Being able to measure customer value is a prerequisite for effective customer relationship management and data-driven marketing strategy, as it allows to maximize return on marketing investment, particularly when resources are limited. While past profitability is certainly a useful metric, it is insufficient when trying to predict which customers are going to be most valuable in the future so as to decide in whom to invest and how much. In this paper we present the concept of Customer Lifetime Value (CLV), a forward-looking quantitative indicator of individual customer profitability, and demonstrate its advantages over other methods commonly used for allocating marketing resources. We describe the concept in detail, discuss the prerequisites and best practices for measuring customer value, and compare different methods for computing CLV.
Customer Value

Customers are arguably the most valuable asset of a firm - customers drive profits. Hence, maximizing customer value is one of the key objectives of customer relationship management - from acquiring and retaining profitable customers through targeted marketing to increasing their value over time through cross- and upselling campaigns. In particular when marketing resources are tight, it is often necessary to identify the most “valuable” customers up front so as to allocate these limited resources appropriately.

How does one measure customer value? Past customer profitability is insufficient when trying to predict the future value: a client who has just subscribed to five new magazines at a promotional rate is not guaranteed to renew all of them once the special rate ends. Furthermore, customers are free to “leave”, at the latest when their current contract expires. Customer Lifetime Value (CLV) is a metric that encompasses both the past and the future value of the client while reflecting the uncertainty associated with the latter. CLV of a given client consists of the profit generated by the customer currently and the present value of all expected future profits associated with this client. Both the revenues derived from the client and the costs associated with maintaining a customer relationship with her are usually incorporated into CLV.

Advantages of CLV

Traditional customer value models are based on the premise that some clients are more valuable than others and hence should be treated preferentially or have more resources allocated to developing their potential. The goal is then to identify the most promising clients without necessarily measuring their value directly. This approach is exemplified by two popular customer value models:\(^1\): customer scoring and A-B-C segmentation.

In the A-B-C segmentation, customers are split into a fixed number of classes with predefined labels corresponding to their perceived value, from “high-potential” to “money-losing”. The assignment is based on inputs such as individual profitability, loyalty and payment history, with the exact logic determined by business rules or explicit targets for the percentage of clients in each segment. Customer scoring, the other well-established method, involves summing up various measures reflecting each individual client's past profitability and loyalty with weights determined by business rules. The goal is to assign each customer a numerical score that allows to compare and rank all the clients - the higher the score, the higher is the perceived potential of a client.

In contrast to these traditional methods, the CLV metric produces a monetary value for each individual customer directly related to her expected future profitability. This simple, yet powerful measure can be used not just to determine which clients have the most potential, but also to decide how much marketing expenditures is justified for each one. This is the main strength and advantage of CLV — neither A-B-C segmentation, nor customer scoring produce such a monetary value. While the latter method assigns a numerical score to each client, it is usually artificially defined rather than measured, so that its absolute value carries no meaning. Furthermore, both of these traditional models tend to mostly reflect a client’s historic profitability, whereas CLV is a forward-looking predictive measure. It doesn’t simply extrapolate the future profit from the past, but uses predictive models to estimate it per client. Moreover, it explicitly incorporates the possibility of a customer ceasing to be one, i.e. churning, as part of estimating her expected future value.

CLV Computation

In order to calculate CLV of a client, we first need to determine her current profitability. For a prospective customer this is zero or even negative if one includes the cost of trying to acquire this prospect. For an existing customer we sum up the premiums of all the products purchased and subtract the cost to the firm of goods/services provided, as well as other costs associated with servicing this client and/or marketing additional products to her. The period over which to add up the revenues is normally chosen to be relatively short, e.g. 1 year (or whatever is the standard contract period), so as to obtain the residual lifetime value. While it is also possible to go all the way back and include the revenues from the very start of the customer relationship, in our view this additional complexity is not justified, particularly if the CLV is to be used in the forward-looking marketing activities.

The next step in the CLV computation is to estimate the future value of the customer. This value is made up of the revenues (and costs) associated with the product(s) the client would purchase summed over the residual lifetime of this customer. Here we need to differentiate between contractual and non-contractual settings. In a contractual setting, such as mobile telephony or an insurance company, there is a clearly defined relationship between a customer and a company with an associated duration and costs of products or services rendered during this period.\(^2\) Hence, in this setting we can project future revenues from a given client by estimating the likelihood of this client renewing or upgrading her present contract(s) in a given time period.

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\(^1\) N. Alves and N. Vorlänthen (2008). „Kundenerwertanalyse bei den Unternehmen des SMI Expanded“, Seminararbeit of the Faculty of Economics and Social Sciences University of Fribourg.

\(^2\) In the context of telecom operators, this model describes contract-based mobile plans, though pre-paid usage has many of the same characteristics as well.
In a non-contractual scenario, such as a mail-order catalog or internet shopping, the time interval between purchases is not fixed, plus there is usually a much larger selection of potential products. Thus both the timing of the next transaction and its value need to be modeled. Furthermore, it is not always clear when a customer ceases to be one - a client who has not purchased in a long time might have switched to a different catalog/online shop or might just be waiting for Christmas. For simplicity we will focus our attention on the contractual setting for the rest of this paper, while indicating when and how the techniques apply to the non-contractual one.

We propose two different approaches to estimating the future value of the customer. The first approach, which we call the Static CLV, computes for each product the company has on offer the client's affinity towards it and multiplies it by the likely number of years she would remain with the firm or hold on to the product. The other approach, the Dynamic CLV, examines all the potential development pathways of a client in the context of the relationship lifecycle and estimates the value and the likelihood of each. This approach is very versatile and can be extended to non-contractual settings.

