

ASPECTS OF TRANSPORT MANAGEMENT WITH RESPECT TO THE PROBLEMS OF LOGISTICS

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Abstract: In contemporary world, logistics encompasses increasingly wide area of operations compared to its conventional approach. Logistics predominantly concerns the transfer of goods or people. Hence, one of the issues in the field of logistics is transport, with particular focus on transport management. Transport management means a variety of activities aimed at improved quality of transport, enhanced competitiveness of transport services, reduction in costs of services, i.e. improvement in the quality of transport processes. These activities concern both sector of private enterprises and the sector of public transport. Similar mechanisms of transport management are used at both levels, in consideration of their specific nature. Transport management can be divided into the two consecutive stages: a stage of planning (and design) of transport processes and implementation of these processes. The stage of planning means the definition of the area of operation, definition of the routes, profitability of transport of cargo or people with respect to public transport, definition of the plans in the area of cities or regions throughout years. The stage of implementation is characterized in particular by effective use of tools for increasing the quality of transport services. These include the costs of transport processes, their price and using external services i.e. outsourcing.

Keywords: transport, transport management, planning and implementation, transport processes, costs of transport, outsourcing in transport

Logistics and Transport

The concept of logistics has evolved with progressing technological advances. Over five decades have passed since the origins of scientific studies on logistics in the area of management of flow of goods; yet, there is still little agreement as to what the essence of logistics actually is. Logistics is viewed from many aspects which relate to the goals, subject and management instruments.

In the conceptual and functional aspect, logistics can be understood as a particular concept of management of flow of goods and information meaning certain set of functions and instruments of planning, control, organization and verification¹. Another definition views logistics as a concept of management of processes and potential for coordinated implementation of flow of goods in the enterprise and relationships between its market partners. Coordination oriented towards flow of goods consists in particular in coordination of suppliers, enterprises and customers².

¹ P. Blaik, *Logistyka, Koncepcja zintegrowanego zarządzania*, Wyd. Naukowe PWN, Warsaw 2010, p. 18.

² J. Weber, *Logistik-Controlling*, Schafer-Poeschl Verlag, Stuttgart 1993; zob. P. Blaik, *Logistyka, Koncepcja ...*, op. cit.

With respect to the science of management, it is worth noting an interesting (due to its management-related systematic and integrated character) definition of logistics proposed by I. Göpfert, who argued that logistics means a modern concept of management aimed at development, formation, control and performance of effective and efficient flows of objects (goods, information, cash, people) in the systems of creation of value in the enterprises and between each other³. This approach to logistics means that the logistics might concern a variety of domains of the economy, where flow of such objects occurs.

Basic logistics areas include in particular:

- production management
- inventory management
- purchasing and supply
- transport
- warehousing.

An essential area of effect in logistics is transport processes. Therefore, the subject of this study is transport viewed from the aspect of management. Transport, as results from the above, is an area where the science of logistics is applied.

Transport means services which consist in moving people or cargo and directly related auxiliary services⁴. As results from this definition, transport is a broad concept, which encompasses a number of activities which allow cargo or persons to be transferred from the place of dispatch/departure to their destinations. In the area of logistics, the biggest interest is attracted to the transport of goods, which, in a logistic chain, is a link which connects other components in the chain i.e.:

- suppliers of raw materials and materials
- manufacturers of semi-finished products and finished products
- wholesalers and agents
- retailers
- final consumers
- waste collection enterprises.

Transport usually represents the most important, single element in the cost of logistics for most enterprises. Freight movement has been observed to absorb between one third and two thirds of a dollar and about six percent of GDP (Gross Domestic Product) with relation to the economy of the United States. That is why it is so important to have knowledge of the problems connected with transport⁵.

