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CUSTOMER LIFETIME VALUE | Business Intelligence & Analytics

Welcome back to this module on customer analytics as a part of the Business Intelligence and Analytics course. We started off discussing the importance of customer analytics in any organization, any business functions for a market and it is customer need that drives any business. There is no business without a customer and customer is a customer because customer has a need. So, customer need is the heart of a business. So, sometimes a business or a smart business creates need for the customer, sometimes a business understands needs of the customer. So, and based on the need that exists or that is created a business tries to fulfills, fulfill that need and that is the value proposition to a customer.

A value that a business creates for a customer is to meet a need or a want of a customer, that is at a philosophical level. Now, since a business exists for customers primarily, how can a business through analytics develop better understanding about the customer, customers needs and customers characteristics and based on that position itself or plan its strategies at customer level or customer segment level. We call it if it is done at customer level individually, we call it personalized services or personalized products. If it is done at customer segment level, we call it customized services because it is for a group of customers, not for an individual customers.

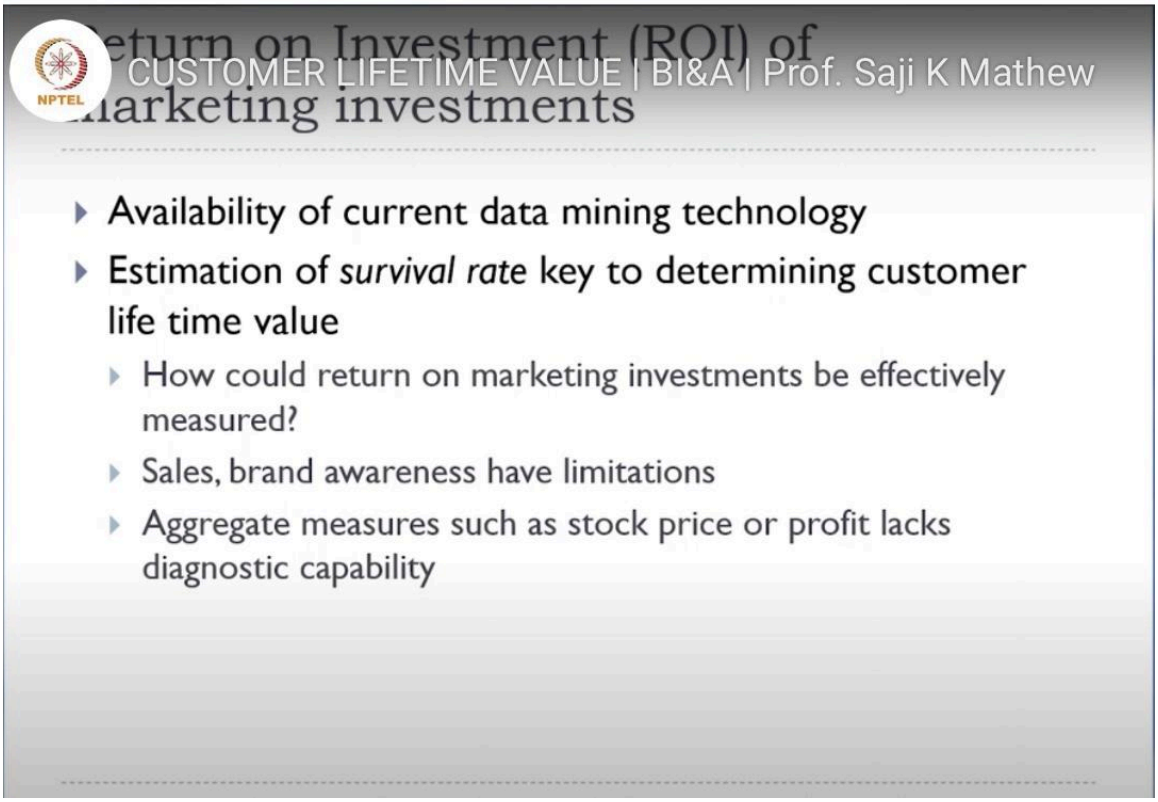
So, there are different strategies in marketing to address the needs of the customer, to reach out to the customer etc. So, our enquiry in this course is how can analytics help or what are some important analytics techniques that can inform decision makers especially in marketing and finance. That is what we are going to see through this module today. But we have already seen an aspect of customer which is customer survival. So, we discussed hazard and survival already.

