Journal of Contemporary Issues in Business and Government Vol. 27, No. 2,2021
https://cibg.org.au/

P-ISSN: 2204-1990; E-ISSN: 1323-6903
DOI: 10.47750/cibg.2021.27.02.196

The Matrix Model of the Tactical Prospects of the Company's Sales Logistics

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Abstract

An enterprise constantly needs to improve its sales logistics. The purpose of the work is to create a matrix of tactical prospects for the company's sales logistics. Tasks for conducting a comprehensive study of the scientific and methodological support of ABC analysis methods have been identified; the use of the economic and mathematical apparatus for modeling the sales matrix; a description of the methodology for building the sales matrix and identifying the tactical prospects of the enterprise. The study relies on systemic and process approaches. The main methods are methods of statistical, economic, and mathematical analysis. The presented matrix model is based on the creation of individual contract sales conditions, grounding on multi-parameter ratings of customers and goods. It is shown that the regulation of relations and flows in the sales sector can be carried out on the basis of standard decisions taken from the proposed model of the matrix of sales logistics.

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P-ISSN: 2204-1990; E-ISSN: 1323-6903
DOI: 10.47750/cibg.2021.27.02.196

Keywords: information logistics, matrix method; product mix management; receivables rating; sales logistics

JEL classification: M11, M21, M31

1. Introduction

The ABC-method is widely used in the methodology of existing logistic operations for managing the company's product mix. The essence of this method is reduced to the breakdown of goods into groups of varying degrees of importance according to a certain criterion (sales volume, profit, quality percentage, etc.) in order to single out the most promising groups in terms of procurement thoroughness, sales promotion, and inventory taking (Yankovskaya and Mikova, 2017; Izmaylova et al., (2018; Bowersox and Closs, 2017). However, the practice of regulating logistics flows in industrial companies, on the basis of which the research was conducted, showed that the capabilities of the classical ABC method are quite narrow for several reasons, in particular:

- as a rule, ranking is carried out only on one basis, while the effectiveness of product mix or client policy formation can be evaluated according to a system of criteria;
- ABC analysis gives only general rules for 3 groups of customers or goods (Yin et al., 2019), not allowing an individual approach to the marketing policy of the company (Voitkevich, 2016; Karkhova, 2019).

Due to the above reasons, a research was conducted, the purpose of which was to obtain a universal methodology aimed at the formation of individual contractual terms and conditions of promotions by the enterprise management, as well as measures to reform the product matrix of the tactical prospects of sales logistics. For this, the following key tasks were solved: a comprehensive review of the scientific and methodological support of the ABC analysis method was carried out; an economic and mathematical tool is proposed for the transition to a comprehensive sales matrix, based on the author's matrix coefficient (Kms); a matrix identifying the tactical prospects of the company's sales logistics was compiled. Research hypothesis: It is expected that an attempt to combine individual customer / debtors and goods ratings to build a tactical matrix for sales logistics will affect the effectiveness of complex decisions in the process of logistic analysis. At the same time, the authors interpret the results as basic information for making decisions in the company's sales policy.

An attractive approach is described in (Uspuriene et al., 2016), according to which the preliminary ranking of material resources is carried out, considering the importance for the processes in public institutions.

The following types of research served as the prerequisites for the author's methodology for rating customers / debtors and goods:

- sales management methods based on combining ABC and XYZ analyzes (Yankovskaya and Mikova, 2017; Bubnova, Voronkov and Guzikova, 2017; Tovma et al., 2020; Zenkova and Gaman, 2017; Guo et al., 2019);
- techniques describing general ratings of logistics performance (Izmaylova, et al., 2018; Karkhova, 2019; Malevich and Aitova, 2018; Novikov and Novikova, 2015; Tang and Abosedra, 2019; Belantová, Gálová and Taraba, 2019).

Distinctive features of the developed matrix method for regulating sales logistics are:

- increased number of evaluation criteria, thus, the method in question can be called multi-parameter;

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- the resulting matrix takes into account both material flows (the effectiveness of the product policy) and financial flows as an element of financial logistics in the field of sales (when evaluating the movement of receivables).

