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APPLICATION OF FUNCTION COST ANALYSIS AND NETWORK SCHEDULING IN LOGISTICS COST MANAGEMENT

Iryna Popovychenko, Kira Spiridonova "Application of function cost analysis and network scheduling in logistics cost management". *Dynamic nature of logistic costs as well as dynamic and complicated modern economic environment urges scientists to seek new and improve existing forms and approaches to identification, accounting and management of companies' logistic costs and supply chains. Adaptation of logistic cost management to modern challenges is important. Business competitiveness nowadays depends on fast and exact reaction of business management on unpredictable, changing and risky micro- and macro environment. Clear and available technologies of influence on profitability of economic activity due to rational decreasing and optimization of expenses become more and more demanded on Ukrainian and world markets. Rational planning and minimization of logistic costs of operational activity of production and commercial companies is great potential reserve and powerful tool on the competitive space if used by experienced specialists.*

In the article it is proposed to combine powerful methods - function cost analysis and network planning on the basis of process, project and logistics management using simplified example. As a result, the client's demands concerning shortening terms of the order with optimal cost and quality of service for both or more sides are fulfilled. At the meantime the riskiest sites of supply chain are determined that allows to predict and avoid possible problems.

The material needs further specification, economic and mathematical modelling, and professional discussion by specialists in management of supply chains, operational managers, IT-specialists, as supply chains are complicated open and flexible systems.

Keywords*:* logistics costs, operational activity, supply chains, function cost analysis, network planning, time factor.

Ірина Поповиченко, Кіра Спірідонова «Застосування логіки функціонально-вартісного аналізу та календарно-сітьового планування в управлінні логістичними витратами». *Динамічність природи логістичних витрат у поєднанні із динамічністю та складністю сучасного економічного середовища спонукає науковців та фахівців-практиків до пошуку нових та вдосконалення існуючих форм та підходів до ідентифікації, обліку й управління логістичними витратами підприємств та ланцюгів постачань. Важливою є адаптація процесів управління логістичними витратами до викликів сьогодення. Конкурентоспроможність бізнесу сьогодні залежить від швидкості та точності реакції менеджменту підприємств та організацій на непередбаченість, мінливість, ризики макро та мікро середовища. Прозорі та доступні технології впливу на прибутковість господарської діяльності через раціональне зменшення та оптимізацію витрат стають сьогодні все більш затребуваними на українському та світових ринках. Раціональне планування та розумна мінімізація логістичних витрат, що супроводжують операційну діяльність виробничих та комерційних підприємств, є великим резервом, наразі більшою мірою потенційним, та потужним знаряддям на конкурентному просторі у руках досвідчених професіоналів.*

У статті на ідеологічному підґрунті процесного, проєктного та логістичного менеджменту на спрощеному практичному прикладі пропонується поєднання потужних методів – функціонально-вартісного аналізу та календарно-сітьового планування, в результаті чого виконуються вимоги клієнта щодо скорочення термінів виконання замовлення при оптимальній для обох чи більше сторін вартості та якості послуги. При цьому проявляються найбільш ризиковані ділянки ланцюга постачання, що дозволяє передбачити можливі проблеми та запобігти ним.

Представлені розробки, безумовно, потребують подальшої деталізації, економіко-математичного моделювання та фахового обговорення у колі фахівців з управління ланцюгами постачання, операційних менеджерів, IT-спеціалістів, оскільки ланцюги постачань – це надскладні відкриті та гнучкі системи.

Ключові слова: логістичні витрати, операційна діяльність, ланцюги постачань, функціонально-вартісний аналіз, календарно-сітьове планування, фактор часу.

Ирина Поповиченко, Кира Спиридонова «Применение логики функционально-стоимостного анализа и календарно-сетевого планирования в управлении логистическими затратами». *Динамичность природы логистических затрат в сочетании с динамичностью и сложностью современной экономической среды побуждает ученых и специалистов-практиков к поиску новых и совершенствование существующих форм и подходов к идентификации, учета и управления логистическими затратами предприятий в цепях поставок. Важна адаптация процессов управления логистическими затратами к вызовам современности. Конкурентоспособность бизнеса сегодня зависит от скорости и точности реакции менеджмента предприятий и организаций на непредсказуемость, изменчивость, риски макро и микросреды. Прозрачные и доступные технологии влияния на прибыльность хозяйственной деятельности за рациональное уменьшение и оптимизацию расходов становятся сегодня все более востребованными на украинском и мировых рынках. Рациональное планирование и умная минимизация логистических издержек, сопровождающих операционную деятельность производственных и коммерческих предприятий, является большим резервом, пока в большей степени потенциальным, и мощным орудием в конкурентном пространстве в руках опытных профессионалов.*

В статье на идеологической основе процессного, проектных и логистического менеджмента на упрощенном практическом примере предлагается сочетание мощных методов - функционально-стоимостного анализа и календарно-сетевого планирования, в результате чего выполняются требования клиента по сокращению сроков выполнения заказа при оптимальной для обеих или более сторон стоимости и качества услуги. При этом проявляются наиболее рискованные участки цепи снабжения, позволяет предвидеть возможные проблемы и предотвратить их.

