Aspects of Information and Analytical Support for the Supply Chain Management of Healthcare Customers' Loyalty

Irina Anatolyevna Ivanova, Tatyana Vasilievna Glukhova

Faculty of Economics, Ogarev Mordovia State University, Saransk, Russia
Corresponding author: IrinaIvanovaprofessor@yandex.ru, TatyanaVGlukhova@yandex.ru

Abstract- **The practice of managing customer loyalty to the organization's services based on the concept of Customer Relationship Management (CRM) is becoming increasingly relevant in the supply chain strategies. It is necessary to study potential consumers, identify their requirements and develop a competent marketing strategy for building mutually beneficial relations of the organization with customers. The development of a mechanism for assessing consumer loyalty to the healthcare facility services, its automation with the help of customer relationship management tools should be methodologically justified. Purpose. The research is aimed at developing a methodological approach to healthcare customer loyalty assessment, including identification of target and profitable segments, regulation of business processes, analysis of the customer database and business environment of an organization to increase the effectiveness of its marketing activities. Systemic research of customer relationships includes the following methods and tools: Data Mining methods with instrumental support of Statistica software, including factor analysis and formation of databases of endogenous and exogenous variables; specification of a mathematical model; correlation analysis; variable multiple linear regression analysis based on the generalized least squares method; model verification using R^2-statistics and Fisher (F-test) and Student (t-test) criteria; ABC- and XYZ analysis of revealing customer consumption profiles; the analytic hierarchy process (AHP) based on expert assessments of the multicriteria problem solution while evaluating the support tools for managing consumer loyalty with a hierarchical structure. The practical and theoretical significance of the results. A methodological approach has been developed to identify healthcare facility (HCF) customer preferences, implemented using a variable multiple linear regression model, including both quantitative (age, number of bed days, etc.) and qualitative (social status, gender, marital status, parental status, education, medical service type) exogenous variables. Consumption profiles of HCF services have been constructed on the basis of their clustering and classification using ABC- and XYZ analyzes. An algorithm for evaluating the support tools of the consumer loyalty analysis has been proposed. The analysis of consumer demand for the organization's services enables to develop an algorithm for assessing consumer loyalty management information systems, to form a system of indicators characterizing potential customers and their preferences in the medical services market; the most rational and customer-oriented services that reflect the customer's consumption profile. The results can be used as practical tools for improving the economic efficiency of the organization depending on the cluster dynamics of consumption and changes in personal customer characteristics and CRM-based marketing performance support tools.**

Keywords; *customer relationship, loyalty, CRM-system, supply chain strategy, Data Mining, the analytic hierarchy process, modelling*

1. Introduction

1.1. Problem statement

A loyalty program is a type of marketing aimed at creating long-term relationships with customers to turn them into loyal ones [1].

A Customer Relationship Management (CRM) systems are modern tools for effective customer relationship management:

– a business strategy for attracting (selecting) and managing customers, aimed at optimization of their value in the long term. CRM assumes that the organization has a customer-oriented philosophy and culture focused on effective performance in marketing, sales and after-sales services. CRM-systems make it possible to effectively manage customer relationships, provided that the company has specific goals, strategy and culture [2, 3];

– application software for organizations designed to automate customer relationship strategies, in particular, to increase sales, improve customer service by storing customer information and the history of relationships with them [4, 5];

– the business ideology, stipulating for the introduction of customer-oriented business strategies in the company, which requires reengineering of business processes, changing operational practices and supported (but not controlled) by the appropriate technology [6, 7];

– the process of actively deepening customer knowledge, and then using this knowledge to customize business and strategies for meeting individual customer needs [8];

The development of a methodological approach to assessing customer loyalty to the organization's services, as well as a reasonable choice of customer relationship management tools, will increase the company's performance indicators and provide additional competitive advantages.

2. Literature Review

In modern economic conditions, any company, regardless of the size and scope of its activities, is in a state of constant interaction with the external environment, in particular, with its partners and customers. The main goal of the customer relationship strategy is to increase the business profitability by ensuring customer satisfaction [9].

