A marketing view of the customer value: Customer lifetime value and customer equity

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Throughout this research the customer valuation trend in marketing is going to be reviewed, emphasizing Customer Lifetime Value and Customer Equity measures. The main theoretical contributions in the development and evolution of the Customer Lifetime Value concept are analysed. Customer Lifetime Value is also differentiated from Customer Equity and Customer Profitability analysis to estimate customer value in terms of firm profitability. Customer Lifetime Value and Customer Equity concepts are formally defined. Additionally, a classification of a set of published researches into Customer Lifetime Value and/or Customer Equity is developed. This classification has been posited according to several criteria that serves as a guide to key requirements for developing these types of models. Finally, several conclusions, suggestions and future research streams are highlighted.

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Introduction

Customers have become the alma mater of any organization, because without them there wouldn´t be incomes, benefits and the resulting market value of the company (Gupta & Lehmann, 2003; Gupta & Zeithaml, 2006). For this reason, identifying the most profitable customers, who will strengthen relationships in the long term, has become a priority for both academics and professionals in marketing. If the latter idea is expressed in more operational terms, the goal is to understand how to effectively manage relationships with customers and how to implement relationship-marketing strategies with the most profitable ones (Kumar, Ramani & Bohling, 2004) in order to retain these customers and increase purchases made by them (Jain & Singh, 2002).

Continuous advances in information and communication technology play an important role in this process, because they have allowed companies to collect large amounts of customer data at a reduced cost. At the same time, these advances have allowed companies to develop skills to store, share, analyse and transfer valuable information from this data and to perform individual level analysis instead of relying on aggregate survey-based measures (such as satisfaction) (Gupta & Lehman, 2008). This trend, coupled with the marketing need to develop key metrics to help management control of the business, has caused that such databases are exploited to the maximum (Fader & Hardie, 2009), enabling to pass from a transaction-centric approach to a relationship marketing approach (Fader , Hardie & Lee, 2006; Kumar *et al.*, 2009).

The increasing availability of customer transaction data and this move towards a relationship marketing approach have led to an interest in estimating and understanding customers value or the assessment of customers. This is an important trend in various disciplines such as accounting, finance and especially in marketing that has taken place since decades (Petrison, Blattberg & Wang, 1993). Nowadays, more and more companies have realized that their most valuable asset is its customer base (Berger *et al.,* 2002; Blattberg, Getz & Thomas, 2001a; Gupta & Lehmann, 2003), and even the financial community calls for the inclusion of a set of customer metrics in financial reports (Persson & Ryals, 2010). In particular, there is an increasing demand for research to develop more rigorous approaches than existing ones that evidences the relationship between marketing performance and business performance (Gleaves *et al*., 2008) and that justifies the work of the marketing managers to make marketing activities more accountable (Rust *et al*., 2004b). Financial accountability is key to a firm's success, because spending without any regard to financial consequences can be disastrous and sound the death knell of the firm (Aravindakshan *et al*., 2004). In this regard, customer value measures are critical to assess the performance of business operations, considered as a good approximation of firm value (Gupta, Lehman & Stuart, 2004) and becoming valuable information that should be given to investors (Wiesel, Skiera & Villanueva, 2008).

Therefore, the main goal of this review is to relate customer valuation trend with the marketing discipline. To achieve our objective, the article begins with an exposition of the main theoretical contributions to the development and evolution of the customer value concept, mainly based on the idea that customers and relationships with customers are important assets for firms and these assets are managed through Customer Relationship Management (CRM) to get competitive advantage. Customer Lifetime Value (CLV) plays an important role in this process because it allows the identification of the most profitable customers to the firm. To justify its importance, several customer value measures are compared, in particular CLV is differentiated from Customer Profitability (CP) analysis and Customer Equity (CE). Additionally, we formally define CLV and CE and perform a classification of a set of empirical articles that estimate CLV and/or CE in different contexts. The majority of these articles were published in journals with an 'impact index' in accordance with the Social Science Citation Index (SSCI) (e.g., *Harvard Business Review, Journal of Interactive Marketing, Journal of Marketing, Journal of Marketing Research, Journal of Service Research* and *Management Science*), which guarantee the quality of the studies[1]. The objective is corroborating the importance of CLV and CE models in marketing. Finally, we make several conclusions, suggestions and highlight future lines of investigation.

A marketing view of the customer value

Customer relationships as valuable assets

From the perspective of a **resource-based view (RBV)**, resources that are valuable, rare, inimitable and non-substitutable (Barney, 1991) make it possible for businesses to develop and maintain competitive advantages. It is understood that firms need to utilize these resources and competitive advantages to get their superior performance (Collis & Montgomery, 1995; Grant, 1991; Wernerfelt, 1984). Leveraging resources to create and sustain perceived value for the organization's stakeholders and, in particular customers, has such importance because of the considerable goodness of fit between marketing theorists (Hunt, 2000) and the assumptions of RBV. Many marketing theorists have accepted the RBV approach because it offers a sophisticated explanation of the role that customers play in the creation of value for the firm. In particular, to get this mixture of marketing and RBV theory, companies create value for customers identifying resources that are both marketing specific (i.e., they are generated and leveraged in large part through marketing activities) and potentially manifest at least some of the desired RBV attributes (i.e., they are rare, inimitable and non-substitutable). **Market-based assets**, (see Srivastava, Shervani & Fahey, 1998) meet both criteria, allowing customers and their relationships with the firm to be treated as critical resources that contributes to competitive advantage for the firm and which should be developed, augmented, leveraged and valued in a similar way to the firm's traditional resources. Furthermore, for Srivastava, Fahey and Christensen (2001) there are two groups of market-based assets that are fundamental for firms to get this superior performance: (i) *relational market-based assets* and (ii) *intellectual market-based assets*. Customers and relationships with customers are considered **relational market-based assets** of the companies, becoming **Customer Relationship Management (CRM)** as a major shift in marketing theory and practice. Rather than focusing on discrete transactions, CRM emphasizes the establishment, development and maintenance of long-term exchanges (Morgan & Hunt, 1994), because such relationships are thought to be more profitable than short-term relationships as a result of exchange efficiencies between company and customer (Reichheld & Sasser, 1990). This paradigm is based on the assumption that a satisfied customer becomes a sustainable competitive advantage for the organization, creating a link between these two sides: customer and organization, therefore analysing the historical records of interactions between the customer and the company, companies will be able to obtain valuable information that will help them to understand customers behaviours and anticipate their needs, which ultimately will impact on business performance.

Customer relationship management in the customer valuation framework

Customer Relationship Management (CRM) is defined as the management of a mutually beneficial relationships from the perspective of the seller (LaPlaca, 2004:463), which benefits all those in the relationship (Mitussis, O'Malley & Patterson, 2006), or in other words, the enterprise approach aimed at understanding and influencing customer behaviour in order to improve customer acquisition, customer retention, customer loyalty and customer profitability (Swift, 2001). CRM posits that during cooperative and collaborative relationships, value is created for the customer and the firm.

