ANALYSIS OF SUPPLY CHAIN FINANCIAL SYSTEM IN REPUBLIC OF LITHUANIA LOGISTICS ENTERPRISES

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Abstract. This paper investigates enterprise logistics process financial system and enterprise logistics process. The authors are made the evaluation of these processes per Republic of Lithuania and abroad countries practice in this range. The paper analyzes in enterprise logistics system existing process and their singularities, shows models used for managing logistics process efficiency, logistics process evaluation singularities, logistics process revenue source and expenditures. The main aim of this article is to show enterprise logistic process financial system, which helps to select most suitable logistic process perform ways, what helps to decrease costs in time, area and finance. In this article were used theoretical and empirical research methods: scientical analysis of literature, comparative analysis, survey and expert assessment.

Keywords: logistics, supply chain, finance, system, management.

JEL classification: G10, G190, M210, R410, R490.

1. Introduction

Enterprises, which work in service, manufactury or retail areas, are unified by the same laws, environment, capital sources and in some ways –same clients and also in some ways similar logistical system. But creation and management of it or in other words supply chain, its complication, what depends only from the enterprises as to structure two same logistic systems is almost impossible. Each of them is individual by itself. However, logistic system or supply chain in every enterprise is part of enterprise, without what enterprise couldn't exist, and moreover it warrants supply of necessary commodities, stores, stocks and other sources for organization and also commodities supply from enterprise.

Logistic system can be defined as business environment, where exist certain logistic processess. Regarding the practice, all companies affairs with certain logistic process problems what exist in supply chain.

Regarding to Sreeniv and Sriniv (2005), Daske and Techmann (2012), Wang *et al.* (2013), the biggest logistic process problem – material flows in time and area variency, which find out from human resources, wrongly filled documents, transport or vehicles damages or breakdowns, payments for warehousing and pick up of the car-

go or got service time variancy and etc. Each of higher mentioned problematic areas belongs for certain logistic process or logistic functional area, where creates certain expenditure.

All existing logistic processes functions general supply chain, which joins all logistic processess to the one general supply chain process financial system.

This article is intended for analysis of supply chain financial system, as and logistic, like process, logistic system, as the sum of certain logistic processes or supply chain is being analysed very wide by (Yue, Tseng 2005; Navickas, Cetiner 2008; Sujeta, Navickas 2010; Meidutė 2010; Bokor 2011; Palšaitis 2010, 2011; Davulis 2012; Tuglular *et al.* 2012; Ping 2013; Wang *et al.* 2013; Yongsheng *et al.* 2013; Meidutė-Kavaliauskienė *et al.* 2014a, b). However, from analysed scientifical sources analysis is being seen missed optimal logistic process financial system activity optimizing model, which works to optimize enterprise supply system and eliminate problematical, biggest expenditure creating areas.

The main aim of this article is survey enterprise logistic process financial system, which helps to select most suitable logistic process perform ways, what helps to decrease costs in time, area and finance.

In this article were used theoretical and empyrical research methods: scientifical analysis of literature, comparative analysis, questionnaire quiz and expert assessement.

2. The singularities of logistic process financial system

Talking about logistic process financial system, can be separated such elements of it:

- logistic process and it's consumers;
- logistic services providing enterprises;
- business subjects, which buys logistic services;
- other different intermediaries and etc.

Every logistic service (loading, delivery, documentation, custom clearance, warehousing and etc.) requires certain expenditures and in the same time creates added value for product (Fig.1).
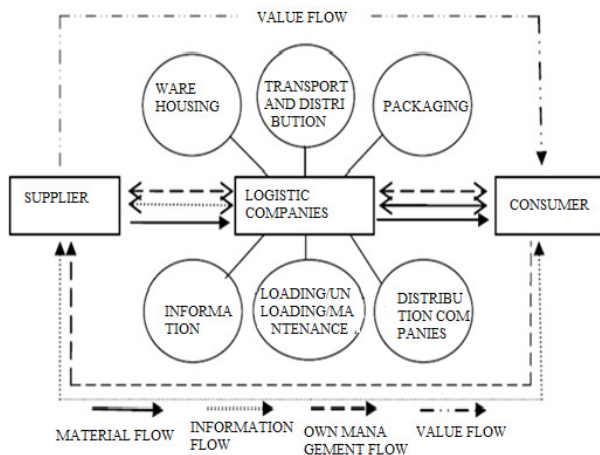

