Simulating Customer Lifetime Value: Implications For Game Design And Student Performance

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ABSTRACT

Notwithstanding the emerging prominence of customer lifetime value (CLV) and customer equity in the marketing literature during the past decade, virtually nothing has been done to address these concepts in the literature on simulation and gaming. This paper addresses the failing, discussing the nature of CLV and customer equity, demonstrating how they might be incorporated into marketing simulations.

INTRODUCTION

In 1983, Ted Levitt suggested that marketers must shift their focus from creating simple, one-time transactions to creating long-term customer relationships, built on a foundation of customer satisfaction. The relationship pays out in the form of an ever-broadening array of products and services that might be sold to loyal customers. Assuming that it is easier to retain and service old customers than it is to win new ones; a company's customer base represents a type of asset -- customer equity, the value of which is captured in the discounted net present value of expected sales extending over the lifetime of the customer.

The impact of these concepts has been enormous, resulting in the publication of hundreds of applied and scholarly articles discussing relationship marketing, customer equity, and customer lifetime value (CLV). In contrast, virtually nothing has been published in the literature on simulation and gaming, whose purpose it is to discuss how key marketing principles can be presented to students in a setting where the students can apply them in a practical, simulated marketing environment. One exception is a paper by Gentry, Macintosh, Stoltman, and Wilson (1994), in which they argue that students should be graded not only on the individual and group outcomes of experiential learning projects, but also the observed quality of the relationships. In a sequence of papers, Cannon and Schwaiger (2003, 2004) note the evolution of competitive pressures in the market, suggest a growing need to nurture customer relationships as a basis for maintaining high levels of corporate profitability. They argue that corporate, or company, reputation constitutes a special case of brand equity and might serve as a basis for relationship building. No other articles have appeared in the literature to address this problem of relationship marketing.

While corporate reputation does indeed address the issue of relationship marketing, it is only one of several factors that contribute to customer equity. More important, it represents a causal factor, not the consequence of the relationship (Rust, Zeithaml, and Lemon 2000). Presumably, an effective simulation would not only model the process by which relationships are formed, but it would monitor their strength and provide measures of customer value, or equity as a criterion of performance.

The purpose of this paper is to address the concept of customer lifetime value, and its derivative, customer equity. It will begin by discussing the nature of the construct, setting the theoretical stage for introducing it into simulation games, also providing useful material for classroom discussion and simulation debriefing. Next, it will consider ways in which the concept of CLV might be incorporated into simulation game algorithms. Finally, it will discuss ways in which CLV might be used as an index of simulation performance.

THE CONCEPT OF CUSTOMER LIFETIME VALUE

The underlying concept of CLV is very simple. A company evaluates each of its customers, determining the expected future revenue and costs, leading to the estimated

net present value of the customers. Its essence can be captured in the following formula (adapted from Jain and Singh 2002):

$$CLV = \sum_{t=0}^{n} \left(\frac{R_t - C_t}{(1+d)^t} \right) \qquad (1)$$

where

= period of cash flow from a customer transaction

R_t = revenue from a customer for period t

C_t = total cost of generating revenue R_t in period t

N = the total number of periods for which revenue is expected from the customer

D = the discount rate for future profits

The sum of all CLVs constitutes a firm's customer equity, or total CLV (Rust, Zeithaml, and Lemon 2004). Customer equity is the residual value of a company's customer base, after the profits associated with all current sales have been recognized. Notwithstanding the simplicity of the concept, the implications are both profound and counterintuitive from a managerial perspective.

MANAGERIAL IMPLICATIONS

If customer satisfaction is driven by a portfolio of products and services at a point in time, customer loyalty must be driven by the expectation that a desired portfolio of problem solutions will be available over time. This, of course, is the flip-side of CLV. Customers have future value if they are predisposed to buy from the company in the future, and they will be predisposed to buy in the future if they anticipate that the company will give them the value they want.

While this point may seem obvious, it is both profound and, for many, counterintuitive in its implications. Consider the case illustrated in Table 1. If management could afford to invest in only one of the two segments, which would it be? By conventional investment criteria, most managers would choose segment 2. It yields twice as much profit contribution per customer, with double the potential net segment contribution. However, if one considers CLV (using equation 1 above), the first segment is clearly the most profitable, due to the difference in length of customer life between segment 1 and segment 2. This demonstrates how an investment in customers, although less profitable in the short run, yields a greater profit in the long run.