And we now understand that each customer has a tenure, a customer may stay with the business for some tenures or a customers may continue to be with the business, if the customer is satisfied for long time. So that is called customer loyalty. So, customers become loyal not because they are born to be loyal all the time, but also because what the business actually does, understands and meets the needs of the customer and therefore, that leads to investment in customer relationship management. This is an

aspect that we have seen and why it is important, why loyalty, how, why and how loyalty pays back is something that we have already seen conceptually. So, today's topic is titled lifetime value analysis.

Or in short, in literature, this may be written as LTV, lifetime value. Or is it in some literature, it may also be written as customer lifetime value, where the life and time are written together, then it will be, CLV will be the short form for customer lifetime value, CLV and LTV in my session, I will treat these two terms are similar. When I use LTV and CLV, I mean the same concept that is understanding or capturing the value in quantifiable terms, value means it is, it should be quantified,in quantified terms, that is over a future span of time. A customer has contributed to a business over the last few tenures. That is one and based on that, how can you project, what would be the future returns from a customer? Future means we have to define a horizon.

And the basic assumption here you can see as in all analytics that we assume that future will be a function of past. Future projection is based on historical data or history repeats. So, that is assumption that we will make in CLV. So, we look at the characteristics of the customer in the past and make a projection for the future. And why it is that, why is it important? It is important because decision makers in marketing can actually take informed decisions about customers and customer segments, as to what kind of plans and how much should be invested in a customer etc for customer retention.



So, these are some of the broad aspects of the discussion that we are going to have. And once I cover these topics at a conceptual level, I am going to take an example. So, this is just an example to illustrate the CLV calculation and how that is useful.

So, the driver for CLV or customer lifetime value. Number one, it is the availability of data and availability of data mining techniques. We have already seen the drivers for analytics and data science today. It is because plenty of data, historical data is available. And we also have technologies and algorithms to analyze them. If we did not have that kind of plentiful data, then we cannot do customer analytics because a business which is into B to C, business to customer. And the C can be a large volume business as an e-commerce.

And when you have millions of customers say in a country, then it becomes a huge challenge to analyze customer transactions, which may run into millions of records in a month. And how can you extract insight from millions of records unless you have the data storage technologies, data analytics technologies and so on. So, essentially what I am saying is to derive insights from sheer customer transaction raw data. Today we have technology and therefore, CLV has evolved as a method for estimating customers lifetime value over a, I would say in the last two decades, in the last two decades. So, and it is widely used as we are going to see.

Now, we have already learned survival, survival as a concept and where do we actually get an estimate of customers survival or survival rate, we have seen that downward trending slope, downward sloping , downward sloping curve, which is typically used to depict the survival rates in terms of tenures at the x axis. So, there is a survival pattern for every customer segment. And that pattern can be quite, you know, predictable as a ratio sometimes, and sometimes it can be a downward sloping curve, but not very linear. But this can be, this can be extracted from historical data, and the survival rate can be estimated. And this is, thanks to data mining.

Again, I am stressing that point, we can extract survival information from customer transaction data due to mining techniques. Of course, we have seen this is nothing but descriptive analytics. So, you can use queries to extract this data and that is quite possible if you have data. And why, so that is one aspect of the driver. So, we have data available, we have data analytics techniques available. And then why would business be interested in doing this. And that is the other key point, that business needs to understand the value of a customer from two perspectives. One is the customer value or CLV. CLV, why is it important? One is to plan, plan investments. How in, to what extent a company should invest in loyalty for a given segment of customers with a particular CLV or customer segmentation based on loyalty etc.