CRM trend has its root in the eighties, when Dwyer, Schurr and Sejo (1987) highlighted the relationship aspect of buyer-seller behaviour instead of single transactions as the focus of the marketing. Later, Reichheld and Sasser (1990) validated that focusing on relationships can lead to significant advantages because customers tend to generate higher profits the longer they stay with the company. More recently, Richards and Jones (2008) classify some of the more common definitions of CRM into two related categories:

(i) CRM is often defined as a form of relationship strategy, for example: "*CRM is a comprehensive strategy and process of acquiring, retaining, and partnering with selective customers to create superior*

[1] Some of the articles within this collection are published in Journals without this 'impact factor' (e.g., *Decision Support Systems, European Journal of Operational Research, Journal of Consumer Marketing, Journal of Database Marketing* and *Journal of Relationship Marketing*). These exceptions were considered because they have received a significant number of cites from other articles about this topic.

value for the company and the customer" (Parvatiyar and Sheth, 2001:5). Within this strategic view of CRM, the system can enable firms to use their customer databases and analytical tools to create opportunities for cross-selling new products and services to existing customers. Also firms can develop customer acquisition and customer retention strategies that ultimately allow them to optimize CE (Blattberg, Getz & Thomas, 2001b; Rust, Zeithaml & Lemon, 2000).

(ii) CRM is also often defined from a more operational view, for example: "*CRM allows companies to gather customer data swiftly, identify the most valuable customers over time, and increase customer loyalty by providing customized products and services*" (Rigby, Reichheld & Schefter, 2002:101). Therefore, within this operational view of CRM, the system facilitates the day-to-day interactions with customers (Van Bruggen & Wierenga, 2005).

From a strategic perspective, CRM is viewed as an asset (Srivastava *et al*., 2001), based on factors such as trust and reputation, that is relatively rare and difficult for competitors to replicate, is intangible, hard to measure and not nurtured. Additionally, relationships with customers are external assets to the firm, and therefore 'available' to a firm, and not 'owned'. Then, from the perspective of CRM, the task oriented to identify the most profitable customers, who will strengthen relationships in the long term, has become a priority for both academics and professionals in marketing, therefore CRM plays an important role in obtaining the firm competitive advantage. More specifically, central to the idea of CRM is the assumption that customers differ in their needs and in the value that they generate to the firm and the way customers are managed should reflect these differences. In particular, from this strategic perspective, CRM is seen to align business processes with customer strategies in order to increase customer loyalty and maximise profits over time (Rigby *et al*., 2002), or in other words, CRM pursues identifying profitable/valuable customers and then allocating the majority of resources and attention to these groups.

The current interest that the marketing discipline is paying to the concept of CLV plays a crucial role in the CRM framework, because CLV comprises a set of techniques that help companies to evaluate their portfolios of customers, improving CRM outputs. Using data, information, technology and applications, CLV allows companies to discover key customers and customer segments in order to understand them, develop long-term relationships with them and co-create value with them, the main goal of CRM (Payne & Frow, 2005:168). Then, this CRM overall goal is aligned with CLV models' goal because CRM is not about offering every single customer the best possible service, but about treating customers differently, for example depending on their CLV. Concretely, the estimation of CLV is the key to managing customer relationships (CRM) (Richards & Jones, 2008), because it is a measure to evaluate marketing decisions (Blattberg & Deighton, 1996) and to predict customer value of each customer in the database (Malthouse & Blattberg, 2005; Venkatesan & Kumar, 2004). This is essential as a base for segmentation and to decide about an investment in (segments of) customers (Zeithaml, Rust & Lemon, 2001), and also to assess the total customer base (Gupta *et al*., 2004) as a sum of CLV predictions of all customers. A large group of researchers have recommended this measure for selecting customers and designing marketing programs (e.g., Reinartz & Kumar, 2003; Venkatesan & Kumar, 2004; Kim *et al*., 2006), because customers selected on the basis of CLV generate more profits than customers selected on the basis of other measures such as socio-demographics (Reinartz & Kumar, 2003; Venkatesan & Kumar, 2004).

As a conclusion it is interesting to note that CRM is claimed to underpin theories on customer value (Mitussis *et al*., 2006), and therefore is inevitably linked with both CLV and CE (Weir, 2008: 808). Managers need to recognize that CRM is an enterprise wide concept that requires their businesses to identify opportunities to simultaneously enhance customer value while reducing costs, two effects that together create sustainable competitive advantage and result in greater short and long-term profitability (Bohling *et al*., 2006).

Different measures to evaluate customers: comparing CLV, CE and CP

The origins of the interest in estimating and understanding customers value or the assessment of customers date back to the forties, when few companies were beginning to estimate the value of their average customer (The Reporter of Direct Mail Advertising, 1941). Later at the end of the sixties, when companies started to use computer technology, the task became more challenging, and companies tried to predict the long-term value of their customers, although by that time they were the first attempts of this kind of predictive analysis (Petrison *et al*., 1993). For example, Sevin (1965) proposed a simple method to compute a single customer's profitability by allocating functional costs to each customer and subtracting them from each customer's yearly revenue.

Nowadays, and as we have noted previously, more and more companies have realized that their most valuable asset is its customer base (Berger *et al*., 2002; Blattberg *et al*., 2001a; Gupta & Lehmann, 2003), and even the financial community calls for the inclusion of a set of customer measures in financial reports (Persson & Ryals, 2010). In particular, it can be identified three stages in the development of customer valuation techniques (Weir, 2008). Although for some researchers there is no difference between them (e.g., Mulhern, 1999), empirical applications differentiate these three approaches. The first one pursues only the analysis of the **Customer Profitability (CP)** (e.g., Mulhern, 1999), the second one pursues the analysis of the **Customer Lifetime Value (CLV)** (e.g., Pfeifer & Carraway, 2000), and the third one pursues the analysis of the **Customer Equity (CE)** (e.g., Blattberg & Deighton, 1996).

Firstly, in the Table 1 we have compared CP and CLV. On the other hand, in the Table 2 we have compared CLV and CE, especially because they are related and sometimes are considered equivalent in the body of research about this topic.

Firstly, we remark that CP is a less powerful measure than CLV and CE, as we can see in the summary of their differences in Table 1. Secondly, CLV and CE are two related measures, therefore when we work with CLV concept, if data are available, it should be reasonable to extend the concept to CE, especially according to its second definition to get to an overall assessment of firms.

At this point we refer the following question, according to Gupta and Lehmann (2008): *"Why do we need CLV in addition to profits, cash flow and other traditional financial metrics?"* The authors explained that in many businesses CLV, as a marketing productivity measure (Rust *et al*., 2004b), provides greater insight than traditional financial metrics for the following reasons:

(1) The components and drivers of CLV[2] provide important diagnostics about the future health of a business, which may not be obvious from traditional financial metrics.

(2) CLV allows us to assess profitability of individual customers.

(3) It is hard to use traditional financial methods (e.g., discounted cash flow or P/E ratio) to assess the value of high growth companies that currently have negative cash flow and/or negative earnings. CLV allow us to value these firms when standard financial methods fail.

(4) CLV provides a structured approach to forecast future cash flows that can be better than using a simple extrapolation approach (e.g., average compound annual growth based on the last 5 years), as is commonly used in finance.