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The formation of healthcare consumer loyalty is based on customer satisfaction with servicing and, in general, the company activities. Consumers of medical services are one of the factors of the healthcare facility competitiveness, and the factor of consumer loyalty becomes its leading element affecting the influx of patients, which leads to the need to clarify this concept [10, 11]

The very concept of "loyalty" is quite multifaceted. Thus, for example, the Great Encyclopedic Dictionary gives the following definition of loyalty: it is "a correct, benevolent attitude towards someone or something" [12]. "Loyalty" is interpreted as the quality inherent in the user of the value (a commodity, a service), constantly returning to its source and passing this source by inheritance; loyalty is commitment to one's source of values [13]. Customer loyalty is "a threshold of insensitivity of the company's customers to the actions of competitors" [14].

Improving patient satisfaction is one of the long-term priorities of any healthcare facility, regardless of its departmental affiliation and form of ownership [15]. Since attracting new customers to an organization is more expensive than retaining the existing ones, therefore, ensuring satisfaction of customers, especially of the loyal ones, is more beneficial for the organization from a financial point of view.

The satisfaction of patients (consumers) is considered as the conformity of the process and the result of the medical services provision in the healthcare facility with their expectations and needs. A high level of customer satisfaction with the quality of the services provided in the healthcare facility meets the high level of patient loyalty to this organization. Loyal consumers form a steady demand for the services of a healthcare facility, providing it with a high level of competition [16].

Identification of factors affecting customer loyalty and customer satisfaction monitoring and assessment contribute to the achievement of the main strategic tasks assigned to the organization. The healthcare consumer satisfaction is largely determined by two main factors: customer focus and customer benefit. The patient is satisfied when his/her expectations coincide with the benefits received, and customer focus through an established dialogue forms the customer loyalty to the healthcare institution. The greater the benefit of using the service, the greater the satisfaction and the higher the service rating. This makes it possible to build long-term relationships in which the consumer favors a service or institution and becomes a loyal customer. [17, 18]

The development of the service sector, regardless of the specifics of the industry, is accompanied by the rapid introduction of various information and communication technologies. Taking into account the relevance of an individual, personalized approach to each customer, healthcare institutions are actively using modern information technologies embodied in the CRM concept. The CRM-system is a powerful tool that is employed to perform monitoring, analytics and planning of the operations with various customers, as well as to automate individual business processes. Traditionally, CRM is used to establish effective customer relationships, increase the level of their satisfaction and loyalty, which ultimately enhances the company's competitive advantages [19].

Using the information platform tools of the CRM-systems allows for quick and efficient tracking of the rapid changes in the external and internal environment, provides the opportunity to develop strategies and predict development directions for interaction with the target audience in terms of expanding customer loyalty programs with regard to their consumer preferences [20].

Large amounts of data accumulate in the course of activities of a healthcare facility that uses the information and communication capabilities of CRM-systems. This is customer information, all kinds of statistics on the use of the services provided, and much more. Effective use of the accumulated information will allow us to identify hidden patterns in customer service processes based on analytical information technologies and build new non-trivial models that can solve many problems of the company [21]. Various methods are used to identify such patterns and build models, including the Data Mining method. This data processing method results in empirical models, classification rules, allocated clusters, and so on. Data Mining makes it possible to see such relationships between data that have never been taken into account previously, and their use can help increase the overall performance of the company.

The stochastic nature of loyalty will enable to forecast possible customer reactions when a company makes a certain impact.

3. Methods and Materials

In this work, a systemic study of customer relationship management was carried out, as exemplified by a healthcare facility, employing the following methods and tools:

– Data Mining methods with instrumental support of Statistica software, including factor analysis and formation of databases of endogenous and exogenous variables; mathematical model specification; correlation analysis; variable multiple linear regression analysis based on the generalized least squares method; model verification using R^2-statistics and Fisher (F-test) and Student (t-test) criteria;

– ABC- and XYZ analysis of revealing customer consumption profiles;

– the analytic hierarchy process (AHP) based on expert assessments of the multicriteria problem solution while evaluating the support tools for managing consumer loyalty with a hierarchical structure and assessment of the criteria of the corporate identity component of the organization.