CLV is a useful concept. And it is a useful value, of course. Sorry, the other aspect why CLV is important is that, that is the finance perspective. Firms invest hugely in marketing. So, how can marketing investments be justified? And that is a very, very, very important, but, you know, a nuanced topic, nuanced in the sense, usually the methods that are used to understand return on investments of marketing are simply sales, revenues, brand awareness etc.

So, well, you can do a survey after making a marketing investment to reach out to customers etc. You can look at, have sales increase based on a marketing investment. For example, you invest in promotions, promoting a product, and then look at the sales, increase in sales that has happened. But we all know that, and literature also supports that, that promotions can temporarily boost sales and revenues, but not in the long term. Sometimes in the long term, it can damage the reputation of the company.

So, you are selling things free or at low cost is not a good image for companies sometimes or especially if you are into branded products. Therefore, sales in itself cannot be a predictor of the value of return on investment of marketing investments. So, what could be a wholesome measure or a more reliable measure that can be useful for management, especially for finance and marketing together? How can the return on investment in marketing can be assessed better? Plus, so, in order to assess return on investments or marketing. That is the second aspect of CLV. This is also important, because any assessment process should also inform the management about what is going wrong or what is going right or what we call as diagnostics capability.

An analytics process or an assessment process should be helpful in informing the management where action should be taken to, for course correction. So, for example, if marketing investments are not returning, well, what is wrong? And what is the reason why the return is not happening? Or in other words, is investment happening at the right point? Are we addressing the right problem? So, the diagnostic capability is also important. And that is where sales, brand awareness, aggregate measures like stock price, profits etc, may not be useful because they can be very temporal and may not sustain. So, that is where the value of CLV comes in. And also I must tell you, why is marketing investment seen as an important topic? So, we should think about that also.

If marketing investment is not a big focus for organizations, then we should not spend our time studying CLV. But how much do firms typically invest in marketing? Okay. You look at publicly, data available in public, so 5 to 25 percent of the revenues of the organization goes into marketing. So, that is a major investment. And oftentimes, this is something I challenge you, you can go back and check the annual revenues, investment in, investment in marketing versus investment in R&D.

Where does firms invest more? So, you will find and this will be more true for Indian firms. Investment is more in marketing than in R&D. Look, I recently looked at the data of Microsoft. We expect Microsoft is, to be an R&D organization, it is a product company. And therefore, it brings new products or products or services into the market.

And therefore, a lot of research must be going on behind Microsoft's capability to bring new products and services into the market. That is true, Microsoft invest in the year that ended in 2022, the investment in R&D, MS investment in R&D was about 24 billion US dollars, US dollar 24 billion. And what about this is R&D, Microsoft, what about marketing? It was about dollars 23 billion. This is year 2022. I access this data from sources in public domain.