2. ABC analysis development

An analysis of subject publications shows that scientists from Russia and the CIS countries are engaged in similar researches devoted to building information systems for evaluating sales logistics (Bubnova, Voronkov and Guzikova, 2017; Malevich and Aitova, 2018; Beysenbaev and Dus, 2019; Borisova and Balabanov, 2010). We propose a methodology for constructing a model of the matrix of tactical prospects of the enterprise to solve the problem of insufficient information base to support logistics solutions in the field of marketing.

The proposed management methodology in the field of sales is based on the principle of a multiplicity of parameters for the implementation of financial analysis in relation to both customers/debtors and the product mix policy of the enterprise (Kuzmin and Volkova, 2018). In the process of researching this topic, the main criteria were proposed for information support for managing customer relations and goods, while regulating financial and material flows in the company's sales logistics:

1. Economic criteria for the effectiveness of a company's credit policy:

1.1. Debt creation period (days).
1.2. Amount (RUB).
1.3. The duration of the business relationship (months)–P.
1.4. The total amount of shipments for the period of interactions with the client (CU) is ∑.
1.5. The number of payment failures for the period of interactions–C (-).
1.6. The number of orders (shipments)–O.
1.7. The average monthly amount of shipments (CU) = ∑ / I.
1.8. Frequency of customer behavior (average monthly number of orders of goods) = O / P.
1.9. Payment discipline (probability of failing payment terms in the future) (%) = C (-) / O * 100%.

2. Financial criteria for the effectiveness of the formation of the product mix:

2.1. Revenue, RUB (R).
2.2. Sales margin, %: (RP = P (profit from sales) / V * 100).
2.3. Average monthly order, RUB: (SV = Vg (revenue for the year) / 12).
2.4. Turnover ratio: (KO = W/Z (monetary value of sales inventory).
2.5. Dynamics of sales, %: (Tr = B / B0 (revenue for the previous period) * 100).
2.6. The level of surplus stocks, %: (UNL = NL (monetary value of surplus stocks for more than six months) / Z * 100).
2.7. Order level: (Spr = V / CB).

A review of this information base indicates that we have a certain term of reference: the so-called multiplicity of criteria (Grishunin and Dyachkova, 2017), i.e. the need to consider immediately 7-9 criteria when making managerial decisions (Bubnova, Voronkov and Guzikova, 2017) in sales logistics. As an affordable tool for the task to be solved, an individual rating of customers/debtors and goods was selected and developed by modifying the ABC method.

3. Methodology for compiling an individual rating of customers and goods

The creation of individual customer and product ratings (Gavin, 2019) is primarily based on the principle of ABC ranking, when for each indicator in the sales statistics, goods and customers/debtors are divided into groups A (about 75-80% of the contribution to the indicator in as a whole), B (about 15-20% of the contribution to the indicator as a whole), C

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(about 5-10% of the contribution to the indicator as a whole) (Grishunin and Dyachkova, 2017), with assignment of the corresponding letter sign and obtaining the final rating.

The formation of an individual rating of goods and debtors was carried out by statistical data processing–by the method of relative structure values (RSV), which characterizes the shares, specific gravities of composite production and financial and economic indicators in all. As a rule, they are obtained in the form of a percentage and determined by the formula (1).

$$RSV = \frac{Pi}{\sum_{n} Pn} \times 100\% \quad (1)$$

where: Pi–value of i-indicator; $\sum$ Pn is the sum of all indicators of a given series; n is the number of indicators of this series.

Conventional examples of the application of the above method of rating goods and customers/debtors are presented in Table 1 and Table 2.

Table 1: The creation of an individual rating of goods

Indicators	Product 1	Product 2	Product 3	Product 4	Product 5	Total
1. Revenue, RUB	297,000	178,000	8150	20,000	92,000	595,150
Also, %	49.9	29.91	1.37	3.36	15.46	100.00
Rating category	A	A	C	C	B	
2. Profitability, %	31	36	18	10.5	16.8	112.30
Also, %	27.6	32.06	16.03	9.35	14.96	100.00
Rating category	A	A	B	C	B	
3. Average monthly order, RUB	350,000	191,000	5500	16,500	111,500	674,500
Also, %	51.89	28.32	0.82	2.45	16.52	100.00
Rating category	A	A	C	C	B	
4. Turnover ratio, speed	6.9	5.7	9.5	8.6	6.05	36.75
Also, %	18.78	15.51	25.85	23.4	16.46	100.00
Rating category	A	C	A	A	B	
5. Sales dynamics[1], %	92	105	115	104	101	517
Also, %	17.79	20.31	22.24	20.12	19.54	100.00
Rating category	C	A	A	A	B	
6. Level of surplus goods[2], %	6.5	14	12	2.5	4.7	39.7
Also, %	16.37	35.26	30.23	6.3	11.84	100.00
Rating category	B	C	C	A	B	
7. Order level, coefficient.	0.8486	0.9319	1.4818	1.2121	0.8251	5.2995
Also, %	16.01	17.58	27.96	22.87	15.58	100.00
Rating category	B	A	A	A	C	
Total rating	AAAABBC	AAAAACC	AAABCCC	AAAACCC	BBBBBBC	