Представленные разработки, безусловно, нуждаются в дальнейшей детализации, экономико-математического моделирования и профессионального обсуждения в кругу специалистов по

управлению цепочками поставок, операционных менеджеров, IT-специалистов, поскольку цепи поставок - это сложнейшие открытые и гибкие системы.

Ключевые слова: логистические расходы, операционная деятельность, цепь поставок, функционально-стоимостной анализ, календарно-сетевое планирование, фактор времени.

Introduction. The problem of accounting and analysis of the sources of logistic costs formation and management is of great importance nowadays and is examined by variety of scientists and specialists due to some reasons:

- dynamism (flow and not static nature) of logistics costs in logistical system as an object of control is a more complicated substance than an enterprise. So the chain 'supplier-enterprise-consumer' is the logistical system. It is obvious that it makes regional, national and macrologistical systems aiming to be effective and as a result competitive. In its turn business effectiveness is highly dependent on incomes and expenses that are generated with logistical activity providing operational activity of company's / companies'- participants of the supply chain;
- It is difficult to determine logistics and transaction costs centres as they are related to different functional structural departments. Even if the centers of logistic costs are identified and all logistic costs from different centers are aggregated and accumulated, eventually this aggregated value in fact does not often coincide with arithmetical sum of the certain costs in specific departments (centres). It is considerably connected with classical disadvantages of enterprise's functional organization structure, i.e. disadvantages of functional specialization. This happens because some considerable logistic and transactional costs remain unnoticed, not identified and/or standardized in cross-functional relations with suppliers and customers, as it is not possible to determine clearly what functional department is responsible for them (for example, purchasing or transportation department, sales department or finished products warehouse). However, if these expenses are neither noticed nor accounted it doesn't mean that they don't decrease the company's profit. It is difficult to determine who is responsible for these turnover costs in the chain 'purchase-production-sales'. As a result, it is difficult to control, regulate and manage them in time and space.
- Normative documents of state authority and service concerning cost accounting do not include methods of cost identification connected with logistic processes. There are neither clear criteria of cost allocation to some account nor the order of current logistic cost reflection.

Thus, the problem of accounting and management of logistic costs is connected with developing approaches to rational separation of information concerning logistic costs from the company's information flows. This problem, beginning with definition and classification of logistic costs is investigated in works of Sumets O.M. [1,2], Krykavskyy, E.V. .[3], Mirotin L.B., Tashbaev E. [4], Oklander M. A. [5], Reta M.V. [6], Yatsenko G. [7], James R. Stock, Douglas M. Lambert [8] and others. The authors Zavitii O., Didorenko T., Kondratyuk L. [9] investigated logistic costs of production enterprises as objects of accounting and control. Scientific analysis concerning composition and grouping of logistical costs were carried on, specific aspects of logistic costs in enterprise's accounting and control were determined. The authors Minko K.M, Korotuha K.M. presented the general definition: 'Logistic costs management is a process of making logistic decisions based on the data of total costs accounting of material, informational and financial flows management in the whole logistic system in order to achieve decreasing of logistic activity costs' [10]. However, dynamic nature of logistic costs as well as dynamic and complicated modern economic environment

urges scientists and specialists to seek and implement new forms and approaches to logistic costs identification, accounting and management.

The purpose and tasks of the research. In order to improve accounting of logistic operations and costs as well as management of these expenses it is necessary to create an adequate system of management accounting and controlling within a company allowing to receive information for analysis, taking and realization of managerial decisions concerning logistic costs. In our opinion, it is possible to evaluate effective and control logistic costs effectively on the basis of the concept and technology of process management, in particular using functional cost analysis. If one combines process management with project approach and effective logistic management, it will lead to increasing of the company's competitiveness (excluding force majeure).

Therefore, the purpose of this research is analysis of possibilities and feasibility of functional cost analysis usage combining method of network scheduling for optimization of logistic costs in supply chains considering time factor.

Tasks of the research: to show on the simple example the process of organization, tracking and regulation of logistic business-processes that are viewed as a sequence of interconnected operations in time and space with criteria of effectiveness – minimum of total costs on the client's order within the given level of quality and time. Instrument that is proposed in order to fulfil the task is function cost analysis combining with network planning.

The main material and results. Having made analysis of popular cost management methods concerning logistic costs (Absorption costing, Direct costing, Standard costing, Target costing, Kaizen costing) we came to the conclusion that none of the approaches can be considered a universal one for all enterprises as they don't allow to assess logistic costs as a dynamic category with changing value [2,11]. Realizing significance and advantages of these methods, let us try to view the primary elementary level of logistic costs formation and control with the help of combined usage of function cost analysis concept and network panning instrument considering logistic management.

It is known that function cost analysis (FCA) or analysis of function (or operation making the process) cost appeared as a method of production effectiveness increasing based on finding reserves and cost decreasing in technological processes on life cycle stages of a product (pre-production, production, operational and utilization). So function cost analysis is a complex research of objects functions (product, process, structure), aiming at optimization of quality functions and expenses.

