“Strategically supplier-oriented management in the procurement process of JSC “Russian Railways””

AUTHORS	Natalia Karpova https://orcid.org/0000-0002-3456-044X Sergey Noskov Irina Toymentseva https://orcid.org/0000-0003-2181-1534 Elena Shvetsova

ARTICLE INFO	Natalia Karpova, Sergey Noskov, Irina Toymentseva and Elena Shvetsova (2018). Strategically supplier-oriented management in the procurement process of JSC “Russian Railways”. *Problems and Perspectives in Management*, *16*(3), 14-27. doi:10.21511/ppm.16(3).2018.02
DOI	http://dx.doi.org/10.21511/ppm.16(3).2018.02
RELEASED ON	Thursday, 05 July 2018
RECEIVED ON	Monday, 28 August 2017
ACCEPTED ON	Monday, 11 June 2018

LICENSE	This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License

JOURNAL	"Problems and Perspectives in Management"
ISSN PRINT	1727-7051
ISSN ONLINE	1810-5467
PUBLISHER	LLC “Consulting Publishing Company “Business Perspectives”
FOUNDER	LLC “Consulting Publishing Company “Business Perspectives”

NUMBER OF REFERENCES	NUMBER OF FIGURES	NUMBER OF TABLES
22	2	10

© The author(s) 2026. This publication is an open access article.

BUSINESS PERSPECTIVES

LLC "CPC "Business Perspectives"
Hryhorii Skovoroda lane, 10, Sumy, 40022, Ukraine

www.businessperspectives.org

Natalia Karpova (Russia), **Sergey Noskov** (Russia), **Irina Toymentseva** (Russia), **Elena Shvetsova** (Russia)

STRATEGICALLY SUPPLIER-ORIENTED MANAGEMENT IN THE PROCUREMENT PROCESS OF JSC "RUSSIAN RAILWAYS"

Abstract

JSC "Russian Railways" is one of the world's largest companies in the railway market. It ensures the safety and accessibility of transport in Russia, reduces the transport load on its economy. JSC "Russian Railways" is a company founded by the Russian Federation. In the conditions of the global financial crisis and limited budget resources, the search for ways to reduce the costs of its operation comes to the forefront. In the supply, there is a significant potential for increasing the efficiency of any company's activity by saving on purchases in the case of choosing a key supplier that meets all customer's criteria. In turn, the growing relevance in modern conditions is acquired by strategically supplier-oriented management in the process of meeting the needs and requirements of companies. In this regard, the article substantiates the need for strategically supplier-oriented management of commodity and material values in supply chains, systematizes supplier management strategies. The experience of procurement and selection of suppliers of goods, works and services for the needs of JSC "Russian Railways" was studied, a methodology was proposed for ranking criteria for the selection of products and suppliers in order of the decreasing significance value, allowing to expand the method of rating the existing and potential sources of supply.

Keywords Russian railways, suppliers, supply, supply and selection strategies, supplier selection criteria, supply chain

JEL Classification L92, M21

Received on: 28th of August, 2017
Accepted on: 11th of June, 2018

© Natalia Karpova, Sergey Noskov, Irina Toymentseva, Elena Shvetsova, 2018

Natalia Karpova, Doctor of Economics, Professor, Associate Professor, Samara State University of Economics, Russia.

Sergey Noskov, Doctor of Economics, Professor, Samara State University of Economics, Russia.

Irina Toymentseva, Doctor of Economics, Professor, Associate Professor, Samara State University of Economics, Russia.

Elena Shvetsova, Candidate of Economics, Associate Professor, Samara State University of Economics, Russia.

This is an Open Access article, distributed under the terms of the Creative Commons Attribution-Non-Commercial 4.0 International license, which permits re-use, distribution, and reproduction, provided the materials aren't used for commercial purposes and the original work is properly cited.

INTRODUCTION

In modern conditions, strategic importance is acquired by strategic management in companies of various spheres of activity. It is aimed at the consistent alignment of strategies and the delivery of strategic benchmarks to all employees of the company. If the supply chain is involved, then, all its participants should also be aimed at achieving common strategic benchmarks through inter-organizational integration and coordination of efforts. This will yield a synergistic effect that exceeds the sum of individual effects. Thus, the principles of strategically oriented management find their application both at the micro- and macro-levels. In turn, suppliers are elements of the supply chain. Companies using a strategically oriented approach to the system of relationships with suppliers in their activities are in a winning position in comparison with those who do not pay due attention to this issue. In this regard, the aim of the research is to study the features of strategically supplier-oriented management in the process of supplying the leader of the rail industry in Russia – JSC "Russian Railways". Thus, the company is the object of the study, the share of which in the freight turnover of the transport system of Russia is 45.3%, and the

share in the passenger turnover of our country is 26.4%. The main activity of JSC "Russian Railways" is to organize the transportation of goods and passengers, and there should be a developed infrastructure to do it. Thus, the operational length of railways of JSC "Russian Railways" is 85.3 thousand km, the length of electrified lines is 43.4 thousand km. Suppliers play an important role in ensuring the normal operation of the company's logistics infrastructure, supplying the necessary material and technical resources, works and services. Therefore, the issue of studying the features of management to be relevant is considered.

This study covers a set of issues related to defining the specifics of strategically supplier-oriented management in the process of supplying Russian Railways and developing a set of measures aimed at improving the effectiveness of counterparty management.

1. LITERATURE REVIEW

The works of many foreign and domestic scientists are devoted to the study of supply management: Linders et al. (2014), Sergeev (2013), Bowersox, Closs, and Copper (2012, 2017), Christopher (2016), Cirjaliu et al. (2016), Gattorna (2015), Lysons and Farrington (2016), Mani et al. (2014), Scott et al. (2015), Stelzer (2016), Waters and Rinsler (2014) and others. At the same time, scientists do not distinguish between terms such as procurement and supply. As a rule, they are identified as synonymous terms. Thus, the procurement is understood as the process of acquiring inventory items, including such actions as awareness of the need to purchase goods and services, finding sources of supply, negotiating and signing supply contracts (Linders et al., 2014; Bowersox et al., 2012, 2017; Malikov, 2015).

