

A Fuzzy-LTV Model For Customer Segmentation: A Case Study In Hospital Industry

Arash N. Khalili, Hojat Tayaran

Department of Industrial Engineering, Faculty of Engineering, Tarbiat Modares University, Tehran, Iran
a_k_nasr@yahoo.com

Abstract: In order to get more on the market and sale's situation of a product, classifying customers is a way that can lead you to take a good language for having a long lasting relationship with customers and overcoming on other competitors in the market. There are so many algorithms in business literature, for having a suitable classification. Meanwhile, among these algorithms, the way that specifies value to each customer has been more noticed that is called "Life time value" in business literature. But as you can see, this algorithm has so many implementation limitations. For instance, this algorithm classifies customers by the value they show, and not by the value they have. Also, by having a good classification that company may lose so many high valued customers. Additionally LTV algorithm needs lots of data to make suitable classification that might not be found wherever you want. In presented paper a new LTV model that we called it "Fuzzy life time value model" is proposed and successfully tested on two hospitals. So, they can put strategies for getting better market stocks in hospital industry.

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1. Introduction

Maximizing profit is one of the basic goals in business literatures. Obviously, this would takes place whenever they use a strategy for increasing revenue or decreasing cost.

Customers classification is a branch of Customer Relationship Management (CRM) that can result in revenue increase and cost decrease, simultaneously (Rosset 2003) By classifying customers, that company can raise customers satisfaction and retention. Then, less money is needed for customers attraction. (=decreasing cost) (Jain 2002).

Also, for suitably satisfying Customer, that business can think of making more money in near future (=increasing revenue) (Venkatesan 2004).

Life time value (LTV) model is one of methodologies that can classify customers. This model assigns value to each customer. in this way, classifying customers would be carried on.

Presented paper, proposes a new Life Time Value (LTV) model and customers classification named "Fuzzy-Life Time Value Model". The framework is as below:

In part 2 we will review the main previous studies about LTV. Also, we'll talk about limitation of those studies and try to find a way to solve those limitations. Part 3, suggests a new Life Time Value model and justify proposed method. Also, we will examine that model in Hospital industry and all results will be reported. In part 4, we'll check the validity of proposed method. Finally, we'll summarize all of the research results as well as reporting weaknesses and future research direction.

2. Main Previous works

2.1. LTV Concept

In customer relationship management literatures, value of customer has been studied under the name of Customer Profitability, Customer Equity, Customer Life Time Value and Life Time Value (LTV) (Verhoef 2001).

LTV is present value of all future profits generated from a customer (Jackson 1994).

In much more detail, LTV could be calculated by subtracting cost of advertising, selling and servicing specific customer from revenues have been generated from that customer over the life time of transaction, regarding money time value (Malthouse 2005).

2.2. Models of Life Time Value calculation

There are various models of calculation exist in literature. For instance, Dwyer in 1997 has calculated Value of customers concerning migration and retention behavior of customers.

Hoekstra and Huizingh in 1999 categorized input data and then suggested a conceptual value modeling based on those categories.

Hansotia and Rukstales in 2002 proposed incremental value modeling.

Although there are lots of models about how to calculate Life time value (LTV), but the basic concept of them were on the basis of Net Present Value of profit, a customer makes in the period in which he has been in relationship with that company (Bayon 2002).

In other words, all of those equations stems from this simple equation:

$$LTV = \sum_{i=1}^N \Pi(t) \times \frac{1}{(1+d)^i} \quad (1)$$

Where $\Pi(t)$ is profit function of specific customer. i is the period of cash flow from customer transaction (Gloy 1997). It is much useful to mention that for ignoring sales and cost fluctuation, one substitutes the following equation in profit function.

$$\Pi(t) = R_i - C_i \quad (2)$$

Where R_i is the revenue from customer in period i , C_i is total cost that is needed for generating R_i (Knox 1998).

Using Eq.1, each customer must trace in short period of time. For instance, LTV formula must be monthly calculated for each customer and predicted LTV amount for next month. In this way, customers can be easily classified (Kim 1999).