Therefore, nowadays CLV is the most popular customer value measure because (1) many traditional marketing measures (e.g., brand awareness/attitude, market share) are not enough to evaluate returns of marketing investment, especially in the long-term, (2) includes all the elements of CP, (3) it is forward-looking, and (4) it is an essential element of the customer-centric paradigm (Kumar & Shah, 2004), mainly because it is meaningful for managers to understand customer value at the individual level to allocate resources accordingly (Zhang, Dixit & Friedman, 2010). For these reasons, we focus on the second and third stages of customer valuation (i.e., CLV and CE) to develop this research, closer to the marketing discipline (research on modelling CLV was one of the MSI research priorities (MSI, 2004)) and characterized by more complete analysis, taking into account a greater number of variables (not only financial, as in the first case). In particular, as Gupta and Zeithaml (2006) determine, CLV and CE provide good basis to assess the market value of a firm, furthermore marketing decisions based on these observed customer measures improve a firm's financial performance.

Customer lifetime value and customer equity

Customer lifetime value (CLV)

Customer Lifetime Value has been studied under different names, such as *Lifetime Value (LTV)*, *Customer Equity (CE)*, *Net Present Value (NPV)*, *Customer Profitability (CP)*, or simply *Customer Value (CV)*. The differences between the definitions are slight (Hwang, Jung & Shu, 2004), and we have explained the most important ones in the previous section of this research (see 2.3. Different measures to evaluate customers: comparing CLV, CE and CP). Customer lifetime value, just as the name indicates, evaluates the long-term value of customers with the company (Wu, Liu & Li, 2005).

CLV was firstly defined by Kotler (1974:24) as the present value of the future profit stream expected over a given time horizon of transacting with the customer. More recently, CLV is defined as the present value of the future cash flows associated with a customer (Pfeifer, Haskins & conroy, 2005). It is also formally defined as the sum of the discounted cash flows that an individual or a segment/group of individuals generates during his/her relationship with the company (Berger & Nasr, 1998), in other words, is the net present value of benefits associated with each customer, once he or she has been acquired, after subtracting incremental costs associated with each customer (e.g., marketing, selling, production and service), over his or her entire life time with the company (Blattberg, Kim & Neslin, 2008; Dywer, 1997). In general, the CLV framework measures how changes in customer behaviour (e.g., increased purchase, retention) could influence customers' future profits, or their profitability to the firm (Zhang *et al*., 2010), making a bridge between marketing and finance. In Table 3 several definitions of CLV are shown.

CLV (and by extension CE) are mainly based on the principles of contemporary finance of assets' valuation, more precisely the **discounted cash flow (DCF) method**, proposed by Rappaport in 1986, with two key differences (Gupta *et al*., 2006; Gupta & Lehmann, 2008): (1) CLV is typically defined and estimated at an individual customer or segment level, allowing differentiation between customers based on profitability in order to identify customers who are more profitable than others and target them appropriately; and (2) unlike in financial evaluations (e.g., Noone & Griffin, 1997; Smith & Dikoli, 1995; Van Raaij, Vernooijb & Van Triest, 2003), CLV explicitly incorporates the possibility for future customer defection, typically through a retention rate.

[2] Persson and Ryals (2010) make an important distinction between components and drivers of CE and by extension, of CLV. First, they point out that the components of CLV and CE are retention rate, cash flows (or alternatively profits) the firm expects to receive from the customer in each future period and discount rate. Second, they complement CLV concept with its drivers, they are customer perceptions (e.g., satisfaction) and customer behaviours (e.g., purchase frequency).

Table 1: Comparison between CP and CLV

Customer Profitability	Customer Lifetime Value	References
Is an arithmetic calculation of revenues minus costs for a specified period of time	Is the present value of future cash flows	Boyce (2000); Pfeifer *et al.* (2005)
This measure is calculated on a single period basis, usually the last economic year	This measure needs several time periods of data to be calculated	Ryals (2006)
Is an accounting summary of events from the present and the past. Is not forward looking	Is forward looking, for this reason CLV is a more powerful measure than historic CP analysis; CLV looks at the future potential of the customer	Boyce (2000); Jain and Singh (2002)
Is not a good basis for developing marketing strategies	Is a good basis for developing marketing strategies	Ryals (2002)
Treats marketing as expense, which leads to negative operating margin in the early stages of a high growth company	Treats customers as assets and marketing expenditure on them as investment	Gupta (2009)

Table 2: Comparison between CLV and CE

Customer Lifetime Value	Customer Equity	References
There is a general agreement on the definition of CLV	There are different definitions of CE:	
	In particular some authors define it as the average CLV less acquisition cost	Berger and Nasr (1998); Blattberg and Deighton (1996); Blattberg *et al.* (2001a)
	Other authors propose that the firm's CE is formed by the CLVs of all the current and potential customers, which has been found to be a good proxy measure of the firm's equity-market valuation	Zhang *et al.* (2010); Gupta et al. (2004)
Is a micro-level metric	Is a macro-level metric that can be applied directly to understand equity market reactions to marketing actions	Zhang *et al.* (2010)

Table 3: Definitions of CLV (Hwang *et al.*, 2004)

Definition	Reference
The net present value of all future contributions to overhead and profit.	Roberts and Berger (1989)
The net present value of a future stream of contributions to overheads and profit expected from the customer.	Jackson (1994)
The net present value of all future contributions to profit and overhead expected from the customer.	Courtheoux (1995)
The total discounted net profit that a customer generates during her life on the house list.	Bitran and Mondschein (1996)
Expected profits from customers, exclusive of costs related to customer management.	Blattberg and Deighton (1996)
The net present value of the stream of contributions to profit that result from customer transactions and contacts with the company.	Pearson (1996)
The net profit or loss to the firm from a customer over the entire life of transactions of that customer with the firm.	Berger and Nasr (1998)
The present value of all future profits generated from a customer.	Gupta and Lehmann (2003)

Kumar and George (2007) explain that the value a customer brings to the firm is not limited to the profit from each transaction and is the total profit he/she may provide over the duration of his/her relationship with the firm. CLV is a concept that is forward looking and the right definition and modelling should consider the essence of the concept as against rigid definitions (Jain & Singh, 2002). To be true to the notion of CLV, measures should look to the future, not to the past (Fader, Hardie & Lee, 2005), although unfortunately because of the challenges associated with forecasting future revenue streams, most empirical research of lifetime value has actually computed customer profitability solely on the basis of customer´s prior behaviour. Finally, it is important to note that CLV calculation helps companies to order customers according to their contribution to profits, which allows them to treat differently each one (Kumar & Rajan, 2009b).

