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AN INFORMATION TECHNOLOGY FOR THE SUPPORT FOR SOLVING THE ANALYSIS PROBLEM OF THE CUSTOMERS' VALUE WITHIN THE ENTERPRISE CRM-STRATEGY IMPLEMENTATION

This study considers a CRM-approach and methods for analyzing customer base. Mathematical and algorithmic support was developed for the analysis of customer value in a trading enterprise. Algorithmic support is presented using the IDEF0 notation. A software solution was developed to assess customer value in a commercial enterprise. A fragment of the data model for the software solution was developed using the IDEF1x notation. The parameters for estimating the value of customers in a commercial enterprise were calculated using the processed data obtained by applying the developed software solution. The developed software solution allows to segment the customer base according to different criteria and provide marketing recommendations to each groups of customers. Therefore, customers were divided into groups according to the calculated parameters. As a result of the analysis, each group of clients receives a marketing recommendations. After the application of recommendations an increase in the purchasing power of clients, belonging to the group to which the marketing recommendation has been provided, is expected. Another used method for analyzing the customer base in the developed software solution is the sales funnel, which displays the effectiveness of the marketing unit at each of the sales stages, thereby allowing to identify weak points in the sales department. Thus, unlike existing software solutions, the developed software allows not only to segment customers by their costs, but also to provide marketing recommendations in order to increase the enterprise's profit. The generation of recommendations is based on the developed mathematical support. By using this mathematical support, the calculations are carried out. Customers are allocated into certain groups, each of which is provided with the relevant marketing recommendations, by using the results of the performed calculations. In addition, the developed software solution allows not only to design sales funnels, but also to analyze sales funnels.

Keywords: client, customer value, customer classification, CRM analysis, value analysis, sales funnel, RFM analysis.

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ІНФОРМАЦІЙНА ТЕХНОЛОГІЯ ПІДТРИМКИ ПРОЦЕСУ ОЦІНКИ ЦІННОСТІ КЛІЄНТА В РАМКАХ РЕАЛІЗАЦІЇ CRM-СТРАТЕГІЇ ПІДПРИЄМСТВА

Розглянуто CRM-підхід і методи аналізу клієнтської бази. Було розроблено математичне та алгоритмічне забезпечення аналізу цінності клієнта в торговому підприємстві. Алгоритмічне забезпечення представлено в нотації IDEF0. Було розроблено програмне рішення для оцінки цінності клієнта в торговому підприємстві. На його основі розроблений фрагмент моделі даних в нотації IDEF1x. На основі опрацьованих даних за допомогою розробленого програмного рішення розраховуються параметри оцінки цінності клієнтів в торговому підприємстві. Розроблене програмне рішення дозволяє сегментувати клієнтську базу за різними критеріями та формувати маркетингові рекомендації для кожної групи клієнтів. Виходячи з розрахованих параметрів, клієнти діляться на групи. В результаті аналізу, кожна група клієнтів отримує маркетингову рекомендацію. Після застосування рекомендації очікується підвищення купівельної здатності клієнтів, що відносяться до групи, до якої була надана маркетингова рекомендація. Ще одним використовуваним методом аналізу клієнтської бази в розробленому програмному рішенні є воронка продажів, яка відображає ефективність роботи маркетингового підрозділу на кожному з етапів продажу, тим самим дозволяючи виявити слабкі місця в роботі відділу продажів. Таким чином, на відміну від існуючих рішень, розроблене програмне забезпечення дозволяє не тільки сегментувати клієнтів за їх вартістю, але й надавати маркетингові рекомендації для збільшення прибутку підприємства. Формування рекомендацій здійснюється на основі розробленого математичного забезпечення, на основі якого виконуються розрахунки, за результатами яких клієнти розподіляються на певні групи, кожній з яких надаються відповідні маркетингові рекомендації. Крім того, розроблене програмне рішення дозволяє виконувати не тільки побудову воронок продажів, а й їхній аналіз.

Ключові слова: клієнт, цінність клієнта, класифікація клієнтів, CRM-підхід, аналіз цінності, воронка продажів, RFM-аналіз.

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ИНФОРМАЦИОННАЯ ТЕХНОЛОГИЯ ПОДДЕРЖКИ ПРОЦЕССА ОЦЕНКИ ЦЕННОСТИ КЛИЕНТА В РАМКАХ РЕАЛИЗАЦИИ CRM-СТРАТЕГИИ ПРЕДПРИЯТИЯ

Рассмотрены CRM-подход и методы анализа клиентской базы. Было разработано математическое и алгоритмическое обеспечение анализа ценности клиента в торговом предприятии. Алгоритмическое обеспечение представлено в нотации IDEF0. Было разработано программное решение для оценки ценности клиента в торговом предприятии. На его основе разработан фрагмент модели данных в нотации IDEF1x. На основе обработанных данных с помощью разработанного программного решения рассчитываются параметры оценки ценности клиентов в торговом предприятии. Разработанное программное решение позволяет сегментировать клиентскую базу по различным критериям и формировать маркетинговые рекомендации для каждой группы клиентов. Исходя из рассчитанных параметров, клиенты делятся на группы. В результате анализа, каждая группа клиентов получает маркетинговую рекомендацию. После применения рекомендации ожидается повышение покупательная способности клиентов, относящихся к группе, к которой была предоставлена маркетинговая рекомендация. Еще одним используемым методом анализа клиентской базы в разработанном программном решении является воронка продаж, которая отображает эффективность работы маркетингового подразделения на каждом из этапов продажи, тем самым позволяя выявить слабые места в работе отдела продаж. Таким образом, в отличие от существующих решений, разработанное программное обеспечение позволяет не только сегментировать клиентов по их стоимости, но и представлять маркетинговые рекомендации для увеличения прибыли предприятия. Формирование рекомендаций осуществляется на основе разработанного математического обеспечения, на основе которого выполняются расчеты. По результатам расчетов клиенты делятся на определенные группы, каждой из которых предоставляются соответствующие маркетинговые рекомендации. Кроме того, разработанное программное решение позволяет выполнять не только построение воронок продаж, но и их анализ.

Ключевые слова: клиент, ценность клиента, классификация клиентов, CRM-подход, анализ ценности, воронка продаж, RFM-анализ.

