, the catalog retailer makes changes to the product line four times a year. Historical data has shown that one can roughly segment the market of current customers after one year into frequent buyers, who purchase twice a year with an average order size of \$50, and occasional buyers, who purchase only once a year with an average order size of \$80. The retention rate (percentage of customers who continue to make a purchase with the company in the next period) is 75% for frequent buyers and 50% for occasional buyers. Thus, the likelihood an individual acquired today will remain a customer by year five, or the *survival rate* of year five, is approximately 30% for the frequent buyers and 6% for the occasional buyers.<sup>3</sup> Gross margins are 20% of sales, and include all expenses aside from the cost of sending out catalogs. In the first year, the retailer sends a catalog every month (with the same catalog sent in three consecutive months) to all acquired customers. Based on first year purchase patterns, frequent buyers continue to receive 12 catalogs a year, while occasional buyers receive only four. The catalog retailer is interested in knowing how many years it would take to recoup initial costs of acquisition, assuming customers were acquired using rented names.

To address the retailer's question, it is useful to construct the following table for each of the two segments:

**Figure A** Customer Break-Even Analysis for Frequent and Occasional Buyers

*In both tables below: In line D, expected profits in each year are obtained by multiplying the survival rate by the total margin per customer net of catalog mailing costs. For line E in Year One, the acquisition cost (\$17.5) is subtracted from the sum of expected profits per customer. In subsequent years, the cumulative profits per customer of the previous year are added to the total expected profit per customer of that year.*

	Frequent Buyers	Year One	Year Two
A.	Margin on each purchase	\$10	\$10
B.	Survival rate	100%	75%
C.	Cost of mailing catalogs	.5*12=\$6	\$6
D.	Total expected profit per customer	2*10-6=\$14	.75*(20-6)=\$10.5
E.	Cumulative profits per customer (net of acquisition costs)	\$(3.5)	\$7

<sup>3</sup> For frequent buyers:  $.75^{(5-1)} = .75^4 \cong .30$ , and for occasional buyers:  $.5^{(5-1)} = .5^4 \cong .06$ . See also line B of **Figure B**.

Occasional Buyers		Year One	Year Two	Year Three
A.	Margin on each purchase	\$16	\$16	\$16
B.	Survival rate	100%	50%	25%
C.	Cost of mailing catalogs	.5*12=\$6	.5*4=\$2	\$2
D.	Total expected profit per customer	16-6=\$10	.5*(16-2)=\$7	.25*(16-2)=\$3.5
E.	<i>Cumulative profits per customer (net of acquisition costs)</i>	\$(7.5)	\$(0.5)	<b>\$3</b>

Source: Casewriter.

From the analysis above, the direct retailer finds that frequent buyers become profitable by the end of year two. Occasional buyers become profitable by the end of year three.

#### Additional Comments:

- a. In the above calculations, the discount rate has been ignored. The discount rate allows the seller to control for the fact that money received in the future is not equal to the value of money received today. Money today can be invested and interest on it can be earned. To adjust for discounting, total expected profits for each customer should be deflated for each year by a factor of  $D^a = (1 + i)^a$ , where  $i$  is the interest rate, and  $a$  the number of years you wait to receive the money. The discount rate will be taken into account in the next part of the example.
- b. For simplicity, the analysis in line D assumes the retailer would cease sending catalogs to customers who drop out, in the same year they stop making purchases. In reality, a firm may send out the full number of planned catalogs prior to delisting a customer who does not make purchases in a given year. If this is the case, one should adjust line D and multiply the cost of mailing out catalogs by the survival rate of the preceding year (and not the current year).
- c. In some cases, gross margins are not explicitly given and one has to establish them by incorporating all costs associated with a purchase (such as, delivery, payment to manufacturer, and processing fees). In other cases, the "net contribution" appearing on a company's income statement may need to be adjusted for sales that eventually didn't take place due to returns and cancellations (by multiplying contribution by (1-% sales returned)). If net contribution includes costs of promotions and communications that are then separated out in the analysis, such as cost of mailing catalogs in the example above, those need to be excluded from the net contribution percentage.

