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THE ECONOMIC PERFORMANCE AND LEGAL ISSUES OF THE FOURTH PARTY LOGISTICS (4PL) IN THE AVIATION INDUSTRY OF RUSSIA

Dzh.-M. Akhmatova

*Master of Law,
ORCID 0000-0001-7535-9673,
e-mail: dzhennet-mari.akhmatova@mail.ru,
Lomonosov Moscow State University,
Moscow, Russia*

M.-S. Akhmatova

*Master of Engineering,
ORCID 0000-0001-6500-940X,
e-mail: malika_sofi@mail.ru,
School of Aeronautics and Astronautics,
Shanghai Jiao Tong University,
Shanghai, China*

Abstract. This article examines the potential performance of the Fourth Party Logistics (4PL) in the framework of the Supply Chain Management (SCM) programme executed by the enterprises of the Russian civil aviation. Furthermore, the conspicuous legal risks faced by the members of the supply chain are highlighted. The major contribution of this paper consists of the practical proposals that would contribute to the sustainable and beneficial cooperation among the supply chain's stakeholders.

Keywords: business law; SCM; logistics providers; aviation industry.

I. Introduction

The aircraft enterprises' activities depend on the availability of raw materials, items, and different services to maintain the life cycle of the final products. In this context, SCM is considered as a strategy on design, planning, execution, control, and monitoring of supply chain activities for creating net value, building a competitive infrastructure, leveraging worldwide logistics, synchronizing supply with demand and measuring performance globally [3].

Early research works [15], [17] considered the importance of SCM for sustainable development of the enterprises and indicated the significant challenges faced by the supply chain's members. Some studies also empha-

sized that SCM virtually affects every aspect of the enterprise's activities [2], [12].

Currently, SCM acts as a contemporary strategic approach to procurement and logistics operations [8], [27], [9], combining state-of-the-art transport technologies and ensuring a rapid promotion of the ideology of supply chain integration into the business. One of the relevant ways to perform the transition from plain logistics systems to comprehensive ones is to introduce the concept of the Fourth Party Logistics (4PL) into the practice of aviation SCM. However, the application of the Fourth Party Logistics in practice often faces the legal obstacles [14], [4] that could negatively affect its effectiveness. Thus, this article is aimed at revealing the potential performance of the 4PL-provider and identifying





the conspicuous legal risks in its implementation in the context of SCM in Russian aviation enterprises. The main contribution of this paper consists of the recommendations that would ensure the long-term beneficial cooperation with 4PL-providers and fill the existing gap in its understanding [27].

The remainder of this paper is organized as follows. Section II presents the concept of logistics outsourcing in the framework of SCM. The kernel of the Fourth Party Logistics is considered in Section III. Section IV examines the proposed system methodology. Section V describes the process of methodology implementation and results. Section VI highlights the legal aspects of cooperation with the 4PL-providers. Finally, the concluding remarks are in Section VII.

II. Logistics outsourcing in SCM

According to the core competence theory and outsourcing theory [26], the enterprises' resources are limited: the enterprise cannot gain a competitive advantage in all fields of the business [16]. This way, plenty of companies outsource parts of their business to focus on their key activities (manufacturing, service, etc.) to reduce the logistics costs, thus encouraging the development of SCM in a wide range of areas of industrial activity.

To indicate the type of the outsourcing company, the terminology xPL is used, where x is a specific number: 1, 2, 3, 4 or 5 [10]. The term "PL" or "Party Logistics" implies the opinion of the client company regarding the complexity of logistics functions performed by the logistic provider.

In the context of the First Party Logistics (1PL), the logistics operations are carried out directly by the cargo-owner [15]. In the aviation industry, 1PL-providers have been replaced by the providers of higher level due to the complexity of procurement, transportation, and distribution processes. In turn, the Second Party Logistics (2PL) is a single-purpose logistics broker or a transport com-

pany (freight forwarder, customs agent, etc.) that cooperates with the cargo-owner that does not have own vehicles for transportation of the requested resources.