In her scientific and practical works Melnikova K.V. reviews function cost analysis as a financial instrument in strategic management of logistic costs that allows to decrease production and service costs and increase level of their quality. Function cost analysis is a way to decrease level of logistic costs as during the analysis separate stages of the process (operation) of customer's orders are carefully examined, possibilities of their standardization and making service process less expensive are considered [12, p. 34-36].

In order to use function cost analysis, it is necessary to describe business processes of the company as a part of its business activity. Having made the correspondence between each function and its cost it is possible to fulfil the following kinds of analysis:

- research of cost distribution with their functions (operations) as well as determination of the most expensive functions (operations) in order to improve them firstly;
- determination of functional directions (operations) that should be fulfilled independently or use service of outsourcers or combine both in a certain proportion;
- cost modelling of business processes determining structure (architecture) of business process with the most optimal cost.

One more important criterion that characterizes function (operation) or business-process, except value, is time of the (function) operation or the whole business-process. For example, if the shipment time in one company is 10-20% more than in the company of their competitor, the company can lose its market share very quickly if their products and services don't have other competitive advantages: price, payment terms, quality, service, after-sales service. As a result, function cost analysis along with time costs study significantly broadens possibilities of the method. In general case during function cost analysis time and value expenses are used simultaneously and they are interconnected in most cases. As a result of function cost analysis optimal structure of the business process with optimal parameters of time and value is developed. Strategic goals of the company determine optimal or desired parameters.

Organization of logistic business processes is considered as sequence of the certain interconnected operations fulfilled in time and space, so function cost analysis for taking logistic decisions should be viewed along with methods of network scheduling used in project management. Criterion of effectiveness is minimum of total expenses for the client's certain order at the given level of quality and abidance by given time frames.

Therefore, we should recollect the main idea of network planning as a method of project management. A project in wide understanding is any task that should be realized in the given term, within determined budget and with expected level of quality. It is obvious that there are three out of six well-known rules of logistics (time, costs, quality) in this definition. These are key characteristics of effective organization of logistic process.

Network planning allows to combine time management, cost management and management of resources while solving any task or project dividing them on elemental components. Its methods have such well-known international names and abbreviations as CPM (Critical path method), CPA (Critical path analysis) or PERT (Program evaluation and review technique. It is possible to:

– determine and present full volume of works – logistic operations as charts;

– determine clear and achievable goals concerning time of works – logistic operations, their cost and necessary resources;

– assess the budget (value) of task (order) fulfilment;

– monitor and control fulfilment of work (logistic operations) and predict the further course of events;

– delegate responsibility among participants of logistic process and/or employees of the company's logistic department effectively;

– redistribute resources, decrease risks and uncertainty based on determination of critical work (logistic operations). In project management critical work means operations without reserve of time for its fulfilment. So it is impossible to change its beginning and end (for example due to technological reasons or other limitations).

Network planning means creating logic diagrams of sequence of project works (operations) fulfilment – network chart and determination of duration of these works (operations) and the project in general with the purpose of further control.

Using network planning helps to answer the following questions [13]:

1. How much time does it take to complete certain operations and the whole project (or the certain order)?

2. What time is it necessary to begin and finish some works and operations?

3. What works-operations are 'critical' and must be fulfilled as scheduled in order to meet deadlines of the project (or the order) in general?

4. What term is it possible to postpone fulfilment of 'non-critical' works in order not to impact the terms of the project (the order)?

Network schedule presents sequence and interconnection of works-operations of the project. In order to develop it one should

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have such information: list of operations, time of operations fulfilment, logical connections among them. Then linking the chart received to the schedule, we have the exact final date of the order / project fulfilment convenient for both sides - customer and contractor, complying with the terms of the price, quality of the service and possible risks. Logical links among works (operations) can be basically of two types:

– consistent when the next work (operation) is fulfilled after the previous one;

– parallel when several works (operations) can be fulfilled simultaneously.

There are also requirements concerning simultaneous beginning and end of several operations that can be caused by technological or other subjective or objective factors.

Below we give an example of network planning usage admitting that there is information about composition and architecture of some business processes and operations. Minimum possible and normal duration and value of these operations fulfilment is also known. In the table 1 there is information about logistic provision of the order fulfilment concerning purchase and delivery of loads from two foreign countries for one customer in Kyiv. It is necessary:

a) to make Work Breakdown Structure (WBS) and network schedule of the order determining critical operations;

b) to analyze opportunities of speeding of the order fulfilment for two days with minimum expenses using additional information from table 2.

Work (operation) can be determined as an action necessary for realization of a project (order). In network schedules works and operations have their number or code as to Work Breakdown Structure. WBS is the sequent breakdown of a project (task) to subprojects (subtasks), work packages of different level, exact operations.

Table 1.