### Part III – Lifetime Value Analysis

Besides knowing how many years it will take to start making profits, it is obviously of interest for the catalog retailer to establish the total expected profit stream arising from each customer over the lifetime of his or her relationship with the company.

In the analysis below, we assume an interest rate of 10% for purposes of discounting future revenue streams. Expected profits are recognized at the end of each year.

**Figure B** Lifetime Value Analysis for Frequent and Occasional Buyers

In line F, the cumulative profits per customer are determined in Year One by subtracting the acquisition costs (\$17.5) from the net present value of profits. In subsequent years, the net present value of profits is added to the previous year's cumulative profits per customer.

Frequent Buyers		Year One	Two	Three	Four	Five	Six	Seven	Eight
A.	Margin on each purchase	\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$10
B.	Survival rate	100%	75%	56%	42%	32%	24%	18%	13%
C.	Cost of mailing catalogs	\$6	\$6	\$6	\$6	\$6	\$6	\$6	\$6
D.	Total expected profit per customer	\$14	\$10.5	\$7.9	\$5.9	\$4.4	\$3.3	\$2.5	\$1.9
E.	Net present value of profits per customer (discount rate applied)	\$12.7	\$8.7	\$5.9	\$4	\$2.8	\$1.9	\$1.3	\$0.9
F.	<i>Cumulative profits per customer (net of acquisition costs)</i>	\$(4.8)	\$3.9	\$9.8	\$13.8	\$16.6	\$18.5	\$19.8	\$20.7

  

Occasional Buyers		Year One	Two	Three	Four	Five
A.	Margin on each purchase	\$16	\$16	\$16	\$16	\$16
B.	Survival rate	100%	50%	25%	12.5%	6.25%
C.	Cost of mailing catalogs	\$6	\$2	\$2	\$2	\$2
D.	Total expected profit per customer	\$10	\$7	\$3.5	\$1.75	\$.88
E.	Net present value of profits per customer (discount rate applied)	\$9.1	\$5.8	\$2.6	\$1.2	\$0.5
F.	<i>Cumulative profits per customer (net of acquisition costs)</i>	\$(8.4)	\$(2.6)	\$0	\$1.2	\$1.7

Source: Casewriter.

In computing lifetime value as depicted in **Figure B**, the retailer has assumed a relationship with the customer until the point where net present value of profits become less than \$1 for the first time.<sup>4</sup> This extends our previous break-even analysis across multiple years. As can be seen, a frequent buyer has an eight-year time span and generates a little over \$20 of profits. An occasional buyer has an expected useful life of five years and generates about \$2 in profits. The retailer may decide to send more (or fewer) catalogs or targeted promotions to these buyers to see whether they increase profitability or, alternatively, may decide they are not worthwhile pursuing and drop them once identified. To calculate aggregate profits, the retailer needs to know the size of each segment. This can be determined by the size of the pool from which customers will be acquired and the probability an

<sup>4</sup> Clearly one could use other criteria, such as when the survival rate drops below some percentage. In some cases, the duration of the relationship is known with greater accuracy in advance (such as reaching a certain age).

acquired customer is a frequent/occasional buyer. Note that cumulative profitability of each customer differs from **Figure A**, given that discounting has been incorporated.

One can summarize the analysis presented in **Figure B** by formally writing an expression for customer lifetime value (CLV) as follows:

$$CLV_1 = \sum_{a=1}^N \frac{(M_a - c_a)r^{(a-1)}}{(1+i)^a} - AC$$

where:

$N$  = the number of years over which the relationship is calculated.

$M_a$  = the margin the customer generates in year  $a$ .

$c_a$  = the cost of marketing communications or promotions targeted to the customer in year  $a$ .

$r$  = the retention rate ( $r^{(a-1)}$  is the survival rate for year  $a$ ).

$i$  = the interest rate.

$AC$  = the acquisition cost.

If  $M_a$  and  $c_a$  are relatively fixed across periods, one can simplify the above expression by assuming an infinite economic life (i.e., letting  $N \rightarrow \infty$ ), which leads to:

$$CLV_2 = \frac{M - c}{1 - r + i} - AC$$

Using this approach, it is easy to establish that the CLV of frequent buyers is

$$\frac{20 - 6}{1 - .75 + .1} - 17.5 = \$22.5$$

Unless the retention rate is exceptionally high, this simplification produces results that are very close to the more precise formulation. The more years used in **Figure B** (or  $CLV_1$ ), the lower the discrepancy.