4. Results

The competitive advantages of a healthcare facility are unique, special characteristics of a company, focused on the needs of the customers, including highly qualified personnel; the availability of optimal management and marketing systems; variety of services that are significant to the consumers; timeliness and quality of their provision; introduction of innovative technologies; up-to-date material and technical base, stable financial condition, minimization of costs per unit of medical services provided, as well as prices for them, etc. [22].

Identification of the full range of services offered and their competitive advantages, as well as analysis of potential competitors and assessment of their positions

make the image component of the healthcare facility and its competitive positions. Moreover, the effectiveness of HCF marketing services depends on the segmentation of the medical services market, which allows to provide medical care (to satisfy a specific demand) taking into account the patient's individuality and mass consumption of medical services [23].

This research presents the authors' assessment of the criteria of the company's corporate identity component as one of the elements of the effectiveness of its marketing activities (Table 1).

Table 1. Expert assessment of corporate identity criteria

Indicators	Criterion assessment		
	0	1	2
Resource identity (state of financial, labor, manufacturing resources, etc.)			
Return on sales, K_1	Below 5 %	5 % – 30 %	Above 30%
Return on assets, K_2	Below 5 %	5 % – 20 %	Above 20 %
Return on equity, K_3	Below 5 %	5 % – 25 %	Above 25 %
Staff turnover rate, K_4	Above 15 %	10 % – 15 %	Below 10 %
The proportion of higher education staff, K_5	Below 10 %	10 % – 25 %	Above 25 %
The proportion of employees with an academic degree, K_6	0 %	0 % – 0.04 %	Above 0.04 %
Managerial identity			
Availability of the identity development management system, K_7	Absent at the enterprise	at the implementation stage	operating at the enterprise
Implementation of the identity development strategy, K_8	Implemented by less than 65 %	Implemented by more than 65 %, but less than 100 %	Implemented by more than 100 %
Social identity			
Costs associated with social projects and charitable activities, K_9	No expenditures	Irregular expenditures	Constant expenditures for charity
Availability of non-financial reporting, K_{10}	No non-financial reporting	Partial information provided on the company's website	Complete information provided annually on the company's website
Employees' wage level, K_{11}	At the average wage level in the region	By 1.2 - 1.5 times higher than the average wage in the region	Exceeding the average wage in the region by more than 1.5 times
Personnel training costs, K_{12}	Below 0.5 % of the payroll	0.5 % – 9 % of the payroll	Above 9 % of the payroll
Innovation identity			
The share of innovative products in the company's turnover, K_{13}	Below 5%	5 % – 30 %	Above 30 %
The share of the use of innovative technologies, K_{14}	Below 0.1 %	0.1 – 0.3 %	Above 0.3 %
Internal reputation			
Availability of the company's vision, mission and goal, K_{15}	Absent	At the implementation stage	Available
Availability of the company's code of conduct, K_{16}	Absent	The code of conduct contains 5 to 9 chapters out of 10 recommended	The code of conduct contains all 10 chapters out of 10 recommended.
Commodity reputation			
Product profitability, K_{17}	Below 5 %	5 % – 20 %	Above 20 %
Availability of a Quality Management System certified to comply with the MS ISO 9001: 2008 standard, K_{18}	Absent	Quality Management System is at the implementation stage	Implemented
Availability of the HACCP quality management system, K_{19}	Absent	Quality Management System is at the implementation stage	Implemented
Return of commodities due to faulty products, K_{20}	Above 0.5 %	0.3 – 0.5 %	Below 0.3 %
Depth of market coverage in the own region, K_{21}	Below 40 %	40 – 70 %	Above 70 %
Degree of market geography expansion, K_{22}	Below 10 %	10 – 30 %	Above 30 %
Availability of additional services, K_{23}	Absent	At the implementation stage	Implemented
Buyer identity			
Availability of customer database, K_{24}	Absent	At the implementation stage	Implemented