Note that the example is deliberately simplistic. Equation 1 addresses the future value of a single customer. Even a relatively homogeneous segment would include customers whose life expectancy would differ somewhat from one to another. We have assumed that average yearly revenue and cost will be constant over time. Additionally, we have assumed that the cost of customer retention is zero. However, a customer-lifetime-value analysis would typically be used in conjunction with a strategy of relationship marketing. While the costs may not increase, one of the key elements of relationship-marketing strategy is to increase profits by exploiting lower transaction costs with existing customers, selling more and more products to the same people (Cannon and Schwaiger 2004). This would tend to increase revenue with relatively little increase in promotional costs.

These simplifications are not critical to the point we are discussing. Relaxing the assumption of equal customer life

TABLE 1: A comparison of profitability for two hypothetical segments by conventional and lifetime-value criteria

Conventional Analysis	Segment 1	Segment 2
Average revenue per customer	$500	$900
Average cost of generating revenue	$300	$600
Average acquisition cost per customer	$100	$100
Profit contribution per customer	$100	$200
Estimated potential customers	5,000	5,000
Potential net segment contribution	$500,000	$1,000,000
Lifetime-Value Analysis	Segment 1	Segment 2
Average revenue per customer	$500	$900
Average cost of generating revenue	$300	$600
Yearly profit contribution per customer	$200	$300
Number of years for which revenue is expected	7	3
Discount rate for future profits	12%	12%
Future customer lifetime value acc. to eq. (1)	$913	$721
Estimated potential customers	5,000	5,000
Future net segment contribution	$4,563,757	$3,602,747
1st yr Potential net segment contribution (above)	$500,000	$1,000,000
Total customer lifetime value	$5,063,757	$4,602,747

expectancies could be addressed by introducing an attrition rate, whereby a certain proportion of customers would defect each year. This would make the calculations more complicated, but it would not detract from the superiority of the segment with higher customer life expectancies. Similarly, we could add an additional allocation for customer retention. This would tend to decrease the attrition rate, further complicating the calculations, but again, it would not detract from our basic argument as long as the cost to retain a customer does not exceed the cost of attracting a comparable new customer. In fact, allowing revenue per customer to increase each year the company retains a customer would actually increase segment 1's superiority.

THE IMPLICATIONS OF CUSTOMER LIFETIME VALUE FOR ESTABLISHING THE PROMOTIONAL BUDGET

Table 1 expresses the cost of customer acquisition as a constant cost per unit. However, the advertising literature suggests that promotional expenditures (of which customer acquisition is a special case) are subject to diminishing returns (Simon and Arndt 1980). We can illustrate this in the form of a response curve, relating acquisition expenditures to the total number of customers acquired.

Figure 4 illustrates such a curve, developed from an analysis of customers in segment 1. Its shape (concave) reflects the continually diminishing returns on additional promotional expenditures. The regular shape of the curve makes it easy to create. A manager (or a game developer) need only estimate three expenditure-response points along the curve, and the curve may be unambiguously fitted to the data. This, then, provides a means for estimating any other combination of promotional expenditure and market response (Cannon, Leckenby and Abernethy 2002).

Given the availability of response estimates provided by the curve, the company can construct a series of profit projections representing each of several possible customer-acquisition budgets, as we have done in Table 2. The table, in turn, enables the company to optimize its customer acquisition expenditures through marginal analysis, selecting a budget where the additional revenue created by customer acquisition activities is offset by the additional cost. Considering only a single-period estimated profit contribution per customer (conventional analysis), the company illustrated in Table 2 would spend approximately $500,000. However, if the company were to add lifetime customer value, the optimal budget would increase to $2,000,000 (actually yielding a loss using conventional analysis), an increase of 400%. Ignoring lifetime customer value would cause the company to dramatically under-spend on customer acquisition.