**Static Approach**
When pursuing the static approach to CLV computation, the first step is to estimate how much longer the customer would remain with the firm, i.e. her expected residual lifetime. This can be done by using survival analysis, for example, which also allows to differentiate between different customer groups and products. The next step is to calculate for each product/service not yet in the client's portfolio the likelihood that the customer would purchase it during her remaining lifetime. This requires building a cross-sell model for each product or category of products. We can improve the calculation further by estimating the expected (residual) lifetime separately for each product instead of using the same remaining customer lifetime for all of them.

This approach is illustrated in Figure 1 using, as an example, a customer of an insurance company who already in car insurance and/or homeowner's policy. The static approach computes CLV as a monetary value in a way that is easily interpreted and understood. It is particularly suitable in settings with a small number of potential products and/or little interdependency between them, that is when adding product A to the portfolio has little impact on the likelihood of the customer later buying (or not buying) product B. Furthermore, it delivers additional benefits in the form of the product(s) a client is most likely to buy, as well as the identification of clients with short remaining lifetimes that are likely to churn. These by-products can be very valuable in themselves and could be directly utilized in the context of customer relationship management.

Therefore we usually recommend this approach to clients who already have cross/up-sell models for individual products or put a high premium on putting them into place. On the downside, the usage of the expected remaining customer lifetime in computing future profits tends to (mathematically) overestimate the expected revenue. Furthermore, the cross-sell models are "static" and do not take into account that a client's affinity towards a given product might vary throughout the lifecycle contingent on the changes in the client's portfolio and/or in the customer's personal life (e.g. having children or retiring).

When deciding on whether and how to implement CLV, firms should consider what are their short- and long-term objectives, how quickly results should become visible, which relevant models are already in place and what is already known about the client lifecycle dynamics.

**Dynamic Approach**
To overcome these "static" limitations we need to model the client lifecycle as a dynamic process evolving in time, with the next stage being directly impacted by internal events, i.e. interactions between the customer and the firm, and by external events in her personal life. These dynamics can be captured by a Markov chain model, in which customers are assigned to states corresponding to

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different stages in their lifecycle. Each state has an associated monetary value based on the profitability of the corresponding product portfolio. What makes this model so powerful and versatile is that the states can also incorporate (but don’t have to) other attributes such as customer tenure, demographics, lifecycle events, etc., which impact the development and the value of the client’s portfolio. For example, a sample state of an insurance customer could be: "Products: Travel + Car, 850 SFr/y: male, 30-40 years old, residing in St. Gallen, got married < 12 months ago".

Depending on whether the client decides to renew her contracts, expand the portfolio or to leave the firm altogether, the client can stay in the same state or transition to one of other feasible states in the next time period. There is also a special “absorbing” state with value 0 corresponding to former customers - once a client enters this state she will stay there forever.

State changes can be brought on by internal events (e.g. cross-sell campaigns), as well as external (e.g. getting married). In case of a client in a sample state mentioned above, we could expect him to purchase a homeowner’s insurance or upgrade his car insurance in the near future since he recently started a family and might want to buy a house or a new car. By analyzing historical client data, we can easily derive probabilities of all such potential transitions. This modeling approach can be extended to non-contractual settings by taking as the basis for states not the exact product portfolio per se, but rather more general aspects of the client behavior, like average spending per purchase, frequency of purchases, how long ago the last transaction took place, etc.

This approach is illustrated in Figure 2 using, once again, the insurance client with the Travel insurance. Based on historical data, one obtains the probabilities of her holding various possible product combinations after 1 year given her current portfolio. By stringing together the probabilities of getting to each of the potential states from the initial state we obtain for each year the expected customer value; the values from all years are then added up to yield the net CLV. The dynamic CLV computation method is particularly suitable in the settings in which product acquisition is sequential or is strongly influenced by external events in the customer’s lifecycle. Thus, we usually recommend this approach to financial services and insurance firms, since customers tend to purchase their products in a natural order dependent on product sophistication and their own financial maturity. The main strength of this method is the individual view it provides of how a given client could “evolve” from her initial state to any one of the potential states she could end up in.

At the same time it yields the most frequent client development pathways - a valuable by-product for those firms wishing to better understand the lifecycle dynamics of their clients. The model also provides churn rates for clients in different states, as well as the next-best profitable state, which can be leveraged in the design of marketing campaigns. Furthermore, the states of the model yield a natural segmentation of clients, both in the present and in the past. In fact, one can implement a quick proof-of-concept of the Dynamic CLV approach based on an existing segmentation of clients modeling transitions between the segments and examining the drivers behind them.

**Closing notes**

Customer Lifetime Value measure can be used for valuing customers over the course of their entire relationship with a company regardless of the precise nature of the firm’s business. It is particularly useful for managing and growing customer value across the lifecycle, from deciding whether acquisition/marketing costs are justified by the potential gain, to selecting customers to target with loyalty rewards program or other development measures, to identifying which at-risk clients should be retained (and which let go) and how much they are worth.

Insofar as the customer base forms a large part of a company’s overall value, valuing customers makes it possible to value the firm. This is especially applicable to the high-growth businesses, whose financial value is better captured by the concept of Customer Equity, which is the sum of the individual value of all present and future customers measured over their lifetimes with the firm, than by traditional cash-flow based methods. This metric directly links marketing initiatives to the shareholder value by allowing to assess the impact of the changes, say in retention rates, on the firm’s value.

While the calculation of CLV might appear complex, the complete process produces a sound foundation for a data-driven marketing strategy. When deciding on whether and how to implement CLV, firms should consider what are their short- and long-term objectives, how quickly results should become visible, which relevant models are already in place and what is already known about the client lifecy-
cle dynamics. Answering these questions is the first step towards customer intelligence success.

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