In 2001, Verhoef and Donkers introduced a new dimension called "Potential Value" model that is previously mentioned. It considers willingness to pay for other products of a company and do not judge customer value only by the product that he had already bought (Malthouse 2005).

Hwang et al., 2004 introduced a new LTV model and complete all previous works. In this model customer defection had been taken into account. With this model a customer who has greater loyalty to a specific business, get higher value than a customer who churns that company in near future.

Equation (3) illustrates this new model:

$$\sum_{t_i=0}^{N_i} \Pi_p(t_i) (1+d)^{N_i-t_i} + \sum_{t_i=N_i+1}^{N_i+E(i)+1} \frac{\Pi_f(t_i) + B(t_i)}{(1+d)^{t_i-N_i}} \quad (3)$$

Where:

- t_i service period index of customer i
- N_i total service period of customer i
- d interest rate
- $E(i)$ expected service period of customer i

$\Pi_f(t_i)$ future profit contribution of customer i at period t_i

$\Pi_p(t_i)$ past profit contribution of customer i at period t_i

$B(t_i)$ potential benefit from customer i at period t_i

Then, four parameters would be calculated. Firstly, it is much better to have a clear definition on them:

1-Current value:

This value means the amount of money that specific customer has already paid for business services or products (Pfeifer 2005).

2-Future value:

From the past contribution profit of a customer, one can predict the profit that customer would make for that kind of business in the future (Hansotia 2002).

3-potential value:

It refers to revenue that would exist if specific service or goods be proposed in the future that has not been proposed, up to now (Hogan 2001).

4-Loyalty period:

To collected data from that customer, business can predict the period in which a specific customer would use their product.

Finally, using specific interest rates, all of those values should be converted to present value.

Practically, what happened in the Last model that is the most complete model in literature is as follows:

- a. A customer will be attracted to a business to meet at least one need.
- b. After quite a long time, there will be enough data for estimating future value (=the amount of money that customer would pay for the same product in the future) and potential value (= the amount of money that customer would pay for other product in the future).
- c. Then, one can simply estimate LTV (Kumar 2004).

It is obvious, many problems exist in mentioned algorithm:

1. As potential value is used along with current value in LTV model, it is much clear that the aim of LTV model is to rank all customers by **the value they have and not the value they show toward a business**. But, in practice, the algorithm works with the data that is in database. Indirectly means, algorithm is based on the value that specific customer would show, not the value he has. So, it is much needed for a model to find high valued customers and report them to that business.
2. Equation 3 reveals that gathering huge amounts of data for estimating future value and potential value are needed to estimate a customer's value in a business.

So, this limitation makes that model inapplicable in various businesses.

3. In such a business in which gathering those data is feasible, that company would lose a long period of time for collecting data. So business might have no idea about their customers and might lose some of high valued customers.

4. Estimating loyalty period is another problem that must be considered. This item would be estimated if that company loses a large number of its customers. So, another algorithm that can estimate customer's value before losing some of high valued customers would be needed.

3. New LTV model:

3.1 Introduction to "Fuzzy-LTV Model"

The main solution for meeting four mentioned items in last chapter is; using a modeling framework that can solve qualitative problems most effectively.

Model that would be proposed in this paper is based on fuzzy logic that use linguistic variables for modeling qualitative problem. By using such variables, following characteristics has been found:

A. Compute the value a customer has and not the value he shows.

B. Need limited data for estimating value of customer.

C. Calculate customer value before losing large amount of customers. In other words, this model would put value on customer at the time of entrance. And then correct their value through time.

This model is successfully tested in hospital industry with 94 percent validation in 2 private hospitals in IRAN.

3.2 Algorithm of Constructing Fuzzy-Life Time Value Model:

For constructing Fuzzy-life time value model, the following procedures must be done:

1-Simplifying LTV model to a model that is easily formulated by Fuzzy logic. In this part, model parameter would be recognized.

2-Selecting an industry to create fuzzy model on it.

3-Diagnosing all linguistics variables that impact on models' parameters.

4-Generating a comprehensive rule for relating linguistic variable to model parameters.

5-Computing model parameters by using fuzzy model.

6-Computing LTV.

7-Rank customers by using LTV quantities.

8-Testing validity of model that is established and correct it until acceptable answer would be gotten.