FIGURE 4: A promotional response curve relating customer acquisition expenditures to the number of customers acquired
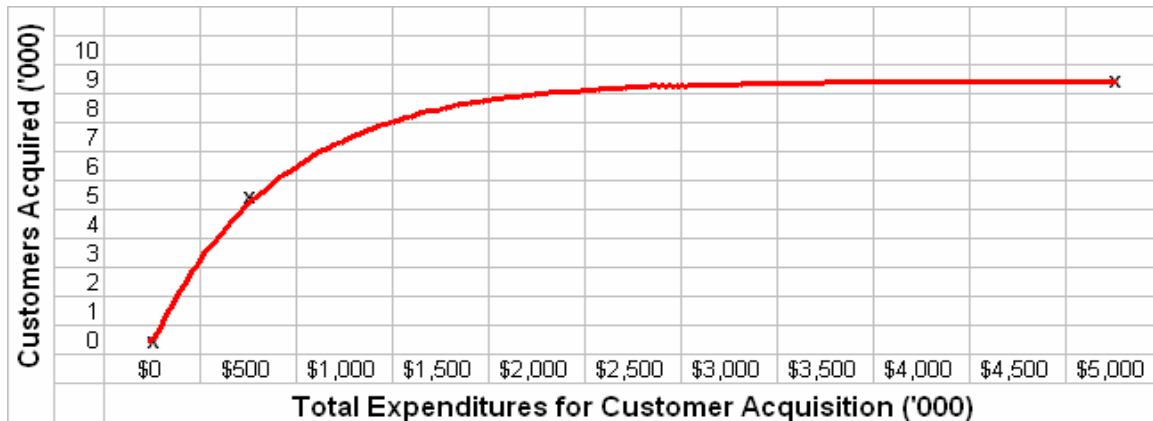
TABLE 2: Promotional budget analysis using a conventional versus a lifetime-value analysis

Promotional Budget	Customers Acquired	Revenue	Cost of Revenue	Profit	CLV	Profit (with CLV)
$ 0	0	$ 0	$ 0	$ 0	$ 0	$ 0
$ 500,000	5,000	$2,500,000	$1,500,000	$500,000	$4,563,757	$5,063,757
$1,000,000	6,900	$3,450,000	$2,070,000	$380,000	$6,297,984	$6,677,984
$1,500,000	8,000	$4,000,000	$2,400,000	$100,000	$7,302,010	$7,402,010
$2,000,000	8,500	$4,250,000	$2,550,000	$(300,000)	$7,758,386	$7,458,386
$2,500,000	8,650	$4,325,000	$2,595,000	$(770,000)	$7,895,299	$7,125,299
$3,000,000	8,750	$4,375,000	$2,625,000	$(1,250,000)	$7,986,574	$6,736,574
$3,500,000	8,850	$4,425,000	$2,655,000	$(1,730,000)	$8,077,849	$6,347,849
$4,000,000	8,900	$4,450,000	$2,670,000	$(2,220,000)	$8,123,487	$5,903,487
$4,500,000	8,900	$4,450,000	$2,670,000	$(2,720,000)	$8,123,487	$5,403,487
$5,000,000	8,900	$4,450,000	$2,670,000	$(3,220,000)	$8,123,487	$4,903,487

MODELING THE CONCEPT

Ideally, design research involving the modeling of any new business phenomena would take the form of simple modifications to a standard platform, or what Cannon and Schwaiger (2004) refer to as the "Gold standard." Noting the incompatibilities created by individual biases and disciplinary conventions, Gold (2003) proposed a system-dynamic-based model, drawing on well-accepted economic theory. We will seek to apply the Gold standard to our design efforts, thus minimizing the number of design modifications a game developer would need to make when incorporating customer-lifetime-value concepts into their game.

As a starting point, Blattberg, Getz, and Thomas (2001) provide an equation for assessing customer equity, following the basic logic contained in equation (1). It is useful, because it specifies the key variables and functional forms that combine to form a total measure of CLV, suggesting the issues that need to be worked out in order to fit customer equity into a standardized demand model. The equation is

$$\text{CE}(t) = \sum_{j=1}^{I} \left[N_{j,t}\alpha_{j,t}\left(S_{j,t} - C_{j,t}\right) - N_{j,t}B_{j,a,t} + \sum_{k=1}^{\infty} \frac{N_{j,t}\alpha_{j,t}\left(\prod_{j=1}^{k}L_{j,t+k}\right)\left(S_{j,t+k} - C_{j,t+k} - B_{j,r,t+k} - B_{j,AO,t+k}\right)}{(1+d)^k} \right] \tag{2}$$

where

$CE(t)$ = the customer equity value for customers acquired at time t

$N_{j,t}$ = the number of potential customers at time t for segment j

$\alpha_{j,t}$ = the acquisition probability at time t for segment j

$L_{j,t}$ = the retention probability at time t for a customer for segment j

$B_{j,a,t}$ = the marketing cost per prospect (N) for acquiring customers at time t for segment j

$B_{j,r,t}$ = the marketing cost in time period t for retained customers for segment j

$B_{j,AO,t}$ = the marketing cost in time period t for all add-on selling for segment j