Logistic support of the order – purchase and delivery of loads 'X' and 'Y' for the customer 'Z' from Ankara (Turkey), Berlin (Germany) to Kyiv (Ukraine)

Operation code	Operation	Previous operation	Duration (days)
A	Making an agreement on the load delivery 'X' from Turkey.	—	3
B	Transportation of load 'X' from Ankara to Kyiv by two means of transport with customs clearance in Odesa port	*A*	7
C	Making an agreement on the load delivery 'Y' from Germany.	—	3
D	Transportation of load 'Y' from Berlin to Kyiv by one means of transport with customs clearance in Rava-Ruska	*C*	6
E	Placement of loads 'X' and 'Y' on cross-docking storage in distribution center in Kyiv.	*B, D*	2

Table 2.

Characteristic of logistic operations terms and expenses on their fulfilment under scenarios of normal and minimum possible duration of such operations

Operation code	Duration of the operation, days		Costs, *(y.o.)*		Maximum shortening of duration, *days (2)-(3)*	*Unit expenses on reduction of operation duration, conventional units/day [(5)-(4)] /(6)*
	normal	minimum	Normal duration	Shortened duration		
1	*2*	*3*	*4*	*5*	*6*	*7*
A	3	2	400	700	1	300
B	7	4	1000	1600	3	200
C	3	1	400	1000	2	300
D	6	4	1000	1800	2	400
E	2	1	600	1100	1	500
Total			3400	6200	—	

Solution

A) Let us present WBS-structure of this order (№1) on Figure 1.

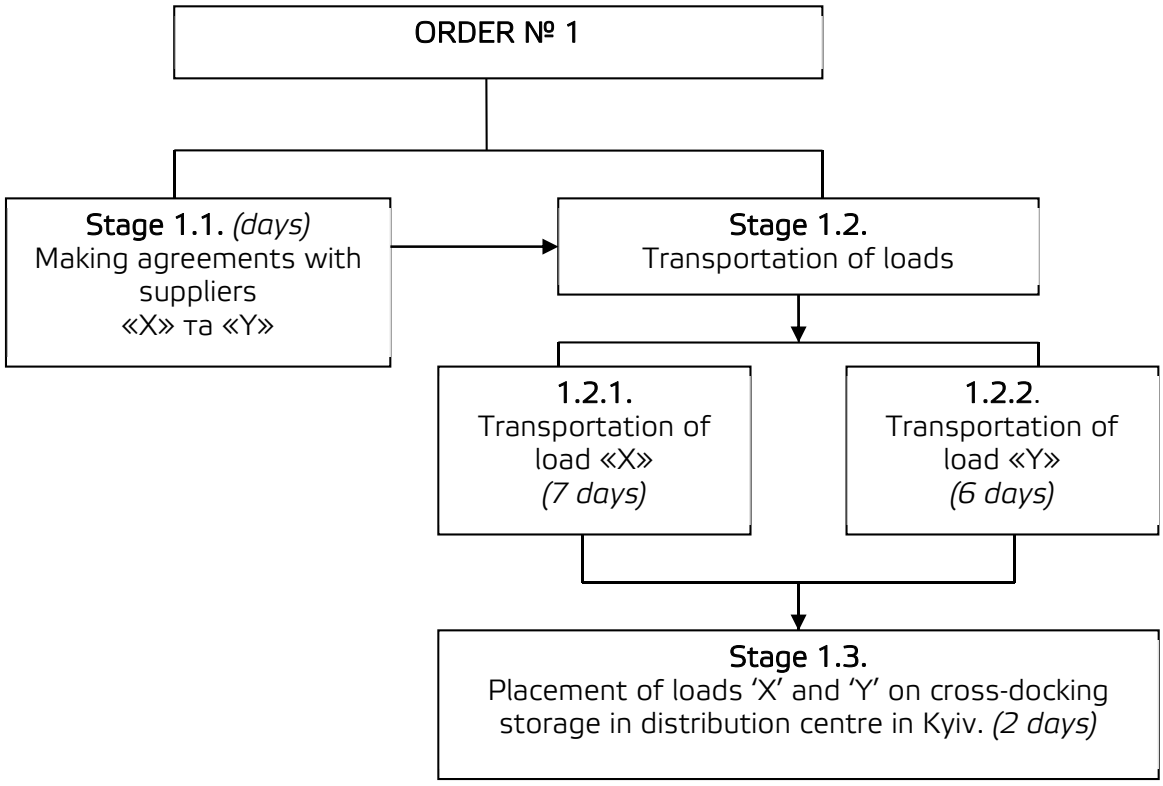

Figure 1 - WBS-structure of the order – purchase and delivery of loads 'X' and 'Y' from Turkey (Ankarra) and Germany (Berlin) to Kyiv

B) Let us make network schedule of this order using sector method (figure 2).