Fig. 1. Flows of values in logistic value chain (Source: Zhou 2013)

Finance, moving in logistic system of enterprise, serves certain logistic processes, creates enterprise logistic process financial system, what has the final result – profit, which is being ensured by bigger revenue or smaller expenditure.

Analyzing logistic process sources of revenue, can be excluded as: direct and indirect, i.e. dividend, got from profit; credits or loans got from banks; revenues got from enterprise provided services; clusters provided possibilities; the contributions of shareholders; the contributions of owners; foreign investments; exemption of duties; depreciation of assets; derivatives (swap, future, forward and option – intended for operations with financial assets, for example, for managing exchange rate, for managing prices of raw materials and etc.); insurance disbursement; European Union maintenance and subsidies (for improving infrastructure).

2.1. The ways of ensuring stability of financial system

From scientific literature analysis (Bagchi, Virum 2000; Niemann 2001; Urbonas 2005; Christopher 2007; Bielli, Mecoli 2007; Sujeta, Navickas 2010; Allen *et al.* 2011; Tuglular *et al.* 2012; Lew 2012; Juan, Hyuying 2013; Zhou 2013), can be excluded three ways, which helps to ensure stability of financial system:

- The first one – *ensuring permanent revenue got from logistic processes*.

Scientists Bagchi and Virum (2000) states that it is possible to reach making high quality cargo deliveries or in such ways deliveries day before; providing appropriate and needed documentation; offering extra logistic services ar full complex of them; ensuring cargo deliveries without any mistakes – losses or damages. Establishing such demand increasment ways, for enterprise ensures stable increasing revenues.

Regarding to Christopher (2007) and Urbonas (2005) is stated, that main attention must be concetrated to capital, whom one of sources is enterprise shareholders. They indirectly determine connections between elements of the system. Right financial, human resources, infrastructure, informational and material flow sources usability ensures synergetic effect, determining the efficiency of logistic system.

Regarding Sujeta and Navickas (2010) economical supply chain managing solutions must be accepted regarding to resources and rational usability of them. Nowadays enterprises develops their logistic systems using intermediaries help, working and collaborating with other companies and moreover creating unions of companies, clusters (interdependet logistic enterprises, suppliers, science institutions, is institutions or other groups of players, which collaborating inside, aimed to increase economical activity efficiency, sharing knowledge and creating new products) or joining together, what allows globalizational relations. It is being stated, that in such industry branches, if enterprise wants to ensure effective logistic process financial system are being essential clusters (at this moment in Republic of Lithuania logistic field exist two ranges of clusters – industry and technology – which becomes more and more popular).

Allen *et al.* (2011) points, that next to logistic processes financing sources exist and can be added investments and loans or debts possibilities, however is being noticed, that these operations requires actual level of risk assessement.

Zhou (2013) minded, that a lot of depends from strategical place, optimization of network (the process of creating competition, which creates

synergetic effect); extra spectrum of services and made tasks quality. He states, that for support competitive position, it is worth to cooperate and assess synergy between different processes of joining and subjugating to system activity, to prevail possibility to increase each process and at the same time all system value.

- The second one – *ensuring of the support and financing.*

It is being noticed, that politics of country strongly impacts national plans, standarts and requirements, intended for infrastructure. These requirements reverberate in enterprise logistic process and financial system expenditure, for example, existing worse quality infrastructure, such roads, more frequently are being fixed vehicles, because of what is increasing transport expenditure and decreasing added value, because if it will increase, will decrease revenues, what is related to big competition in market. Like one of extra logistic process financing sources abstracted PFI and other projects. Majority of transport projects distinguishes business and political risks, what can be decreased by guarantee of government. Such guarantee reduces private sector losses and expenditure.