It is obvious that except for item 1 of this algorithm that is general and would be true in each case, all of other steps must be done for any type of industry.

In this paper, for establishing special Fuzzy Life Time Value Model, hospital industry would be selected. In the following chapter, we would go through the algorithm that is proposed earlier.

3.3 Simplifying LTV Model:

For simplifying LTV model, equation 3 is to be changed into a simple one.

As it's mentioned in section 2, one of our purposes in using Fuzzy-LTV model is giving value to customers *at the time of entrance* and not losing so much time that might make high valued customer defection. Because of putting value at the time of entrance, the first part of equation 3 would be omitted. (But $t_i=N_i$ must be considered).

Second simplification way, concerns the second part of equation 3. In the main formula, after calculating potential value as well as future value of specific year we must substitute them in second part and divide them into interest rate powered by the number of years after the main year for reaching net present value of those items.

For estimating LTV at the time of entrance, and not losing high valued customers, some relaxations must take into consideration. At the time of each customer entrance, suppose that future value and current value is the same and potential value is constant during transaction period, LTV could be simply calculated by equation 4:

$$LTV = (\text{potential value} + \text{current value}) * \text{loyalty period} \quad (4)$$

As it is mentioned before, equation 4 must be used if a new customer would enter a business and that business want to know if he or she is high valued customer or not. So, as the time goes and there have enough data about that customer, we would come back to equation 3 to have better answer than before.

So now, for computing LTV regarding equation 4, using Fuzzy-Logic the following parameters must be calculated:

1-Potential value

2-Loyalty period

3.4 Selecting an industry

In this paper hospital industry has been selected and new LTV model that is called "Fuzzy-LTV" has been successfully tested in 2 private hospitals in IRAN.

It is necessary to mention that this model can rank customers with 94 percent validation.

3.5 Diagnosing Linguistics Variable:

A) Current Value:

Fuzzy rule base is not needed for computing current value. Because it is completely obvious

without calculation. But using an example would clear the model to be discussed. Consider a patient come to the hospital. Current value would be the minimum level of service that is needed for curing.

B) Potential Value:

Basic concept:

Potential value would make from 2 ideas. First, selling the same product as a main product that had been already sold. In business literature this is called *up selling*. Second, selling different products to customer. This is called *cross selling*(Pfeifer 2004). For instance, up selling in hospital industry means taking the same experiment as the main experiment that had been taken for reaching higher degree confidence in prescribing medicines or other means of curing. And a good example for Cross selling is prescribing an experiment for taking precaution against illnesses that this customer will probably suffer in near future in the case that he ignore it. It is not needed to say that this probability would be calculated by reading through the life of that customer and checking genetic information as well as job status.

One important point that must be considered is that in hospitals, doctors would take decision on behalf of patient, so they must know about each customer value, before prescription.

Introduction to fuzzy inference system:

Fuzzy inference system based on Mamdani type has three parts that is shown in figure 1.

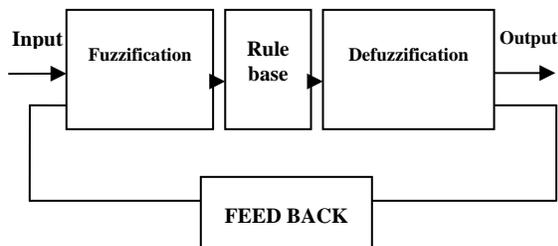


Figure 1.fuzzy inference system (mamdani model)

In FIS, after sending input to this system, fuzzification part fuzzify the input system for transforming crisp input to fuzzy input. Then fuzzy rule based process this input and give us a fuzzy output. At the end defuzzification block transform fuzzy output to crisp input. It'll make this output suitable for engineers to use it in real word.

Fuzzyfication of input for computing potential value in hospital industry:

Although there are so many factors influence on potential value of each patient, based on interviewing with 20 experts in hospital industry in

Iran, it is concluded that 3 factors have the greatest impact on potential value of each customer and using cross selling and up selling method in services it would feasible for doctors to provide without shortening the period of loyalty.