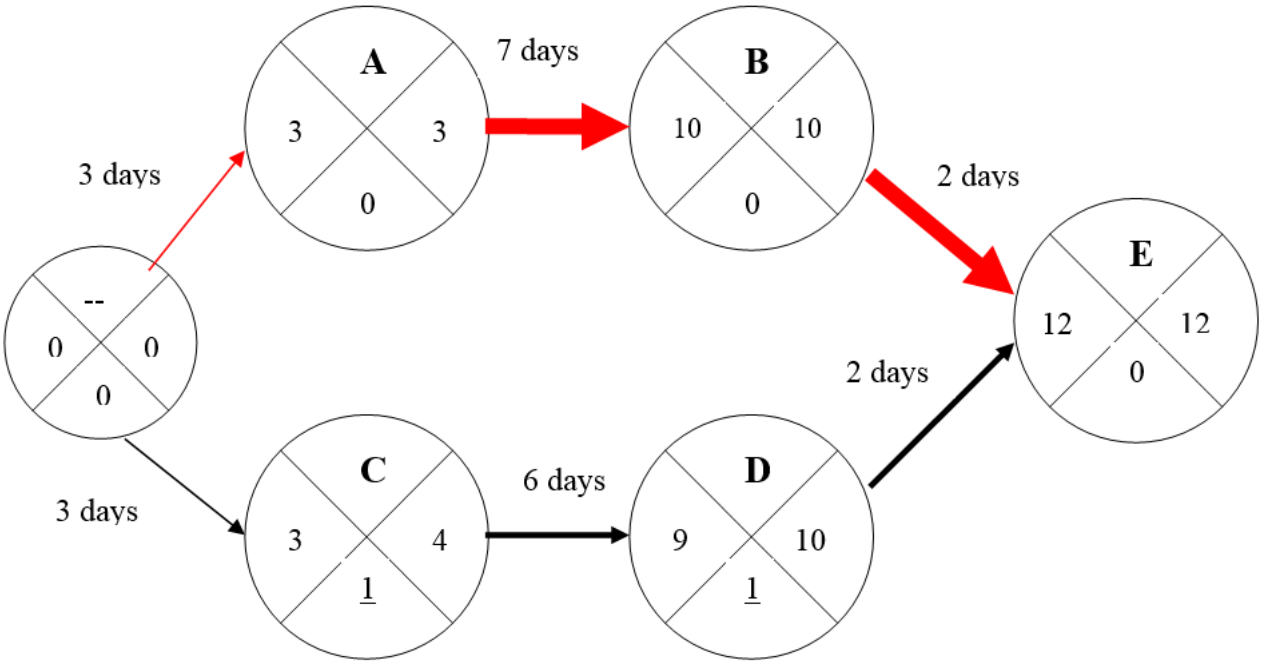

Figure 2 – Network schedule of order №1

Explanations to figure 2 (on the example of operation D) is presented on figure 3.

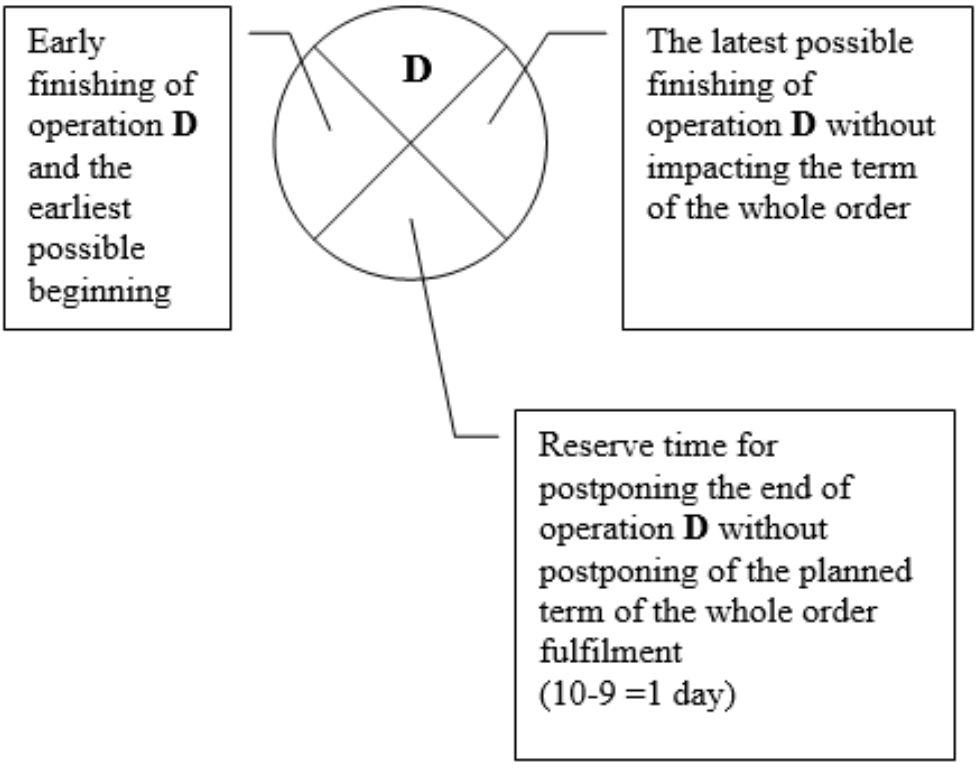

Figure 3 - Explanations to picture 2 (on the example of operation D)

As a result of estimation of network parameters of the order fulfilment with sector method there are three critical operations (critical paths) A, B, E. These operations have no time reserve and we cannot change the terms of their beginning and the end without impacting the term of finishing the task in general. (We see the same value in the right and left sectors of these operations and zero-time reserve written at the bottom sector of these operations).