In the works of Lysons and Farrington (2016), Waters and Rinsler (2014), Christopher (2016), Waters and Rinsler (2014), Sergeeva (2013), Karpova (2015), supply is considered from the perspective of a more capacious concept, which includes management processes and purchases, and suppliers. Purchase management is the organization of deliveries of inventory at the right time and place, with the necessary quantitative and qualitative parameters, at an optimal price. Supplier management is focused on developing a set of activities aimed at establishing long-term partnerships with counterparties through integration and coordination of actions in supply chains.

Nowadays, most companies have strategies for their development, both within the company and in the functional areas of its activity: supply, production, distribution, etc. The strategy is a long-term plan of action in which the goals are fixed, and the main measures for their achievement have been worked out. But none of strategic benchmarks in the company will be achieved if they are not known to every employee of the organization. Thus, strategically oriented management, in our opinion, presupposes the subordination of the company's current activities to its strategic guidelines. In the course of the company's current operations, it is necessary to purchase raw materials, interact with suppliers, carry out a complex of production procedures, warehousing, cargo processing, distribution and sale of inventory. It should be noted that supply is the key business process in the formation of the added value of the final product, so the success of the whole company depends on how well it is organized. Supplies can be defined as the scope of activities for managing the quantitative and qualitative parameters of incoming goods and services flows (Karpova, 2016) in the process of their interaction with suppliers in order to meet demands of internal and external consumers with the optimal level of costs. In modern conditions, it is recommended to build relationships with suppliers in the supply chain from the position of integration, coordination and optimization of efforts in the process of meeting the needs of end users.

The authors believe that strategic supplier management is based on the belief that significant competitiveness can be achieved with the help of suppliers with whom a rational supply chain and supply chain relationships will be built. The desire of any company to meet the needs of its customers and constantly improve the service is directly related to the ability of suppliers to help the company achieve its goal. Thus, unethical actions of suppliers signifi-

cantly affect the image of the company and its business. For example, McDonald's, the largest fast-food chain, fell under fire due to the "expired meat" supplied by its suppliers to McDonald's restaurants in China. This led to the suspension of products supply for hamburgers in Shanghai, China and the United States. The image of the corporation was tarnished due to supplier actions (Mani et al., 2014).

The issues of the strategic procurement management and suppliers are most extensively covered in the works of Bowersox, Closs, and Copper (2012, 2017), Linders et al. (2014), Sergeeva (2013). Paying due attention to the contribution of domestic and foreign scientists to the development of the theory and practice of managing suppliers in the supply process, the authors consider it necessary to pay closer attention to aspects of strategically supplier-oriented management in the process of supplying JSC "Russian Railways", which in modern conditions is becoming increasingly important.

2. METHODS

To substantiate the need for strategically supplier-oriented management of inventory in supply chains, systematization of supplier management strategies, study of the procurement organization and selection of suppliers of goods, works and services for the needs of JSC "Russian Railways", the following experimental and theoretical methods were used: analysis, synthesis, analogy, generalization, deduction and induction. To develop a methodology for selecting suppliers of material and technical resources for the needs of JSC "Russian Railways", the following methods were used: an expert method involving specialists from the Center for Organization of Competitive Purchases of JSC "Russian Railways" in the number of six; method of rating evaluations in order to rank the criteria for selecting products and suppliers in order of the decreasing significance value.

The experimental research to identify the features of strategically supplier-oriented management in the supply process was on JSC "Russian Railways".

The study included several stages. At the first stage, the authors carried out a theoretical analysis of existing points of view of leading foreign and domestic scientists on the topic of the study; the problem, purpose and methods of research are determined. The second stage substantiates the need for strategically supplier-oriented management of inventory in supply chains, systematizes supplier management strategies, studies the procurement and selection of suppliers of goods, works and services for the needs of JSC "Russian Railways". At the third stage, a methodology for ranking the criteria for selecting products and suppliers was proposed and tested in order of the decreasing significance value.

3. RESULTS

Suppliers create and supply materials used in the value chain of the company, therefore, form their value; the quality and cost of source materials affect the company's own costs and/or its differentiation capabilities (Banchuen et al., 2017). In modern conditions, the decision to choose a supplier becomes more and more difficult, because questions of environmental protection, social, political aspects and questions of satisfaction of the end user were added to traditional factors of quality, delivery, cost and service. When choosing suppliers, quantitative analysis methods and mathematical modeling prevail. Typically, they are aimed at improving the accuracy of vendor evaluation (Scott, 2015; Stelzer, 2016).

An unconditional contribution to the theory of the logistics development, including the selection of suppliers and carriers, was made by the Russian scientists Lukinsky et al. (2017). In their opinion, in logistics, there are two main approaches to the choice of suppliers: analytical and expert. The analytical approach involves the selection of a counterparty using calculation formulae, which reflect the use of such parameters as minimum costs for the delivery of inventory in the selection of suppliers, the capacity of vehicles, etc. The expert approach is based on evaluations of specialists on criteria that characterize suppliers, with the aim of obtaining integrated expert assessments (ratings). According to the scientists, different variants of the expert approach are singled out, using one of them they carry out the ranking of criteria for choosing carriers, assigning to each indicator a certain rank, used in the future to calculate the integral rating.

In order of the significance value, foreign scientists (Linders et al., 2014) tried to define the selection criteria for suppliers by:

- quality of goods and material values to be procured;
- time and volume of delivery;
- purchase price;
- availability of service support;

To meet these criteria, according to scientists, suppliers also need to have the following characteristics: the company's previous history, technical strength and infrastructure, financial position, organization and management, reputation, compliance with generally accepted standards, degree of cooperation, employment relationships and location. Also, these scientists propose to conduct a separate evaluation of existing and potential suppliers. In assessing potential sources of supply, the most common factors, in their opinion, are:

- technical or engineering capabilities;
- production or distribution potential;
- financial strength and management capabilities.