To illustrate the definition of CLV we have posited different formulas, from the most basic ones to the most complicated ones. Among the **basic formulas**, Jain and Singh (2002) describe a basic model to calculate firm´s average CLV, which considers only the company's current customers, ignoring the past and potential future customers, the acquisition costs and other factors related stochastic process purchase and the timing of cash flow. The formula for this basic model is enclosed below, where *i* is the time period of the calculation (from a total of n periods), R_i is customer income in the period *i*, C_i is the total cost incurred to generate revenues R_i in the period *i* and *d* is the discount rate.

$$CLV = \sum_{i=1}^{n} \frac{(R_i - C_i)}{(1+d)^{i-0,5}} \qquad \ldots (1)$$

Berger *et al*. (2006) (index *i* refers to each customer) also develop a basic model to calculate CLV of individual customers, where they do not take into account retention rate and acquisition cost. In its basic form, CLV is a function of a customer's future gross profits (revenue after deducting cost of goods sold and other marginal/variable costs). Future costs refer to those that are charged to individual customers, e.g., cost of services. The formula for this model is expressed below.

$$CLV_i = \sum_{i=1}^{n} \frac{(FutureGross\,Profits_{it} - FutureCosts_{it})}{(1+d)^t} \qquad \ldots (2)$$

Glady, Baesens and Croux (2009b) also develop another recent example of a CLV model. They estimate CLV of the customer *i* for the horizon *h* as is indicated below, where *d* is the discount rate, assumed to be constant (it is taken as the weighted average cost of capital disclosed in the 2004 financial statement of the Belgian financial service institution, 8,92% yearly, 0,7146% monthly) and $Cash\ Flow_{i,k}$ is the net cash flow (i.e., the total gains less the total costs) due to the activity of customer *i* during the time period *k*. The CLV of a customer is obviously changing over time, nevertheless they do not introduce this time dependency in the notation, since in their empirical study the moment of prediction of the CLV is identical for all customers.

$$CLV_{i,h} = \sum_{k=1}^{h} \frac{CashFlow_{i,k}}{(1+d)^k} \qquad \ldots (3)$$

Other **formulas take into account marketing costs** (e.g., promotional expenses) in the calculation of CLV. Such is the case of Berger and Nasr (1998). They develop another model to calculate the firm's average CLV using a CLV model for a finite time period, based on three main assumptions: sales take place once a year, annual retention investment (M) and both the retention ratio (r) and the gross margin contribution (GC) are assumed to be constant. Under these assumptions, the CLV is calculated as follows, where n is the length in years and d is the annual discount rate.

$$CLV = \{GC * \sum_{i=0}^{n} [\frac{r^i}{(1+d)^i}]\} - \{M * \sum_{i=1}^{n} [\frac{r^{i-1}}{(1+d)^{i-0,5}}]\} \qquad \ldots (4)$$

At an individual level, Venkatesan and Kumar (2004) want to identify the highest levels of customer response to marketing communications across different channels in order to achieve optimal resource allocation between channels (giving priority to the most effective). We enclose their formula below, where $CM_{i,y}$ is the predicted margin contribution to customer i in purchase occasion y, r is the discount rate for money, $c_{i,m,l}$ are unit marketing costs for customer i channel m in year l, $x_{i,m,l}$ is the number of marketing contacts to customer i in channel m in year l, $frequency_i$ is the predicted purchase frequency for customer i, n is the number of years to forecast and T_i is the predicted number of purchases made by customer i until the end of the planning period.

$$CLV_i = \sum_{y=1}^{T_i} \frac{CM_{i,y}}{(1+r)^{y/frequency_i}} - \sum_{l=1}^{n} \frac{\sum_m c_{i,m,l} * x_{i,m,l}}{(1+r)^{l-1}} \qquad \ldots (5)$$

Other authors consider **CLV as a combination of *current value*, *potential value* and *customer loyalty***. In particular, Hwang et al. (2004) suggest a new LTV model of individual customer considering these three components of CLV (the first summation refers to past profit contribution and the second one refers to expected future cash flow), where t_i is the service period index of customer i, $N_i$is the total service period of customer i, d is the interest rate, E(i) is the expected service period of customer i, $\pi_p(t_i)$ is the past profit contribution of customer i at period t_i, $\pi_f(t_i)$ is the future profit contribution of customer i at period t_i and $B(t_i)$ is the potential benefit from customer i at period t_i.

$$LTV_i = \sum_{t_i=0}^{N_i} \pi_p(t_i)(1+d)^{N_i - t_i} + \sum_{t_i=N_i+1}^{N_i+E(i)+1} \frac{\pi_f(t_i) + B(t_i)}{(1+d)^{t_i - N_i}} \qquad \ldots (6)$$

Finally, other authors consider that **relationships between companies and customers have three dimensions that should be considered in CLV formulas, called: (1) length, (2) depth and (3) breadth** (based on CUSAMS framework by Bolton, Lemon and Verhoef (2004)). Verhoef (2004), in an empirical application of CLV, impute the underlying behaviours into the equation to estimate CLV in the following way, where $P(retention)_{i,t}$ is the probability of continuation of the relationship for customer i at time t (length of the relationship), $Product_{i,j,t}$ is the purchase of product or service j by customer i at time t (breadth), $Usage_{i,j,t}$ is the usage of product or service j by customer i at time t (depth) and $Margin_{j,t}$ is the contribution margin for product or service j per usage or volume entity on time t.

$$CLV_{i,0} = \sum_{t=0}^{T} \frac{P(retention)_{i,t} * (Product_{i,j,t} * Usage_{i,j,t} * Margin_{j,t})}{(1+d)^t} \quad \ldots (7)$$

Customer equity (CE)

The long-term value of a firm is largely determined by the value of the company's customer relationships, which result in the firm's **Customer Equity** (Aravindakshan *et al.*, 2004). The concepts of CLV and CE are related and sometimes are considered equivalent in the literature. While there is a general agreement on the definition of the first, there are different definitions of CE. For some authors CE is the average CLV less acquisition cost (Berger & Nasr, 1998; Blattberg & Deighton, 1996; Blattberg *et al.*, 2001a). In particular, Berger and Nasr (2001) explain that the difference between CE and CLV is that **CE takes acquisition cost into consideration**, as in the following formula, where a is the acquisition rate (proportion of solicited prospects acquired), given a specific level of acquisition costs (A), m is the margin (in monetary units) on a transaction, A is the acquisition cost per customer, R is the retention cost per customer per year, r is the yearly retention rate and d is the yearly discount rate (appropriate for marketing investments).

$$CE = am - A + a * (m - \frac{R}{r}) * [\frac{r^n}{1-r^n}], \text{with}$$
$$r^n = r / (1+d) \quad \ldots (8)$$

Other authors propose that the **firm's CE is formed by the CLVs of all the current and potential customers** (Zhang *et al.*, 2010), which has been found to be a good proxy measure of the firm's equity-market valuation (Gupta *et al.,* 2004). Compared to CLV, CE is a macro-level measure that can be applied directly to understand equity market reactions to marketing actions (Zhang *et al.*, 2010). In particular, CE is defined as the average value of the entire database of customers or customer segments (Wiesel & Skiera, 2005), or in other words it is the customer value at the firm level (Kumar & Shah, 2009). For this research, we refer to CE as the second definition, as we will show next, where CLV_i is customer lifetime value of the customer i and N is the total number of customers that includes the current customer base (or each of the segments) and future customers.

$$CE = \sum_{i=1}^{N} CLV_i \quad \ldots (9)$$

Other similar formula for CE suitable for panel data (where the effect of competition is collected), is the formula enclosed below (Rust *et al.*, 2004a), where $mean_i\ (CLV_{ij})$ is the average lifetime value for firm j's customers i across the sample and POP is the total number of customer in the market across all brands (effect of competition).

$$CE_j = mean_i(CLV_{ij}) * POP \quad \ldots (10)$$

CLV and CE models classification

We have developed a classification of CLV and CE models by combining and updating several criteria taken into account by previous reviews about this topic (see for example Calciu (2009), Fader and Hardie (2009), Gupta *et al.* (2006), Kumar and George (2007) and Villanueva and Hanssens (2007)). Therefore, we offer a global and integral view of CLV-CE models that serves as a guide with key requirements for developing these types of models. The criteria considered are: (1) type of relationship between customer and company; (2) if the analysis is historical or predictive; (3) if the analysis is deterministic or stochastic (data analysis methodology); (4) source of data; (5) if the effect of competition is included; and (6) the aggregation level of the data for CLV calculation. Firstly, we offer Table 4, to guide the reader easily into a deeper explanation. In the following sections, we explain in detail the proposed CLV-CE models classification.