At present state of the development of social and economic relationships, the basis unit of organization of transport operations is enterprises. 'A transport enterprise means any organized form of supply-related side of the market of movement

³ Göpfert I., *Logistik der Zukunft – Logistics for the Future*, Wiesbaden 2006, p.58

⁴ J. Neider, *Transport w handlu międzynarodowym*, Wydawnictwo Uniwersytetu Gdańskiego, Gdańsk 2006, p. 11.

⁵ M. Nowicka-Skowron, M. Smolnik, *Role of Transport Services in International Trade*, [w:] *Total Logistics Management*, Prace Wydziału Zarządzania Politechniki Częstochowskiej, Częstochowa 2002, p. 202.

services, characterized by a particular name and being able to be identified by specific products, termed transport services⁶.

Management of transport enterprises is a multi-layer and multi-aspect economic process which, with the most general understanding, can be defined as the 'system of activities which control operations in a particular organization according to the set goals'⁷. However, transport management encompasses not only the enterprises but also a public area, which has a specific nature and exhibits interesting aspects of management.

With broader approach, transport management encompasses the stage of planning and design of transport solutions and the stage of performance of transport processes.

Planning and Design

The Level of Transport Enterprises

Planning means the use of methods and tools which can support managers in transport and forwarding enterprises so that they can effectively use the resources, effectively perform tasks imposed by the customers and make decisions according to the basic requirements imposed by relevant legal acts. This means in particular:

- design of transport network in terms of space and time
- determination of the regions of services
- assessment of profitability of investments in transport solutions
- planning the costs of building trans-shipment centres.

It is worth emphasizing that the spatial aspect of the network concerns its configuration i.e. determination of the amount and the structure of points in the network and routes used for ensuring the flow of products in the network. This requires making logistics decisions about the location of the networks and its individual facilities termed network modal points. Modal points include warehouses, logistics centres and transport nodes⁸

Planning and design of transport systems calls for a trade-off between temporal and spatial with economical aspects. In the decision process, one should take into consideration location of the entities which participate in a particular transport system, supply potential (production, distribution), absorption potential (demand) of the entities, and throughput of transport network, in both links and nodes. One should know the quantitative, value-related and qualitative characteristics of transported goods, specific nature of modes of transports owned by a decision-maker⁹.

⁶ *Nauka o przedsiębiorstwie*, Joint work, edited by J. Lichtarski, Wydawnictwo Akademii Ekonomicznej, Wrocław 2001, p. 16.

⁷ W. Rydzikowski, K. Wojewódzka-Król, *Transport*, Wyd. Naukowe PWN, Warsaw 2007, p. 352.

⁸ M. Kozerska, *Punkty węzłowe sieci przepływów produktów*, [w:] *Ekonomiczne i techniczne aspekty zarządzania przedsiębiorstwem*, ed. J. Nowakowska-Grunt, Prace Wydziału Zarządzania Politechniki Częstochowskiej, Częstochowa 2007, p. 94.

⁹ I. Dembińska-Cyran, M. Gubała, *Podstawy zarządzania transportem w przyszłości*, Biblioteka Logistyka, Poznań 2005, p. 9.

Design of transport systems can be performed by means of a graphical model of a network of relationships. This network is represented by a graph or as a table in the form of a matrix. In general, a logistics network of relationships is understood as nodes and pathways which go into the making of a system which is characterized by flow of materials, cooperation elements, finished products, energy and information. The nodes encompass the following elements¹⁰:

- acquisition and use, which correspond to the sources or places of flow of materials
- material processing, which might be both sources and locations of flow of goods (places of manufacturing),
- warehousing, which form material objects in temporal aspect (warehouses)
- distributing, which connect material streams with each other or divide them (manoeuvring stations, centres of distribution)
- control and services which perform auxiliary functions.

Pathways in graphical arrangement point to the elements which connect streams between nodes (means of transport) and elements which are the basis for operation of the means of transport (rails, roads). With this understanding of the network of relationships, temporal and spatial distribution of materials, finished products and information occurs. 'Nodes symbolize functions of overcoming time and/or physical transformation of materials and semi-finished products, whereas pathways symbolize the tasks of overcoming the space. Different connections of the production nodes and warehousing nodes through the pathways present different opportunities of movement of materials, finished products and information through the network of relationships'¹¹.