JSC "Russian Railways" is a national company that carries out the bulk of rail transportation in Russia. Most inventory items (more than 60%) necessary to ensure the normal functioning of this company are procured on a competitive basis. The cost of procurement contracts for goods, works and services in JSC "Russian Railways" from 2011 to 2016 is shown in Figure 1. As can be seen from the presented material, the volume of purchases for the needs of the company in the period from 2013 to 2015 significantly decreased. Only in 2016, there is an increase of 37.8% compared to 2015. According to forecasts, the volume of purchases of goods and services will only grow and will amount to 706955614.3 thousand rubles in 2017, and 960933929.5 thousand rubles in 2018.

The range of needs of JSC "Russian Railways" is quite wide: from the purchase of innovative, high-tech products that ensure the safety of passenger and freight traffic to the acquisition of inventory items for the normal functioning of the logistics infrastructure of the carrier (office equipment, overalls, stationery, electrical products, etc.). The structure of purchased products is shown in Figure 2. Thus, for the analyzed period, the average monthly volume of the procurement of innovative and high-tech products amounted to 7059799.776 thousand rubles (12.34%), the rest of goods, works and services were purchased on average 45147197.57 thousand rubles per month (87.66%).

Among the main criteria for selecting suppliers and comparing competitive bids at JSC "Russian Railways", one can distinguish:

1) contract price;

2) functional or qualitative features (consumer) of goods, works, services, considering their interchangeability;

3) qualification of the applicant (including the availability of production facilities (own production), the ability to supply goods, the necessary professional and technical skills, labor

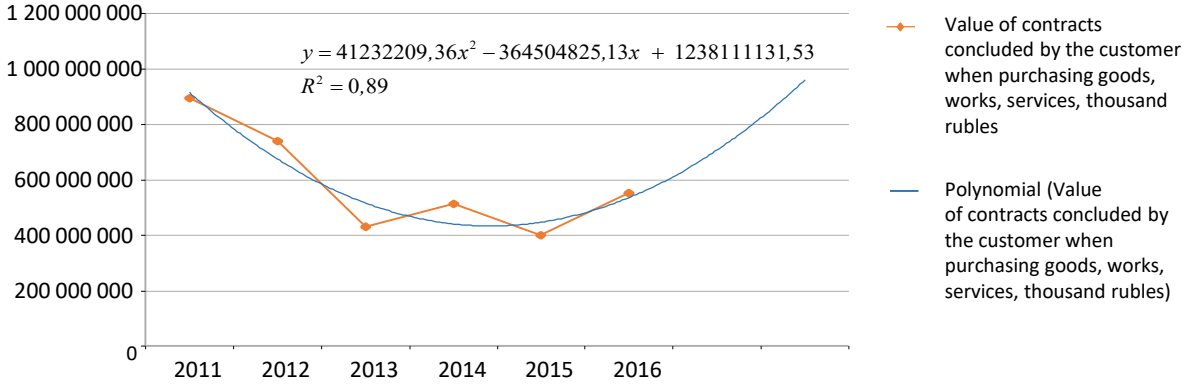

Figure 1. Cost of procurement contracts for goods, works and services in JSC "Russian Railways"

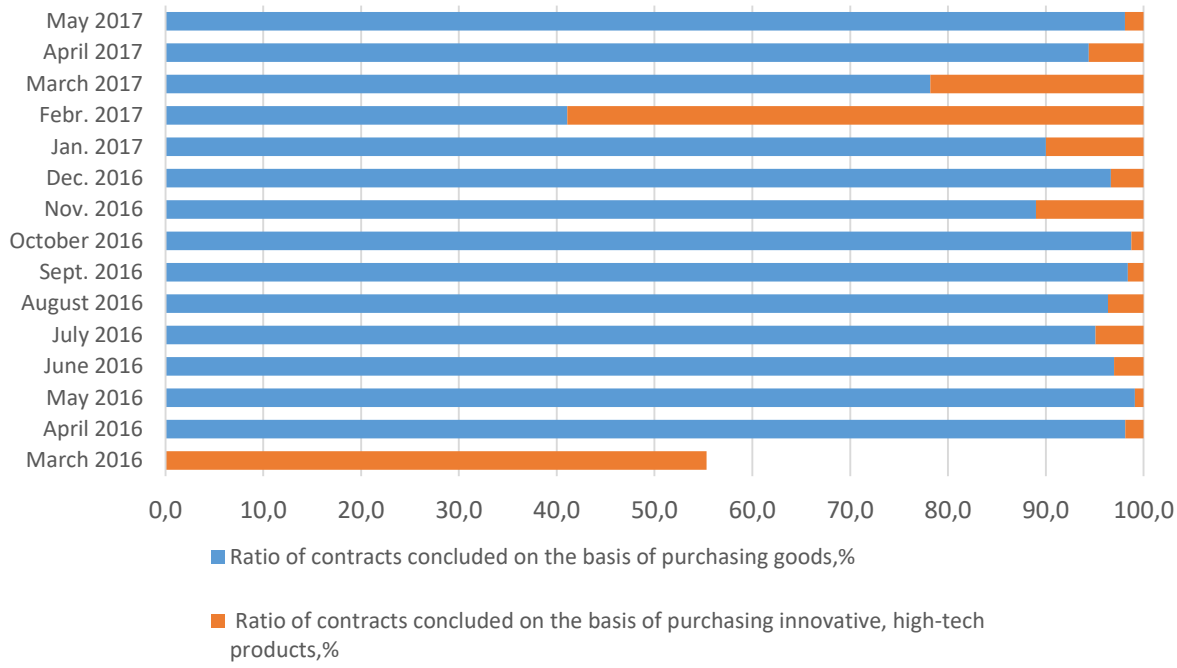

Figure 2. Structure of products purchased in JSC "Russian Railways"

and financial resources, equipment and other material resources, managerial competence, business reputation);

4) experience of the applicant;

5) cost of life cycle (cost of ownership) of goods, works, services;

6) expenses for the exploitation of goods;

7) expenses for maintenance of goods;

8) terms (periods) for the supply of goods, the performance of work, the provision of services;

9) quality of goods, works, services;

10) term for providing quality reassurance of goods, works, services;

11) scope for providing quality reassurance of goods, works, services;

12) availability of a quality management system (the evaluation under this criterion is carried out without fail in the case of the purchase of products subject to inspection and acceptance inspection).