Integral index of corporate identity (CI_I) assessment constructed using the relative importance scale (Table 1) of each individual local criterion by the hierarchy analysis method (Table 2), has the following form:

$$CI_I = (0.052 \cdot K_1 + 0.052 \cdot K_2 + 0.052 \cdot K_3 + 0.031 \cdot K_4 + 0.021 \cdot K_5 + \\ +0.010 \cdot K_6 + 0.144 \cdot K_7 + 0.072 \cdot K_8 + 0.052 \cdot K_9 + 0.064 \cdot K_{10} + 0.038 \cdot K_{11} \\ +0.064 \cdot K_{12} + 0.010 \cdot K_{13} + 0.050 \cdot K_{14} + 0.067 \cdot K_{15} + 0.033 \cdot K_{16} + \\ +0.007 \cdot K_{17} + 0.010 \cdot K_{18} + 0.005 \cdot K_{19} + 0.012 \cdot K_{20} + 0.010 \cdot K_{21} + \\ +0.010 \cdot K_{22} + 0.012 \cdot K_{23} + 0.033 \cdot K_{24}) \cdot 100\ (\%) \quad (1)$$

Table 2. Determination of the priority (weight) vector of the criteria for assessing the company identity

	K_1	K_2	K_3	K_4	K_5	K_6	K_7	K_8	K_9	K_{10}	K_{11}	K_{12}	K_{13}	K_{14}	K_{15}	K_{16}	K_{17}	K_{18}	K_{19}	K_{20}	K_{21}	K_{22}	K_{23}	K_{24}	Weight
K_1	1.0	1.0	1.0	1.7	2.5	5.0	0.4	0.7	1.0	0.8	1.3	0.8	0.5	1.0	0.8	1.5	7.0	5.2	10.4	4.2	5.2	5.2	4.2	1.5	0.052
K_2	1.0	1.0	1.0	1.7	2.5	5.0	0.4	0.7	1.0	0.8	1.3	0.8	0.5	1.0	0.8	1.5	7.0	5.2	10.4	4.2	5.2	5.2	4.2	1.5	0.052
K_3	1.0	1.0	1.0	1.7	2.5	5.0	0.4	0.7	1.0	0.8	1.3	0.8	0.5	1.0	0.8	1.5	7.0	5.2	10.4	4.2	5.2	5.2	4.2	1.5	0.052
K_4	0.6	0.6	0.6	1.0	1.5	3.0	0.2	0.4	0.6	0.5	0.8	0.5	0.3	0.6	0.5	0.9	4.2	3.1	6.3	2.5	3.1	3.1	2.5	0.9	0.031
K_5	0.4	0.4	0.4	0.7	1.0	2.0	0.1	0.3	0.4	0.3	0.5	0.3	0.2	0.4	0.3	0.6	2.8	2.1	4.2	1.7	2.1	2.1	1.7	0.6	0.021
K_6	0.2	0.2	0.2	0.3	0.5	1.0	0.1	0.1	0.2	0.2	0.3	0.2	0.1	0.2	0.2	0.3	1.4	1.0	2.1	0.8	1.0	1.0	0.8	0.3	0.010
K_7	2.8	2.8	2.8	4.7	7.0	14.0	1.0	2.0	2.8	2.3	3.8	2.3	1.4	2.9	2.2	4.3	19.5	14.6	29.3	11.7	14.6	14.6	11.7	4.3	0.144
K_8	1.4	1.4	1.4	2.3	3.5	7.0	0.5	1.0	1.4	1.1	1.9	1.1	0.7	1.4	1.1	2.2	9.8	7.3	14.6	5.9	7.3	7.3	5.9	2.2	0.072
K_9	1.0	1.0	1.0	1.6	2.5	4.9	0.4	0.7	1.0	0.8	1.3	0.8	0.5	1.0	0.8	1.5	6.9	5.2	10.3	4.1	5.2	5.2	4.1	1.5	0.051
K_{10}	1.2	1.2	1.2	2.1	3.1	6.2	0.4	0.9	1.3	1.0	1.7	1.0	0.6	1.3	1.0	1.9	8.6	6.5	12.9	5.2	6.5	6.5	5.2	1.9	0.064
K_{11}	0.7	0.7	0.7	1.2	1.9	3.7	0.3	0.5	0.8	0.6	1.0	0.6	0.4	0.8	0.6	1.1	5.2	3.9	7.7	3.1	3.9	3.9	3.1	1.1	0.038
K_{12}	1.2	1.2	1.2	2.1	3.1	6.2	0.4	0.9	1.3	1.0	1.7	1.0	0.6	1.3	1.0	1.9	8.6	6.5	12.9	5.2	6.5	6.5	5.2	1.9	0.064
K_{13}	1.9	1.9	1.9	3.2	4.8	9.7	0.7	1.4	2.0	1.6	2.6	1.6	1.0	2.0	1.5	3.0	13.5	10.1	20.3	8.1	10.1	10.1	8.1	3.0	0.100
K_{14}	1.0	1.0	1.0	1.6	2.4	4.8	0.3	0.7	1.0	0.8	1.3	0.8	0.5	1.0	0.8	1.5	6.8	5.1	10.1	4.1	5.1	5.1	4.1	1.5	0.050
K_{15}	1.3	1.3	1.3	2.2	3.2	6.5	0.5	0.9	1.3	1.0	1.7	1.0	0.7	1.3	1.0	2.0	9.0	6.8	13.5	5.4	6.8	6.8	5.4	2.0	0.067
K_{16}	0.6	0.6	0.6	1.1	1.6	3.2	0.2	0.5	0.7	0.5	0.9	0.5	0.3	0.7	0.5	1.0	4.5	3.4	6.8	2.7	3.4	3.4	2.7	1.0	0.033
K_{17}	0.1	0.1	0.1	0.2	0.4	0.7	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.2	1.0	0.8	1.5	0.6	0.8	0.8	0.6	0.2	0.007
K_{18}	0.2	0.2	0.2	0.3	0.5	1.0	0.1	0.1	0.2	0.2	0.3	0.2	0.1	0.2	0.1	0.3	1.3	1.0	2.0	0.8	1.0	1.0	0.8	0.3	0.010
K_{19}	0.1	0.1	0.1	0.2	0.2	0.5	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.7	0.5	1.0	0.4	0.5	0.5	0.4	0.1	0.005
K_{20}	0.2	0.2	0.2	0.4	0.6	1.2	0.1	0.2	0.2	0.2	0.3	0.2	0.1	0.2	0.2	0.4	1.7	1.3	2.5	1.0	1.3	1.3	1.0	0.4	0.012
K_{21}	0.2	0.2	0.2	0.3	0.5	1.0	0.1	0.1	0.2	0.2	0.3	0.2	0.1	0.2	0.1	0.3	1.3	1.0	2.0	0.8	1.0	1.0	0.8	0.3	0.010
K_{22}	0.2	0.2	0.2	0.3	0.5	1.0	0.1	0.1	0.2	0.2	0.3	0.2	0.1	0.2	0.1	0.3	1.3	1.0	2.0	0.8	1.0	1.0	0.8	0.3	0.010
K_{23}	0.2	0.2	0.2	0.4	0.6	1.2	0.1	0.2	0.2	0.2	0.3	0.2	0.1	0.2	0.2	0.4	1.7	1.3	2.5	1.0	1.3	1.3	1.0	0.4	0.012
K_{24}	0.6	0.6	0.6	1.1	1.6	3.2	0.2	0.5	0.7	0.5	0.9	0.5	0.3	0.7	0.5	1.0	4.5	3.4	6.8	2.7	3.4	3.4	2.7	1.0	0.033