Introduction. The basis of the success of any company is the correct strategy of work with customers. Business grows as the customer base grows and customers become stronger. Meeting customer needs is becoming a key factor in ensuring and maintaining the company's competitiveness [1].

In this regard, the task of "knowing" your customer becomes more and more relevant, having a complete

picture of what, when and to what extent he has bought and how is satisfied with cooperation with you. This information allows you to predict buying behavior and determine the prospects for further development of relations [2].

Not all customers are equally useful. The Rule of Pareto, a pattern that was taken in the middle of the last century, says, – only 20% of existing customers provides 80% of the total profit. Modern calculations often show some other results, but the original meaning is retained: working with a smaller portion of customers provides the most part of the profit. The problem is to identify those customers who will provide this profit [3].

At the moment, there is quite a lot of software on the market that deals with customer relationship management. One of the most popular are: Microsoft Dynamics CRM, vTiger CRM, Zoho CRM and others. In these systems, much attention is being paid to customer relationship management, but there is no analysis of the value of each customer [4].

The object of the research includes approaches to managing relationships with customers. The subject of the research includes methods for assessing the value of customers.

CRM-approach and its characteristics. The CRM approach is based on the use of management and information technology, through which the company collects information about its customers at all stages of their lifecycle from engaging and retaining loyalty programs, removes information from it and uses it in the interests of its business to build mutually beneficial relationships. The result of applying CRM is to increase competitiveness and profit because relationships built on the basis of a personalized approach allow you to attract new customers and keep the old ones [5].

If we consider the CRM system as a set of technologies, then it is a set of applications that are bound by single business logic and integrated into a corporate information environment based on a single database [6]. Often, in parallel with the CRM-system, an ERP-system is implemented at the enterprise, or the CRM-module is part of the ERP II system. Customer Relationship Management software enables automation of business processes related to marketing, sales and service. As a result, the development of a personalized offer to a particular customer, which is offered to him in certain, favorable for the transaction, time and transmitted to him by the most convenient communication channel for him [7].

The CRM system provides coordination of the activities of different units based on a common information platform for customer interaction. This application avoids the situation when the marketing, sales and service departments are separate from each other, to coordinate their actions and the overall vision of the customer. In addition, like any other information system, CRM can significantly accelerate the flow of information and make it credible, which in turn increases the efficiency of responses to inquiries, the speed of circulation of funds and reduces costs [8].

One of the methods for analyzing a customer base is the RFM analysis (recency, frequency, monetary – recent, frequency, cost) is the technology used to identify customers who are most inclined to respond to a new offer. This technology is widely used in direct marketing [9].

A way to measure the effectiveness of actions to increase sales – a funnel sales. It shows at which stage of work is the loss of the largest number of customers. With its help you can visualize the entire sales cycle. That is, it reflects the total number of customers who are at different stages of relationship with the seller [10]. The problem is the need to determine at what stage of the work there are problems, namely the loss of customers, and how to overcome this problem. The funnel of sales and its analysis allows not only to find out the root of the problem, but also to choose ways to overcome it.

Research problem statement. The main purpose of any company's activity is to generate profits, which is based on the correct strategy of working with customers. The profit of the company grows with the increase of the customer base and strengthening of relations with customers. In this regard, the increasingly important task is to have a complete picture of what, when and to what extent the customer buys and how satisfied with the cooperation with you [1].

In the course of the work it is necessary to analyze the existing methods: CRM-approach, basic approaches to solving the problem of customer value analysis and to review software tools that are used to solve customer relationship management tasks.

After that, you need to develop a mathematical solution to the problem of analyzing the value of customers in a trading company and to simulate the process of analyzing the value of customers in a trading company.

Next it is necessary to develop requirements for application software solution, database structure and directly applied software solution. On the basis of test data, it is necessary to test the software solution and analyze the results.

Mathematical support for solving the analysis problem of the customers' value in a trading company. In our country, mobile operators are the first to measure customer value. Their need was not accidental – due to the high penetration of mobile communication, the cost of attracting one customer became higher and higher – it's time to get rid of unprofitable sales channels and change the distribution model.

Most marketers and analysts use a set of indicators in their work that allows you to evaluate the effectiveness of advertising campaigns: the level of failures, the number and proportion of conversions, the outflow of customers, and the cost of customer involvement. These indicators are able to give a general idea of the effect of marketing activities and the level of customer loyalty.

CLV (from Customer Lifetime Value – consumer's lifetime value, customer value for business) is the current value of the probable future net profit expected to be obtained from a particular customer during his entire lifetime, an indicator of "customer life cycle value" for the firm. This is an indicator of the potential of the consumer (buyer), taking into account 3 criteria: customer, time and net profit. Objectives of using CLV: attracting "valuable" customers, increasing the "value" of customers, increasing

"loyalty" of customers, optimizing relations with them. CLV is also a methodology and an effective tool for analyzing customer relationship management, the principle of segmentation of the customer base of the enterprise. The basis of the methodology is the message: over time, the value of the customer increases, but the total number of "valuable" customers decreases [11].

The mathematically simplified CLV model can be represented as follows:

$$CLV = Revenue \times \frac{r}{1 + d - r},$$

where $Revenue$ is the gross amount of contributions for a certain period of time;

r is the percentage of customer retention;

d is the size of the discount.

This formula focuses on how much the customer spends on (monetary value), assuming a continuous valuation period for all customers [12].

To move to the next level, we will need to enter two variables of the time intervals – recent and frequency:

$$CLV = \sum_{t=0}^{T} \frac{(p_t - c_t) r_t}{(1 + i)^t} - AC,$$

where p_t is the price paid by the customer at time t;

c_t is the direct costs for customer service at time t;

i is the size of the discount or the price of capital for the firm/company;

r_t is the likelihood of a re-purchase or that the customer's life cycle will not end at the time t;

AC is the cost of acquisition;

T is the time period selected for CLV evaluation [12].

The probability of a re-purchase or that the customer's life cycle does not end at the time t is calculated using the following formula:

$$r_t = \frac{(n_0 + n) - w}{n_0 + n},$$

where n_0 is the number of customers at the beginning of the period;

n is the number of new customers;

w is the number of customers who have gone.

This value can range from 0% to 100%:

- 100%: the organization has successfully saved all its customers (there was no departure);
- 0%: the organization has stopped its activities.

