

The Supply Chain Process Management Methodology within the Strategic Space and Considering the Leasing for Market Development

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Abstract— The development of supply chain relations implies a methodological basis for assessing the supply chain process effectiveness that is adequate to the market development. The study contains a description of the methodology for assessing and managing the supply chain process from the perspective of the interests of the lessee and the external and internal environment factors. The study is based on the methodology for modeling cash flows of the recipient enterprise and the method of discounting its cash flows generated with the participation of the industrial enterprise in the supply chain process. The proposed methodology is a universal tool for assessing and managing the supply chain process, which includes the strengths of advanced methods for assessing the effectiveness of the supply chain scheme for financing industrial investments accumulated in scientific works devoted to supply chain. The proposed structure of strategic features based on the totality of the methods for assessing the supply chain activity, market development, and leasing process allows an industrial enterprise to generate the supply chain process management strategies based on the analysis of the performance indicators. A number of definitions have been introduced into the scientific discourse and a methodology for assessing the supply chain activity, market development, and leasing process has been developed. The assessment and management methodology is of practical value for a wide range of organizations considering the possibility of technological re-equipment of industrial production in a business network.

Keywords— *supply chain, leasing process, market development, supply chain activity.*

1. Introduction

Extensive knowledge on managing logistics chains, which includes a number of methods, has been accumulated in the modern scientific literature. In foreign literature, the following experts devoted their research to this field of knowledge: Simatupang and Sridharan [1], DeAngelis, Howard and Miemczyk [2]. Chinese experts [3] examined the use of Blockchain technology in the construction industry. The research subject is the use of supply chain in business network holdings aimed at optimizing logistics communications. A number of specialists [4] considered supply chain as a method of centralized management of a civil technology park. There are studies [5] devoted to the methods for measuring the effectiveness of logistics and the Kolinska and Cudzilo examined the methods of comparing the effectiveness of logistics [6]. Altintas, Keuschen, Saur and Klumpp studied [7] the common problems of formation. Shapiro [8] divided management (SCM) methods into transactional and analytical methods. The Russian scholar Bochkarev [9] offers a hierarchical classification of management models, which provides a deeper understanding of the areas of application and use of certain models.

However, in the methodological aspect of management, there is a gap in the use of supply chain to develop an effective. A methodological basis based on the accumulated theoretical and methodological practices is required for the effective management of the supply chain process. The proposed methodology for strategic management of the supply chain process (SMLP) is based on the system analysis studies [10], as well as on the methods of supply chain efficiency.

Most foreign lease evaluation techniques are based on calculating the lease payment amount for lessees and comparing supply chain with alternative financing schemes based on a payment schedule; for example, this is described in the studies by Brealey and Myers [11] and Contino [12]. Another group of Western researchers [13], [14] considered organizations in terms of their attractiveness to participate in a supply chain transaction. A separate group of specialists [4], [15], [16] investigated the effectiveness of supply chain transactions through the prism of changes in the lessee's capitalization as a result of the supply chain process and the effect of an operating lease.

A great number of domestic methodological approaches to assessing the effectiveness of supply chain are reduced to cash flow analysis based on the industry specifics of the lessee. The economic sanctions that make the national economy intensify industrial import substitution require a paradigm shift in the development of supply chain; the focus should be turned toward large-scale industrial projects rather than selective technological re-equipment of industrial enterprises [17].

Recently, the study of platform business models described by Gawer A. and Cusumano M. A. has become popular. The models create value through the exchange between several independent groups, for example, consumers and producers. The methodological solution harmoniously fits into the concept of the present study. Despite the significant methodological and fundamental contribution to Economics, there is a lack of a systematic approach and the possibility of regenerating a strategy for managing the supply chain process based on the operational data in the context of a platform business model. This fact determined the purpose of the present study.

However, the analysis of the studies by domestic and foreign experts revealed a methodological and theoretical gap in research aimed at solving problems in the systematic management of the supply chain process in a networked business when implementing large-scale investment projects.

1.2 Problem Statement

To effectively implement strategic objectives, the lessee enterprise should apply cash flow management techniques and be conscious of a change in the institutional environment in order to timely switch to another supply chain process

management strategy. On the other hand, it is important to have a methodological basis for assessing the adequacy of the institutional environment and the immediate external environment to meet the goals of the project when implementing large-scale investment projects that require capital injections from several supply chain companies.

Thus, the purpose of the study is to propose a methodology for managing the supply chain process within the framework of the strategic space of an industrial enterprise aimed at increasing the efficiency of the economic activity and solving the operational and strategic objectives. In order to achieve the goal, the following tasks have been set: to introduce into scientific discourse the concepts of supply chain climate, supply chain activity and market development in leasing process of an industrial enterprise and to develop a set of assessment methods.