1-That patient has enough income for paying hospital costs or get covered by a good insurance company. So it should be defined as a linguistic variable that is called **P2P** and stands for “potential to pay”. This variable varies from 0 to 3. It should be said that this variable carries no dimension and is calculated by a checklist.

There are three fuzzy sets named “low, medium, high” that are structured on this domain. So, P2P by getting a number between 0 and 3 would belong to some of above sets with some degree of belongingness.

Figure 2 would show the P2P as a linguistic variable subject to 3 fuzzy set.

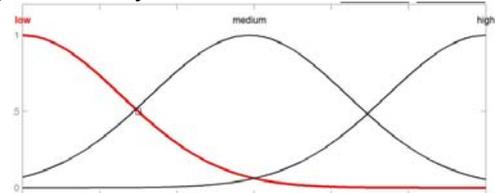


Figure 2.P2P subject to 3 fuzzy set.

2-The level of education of that customer is so high that makes it acceptable for customer to be checked for some precautionous purposes.

Y2E is the linguistic variable that is defined for this purpose. Y2E stands for Year to Educate and is a number between 0-30 years. This variable means total years that this specific customer had academic education and 3 fuzzy set named “high, medium, low” that is based on this linguistic variable. It is so that in so many scientific fields no one can learn for about 30 years, some corrections had been made in input graph of this fuzzy system.

Figure 3 shows how Y2E linguistic variable connect to 3 fuzzy sets that are based on it.

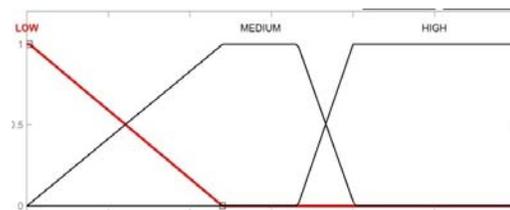


Figure 3.Y2E Linguistic variable and their relation with 3 fuzzy set.

3- Potential value of customer get higher and higher if that patient in near past duration and now come to the hospital frequently. In other words, the more patients come to the hospital, the more they would use offered

services. Because a customer that come to hospital in a more frequent way would have higher willingness for getting rid of illness, he would pay much easier for service offered. Also because of length of cure period, these customers would get some knowledge about their illnesses in non-academic way and would ask their doctors about other means of curing. Furthermore, these patients would buy some equipment to decrease the severity of pains. For calling such a linguistic variable we would use AVN. This variable is stand for average variable number and means how often a customer has gone to the hospital in last year. This linguistic variable would vary from 0 to 10 and there are 3 fuzzy sets based on this linguistic variable named “high, medium, low”.

Figure 4 shows the AVN variable in which 3 fuzzy sets had been mentioned.

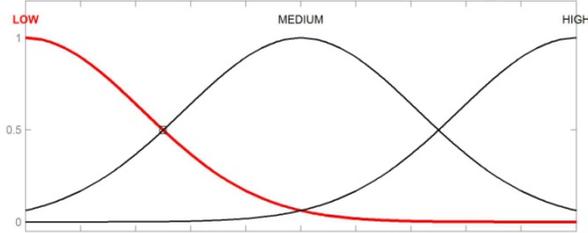


Figure 4. AVN linguistic variable subject to 3 fuzzy set

Figure 5 shows fuzzy model that is proposed for calculating potential value in this paper.

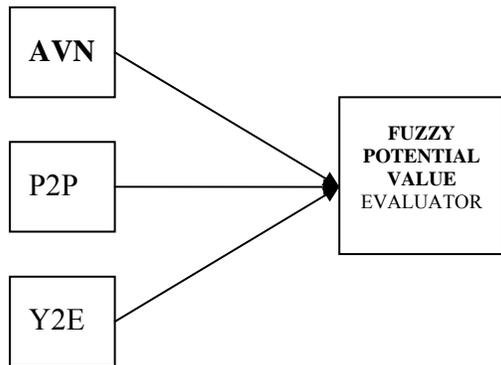


Figure 5.fuzzy potential value evaluator

Fuzzy rule base:

Now after defining these linguistic variables as well as those fuzzy sets, it is time to make Rule base that the judgments of this fuzzy set would be based on.