Additional Comments:

- It is also possible to use a variation of  $CLV_2$  for occasional buyers. There is a need to adjust for year one because the cost of mailing *catalogs* is \$6 instead of \$2 for each subsequent year. This yields  $\frac{16 - 2}{1 - .5 + .1} - 17.5 - \left( \frac{16 - 2}{1 + .1} - \frac{16 - 6}{1 + .1} \right) = \$2.2$
- If inflationary pressures are expected, one can adjust the expression for  $CLV_1$  by multiplying the numerator by  $(1+u)^{(a-1)}$ , where  $u$  is the annual level of inflation. In  $CLV_2$ , the denominator would become  $(1 - r * (1+u) + i)$ .
- In some business contexts, the relevant time frame between purchases may be more than a single year (for example, with industrial clients upgrading computer hardware every three

- years). In these settings, calculating CLV may be easier when working with periods that recur every  $x$  number of years ( $x$  = time between purchases) than with annual values. The analysis would then require transforming the discount rate and inflation rate (that are typically given in annual values), to span the duration of the period. Thus, in the expression for  $CLV_1$ ,  $a$  would be the number of periods and one would replace  $i$  by  $(1+i)^x-1$ .
- d) In some business contexts  $M_a$  and/or  $c_a$ , the per-period profits and costs of serving customers, may not be fixed over the entire lifetime of the customer. For example, as mechanical products age and require more maintenance, the servicing agent can expect to see increased profits from a customer. Annual average profits per customer may not highlight these changes. These make it more difficult to use the simplified expression  $CLV_2$ . The same is true for the retention rate  $r$ , which may increase the more purchases an individual makes with the company. By contrast, competitor poaching and harsher economic conditions usually negatively impact the retention likelihood.
- e) As explained, we assumed in the calculations in Figure B, as well as in the construction of the  $CLV_1$  expression, that expected profits accrue at the end of each period (including the first) and that attrition occurs right before the start of the next period (hence the survival rate is applied from the second period onward). Under these assumptions, the infinite horizon formula simplifies to the expression given in  $CLV_2$  above. If, alternatively, one assumes that profits are realized at the beginning of each period (including first year profits), then, all else equal, we will have:  $CLV_2 = \frac{(M - c) * (1 + i)}{1 - r + i} - AC$ . If, on the other hand, attrition is assumed to occur during the period, starting from the first period, while profits from surviving customers are realized only towards the end of the period, then we need to discount first year profits (as done in Figure B and  $CLV_1$ ) yet apply the survival rate even to these first year profits. In this case the infinite horizon formula becomes:  $CLV_2 = \frac{(M - c) * r}{1 - r + i} - AC$ .

## Strategic Implications of Customer Lifetime Value Analysis

The benefit from CLV calculations is two-fold: understanding the potential value of customers and prompting firms to learn more about the patterns of individuals or groups of customers. This information allows the firm to devise optimal strategies for each customer, eliminate wasteful costs, and create a long-term perspective of the potential relationship with customers. Firms can tailor strategies to deal with different customer segments that exhibit differences in buying characteristics at any given time, and they can also customize different strategies for the same customer depending on the stage of relationship between the customer and the firm.

Measuring CLV typically involves the use of historical sales data to allow detailed analysis of the profits customers are likely to produce across their “lifetime” (the time a company is likely to retain a customer). When a business is familiar with the historical buying patterns of its customers – and future customers are assumed to produce predictable levels of loyalty – then CLV can be used to estimate the likely profitability of those customers. As stated above, when a company has calculated CLV, it is in a position to evaluate its customer base and devise marketing strategies for individuals or groups of customers. Common actions include:

### a) "Firing" Customers

A company may find that only a fraction of its customers are profitable. Aside from attempting to make marginal customers become profitable, the company may be motivated to lose a percentage of the least-performing individuals. In some cases, this can be achieved by simply raising prices for the less profitable products. Best customers typically outspend others considerably, with a ratio of 15 to 1 in some industries. There is a competitive advantage for firms that can retain high value customers with minimal costs, and detailed information about customer profitability allows a firm to identify weaker customers. For purposes of firing customers, firms may also attempt to identify customers who create substantial costs, such as those making regular product returns or demanding increased levels of service.