The pre-implementation stage is also composed of design of transport networks in terms of profitability of a particular investment. In order to be able to determine the profitability of the investment in means of transport, one should familiarize with the indexes which help initially evaluate the profitability of an individual project (absolute investment profitability) or compare profitability of several investment scenarios (relative investment profitability)¹². In order to ensure a comprehensive assessment of profitability, which will take into consideration the changes in the value of cash in time, one can employ the method which deals with:

- net present value
- investment return ratio
- internal rate of return
- discounted payback period.

The stage of planning at the level of enterprises means a strategic approach to operations with respect to the surrounding world of economy. Each carrier or forwarder, if they want to survive in the market, must stimulate their own development and create their own identity. With this aim in view, enterprises plan their

¹⁰ M. Sołtysik, *Zarządzanie logistyczne*, Akademia Ekonomiczna, Katowice 2000, p. 44.

¹¹ Pfohl H.Ch., *Systemy logistyczne*, Biblioteka Logistyka, Poznań 1998; zob. Sołtysik M., *Zarządzanie logistyczne...*, op. cit., p. 44.

¹² I. Dembińska-Cyran, M. Gubała, *Podstawy zarządzania transportem ...*, op. cit.

development and plan their long-term strategic policies for future years. The stage of planning or definition of strategic policies is an art of using all opportunities or limitation of the negative effects of threats which continuously arise in the market to the minimum.

Planning of transport processes largely depends on proper determination of the order of strategic decisions and coordination of the arrangements in different areas and at different levels of management in enterprises. Proper planning should define the direction, rate and the way the enterprise is developed. It defines the sectors of transport market where the enterprise operates in the nearest several years, the method the investments are implemented and the sectors where company's operations will be limited or liquidated. During planning future transport processes, the focus is on the following questions¹³:

- Which rate of development of transport enterprise is proper and safe from e.g. the standpoint of actual capital supply or tendencies of changes in demand for services?
- Is it better to be oriented towards a narrow scope of services and staying within one market sector or to decide to develop through entering new market segments and new geographical areas?
- Will the development be based on the range of services offered previously in the market or is it legitimate to diversify business activity?

After the phase of strategic planning of transport processes, one can start operational planning which concerns the stage of implementation which can be defined within a short period of time. Planning encompasses e.g.:

- design of transport networks with respect to space, which includes planning the network for future transport services, balancing transit points, marking the shortest routes,
- design of transport networks with respect to time, which includes temporal and spatial calculations of handling operations,
- planning regions of services by the enterprise,
- planning the implementation of transport services with respect to profitability of routes i.e. calculation of costs in terms of location of dispatch, reception, transshipment places and centres.

The level of Public Transport

Although primarily associated with managing the transport at the level of enterprise, the stage of planning plays similarly essential role at the level of management of public transport e.g. in the cities. It seems quite obvious that the cities necessitate the logistics support, which is caused by even fiercer competition, increasing dynamics of business processes and the increasing strength of competition between the cities and regions. Urban logistics imposes a series of solutions

¹³ A. Szewczuk, *Strategiczne podejście do zarządzania przedsiębiorstwem transportowym*, [w:] *Transport*, ed. W. Rydykowski, K. Wojewódzka-Król, Wyd. Naukowe PWN, Warsaw 2005, p. 370.

which facilitate effective management of urban transport. These include organizational, legal and financial resources and the resources connected with land development and the infrastructure. The funds necessary for effective management of municipal transport consist, on the one hand, in using fiscal instruments, the system of charges for access and using the infrastructure and, on the other hand, in proper planning of the transport system which is sustainable in technological, spatial, economic, social and environmental terms.