In constructing a fuzzy rule base, all of the states that each input variable can take must be considered not to have a state that there is no answer for a request. So because there are 3 linguistic variables as input and each variable can take 3 states (because there are 3 fuzzy set for each variable), there must be 3*3*3=27 rules in this rule base. Table 1

shows the rules that had been gathered from experts view points.

Table 1. Potential value Fuzzy Rule Base

No	AVN	Y2E	P2P	PV
1	L	L	L	L
2	L	L	M	L
3	L	L	H	L
4	L	M	L	L
5	L	M	M	L
6	L	M	H	L
7	L	H	L	L
8	L	H	M	L
9	L	H	H	L
10	M	L	L	L
11	M	L	M	L
12	M	L	H	L
13	M	M	L	L
14	M	M	M	M
15	M	M	H	M
16	M	H	L	L
17	M	H	M	M
18	M	H	H	H
19	H	L	L	L
20	H	L	M	L
21	H	L	H	L
22	H	M	L	L
23	H	M	M	M
24	H	M	H	H
25	H	H	L	M
26	H	H	M	H
27	H	H	H	H

As you can see, table 1 can be simplified to table 2. For instance, rules 1 to 9 can be simplified to rule 1. This happens since it is not important whether Y2E and P2P are low, medium or high. So, by merging such rules, 27 rules that had been stated in table 1, turn into 15 rules.

Table 2.simplified potential fuzzy rule base

No	ANR	Y2E	P2P	PV
1	L	-	-	L
2	M	L	-	L
3	M	M	L	L
4	M	M	M	M
5	M	M	H	M
6	M	H	L	L
7	M	H	M	M
8	M	H	H	H
9	H	L	-	L
10	H	M	L	L
11	H	M	M	M
12	H	M	H	H
13	H	H	L	M
14	H	H	M	H
15	H	H	H	H

Fuzzy output and judging:

The following items happen one by one for making judgment using fuzzy system:

1-Crisp input gathered from the hospital is going to be ranked. Simply saying, AVN, Y2E and P2P would be calculated.

2- These crisp items must be fuzzified by sending to fuzzification part of fuzzy system. In other words, by using fuzzification notice that had been proposed in figure 2, 3, 4, the crisp input must be fuzzified.

- 3- Fuzzified input would send to fuzzy rule based and some rules would be fired there.
- 4- These rules then simplified with fuzzy output that is shown in figure 6 and get together to make a decision.
- 5-This fuzzy decision then defuzzify and a crisp solution will be given to user.

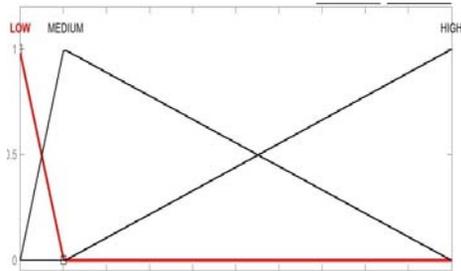


Figure 6.output of fuzzy rule based named “potential value”

At the end of potential value of fuzzy system, it is necessary to mention that this fuzzy system and loyalty fuzzy system that is proposed in next chapter are based on *Mamdani inference engine*. Because this inference engine estimates output parameter in much pessimistic way, it'll make that computation of LTV have low sensitivity to fluctuation of environment that this specific business working.

C) Loyalty:

In business literature, loyalty is defined as “continue buying from specific provider and not changing them”(Jonker 2004).

Having lots of interviews with health experts in 2 hospitals in IRAN, among lots of linguistic variables that had been proposed, 2 linguistic variables have been focused and can play as a base for the Fuzzy rule. These are as follows:

1-One of the main factors that customer chose the hospital and does not want to change it, is that they feel satisfied from services that had been used. COA is a linguistic variable for showing this satisfaction. COA shows the mark that customers would give to the services that had been provided. After the period of relationship with patient during treatment, a checklist would be given to each customer and customers would fill it out. Then, the mark that each customer gives to this business would be calculated. This mark then will be used in calculation of loyalty of that customer. In this part, as before, 3fuzzy sets are based on this linguistic variable; “low, medium, high”.