Type of relationship between customer and company (Dwyer, 1997; Fader & Hardie, 2009; Rust *et al.*, 2004a; Venkatesan & Kumar, 2004)

Traditionally researches have considered two types of customer-company relationships to calculate CLV, depending on the way this relationship is interpreted: (i) l*ost for good/retention/contractual setting* (e.g., Blattberg & Deighton, 1996; Wiesel *et al.*, 2008) and (ii) *always a share/migration/non-contractual setting* (e.g., Venkatesan & Kumar, 2004; Rust *et al.*, 2004a). Recently, another type of relationship has been termed as (iii) *semi-contractual* (Borle *et al.,* 2008). The two traditional types of relationships have been named differently according to different authors, as we can see in Table 5.

These two behaviours display different patterns and imply to take a previous decision before starting to solve the problem, choosing a suitable scenario in order to apply the correct methodology. Despite the fact that it is totally unacceptable to apply a model developed for a contractual setting in a non-contractual one and vice versa (Fader & Hardie, 2009), Borle, Sing and Jain (2008) and more recently Abe (2009a; 2009b) have applied Hierarchical Bayes approach to calculate CLV. This methodology is more flexible and can accommodate both situations (i) and (ii). In particular Borle *et al.* (2008) point out that a third kind of relationship between customer-company is possible: (iii) *semi-contractual*.

Table 4: Summary of the CLV and CE models classification

Criteria	Values		Examples
4.1. Type of relationship between customer and company	(i) *lost for good/retention/contractual setting*		Blattberg and Deighton (1996); Wiesel *et al.* (2008)
	(ii) *always a share/migration/non-contractual setting*		Venkatesan and Kumar (2004); Rust *et al*. (2004a)
	(iii) *semi-contractual setting*		Borle *et al.* (2008)
4.2. Historical or predictive analysis?	(i) *historical CLV models*		Reinartz and Kumar (2003); Venkatesan and Kumar (2004)
	(ii) *predictive CLV models*		Gupta *et al.* (2004); Malthouse and Mulhern (2008)
4.3. Deterministic or stochastic analysis?	*Deterministic equations*	(i) *RFM models*	Kahan (1998); Marcus (1998); Miglautsch (2000)
		(ii) *Growth and diffusion models*	Gupta *et al*. (2004); Hogan *et al*. (2003)
	Stochastic process	(i) *Probability model*	Abe (2009b); Borle *et al.* (2008); Libai *et al.* (2002); Reinartz and Kumar (2000, 2003); Rust *et al.* (2004a)
		(ii) *Econometric models*	Van den Poel and Larivière (2004)
		(iii) *Persistence models*	Villanueva *et al.* (2008); Yoo and Hanssens (2005)
		(iv) *Computer science models*	Neslin *et al.* (2006)
4.4. Source of data	(i) *Database of customers*		Venkatesan and Kumar (2004); Verhoef and Donkers (2001)
	(ii) *Survey*		Rust *et al*. (2004a)
	(iii) *Public reports*		Gupta *et al*. (2004); Gupta and Lehmann (2003)
	(iv) *Panel data*		Yoo and Hanssens (2005)
	(v) *Managerial judgments*		Blattberg and Deighton (1996); Ryals (2005)
4.5. Is effect of competition included?	Yes		Reinartz *et al.* (2005); Yoo and Hanssens (2005)
	No		Villanueva *et al.* (2008); Ryals (2005)
4.6. Level of aggregation in the data for the CLV calculation	(i) *Calculation of average CLV from aggregate measures*		Blattberg and Deighton (1996); Gupta and Lehmann (2003); Gupta *et al.* (2004)
	(ii) *Calculation of individual CLV from individual measures*		Drèze and Bonfrer (2002); Reinartz and Kumar (2000, 2003); Venkatesan and Kumar (2004)

Table 5: Type of relationship between customer and company

Authors	(i)	(ii)
Jackson (1985)	Lost for good	Always a share
Dwyer (1997)	Retention	Migration
Reinartz and Kumar (2000)	Contractual	Non-contractual

The first case ***(i) lost for good/retention/contractual setting*** implies that customers have made long-term commitments to a vendor because switching vendors is costly and assets dedicated to the transaction cannot be redeployed easily (Dwyer, 1997). The firm observes the time at which a customer becomes inactive (attrition) because the company maintains a record of each customer by establishing contracts with them. Therefore retention rate (or its opposite, churn rate) is a directly observable variable. This kind of relationship considers that a customer remains alive as long as he/she generates transactions. This means that if at some given moment customers do not renew their contracts or do not generate any transaction, they can be considered as 'lost for good' or as 'ex-customers'. It also means that if an ex-customer buys again he/she is considered as a new customer and one deals with an acquisition rather than a customer retention issue. Dwyer (1997) stated that a lost for good situation is best modelled as a customer retention problem.

The evaluation of customers in this kind of relationship will only take into account the customers' probability to remain active from one period to another and this is the number of successive periods during which the customer is active. This scenario is questionable, since it understates the CLV because it does not allow a defected customer to return to the company (Rust *et al*., 2004a).

The second case ***(ii) always a share/migration/non-contractual setting*** implies that customers may rely on several vendors and can adjust their share of business done with each one (Dwyer, 1997). The time at which a customer becomes inactive is unobserved by the firm, i.e., customers do not notify the firm "*when they stop being a customer. Instead they just silently attrite*" (Mason, 2003:55). This type of relationship considers that customers can reappear (turn up again) after some periods during which they did not make transactions. In other words, after a certain period of inactivity a customer can return to the company and he/she is not considered a lost customer. For this setting, Dwyer (1997) described a customer migration model, using purchase recency to predict purchase behaviour.

Therefore, in non-contractual settings firms have to infer if a customer is still active. Most companies define an active customer based on simple rules-of-thumb (for example, eBay defines a customer to be active if he/she has bid, bought or listed on its site during the last 12 months), although researchers prefer to base themselves on statistical models to assess the probability of retention. The importance of retention has led researchers to spend a large amount of time and energy in modelling this component of CLV.

As Calciu (2008:223; 2009:261) explains, the 'always a share' behaviour is the alternative scheme to 'lost for good' in what is known as a dichotomy. CLV here comes not only from surviving customers but also from customers allowed to reactivate after a given number of inactive periods. Customers are considered 'lost for good' only after exceeding that number of successive periods of inactivity. By reducing the tolerated number of successive periods of inactivity to zero, the 'always a share' model reduces to the 'lost for good' model. Therefore and as a conclusion, 'lost for good' is a special case of 'always a share', a more general and complete model (Rust *et al*., 2004a).