D = the discount rate

$S_{j,t}$ = sales of the product/services offered by the firm at time t for segment j

$C_{j,t}$ = cost of goods at time t for segment j

I = the number of segments

J = the segment designation

t_0 = the initial time period

While equation (2) is somewhat complicated in its structure, it fits relatively neatly into Gold's standard algorithm. One needs only create two classes of customers (new and retained), creating a separate demand function for each. Players would then have the option of designing promotional activities that are specially suited to winning new customers, others retaining old customers, and additional ones for stimulating add-on sales. Each class of promotional activities would have its own response function, resulting in a quantity demanded that would have to be aggregated to get total sales. Quantity demanded, then, instead of Gold's quantity sold to segment j (Q_j), would be quantity sold to segment customer type k in segment j (Q_{jk}).

In practice, most gaming applications might be served with a much simpler solution. Gold's demand equation features three components: price (P_j), product-market fit (D_j), the average difference, or gap, between the actual product attributes and the ideal product attributes based on customer preferences in the segment), and marketing budget (M_j). Each of these is critical to building customer equity. Price and product-market fit would require no modification. Marketing budget would require minor adjustments.

ADJUSTING THE IMPACT OF MARKETING BUDGET

Equation (2) addresses a number of variables that might be considered when adjusting the value of the marketing budgeting (M_j) to accommodate CLV. However, these are best suited to a game that models a data-base-driven marketing program, or at very least, one that lends itself to highly targeted programs of customer acquisition. Most simulation games are cast in a much broader marketing context. Rust, Zeithaml and Lemon (2002) provide a more generalized framework. While the basic functions of customer acquisition and retention are still important, Rust et. al. argue that customer equity is driven by a combination of three factors:

- ✓ *Value equity*, or the customer's objective assessment of the brand's utility;
- ✓ *Brand equity*, or the customer's subjective assessment of the brand, beyond its objectively determined value;
- ✓ *Retention equity*, or the tendency to remain loyal, beyond whatever is explained by the first two factors.

The relative importance of these customer-equity drivers varies with the type of decision making a product is likely to elicit. The underlying logic behind the framework appears to be consistent with the classic Foote, Cone and Belding (FCB) model used for developing creative strategy in advertising (Vaughan 1980, 1986; Ratchford 1987; Ratchford and Vaughan 1989), which distinguishes between products for which consumers tend to respond with "thinking" versus "feeling" and high- versus low-involvement decision making. This is portrayed in Figure 5.

FIGURE 5: Using the FCB-type model for explaining appropriate promotion

Type of Information Processing

		Thinking	Feeling
Involvement	**High**	Emphasize value equity	Emphasize brand equity
	Low	Emphasize retention equity	Emphasize brand equity

The figure suggests that value equity is very important for "thinking," or utilitarian (Babin, Darden and Griffin 1994), purchases calling for rational, high-involvement decision making. For example, these would tend to include business-to-business transactions, functionally oriented consumer durables such as home appliances, and new products. Appropriate promotional approaches would tend to emphasize information regarding product functionality and value, utilizing information-rich approaches such as informational advertising, demonstrations, and personal selling, building awareness and attracting customers.

Brand equity tends to be important for "feeling," or hedonic (Babin, Darden and Griffin 1994), purchases. These include high-involvement specialty products, such as sports cars or exotic vacations, where the brand represents subjective benefits such as prestige, excitement, or self-expression. They also include low-involvement "feeling" purchases, such as frequently purchased packaged goods, whose selection is based on "peripheral" cues (Petty, Cacioppo and Schumann 1983) – images created by association rather than logical analysis of product attributes. Appropriate promotional approaches would tend to focus on image-oriented messages, designed to build emotional connections with customers.

Retention equity tends to be important for low-involvement "thinking" purchases. These may be planned or routine purchases, where customers have already processed the necessary information and products are purchased as part of an on-going supplier-customer relationship. They would also include simple, utilitarian products where the necessary choice information is obvious and may not vary greatly across products. Appropriate promotional approaches would tend to focus on customer service, utilizing customer data to customize products and purchase opportunities, giving customers special treatment and recognition, building loyalty programs, and so forth.

Using this framework as a guide, the game designer has two (non-mutually-exclusive) approaches available to account for the impact of appropriate promotional activities. The first would be to adjust the parameters of the response curve to reward players for using the kind of promotion that is appropriate to the nature of the product.