Bielli and Mecoli (2007) noticed that regarding to the market and business, companies works by law of demand/supply in the market. Global system is being joined with wide world network of services and enterprises. Supply chain is complex of organization network with different its different aims, what are being controlled by main partner or in supply chain, where exist agents/intermediaries, responding for fast, safe and reliable raw materials/commodities or other products delivery. Majority of European projects, for example, CO–DESNET are being financed and intended for logistic process financing or their activity implementation and improvement of infrastructure.

Tuglular *et al.* (2012) stated, that European Union each time more and more supports intermodal deliveries, in such way reducing expenditure, stimulating enterprises to use different transport , for example, sea, air, water and road – scope is increasing all the time. Recently enterprises logistic and logistic enterprises logistic process productivity determines long term contracts.

Juan and Hyuying (2013) big attention pays to small expenditure, law risk level, high efficiency systems joining to enterprises supply chain, developing their activity and saving financial flows. Authors marks three main logistic financing ways: small and medium enterprices (it have more possibilities to practise different financial products, contacts, ensuring revenues and stable payments), finance institutions and 3PL (third part logistics) logistic enterprises – this type of companies works

as intermediaries between first two logistic finance sources. Working as an agent, 3PL enterprises monitors and controls small and medium enterprises logistic activity. 3PL enterprises have two strategies: first strategy – conspiracy (plot) and second one strategy – non-conspiracy. Existing conspiracy strategy, each of parts – 3PL enterprises, small and medium enterprises and financial institutions have its interests. Between small and medium enterprises and 3PL entrprises exist cooperative relationship, while at that moment with financial institutions exist non-cooperational relationship. Each of sides gets part of profit. However, because of imperfetiviness of market mechanism, external factors, macro environment influence can't be reached optimal result.

The third one – *ensuring of reduction of logistic process activity.*

Niemann (2001) states, that this aim can be reached optimizing routs, planning territories and loading functions. It is being noticed, that using IT and ensuring warrants of big range projects, enterprise warrants efficient activity of enterprice logistic process financial system.

It is determined by (OECD ... 2002), that for enterprises, if they re-form logistic systems or supply chains, i.e. concentrating production and stores amounts in few palces, saves more money, because of decreasing transport expenditure, operational expenditure and other expenditure.

(Korea ... 2007) noticed that other ways to reduce expenditure is keeping cargo/production in area of port warehouses or logistic centre. Cargo warehousing in such place, especially next to the sea, what is strategically perfect place, because of existing suitable infrastructure, less documentation formalities and as fastly is being processed cargoes. Moreover, supply chain is being influenced by growing up world suppliers scope, increasing demand, increasing range of suppliers, transport and vehicles, enterprises, manufacturers, carriers and other intermediaries – whats complicates integration and communication, unless amalgamation and merger processes extends infrastructure of enterprise, while transferring operations abroad have and negative and positive impacts (cheap workforce, but different law system, differencies in language, packaging specifications, fuel price and other differencies) – all these factors changes supply chain and in the same time determines enterpirse logistic process financial system.

Lew (2012) states, that enterprise reach efficiency automativating transaction process and data systems, what is associated with cupply chain and logistic process. Managing supply chain – it is marked enterprises expenditure reducing and revenue earning source. Majority of enterprises, ap-

propriate supply chain management helps to reduce expenditure about 10–40%.

Lew (2012) points, that evaluation of expenditure is important and especially important for logistic process financial systems. Applicable amnagement of expenditure increases the value of enterprise and demand of enterprise services – what determines logistic process financial system effectiviness.

2.2. Expenditure of logistic process

Analyzing logistic process expenditure can be pointed such expenditures: expenses, intended to warrant activity; risk management expenses; losses; debts and interests; Force majore.