The functions of the Third Party Logistics (3PL) providers have been formed through the integration of the two traditional logistics functions of 2PL-providers (transportation and storage) and supplemented by the previously independent services (insurance, goods marking, etc.), often using subcontractors [20]. The cooperation with the outstanding 3PL-providers contributes not only to the reduction of logistic costs but also improves the investment redounding rate as much as possible [19].

Although the 3PL – providers perform complex work on procurement of required items, their activities are generally focused on the certain functions and operations that is not relevant to today's market, because currently the top-management strives to identify the ways to provide the modern integrated approaches to refine the enterprise's processes. Furthermore, some studies highlighted that maintaining reliable and cost-effective partnership between the shipper and 3PL-provider can be a complex practice [1]. Thus, a promising direction is the development of the Fourth Party Logistics (4PL) companies as they are focused on SCM and integration of all the companies involved in the supply chain to optimize the total logistics costs.

III. Kernel of the Fourth Party Logistics

The concept of the Fourth Party Logistics (4PL) was defined by Andersen Consulting (Now Accenture) as an integrator that assembles the resources, capabilities and technology of its own organization and other organizations to design, build, and run the comprehensive supply chain solutions [22].

The 4PL-providers can impact and integrate the entire supply chain through the key drivers of shareholder value: increased revenue, operating-cost reduction, working-



capital reduction, etc. [6]. The 4PL-providers ensure cooperation among the logistics operators of lower-level services (2PL and 3PL) and various single-purpose logistics intermediaries, striving to accomplish common goals related to SCM performance [18]. Some experts [13], [21] also pointed out that 4PL-providers are associated with lower logistics costs and can enhance coordination in the specific supply chain.

The 4PL-providers coordinate the informational and physical flows with the frameworks of various software suitable for the SCM execution. For instance, the ERP (Enterprise Resource Planning) system is an indispensable element contributing to the performance of the supply chain. Also, it acts as “consumer” of design and engineering data, integrating with the relevant Product Lifecycle Management (PLM) system, and offering a greater business value [7].

IV. Methodology

The effectiveness of procurement, inventory and logistics management processes incorporated in the SCM system has a direct impact on the company's financial results. In this section of the paper, the methodology steps based on the major aspects of financial analysis [25] are listed in order to successfully realize the project on cooperation with the 4PL-provider and identify the potential performance of SCM.

Step 1. System analysis of the enterprise's financial and economic results

To ensure this step, the values of fixed (long-live) assets and current assets, capital and reserves, long-term and short-term liabilities, financial results of the company for at least three years are compared in order to provide an overall picture of the changes and detect the potential problems in the enterprise's activities.

Step 2. System assessment of the enterprise's financial stability indicators

At this stage, the specific indicators should be estimated, such as (1) value of the

working capital; (2) value of the net assets; (3) coefficient of the investment attractiveness; (4) value of the equity ratio; (5) ratio of the enterprise's working capital; (6) security of reserves.

Step 3. Assessment of the inventory management's main factors

At this stage, the specific indicators should be estimated, such as (1) inventory turnover ratio; (2) share of stocks in the total current assets; (3) inventory turnover duration.

Step 4. Assessment of the liquidity (solvency) ratios

The solvency of the enterprise is its ability to cover the short-term obligations (including debts to suppliers and contractors) promptly, considering the following indicators: (1) absolute liquidity ratio; (2) value of earnings before tax; (3) value of sales profit; (4) value of net profit; (5) value of selling and executive expenses.

Step 5. Assessment of the enterprise profitability indicators

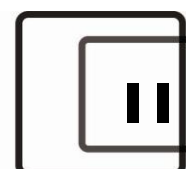
The favourable value of profitability depends on the effectiveness of procurement activity of the enterprise and should be positive. The following indicators should be calculated: (1) return on shareholders' equity; (2) return on assets; (3) return on current assets; (4) output profitability; (5) profitability of sales.

Step 6. Determination of the directions and purposes of deliveries

Step 7. Approval of the decision on supply activity improvement by the enterprise's top-management

Step 8. Forecasting results of project implementation

The following indicators of the project efficiency should be estimated and be equal to the optimal values for the specific project: (1) Return on Investment (ROI); (2) Net Present Value (NPV); (3) Net Terminal Value (NTV); (4) Internal Rate of Return (IRR); (5) Profitability index (PI); (6) Pay-back Pe-





riod in the static framework (PPs) and dynamic framework (PPd).