LTV (Lifetime Value) is the aggregate profit of a company that is received from a single customer for all time with him. The simple formula has the following form [13]:

$$LTV = D - V,$$

where D is the revenue from the customer;

V is the costs of attracting and retaining a customer.

There is also a basic formula. This calculation method is more precise than the simple formula [13]:

$$LTV = SP \times SN \times ST,$$

where SP is the average selling cost;

SN is the fair number of sales per month;

ST is the average customer retention time in months.

Also, a predictive formula can be used, which has the following form [12]:

$$LTV = T \times AOV \times AGM \times ALT,$$

where T is the average number of orders (sales) per month;

AOV is the average check;

ALT is the average duration of customer interaction with the company (in months);

AGM is the share of revenue in revenue.

Also, LTV can be calculated according to the following formula (for n customers) [12]:

$$LTV = \sum_{x=1}^{n} \frac{ARPU_x - Costs_x}{(1 + WACC)^x} - SAC,$$

where $APRU_x$ is the average revenue per customer;

$WACC$ is the average weighted value of capital;

$Costs_x$ is the annual expenses for user support for a certain period;

SAC is the cost to the customer.

Customer referral value (CRV):

$$CRV_i = \sum_{t=1}^{T} \sum_{y=1}^{n_1} \frac{A_{ty} - a_{ty} + M_{ty} + ACQ1_{ty}}{(1 + r)^t} + \sum_{l=1}^{T} \sum_{y=n_1}^{n_2} \frac{ACQ2_{ty}}{(1 + r)^t},$$

where T is the number of time periods (years or months);

a_{ty} is the marginal profit (cost of sales minus variable costs) of the customer who would not have bought on the recommendation;

A_{ty} is the value of the customer involved for the customer;

n_1 is the number of customers who came for the recommendation;

n_2 is the number of customers who came without a recommendation;

M_{ty} is the marketing costs for customer retention;

$ACQ1_{ty}$ is the saving on attracting the customer, who came for the recommendation (did not have to spend on advertising for primary attraction);

$ACQ2_{ty}$ is the saving on attracting a customer who came independently (did not have to spend on referral payments and marketing) [12].

The first sentence is the value of the customers who came for the recommendation, and the second term is the savings on customers who came on their own.

The Value of a Loyal Customer (VLC) is a measure that quantifies the cumulative income or profit that each target market customer generates over the customer's life cycle. This indicator is calculated according to the following formula [11]:

$$VLC = P \times RF \times CM \times BLC,$$

where P is the income per unit (average revenue from the purchase);

CM is the marginal profit (difference between income and expense);

RF is the frequency of purchases;

BLC is the customer life cycle.

To calculate the customer's life cycle (BLC), you need to make the following calculations using the three formulas:

$$D\# = n_0 - n, DR = \frac{D\#}{n_0}, BLC = \frac{1}{DR},$$

where n_0 is the number of customers at the beginning of the period;

n is the final number of customers;

$D\#$ is the outflow of customers;

DR is the speed of outflow of customers.

The cost of customer acquisition (CAC, Customer Acquisition Cost) consists of aggregate marketing and sales costs. In simple words, SAS is the total amount of all marketing efforts required to attract one customer. This factor largely determines whether your company has a viable business model that allows you to maintain a low level of CAC when scaling your business. In addition, CAC has a tendency to continuous growth – as new promotional campaigns start up and the development of new techniques of promotion. The simplified formula has the following form [10]:

$$CAC = \frac{MCC}{CA},$$

where MCC is the marketing expenses;

CA is the number of attracted customers.

There is also a complex formula that will give you a more accurate result:

$$CAC = \frac{MCC + W + S + PS + O}{CA},$$

where MCC is the marketing costs;

CA is the number of customers attracted;

W is the salary related to marketing sales;

S is the software cost;

PS are the any additional professional services used in marketing or sales;

O is the other overhead costs associated with marketing and sales.

Algorithmic support for solving the problem of analyzing the value of customers in a trading company. Based on the information above, a detailed chart of the first level of the customer value analysis process in the IDEF0 notation was developed. It includes the following processes: data preparation, RFM analysis, parameter calculation to assess customer value, analysis of results and recommendations. The diagram is shown in Fig. 1.

Development of software solution for solving the problem of analyzing the value of customers in a trading company. A fragment of the data model, shown in Fig. 2, was also developed.

One of the key entities is the counterparty – one of the parties to the contract in civil law. In this structure, contractors are suppliers and customers. Counterparties are divided into legal entities and individuals. An email address and phone number for communication is known about them, which may be several, since now almost every person has a phone number of different operators. Also, the obligatory attribute is the date of the counterparty's registration (that is, the date the company added the counterparty to its database).

- Suppliers deliver goods to the company, which are then sold to customers. The obligatory attribute of a product is a commodity group and units of measurement. A separate entity is the supplied goods, which is necessary to prevent the company from selling the unmodified product. For each item, a delivery is made, which specifies the supplier, the date and the goods that were