However, there is a question – what to do if our client is not satisfied with the term of the order fulfilment of 12 days and he wants to receive his load not later than in 10 days?

In this case there is a necessity of shortening the term of some operations to provide the planned term of the order fulfilment. This procedure is also called optimization of the network schedule.

Manager-logistician in general can use such methods of shortening operations duration:

1) redistribution of resources from non-critical to critical operations (in order to shorten the term of their fulfilment) within extra time;

2) changing logistic links among operations where possible – parallel instead of consistent ones;

3) new estimation of operations duration with critical path (as more information becomes available);

4) changing operation mode (six or seven-day work week instead of five-day one). However, it is necessary to consider decrease of labour productivity and increase of labour costs;

5) if inner resources are overloaded, one should use subcontractors, outsourcers or temporary workers;

6) changing means of transportation if using a certain kind of transport causes delay: planes instead of ships or trains;

7) technical changes that decrease duration of the work fulfilment and simplify its content (other routes, way of doing);

8) improvement of working conditions, motivation, material stimulation – bonus for shortening of operations duration (if possible);

9) increasing of qualification level that increases effectiveness of the work performed;

10) if the main criteria are time and expenses, decreasing of volume and/or labour intensity of operations, for example due to effective automation and mechanization of certain logistic operations.

The most appropriate ways for solving this task are numbers 1, 5-7, 9,10 from the general list of possible ways given above. Usually all these ways demand increasing of recourses (using additional workers or overtime) leading to increasing of expenses. That is why a manager-logistician should every time seek for the compromise between shortening of time of operation fulfilment and economy of additional expenses on completing the order in the shortest terms. He should also consider 'behaviour' of different expenses: direct variable costs that make up to 80% of all costs on the order increase when duration of operation shortens (on should use more workers, equipment, etc.). Fixed overhead costs (rent, depreciation changes, etc.) decrease.

As it is shown on picture 4, it is possible to find such a duration of the order that allows to minimize total costs necessary to complete planned operations. However, if time is the priority and the main task is to shorten duration of the initial network schedule, there is a necessity to shorten duration at the expense of increasing costs.

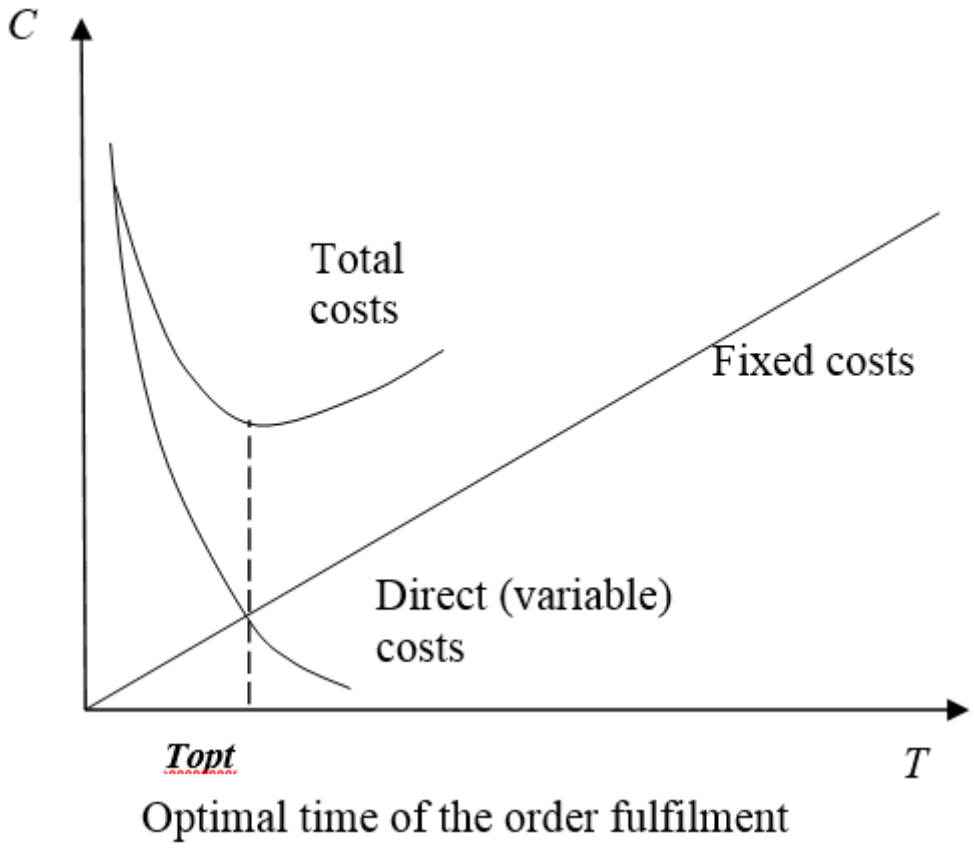

Figure 4 Graphs of total costs of the order

In our example the client insists on the order to be completed during 10 days. This can be provided with shortening of duration of some operations. So it is necessary to determine what operations (works) should be shortened and to what extent. As a result, one needs information about the possible duration of each operation and additional costs necessary for this Manager-logician must determine:

1) estimated costs of operations during their normal or expected fulfilment;

2) duration of operations provided that they are decreased at the expense of additional recourses (minimum possible duration of operation);

3) estimated costs of operations at the expense of maximum shortening of their time.