2- Potential to Pay (=P2P), again, must be used for calculating loyalty of each customer. Because in many cases customer without enough potential to pay, wants to use services for short period of time. This situation happens when at least one of the following situations be true:

A- Patient is in emergency situation and he’s taken into this hospital because of less distance it has from where the event has taken place.

B-a popular doctor or specific service offer in that hospital that this make lots of patient have high willingness to pay for using this kind of services.

C- ...

However, having enough P2P is really important factor for having long time relationship with customers.

In short, when a customer is satisfied with the services received and can afford the money for using such a service, they would continue extending their relationship. One of the main reasons that prevent customers changing their hospital for using such a service is lowering their risk for being healthy. In other words, because patient had gained good result, their willingness to come to this hospital is so high that they would not change their hospital for testing various services. But if he or she can not afford such services, they must churn from this hospital.

Figure 7 summarize the proposed fuzzy model.

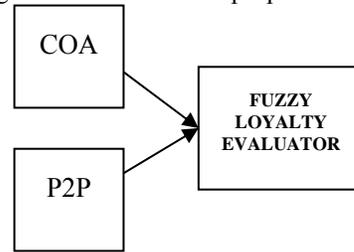


Figure 7.fuzzy loyalty evaluator

Table 3 shows fuzzy rule base that is used for constructing a system for estimating loyalty period.

Table 3.loyalty fuzzy rule base

No	COA	P2P	Loyalty
1	L	L	L
2	L	M	L
3	L	H	L
4	M	L	L
5	M	M	L
6	M	H	M
7	H	L	M
8	H	M	H
9	H	H	H

By simplifying table 3, table 4 with merging 2 rules, the rest would be generated.

Table 4.simplified loyalty fuzzy rule base

No	COA	P2P	Loyalty
1	L	-	L
2	M	L	L
3	M	M	L
4	M	H	M
5	H	L	M
6	H	M	H
7	H	H	H

Referring table 4, Fuzzy rule base fires those rules that related to fuzzy input and simplified it with fuzzy output that is illustrated in figure 8.

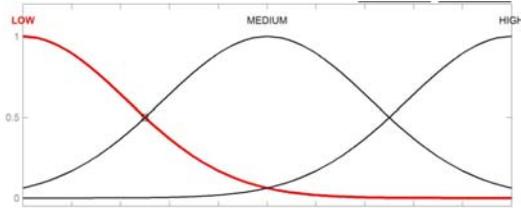


Figure 8.out put of fuzzy rule base” loyalty”

D) Model summary:

It is obvious that proposed model in this paper has many parts and it is the time to reach to a framework for summarizing this model. Figure 9 shows this summarization. This figure shows that for calculating LTV, two fuzzy systems named “fuzzy loyalty evaluator and fuzzy potential value evaluator” and one non-fuzzy system named” current value computer” must be used. Also, it shows that there are three linguistic variables in the fuzzy-potential value computer that is called “AVN, P2P, and Y2E” and in the fuzzy-loyalty evaluator there are two linguistic variables named “P2P and COA”. These linguistic variables in each system are used for making conclusion in fuzzy rule bases. So, after finding loyalty period, potential value and current value, LTV can be computed by using equation 4 that is a simplified equation of LTV for using in fuzzy system.

3.6 Validity checking algorithm of fuzzy life time model in two private hospitals in IRAN

For testing the model had been proposed in this paper, 2 private hospitals are considered as case studies. In each of them 25 samples had been taken and LTV is calculated as table 5 and 6. For checking the validity of this model, the following algorithm had been considered:

- 1-LTV calculation with the data had been gathered from customers.
- 2- Using table 5, categorize customers in 5 ranks.
- 1-LTV calculation with the data had been gathered from customers.
- 2- Using table 5, categorize customers in 5 ranks.
- 3-Asking authorized people (i.e. doctors or related staff) for ranking customers without using Fuzzy-LTV.
- 4-Checking the compatibility of Fuzzy-LTV result with the result gained in item 3 of this algorithm.
- 5-Calculate variances’ results. Then, report it to hospitals.