2. Methods

When studying problems of the supply chain process management, a wide range of methods should be applied, including methods for assessing the profitability and turnover of enterprise resources, economic and mathematical modeling, strategic analysis, planning and design analysis, as well as methods synthesized from the methodologies of special theories, namely development modeling, cash flow and management. The research is primarily based on the analysis of the cash flows of an industrial enterprise and their modeling in the context of the volatile external and institutional environment. The research relies on the statistical data for the period from 2003 to 2019, periodic financial statements of eight large Russian machine-building plants, and management information on three supply chain contracts aimed at large-scale financing of technological re-equipment. These methods will significantly improve the assessment quality and help future managers to develop the guidelines for managerial decision-making in the lease financing of investment projects.

3. Results

For the purpose of the operation of the supply chain process management system, the subjects of the supply chain transaction act as key constraints that structure the environment. Targets based on the strategic objectives of the owners and managers of industrial enterprises set specific challenges and expectations that define the vector and scope of management decisions based on forecasting the reaction of the supply chain

system subjects.

As a result of the historical evolution of economic thought, the systemic paradigm is currently dominant, which is the logical basis for the relatively new synergetic paradigm focused on a system that includes interrelated components and transformational potential [18].

In order to describe the supply chain process management system (LPMS), it is necessary to introduce into the scientific discourse the definition of strategic space and identify the features that form it. In the present study, strategic space is described as a closed and filled sphere of phenomena that differ in terms of the possibility of their identification.

Kleiner [10] and later Zubkova [19] considered strategic features as a way to build a certain part of strategic space. Figure 1 shows the strategic space for managing the supply chain process that is formed in accordance with the specified features as a way to build a certain part of it [20].

At the same time, strategic features stand for x, y, z :

$$\begin{aligned}y &= 1, 2, \dots, p; \\x &= 1, 2, \dots, r; \\z &= 1, 2, \dots, q.\end{aligned}$$

Thus, a system is an integral part of strategic space that is resistant to external and internal influences and singled out based on several features.

The concepts of structure and system refer to the basic concepts of system analysis.

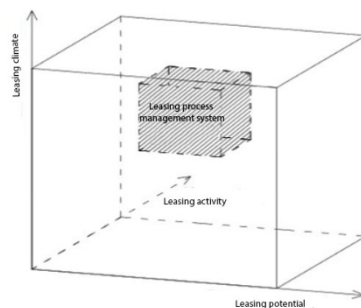


Figure 1. Strategic space of the supply chain process management system formed in accordance with three strategic features (own development)

The method of the supply chain activity of an industrial enterprise. The strategic criterion of the supply chain process management system at an industrial enterprise is the supply chain activity, which is generally defined as a complex of financial and economic ties reflecting the scale and intensity of the formation and use of own and borrowed capital to modernize production with the purpose of

tactical and strategic management based on the supply chain scheme.

Supply chain activity as an economic category and an important strategic space criterion that affects the supply chain process management has not been described in scientific literature and has not been scientifically identified.

In our opinion, the concept of “supply chain activity” can be divided into two categories: “activity” and “supply chain”, which indicates the intensity of the process, its nature and is associated with the categories of leasing and the supply chain activity intensity. These economic phenomena allow us to diagnose the dynamic activity and scale of supply chain processes taking place at an industrial enterprise in relation to the size of the lessee. Supply chain activity provides quantitative and qualitative characteristics of the intensity of the supply chain processes of an industrial enterprise; it seems to be a certain guiding indicator of the enterprise. Thus, we define supply chain activity as the degree of proportionality and intensity of sponsored and motivated activities of enterprises aimed at technological re-equipment and development based on the supply chain scheme.

Supply chain activity demonstrates a change in the volume and structural indicators of attracted investments as leases and also compares certain factors that describe and characterize the degree of volatility of the supply chain activity of an industrial enterprise.

Generally, internal factors can be divided into two groups: factors of the scale and intensity of supply chain activity.

Scale factors (structural factors) include the following characteristics:

- the scale of the enterprise (balance sheet total);
- the average annual value of non-current assets and fixed assets;
- total investment volume (portfolio investment and investments in non-current assets);
- volume of production investments;
- the value of the enterprise depreciation fund;
- the value of accounts payable for acquired fixed assets for industrial purposes.