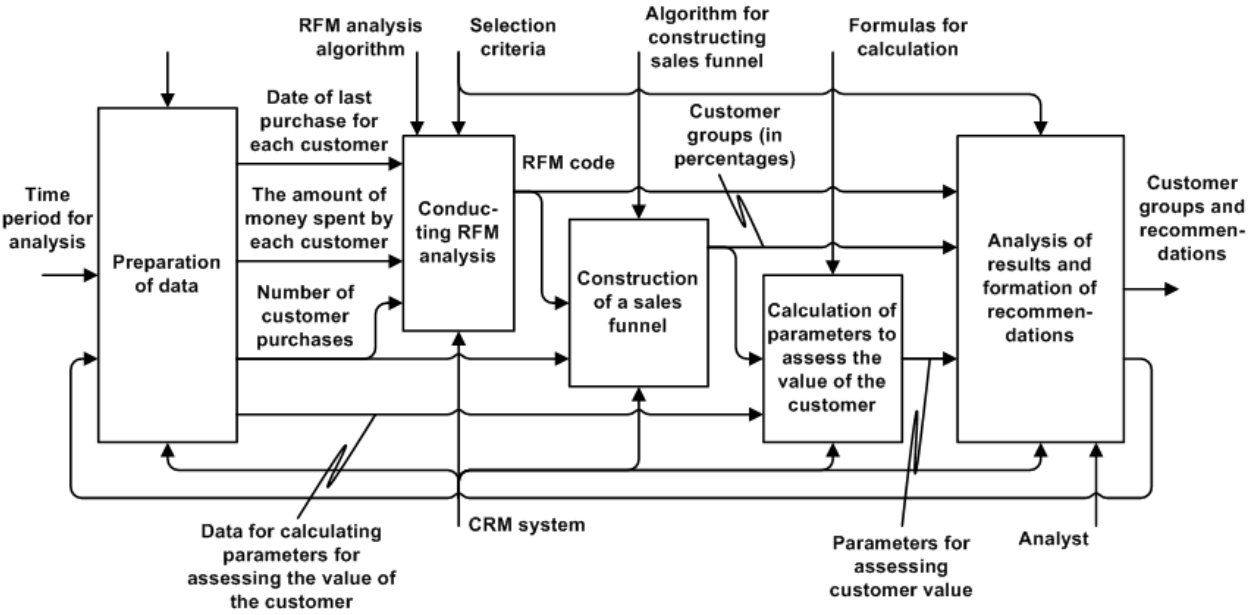

Fig. 1. Detailed diagram of the first level

delivered for this delivery at a certain price, as well as the batch. The customer can pass different stages of work with the customer. Usually, these stages are then displayed in the sales funnel. Therefore, at the stages of a particular customer, the start and end of the stage, the code of the manager involved in this stage, and the sale with which this stage is linked, is indicated. Also, the customer may have certain statuses. For each customer, the date of becoming a status is registered.

The customer may have a discount on a certain group of goods. The discount card table shows the discount product, the discount customer, the discount amount, and the start and end dates of the discount.

For each sale, be sure to fix the costs for it. The sale records the date, code of the manager who was engaged in this sale and the customer's code. There is a table of sold goods, which displays the quantity of goods and the price at which it was sold.

A sales manager (customer service) and a supply manager (work with suppliers) and an analyst will work with a software solution that implements support for solving the problem of customer value analysis in a trading company. The features which are available to the analyst include RFM analysis, construction of a funnel of sales, and calculations by the formulas for the analysis of the value of the customer.

In the customer window, the manager has the opportunity to add a new customer by adding the following information about the customer: name, tax number and certificate number, if it is a legal person and full name, first name, patronymic and tax number. In other case, an electronic address, a telephone number (one or more), and an automatic registration date (the date of the first input of the information for this counterparty) is added automatically. When editing data, the manager can edit the data that was entered earlier, as well as add the status of the customer and stages of working with him. Also, the customer may be given a discount on a group of goods, while fixing the period and the group of goods for which it is provided.

Any customer can be ordered for sale. The manager adds the sales date, the manager who made it, the customer to whom the product was sold, the product that was sold (one or more), as well as their number. The sale price is automatically calculated by the system, depending on the value of the product already in the database.

In the window of work with the supplier, the manager has the opportunity to add a new supplier by adding the following information about the supplier: name, tax number and certificate number, if it is a legal entity and full name, name, and tax number. In other case, an electronic address, a telephone number (one or more), and an automatic registration date (the date of the first input of the information for this counterparty) is added automatically. When editing data, the manager has the ability to edit the data that was entered earlier.

Also, the window of work with the supplier should be a window of delivery of delivery. First, the manager is able to add a new item if it has been delivered, but the database does not have such a name yet. This includes the introduction of the name of the product, the addition of the product group and the unit of measurement. When making a delivery, the manager introduces the date of this delivery, adds the supplier, who carries it, the goods that are delivered their price and the size of the batch.

The manager has the opportunity to conduct RFM-analysis of the customer base, which will give him the opportunity to get a report in which customers will be divided into groups, which were obtained through RFM-analysis. Each group of customers will be given a marketing recommendation, in which the company's revenue can increase.

The manager will be able to receive a report with a detailed sales funnel: there will be shown how many customers are at each of its stages in quantitative and percentage terms. And also this funnel will be displayed

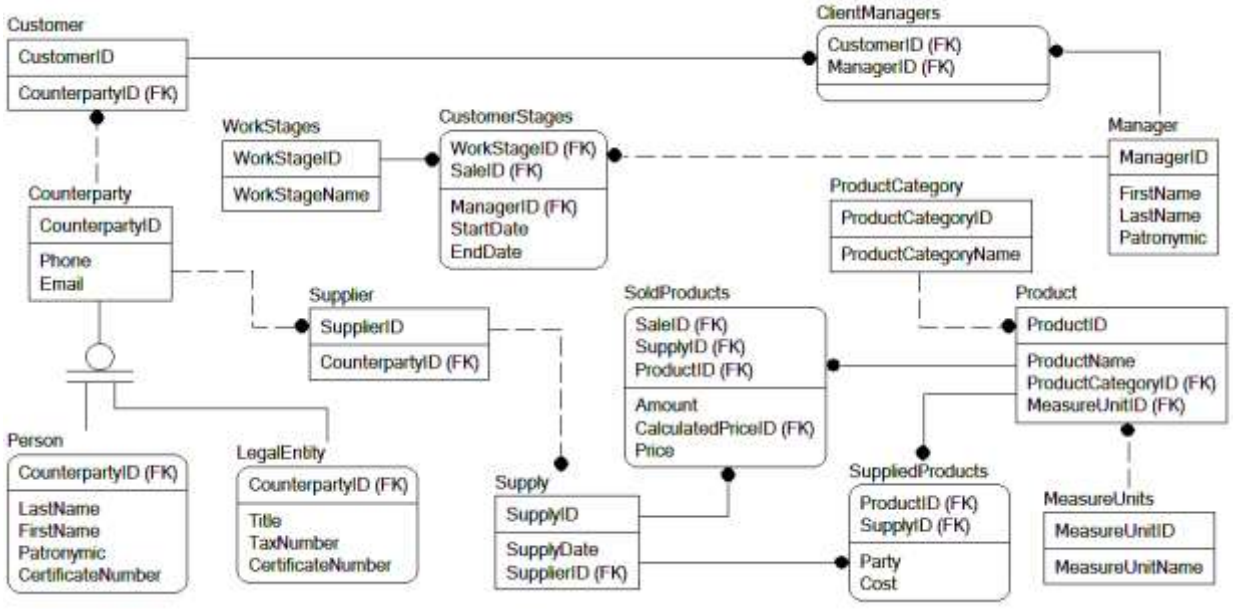

Fig. 2. Fragment of the data model

graphically: in the form of an inverted triangle, which is divided into stages in an appropriate proportion.