Analyzed logistic process financial system per enterprise aims structure, can be seen from where founds all the expenses and revenues – cash flows movements, what designes financial system. Reducing logistic process expenses, which institutes the biggest part of total costs of enterprise, are being improving enterprise financial indicators, because of what logistic process financial systems works more efficiently (Fig. 2).
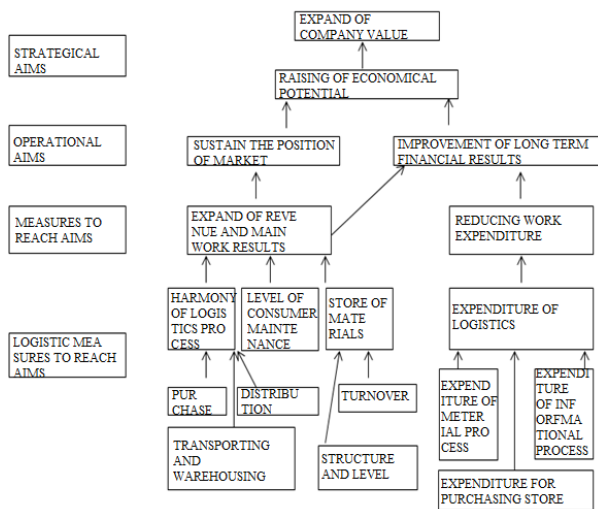

Fig. 2. Enterprise logistic process financial system (Source: Created by authors)

Each of noticed process must be monitored, managed and controlled everytime. Šalčius (2009) excluded effective activity control system warranting features – appointed gauges of legitimacy (existing parameters creates activity of motivation system), simplicity, flexibility, economy, promptitude (if exist aberration, executive is being informed, because of what on time can be made good decision), precision, usability of stages, balance of information and data, plenty of gauge and strategical singleness (system is used for monitoring of important aspects).

Ping (2013) stated that financial systems help to plan and implement activity of enterprise, allocate resourse and compete with other organizations. There are segreg important of financial system:

a) Financial system efficiency helps for organization to increase cash flows;

b) Assessement of revenue and expenditure per financial system benefits to create extra sources of revenue;

c) Financial system efficiency of organization monitors government instituttions;

d) Financial system effectiviness is important for investors, shareholders and owners of enterprise;

e) Suitable financial system management creates loan and other financing soruces usability possibilities.

To warrant relevant financial system management contributes regular information data base filling, financial planning (evaluating past data statistics), financial activity monitoring and management, forming of budget, internal control (control of financial sources).

Regarding analysed scientific literature, stated, that applicable logistic system management determines efficient enterprise logistic process financial system work.

3. Research of supply chain financial system

In practical part of this article – is being analysed in the end of 2013 year made questionnaire quiz and expert assessement.

3.1. The results and methodology of logistic enterprises research

To find out the problematic areas of supply chain financial system was made questionnaire quiz only in logistic service providing enterprises.

Was chosen this sector, because in transport and warehousing scope each year works more people – 2010 year (74525 person), 2011 year (80584 person), 2012 year (86694 person) – from whom executives, responsible for transport and warehousing are 4000 person, because of that improving Raosoft part of population counting method was setted level of significance 5%, reliability – 95% and answer repartitions 96%, part of population size – 59 respondents.

In questionnaire quiz participated only logistic services providing enterprises, because it have a lot of experience in management logistic process and best know companies mistakes made in such activity and moreover ways to manage some logistic process problems, which reflects in logistic process financial system.

The results of this questionnaire quiz fistly shows which of logistic areas is mostly developed, secondly – in which of logistic areas exist lowest prices, thirdly – which of logistic areas characterizes flexibility and efficiency, and most important, with what problems has impact logistic enterprises and companies, for which their logistic system makes a big influence. To these problematic areas for each of enterprise must concentrate more attention, with aim to establish more efficient, flexible and profitable logistic supply chain financial system.

In this questionnaire quiz was wondered to respondets work and personal characteristics, but the most important consideration was intended to logistic process and problems, which influants logistic supply chain financial system.