Further, companies are ranked into classes according to the level of identity development, depending on the number of points according to the developed scale for company assessment (Table 3).

Table 3. Classification of companies based on the assessment of the identity development level

Class	CI_I value	Characterization
1st	151-200	The company is characterized by a very high level of corporate identity development: there is an identity development management system; identity development strategy is implemented by more than 100%, the company's products are competitive, the market geography is wide, the customer database is constantly updated, the company employs highly qualified personnel, the company takes care of its employees, the company is socially and innovatively oriented, the profitability level is high
2nd	101-150	The corporate identity level is high. The company has an identity development management system, the identity development strategy is being implemented, but not in full, the products are competitive, but a set of measures is needed to more carefully promote them in the new markets, the customer database is maintained, the company employs highly qualified personnel and the company is interested in developing its staff, a set of measures regarding the company's social orientation is insufficiently thought out, the profitability level is high
3rd	51-100	The corporate identity level is assessed as average. The corporate identity development strategy is implemented by no more than 75%, the identity development management system is at the implementation stage, the company's products are not competitive enough, the company mainly operates in the market of its own region, employee wages are at the average level, staff training occurs from time to time, expenditures for social projects and charitable activities are irregular, the profitability level is medium
4th	0-50	Such a company has a low level of corporate identity, there is no identity management system and customer database, the corporate identity development strategy, if any, is almost not implemented, the company's products are uncompetitive, wages are at a low level, the company is not interested in developing its personnel, the company is not socially oriented and the profitability level is low