As an extension to the previously mentioned non-contractual setting, where firms cannot know when a customer becomes inactive, intuitively firm managers can apply rules (conventions) based on the RFM amount of past purchases in order to decide whether or not a customer is still active. By fixing RFM states, based on past behaviour, transition probabilities from one state to another can be computed and organized into a matrix of transition probabilities in order to form a Markov Chain. A detailed discussion of the matrix approach applied to customer migration is found in the study by Pfeifer and Carraway (2000). Other researchers that use this matrix approach to calculate CLV are Bitran and Mondschein (1996) and Rust *et al*. (2004a).

The third case is a ***(iii) semi-contractual setting*** (Borle *et al*., 2008). Borle *et al*. (2008) selected a special context for their study: membership-based direct marketing company; examples of such companies are membership-based clubs such as music clubs, book clubs and other types of purchase-related clubs. This context has elements of both contractual and non-contractual settings, a scenario that has not been analysed in-depth previously (Singh & Jain, 2007). As in a contractual setting, the firm knows customer lifetime information of past customers with certainty (i.e., the time when a membership begins and the time when he/she ends are known once these events happen for each customer). On the other hand, as in a non-contractual setting both the purchase timing and spending on purchases do not happen continuously or at known periods and can only be predicted probabilistically.

Historical or predictive analysis? (Jackson, 1989b; Kumar and George, 2007)

Starting from the premise that the past dictates the future, there are two different models of CLV: (i) *historical* and (ii) *predictive* (Jackson, 1989). Kumar and George (2007) call this approach to classify studies as such: *the time period of calculation*. It can be finite (historical model) or infinite (predictive models).

The first group of models, ***(i) historical CLV models***, based on customer data available, examine only what happens in the past (e.g., Reinartz & Kumar, 2003; Venkatesan & Kumar, 2004). The second group of models, ***(ii) predictive CLV models***, as a result of historical perspective, they want to discover what will happen in the future under similar conditions (e.g., Gupta *et al*., 2004; Malthouse & Mulhern, 2008).

The models that try to calculate the long-term value of the financial contributions of a customer always include a retention rate, a time horizon of the study, or both. Since retention rates are generally less than one, some researchers state that the research time horizon should be infinite (Gupta *et al*., 2004). In theory, CLV models should estimate the value of customers across the entire customer-company relationship (Benoit & Van den Poel, 2009), although in practice using a finite time period of data from three to four years (e.g., Donkers, Verhoef & De Jong, 2007; Rust *et al.*, 2000), or even shorter time periods (e.g., Hwang *et al.*, 2004), seem to be enough to capture the possible changes in the environment. Therefore, the goal should be to work with a data period that is broad enough to reflect the reality of the marketplace.

Deterministic or stochastic analysis? (Calciu, 2009; Gupta *et al.*, 2006; Villanueva & Hanssens, 2007)

Gupta *et al*. (2006) identify six types of models that researches have usually used to examine CLV components (acquisition, retention and expansion or cross-selling). These models are: RFM models, probability models, econometric models, persistence models (multivariate time series analysis), computer science models (data mining, machine learning and nonparametric statistics) and growth and diffusion models.

In particular, the ***deterministic equations*** in which the terms are entered directly in the calculation of CLV are used in the first analysis (e.g., Dwyer, 1997; Berger & Nasr, 1998; Blattberg & Deighton, 1996). These models adopt simplified calculations that ignore heterogeneity of individual customer response probabilities (e.g., customers' retention and/or customers churn rates within a cohort), producing formulas that can be easily used by managers and solving a greater number of managerial problems, but in a way purely descriptive. The deterministic models include (i) *RFM models* and (ii) *growth and diffusion models* (for a review see Gupta *et al*., 2006).

(i) *RFM models* describe customer behaviour based on three variables of customer past buying behaviour or prior purchases: recency (time since the last transaction), frequency (number of transactions during a time period of calculation) and monetary value (of transactions). The simplest models classify customers into groups based on each value of these three variables (e.g., Kahan, 1998; Marcus, 1998; Miglautsch, 2000). In the same vein other studies use weights to each RFM variable to assign different levels of importance to these RFM variables (e.g., Hu & Jing, 2008; Liu *et al*., 2011). RFM models provide enough statistical rigor to serve as a basis of a CLV model (Fader *et al*., 2005), but have been criticized (Reinartz & Kumar, 2003; Venkatesan & Kumar, 2004), because they have certain limitations. For example they predict the behaviour only for the next period, RFM variables are considered imperfect indicators of actual behaviour, ignore the effect of other variables (such as marketing activities undertaken by the company) and do not offer the monetary amount of customer value as a model output. These limitations have been overcome incorporating RFM measures in CLV models through stochastic modelling approaches (e.g., Abe, 2009b; Borle *et al*., 2008; Fader *et al*., 2005; Pfeifer & Carraway, 2000). Pfeifer and Carraway (2000) are between the first researchers that solved these limitations mixing RFM models with CLV concept through Markov Chain Models (MCM). Later, other authors have used other methodologies to mix RFM measures with the CLV concept (see stochastic models in this same section).

(ii) *Growth and diffusion models*, such as the Bass model. This model uses aggregated data to describe the number of customers who are likely to acquire by company in the future (Gupta *et al*., 2004) or the direct value (profitability) and indirect (word of mouth) of lost customers by the company (Hogan, Lemon & Libai, 2003), among other applications.

A ***stochastic process*** is used to characterize a sequence of random variables (stochastic) that evolve in terms of another variable, usually time. Each of the random variables of the process has its own probability distribution function and among them, they may or may not correlate. Stochastic CLV models bring much more precision to CLV calculations by considering customer heterogeneity (e.g., in retention and/or in churn rate). In the framework of stochastic modelling related to CLV, we could find four types of methodologies used by researchers to model the drivers or components of CLV, i.e., acquisition, retention and margin expansion (e.g., cross-selling and up-selling) (for a review see Gupta *et al*., 2006). These methods are: (i) *probability models*, (ii) *econometric models*, (iii) *persistence models (time series analysis)* and (iv) *computer science models*.

(i) A *probability model* is a representation of reality in which the observed behaviour is modelled as a stochastic process governed by an unobserved or latent behaviour, which is different among individuals according to some probability distribution. This is used to describe-predict behaviour. One of the first models in this category explicitly used to estimate the variable P(Alive) as a component of CLV in a non-contractual setting was the Pareto/NBD (Schmittlein, Morrison & Colombo, 1987; Reinartz & Kumar, 2000; 2003). Also within this category are Markov Chains (Libai, Narayandas & Humby, 2002; Rust *et al*., 2004a) used to create models of buying behaviour. Recently some researchers have used another type of probability models called Hierarchical Bayesian approach to estimate CLV (Abe, 2009b; Borle *et al*., 2008).

(ii) *Econometric models* share the same philosophy as probability models. In particular, hazard models estimate customer retention similar to the Pareto/NBD, but applied to another context in which the duration of the customer-company relationship can be measured (contractual or lost for good) (Van den Poel & Larivière, 2004). When trying to model the change, for example between suppliers (if data on competitors is available), again the Markov chains are set up as a model to consider that also could be framed within this group.