The second would be to use the appropriateness of equity-building promotion to increase customer equity directly. Traditional simulations recognize the carry-over effects of past marketing activities by using a smoothing coefficient to dampen current-year changes (Gold and Pray 1983). A similar logic would argue that the net effect of all marketing activities – quantity demanded (Q_j) – would also carry over to some degree. This would take the form of residual sales from customers who remain loyal to the company, expressed through a retention rate -- $L_{j,t}$ in Equation (2). If $N_{j,0}$ represents the number of segment j customers in time $t=0$, $L_{j,1} N_{j,0}$ would represent the number of customers retained in period $t=1$. If $q_{j,0}$ represents the average unit sales per customer, then $L_{j,1} N_{j,0} q_{j,0}$, or (if $Q_{j,0} = N_{j,0} q_{j,0}$) the expression $L_{j,1} Q_{j,0}$ would represent the customer equity realized in time $t=1$, providing sales rate per customer ($q_{j,0}$) does not change (i.e. $q_{j,0} = q_{j,1}$). Incorporating this logic into Equation (1), customer equity may be represented by:

$$CE = \sum_{j=1}^{I} \sum_{t=1}^{n} \frac{\prod_{i=1}^{t} L_{j,t} \cdot Q_{j,0} \cdot (R_t - C_t)}{(1+d)^{t-.5}} \tag{3}$$

where

CE	=	customer equity
t	=	period of cash flow from a customer transaction
R_t	=	revenue from a single customer for period t
C_t	=	cost of generating revenue R_t in period t
n	=	the total number of periods for which revenue is expected from the customer
d	=	the discount rate for future profits
$L_{j,t}$	=	the customer retention probability for segment j at time t
$Q_{j,0}$	=	the quantify sold in segment j at time $t=0$

The most direct way for the appropriateness of equity-building promotional activities to influence customer equity is to make p_t a function of appropriate promotion. Of course,

appropriate promotion does not work if there is nothing appropriate to promote. The company must offer an attractive price and product. These are addressed by the other two variables in the demand equation: P_j and D_j. We assume that customer loyalty (expressed through $L_{j,t}$) is the product of a type of psychological customer contract. Customers will be loyal (at least those who are prone to loyalty) providing they trust the marketer to consistently fulfill the terms of their contract. In practice, this is usually a fair price and a product/service assortment that is tailored toward their needs. The purpose of appropriate promotional activities is to capitalize on the fact that the contract was fulfilled.

The operational measure of promotional appropriateness is simply the amount of money a company chooses to spend on a given type of promotion. Thus, M_j would become $M_{j,k}$, where k represents expenditures aimed at value equity ($k=1$) versus brand equity ($k=2$) versus retention equity ($k=3$). Ideally, each would be entered directly into the demand function, each carrying with it a different set of response-curve parameters, representing the relative appropriateness of the promotional expenditures to the type of organization being modeled. However, we might use a simpler approximation that leaves the M_j intact.

We may begin by positing an "ideal" budget allocation ($v_{j,k}$) to promotion targeted to each of the three types of equity in each segment. For instance, rental cars typically respond best to efforts aimed at creating value and retention equity, but not brand equity. The ideal allocation (assigned by the game designer) might be 40% (value equity), 20% (brand equity), and 40% retention equity. While Rust, Zeithaml, and Lemon (2002) only suggest that the relative effectiveness of each type of equity-driven promotion would vary by product category, we can assume that it would vary by segment as well (hence, the addition of subscript j). We can estimate an effective promotional budget (a modified value for M_j) consisting of an adjustment to the actual dollars spent by a player in each segment (B_j), based on the degree to which it differs from the ideal allocation. The formulas would be:

$$M_j = \sum_{k}^{3} M_{j,k} \tag{4}$$

$$M_{j,k} = \min\{v_{j,k}; \widetilde{v}_{j,k}\} \cdot B_j + \frac{v_{j,k}}{\widetilde{v}_{j,k}} (\widetilde{v}_{j,k} - \min\{v_{j,k}; \widetilde{v}_{j,k}\} \cdot B_j) \tag{5}$$

where

M_j = the effective marketing (promotional) budget for segment j

$M_{j,k}$ = the effective budget for promotional type k in segment j

K = an index representing the type of promotion, where $k=1$ is value equity, $k=2$ is brand equity, and $k=3$ is retention equity

B_j = the actual promotional dollars budgeted by a player for each segment

$v_{j,k}$ = the "ideal" percentage that should be spent on promotional type k in segment j, as specified by the parameters of the game