Creating a corporate identity rating is an effective tool to increase the company's competitiveness. To a large extent, the company's commercial success is facilitated by its positive corporate identity, which is closely dependent on the efforts of the company itself and needs constant evaluation and adjustment [22]. The provisions developed and the results obtained can become the basis for increasing the effectiveness of the company's marketing activities and improving the policy of relations of healthcare facilities with service consumers.

When researching the medical industry market, it is necessary to analyze the preferences of the company's service consumers, in particular, analyze and model the dependence of the average cost of the provided medical services (Y) on the factors characterizing potential customers and their preferences.

In this study, statistical and expert information for 2018 (197 observations) and multiple linear regression analysis with a variable structure [24, 25] was used for modeling. The impact of qualitative attributes on the outcome variable (Y determines the cost of the services provided) was assessed by including dummy variables [26].

The method of successive step-by-step adjunction was used to construct a multiple regression equation (2) for the dependence of the average cost of medical services provided by a healthcare facility (Y) on the presented factors, excluding factors that are statistically insignificant by the Student criterion.

$$Y = -16375.77 + 9860.10D_{11} + 7870.76D_{12} + 6875.62D_{13} + 912.60D_2 + 87.49X_3 + \\ (3.89) \quad (2.83) \quad (2.24) \quad (2.04) \quad (2.01)$$

$$+2230.85X_8 + 1524.43X_9 - 1063.08X_{10} - 945.73X_{11} + 952.55X_{12} + 1504.13X_{13} + \varepsilon, \quad (2)$$
$$(21.18) \quad (2.92) \quad (-2.33) \quad (-2.23) \quad (2.19) \quad (2.88)$$

$$F = 47.44, \quad R^2 = 0.72$$

where

$D_{11} = \begin{cases} 1, & employee \\ 0, & worker \\ 0, & pensioner \end{cases}$, $D_{12} = \begin{cases} 0, & employee \\ 1, & worker \\ 0, & pensioner \end{cases}$ – dummy variables reflecting the customer's social status;

$D_2 = \begin{cases} 1, & male \\ 0, & female \end{cases}$ – dummy variable reflecting the customer's gender;

X_3 – age, years;

X_8 – number of bed days, pcs.

$X_{9\text{-}13}$ – the type of medical service (mineral bubble bath, general massage, underwater shower massage, heart examination, mud application, thalassotherapy, manual therapy, etc.)

$X_{9-13} = \begin{cases} 1, & service\ is\ provided \\ 0, & service\ is\ not\ provided \end{cases}$;

Y – cost of the services provided, RUB.

The coefficients of the regression equation are statistically significant by the Student criterion at a significance level of α=0.05; the regression equation is reliable by the Fisher criterion at a significance level of α = 0.001, the normalized determination coefficient is $R^2 = 0.72$. Therefore, the share of variation of the dependent variable Y, conditioned by a change in the explanatory variables, included in the model is 72.3%, and consequently, it is applicable for research and forecasting.

The analysis of the obtained econometric model (2) makes it possible to draw the following conclusions using an economic interpretation of its parameters:

– the cost of medical services provided to customers-employees exceeds on average the cost of similar services rendered to the retired customers by 9,860 rubles 10 kopecks;

– the cost of medical services provided to customers-workers exceeds on average the cost of similar services to the retired customers by 7,870 rubles 76 kopecks;

– the cost of medical services provided to male customers exceeds on average the cost of similar services to female clients by 912 rubles 60 kopecks;

– with an increase in age by 1 year, the cost of medical services provided will increase on average by 87.49 rubles while binding other exogenous variables at a constant average level;

– with an increase in the number of bed days on average by 1 unit the cost of medical services provided will increase on average by 2,230 rubles 85 kopecks while binding other exogenous variables at a constant average level, etc.