Step 9. Planning of successful stages on SCM implementation

Step 10. Selection of appropriate software for SCM support

Step 11. Establishment of the 4PL-provider's centers

Step 12. Evaluation of project outcomes

V. Results

In this section, the application of proposed system methodology is presented based on the example of the Aircraft Corporation "N" consisting of the association of the aviation enterprises for the further improvement of its procurement activities. Also, this

section shows the results of the expert assessment regarding the potential impact of the proposed methodology implementation based on the cooperation with the 4PL-provider.

Considering the commercial confidentiality of the information on financial and economic activities of the Russian aviation enterprises, the required calculations have been performed based on the nominal values to reflect the whole scope of the methodology application. Generally, the calculation of the main indicators from the following steps should be based on the production, financial, economic statements of the enterprise and balance sheet data (Table 1).

Table 1

Calculation of the major methodological indicators (Step 2 – Step 3)

Indicator's name	Indicator value			Meaning of the value
	Beginning of the plan year	Beginning of the reporting year	End of the reporting year	
Step 2: The system assessment of the enterprise's financial stability indicators				
Value of working capital	US \$1.5 billion	US \$1.5 billion	US \$1.6 billion	Effectiveness of material resources usage, increase in volumes of production, speed of the working capital turnover
Value of net assets	US \$2.2 billion	US \$2.1 billion	US \$2.5 billion	Confirmation of the financial stability
Coefficient of the investment attractiveness	0,9	0,8	1,5	Absence of the bankruptcy signs
Equity ratio	0,57	0,55	0,63	Improvement in financial sustainability in the reporting year
Ratio of enterprise's working capital	0,55	0,54	0,61	Coefficient values are within the recommended value range
Security of reserves	27,10	27,15	35,10	A decrease in the demand for the borrowed capital



Step 3: The assessment of the inventory management's main factors				
Inventory turn-over ratio	12,60	12,34	6,59	Excess inventory and a decrease in the warehouse management efficiency
Share of stocks in the total current assets	3,10 %	3,12 %	3,00 %	Insignificant changes
Inventory turn-over duration	30 days	30 days	45 days	Increasing by 15 days that means a decrease in the efficiency

The assessment of the liquidity ratios (Step 4) and enterprise profitability indicators (Step 5) should be considered in conjunction with other indicators (Table 2). The particu-

lar attention should be given to net profit value, as it directly affects the profitability indicators.

Table 2

Calculation of the major methodological indicators (Step 4 – Step 5)

Indicator's name	The indicator value		Meaning of the value
	Previous year	Reporting year	
Step 4: Assessment of the liquidity ratios			
Absolute liquidity ratio	0,80	1,02	Optimal values
Value of earnings before tax	US \$123 million	- US \$124 million	Significant deterioration of the corporation financial condition
Value of sales profit	US \$16,1 million	- US \$16,3 million	Loss from sales for the year
Value of net profit	US \$122 million	- US \$125 million	Net loss for the year
Selling and executive expenses	The significant increase in the reporting year		
Step 5: Assessment of the enterprise profitability indicators			
Return on shareholders' equity	3,1 %	- 3,6 %	The inefficiency of indicators in the reporting year
Return on the assets	2,5 %	- 2,6 %	
Return on current assets	3,5	- 4,1 %	
Output profitability	- 3,1	- 3,5 %	Increase in the production cost and reduction of the profit
Profitability of sales	- 2,9	- 3,2 %	Losses from sales



The values of current indicators (such as the profitability of enterprise), which are closely linked with the efficiency of processes in the supply chain, require the urgent optimization that would be carried out through the introduction of the proposed project (Step 7).

The calculated forecasted results of the project implementation (Step 8) are optimal and within the recommended limits, as the effect of the project covers the costs of its implementation. For instance, the value of IRR is equal to 16,1 per cent and the payback periods are not more than 3 year that underlines the acceptability of the project.