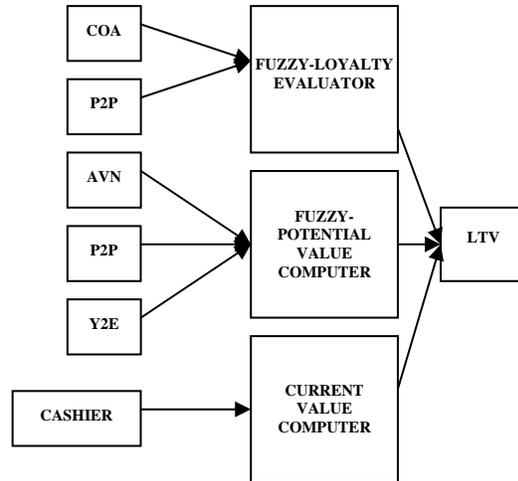


Figure 9. fuzzy life time value model (Fuzzy-LTV)

Table 5. ranking meter

RANK	MARK
A	40 -...
B	30_40
C	20_30
E	10_20
F	1_10

It is necessary to mention that because of Matlab toolbox (fuzzy) simple form, it had been used for calculation.

In this table, following abbreviations had been used:

- 1-PV: Potential value
- 2-CV: Current value
- 3-Rank: fuzzy rank that had been calculated by Fuzzy-LTV algorithm.
- 4-R: rank reported by authorized people in the hospital.
- 5-Non compatibility: star is used for mentioning non-compatibility. Number that follows star is used for reporting the degree of noncompatibility.

3.7 Reporting results:

Equation 5 shows validity of Fuzzy-LTV formula:

$$\text{Validity} = \frac{D}{T} \quad (5)$$

Where

D: degree of compatibility

T: total degree

Or a simplified equation would be:

$$\text{Validity} = 1 - \frac{ND}{T} \quad (6)$$

Where

ND: Degree of non compatibility

T: Total degree

For computing validity, 2 parameters must be calculated:

In simple word, ND is adding all the numbers that had been written in parentheses in the non compatibility column. Equation 7 shows this calculation.

$$ND=3*2+2*3=12 (7)$$

Because there are 5 categories in this ranking problem. 4 capacities exist as total degree in each sample. Furthermore, these capacities must be added up in all samples. So there is 200 degree as total degree. Equation 8 shows how this is calculated.

$$T= 4*50=200 (8)$$

So now validity can easily be calculated:

Table 6. LTV computation in 2 private hospital in IRAN

NO	ANR	Y2E	P2P	PV	COA	P2P	LOYALTY	CV	LTV	RANK	R	Non compatibility
	0-10	0-30	0-3	0-5	0-100	0-3		0-15				
1	5	0	0.3	0.152	54	0.3	1.28	1	1.47456	F	D	*(2)
2	3	12	0.6	2	77	0.6	2.44	3	12.2	E	E	
3	2	16	0.5	2.02	66	0.5	1.95	2	7.839	F	F	
4	4	3	0.1	1.71	87	0.1	2.45	5	16.4395	F	F	
5	6	12	0.9	1.91	50	0.9	1.25	1	3.6375	F	F	
6	1	5	1.5	1.89	80	1.5	2.88	4	16.9632	E	E	
7	9	12	1.6	1.87	30	1.6	1.36	5	9.3432	F	F	
8	10	16	3	3.47	25	3	2.18	3	14.1046	E	E	
9	10	16	2.3	2.72	80	2.3	2.73	5	21.0756	C	C	
10	6	12	1.2	1.84	77	1.2	2.66	3	12.8744	E	E	
11	3	5	2	2	32	2	1.83	2	7.32	F	F	
12	8	0	3	0.17	54	3	2.5	14	35.425	B	E	*(3)
13	4	16	1.4	1.84	21	1.4	1.17	3	5.6628	F	F	
14	8	12	1.1	1.95	35	1.1	0.926	5	6.4357	F	F	
15	3	11	1.2	1.92	80	1.2	2.87	9	31.3404	B	B	
16	1	10	1.4	1.89	90	1.4	3.5	8	34.615	B	B	
17	4	5	3	2	45	3	2.49	4	14.94	E	E	
18	8	22	2	2.89	58	2	1.85	6	16.4465	E	E	
19	3	30	1.1	1.92	90	1.1	3.3	11	42.636	A	A	
20	3	5	2.1	2	32	2.1	1.97	12	27.58	C	E	*(2)
21	9	28	2.8	3.4	55	2.8	2.49	3	15.936	E	E	
22	6	9	2.4	2.03	74	2.4	2.6	5	18.278	E	E	
23	10	30	3	3.48	100	3	3.91	15	72.2568	A	A	
IRANMEHR HOSPITAL												
24	7	12	1.2	1.95	57	1.2	1.41	1	4.1595	F	F	
25	3	16	1.4	1.92	32	1.4	1.11	4	6.5712	F	F	
26	5	5	2	2.02	66	2	1.97	5	13.8294	E	E	
27	7	16	3	2.28	45	3	2.49	8	25.5972	C	C	
28	3	12	1	1.92	89	1	3.13	3	15.3996	E	E	
29	9	16	1.2	1.84	39	1.2	0.929	6	7.28336	F	F	
30	1	14	3	1.89	68	3	2.63	5	18.1207	E	E	
31	3	18	2.1	2.27	47	2.1	1.97	4	12.3519	E	E	
32	4	23	3	3.38	98	3	3.85	8	43.813	A	A	
33	5	22	2.1	2.3	65	2.1	2.09	4	13.167	E	B	*(3)
34	7	25	1.8	2.28	64	1.8	1.79	5	13.0312	E	E	
35	3	30	1.4	1.93	58	1.4	1.43	7	12.7699	E	E	
36	2	16	0.4	2.02	96	0.4	2.56	11	33.3312	B	B	
37	8	12	0.3	1.98	87	0.3	2.48	2	9.8704	F	F	
38	9	5	0.5	2.04	68	0.5	2.05	6	16.482	E	E	
39	2	16	1.2	2.01	45	1.2	1	8	10.01	E	C	*(2)
40	1	0	0.2	0.155	78	0.2	2.3	4	9.5565	F	F	
41	2	16	1.2	2.01	46	1.2	1.02	3	5.1102	F	F	
42	5	18	2.9	2.36	29	2.9	2.3	2	10.028	E	E	
43	9	14	2.3	2.72	46	2.3	2.23	4	14.9856	E	E	
44	10	11	2.1	2.3	75	2.1	2.52	5	18.396	E	E	
45	4	11	1.7	1.84	65	1.7	1.83	10	21.6672	C	C	
46	3	25	1.4	1.93	74	1.4	2.45	7	21.8785	C	C	
47	7	30	1.6	2.27	47	1.6	1.22	8	12.5294	E	E	
48	1	29	1.1	1.89	97	1.1	3.34	6	26.3526	C	C	
49	9	23	1.2	3.31	100	1.2	3.91	7	40.3121	A	A	
50	3	12	0.9	1.92	49	0.9	1.22	3	6.0024	F	F	

$$1-12/200=0.94$$

4. Conclusion:

Classifying customers is one of the ways that results in lower cost of a business and more revenue than before. In this paper, we computation in 2 private hospital in IRAN

Focus on one of the most favorite way of segmentation in CRM literature that is called Life time value. Some way of computation

LTV had been stated and we select the last model that is based on 3 factors named "potential value, current value and loyalty".

As it mentioned before, the last model has the following defections in computing life time value:

1-the last model calculate the value that specific customer shows to a business. It means a customer must prove his self for being valued to him. But this is not the case and a model that can value customer in advance is needed.

2-Last model needed so many data for differentiating high valued customer from low valued one. So a new model that can do this calculation without so many data from customer is urgently needed.

3-Calculating the level of loyalty is another problem that the users of last model come across with it. Because for calculating such a parameter there must be enough defection! So this makes that business lose so many high valued customers before diagnosing such customers.

In new model that is proposed in this article, one can find customer value after the first interaction with customer. So, that business can find their customer and classify them for putting their strategies in the best way. This model had been tested in 2 hospitals and verified with 0.94 percent compatibility.

Corresponding Author:

Mr. Arash Khalili Nasr

Department of Industrial Engineering, Faculty of Engineering, Tarbiat Modares University, Tehran, Iran

E-mail: a_k_nasr@yahoo.com

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