The manager can receive a report with calculations, which includes the calculation of the following values:

- LTV (on the life value of the consumer);
- SAS (cost of customer acquisition);
- CLV (profit from a single customer);
- VLC (cost of loyal customer);
- CRV (referral cost of the customer).

The results of these calculations will be reflected in the report, which will be divided into customers, depending on the value of these metrics. Each group of customers will be given a marketing recommendation, in which the company's revenue can increase.

Fig. 3 shows a sequence diagram for a software solution to support the solution of the problem of analyzing the value of customers in a trading company.

A software solution was developed, which included test data, which was the subject of further analysis. Analysis window contains 4 tabs: RFM analysis, CLV/CRV, other indicators, sales funnel.

Fig. 4 shows the tab "RFM-analysis". The user selects a period of time for analysis and clicks the button "Calculate". Customers who made purchases in the selected period are divided into 6 groups and are entered into the appropriate blocks. Also, the user has the ability to sort by specific product or product group. This allows you to detail the analysis performed. Each group has its name and marketing recommendation. As a result of the analysis the following groups are obtained:

- the best customers (regularly make a purchase, spend large amounts of money and recently made the last purchase), recommendation: provide a discount for regular customers;

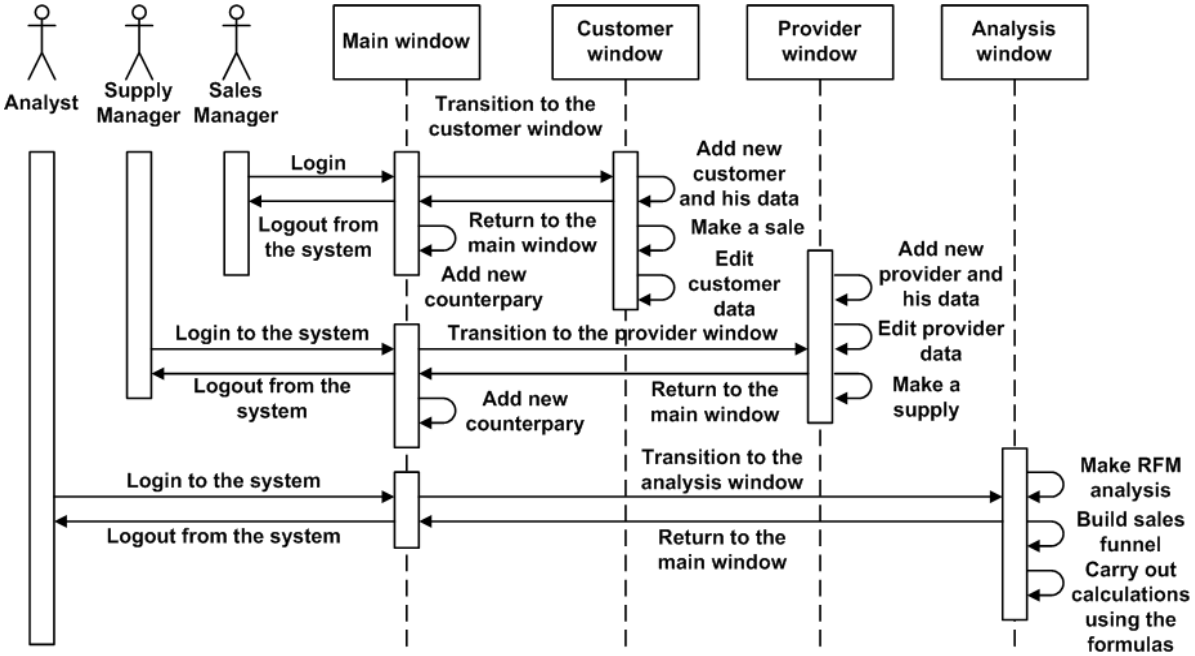

Fig. 3. Sequence diagram

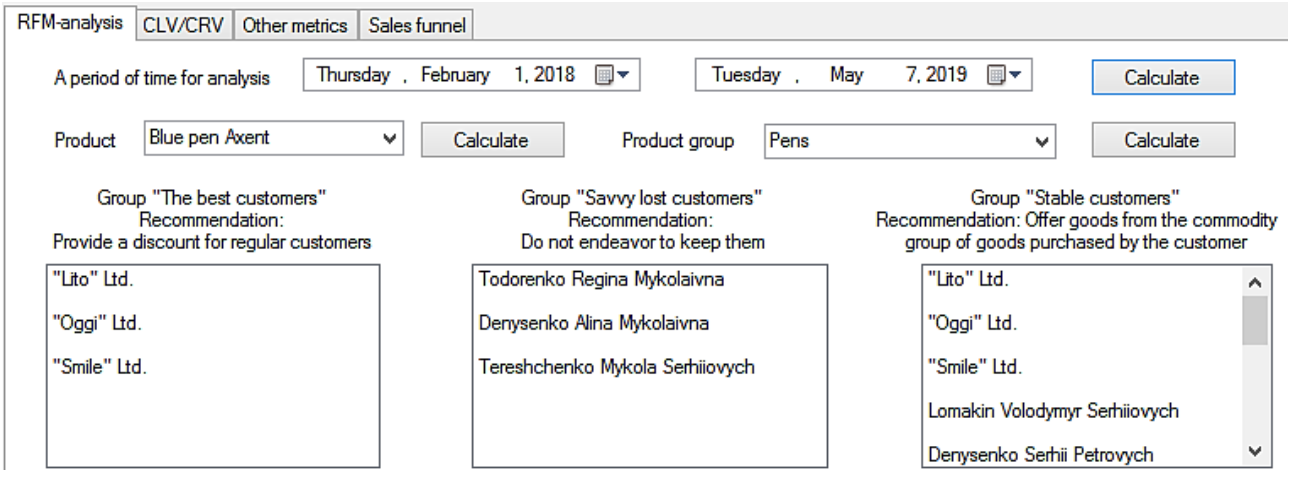

Fig. 4. "RFM-analysis" tab

- lost customers (regularly bought in the past, spent a large sum of money, but for some reason they have not bought anything for a long time); recommendation: the maximum allowable discount for a short period;
- savvy lost customers (little was bought, little wasted money and bought for a long time), a recommendation: do not endeavor to keep them;
- spenders (spend the most money from all, while not taking into account the frequency of their purchases), the recommendation: to offer goods with the most expensive price from the commodity group of goods purchased by the customer;
- stable customers (the frequency of their purchases most), recommendation: to offer goods from the commodity group of goods purchased by the customer;
- new customers (made their first purchase recently), recommendation: offer them a discount for their initial customers.