$\widetilde{v}_{j,k}$ = the actual percentage of the player's budget (B_j) assigned to promotional type k in segment j

The logic of Equation (5) suggests that any budget expenditures will have full value, as long as they are equal to or less than the "ideal" allocation (i.e. the minimum of either the ideal allocation, $v_{j,k}$, or what the player actually spends, $\widetilde{v}_{j,k}$), multiplied by the actual budget (B_j). If $\widetilde{v}_{j,k}$ is greater than $v_{j,k}$, the value of the excess spending will be dramatically discounted, as suggested by the second term of the equation. Indeed, the greater the overspending (the greater the discrepancy between the ideal and the actual, expressed by $v_{j,k}$ as a proportion of $\widetilde{v}_{j,k}$), the greater the discounting of promotional value, thus yielding rapidly diminishing returns.

While Equations (4) and (5) enable us to calculate an effective level of marketing, or promotional effort, (M_j) for a standard demand equation, they do not give us the desired customer retention rate ($L_{j,t}$) we need to calculate customer equity using Equation (3). Equations (6) through (9) enable us to determine this rate:

$$L_{j,t} = a \cdot \left[L_{\min} + (L_{\max} - L_{\min}) \cdot \left(\frac{(\widetilde{P}_j \cdot \widetilde{D}_j \cdot \widetilde{M}_j)^b}{c + (\widetilde{P}_j \cdot \widetilde{D}_j \cdot \widetilde{M}_j)^b} \right) \right] + (1-a) \cdot L_{j,t-1} \tag{6}$$

$$\widetilde{P}_j = \left(\frac{\overline{P}_j}{P_j} \right) \tag{7}$$

$$\widetilde{D}_j = \left(\frac{\overline{D}_j}{D_j} \right) \tag{8}$$

$$\widetilde{M}_j = \left(\frac{M_j}{\overline{M}_j} \right) \tag{9}$$

where

$L_{j,t}$	=	the customer retention probability for segment j at time t
$L_{\min}$	=	the minimum loyalty the company can be expected to achieve
$L_{\max}$	=	the maximum loyalty the company can be expected to achieve
$\widetilde{P}_j$	=	an index of relative price advantage in segment j
$\overline{P}_j$	=	a reference price, against which the relative performance of the company would be compared in segment j (generally that of the next closest competitor)
P_j	=	the company's effective price in segment j
$\widetilde{D}_j$	=	an index of relative product-market fit in segment j
$\overline{D}_j$	=	a reference product-market fit, against which the relative performance of the company would be compared in segment j (generally that of the next closest competitor)
D_j	=	the company's product-market fit in segment j (average difference, or gap, between the actual product attributes and the ideal product attributes based on customer preferences in the segment)
$\widetilde{M}_j$	=	an index of relative budget performance in segment j
$\overline{M}_j$	=	a reference budget, against which the relative performance of the company would be compared in segment j (generally that of the next closest competitor)
M_j	=	the company's effective marketing budget in segment j
a	=	a smoothing factor to account for customer "inertia" in withdrawing loyalty
b	=	a parameter determining the slope of the response curve (suggested $b=10$)
c	=	a parameter determining the shape of the response curve (suggested $c=1$)