Effective management of municipal transport encompasses the improvement in management of traffic (limitation of the number of vehicles on the roads), effective policies of car park management (parking charges, limitation of the number of parking places), use of available technology for better traffic management, improvement in the system of public transport, promotion of the combined transport, integrated planning of transport and spatial management, fuel pricing policies, charging users with the costs of the infrastructure, promotion and development of research in the field of design of vehicles and engines, promotion and development of the research on alternative fuels¹⁴.

Under European conditions, Germany is a country which was able to effectively manage municipal logistics. One example of efficient planning and design of municipal transport in this country is the city of Stuttgart, being a regional capital with 570,000 inhabitants, similar to Polish cities such as Wroclaw, Poznan or Krakow.

Stuttgart is the capital of federal state of Baden-Württemberg, which, after World War II, became one of the leading industrial regions in Germany, with huge scientific, research and innovation potential. Development of the economy after the war was so intensive that as early as in the late sixties of 20th century, the process of settlement in the city suburbs started in the areas of the factories, plants, workplaces, logistics centres or research centres. In this city, planning, financing, building and use of transport system is viewed as problems which can be solved on a scale of the whole region. The two main problems which determine the opportunities of further development of the region and effectiveness of its functioning are closely related to the problems of transport. The first of them is effective unloading the city centre in Stuttgart from commuter car traffic, the second is alignment of building regional train and designation of new lands for workplaces and housing areas in the region.

After World War II, when new democratic authorities were able to start planning the reconstruction of the city after war damages, a special unit which managed and coordinated planning of city rebuilding was established. The unit gave primacy to the system of transport within the plans of Stuttgart's rebuilding. Finally, it was decided that the main city centre will be a quadrangle with dimensions of 1400 and 500 metres oriented through the then main city roads, which also played the role of state roads which went through the city. The main focus in this area was on commerce, services, business and city institutions. In terms of rail communication, the

¹⁴ U. Steiner, *Möglichkeiten und Grenzen einer Verreinigung der Kraftfahrzeuge im Innenstadtbereich mit den Mitteln des Strassenrechts*, [w:] W. Blümel, *Einschaltung privater beim Verkehrswegebau - Innenstadtverkehr* Forschungsinstitut für Öffentliche Verwaltung, Speyer 1993, p. 62.

most important proposal in the Urban Framework Plan¹⁵ was development of fast regional train from the main railway station in the city centre to the region of the northern airport, which was build in a tunnel in the city centre region.

The increasingly important use of cars, accompanied with even richer societies as a result of 'economic miracle' caused that the priority in urban development plans was cars as a means of transport for working citizens. This resulted in two phenomena, which were revealed in the mid fifties and have remained the main problems of road transport in the city: rush hours saw congestion of the network of the streets in the city centre and the number of car parks in this area was able to satisfy only a small part of the needs. Then, the goals for the development of the city were adopted for the next 20 years, focused on the investments in the infrastructure. A general plan of land development¹⁶ was prepared, which was dominated by the transport problems, and, more specifically, the road system and car transport. It envisaged road services in the city centre through 4 tangents with the character of urban motorways and three huge external road nodes. Moreover, extension of 45 multi-level car parks was foreseen.

The seventies were a period of expansion of fast urban train (S-Bahn). The 'economic miracle' led to such an intensification of the industry and services around Stuttgart that the workplaces and convenient places have spread around the city, creating insignificant but developed and rich towns and municipalities. This led to the conclusion that the extension of only road network cannot ensure the communication availability of the city. The network of fast urban train started to be built, with the scope which allowed for the access even from municipalities at the distance of 30 km from the city centre. Today, this includes six electrified train lines. The advantage of focusing of six lines in one tunnel section built under the city centre is perfect transport-related access to the city centre and those areas which are located near the stops throughout the tunnel section.