Each of these groups is provided with marketing recommendations that will allow you to maximize profits for each specific group of customers.

Fig. 5 shows the CLV/CRV tab. The user selects a period of time for analysis and clicks the button "Calculate". Customers who made purchases in the chosen period are divided into 4 groups and entered into the corresponding blocks. Each group has its name and marketing recommendation, namely:

- low CLV and high CRV: offer discounts to initial customers;
- high CLV and high CRV: informing them about referral programs through personalized communication;
- low CLV and low CRV: minimize investment in stimulating purchases using cheap communication channels;
- high CLV and low CRV: regular reminders about company offers (2 times more often than other customers).

In addition to sorting by date, the user has the opportunity to choose sorting by product or product group. In the case when the analysis is made taking into account the period for analysis, all the data obtained are stored in the database. This allows you to speed up the program in the future: no need to re-count the metrics since they will already be in the database. Real databases can have hundreds of thousands of records. And the transfer of metrics for each customer can take a significant period of time.

In the case where the user chooses the time period for analysis already in the database, the calculation is performed again, but data are not entered into the database. This prevents the accumulation and duplication of data. Such software solutions can be used for decades or more. That is why the issue of disk space saving is an important issue that cannot be overlooked. Thus, the developed software solution is suitable for use over many years as it prevents the accumulation of unnecessary data in the database.

Fig. 6 shows the "Other metrics" tab. The user selects a period of time for analysis and clicks the button "Calculate". This tab defines 2 groups of customers: low LTV and VLC. A low-LTV group has the recommendation to offer goods from the product group of goods purchased by the customer. For a low-VLC group, there is a recommendation: to minimize investment in stimulating purchases using cheap communication channels (e.g. email). In addition to sorting by date, the user has the opportunity to choose sorting by product or product group.

In the case when the analysis is made taking into account the period for analysis, all the data obtained are stored in the database. This allows you to speed up the program in the future: no need to re-count the metrics since they will already be in the database. Real databases can have hundreds of thousands of records. And the transfer of metrics for each customer can take a significant period of time.

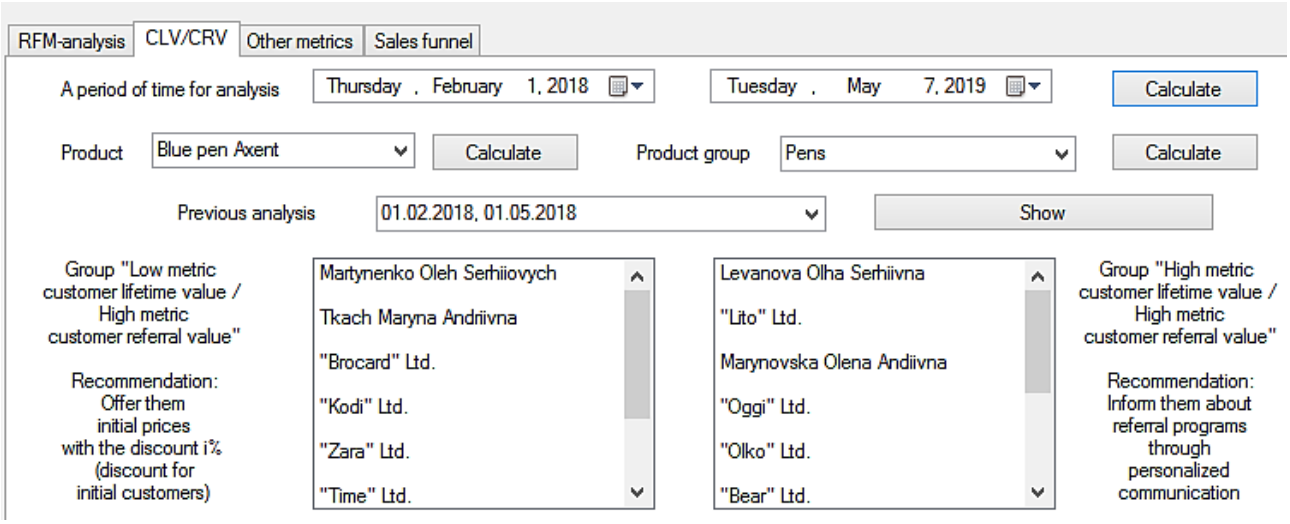

Fig. 5. "CLV/CRV" tab

In case the user chooses the time period for analysis already in the database, the calculation is performed again, but data are not entered into the database. This prevents the accumulation and duplication of data. Such software solutions can be used for decades or more. That is why the issue of disk space saving is an important issue that cannot be overlooked. Thus, the developed software solution is suitable for use over many years as it prevents the accumulation of unnecessary data in the database.

Fig. 7 shows the "Sales funnel" tab. By clicking on the "Build a sales funnel" button, a funnel for sales is under construction. This tab shows the conversion of the entire funnel and micro conversion for each stage. The user has the opportunity to select a period of time for analysis. The first phase micro conversion in any case is 100%, so it is not included in the block where the micro conversions are represented in steps. Stages can be any number, they are defined by the user (in the steps tab on the customer). The first stage is at the top of the sales funnel. The latter is at the bottom of the sales funnel. That is, the steps are displayed from top to bottom.

Figure 8 depicts an unbalanced sales funnel. As can be seen from the figure, in the first stage there was a large number of customers, but only 16% of them went into the second stage (micro conversion of the second stage), which is a rather small indicator, compared to the micro conversions of other stages. So, we can conclude that after the first stage there is a large loss of customers. This provides the basis for further analysis of the first stage, to determine the problem situation. The conversion of the entire funnel is only 3%, which is very small compared to the funnel conversion in Figure 7 (44%). That is, only 3% of customers who were in the first stage, have reached the last stage.