An important criterion for choosing a supplier of high-tech and innovative products is its quality, for the other groups of goods, works and services, the most important is the price criterion.

It is worth paying attention in the above criteria to the fact that they characterize both the acquired inventory and suppliers themselves. In the conditions of the Russian economy, in the lack of data characterizing the counterparties' activity, the authors consider it most legitimate to divide the parameters of the evaluation of the goods (services) purchased and directly suppliers. In this regard, it is proposed to systematize the criteria for selecting goods (services) and suppliers in order of the decreasing significance value of indicators with assignment of a certain rank to each of them.

The determination of criteria ranks was carried out on the basis of some algorithm or procedures. The first procedure for determining ranks was to create a commission of experts (specialists of the Center for organization of competitive procurement of JSC "Russian Railways") in the number of 6 people. The number of criteria for choosing products purchased was twelve, and their name is given in Table 1.

The next procedure for determining the criteria for selecting products purchased was to conduct

a questionnaire in order to obtain data on their preferences with respect to benchmarks and assigning criteria to the rank number. The criterion having the highest preference was ranked 1, the least high – rank 12. Based on the processing of the questionnaire data, Tables 1, 2 (the composite matrix of ranks and calculated matrix of ranks) are compiled.

Table 1. Overall matrix of ranks

No	Experts	1	2	3	4	5	6
1	Price/quality of goods and services*	1	2	2	3	2	1
2	Functional (consumer) features of goods	2	3	1	2	1	3
3	Cost of ownership of goods (costs of maintenance and operation)	3	1	4	5	3	2
4	Terms of payment (possibility of payment by installments, commodity loan, etc.)	4	5	3	1	4	5
5	Pre-sale, warranty, post-warranty service	5	4	6	6	6	4
6	Availability of spare parts	6	6	5	4	5	7
7	Supporting logistics services	7	8	8	9	7	9
8	Packaging	8	9	7	8	8	6
9	Accessibility	9	7	10	12	9	11
10	Interchangeability of goods (degree of unification, standardization)	10	12	9	7	11	10
11	Service life of goods	11	10	12	11	10	12
12	Disposal after the expiry date (service)	12	11	11	10	12	8

Note: * For the purchase of high-tech, innovative, technologically complex products (goods, works, services), the criterion "Quality" is selected, for the rest – the criterion "Price" is selected.

Table 2 uses the following calculation formula:

$$d = \sum x_{ij} - \frac{\sum\sum x_{ij}}{n} = \sum x_{ij} - 39, \qquad (1)$$

where x_{ij} – is the rank of the i-th criterion by the j-th expert.

The verification of the matrix compilation is based on the determination of the checksum, where n – the number of the criteria:

$$\sum x_{ij} = \frac{(1+n)\cdot n}{2} = \frac{(1+12)\cdot 12}{2} = 78. \qquad (2)$$

The sums by columns of the matrix are equal to each other and to the checksum, hence, the matrix is correctly formed.

The procedure for analyzing the significance value of the analyzed criteria is shown in Table 3.

The criteria in order of the significance value were distributed as follows, as evidenced by sums of ranks.

Table 3. Distribution of the criteria in order of the significance value

Criteria	Sum of ranks
x_1	11
x_2	12
x_3	18
x_4	22
x_5	31
x_6	33
x_8	46
x_7	48
x_9	58
x_{10}	59
x_{12}	64
x_{11}	66

Table 2. Calculated matrix of ranks

Criteria \ Experts	1	2	3	4	5	6	Sum of ranks	d	d^2
x_1	1	2	2	3	2	1	11	–28	784
x_2	2	3	1	2	1	3	12	–27	729
x_3	3	1	4	5	3	2	18	–21	441
x_4	4	5	3	1	4	5	22	–17	289
x_5	5	4	6	6	6	4	31	–8	64
x_6	6	6	5	4	5	7	33	–6	36
x_7	7	8	8	9	7	9	48	9	81
x_8	8	9	7	8	8	6	46	7	49
x_9	9	7	10	12	9	11	58	19	361
x_{10}	10	12	9	7	11	10	59	20	400
x_{11}	11	10	12	11	10	12	66	27	729
x_{12}	12	11	11	10	12	8	64	25	625
Total	78	78	78	78	78	78	468	–	4588

The procedure for assessing the average degree of agreement among all experts was based on the calculation of the concordance coefficient (W) according to the following formula:

$$W = \frac{12 \cdot S}{m^2 \cdot \left(n^3 - n\right)}, \quad (3)$$

where $S = 4588,\ n = 12,\ m = 6,$

$$W = \frac{12 \cdot 4588}{6^2 \cdot \left(12^3 - 12\right)} = 0.891.$$

The value of the concordance coefficient, equal to 0.891, indicates that there is a high degree of agreement among experts.

The significance of the concordance coefficient was estimated on the basis of the Pearson consensus criterion $\left(\chi^2\right)$:

$$\chi^2 = \frac{12 \cdot S}{m \cdot n \cdot \left(n+1\right)} = n \cdot \left(m-1\right) \cdot W, \quad (4)$$

$$\chi^2 = 6 \cdot \left(12-1\right) \cdot 0.891 = 58.82.$$

The consensus criterion χ^2 was compared with the tabulated value for the number of degrees of freedom K for a given significance value α (α is 0.05):

$$K = n - 1 = 12 - 1 = 11.$$

Since the calculated χ^2, equal to 58.82, is greater than the tabular one (19.67514), the concordance coefficient (0.891) is not random, hence, it can be used in further analysis and calculation of criteria ranks.