The intensity factors (dynamic factors) of supply chain activity include the growth rate of the assets and liabilities of the enterprise relative to the investment as leases. Based on the above, we have developed an algorithm for assessing the supply chain activity of an industrial enterprise in order to manage the economy of the leasing process; based on the requirements for the nature of investing in real assets through lease

contracts, the actual procedure of the valuation can be presented as follows in accordance with Figure 2.

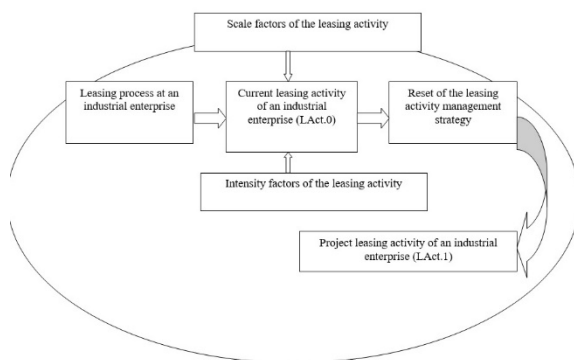


Figure 2. The logical scheme for assessing and managing the supply chain activity of an industrial enterprise

Thus, the algorithm for assessing the supply chain activity of an industrial enterprise in the context of its participation in the supply chain process (i.e., the assessment is carried out to the benefit of the economic entity management) includes four successive steps. In addition to the assessment of the supply chain activity of the recipient enterprise, the possibility of restarting the leasing process based on the supply chain activity is indicated.

The supply chain activity assessment within the strategic space of the strategic management of the supply chain enterprise is carried out based on a diagnostic scale; RLA ranges between $\{0; 1\}$, whereby:

$RLA \geq 0.33$ - the supply chain activity is in crisis;

$0.34 \geq RLA \leq 0.66$ - the supply chain activity is stable;

$0.67 \geq RLA$ - the supply chain activity is growing.

To evaluate RLA, the M value of the nth group of factors of the j strategy for managing the supply chain process should be calculated based on the following expression:

$$RLA = \frac{\sum M_{ij}}{\sum M_{ij}^{max}}; \quad (1)$$

The supply chain climate of RLA is formed on the basis of two groups of factors:

1. Dynamic (intensity) factors:

$$M_{int.} = \frac{\sum a_{int}}{a_{int}^{max}}; \quad (2)$$

2. Scale (structural) factors:

$$M_{scale} = \frac{\sum a_{scale}}{a_{scale}^{max}}; \quad (2)$$

The proposed method for assessing supply chain activity provides for the possibility of replenishing the list of additionally evaluated characteristics

which contributes to the openness of the proposed system for assessing the supply chain activity of an industrial enterprise. Thereby, it increases its adaptability to the variation of the intensity factors of investment and supply chain activities (dynamic factors). This also applies to scale factors (structural factors).

2. The method of the industrial enterprise supply chain climate. During the course of the supply chain process, the lessee interacts with other entities within the external environment of the economic activity and produces products (works, services) in the internal environment. The quantitative assessment of the supply chain climate that takes into account every procedure of the lessee's operation within internal and external environment systems allows characterizing the supply chain attractiveness of the lessee. When assessing the supply chain climate, the omission of any operating procedure that is important for the lessee may lead to an erroneous assessment and negative economic effect based on the results of lease financing.

To supply chain climate assessment (R_{LC}) within the strategic space of the supply chain process management system is based on a diagnostic scale; R_{LC} ranges between $\{0; 1\}$, whereby:

$R_{LC} \geq 0.33$ – the supply chain climate is in crisis;

$0,33 \geq R_{LC} \leq 0,66$ – the supply chain climate is stable;

$0,36 \geq R_{LC}$ – the supply chain climate is growing;

To evaluate R_{LC} , the N value of the i block of factors of the j strategy for managing the supply chain process is derived based on the expression:

$$R_{LC} = \frac{\sum N_{ij}}{\sum N_{ij}^{max}}; \quad (1)$$

Supply chain climate R_{LC} is based on four basic group of factors:

1. Economic climate factors:

$$N_{EAF} = \frac{\sum b_{economic\ climate}}{b_{economic\ climate}^{max}}; \quad (2)$$

where $\sum b_{economic\ climate}$ is the assessment score of the economic climate of the industrial enterprise;

$b_{economic\ climate}^{max}$ is the maximum score of the economic climate assessment of an industrial enterprise.

2. Factors of enterprise infrastructure:

$$N_{INTERNAL} = \frac{\sum b_{infrastructure}}{b_{infrastructure}^{max}}; \quad (3)$$

where $\sum b_{infrastructure}$ is the assessment score of the industrial enterprise infrastructure;

$b_{infrastructure}^{max}$ is the maximum score of the assessment of the industrial enterprise infrastructure.