(iii) When you have enough time series data, *persistence models* make possible the processing of such data (e.g., VAR models, unit roots, cointegration). In particular, the VAR methodology has been used in the context of the CLV to study the impact of advertising, discounts and product quality on CE (Yoo & Hanssens, 2005) and to examine differences in CLV between customers acquired through different marketing channels (Villanueva, Yoo & Hanssens., 2008).

(iv) The application of computer *science models* (e.g., data mining, machine learning and statistical non-parametric) for the calculation of CLV (Neslin *et al*., 2006) is configured as a prolific research stream, since they are able to deal with large amounts of data (variables) providing results with high predictive ability. As indicated earlier in this article, in the marketing discipline more importance has traditionally been given to the parametric statistics (based on theory and easy to interpret). Therefore, computer science models should be explored and exploited in the future.

Source of data (Villanueva & Hanssens, 2007)

Villanueva and Hanssens (2007) propose a comprehensive typology of CE models based on the data source for analysis, with the following categories: (i) *internal databases*, (ii) *surveys*, (iii) *company reports* (public information), (iv) *panel data* and (v) *managerial judgments*. The type of data available for each company often depends on the type of relationship with customers as well as determines the unit of analysis, as we explained below.
Companies with a ***(i) database of customers*** are those whose relationships with their customers are governed by a contract and they have data about individual customers (Venkatesan & Kumar, 2004; Verhoef & Donkers, 2001). These kinds of data allow the calculations to occur at the individual level, to get individual CLV. If no information is available from databases, a ***(ii) survey*** that collects customer perceptions is another important source of information for each individual customer (Rust *et al*., 2004a), which allows gathering information even on competitors and implementing a CLV model through modelling techniques less complicated than if we had a customer base. This type of data is configured as an important information resource for small businesses, which often have less access to database technologies. If the company pursues only the objective of assessment, it is enough to have data from ***(iii) public reports***, such as financial statements (Gupta *et al*., 2004; Gupta & Lehmann, 2003). These data collect and aggregate information, enabling analysis at an aggregated level (i.e., aggregated CLV). When customers switch brands frequently, it is interesting to collect ***(iv) panel data*** with the effect of competition at an individual customer level (Yoo & Hanssens, 2005). Finally, ***(v) managerial judgments*** themselves are also configured as a possible source of aggregate information (Blattberg & Deighton, 1996; Ryals, 2005).

Is effect of competition included? (Villanueva & Hanssens, 2007)

Despite the fact that including the effect of competition in the calculation of CLV could enrich the results (e.g., Reinartz, Thomas & Kumar, 2005; Yoo & Hanssens, 2005), most models have not explicitly included this information, because it is difficult and expensive to obtain (e.g., Villanueva *et al*., 2008; Ryals, 2005). This effect of competition has been measured through perceptions, collected by customer surveys and modelled by Markov processes to study, for example, brand switching (Rust *et al*., 2004a), or also modelled by data panel and time series analysis (Yoo & Hanssens, 2005).

Level of aggregation in the CLV calculation (Kumar & George, 2007; Villanueva & Hanssens, 2007)

About the level of aggregation in the CLV calculation, two approaches have been developed for the assessment of customers. A company may (i) *calculate the total value of its customer base from aggregate financial measures*, at a global level or by customer segments (e.g., Berger & Nasr, 1998; Blattberg *et al*., 2001a; Gupta, *et al*. 2004; Rust *et al*., 2004a), or (ii) *calculate the value of each individual customer from the transactional history of each one* (e.g., Kumar & Shah, 2009; Lewis, 2005; Venkatesan & Kumar, 2004; Verhoef & Donkers, 2001). Based on the level of aggregation in the data, the estimation objectives could be diverse (for recent reviews about this topic see Kumar *et al*. (2004), Kumar and George (2007) and Malthouse and Mulhern (2008)).

When companies perform ***(i) calculation of average CLV from aggregate measures***, the most common application has been to determine how much to invest in acquiring new customers, as well as retain existing ones. Such investments should not exceed the CLV (e.g., Blattberg & Deighton, 1996). Another important application is the estimation of the value of the customer base as an intangible asset of the company, in particular by assessing competitors using public data such as annual reports and financial statements (e.g., Gupta & Lehmann, 2003). Finally, firms use aggregate CLV to calculate the market value of a company with which to base decisions on mergers and acquisitions (e.g., Gupta *et al*., 2004).

On the other hand, when companies perform ***(ii) calculation of individual CLV from individual measures***, the most frequent applications have been the calculation of the duration of profitable lifetime of customers (e.g., Reinartz & Kumar, 2000) to obtain optimal methods of resource allocation to optimize CLV (i.e., prioritize and select customers based on the variables that explain differences in the duration of profitable lifetime of customers (Reinartz & Kumar, 2003)); or allocate marketing resources to individual customer, choosing the best mix and frequency of marketing contacts to each customer (e.g., Drèze & Bonfrer, 2002; Venkatesan & Kumar, 2004).

Therefore, the lifetime value of customers can be managed (i) at an *individual* or (ii) at an *aggregate* level. In the first case, the marketing actions depend on the individual customer value and in the second case marketing decisions are evaluated based on their impact on the whole (global or segments) of the customer base (CE). Empirical studies have shown that customer value is usually not constant (Mulhern, 1999). In some cases, following the Pareto principle, 20% of customers can generate over 80% of profits (Stahl, Matzler & Hinterhuber, 2003). Moreover, researchers frequently find that the top 20% of customers generate between 150% and 300% of total profits; the middle between 60% and 70% of customers just about break-even; and the bottom between 10% and 20% of customers makes the firm lose between

50% and 200% of total profits (Kaplan & Narayanan, 2001; Lingle, 1995). If the company loses the top 20%, they will lose their most valuable customers. This fact will have a negative impact on the business and managers should know precisely which customers should be targeted for acquisition or retention efforts.

Conclusions and suggestions for the CLV and CE calculation

Customer value, considered as an important firm asset, has been measured through different techniques, such as Customer Profitability (CP), Customer Lifetime Value (CLV) and Customer Equity (CE). Within this research the importance and validity of CLV and its aggregation (i.e., CE) measures have been highlighted to assess the customer-base and, by extension, the firm. For this reason, and given the great number of CLV and CE models developed until now, a classification of a set of published researches about CLV and CE models is performed according with several criteria, such as *type of relationship between customer and company*, *if the analysis is historical or predictive* and *deterministic or stochastic*, *source of data*, *if the effect of competition is included* and *level of aggregation in the CLV calculation*. This classification serves as a guide to key requirements for developing these types of models.

Additionally, in this research it has been posited that customer valuation is mainly based on the principles of contemporary finance of assets' valuation, more precisely the discounted cash flow (DCF) method. CLV (and by extension CE) has been differentiated from CP and DCF, but the main idea that emerges from these related techniques is that CLV borns from these financial measures (that is DCF and CP). According to this financial origin of CLV-CE, researchers should consider these two important aspects: (i) *how to calculate the monetary value that each customer brings to the firm* and (ii) *how to calculate the present value of this monetary value*.