[1]Revenue relative to the previous month.

[2]Calculated as the share of stocks (more than 6 months in stock) to the total value of finished goods stocks, expressed in RUB.

As an example, consider the value of the relative value of the structure in terms of revenue, we get:

$$RVS(revenue)\frac{297{,}000}{595{,}150} \times 100\% = 49.9\%$$

The values of the relative magnitude of the structure are also calculated for other production and financial and economic indicators.

The final ratings of goods and customers/creditors serve as the basis for making logistic management decisions on changing individual contractual conditions and reforming the product matrix, as well as being the informational basis for the logistics regulation of financial flows in the sales sphere.

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Table 2: The formation of an individual rating of debtors

Indicators	Debtor 1	Debtor 2	Debtor 3	Debtor 4	Debtor 5	Debtor 6	Debtor 7	Total
1. Age of receivables, days	22	47	33	14	101	68	52	337
Also, %	6.53	13.95	9.79	4.15	29.97	20.18	15.43	100
Rating category	A	B	B	A	C	C	C	
2. Amount of debt, RUB	3730	75,100	150,720	1080	358,000	172,00	3140	608,970
Also, %	0.61	12.33	24.75	0.18	58.79	2.82	0.52	100
Rating category	C	B	A	C	A	C	C	
3. The period of relations, months	23	87	125	14	57	45	37	388
Also, %	5.93	22.42	32.22	3.61	14.69	11.6	9.53	100
Rating category	C	A	A	C	A	B	B	
4. The total amount of actual orders, thousand RUB	90	6800	1350	32	38,000	820	151	47,243
Also, %	0.19	14.39	2.86	0.07	80.44	1.74	0.31	100
Rating category	C	B	C	C	A	C	C	
5. Number of payment failures	1	6	4	2	11	5	7	36
Also, %	2.78	16.67	11.11	5.56	30.56	13.89	19.43	100
Rating category	A	C	B	A	C	B	C	
6. Number of shipments	12	131	192	12	41	30	38	456
Also, %	2.63	28.73	42.11	2.63	8,99	6.58	8.33	100
Rating category	C	A	A	C	B	B	B	
7. The average monthly amount of shipments, RUB	3913	78,161	10,800	2286	666,667	18,222	4081	784,130
Also, %	0.5	9.97	1.38	0.29	85.02	2.32	0.52	100
Rating category	C	B	C	C	A	C	C	
8. Frequency of behavior, coefficient	0.522	1.506	1.536	0.857	0.719	0.667	1.027	6.834
Also, %	7.64	22.04	22.48	12.54	10.52	9.76	15.02	100
Rating category	C	A	A	A	B	B	A	
9. Payment discipline, %	8.33	4.58	2.08	16.67	26.83	16.67	18.42	93.58
Also, %	8.9	4.89	2.22	17.81	28.67	17.81	19.7	100
Rating category	B	A	A	C	C	C	C	
Total rating	AABCC CCCC	AAAAB BBBC	AAAAA BBCC	AAACC CCCC	AAAAB BCCC	BBBBC CCCC	ABBCC CCCC	

Conducting an intermediate conclusion on the results of the formation of an individual rating of goods and debtors, it can be said that for products that are mainly in zone A, advertising and promotional methods for promoting products on the market should be widely used. In particular, these can be various promotions to further stimulate sales, and transfer regular customers of this group to individual VIP conditions. A positive customer rating affects (Jain and Panchal, 2019) on the application of increased shipment limits, price discounts, grace period, etc. to such customers.