Let us turn to table 2 (columns 2-5) with the necessary information for further calculations and necessary calculations in columns 6, 7.

In order to make further steps towards shortening of work duration for our order let us make an assumption about proportion: any additional share of shortening the time of operation fulfilment demands the same share of additional costs.

For example, in order to shorten operation B for 1.5 days (not 3 days), additional costs will be 200 conventional units x 1,5 = 300 conventional units.

Information about cost per unit on shortening of works (column 7 table 2) leads to the question: duration of what works should be shortened? It is obvious that the specialist taking the decision has the alternatives of shortening duration of certain operations:

1) he can shorten duration of non-critical operations that will lead to increasing of costs, however will have no influence on the duration of the whole order;

2) shortening of terms of critical operations fulfilment that will influence on the decreasing of the order duration in

general and lead to increasing of costs up to limited level, because new critical paths can occur;

3) shortening of all works within old and new critical paths to achieve new desirable duration of the order fulfilment.

It is clear that one should calculate a lot of variants using special computer programs or mathematical programming, especially when there are plenty of operations and well-developed supply chain. However, in any case such a principal algorithm of shortening duration of the operation remains valid:

1. To determine critical path.
2. To determine operations to be shortened within the critical path.
3. To determine the priority of shortening terms of operations fulfilment:

a) operations with the lowest costs per day (time unit);

b) operations with the easiest possible way to shorten duration;

c) operations with the most effective influence on the term of the order fulfilment.

4. to shorten operations duration on one day and observe whether the new critical path will occur.

Concerning the given example shortening duration of the order demand first of all shortening duration of operation B as it is a critical one with the lowest unit expenses on the shortening (table 2). However, as to point 4 of the algorithm given above, shortening of operation B on one day creates a new critical path with operations C and D within. Continuing these actions, it turns out that the final and the most economic variant of shortening duration of the order up to 10 days will be shortening duration of operation B on two days with additional expenses of 400 conventional units and operations C or A on one day with additional expenses of 300 conventional units.

Thus, the new duration of the order fulfilment during 10 day will cost the company additional 700 conventional units.

The method of network planning presented above allows to use the calculation within the calendar and determine the starting and the final date (deadline) of the order fulfilment and consider working time schedule.

Conclusions. It is obvious that companies' and business competitiveness directly depends on successful effective synergistic interconnection of the company with suppliers, contractors, investors, companies of related industries, service and transport structures. Therefore, raising of market competition increases improvement of logistic mechanism of economic activity for Ukrainian enterprises. Main principles of logistics are the basis for complex mechanism of effective logistic management for companies and supply chains. Both scientific and practical result of this article are presented on the simple example suggestions concerning identification, planning, control and regulation of logistic costs caused with operational business processes in chain supply. The advantage of these proposals is considering time factor while determination of logistic costs at the expense of symbiosis of principles of function cost analysis, time management, cost management of works in project management based on logistic concept of economic activity. The material needs further specification, economic and mathematical modelling, digitalization for complex systems particularly supply chains. These are perspectives for further research.

References

1. Sumets O. M. Rekomendatsii shchodo zaprovadzhennia syntetychnoho obliku lohistychnykh vytrat na pidpryiemstvi. Lohystyka: problemы y reshenyia. Kharkiv, 2011. № 4(35). S. 42 – 47.

2. Sumets O. M. Lohistychni vytraty pidpryiemstva: teoretychnyi aspekt: monohrafiia. Kharkiv: Kharkivskyi natsionalnyi tekhnichnyi universytet silskoho hospodarstva im. Petra Vasylenka, Miska drukarnia, 2013. 223 s.

3. Vaselevskyi M, Bilyk I., Deineha O. ta in. Ekonomika lohistychnykh system: monohrafiia / za nauk. red. Ye. Krykavskoho, S. Kubiva. Lviv: Vydavnytstvo Natsionalnoho universytetu «Lvivska politekhnika», 2012. 596 s.

4. Mirotin L. B., Tashibaєv Je. Logistika dlja predprinimatelja: osnovnye ponjatija, opredelenija, polozhenija i procedury: uch. posobie. M.: INFRA-M, 2002. 252 s.