The final procedure for determining criteria ranks for selecting products purchased was the determination of real and reasonable ranks, as well as indicators of the criteria ratio. Based on the survey matrix, a matrix of transformed ranks $\left(s_{ij}\right)$ is compiled according to the formula:

$$s_{ij} = x_{\max} - x_{ij}, \quad (5)$$

where $x_{\max} = 12.$

The matrix of transformed ranks and ratio is presented in Table 4.

Table 4. Matrix of transformed ranks

No \ Experts	1	2	3	4	5	6	Σ	Rank	Ratio
1	11	10	10	9	10	11	61	1	0.154
2	10	9	11	10	11	9	60	2	0.1515
3	9	11	8	7	9	10	54	3	0.1364
4	8	7	9	11	8	7	50	4	0.1263
5	7	8	6	6	6	8	41	5	0.1035
6	6	6	7	8	7	5	39	6	0.09848
7	5	4	4	3	5	3	24	8	0.06061
8	4	3	5	4	4	6	26	7	0.06566
9	3	5	2	0	3	1	14	9	0.03535
10	2	0	3	5	1	2	13	10	0.03283
11	1	2	0	1	2	0	6	12	0.01515
12	0	1	1	2	0	4	8	11	0.0202
Total	–	–	–	–	–	–	396	–	1

Determining criteria ranks for selecting suppliers is similar to the algorithm and procedures for determining criteria ranks for selecting purchased products.

Based on the questionnaire data, an overall matrix of ranks is compiled (Table 5).

Table 5. Overall matrix of ranks

No	Experts	1	2	3	4	5	6
1	Reliability of supply	1	2	4	3	5	3
2	Flexibility of supply	2	1	2	4	3	5
3	Lead time	3	5	3	2	4	2
4	Reputation, business history and size of the supplier, producer of goods and services, outsourcer, lessor	5	3	1	1	2	4
5	Location of the supplier, producer of goods and services, outsourcer, lessor	4	4	6	5	1	1
6	Technical, technological or engineering capabilities, including the availability of the information system	6	7	5	6	7	6
7	Financial stability	8	6	7	8	6	7
8	Production or distribution potential	7	9	8	7	8	9
9	Compatibility in management matters, including the availability of the quality management system	9	8	10	9	9	8
10	Qualifications of staff	10	12	9	11	11	10
11	Readiness for negotiations	12	11	11	12	10	12
12	Compatibility in environmental and safety matters	11	10	12	10	12	11

Next, a calculated matrix of ranks is presented in Table 6.

Table 6. Calculated matrix of ranks

Criteria \ Experts	1	2	3	4	5	6	Sum of ranks	d	d²
x_1	1	2	4	3	5	3	18	–21	441
x_2	2	1	2	4	3	5	17	–22	484
x_3	3	5	3	2	4	2	19	–20	400
x_4	5	3	1	1	2	4	16	–23	529
x_5	4	4	6	5	1	1	21	–18	324
x_6	6	7	5	6	7	6	37	–2	4
x_7	8	6	7	8	6	7	42	3	9
x_8	7	9	8	7	8	9	48	9	81
x_9	9	8	10	9	9	8	53	14	196
x_{10}	10	12	9	11	11	10	63	24	576
x_{11}	12	11	11	12	10	12	68	29	841
x_{12}	11	10	12	10	12	11	66	27	729
Total	78	78	78	78	78	78	468	–	4614

$$d = \sum x_{ij} - \frac{\sum\sum x_{ij}}{n} = \sum x_{ij} - 39, \qquad (6)$$

where x_{ij} – is the rank of the i-th criterion by the l-th expert.

The vertification of the matrix compilation based on the determination of the checksum was made:

$$\sum x_{ij} = \frac{(1+n)\cdot n}{2} = \frac{(1+12)\cdot 12}{2} = 78. \qquad (7)$$

The sums by the columns of the matrix are equal to each other and to the checksum, hence, the matrix is correctly formed.

The procedure for analyzing the significance value of the analyzed criteria is shown in Table 7.

The criteria in order of the significance value were distributed as follows, as evidenced by sums of ranks.

Table 7. Distribution of criteria in order of the significance value

Criteria	Sum of ranks
x_4	16
x_2	17
x_1	18
x_3	19
x_5	21
x_6	37
x_7	42
x_8	48
x_9	53
x_{10}	63
x_{12}	66
x_{11}	68

The procedure for assessing the average degree of agreement among all experts was based on the calculation of the concordance coefficient (W) according to the following formula:

$$W = \frac{12\cdot S}{m^2\cdot(n^3 - n)}, \qquad (8)$$

where $S = 4614,\ n = 12,\ m = 6.$

$$W = \frac{12\cdot 4614}{6^2\cdot(12^3 - 12)} = 0.896.$$

The value of the concordance coefficient, equal to 0.896, indicates that there is a high degree of agreement among experts.

The significance value of the concordance coefficient was estimated on the basis of the Pearson consensus criterion (χ^2):

$$\chi^2 = \frac{12\cdot S}{m\cdot n\cdot(n+1)} = n\cdot(m-1)\cdot W, \qquad (9)$$

$$\chi^2 = 6\cdot(12-1)\cdot 0.896 = 59.15.$$

The consensus criterion χ^2 was compared with the tabulated value for the number of degrees of freedom K for a given significance level α (α is 0.05):

$$K = n - 1 = 12 - 1 = 11.$$

Since the calculated χ^2, equal to 59,15, is greater than the tabular (19,67514), the concordance coefficient (0,896) is not random, therefore, it can be used in further analysis and calculation of criteria ranks.

The final procedure for determining criteria ranks for selecting suppliers of products was the determination of reasonable ranks, as well as ratio indicators. Based on the survey matrix, a matrix of transformed ranks $\left(s_{ij}\right)$ is compiled according to the formula:

$$s_{ij} = x_{\max} - x_{ij}, \qquad (10)$$

where $x_{\max} = 12$.

The matrix of transformed ranks and ratio coefficients is presented in Table 8.