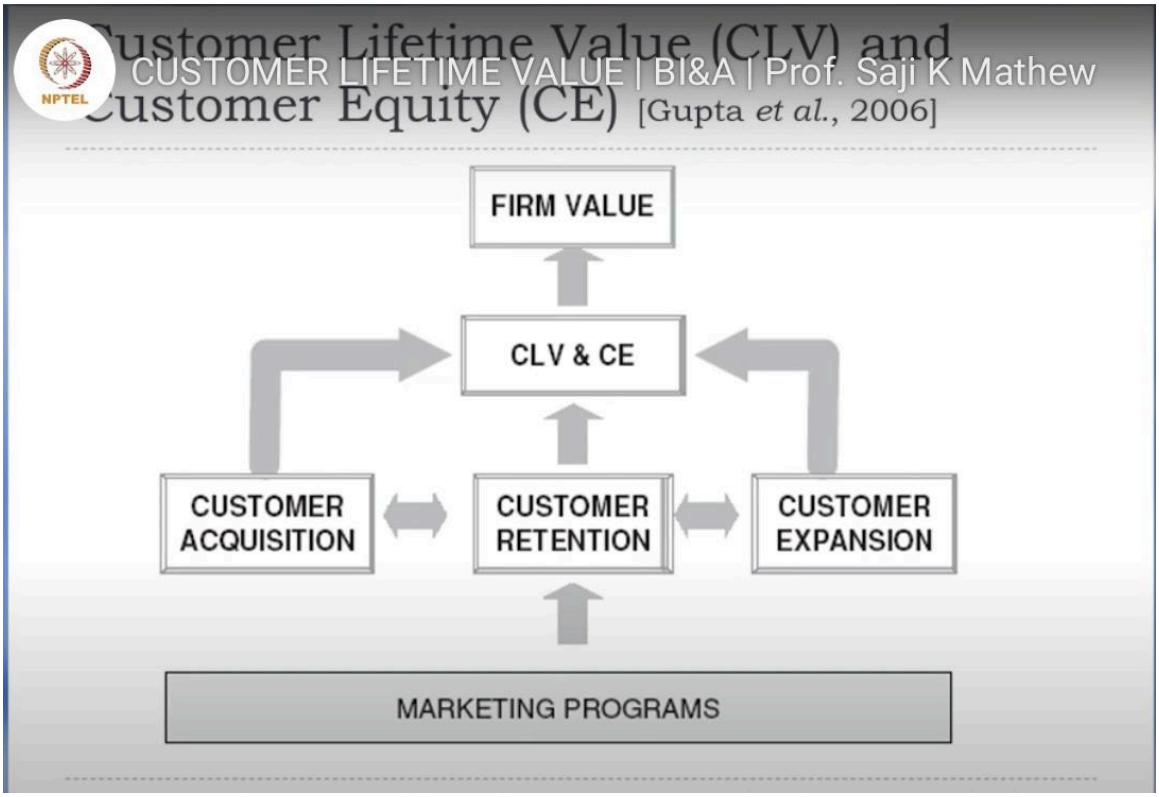
So, it gives us a sense of the importance of investment in marketing. It, a technology company like Microsoft, which you expect does not require any marketing investment is investing as much as, as much money as it invests in R&D as in marketing. So, these are actually huge cost for companies. Marketing is a huge cost element. And therefore, from a business perspective, it is important for firms to understand how these investments are coming back, returning value to the business.

Any investment a firm makes is to get returns. Return on investment in finance is a very important aspect. No firm will invest money without expecting returns. For example, if it invest 100 rupees on a project, there has to be a rationale provided to the investment decision, decision makers, that how the 100 rupees will come back over a horizon of say, 3 years or 5 years, the 100 rupees should come back as 150, 170, 180, 190. So, that is a measure, that is measured using the ROI analysis, return on investment analysis, that is finance.

So, essentially, we are building a rationale for understanding what is CLV. So, we need to have a measure, a overall measure of return on investment of marketing. And how can analytics help? That is the problem that we are looking at. And we see that current measures or, you know, sales and profit etc, lack the information to direct the investments of the organization in a, in a, in an intelligent way. Okay, so, so, in short, I am actually quoting from the research paper published by Gupta and others in 2006, who actually, who actually gave also a good review of how firms worldwide are adopting CLV as a measure for understanding and of course, planning for marketing investments.

So essentially, if you look at a firm as a whole, and from the marketing perspective, there are three activities that any, any marketing department engages on. Number one is

acquiring new customers, customer acquisition. Acquiring new customers means there are customers who are in the list of a company's competitors. They have to be wooed, they have to be attracted to the products and services of your firm. And that involves investment, that is called customer acquisition.



And customer retention. Once you acquire a customer, the customer should continue business with your business. And that is retention. This is something that we already discussed in connection with survival analysis, because retention brings value. And unless customers are retained for a reasonable period of time, the firm does not benefit sufficiently. And therefore, investment in customer retention is very important and that is another investment that happens or another budget that marketing department will have. So, one budget for customer acquisition, second budget for customer retention, and third is for customer expansion. Customer expansion meaning existing customers are buying some products, how do you make those customers buy more or how do you make those customers enter into different categories of products and services that the firm offers. So, that is expansion, customer expansion, making the existing customers buy more.