### b) Rewarding Customers

Likewise, a firm may choose to reward customers with discount vouchers or preferential services. Identifying a firm's best customers and investing in them can lead to higher loyalty (thus increasing their retention rate) and to improve sales.

### c) Identifying Cross-Selling Opportunities

With detailed information about the interests and shopping patterns of individual customers, firms can identify opportunities to offer additional or related products (either separately or in the form of package deals). In some cases, firms may choose to proactively leverage collaborators whose products and competencies complement their own.

### d) Forecasting Innovation Value

Firms often seek to understand the long-term profitability of an innovation they are about to launch or that has recently been introduced into the marketplace. Such an assessment would allow them to quantify an expected return on investment (ROI) and better evaluate the advisability of proposed marketing actions for the new product or service in question. For startups, a solid innovation profitability forecast can also serve as a way to convince investors to provide funding.

One approach to performing this forecasting task is to combine two central marketing frameworks: innovation diffusion and customer lifetime value. The idea here is that a well-grounded innovation diffusion model would provide the number of new adopters expected in each time period and that a customer lifetime value model (such as the one presented in this note) would yield the total monetary worth of each adopter (= new customer). Summing up the lifetime values of all new customers across all periods (taking care to properly discount future earnings) produces the overall expected profitability of an innovation. Readers interested in learning more about how diffusion modeling can be combined with lifetime value analysis are referred to *Innovation Equity: Assessing and Managing the Monetary Value of New Products and Services* (Ofek, Muller and Libai, 2016, University of Chicago Press).

## CLV and Relationship Marketing

In closing, it is worth emphasizing that the relationship between the customer and the firm typically evolves over time and is not static. To enhance the mutual value created by the relationship, it may be important for the firm to recognize the different phases of the customer life cycle. One sub-categorization that can be useful for lifetime value analysis, suggested by Blattberg, Getz and Thomas

in *Customer Equity: building and managing relationships as valuable assets*. (Boston, MA: Harvard Business School Press, 2001), identifies five life cycle stages:

### *Stage 1: Prospects*

Marketing effort is directed at attracting potential customers, who at this stage primarily develop expectations about the firm and its competencies. This stage is critical, therefore, for determining the long-term satisfaction and retention of a customer. If the firm creates expectations that are exceedingly high, customers may be easily acquired but will not be satisfied or retained, affecting both per-period revenues and survival rates.

### *Stage 2: First-Time Buyers*

After making their first purchase, customers have some experience to assess the value created by the firm's products and services for them—the risk of defection is typically high during this stage. For industries with short purchase cycles, satisfaction during this stage is critical for establishing repeat buyers.

### *Stage 3: Early Repeat Buyers*

Customers who make a repeat purchase are more likely to buy again than first-time buyers. As their confidence in the firm grows, their perception of value from the product increases and the rate of defection is reduced.

### *Stage 4: Core Customers*

The rate of defection in this stage is typically low, and customers will not defect unless they encounter a high level of dissatisfaction.

### *Stage 5: Core Defectors*

Many reasons, including the arrival of competitors with new products or enticing promotions and inconsistent delivery of service/quality by the firm, eventually cause some customers to switch suppliers. In some situations, external factors do not allow a firm to react to the loss of the customer, while in other situations a firm can bring back a defector if the problem can be identified and rectified.

Relationship marketing assumes the possibility of creating an ongoing relationship with a customer, and that customer satisfaction will be strong enough to create loyal or repeat buyers. In these situations, firms strive to find ways to increase customer satisfaction: provision of quality, additional services, and rewards for loyalty and repeat purchases. Satisfied customers tend to be less price sensitive and are likely to remain loyal for a longer period.

Evolving customer needs, competitors' actions, opportunities to leverage collaborators, and changing economic and social conditions can all potentially affect the relationship between the firm and its customers. Customer lifetime value analysis, and the constant re-evaluation of the parameters determining it, presents the company with a framework to optimally respond to these changes.

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