The company services were classified depending on the degree of demand among consumers and economic profitability for the company on the basis of ABC- and XYZ analyzes, which allowed for optimization of expenditures and revenues of institutions via tracking key positions, factors and reasons for changing the cost structure, forecasting and strategic planning of financial and business activities of the company [27, 28, 29, 30].

The nomenclature of services of OJSC Saransky Sanatorium comprises more than 90 types of services.

Group A included 19 out of 92 services of the healthcare facility (21% of all services) providing 80.96% of the company's turnover. Group B includes 21 HCF services out of 92 (22.8% of all services) that provide 14.4% of the company's turnover. There is the company's "heavy load" (services that provide modest income making 4.33% of the total turnover) among the services included in group C, which accounts for 54% of the HCF nomenclature (50 of 92). As a result of combining the analysis by two criteria (ABC and XYZ), we obtain a classification (grouping) of company services from the categories that are most popular among the consumers and economically advantageous for the company (AX group – services that should always be available without creating an insurance reserve, they determine financial stability of the company, and are characterized by a high degree of the forecast reliability due to the stability of consumption) to the least profitable for the company and unpopular with customers (CZ group) [22].

CRM systems make it possible to increase the effectiveness of the company's marketing division by optimizing the entire sales cycle and the corresponding information flows; improved monitoring of customer

relationships, accuracy of sales forecasting; slowdown in spending for customer support and advertising; enhanced customer loyalty; and increased cross-selling. CRM systems are represented in the market by the following products: StorVerk CRM, Terrasoft bpm'online, Microsoft Dynamics CRM, Bitrix24, 1C:CRM, amo CRM, Megaplan and others with different functional characteristics; their comparative analysis is presented in Table. 4.

Table 4. Rating of local criteria for CRM systems

Feature */Software Product	StorVerk CRM	Terrasoft bpm' online	Microsoft Dynamics CRM	Bitrix24	1C:CRM	amo CRM	Megaplan
Functionalities	**4**	**5**	**4**	**5**	**5**	**3**	**3**
Availability of web services	1	1	1	1	1	1	1
Maintaining and managing the customer database	1	1	1	1	1	1	1
Business processes	1	1	1	1	1	0	0
Teamwork opportunity	1	1	1	1	1	1	1
Implementation of the system in all departments of the company	0	1	0	1	1	0	0
Analytics	**5**	**5**	**3**	**4**	**4**	**4**	**3**
Sales funnel	1	1	1	1	1	1	1
Profit analysis for the period	1	1	1	1	1	1	1
Activity Analytics	1	1	1	1	1	1	1
Marketing Performance Analysis	1	1	0	0	0	0	0
Risk assessment	1	1	0	1	1	1	0
Marketing unit	**2**	**2**	**1**	**2**	**1**	**1**	**2**
Import of documentation from other software	**2**	**1**	**1**	**2**	**1**	**2**	**1**
Report Export	**2**	**1**	**2**	**2**	**1**	**2**	**1**
MS Excel	1	1	1	1	1	1	1
CSV	1	0	1	1	0	1	0
Delivery option	**1**	**2**	**1**	**2**	**2**	**1**	**2**
SAAS	0	1	1	1	1	1	1
Stand Alone	1	1	0	1	1	0	1
Integration with other systems	**3**	**3**	**3**	**3**	**3**	**3**	**3**
1C	1	1	1	1	1	1	1
SIP	1	1	1	1	1	1	1
Website	1	1	1	1	1	1	1
Cost of one license	**4**	**7**	**5**	**6**	**3**	**1**	**2**

*1 – there is an opportunity, 0 – there is no opportunity

In this study, an algorithm for evaluating the support tool of consumer loyalty analysis was considered using the analytic hierarchy process (AHP) [31, 32] based on expert assessments identifying significant approaches to assessing the quality of a software product and ranking them according to the most significant local criteria (functionality, analytics, marketing tasks, user-friendly interface, report making, integration with other systems, the cost of one license, etc.). The priority vector is determined from the developed priorities of the information system quality evaluation on the scale of their relative significance (weight) of the local criteria of each approach; matrices of pairwise comparisons are formed for each level of the hierarchy according to the force of influence on the managed elements (approaches).