From research leakaged, that generally in this area works more men (70%), age of repsondents was till 30 years (90%) from 31 till 61 year (10%), with higher education (75%), in logistic area works 1–5 year (85%), from 6 to 10 year (10%), but more than 5% of respondent's works in this area from 11 to 15 years.

Regarding to work position, respondents can be divided in such way: warehousing and transport department executives, managers, route coordinators, logistic process and sell departments executives.

Regarding to functional logistic area, respondets spread like that: in supply logistic works 45% respondents, 10% respondents works in manufactury logistic and 45% respondents works in distribution logistic.

Respondents basicly work with road transport (65%) and water transport (25%) and only 10% respondent's works in air transport area.

As main logistic process problems reasons were mentioned human factor (21.3%), financial enterpsie potential (18.7%), time terms (14.7%), lack of human experience (10.7%), singularities of documentation (10.7%) and breakdown and damages of transport and vehicles (6.7%) (Fig. 3).

Enterprises, which want to create efficient logistic process financial system, face with a biggest problem – huge competition, because of what is difficult to enter the market (60%), but respondents mentions, that in market still exist areas and not used possibilities (35%).

Respondents stated, that for creation appropriate logistic process financial system, attention must be payed for clients, consumers, exclusive serviss (logistic process speed, decision making speed), price in market, financial resources and new niche, where can be pssobilities to offer new services and its quality.

Eligible logistic process financial system activity determines reasonable partners, existing and potential clients, human and financial resources, appropriate solutions of different problems and inventory.
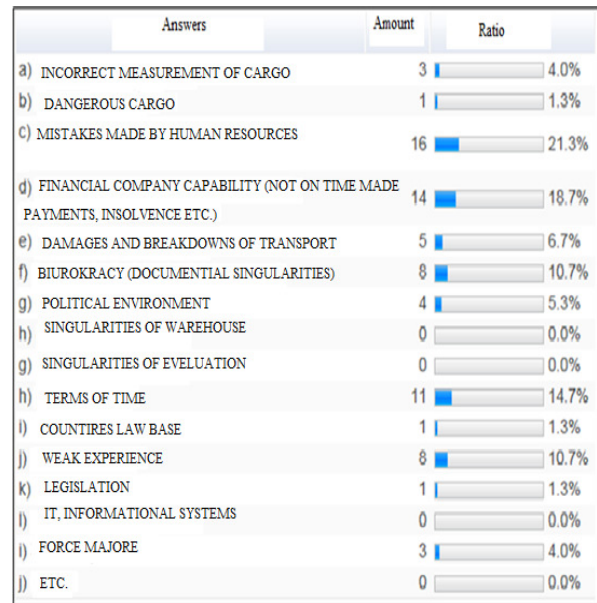

Fig. 3. Biggest problems in logistic process reasons (Source: Created by authors)

3.2. The resuls regarding to financial expenses in logistic process financial system by expert assessement

The second one analysis, intended to logistic supply chain financial system research is expert assessement. Analysis main aim – to state problematic factor, which regarding in logistic area working specialists, creates the biggest expenses for enterprises, and because of that their supply chain financial system efficiency is decreasing in quite amount. Performing expert assessement was refered by eight in logistic area working professional's experts from companies *Ace Logistics, DSV Transport, Evergreen, GreenCarrier, Parnasas, Transocean Lietuva, Yang Ming and etc.* opinion.

Experts get questionnaires, where from 1 to 10 points must be evaluated logistic processes, in which icures the biggest expenses.

Segregated such logistic process – transport and deliveries, warehousing, documentation, packaging, information flow management, custom procedures, booking and orders, equipment running – factors, what determines logistic process financial system efficiency.

Serving this reaserch was appealed to assumption, that solution can be get only if exist experts opinion compatibility. Because by serving experts assessement participated more than two experts, to check their opinion comapatibility was used ratio of concordance.

Average sum of ranks a is being counted by formula (1):

$$a = 0,5 * m * (k+1),\qquad (1)$$

where:
a – average sum of ranks;
m – experts number;
k – amount of proposition.