According to (i) the first idea, some researchers argue that CLV is based on the difference between customer revenues and costs (e.g., Calciu & Salerno, 2002; Mulhern, 1999), while others propose contribution margin as this monetary value (e.g., Berger & Nasr, 1998; Malthouse & Blattberg, 2005; Reinartz & Kumar, 2000). Nevertheless, according to the financial theory, the value of any asset is the present value of its cash flows over time (i.e., cash inflows minus cash outflows), issue that few researchers have accurately applied in their CLV models (an exception is Buhl and Heinrich's (2008) research).

According to (ii) the second idea, it is also needed a discount rate to estimate CLV used to transform expected future cash flows into a present value. The discount rate has to reflect the riskiness of the cash flows (Damodaran, 2002). Some researchers argue that discount rate is based on the lending rate that is appropriate for the time of the study (e.g., Venkatesan & Kumar, 2004), or depends on the general rate of interest and is normally proportional to the treasury bill or the interest that banks pay on saving accounts (Kumar, 2008: 48). Nevertheless, according to the financial theory, the Weighted Average Cost of Capital (WACC) is the method used to discount customer cash flows (Ryals & Knox, 2007).

Therefore, two important suggestions emerge from the two previous paragraphs: (i) the present value of future cash flows over time is the most suitable technique to calculate the numerator of the CLV formula (i.e., monetary value that each customer brings to the firm) and (ii) WACC is also the most appropriate method to get the discount rate.

On the other hand, despite the fact that the assessment of customer is an important trend in various disciplines such as accounting, finance and especially in marketing, multidisciplinary approach is needed to complement the models developed to date, establishing a dialogue between marketing and finance (Bauer & Hammerschmidt, 2005; Wiesel *et al.*, 2008), as well as dialogue between marketing and the discipline of computer science (Gupta *et al.*, 2006; Rust & Chung, 2006), to integrate their modelling with the marketing measures. In this research it has also been noted that finance is an important support to calculate CLV-CE, although continuous advances in information and communication technology have also had an important role in the development of this framework. They have allowed companies to collect large amounts of customer data at a reduced cost and consequently, these companies have been forced to acquire skills to store, share, analyse and transfer valuable information from this data. The objective is to guide marketing strategies and gain control (e.g., direct, optimize and automate) over the decisions they make every day (Apte *et al.*, 2003). To aid companies in these tasks, computer science discipline brings advanced (also known as predictive) analytics techniques that combine information on past circumstances, present events and projected future actions to answer questions or solve problems (Bose, 2009). These techniques are applied to get an automated extraction of hidden predictive information from databases, especially in companies with a strong customer focus. In particular, advanced analytics are classified into several groups: data processing, prediction, regression, classification, clustering, link analysis (associations), model visualization and exploratory data analysis. Examples of data mining methods are: statistical methods, case-based reasoning, neural networks, decision trees, rule induction, Bayesian belief networks, genetic algorithms/evolutionary programming, fuzzy sets and rough sets. They are used in combination with one another to gain information, analyse information and predict outcomes of the problem solutions (e.g., in the areas of sales forecasting, direct marketing, customer acquisition, retention and extension purposes and marketing campaign analysis). Therefore, managers also can use advanced analytics with data mining to model CLV-CE and to get more accurate analysis.

Future research streams to treat CLV and CE as an integrated framework

The first suggestion

The first suggestion before starting to develop a CLV-CE model is to define the objectives of the research clearly. In other words, the researcher should determine the model output that is to be achieved in order to select the most appropriate analysis methodology. Additionally, researchers should not restrict the clarification of these objectives to the available data; instead they should determine data requirements once defined as the objectives of the research (Kumar & George, 2007) in order to not limit themselves.

Developing simple and comprehensive models

Furthermore, despite efforts from researchers to drive the implementation of customer value management and the related models –for instance through churn tournaments (Neslin *et al*., 2006) or implementing NBD-models in Excel to facilitate their usage (Fader *et al*., 2005)– practitioners are still reluctant to adopt the suggested models. To alter this, researchers have to clearly demonstrate and communicate that their models outperform the heuristics typically used by practitioners. Also, researchers have to continue their efforts to make their work more accessible, by for instance implementing their models in standard software. It is also desirable that more marketing executives put the models and heuristics they use at the moment to the test and consider implementing the state of the art models (Verhoef, Van Doorn & Dorotic, 2007).

Taking into account a larger number of variables

From our examination of the studies focused on CLV it has been shown that CLV is often operationalized by considering retention as the only relevant source of value (e.g., Gupta *et al*., 2004). Many studies have ignored the contribution of other behaviours, such as service usage and cross-buying to business performance (e.g., Blattberg *et al*., 2001a). Database marketers are an exception because they have incorporated additional sources of value into their calculation of CLV (e.g., Hughes, 1996; Wayland & Cole, 1997), although many such studies focus on predicting the future CLV of customers rather than predicting the underlying sources of value or customer purchase behaviours. It is considered an important future research stream, because inattention to underlying sources of customer value (e.g., not taking into account the level of usage of a service or the additional revenues from customers' cross-buying additional services) can have substantial consequences for the business performance of service companies (Johnson & Selnes, 2004). In particular, a remarkably way to predict the underlying sources of value or customer purchase behaviours is through CUSAMS (customer asset management of services) framework, proposed by Bolton. (2004) (for more details see section 3.1. Customer Lifetime Value (CLV)). The goal of this model is to make a comprehensive assessment of the value of the customer assets (through length, depth and breadth of the relationship) and to understand the influence of marketing instruments (e.g., price, service quality programs, direct marketing promotions, relationship marketing instruments, advertising/communications, distribution channels) on them and thereby on CLV.

CLV-CE as an input for segmentation

Predictions about the CLV are an important input to target customers for special treatment, which is a central operational tactic of relationship management (Drew, Betz & Datta, 2001). More valuable customers should be treated in special ways in order to retain them, thus enhancing profit production and increase the profitability of a company. However, less valuable customers should be offered a product or service that is less costly to provide.

A proposed path to develop a CLV-CE model

As a conclusion, following a path through the different criteria that we have explained in section 4, it has been established new research streams choosing a category for each criterion.

Firstly, according to the criterion *type of relationship between customer and company*, it depends on whether a company knows the length of the relationship between customer and company (lost for good, retention, contractual) or not (always a share, migration, non-contractual). Therefore, in this first case we cannot select only one choice, because this is an individual assumption of each researcher. Secondly, according to the criterion *if the analysis is historical or predictive*, the most interesting choice is to develop a predictive analysis, it is the only way to obtain predictions into the future and calculate CLV-CE estimations more accurately. Thirdly, according to *if the analysis is deterministic or stochastic*, the choice is stochastic because is the best solution to take into account heterogeneity between customers through, for example, probability models. Fourthly, about *source of data*, a company database offers the possibility to work with objective measures. Regarding survey measures (such as satisfaction) a cautionary note has been placed because they are ambiguous, subjective and backward looking, then they have some drawbacks to be used in isolation to estimate CLV. Another possibility is to combine company database and survey measures, but is a more expensive choice. Fifthly, about *if the effect of competition is included*, we posit that although most modelling approaches ignore competition because of the lack of competitive data, if you can take them into account you could enrich the results of the model because is a way to consider the context outside the company. Finally, according *level of aggregation in the CLV calculation*, we suggest using individual data to get individual CLVs. A customer is the smallest unit to analyse, therefore estimations should be made at this level, although after that a segmentation scheme is possible (see point d in this section).

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