Fascination with the extension of road network and facilities for car traffic started to disappear in the beginning of the seventies. The city of those days had well-extended transport network, but it was also a particular problem for its inhabitants. It was claimed that the city cannot be a network of thick road connections in its every corner but it should have a zone which is free of traffic, designed only for pedestrians. This concept was implemented at the late seventies, when, as a result of huge excavation works connected with building tram tunnels and subways in the city centre, a pedestrian zone of commerce and services was created. This means the Royal Avenue (Königsallee) and the adjacent smaller streets which create in total more than ten streets, used only by pedestrians.

The eighties and nineties saw the end of huge infrastructural investments. The increasing importance of the green political party in Germany and world trends of respecting the principles of environmental protection in planning of city development led to increasing of the investments oriented towards the quality of life,

¹⁵ A. Jędraszko, *Zarządzanie mieszkalnictwem i planowanie komunikacji przez samorząd terytorialny w Niemczech*, Wyd. Unia Metropolii Polskich, Łódź 1996, pp. 183-184.

¹⁶ A. Jędraszko, *Zarządzanie mieszkalnictwem ...*, op. cit., p.185.

extension of green areas, rebuilding older part of the city at the expense of continuous pursuit of new roads, connections, crossings etc.

These activities allowed Stuttgart to become an example of how the effective management of transport and public transport affects development of the city. The process of urban public transport depended on economic development of the city, which translated into financial opportunities, on evaluation of economic profitability of the investment in long terms, on civilization needs, on convincing the local authorities and on world trends. At each stage of development changes, the city of Stuttgart had a coherent plan of development which corresponded to the needs of a particular period of time. These plans, although not free of mistakes, set an example of how a network of transport connections which offer convenient conditions to the inhabitants of both the city and its surroundings should be developed and they show how urban development should be adapted to logistics and macro-economic processes.

After this complex and exhaustive description of the problems of planning and design of transport processes, both in the area of transport enterprises and public transport, one can start its efficient implementation.

Implementation of Transport Processes

Cost and Price Management

Implementation of transport processes means in particular the effective management of costs of logistics processes. These processes, which encompass material, information and some components of financial processes, cause generation of particular costs, which, in practice, are not necessarily identified with the costs in strict terms. Both the costs which occur always and the occasional, additional costs which frequently occur are the components of good management of logistics processes. Therefore, the following groups of economic events connected with logistics processes which finally contribute through an appropriate level of management to the financial result in the enterprise should be emphasized¹⁷:

- consumption of labour, means and objects of labour and foreign services connected with the implementation of logistics processes
- cash expenditures in the enterprise, which are a part of value-added production and a component of costs of operation or the element of profit division, which include:
 - real estate taxes, taxes from means of transports
 - charges which result from the use of the environment by an enterprise
 - costs of locked-up capital (this is manifested in particular in the percentage of foreign capitals which finance the enterprise's property)

¹⁷ Cz. Skowronek, Z. Sarjusz-Wolski, *Logistyka w przedsiębiorstwie*, Wyd. Naukowe PWN, Warsaw 2008, p. 270.

- extraordinary depletion of the property in the enterprise which results from ineffective logistics processes, which include the penalty charges from suppliers and customers, the loss due to bad quality of production resulting from faulty processes of flow, loss on ageing of stock, re-pricing and revaluation of stock
- loss of potential revenues which result from ineffective logistics processes e.g. lack of stock of products with high demand, discounts and price reductions, originated from logistics processes.

In consideration of the above, a vivid presentation of the three fundamental types of costs of logistics processes can be made, illustrated in Figure 1.