3. External factors of the macroeconomic environment:

$$N_{Macro} = \frac{\sum b_{Macro}}{b_{Macro}^{max}}, \quad (4)$$

where $\sum b_{Macro}$ is the assessment score of the microeconomic environment of the industrial enterprise;

b_{Macro}^{max} is the maximum assessment score of the microeconomic factors of the industrial enterprise.

4. External factors of the microeconomic environment:

$$N_{Micro} = \frac{\sum b_{Micro}}{b_{Micro}^{max}}, \quad (5)$$

where $\sum b_{Micro}$ is the assessment score of the microeconomic environment of the industrial enterprise;

b_{Micro}^{max} is the maximum assessment score of the microeconomic factors of the industrial enterprise.

We believe that external macroeconomic and macroeconomic environment factors of an industrial enterprise participating in the supply chain process are important for the lessor [21]. In our opinion, the major factors of the microeconomic environment of an industrial enterprise include:

- current state and development trend of the industry;
- level of the state (regional or federal) support for the industry (industrial cluster or enterprise), number of government contracts;
- unemployment rate in the region.

The factors of the macroeconomic environment of an industrial enterprise include:

- general state and development trends of the national economy;
- dynamics of the Central Bank refinancing rate;
- registered inflation rate.

The possibility of replenishing the list of additionally evaluated characteristics contributes to the openness of the proposed system for assessing the supply chain activity of an industrial enterprise. Thereby, it increases its adaptability to the variation of the external environment factors of the current and future projects. This also applies to factors and characteristics of the internal environment of an industrial enterprise.

The analysis of the scientific literature has shown [22] - [24] that the concept of potential is usually used as a synonym for resources in certain areas of scientific knowledge. According to L.I. Abalkin, potential is a generalized cumulative characteristic of resources that is dependant on the place and time [21]. This point of view is also shared by other prominent specialists [9], [18].

It should be noted that in the present study, the concept of potential should be considered from the perspective of a result aimed at the implementation of certain opportunities within the framework of the strategic tasks assigned to the enterprise; in addition, the perception of potential is shifted from “resource” to “opportunity”.

The overall effectiveness of the supply chain process is estimated with respect to an alternative financing scheme (a bank loan), which has similar cash flows during the use of borrowed resources. In the context of a high variation of the internal and external environment factors, the entire economy of the supply chain process is changing, which can make the supply chain process effectiveness “negative”. These conditions pose a challenge to the industrial enterprise management to consider bank refinancing of the lease debt.

We consider supply chain potential as the accumulated net present economic effect generated during the course of the leasing process.

The studies on the assessment and management of the supply chain effect [21] become the basis for the assessment of supply chain potential (RLP) and its value is characterized as the difference between the discounted cash flows based on the supply chain scheme (DCFlease) and similar flows based on the credit financing scheme (DCFcr):

$$RLP = DCF_{lease} - DCF_{cr}$$

The task of assessing the supply chain potential is to identify the period of the leasing process within the framework of the current lease agreement in which a positive value of the supply chain potential is formed.

In order to diagnose the supply chain potential (RLP) within the strategic space of the leasing process management system (LPMS), it is proposed to use a diagnostic scale within which RLP ranges between {0; 1} and the assessment is carried out based on a point-scale depending on the starting point of the generation of a positive RLP value, whereby:

— RLP equals 3 provided that $(DCF_{lease} - DCF_{cr}) \geq 0$ within the range of {0; 0.33}; this indicates the supply chain potential growth;

— RLP is 2 provided that $(DCF_{lease} - DCF_{cr}) \geq 0$ within the range of {0.33; 0.67}; this indicates the supply chain potential stability;

— RLP equals 1 provided that $(DCF_{lease} - DCF_{cr}) \geq 0$ within the range of {0.67; 1} or $RLP \leq 0$; this indicates the supply chain potential stability.

The assessment of DCFlease and DCFcr is based on the key conditions of the lease agreement, which include

the place of registration of the supply chain process, the term of the lease agreement, the value of the selected special ratio, the amount of remuneration for the transaction, the margin of the supply chain company, etc.

The lease agreement factors form a model of enterprise cash flows (Table 1) that are generated during the course of the supply chain process; the cash flow analysis provides analytical information about the value of the resulting criterion.

The calculation of the accumulated net present effect, which is formed on the basis of the net income principle, provides an opportunity to fully take into account the whole range of tax shields that are developed based on the value-added tax, business property tax, and income tax; the use of the net cost principle to assess the effectiveness of financing schemes does not provide such opportunities.