That is also an investment. If you look at e-commerce, you know recommender systems. So, recommender systems are defined, designed to personalize recommendations to

customers so that existing customers alongside what they buy now, they buy more. So, you know all these are investment. Developing analytics itself is an investment. So, you can see 1, 2, 3, 3 areas where marketing investments go.

So, if you look at firm's marketing budget, total budget, say X or as we saw in the case of Microsoft say 23 billion dollars, it must be falling into 3 categories essentially. That is the meaning here. Now, as we said, overall investment happens this way, but from this investment, the firm should be getting benefits or getting returns. Returns should flow into the firm, whatever investment is made in recommender systems, for example, should return value to the firm and that is a business value, that is how business benefits. If it does not happen, it is a dead investment and it is not for fun that actually Amazon develop, they will invest in recommender systems, but it is to get return on investment.

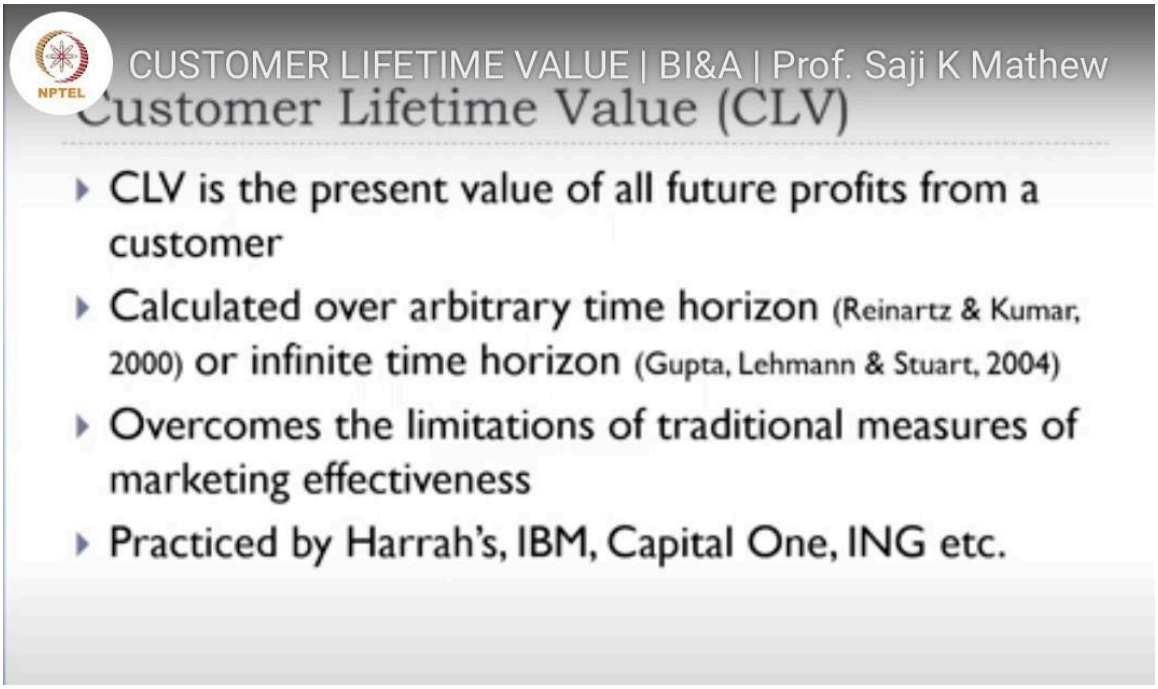
So, therefore, the return should flow from all the 3 investments. And the question in front of us is, how can return on investment be measured effectively and in particular with diagnostics capability and not looking at the past alone, but also looking at the future potential of customers, which can be more useful information for a firm to plan and make its future investments. And therefore, you know, any budgeting requires planning, as you are aware in finance. So, this is an information that is useful for firms to make their plans and make informed decisions in budgeting. And therefore, the idea of CLV or a customer lifetime value.

And the point I want to stress here is CLV is done at customer level or at single customer, individual customer level. So, the unit of analysis is a customer, it is done at customer level. If you say CLV for a customer, CLV is say 100, INR 100, just a value. What is meant is not that the customer base as a whole is returning 100 rupees, but it is for a single customer, it is for a single customer that you calculate CLV. So, the level of analysis is individual, but there is another concept related concept called customer equity.