The developed software solution allows to segment the customer base according to different criteria and

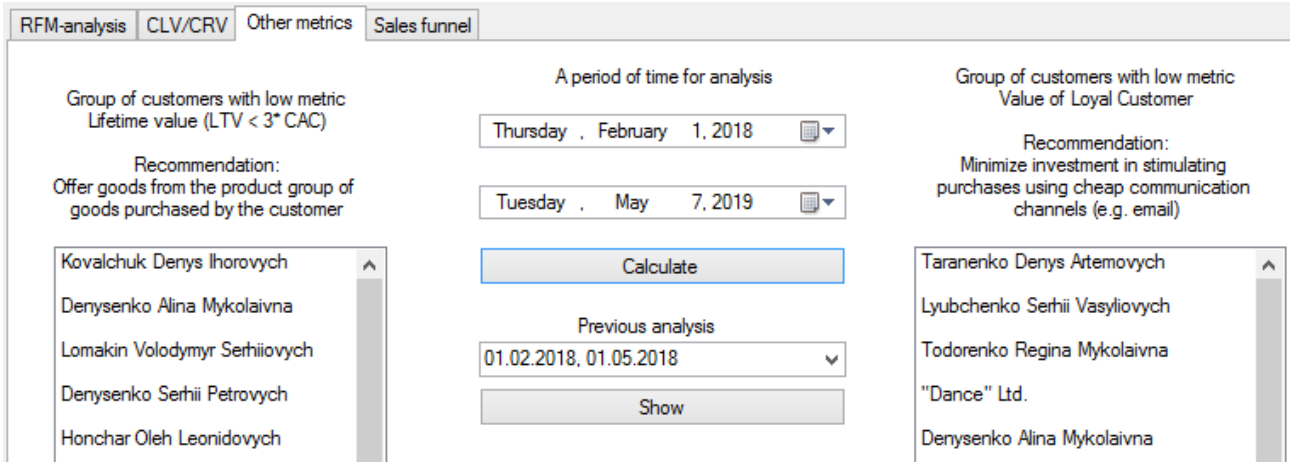

Fig. 6. "Other metrics" tab

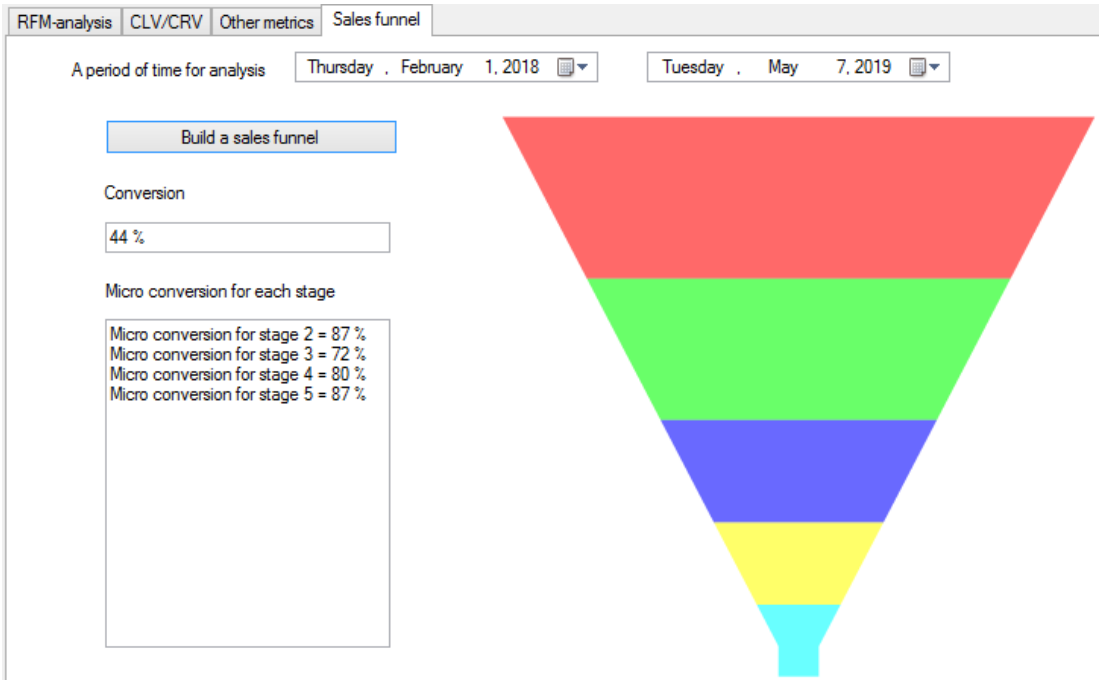

Fig. 7. "Sales funnel" tab

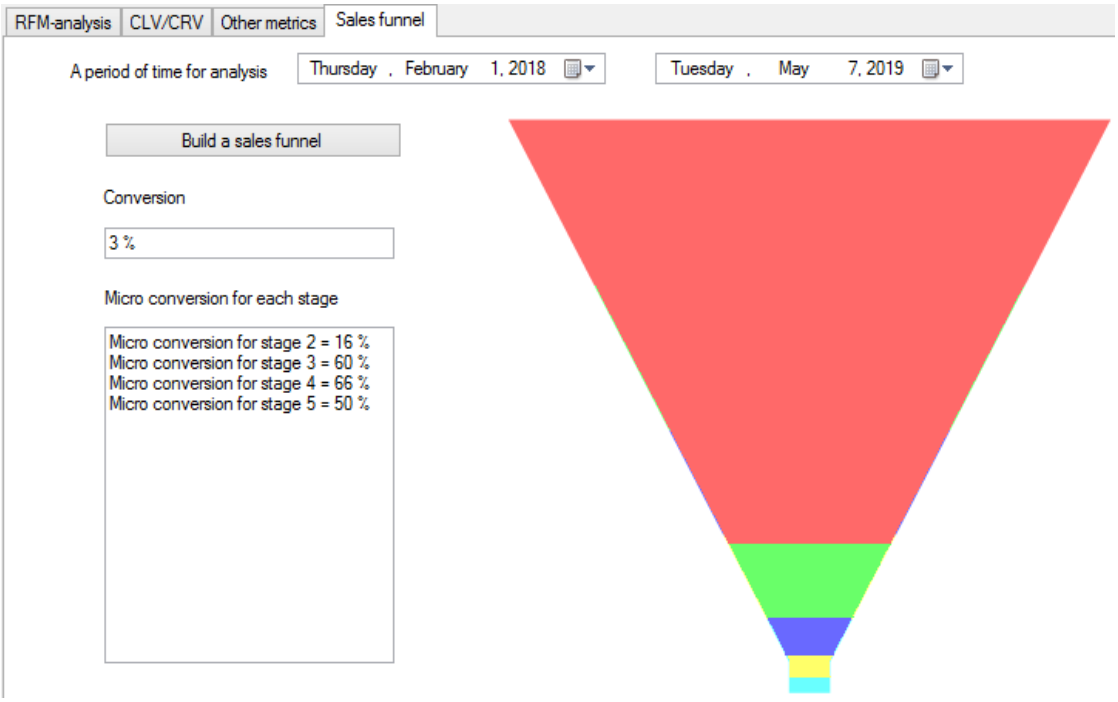

Fig. 8. Unbalanced sales funnel

provide marketing recommendations to each group of customers.