According to the proposed author's approach, it is still necessary to apply additional efforts to generate demand for goods from zone B, resolve incentive issues, and take care to increase the level of competitiveness. If obvious product outsiders are identified with predominance in

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rating C, it is worth revising the cost structure for them, supplementing them with the necessary functionality, or completely abandoning their production.

4. A matrix model of tactical prospects for sales logistics

In order to make a comprehensive solution to the problem of the development of logistics analysis as a whole, it is proposed to combine individual ratings of customers/debtors and goods to build a tactical matrix of the effectiveness of sales logistics.

The mathematical tool for the transition to a complex matrix can be the proposed matrix coefficient (Kms), according to the ratings of goods and customers, calculated by the formula (2):

$$Kms = 0{,}75 \times \sum_{n} Aij + 0{,}2 \times \sum_{n} Bij + 0{,}05 \sum_{n} Ci\,j \qquad (2)$$

where:

- Kms is the matrix coefficient for the case of sales logistics;
- $\sum_{n}$ Aij is the arithmetic average of the share of category A i-products / j-clients from an individual rating;
- $\sum_{n}$ Bij is the arithmetic average of the share of i-products / j-customers of category B from the individual rating;
- $\sum_{n}$ Cij is the arithmetic average of the share of i-products / j-customers of category C from an individual rating;
- n is the quantitative indicator of the value of a number of i-products / j-customers (debtors).

The values of the ratios of the shares of the considered categories of goods / customers (debtors) are determined on the basis of expert estimates, taking into account the available techniques, and also based on the logic of the ABC method (Grishunin and Dyachkova, 2017).

We will calculate the matrix coefficients for product groups (Table 3) from our conditional data presented in Tables 1-2. Also, by analogy, we will calculate the matrix coefficients for customers/debtors (Table 4).

The value of the matrix coefficient serves as a boundary assessment of the effectiveness of product and customer policies, respectively. A rating scale was introduced by the authors by comparing the obtained values when testing hypotheses according to a number of industrial companies.

Table 3: Example of calculating the coefficient for the matrix (goods)

Products	Category A share	Category B share	Category C share
Product 1	0.5714	0.2857	0.1429
Product 2	0.7143	-	0.2857
Product 3	0.4286	0.1428	0.4286
Product 4	0.5714	-	0.4286
Product 5	-	0.8571	0.1429
Average value	0.45714	0.25712	0.28574
Kms (products) = 0.75 * 0.45714 + 0.2 * 0.25712 + 0.05 * 0.28574 = 0.409			

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DOI: 10.47750/cibg.2021.27.02.196

Table 4: The calculation of the matrix coefficient for customers/debtors

Debtors	Category A share	Category B share	Category C share
Debtor 1	0.2222	0.1111	0.6667
Debtor 2	0.4444	0.4444	0.1112
Debtor 3	0.5556	0.2222	0.2222
Debtor 4	0.3333	-	0.6667
Debtor 5	0.4444	0.2222	0.3334
Debtor 6	-	0.4444	0.5556
Debtor 7	0.1111	0.2222	0.6667
Average value	0.30157	0.2381	0.4604
Kms (debtors) = 0.75 * 0.30157 + 0.2 * 0.2381 + 0.05 * 0.4604 = 0.297			

5. Result: A matrix model of tactical prospects for sales logistics

A matrix option with conditionally probabilistic ball scales was proposed to identify tactical prospects of the company's sales logistics to further apply the results of the economic and mathematical calculation of the matrix coefficient, by the method of expert analysis, based on the correlation dependence of the client's policy of the enterprise on its product policy (Table 5).

From this matrix of prospects for sales policy, it is possible to implement nine tactics for regulating and improving the efficiency of distribution in the field of marketing. The choice of tactics for making a managerial decision on sales logistics is carried out by finding the appropriate matrix cell located at the intersection of the obtained values according to the matrix coefficients for customers and goods. The scale of interval values of each matrix cell has its own values corresponding to the ratios of the shares of the considered categories of goods/customers (C–10%, B–20%, A–70%).

In this example, based on the obtained values of the matrix criteria for goods $Kms_{(goods)}$ = 0.409 and customers (debtors) $Kms_{(debtors)}$ = 0.297, for the prospective management of sales logistics, tactic 2 was chosen. This tactic suggests that for development and strengthening internal factors of the development of customer service, it is necessary to concentrate attention and managerial impact on staff motivation for innovative mechanisms for the implementation of technological and business processes, as well as knowledge management.