A consolidated matrix of local priorities is made (3):

$$r = \begin{pmatrix} 6.91 & 8.91 & 7.00 & 9.42 & 10.40 & 9.42 & 4.71 & 8.28 \\ 8.63 & 8.91 & 7.00 & 9.42 & 5.20 & 4.71 & 9.42 & 14.50 \\ 6.91 & 5.35 & 7.00 & 4.71 & 5.20 & 9.42 & 4.71 & 10.35 \\ 8.63 & 7.13 & 7.00 & 9.42 & 10.40 & 9.42 & 9.42 & 12.43 \\ 8.63 & 7.13 & 7.00 & 4.71 & 5.20 & 4.71 & 9.42 & 6.21 \\ 5.18 & 7.13 & 7.00 & 4.71 & 10.40 & 9.42 & 4.71 & 4.14 \\ 5.18 & 5.35 & 7.00 & 9.42 & 5.20 & 4.71 & 9.42 & 2.07 \end{pmatrix} \quad (3)$$

The obtained matrix of local priorities is convolved (4):

$$n = \begin{pmatrix} 7.92 \\ 8.01 \\ 6.43 \\ 9.09 \\ 6.43 \\ 6.25 \\ 5.53 \end{pmatrix} \quad (4)$$

Global priority vector is written as (5):

$$\begin{pmatrix} StorVerk\ CRM \\ Terrasoft\ bpm'online \\ Microsoft\ Dynamics\ CRM \\ Bitrix24 \\ 1C{:}\ CRM \\ amo\ CRM \\ Megaplan \end{pmatrix} \rightarrow \begin{pmatrix} 6.91 & 8.91 & 7.00 & 9.42 & 10.40 & 9.42 & 4.71 & 8.28 \\ 8.63 & 8.91 & 7.00 & 9.42 & 5.20 & 4.71 & 9.42 & 14.50 \\ 6.91 & 5.35 & 7.00 & 4.71 & 5.20 & 9.42 & 4.71 & 10.35 \\ 8.63 & 7.13 & 7.00 & 9.42 & 10.40 & 9.42 & 9.42 & 12.43 \\ 8.63 & 7.13 & 7.00 & 4.71 & 5.20 & 4.71 & 9.42 & 6.21 \\ 5.18 & 7.13 & 7.00 & 4.71 & 10.40 & 9.42 & 4.71 & 4.14 \\ 5.18 & 5.35 & 7.00 & 9.42 & 5.20 & 4.71 & 9.42 & 2.07 \end{pmatrix} * \begin{pmatrix} 12.11 \\ 10.90 \\ 9.69 \\ 8.48 \\ 7.27 \\ 7.27 \\ 6.05 \\ 4.84 \end{pmatrix} = \begin{pmatrix} \mathbf{541,12} \\ \mathbf{548,63} \\ 434.57 \\ \mathbf{591,18} \\ 449.14 \\ 440.79 \\ 407.77 \end{pmatrix} \quad (5)$$

It can be concluded from (4) that the following CRM systems are the priority software products to support the customer relationship management system: StorVerk CRM, Terrasoft bpm'online, Bitrix24.

5. Discussion

The analysis confirms the relevance of this problem, since the formation of an effective marketing strategy of a healthcare facility is impossible without identifying target and profitable segments, regulating business processes, analyzing the company's customer database and business environment. Further research should be aimed at substantiating effective methods and tools for implementing marketing policies, taking into account customer preferences and automating customer relationship strategies to ensure the sustainability of the company's resource base and improve the quality of control processes, analytics and planning the work with service consumers, as well as to optimize individual businesses processes of the company.

6. Conclusions

The research is develop to realize the position of the CRM in supply chain strategies in health issues. The results can be used as practical tools to increase the company's effectiveness based on the customer loyalty formation with regard to customer preferences and automation of the process of forming HCF services, depending on the cluster dynamics of consumption and changing personal customer characteristics and individual preferences.

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