Table 8. Matrix of transformed ranks

No \ Experts	1	2	3	4	5	6	∑	Rank	Ratio
1	11	10	8	9	7	9	54	3	0.1364
2	10	11	10	8	9	7	55	2	0.1389
3	9	7	9	10	8	10	53	4	0.1338
4	7	9	11	11	10	8	56	1	0.1414
5	8	8	6	7	11	11	51	5	0.1288
6	6	5	7	6	5	6	35	6	0.08838
7	4	6	5	4	6	5	30	7	0.07576
8	5	3	4	5	4	3	24	8	0.06061
9	3	4	2	3	3	4	19	9	0.04798
10	2	0	3	1	1	2	9	10	0.02273
11	0	1	1	0	2	0	4	12	0.0101
12	1	2	0	2	0	1	6	11	0.01515
Total	–	–	–	–	–	–	396	–	1

Thus, the overall matrix of the transformed rank criteria for the selection of goods (services) and suppliers is presented in Table 9.

Table 9. Summary matrix of the transformed rank criteria for the selection of goods (services) and suppliers

Rank criteria for the selection of goods (services) $\left(r_i\right)$	Criteria for the selection of goods (services)	Rank criteria for the selection of suppliers of goods (services) $\left(k_j\right)$	Criteria for the selection of suppliers of goods (services)
1	Price/Quality of goods and services *	1	Reputation, business history and size of the supplier/ producer of goods and services, outsourcer, lessor
2	Functional (consumer) features of goods	2	Flexibility of supply
3	Cost of ownership of goods (costs of maintenance and operation)	3	Reliability of delivery
4	Terms of payment (possibility of payment by installments, commodity loan, etc.)	4	Time of order execution
5	Pre-sale, warranty, post-warranty service	5	Location of the supplier, producer of goods and services, outsourcer, lessor
6	Availability of spare parts	6	Technical, technological or engineering capabilities, including the availability of the information system
7	Packaging	7	Financial stabilitity
8	Accompanying logistics services	8	Production or distribution potential
9	Availability	9	Compatibility in management matters, including the availability of the quality management system
10	Interchangeability of goods (degree of unification, standardization)	10	Personnel qualification
11	Disposal after expiry date (service)	11	Compatibility in environmental protection and safety matters
12	Service life	12	Ready for negotiation

Note: * For the purchase of high-tech, innovative, technologically complex products (goods, works, services), the criterion "Quality" is selected, for the rest – the criterion "Price" is selected.

The selection criteria for the proposed methodology in the evaluation of goods (services) and suppliers can be carried out either by a separate employee in the purchasing or supply department, or by the entire department (a group of employees in this department) or by invited specialists. In this process, the representative of the supplier (producer, outsourcer, lessor) can also take part. The final value of rating values and suppliers is proposed to be determined by summing the criterion ratio (significance) and its expert scoring (forms 11, 12, 13).

$$R_j = \sum_{i=1}^{V} \frac{V}{r_i} \cdot a_{ij}, \quad j = \overline{1,n}, \tag{11}$$

where R_j – the rating of the j-th product (service), V – the number of selected criteria evaluating purchased goods (services) from Table 9, r_i – the rank assigned to the i-th criterion (Table 9), a_{ij} – scores of the i-th product (service) given by experts according to the selected criterion.

$$P_i = \sum_{j=1}^{V} \frac{V}{k_j} \cdot b_{ij}, \quad i = \overline{1,m}, \tag{12}$$

where P_i – is the rating of the i-th supplier, V – the number of selected criteria evaluating suppliers from Table 9, k_j – the rank assigned to the j-th criterion (Table 9), b_{ij} – scores of the j-th supplier given by experts according to the selected criterion.

$$I = \sum_{i=1}^{2} \sum_{j=1}^{2} \left(q \cdot R_j + f \cdot P_i \right), \tag{13}$$

where I – the integral rating of suppliers of necessary commodity-material assets, q – the selection criteria of goods (services) in order of the significance value, f – the selection criteria of suppliers in order of the significance value.

The authors select the supplier of inventory items, which received the maximum integral rating.

The proposed methodology was approved by JSC "Russian Railways" in the process of competitive selection of suppliers of electrical products (Table 10).

As can be seen from presented calculations, the first supplier is the most important, having scored the maximum integral rating.

The advantages of the proposed methodology are the simplicity and versatility of the assessment, in which a large number of criteria are taken into account. In addition, this technique is acceptable for working with potential counterparties.

The selection of suppliers is a strategically important task for any company. The success of the company's activity directly depends on future supplier. In this connection, under current conditions, there are tendencies to use a single supplier in the supply chain and establish long-term contracts (Tokarev, 2004). However, this may entail a number of shortcomings: getting into dependence on a single counterparty, lack of the right products at the right time, etc. To eliminate these shortcomings, it is necessary to highlight the following indicators, reflecting the effectiveness of relationships with suppliers in JSC "Russian Railways":

1) control costs for the purchase of material and technical resources, works and services (by nomenclature positions and suppliers);

2) share of strategic suppliers performing timely delivery (by nomenclature positions and suppliers).

3) average delivery time (according to nomenclature items and suppliers);

4) saving costs for the purchase of material and technical resources;

5) level of the quality of products supplied (by nomenclature items and suppliers);

6) percentage of strategic suppliers certified in accordance with international standards;

7) rate of increase in prices for products supplied.

8) number of long-term contracts.