It should be noted that the considered method of managing sales logistics is possible only under the conditions of maintaining relevant databases of buyers and sales according to specified criteria.

Table 5: The matrix identifying the tactical prospects of the company's sales logistics

		Client policy (Kms clients)		
		Kms ≤ 0.15	*0.15 < Kms < 0.7*	*Kms ≥ 0.7*

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DOI: 10.47750/cibg.2021.27.02.196

Product policy (Kms products)	*Kms ≤ 0.15*	*Tactic 1.* Expedient actions in the short term: the introduction of new measures for the logistics service, informational advertising focused on new products\new properties of goods.	*Tactic 2.* In order to develop and strengthen intra-production factors for the development of customer service, it is necessary to focus attention and managerial influences on staff motivation for innovative mechanisms of technological and business processes, as well as knowledge management.	*Tactic 3:* - extension of the social package and salary growth for marketers; - patenting and licensing of new production and technological competencies; - development of vivid competitive advantages; - development of diverse criteria for stimulating dealers and consumers; - development of the R&D function, strengthening the management of intangible assets.
	0.15 < Kms < 0.7	*Tactic 4.* Tighter control mechanisms for sales professionals. At the same time, a plan is needed to stimulate the sale of new goods, a concentration of efforts in production on the innovative qualities of the goods.	*Tactic 5.* Development of management decisions to expand the market, the development of new forms of cooperation with a constant clientele.	*Tactic 6:* - active promotion of category A consumers; - conducting marketing research in order to identify new forms of sales and advertising; - identification of the most promising sales managers.
	Kms ≥ 0.7	*Tactic 7.* Intrusion into this quadrant indicates obsolete properties of goods or passivity of sales personnel. For sales growth it is necessary: - identification and rejection of surplus commodity items, non-core businesses; - inventory and rotation of used production and business technologies; - rotation or outsourcing of marketing activities; - search for strong market positions of the company.	*Tactic 8*: - improving the quality of manufactured goods; - search for new / improved production technologies; - entrust the development of the market only to the most effective sales managers; - segmented cost analysis, preparation and implementation of a plan to reduce costs and logistics costs.	*Tactic 9:* - introduction of motivation schemes for marketers; - certification of production personnel; - identification of consumer preferences.

Initially, this technique was obtained for application by its most prominent representatives of the Kaluga radio-electronic industry (Russia, Kaluga region), which at the time of the launch of the research in 2015, occupied 19% in the gross regional product (GRP) of the Kaluga region, and in 2017, the contribution to the gross domestic the product (GDP) of Russia, the complex of the electronic industry was 10%. Currently (since 2019), the developed management method is being implemented at the enterprises of one of the largest industrial parks in Russia located in the Kaluga Region.

Logistic-oriented analysis in the field of sales, as shown by the example of industrial companies in the radio electronics industry of Kaluga, allows achieving an economic effect. We note the components and sources of the results obtained by Kaluga enterprises:

P-ISSN: 2204-1990; E-ISSN: 1323-6903
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- reduction of manual labor due to receiving multi-parameter customer information online by 10 calculated iterations per 1 working day;

integration of logistic analysis with several options of stock and sales budgets speeds up calculations by 8 hours a month and qualitatively improves logistics management in the field of sales, choosing the best option after a situational analysis provides an increase in financial results compared to average by 500 thousand RUB;

- timely identification of intellectual product innovations accelerates the process of their implementation, increases competitiveness on average faster than competitors by 1 month, which accelerates turnover in monetary terms by 20 thousand RUB per month;
- an objective assessment of consumers leads to the selection of the most optimal and high-quality counterparties for financial relations, which leads to an increase in turnover by 2 days and results by 25 thousand RUB per month.

Thus, the testing and implementation of these management techniques at a number of large-scale enterprises of the radio-electronic industry of the Kaluga Region (Russian Federation) shows that the annual effect in the sales of profit growth of more than 200 million RUB is possible (about 2.7 million EUR). This is achieved by acceleration of turnover due to the targeted use of promotions; concentration on promising new consumers; strengthening informative control over the movement and collection of debt; Improvement and modification of the demanded characteristics of the goods.