Table 1. Cash flow model for the supply chain and credit financing schemes

Revenue from sales without excise taxes and VAT		
(-) Cost of revenue		
(=) Gross profit		
Financing scheme - Credit	Financing scheme - Supply chain (no capitalization)	Financing scheme - Supply chain (with capitalization)
(-) Organizational costs		
(+) Receipt of funds as a loan	(-) Retainer payment	
(-) Retainer payment	(-) Lease payment (LP)	
(-) Payment for equipment	(-) Asset insurance	
(-) Payment for related services	(-) VAT to the budget	
(-) Asset insurance	(-) Liquidation payment	
(-) Credit payment		(-) Corporate property tax

(-) Property tax		
(-) VAT to the budget		
(-) Corporate income tax		
(=) Adjusted project revenue		
(-) Discounted cash flow at the market rate		
(=) DCF _{cr}	(=) DCFL _{lease}	(=) DCFL _{lease}

The algorithmization of the choice of financing sources of a project for technological modernization of an industrial enterprise and analysis of the effectiveness of alternative financing schemes carried out during the course of the supply chain process (Figure 3) allows us to identify its negative effectiveness with respect to credit both at the pre-investment stage and at any time for the purpose of further refinancing.

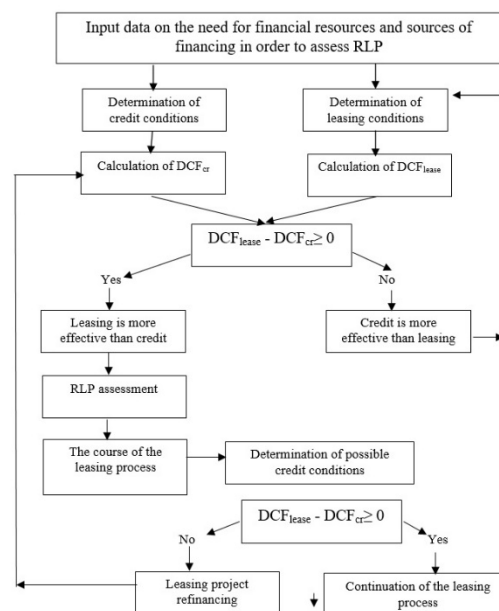


Figure 3. The algorithm of choosing a financing scheme and assessing the supply chain potential of an industrial enterprise

The proposed method for assessing supply chain potential is based on the performance indicators of investment activity and involves the analysis of cash flows formed during the course of the supply chain process.

The proposed cash flow model allows obtaining analytical information for managing the supply chain process aimed at possible regeneration of its operational strategy within the framework of strategic space.

The study revealed the potential of the dynamic assessment of performance indicators, which, in our

opinion, is highly flexible and can contribute to both the formation of a supply chain process management strategy and the centralized selection of a potential lessee to finance large-scale import substitution.

The identification of 27 supply chain process management strategies during the entire course of the leasing process on the basis of its performance indicators allows an industrial enterprise to achieve strategic business goals in the context of platform business models.

To build an economic-mathematical model of the study object (LPMS), a “map” of the model that distinguishes the LPMS models is presented (Figure 4).

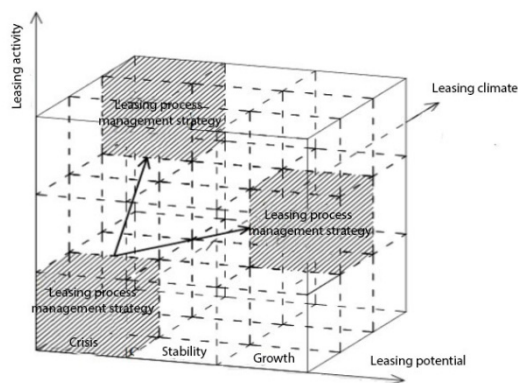


Figure 4. “Map” of the economic-mathematical model of the supply chain process management system

The identification of 27 supply chain process management strategies during the entire course of the supply chain process on the basis of its performance indicators allows an industrial enterprise to achieve strategic business goals in the context of platform business models.

4. Conclusions

In the course of the present study, the concepts of “supply chain climate”, “leasing activity” and “market development” have been introduced into scientific discourse and their identification factors have been determined. A methodological basis for assessing strategic criteria within the strategic space has been developed along with the identification of 27 supply chain process development strategies aimed at its further management.

The practical development of the concept of managing the supply chain process of an industrial enterprise in a business network meets the

requirements of the modern Russian environment and the needs of the structural industry for the implementation of the import substitution policies.

5. Acknowledgments

This article was written with the support of the Russian Foundation for Basic Research, grant No. 19-010-00235.

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