Because in experts assessments where conterminous ranks, maximum possible deviation from rank average quadrat sum is being counted by formula (2)

$$S^2_{\max;conterm} = \frac{m^2 * (k^3 - k) - m * \sum_{l=1}^{r} T_l}{12},\quad (2)$$

where:
$S^2_{\max;conterm}$ – maximum possible deviation from rank average quadrat sum;
r – line, which have conterminous ranks, quantity;
T_{l_1} – conterminous rank in l rank line quantity (Table 1).

Table 1. Countings of conterminous rank in l rank line (Source: Created by authors)

Tl	=	84
1 line	9 and 10	12
2 line	7 and 8	12
3 line	2	6
4 line	2 and 6	12
5 line	7	6
6 line	2 and 3	12
7 eline	8 and 10	12
8 line	2 and 4	12

T_{l_1} is being counted by formula (3):

$$T_{l_1} = \sum_{q=1}^{u} \left(t_q^3 - t_q \right),\qquad (3)$$

where:
t – number q type of homogeneous rank groups in l rank line;
u – related rank type number in line.

Ratio of concordance is being counted by formula (4):

$$W = \frac{12 * S^2}{m^2 * \left(k^3 - k \right) - m * \sum_{l=1}^{r} T_l},\qquad (4)$$

where:
W – ratio of concordance (Table 2).

Table 2. Expert assessments countings meanings (Source: Created by authors)

Average sum of ranks $a = 0,5m(k+1) =$	36
Sum $S^2 =$	1951
S^2 max =	2632
Ratio of concordance W =	0.741

Examining expert's opinion compatibility, where created two hypotheses:
H0: assessments of experts where different (ratio of concordance equal for 0);
Ha: assessments of expert's similar (ratio of concordance unequal for 0).

Counting experts opinion compatibility, was assessed the level of significance α. H0 hypothesis is being declined, because counted meaning of W is less than critical W_α meaning.

Furhermore is beings assessed the competence of experts, because counted ratio of concordance doesn't answer to questions: or exist experts, whose opinion differ from all and which axperts are these.

The competence ratio of experts is being counted by alternative assessement results, what refers by idea that experts opinion must fit with all group opinion. To reach this aim from the group or experts are being removed experts, which opinion deffers from majority. The ratio of competence is assessed in two ways: firstly $t = 0$, giving the equal values for ratios of competence (5 formula):

$$K_i^0 = \frac{1}{m},\qquad (5)$$

where
K – experts competence ratio.

In first stage $t = 0$ for all experts is being gived equal ratio of competence $K_i^0 = 0.125$.

On second stage $t = 1$ were found out sectional values. In other stages $t = 1, 2 \dots$ ratios of competence are being corrected by formula (6 formula and Table 3):

$$x_j^t = \sum_{i=1}^{m} K_i^{t-1} * X_{ij}.\qquad (6)$$

Table 3. Selectional alternative value (Source: Created by authors)

x1	x2	x3	x4	x5	x6	x7	x8
7.6	5.5	7.1	4.375	7.0	7.0	4.3	5.0

Selectional alternative values are being got each of eight alternatives multiplied from it assessed expert ratio of competence. In further stage each of alternatives (column) is being multiplied from selectional value and computed the sum of elements (Table 4 and 7 formula):

$$\lambda^t = \sum_{j=1}^{n} * \sum_{i=1}^{m} * X_j^t * X_{ij}.\qquad (7)$$

At the last satge all values are being multiplied from primary matrix line and are being plused. A got sum are divided from before got

Table 4. Sum of elements (Source: Created by authors)