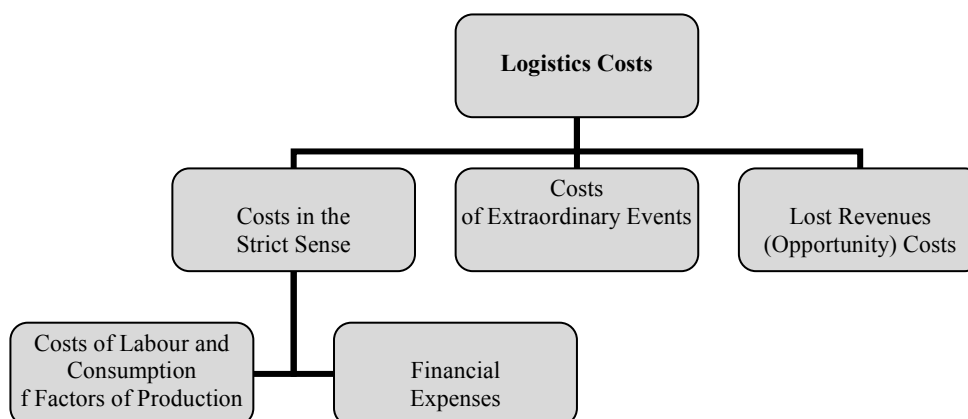


Fig. 1. The scope of logistics costs

Source: Cz. Skowronek, Z. Sarjusz-Wolski, *Logistyka w przedsiębiorstwie*, Wyd. Naukowe PWN, Warsaw 2008, p. 271

The first group is logistics costs in strict sense which are the centre of gravity in the structure of costs and are connected directly with: implementation of particular logistics processes (material purchases, transport, warehousing, packaging, sales of finished products), maintaining necessary standards of customer service and products and maintaining the appropriate market position of the enterprise and creation of a part of value-added production as expenses connected with capital lock-up and charges.

The second group includes the costs of extraordinary events, which involve loss and depletion of the property and economic resources due to logistics operations and are caused by insufficient standards and quality of both raw materials and products, different discounts and price reductions and random factors.

Lost cash revenues in the enterprise, which are not reflected in the profit and loss account in the enterprise, belong to the third type of costs and are typically a result of lack of suitable stock to cover market or production demand, customer service which does not match the agreements and deterioration of market position¹⁸

¹⁸ J. Twaróg, *Koszty logistyki przedsiębiorstw*, Biblioteka Logistyka, Poznań 2003, p. 51.

Management of transport processes in the aspect of costs of these processes also involves two concepts. The first concept is functional effectiveness, which consists in effective organization of transport process, which corresponds directly to the opinions of users with respect to the quality and the method of performance of transport services. The second concept is economic effectiveness which consists in organization of the transport process so that it guarantees users the lowest expenses of both costs connected with performing transport activities and the total costs of core activities.

The investigations and analyses reveal that global logistics costs in enterprises account for 10 to 35 percent of revenues on sales generated by the enterprises and are a group of costs with the highest reserves for safety operations¹⁹.

This causes that the problems connected with the costs of logistics incurred in order to achieve the basic goal of the enterprise, that is, maximization of long-term profits, become a factor which is of essential importance. The starting point for the policy of rationalization and reduction of logistics costs is to understand its complex character and avoiding optimization of costs in individual subsystems without verification of their effect on other areas of operation of the logistics chain. These activities are necessary for creation of efficient logistics chain. In order for these activities to be possible to be performed, the costs of logistics processes should be identified in detail and the factors which might affect the level of individual costs and their generation in particular points of the logistics chain should be defined²⁰.

In practical dimension, an adequate example which demonstrates cost management in transport processes is the example cited by I. Dembińska-Cyran i M. Gubała²¹ of Fenix, a mineral wool manufacturer from Siemianowice Śląskie, Poland, which exports their products to the Western European countries. In order to facilitate the system of distribution, based on road transport, the enterprise considers organization of transport by rail. The cost connected with each of these means of transport is varied, similarly to the quality of supplies. Rail transport guarantees supplies within four days on average, whereas the road transport necessitates two-day lead time on average. In order to carry out the analysis, the authors assessed the costs of supplies for both modes of transport and inventory carrying costs. With respect to only costs of transport, Fenix could decide to use rail transport since the level of costs is lower in this case and amounts to 257,004 zloty per annum. However, despite the fact that the costs of rail transport are more attractive compared to road transport, it does not guarantee quick deliveries. This results in higher level of inventory costs due to higher level of stock which should be maintained. Therefore, Fenix should consider total costs, which are the total of the costs of transport and inventory carrying costs and then to search for minimal total costs of deliveries. The table below illustrates the results of the analysis of costs.