Or you know, it is very intuitive term because it is customers equity in a firm. And that is the sum, that is the aggregate CLV over entire customer base. If you aggregate the CLV over its entire customer base, from a level of individual customer when you go to the entire customer base, then it actually becomes customer equity. So, you need to calculate of course CLV first only then you can actually compute customer equity.

And that actually becomes an element of firm value. Those in finance would understand firm value is the value of the firm as a whole and there are measures for it like Tobin's Q and many other techniques which have been developed. So, here in this session, we are looking at the importance of CLV as a measure for understanding firm value as customer

equity, through the lens of customer equity and CLV is a analytics concept. CLV is nothing but analytics, CLV is actually calculated from historical transaction data stored in databases. So, the calculation of it is nuanced and that is again, I will get into it very shortly. But before doing that, it is important for the learners to know that what you are doing when you work on a CLV project is that you are going to understand the customer s equity in a business through that measure.



And that is why CLV has received a lot of attention in research in different disciplines, like finance and marketing. So, this is a very important topic as far as customer analytics is concerned. Now, from a broad level of looking at CLV, let us go to a more specific level in terms of understanding what is CLV and how CLV can be calculated or estimated because CLV is an estimate for the future. So, and therefore, there is probability involved in this. And we will look at how this CLV estimation can be done for a given information.

We start with some basic data and then we will see how CLV can be estimated. So, first of all, CLV is the present value of all future profits. So, there is a present value concept in finance, present value and net present value. So, if you, the understanding here is, if you make an investment today, okay, today's investment returns, create returns in future, then there is a value of that investment today and there is also an interest on that investment. Any investment in finance incurs money, incurs interest over time.

Time means money, time means interest. So, if you spend 100 rupees today and the

return is going to come only after 2 years, then you are not investing just 100 rupees today, but the interest for 2 years for that 100 rupees. And that is, that should be factored in when you calculate the present value of future returns, the present value of future returns, because 100 rupees today is not 100 rupees tomorrow, you need to pay interest for it. And therefore, in other terms, the future returns should be discounted, because you are not getting the returns today, return is going to come in future. Therefore, future returns should be discounted according to some interest rate of the capital, you are investing capital and therefore, it has to be discounted, the return should be discounted based on the interest rate. That is the basic concept that runs behind the ROI analysis, return on investment analysis and present value and net present value concepts.