								Suma	K^t
61	38,5	71,3	39,4	70,0	63,0	21,3	30,0	394,4	0,17
76,25	44	49,9	17,5	63,0	56,0	12,8	35,0	354,4	0,15
22,875	11	71,3	8,8	49,0	56,0	25,5	20,0	264,4	0,11
61	33	49,9	8,8	42,0	35,0	8,5	15,0	253,1	0,11
68,625	38,5	49,9	30,6	56,0	49,0	29,8	35,0	357,4	0,15
45,75	27,5	14,3	8,8	14,0	14,0	8,5	15,0	147,8	0,06
61	22	64,125	30,625	70	70	25,5	40	383,3	0,16
68,63	27,50	28,50	8,75	28,00	49,00	12,75	10,00	233,1	0,10
								2387,8	1,00

sums of elements and in such way is being found out new value of ratio of competence (8 formula):

$$K_i^t = \frac{1}{\lambda^t} * \sum_{j=1}^{n} X_j^t * X_{ij} \,. \qquad (8)$$

It is noticed, that the sum of ratio of competence always is equal to 1 and is being counted by formula (9 formula):

$$\sum_{i=1}^{m} K_i^t = 1 \,. \qquad (9)$$

For derivation of expert's opinion compatibility acceptance is being choosen the level of significance $\alpha = 0.05$.

Zero hypothesis is being declined, once W meaning is bigger than W_α. Because quantity of alternatives $k > 7$, for significancy of ratio of concordancy check is being used criterion X^2. This criterion is being counted by formula (10 formula):

$$\chi^2 = W * M * (k - 1) \,. \qquad (10)$$

Here is being proved the compatibility of expert's opinion regarding assessment question and is being made inference, that hypothesis H0 is beind declined, and is predicated, that expert's similary think about logistic process financial system efficiency factors (Table 5).

Table 5. The provement of hypothesys (Sources: Created by authors)

$\chi =$	41.51						
χ crit. $=$	14.07	41.51 >14.07, so H0 declined					

Accomplished expert assessement, assessing factors, which determine logistics process financial system efficiency.

Evaluated eight experts opinions, assessing, which of gicen logistic process – transport and deliveries, warehousing, documentation, packagging, information flow management, booking and ordering, running of equipment – mostly determinate logistic process financial system efficiency, estimated, that biggest influence for logistic process financial system efficiency has transport, warehousing, documentation, information flows management and customs procedures – what shows compatibility of experts opinion, regarding these logistic process, which requires biggest expenses.

4. Conclusions

Logistic process financial system is constituted by such elements – logistic process and their consumers, logistic service providing enterprises, business subjects, which buy logistic services and different intermediaries and etc.

Each of logistic service – loading, transport and delivery, documentation, custom clearance, warehousing and etc. requires certain expenses, and in the same time creates added value. Is being pointed, that finances, moving in enterprise logistic system, making such logistic processes, creates enterprise logistic process financial system, which has a result – economical benefit, got in two ways – profit is being ensured by bigger revenues or less expenses.

Logistic process sources of revenue, can be excluded as: direct and indirect, i.e. dividend, got from profit; credits or loans got from banks; revenues got from enterprise provided services; clusters provided possibilities; the contributions of shareholders; the contributions of owners; foreign investments; exemption of duties; depreciation of assets; derivatives (swap, future, forward and option); insurance disbursement; European Union maintenance and subsidies (for improving infrastructure).

In practice exist three ways to ensure financial system efficiency – permanent revenue got from logistic processes, of the support and financing, of reduction of logistic process activity.

Logistic process expenditure can be pointed such expenditures: expenses, intended to warrant activity; risk management expenses; losses; debts and interests; Force majeure.

The accomplished research shows that appropriate logistic process financial system activity determines suitable partners, existing and potential clients, human and financial resources, convenient different problems slutions and existing inventory. Moreover, assessing, which of these logistic processes – transport and delivery, warehousing, documentation, packaging, management of information flows, custom clearance procedure, bookings and orders, running equipment mostly determines logistic process financial system – is estimated transport and delivery, warehousing, documentation, management of information flows and custom clearance procedure.

Appropriate such logistic process financial system activity planning, organizing, control, management of transport, and delivery, warehousing, documentation, management of information flows and custom clearance procedures expenditure and monitoring of it creates certain additional financial flows, which generates added values in each logistic process financial system logistic process.

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