FIGURE 6: Probability of retention as a function of marketing performance
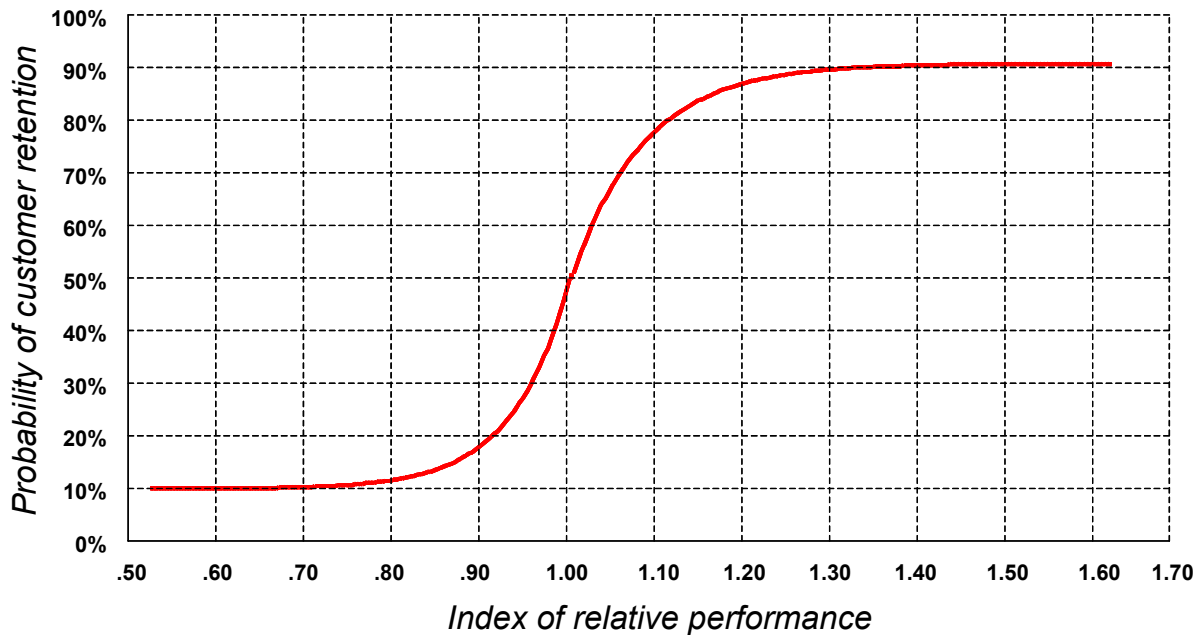
The logic behind Equations (7) through (9) is that the implicit customer contract governing loyalty depends on a company's ability to deliver products and services that are equal to or better than the competition. When this is the case – as the performance indices ($\widetilde{P}_j, \widetilde{D}_j, \widetilde{M}_j$) rise above 1.0 – loyalty will increase dramatically, then at a diminishing rate as additional increases in performance add little to the clearly superior performance of the company. Conversely, if a company's efforts fall short, the performance indices will fall below 1.0. Loyalty will fall dramatically at a diminishing rate as additional short-falls contribute little to customers' disappointment in the company's performance. Figure 6 provides a visual representation of this pattern. The smoothing factor accounts for the fact that customers often hesitate to abandon a preferred supplier, sometimes from shear inertia, but also because it takes time for customers to recognize a performance short-fall. Often, the abandonment waits until the next purchase or the first bad-service encounter.

Note that $\widetilde{v}_{j,k}$ in Equation (5) is a decision variable – percentage of the player's budget (B_j) assigned to promotional type k in segment j. In actual practice, $\widetilde{v}_{j,k}$ values would be inferred from student budget allocation to actual promotional activities, each of which would contribute to a particular type of equity. The following is a list of suggested types of activities taken from Rust, Zeithaml, and Lemon (2002), along with the type of equity they would be designed to promote. The specific activities, of course, would depend on the product/service category and the business environment being simulated in the game. Players would typically not be told what type of equity results from each type of promotional activity. One of the judgments they would have to make is how to determine what kind of promotional activities fit their particular equity strategy, based on their general understanding of the nature of value, brand, and retention equity.

- ✓ *Well-defined functionality (value equity).* Promotional activities emphasizing the specific functional aspects of your product.
- ✓ *Broad product awareness (value equity).* Advertising and other types of mass promotion aimed at creating product awareness.
- ✓ *Cost competitiveness (value equity).* Advertising and promotional activities designed to emphasize the product's cost competitiveness.
- ✓ *Association with emotional activities and events (brand equity).* Advertising and other promotional activities associate the product with activities or events that have deep emotional significance for consumers.
- ✓ *Association with high-profile brand (brand equity).* Advertising and other promotional activities that build brand image and prestige.
- ✓ *Customer service (retention equity).* Customer relationship management and service activities aimed at ensuring on-going customer satisfaction and repeat purchase.
- ✓ *Return customer promotion (retention equity).* Promotional activities aimed at generating

additional revenue per customer through product upgrades and add-on selling.

✓ *Loyalty/customer recognition programs (retention equity)*. Programs and promotions that reward customers for repeat purchase and increased purchase volume.

In order for the equity framework to function properly, players need to be given research information on how different segments respond to various types of promotion. Table 3 illustrates such a report.

USING CUSTOMER LIFETIME VALUE FOR INDICES OF SIMULATED MANAGEMENT PERFORMANCE

One of the problems with adding elements such as CLV to a simulation is that, however realistic they may be, they make a simulation more complex, obscuring the players' understanding of cause and effect (Cannon 1995). This, of course, defeats the purpose of the game.