5. Oklander M. A. Lohistyka: Pidruchnyk. Kyiv: Tsentr uchbovoi literatury, 2008. 346 s.

6. Reta M. V. Lohistychni vytraty: vyznachennia, klasyfikatsiia ta oblik. Biznesinform, 2012. № 8. S. 155-158.

7. Jacenko G. Ne sovsem ochevidnye njuansy porozhdajut bol'shie problemy s tolkovaniem termina «logisticheskie zatraty». Logistika: problemy i reshenija. Harkiv, 2011. № 3. S. 66 – 67.

8. Dzhejms R. Stok, Duglas M. Lambert. Strategicheskoe upravlenie logistikoj. M.: INFRA-M, 2005. 828 s.

9. Zavytii O., Didorenko T., Kondriuk L. Lohistychni vytraty vyrobnychykh pidpryiemstv yak ob'iekty obliku ta kontroliu. Kontrol ta analiz v umovakh hlobalizatsii. Instytut bukhhalterskoho obliku, 2019. Vyp.1-2. S. 49-73

10. Mynko L. M., Korotukha K. M. Metody upravlinnia lohistychnymy vytratamy. Efektyvna ekonomika. 2016. № 1. URL: http://nbuv.gov.ua/UJRN/efek_2016_1_41.pdf. (data zvernennia: 06.08.2020).

11. Tankov K. M. Vyrobnycha lohistyka: navch. posib. dlia stud. vyshch. navch. zakl. Kharkivskyi derzh. ekonomichnyi un-t. Kharkiv: VD "INZhEK", 2004. 352 s.

12. Melnykova K. V. Finansovi potoky v lohistychnykh systemakh: konspekt lektsii. Kharkiv: KhNEU im. S. Kuznetsia, 2015. 104 s.

13. Mazur I. I., Shapiro V. D., Ol'derogge N. G. Upravlenie proektami: Uchebnoe posobie. M.: Omega-L, 2009. 664 s.

14. Ponomarenko V. S., Tankov K. M., Lepeiko T. I. Lohistychnyi menedzhment / za red. V. S. Ponomarenka. Kharkiv: VD «INZhEK», 2015. 440 s.

15. Wang Bo, Bugayko D.A., Grigorak M.Y. Assessment of the national economy through the application of logistics costs. Economic Thought. 2018. № 3. P. 68-82.

Список використаних джерел

1. Сумець О. М. Рекомендації щодо запровадження синтетичного обліку логістичних витрат на підприємстві. Логистика: проблемы и решения. Харків, 2011. № 4(35). С. 42 – 47.

2. Сумець О. М. Логістичні витрати підприємства: теоретичний аспект: монографія. Харків: Харківський національний технічний університет сільського господарства ім. Петра Василенка, Міська друкарня, 2013. 223 с.

3. Васелевський М, Білик І., Дейнега О. та ін. Економіка логістичних систем: монографія / за наук. ред. Є. Крикавського, С. Кубіва. Львів: Видавництво Національного університету «Львівська політехніка», 2012. 596 с.

4. Миротин Л. Б., Ташибаєв Э. Логистика для предпринимателя: основные понятия, определения, положения и процедуры: уч. пособие. М.: ИНФРА-М, 2002. 252 с.

5. Окландер М. А. Логістика: Підручник. Київ: Центр учбової літератури, 2008. 346 с.

6. Рета М. В. Логістичні витрати: визначення, класифікація та облік. Бізнесінформ, 2012. № 8. С. 155-158.

7. Яценко Г. Не совсем очевидные нюансы порождают большие проблемы с толкованием термина «логистические затраты». Логистика: проблемы и решения. Харків, 2011. № 3. С. 66 – 67.

8. Джеймс Р. Сток, Дуглас М. Ламберт. Стратегическое управление логистикой. М.: ИНФРА-М, 2005. 828 с.

9. Завитій О., Дідоренко Т., Кондрюк Л. Логістичні витрати виробничих підприємств як об'єкти обліку та контролю. Контроль та аналіз в умовах глобалізації. Інститут бухгалтерського обліку, 2019. Вип.1-2. С. 49-73

10. Минко Л. М., Коротуха К. М. Методи управління логістичними витратами. Ефективна економіка. 2016. № 1. URL: http://nbuv.gov.ua/UJRN/efek_2016_1_41.pdf. (дата звернення: 06.08.2020).

11. Таньков К. М. Виробнича логістика: навч. посіб. для студ. вищ. навч. закл. Харківський держ. економічний ун-т. Харків: ВД "ІНЖЕК", 2004. 352 с.

12. Мельникова К. В. Фінансові потоки в логістичних системах: конспект лекцій. Харків: ХНЕУ ім. С. Кузнеця, 2015. 104 с.

13. Мазур И. И., Шапиро В. Д., Ольдерогге Н. Г. Управление проектами: Учебное пособие. М.: Омега-Л, 2009. 664 с.

14. Пономаренко В. С., Таньков К. М., Лепейко Т. І. Логістичний менеджмент / за ред. В. С. Пономаренка. Харків: ВД «ІНЖЕК», 2015. 440 с.

15. Wang Bo, Bugayko D.A., Grigorak M.Y. Assessment of the national economy through the application of logistics costs. Economic Thought. 2018. № 3. P. 68-82.