Conclusions. Whereas previously, the enterprise could become a market leader, focusing on the production and quality of goods, today it should take into account all the concepts of marketing. An enterprise should not just study the needs of the target market, but try to personally identify the needs of each customer, his individual preferences and offers the product or service he needs.

The developed software solution for solving the problem of customer value analysis is preferable to its counterparts, since it involves RFM analysis, which allows not only to segment the customers at their value, but also to issue marketing recommendations to increase company revenue. Similarly, it is done with the help of the developed mathematical support, that is, on the basis of calculations, customers are divided into groups and each group is provided with its marketing recommendations. Also, it includes not only the construction of sales funnels, but also its analysis.

References

1. Черкашин П. *Готовы ли вы к войне за клиента? Стратегия управления взаимоотношениями с клиентами (CRM)*. Москва: ООО «ИНТУИТ.ру», 2014. 384 с.
2. Гринберг П. *CRM со скоростью света: привлечение и удержание клиентов в реальном времени через Интернет*. СПб: Символ Плюс, 2012. 528 с.
3. Гужва В. М. *Інформаційні системи і технології на підприємствах*. Київ: КНЕУ, 2011. 400 с.
4. Герасименко В. В. *Маркетинг*. Проспект, 2015. 489 с.
5. Андреева К. *Лидогенерация. Маркетинг, который продает*. СПб. : Питер, 2014. 240 с.
6. Пэйн Э. *Руководство по CRM: путь к совершенствованию менеджмента клиентов*. Гревцов-паблишер, 2007. 384 с.
7. Каверина А. С. Анализ существующих методов управления клиентской базой для повышения конкурентоспособности аптечной организации. *Бюллетень сибирской медицины*. 2014. Т. 2, № 4. С. 172–180.
8. Кудинов А., Сорокин М., Голышева Е. *CRM: российская практика эффективного бизнеса*. 1С-Паблишинг, 2008. 374 с.
9. Баженов Р. И. RFM-анализ клиентской базы в прикладном решении 1С: Предприятие. *Информатизация и связь*. 2014. № 2. С. 51.
10. Фатхутдинов Р. А. *Инновационный менеджмент*. СПб.: Питер, 2012. 400 с.
11. *LTV:CAC Ratio*. URL: https://www.geckoboard.com/learn/kpi-examples/marketing-kpis/ltv-cac-ratio (access date: 01.04.2018).
12. Kumar V. *Profitable customer engagement: concept, metrics, and strategies*. SAGE Publications India, 2013. 309 p.
13. Молино П. *Технологии CRM. Экспресс-курс*. Москва: Фаир-Пресс, 2012. 272 с.

References (transliterated)

1. Cherkashin P. *Gotovy li vy k voyne za kliyenta? Strategiya upravleniya vzaimootnosheniyami s kliyentami (CRM)* [Are you ready for a war for a client? Customer Relationship Management (CRM) Strategy]. Moscow, “INTUIT.ru” LLC, 2014. 384 p.
2. Grinberg P. *CRM so skorostyu sveta: privlecheniye i uderzhaniye kliyentov v realnom vremeni cherez Internet* [CRM at the speed of light: attracting and retaining customers in real time via the Internet]. Saint-Petersburg, SimvolPlyus, 2012. 528 p.
3. Guzhva V. M. *Informatsiini systemy i tekhnolohii na pidpryiemstvakh* [Information systems and technologies at the enterprises]. Kyiv, KNEU, 2011. 400 p.
4. Gerasimenko V. V. *Marketing* [Marketing]. Prospekt, 2015. 489 p.
5. Andreyeva K. *Lidogeneratsiya. Marketing kotoryy prodayet* [Marketing that sells]. Saint-Petersburg, Piter, 2014. 240 p.
6. Peyn E. *Rukovodstvopo CRM: put k sovershenstvovaniyu menedzhmenta kliyentov* [CRM Guide: The Way to Improve Client Management]. Grevtsov-pablisher, 2007. 384 p.
7. Kaverina A. S. Analiz sushchestvuyushchikh metodov upravleniya kliyentskoy bazoy dlya povysheniya konkurentosposobnosti aptechnoy organizatsii [Analysis of the existing client base management methods to increase the competitiveness of the pharmacyorganization]. *Byulleten sibirskoy meditsiny* [Bulletin of Siberian Medicine]. 2014, no. 4(2), pp. 172–180.
8. Kudinov A., Sorokin M., Golysheva E. *CRM: rossiyskaya praktika effektivnogo biznesa* [CRM: Russian practice of effective business]. 1C-Pablishing, 2008. 374 p.

9. Bazhenov R. I. RFM-analiz kliyentskoy bazy v prikladnom reshenii 1C: Predpriyatiye [RFM analysis of the client base in the 1C: Enterprise application solution]. *Informatizatsiya i svyaz* [Informatization and communication]. 2014, no. 2. pp. 51.
10. Fatkhutdinov R. A. *Innovatsionnyy menedzhment* [Innovative management]. Saint-Petersburg, Piter, 2012. 400 p.
11. *LTV:CAC Ratio*. Available at: https://www.geckoboard.com/learn/kpi-examples/marketing-kpis/ltv-cac-ratio. (accessed 01.04.2018).
12. Kumar V. *Profitable customer engagement: concept, metrics, and strategies*. SAGE Publications India, 2013. 309 p.
13. Molino P. *Tekhnologii CRM. Ekspress-kurs* [CRM technology. Express course]. Moscow, Fair-Press, 2012. 272 p.

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