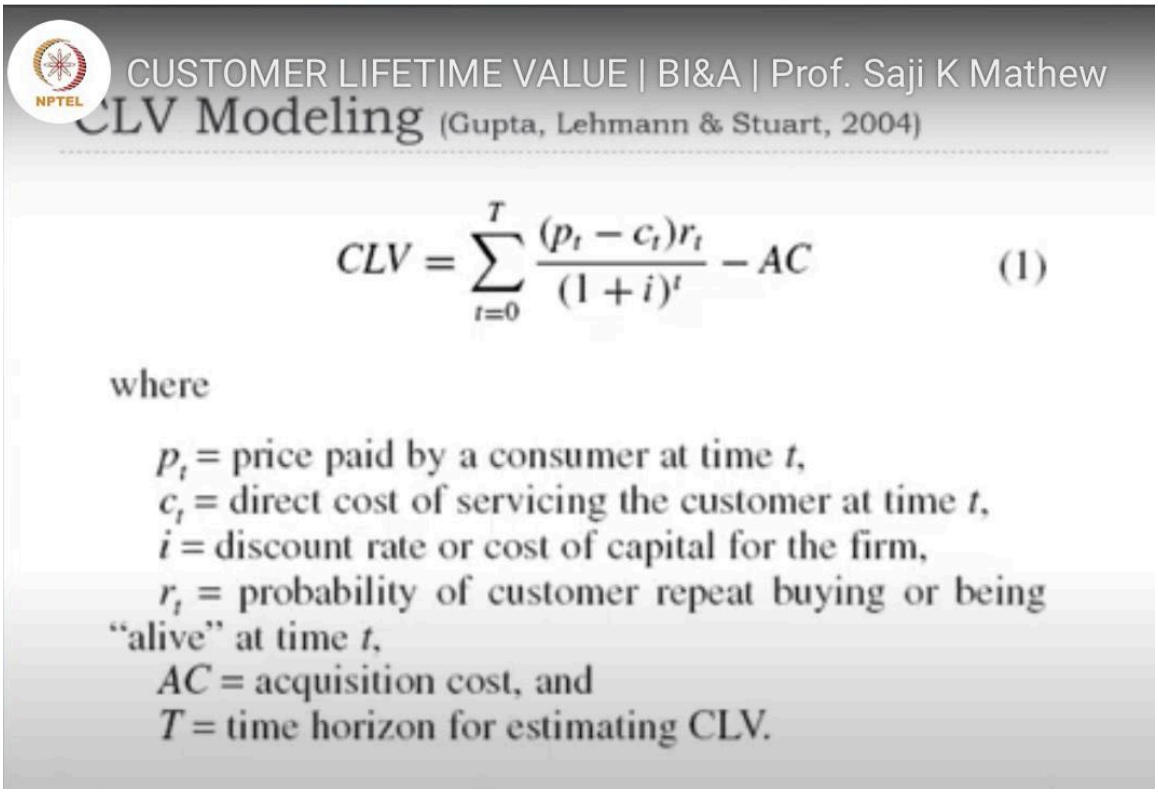
This is finance. And I am not the expert, but I am only using very fundamental concepts for any project that you invest in. Some of you may have done this exercise because we have to show the ROI for project, in project proposals. So, CLV is the present value of future profits from customer. So, and it is calculated over arbitrary times horizon or infinite time horizon. A time horizon actually means what is the future time period that you are looking at in making your calculations.

For example, you can look at 3 year period, you can look at 5 year period, you can look at 8 year period, or as some scholars suggest, you can look at, you know, entire lifespan of a customer. You know, practically, if you do this, you will see that the returns actually become very negligible after 8 years because of the discount rate. And therefore, you know, one could follow one of these methods, either say look at 5 years and that is good. And that gives you a sense of how profitable a customer is going to be. And instead of looking at longer periods. That is a choice that the decision maker or the analyst makes.

And as I said, the CLV estimate actually overcomes the limitations of measures for, you know, the traditional marketing effectiveness measures. And it is widely used. There are case studies on CLV. And I am not going to take any specific case study, I am just going to give you a very fictitious case. Of course, this, of course, connects with reality, but to my idea is to sort of illustrate this and not take you to any specific company and company data etc. which can be proprietary.

Okay, welcome back. Now, having learned what is CLV and the importance of CLV, we are now going to get into doing CLV analysis. And CLV or customer lifetime value analysis requires a method and it also requires algorithm or a formula. And it does exist in literature. And of course, CLV is a broad topic. And therefore, this is not the only formula that is available in literature.

But I am just drawing upon the work of Gupta and others in order to illustrate how CLV analysis can be done using this method. And this, of course, is very comprehensive. And it illustrates all the aspects of CLV that we already discussed. So, CLV is given by the sum of these terms over 0th year or the year of investment to t th year, t is the horizon, you can see t is the time horizon. So, it could be as I said, it could be 3 years, 5 years, 8 years, or infinite time horizon.



So, you sum up all the returns that has happened from a customer, as I said, the unit is a customer, all the returns that is, that can happen, not that has happened, that can happen, which is about future from a customer. So, textually or verbally, that is what this formula mean. But what goes into the formula is a p_t - c_t for the given time line t, given year, if we go by years, for the year 0, there is a price paid by the customer, or total contribution of a customer, or total revenues from a customer, or the price paid by a customer, that is p_t, that is a positive cash flow. And the negative is the cost, the direct cost of serving the customer at time t.