Further, six qualified experts related to the enterprises of the Russian aviation indus-

try have been interviewed regarding the potential effect of cooperation with the centralized 4PL-operator in the framework of the SCM system. To determine the competence of the experts, the argumentation coefficients of each expert on the special five-point scale have been evaluated, as well as the factors of the familiarity and competence. The condition of the high average competence of the group has been met that allowed to consider the average values of the predictive characteristics as the forecast. The main predictive values based on the results of the expert assessment are indicated in Table 3.

Table 3

Predictive values of the expert assessment

Item	Expert number						Average value of the predictive characteristics, %
	1	2	3	4	5	6	
	<i>The expert's assessment, %</i>						
Decline in inventories	30	20	40	20	30	20	27
Reduction of commercial costs	20	5	10	20	35	35	21
Reduction of administrative costs	15	15	20	30	25	40	24
Reduction of aviation technology's cost	8	6	5	10	7	10	8

The obtained results are in compliance with the findings of other researches. According to the most recent achievements [11], in the case of implementation of the integrated logistics and SCM-concept, the enterprise could get the following competitive advantages: (1) the reduction of the operating costs by 15 per cent; (2) reduction of the logistics costs by 8–10 per cent; (3) reduction of the average production cycle by 1.5–3 per cent; (4) reduction in the number of common stocks by 5–8 per cent.

However, obtained findings are associated with greater positive effects due to a system consideration of supply chain through the cooperation with the 4PL-provider. The forecasted deviations from the planned deadlines and planned budget are about 10 per cent and 15 per cent. Besides, through the decline in inventories, it is possible to achieve the following outcomes: (1) reduction of the storage costs by 20 per cent; (2) reduction of the spoilage and theft of goods and materials risks by 99 per cent;



(3) reduction of the labour costs for the search of necessary resources and components in warehouses by 40 per cent; (4) reduction of the costs of repackaging and labeling by 45 per cent.

Thus, the improvement of the supply chain through the cooperation with the 4PL-provider may allow the effective integration of the supply chain for maintaining its stability, reliability, and cost savings by reducing expenses.

VI. Legal aspects of cooperation with the 4PL-provider

The importance of supply chain risk management is attracting the attention of academicians and business managers globally [23]. The following key legal issues that affect the beneficial cooperation among participants of the Fourth Party Logistics system should be highlighted:

- Losses associated with the risks of non-fulfilment of the counterparty's obligations under the contract, such as failure to receive ordered items, aviation equipment and services.
- Liability for non-fulfilment of contractual obligations by suppliers in terms of quantity, quality and delivery time.
- Liability for environmental contamination and damage caused by the industrial enterprises in the course of their economic activity and ill-conceived projects.
- Liability for non-compliance with the delivery contract.
- Liability for the quality of developed aviation equipment and damage to the health of employees of the enterprise.
- Liability for non-performance of financial obligations and non-repayment of borrowed funds, etc.

In order to prevent supply chain and business disruptions, the whole scope of legal risks should be carefully monitored and managed since they can entail adverse impact on a business, and can result in reputational, finan-

cial, and strategic damage [14]. Supply chain risks can be managed more effectively when applying the Supply Chain Risk Management Process (SCRMP) as the structured approach divided into the phases of risk identification, measurement, assessment, control, and monitoring via data management systems [24].

VII. Conclusion

This article has presented the potential performance of the Fourth Party Logistics (4PL) through the implementation of methodology steps and disclosure of significant legal risks affecting it.

A major finding that highlights the novelty of this study is that cooperation with 4PL-provider may contribute to achieving a synergistic effect for improving the efficiency of the aviation enterprise's procurement activities. To meet these challenges, members of the supply chain must work towards a unified system and coordinate with each other [5]. Another important observation is that the implementation of the proposed project may increase the business processes transparency that could serve as an incentive to enhance the degree of employees' involvement in the enterprise's business processes. The findings of this study have to be seen in light of some limitations, such as commercial confidentiality of information on the financial and economic performance of the Russian aviation enterprises.

It is highly recommended that the aircraft corporations should actively perform the risks management concerning the legal aspects of SCM that also can be an object of further research. One of the most crucial characteristics of the modern aviation enterprise is a continuous adaptation to changes in the market environment and seizing new opportunities to strengthen the competitiveness promptly.

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