One solution is to focus student attention on the intermediate outcomes of their decisions, where cause and effect is much more directly apparent (Cannon 1995). Consistent with this approach, Teach (1990b) argues that players should be evaluated on their ability to forecast results rather than on final profits, where a host of other variables over which players have little control can affect the consequences of their decisions.

In our case, we are concerned that players learn to track the relationship between decisions that drive CLV and their company's accumulation of customer equity. In this context, providing students with information regarding CLV is critical (see Table 3). But no less critical is providing feedback regarding results.

One of the most obvious types of feedback would be total customer equity, *CE*, as specified in Equation (3). From a player's perspective, customer equity should be analyzed by segments, because it is through the selection and management of marketing activities within segments that a company achieves the greatest customer equity per dollar invested. However, for external evaluation of performance, the consequences of astute segment management, or total customer equity, is the ultimate criterion of success. Considering customer equity at the end of a game is particularly useful in discouraging players from "harvesting" intangible assets (the lagged effects of prior advertising, for instance) in the final periods of a game, ceasing to invest in an effort to drive up short-term profits. Reporting customer equity makes intangible assets tangible, and takes away the incentive of short-term profits.

In deference to Cannon's (1995) counsel to focus on intermediate measures of performance, an appropriate indicator might be customer loyalty ($L_{j,t}$), the key driver of CLV and customer equity. This is more difficult to measure than total customer equity, because a successful player's performance would depend on segmentation strategy, and is not reflected directly in customer loyalty. However, a useful variation might be loyalty per marketing dollar spent:

TABLE 3: AN ILLUSTRATIVE RESEARCH REPORT CONVEYING CRITICAL INFORMATION REGARDING SEGMENT PREFERENCES AND COMPANY PERFORMANCE

SEGMENT 1 DEMAND POTENTIAL

	Key Information
Potential customers	60,000
Average units per purchase	1,000
Average purchases per year	3

Segment 1 Promotional Response Sensitivities

	% Customer Sensitivity
Association with emotional activities and events	30%
Association with high-profile brand	25%
Broad product awareness	60%
Cost Competitiveness	80%
Customer Service	60%
Loyalty/customer recognition programs	55%
Return customer promotion	50%
Well-defined functionality	75%

$$LPD_t = \frac{1}{I} \sum_{j=1}^{I} \frac{\left(L_{j,t} + (1-a) \cdot L_{j,t-1}\right)}{B_{j,t}} \qquad (10)$$

where

LPD_t	=	loyalty per marketing dollar spent in time t
$L_{j,t}$	=	the customer retention probability for segment j at time t
$B_{j,t}$	=	the actual promotional dollars budgeted by a player for segment j in time t
a	=	the smoothing factor used in Equation (6) to account for customer "inertia" in withdrawing loyalty

Equation (10) removes the smoothing factor used to calculate loyalty in equation (6), reflecting the actual loyalty earned in time t. The measure provides an index of how efficiently players are spending their money in support of customer loyalty, which spending is presumably driven by the players' strategy. Rather than looking at loyalty by segment, the measure rewards players for spending their money in segments where they will get maximum return.

SUMMARY AND CONCLUSIONS

The purpose of this paper has been to address the surprising dearth of literature addressing the topics of customer lifetime value and customer equity in the business simulations. We have discussed the nature of the constructs and how they might impact on simulation performance, rewarding players more directly than conventional simulations for embarking on strategies aimed at building long-term customer value.

In the second section of the paper, we focused on specific methods for incorporating CLV and customer equity concepts into simulation games. These methods can (and should, in our view) be used to update conventional marketing simulations. However, the added complexity they would bring to the game might obscure some of the learning the concepts should bring to a game (Cannon 1995). Another approach would be to use the principles discussed in the paper to develop a game whose primary focus is built around the managing customer value. For instance, one of the changes this would call for might be to focus the marketing budget allocation on customer-equity (and subsequent customer-retention) building activities rather than simply customer attraction activities.

Third, we have suggested two indices of simulation performance that might be used in addition to more traditional indices, such as profit and forecasting accuracy (Teach 1990). These indices are total customer equity and customer loyalty per marketing dollar spent. They are new to the simulation literature, and, we suggest, are potentially useful measures of how well players are addressing customer value in their strategic decisions.

Finally, we have fit our suggestions into Gold's (2003) standard business game algorithm – what Cannon and Schwaiger (2004) call the "Gold standard" – in an effort to make their implementation more efficient and compatible with other concepts game designers might want to address in their simulations. Hopefully, this will facilitate a more rapid incorporation of CLV and customer equity concepts into future games.

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