In the economic literature, the issue of building supply strategies is rather well covered (Bowersox & Kloss, 2017; Linder et al., 2014; Lukinsky et al., 2017; Bowersox et al., 2012; Christopher, 2016; Gattorna, 2015; Waters & Rinsler, 2014). However, scientists do not distinguish a particular group of management strategies to suppliers. For example,

Table 10. Methodology for evaluating inventory items and suppliers by calculating ratings

Criteria for the selection of goods (services)	Rank (r_i)	Criteria ratio $\left(\frac{V}{r_i}\right)$	Scores (a_{ij})			Rating of the i-th product (R_j)		
			Product of the company "ETM"	Product of Trading House "SnabLider"	Product of "SP-Electro"	Product of the company "ETM"	Product of Trading House "SnabLider"	Product of "SP-Electro"
Price	1	4,0	5	3	2	20,0	12,0	8,0
Functional (consumer) features of goods	2	2,0	2	5	4	4,0	10,0	8,0
Packaging	7	0,6	3	4	5	1,8	2,4	3,0
Interchangeability	10	0,4	1	2	3	0,4	0,8	1,2
Subtotal	–	–	11	14	14	26,2	25,2	22,2
Selection criteria of inventory items in order of the significance value (q)	–	0,7	–	–	–	–	–	–
Total	–	–	–	–	–	18,3	17,6	15,5
Suppliers	**Rank (k_j)**	**Criteria ratio $\left(\frac{V}{k_j}\right)$**	**Scores (b_{ij})**			**Rating of the i-th supplier (P_i)**		
			Company "ETM"	**Trading House "SnabLider"**	**"SP-Electro"**	**Company "ETM"**	**Trading House "SnabLider"**	**"SP-Electro"**
Reliability of delivery	3	1,3	4	5	3	5,2	6,5	3,9
Lead time	4	1,0	2	5	5	2,0	5,0	5,0
Reputation	1	4,0	5	2	4	20,0	8,0	16,0
Availability of the information system	6	0,7	3	2	1	2,1	1,2	0,7
Total	–	–	14	13	13	29,3	20,7	25,6
Selection criteria of suppliers in order of the significance value (f)	–	0,3	–	–	–	–	–	–
Total	–	1	25	27	27	8,8	6,2	7,7
Integral rating (I)	–	–	–	–	–	27,1	23,8	23,2

Note: *The estimates are placed on a 5-point scale (5 – excellent, 4 – good, 3 – acceptable, 2 – bad, 1 – very bad).

Linders outlines the following supply strategies (Linders et al., 2014): supply guarantees; reduce costs; support supply; reaction to changes; competitiveness. Zvereva (2007) in her work called "Peculiarities of creating an industry procurement system" distinguishes the following supply strategies: strategies for active consumer behavior in the market; strategies for active search and diversification; alignment strategies.

We consider it necessary to justify and group precisely interaction strategies with suppliers within the framework of material and technical support of the needs and requirements of companies. So, interaction strategies with suppliers should be focused on ensuring the supply of the right goods, works and services at the right time and place with the best possible resources. They should be aimed at establishing trust, partnerships (strategic alliances) with suppliers of commodity-material assets. These include externalization strategies (internalization), vertical integration strategies (backward), and strategies for investing in the development of relationships with suppliers. Externalization strategies are aimed at finding key partners in the framework of outsourcing agreement in order to minimize their own costs and improve the quality of service for both internal and external con-

sumers of the company. Internalization strategies involve the creation of the company's own autonomous units that provide specialized services both to internal customers acting through other divisions or branches and to external counterparties. Vertical integration strategies (backward) involve system integration with key suppliers right up to the purchase of their business. The investment strategy in the development of relationships with suppliers, in our opinion, should be based on the creation of strategic alliances with suppliers of goods and services in order to optimize total costs in the supply chain and improve the quality of service to the end user through the development of a single information space, improving the production process of the supplier, the growth of its effectiveness and the introduction of a quality management system. The presented strategies demonstrate an integrated approach to the formation of supply chains.

Scientists believe (Bowersox & Kloss, 2017; Linders et al., 2014; Lukinsky et al., 2017; Bowersox et al., 2012; Christopher, 2016; Gattorna, 2015; Waters & Rinsler, 2014) that the integral paradigm in chain supplies facilitates the consideration of individual companies as some centers of "logistics activity", directly or indirectly connected in a single integrated process of managing the material flow. In connection with this approach, the interaction of the links in the supply chain should be represented by questions of integrating economic entities into a single chain, i.e., by the choice of strategic partners. Within the framework of building a single supply chain, certain business processes of companies are considered as interrelated and interdependent components. Therefore, in order to build a logistics chain in the rail sector, an integrated approach is necessary, implying that the entire system is not subject to decomposition and is treated as a single whole. In this regard, in the context of integration with supply chains in the rail sector, the cost approach is applicable, the essence of which is that the total value of JSC "Russian Railways" and suppliers acts as an objective function in the management of supply chains. Companies participating in the supply chain in the case of effective interaction have the total value of TV, which is a function in values of individual companies TV_1, TV_2, …, TV_n, which exceeds the sum of values of separately operating companies:

$$\sum_i TV_i \geq TV_1' + TV_2' + \ldots + TV_n', \qquad (14)$$

where TV_1', TV_2', …, TV_n' – the value of independently operating companies, TV_1, TV_2, …, TV_n – the value of companies integrated into the supply chain.

As can be seen from the above formula, integration in this case involves the establishment of such economic links between supply chain participants that would ensure synergies achieved through a higher level of customer service of material assets and lower transaction costs. Thus, in the implementation of the integration concept in the rail market at the strategic level, special attention should be paid to linking the corporate strategies of suppliers with the strategies of the carrier.

CONCLUSION

Supply in supply chains is a key step in the formation of values for consumers of material flows. In the process of research, it was established that supply logistics represents the scope of the company's activity in managing quantitative and qualitative parameters of incoming goods and services flows in the process of their interaction with suppliers in order to effectively meet the demands of internal and external consumers with the optimal level of costs. In the changing environment, a strategically oriented approach is needed both in supply management and in supplier management. In this connection, the article substantiates the need for strategically supplier-oriented management of commodity and material values in supply chains, systematizes supplier management strategies. The object of research was JSC "Russian Railways", and, as a result, the procurement and selection experience of suppliers of goods, works and services for the needs of the carrier was studied. It was found that there are special features in the selection of innovative, high-tech products that ensure the safety of transportation. In the structure of purchased products, the volume of high-tech products is about 10-15% per month. Most of commod-

ity-material assets for the needs of the national company are purchased on a competitive basis. The cost of procurement contracts for goods, works and services in JSC "Russian Railways" increased by 37.8% in 2016 compared to 2015. According to forecasts, the volume of goods and services purchased will only grow and will amount to 706955614.3 thousand rubles in 2017, and 960933929.5 thousand rubles in 2018. In order to improve the efficiency of interaction with counterparties in the process of supply, JSC "Russian Railways" offered a methodology for selecting products and suppliers that allows evaluating both existing and potential sources of supply. To develop the methodology, the expert method was used with the involvement of specialists from the Center for Organizing Competitive Procurement of JSC "Russian Railways" in the number of six people to rank the criteria for selecting products and suppliers in order of the decreasing significance value. Then the proposed methodology was tested in the process of selecting suppliers of electrical products for the needs of JSC "Russian Railways".