In order to serve the customer, there are different costs involved. And that cost of production is the, is the c_t. So, revenue minus cost is the contribution, or the profit in other terms, profit in that, as far as that difference is concerned. So, there is a p_t -c_t,

which is becoming the contribution from the customer. And then you see another interesting point, or a term in the numerator, which is multiplied by r_t

And what is r_t? r_t is nothing but survival rate. This is survival rate. Here it is termed as a rate for ease of calculation, but it can also be a survival value that you can get from, you can actually get from the survival curve of a customer or a customer segment. So, for each tenure, we have seen that there is a, there is a survival rate. This is percentage survival. So, the probability of a customer being present or being active in a given tenure, that is r_t..

And that is nothing but the survival rate. And we have discussed that already. So, now, this gives us an insight into the importance of survival analysis or the application of survival analysis. That is to calculate the customer lifetime value and in term customer equity in a firm at a very strategic level or at a very higher level of analysis. And so therefore, you can see since it is done at a firm value level etc. this is a very strategic analytics or a calculation that we are doing.

So, r_t that way is a very important term in estimating CLV of customers. So, r_t is multiplied, of course, it is very intuitive, because if you are calculating return for the next year, we multiply it by the probability that the customer is presented in that year. And that gives us the expected value of the customer at that point in future timeline. And that completes the numerator of the formula, the contribution into the survival rate. And what is the denominator? Denominator is easily imagined by anyone who is familiar with present value analysis.

Present value analysis is, you know,$(1 + i)^{t.}$ Interest rate, interest rate is i, 1 + i. So you add a discount, basically the return is discounted by this term, it is in the denominator. So you are applying a discount rate, because your future return is not today. And therefore, when you make investment today, future returns need to be discounted. And as the year increases, you can see that the discount rate also multiplies, you can see that in this denominator term.

And this is just borrowed from ROI analysis in finance. So, and therefore, this is established method in finance. But the difference here is, you know, it is not just a discount rate, it is not just a return on investment calculation that is typically done in finance, because you will not have this term or the survival rate. So, when you apply it to the customer's future returns, customer survival also becomes important. And therefore, well, it is return on investment analysis, but it is more nuanced in the sense more detailed, or it involves a factor of customer's survival as well.

And that is how the formula is designed. Now, I have explained all the terms, i is the interest rate, t is of course time, $p_t - c_t$, price minus cost into survival rate. And there is, of course, last of all, there is a minus ac, that is a term that is subtracted just once. And what is that term? It is of course given here in the slide itself, it is a acquisition cost. Acquisition cost is a one time cost, acquisition cost is a one time cost.

A firm invest its resources, which are quantifiable in acquiring a customer. And that cost is also a cost that needs to be deduced from the CLV value, in order to calculate total future returns that the customer is going to make to the business. And you can see, since it is starting from the current year or 0th year and going to future, this is about future returns. Not about past returns, not about today's returns, but it is from starting from today or whichever be your starting point and projecting to the future. But that is, how is future estimate possible without past. So, therefore, you can see that what goes into the formula to make it live is the past, survival rate is actually derived from the past behavior.

p_t and c_t is based on the price paid by the customer in the past and the cost incurred for the customer in the past. So, historical data is the basis for calculation of CLV. That is a very important point to notice here. Now, I am going to conclude this discussion here with a summary of what we discussed. CLV is an important analysis and it follows discounted cash flow as it is very evident from the CLV formula that we just saw in the previous slide.

And it is similar to net present value analysis, but it is also different. It is different in two ways. One is this estimate is not done at a project level, but it is done, it is not at an aggregate level, it is done at a customer level, as I said the unit is a customer. And it incorporates a survival rate, which you do not typically figure in a net present value analysis. So, it is basically drawing upon the net present value concept from finance, but extends this to a single customer and customers future returns based on customers probability of survival.

And there is of course, a fixed cost component, which is the customer acquisition cost. And with this introduction, now I am going to take you to a example. I do not call it a data mining exercise, but some mining is already done, we have some data available. But how do we actually export that data into an NPV spreadsheet and calculate CLV, that is what we are going to do in the current discussion.