6. Discussion

Yin et al. (Yin et al., 2019) repeat the principle applied in constructing the matrix of prospects for sales logistics in the context that only a whole range of informative criteria, regularly expanding, makes the quality of the decision-making process in all business processes; they are building an information system that optimizes the selection of financial resources for logistics activities. Xu et al. (2019) take a similar approach for the e-commerce industry.

Gavin (2019) discloses logistic processes from the point of view of programming business tasks. Ishihara and Ching (2016) disclose a multi-criteria model of logistic analysis in the field of product policy for new products and services. Jain and Panchal (2019), as in our approach, combine two factor systems in evaluating logistics systems: they chose risk and price factor as the key components of information. Douissa and Jabeur (2016) calculate the optimal value of stocks just like them, based on risk factors arising in the process of distribution.

A comparative analysis of the works under consideration indicates their common trait: all the above scientists agree that only the collection of sales statistics leads to the construction of reliable models online that are suitable for making operational decisions on logistics.

A distinctive feature of the built matrix is the combination of two systems of criteria about commodity resources and financial resources in marketing. Note that based on the interpretation (benchmarking) of scientific work on logistics, the authors developed a matrix method for managing sales logistics using a combination of several criteria models.

Interpreting the proposed methodology for building a matrix model for the tactical prospects of sales logistics, in the light of the stated research hypothesis, I would like to note that the proposed mechanism for combining individual ratings of customers/debtors and goods significantly affects the efficiency of complex decision-making by the enterprise management in the process of logistic analysis. The advantage of this technique is the flexibility in use for many industries (Mishenin et al., 2018).

The next step in the application of the obtained economic and mathematical tools for making managerial decisions in the field of sales logistics of an enterprise may be the development of

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a point scale for the formation of a sales budget (Kuznetsova, 2014; Ishihara and Ching, 2016; Otter et al., 2017; Tovma et al., 2020) and the debtor work plan.

7. Conclusion: Research prospects

The result of the research was, in fact, elementary mathematical tools for logisticians and sales managers, allowing implementing an individual approach to the formation of contract conditions and product range in conditions of limited financial resources. Moreover, the developed integrated matrix allows you to identify priorities for tactical actions to regulate the material and financial flows in the sales area. Note that with a point adjustment, a similar technique can be applied in procurement logistics as an argument in negotiations with suppliers.

The authors believe that in the conditions of the development of Internet and web technologies, the considered matrix method can form the basis of the techniques currently practiced by digital logistics specialists and become one of the elements of the designed virtual enterprises when describing their business processes. The algorithm of the integrated matrix of sales logistics seems to be especially important for the development of electronic commerce in B2B markets, because these markets are the most promising in terms of generating financial results for industrial structures. This in the end can serve as the emergence of a new phenomenon in developed economies: smart enterprises and their ecosystems.

The resulting virtual enterprises, in turn, can have an impact on the development of information logistics methods at the macro level, on the algorithm presentation of state statistics systems in the field of e-commerce.

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Matrični model taktičkih izgleda prodajne logistike tvrtke

Sažetak

Poduzeće stalno treba poboljšavati svoju prodajnu logistiku. Svrha rada je stvoriti matricu taktičkih izgleda za prodajnu logistiku tvrtke. Identificirani su zadaci za provođenje sveobuhvatne studije znanstvene i metodološke potpore metodama ABC analize; uporaba ekonomsko-matematičkog aparata za modeliranje prodajne matrice; opis metodologije za izgradnju prodajne matrice i identificiranje taktičkih izgleda poduzeća. Studija se oslanja na sistemski i procesni pristup. Glavne metode su metode statističke, ekonomske i matematičke analize. Predstavljeni matrični model temelji se na stvaranju pojedinačnih uvjeta prodaje po ugovoru, temeljeći se na višeparametarskim ocjenama kupaca i robe. Pokazano je da se regulacija odnosa i tijekova u prodajnom sektoru može provesti na temelju standardnih odluka preuzetih iz predloženog modela matrice prodajne logistike.

Ključne riječi: Informacijska logistika; Matrična metoda; Upravljanje proizvodnim miksom; Ocjena potraživanja; Logistika prodaje

JEL klasifikacija: M11, M21, M31