ACKNOWLEDGEMENT

The study was carried out with the financial support of the Russian Foundation for Basic Research, project No. 17-02-00155 "Strategic solutions in supply logistics for railway companies".

REFERENCES

1. Alekseyeva, Ye. A., & Pakhomova, A. V. (2006). Формирование логистической стратегии управления закупками на основе вариативных компонент [Formirovaniye logisticheskoy strategii upravleniya zakupkami na osnove variativnykh component]. *Logistika segodnya, 4,* 240-245.
2. Banchuen, P., Sadler, I., & Shee, H. (2017). Supply chain collaboration aligns order-winning strategy with business outcomes. *IIMB Management Review, 29*(2), 109-121. Retrieved from https://www.sciencedirect.com/science/article/pii/S0970389617302240
3. Bauersoks, D., & Kloss, D. (2017). *Логистика. Интегрированная цепь поставок [Logistika. Integrirovannaya tsep postavok]* (640 p.). Moskva: Olimp-Biznes.
4. Bowersox, D., Closs, D., & Cooper, M. (2012). *Supply Chain Logistics Management* (4th ed.) (496 p.). New York: McGraw-Hill Education.
5. Christopher, P. M. (2016). *Logistics & Supply Chain Management* (5th ed.) (328 p.).UK: FT Publishing.
6. Cirjaliu, B., Weinschrott, H., Gaureanu, A., & Boatca, E. (2016). A Proposal for a Risk Assessment Management in a Transport Company. *Procedia Economics and Finance, 39,* 229-234. Retrieved from http://www.sciencedirect.com/science/article/pii/S2212567116303173
7. Frolov, A. (2017). *Краткий курс теории вероятностей и математической статистики [Kratkiy kurs teorii veroyatnostey i matematicheskoy statistiki]* (304 p.). Moskva: Lan.
8. Gattorna, J. (2015). *Dynamic Supply Chains: How to Design, Build and Manage People-Centric Value Networks* (3rd ed.) (648 p.). India: FT Publishing International.
9. Karpova, N. P. (2015). Strategic planning in logistic systems. *Actual problems of economics, 2*(164), 31-37.
10. Karpova, N. P., Toymentseva, I. A., Shvetsova, E. V., Chichkina, V. D., & Chubarkova, E. V. (2016). The use of logistics n the quality parameters control system of material flow. *International Journal of Environmental & Science Education, 11*(14). 6726-6743.
11. Linders, M. R., Dzhonson, F., Flinn, A. Ye., & Firon, G. (2014). *Управление закупками и поставками [Upravleniye zakupkami i postavkami]* (752 p.) Moscow: Yuniti-Dana.
12. Lukinskiy, V. S., Lukinskiy, V. V., & Pletneva, N. G. (2017). *Логистика и управление цепями поставок [Logistika i upravleniye tsepyami postavok]* (360 p.). Moscow: Yurayt.
13. Lysons, K., & Farrington, B. (2016). *Procurement and Supply Chain Management* (9th ed.). New York: Pearson.
14. Malikov, O. B. (2015). *Складская и транспортная логистика в цепях поставок [Skladskaya i transportnaya logistika v tsepyakh postavok]* (400 p.). SPb: Piter.
15. Mani, V., Agrawal, R., & Sharma, V. (2014). Supplier selection using social sustainability: AHP based approach in India. *International Strategic Management Review, 2*(2), 98-112. Retrieved from http://www.sciencedirect.com/science/article/pii/S2306774814000209
16. Scott, J., Ho, W., Dey P. K., & Talluri, S. (2015). A decision support system for supplier selection and order allocation in stochastic, multi-stakeholder and multi-criteria environments. *International Journal of Production Economics, 166,* 226-237. Retrieved from http://www.sciencedirect.com/science/article/pii/S0925527314003582

17. Sergeyev, V. I. (Ed.) (2013). *Корпоративная логистика. 300 ответов на вопросы профессионалов* [*Korporativnaya logistika. 300 otvetov na voprosy professionalov]* (976 p.). Moscow: INFRA-M.

18. Stelzer, M. A. (2016). Success Factors in Decision Making and Negotiation Processes for Raw Material Supply Transactions. *Procedia Economics and Finance, 39,* 380-388. Retrieved from http://www.sciencedirect.com/science/article/pii/S2212567116303392

19. Tokarev, D. I. (2004). *Стратегическая логистика в управлении цепочками поставок (на примере предприятий автомобильной промышленности) [Strategicheskaya logistika v upravlenii tsepochkami postavok (na primere predpriyatiy avtomobilnoy promyshlennosti)]* (Doctoral dissertation) (171 p.). Samara: Samar. gos. ekon. akad.

20. Tsevelev, A. (2009). Стратегии развития материально-технического обеспечения железнодорожного транспорта 1-го порядка [Strategii razvitiya materialno-tekhnicheskogo obespecheniya zheleznodorozhnogo transporta 1-go poryadka]. *RISK, 3,* 163-171.

21. Waters, D., & Rinsler, S. (2014). *Global Logistics: New Directions in Supply Chain Management* (7th ed.) (512 p.). GB & USA by Kogan Page.

22. Zvereva, A. O. (2007). Особенности создания отраслевой системы [Osobennosti sozdaniya otraslevoy sistemy]. *RISK, 4,* 20-23.