¹⁹ S. Kępka, *Logistyka - ekonomiczne uzasadniona konieczność*, Przybyliński Trening, Warsaw 2001, p. 44.

²⁰ I. Walczak, K. Witkowski, *Koszty logistyczne w strategiach konkurencyjnych przedsiębiorstw*, [w:] *Controlling w małych i średnich przedsiębiorstwach*, Wydział Zarządzania Uniwersytetu Zielonogórskiego, Zielona Góra 2011, p. 212.

²¹ I. Dembińska-Cyran, M. Gubała, *Podstawy zarządzania transportem ...*, op. cit., p. 148.

Table 1. Annual costs of transport for individual transport sectors and costs of carrying inventory analysed by Fenix in zlotys

Cost	Mode of Transport	
	Transport by Rail	Road Transport
Costs of Transport	257,004	281,113
Costs of Carrying Inventory	189,452	96,358
Total	446,456	377,471

Source: I. Dembińska-Cyran, M. Gubała, *Podstawy zarządzania transportem w przyszłości*, Biblioteka Logistyka, Poznań 2005, p. 148

As results from the above analysis, Fenix should organize their supplies to the countries of the Western Europe by means of the previously used road transport. In the case of rail transport, costs of transport are more effective but the costs of carrying inventory are considerably higher than in the case of road transport as four-day lead time is offered compared to only two-day lead time in road transport, which, in consequence, causes that the inventory level is lower.

Another important problem from the standpoint of management of transport processes is management of pricing policies. The price of transport services is a cash-based expression of its value. It should take into consideration the internal cost of providing the services and profit. The Costs of transport services incurred in individual transport sectors exhibit substantial differences due to the used modes of transport and transport technologies. Therefore, in practice, the effective management of prices necessitates utilization of the higher number of transport modes (typically two). In such cases, prices are determined based on separate cost breakdowns, suitable for each mode of transport. Differentiation of prices for services depends on the type of the means of transport used for performing transport services, since unit cost of transport reduces with an increase in the payload of a means of transport, and, consequently, the transport price is reduced with an increase in cargo weight. Due to different character of transport, prices of transport of people and goods vary. The differences also occur in the principles of calculation of the costs which are the basis for determination of the prices for either type of delivery.

In general, the two methods of price determination in transport can be emphasized: arbitrary system and tariff system.

In arbitrary method of pricing, the dispatcher, who concludes a contract with a carrier or other entity, negotiates the level of price for moving a particular amount of cargo along a particular route and at a particular time. The starting point for negotiations is knowledge of both parties of the prospective contract about the level of current and future prices in the transport market²².

In the case of the tariff method, the entity which provides transport services presents a price offer in the form of a tariff for information and consideration of the potential purchasers. The tariff means comparison of prices for transport services. Price management also consists in creation of tariff classes which represent the

²² J. Neider, *Transport międzynarodowy*, Polskie Wydawnictwo Ekonomiczne, Warsaw 2008, p. 29.

types of goods in consideration of their transport susceptibility and supply flexibility. Tariff method makes the price dependent on a particular unit of distance, weight, type of cargo and uses discounts and reductions depending on the size of dispatch and frequency of orders.

Outsourcing as a Tool for Management

The choice of the branch of transport and freight carrier is among the strategic decisions undertaken by logistics managers. Each branch of transport offers the market services differing in profile with relation to quality and price. Each choice of branch and freight carrier can be identified by specified advantages and costs for the users. The basis of choosing a defined branch of transport is the analysis of the influence, which a given branch of transport has on the total costs of logistics, and also on their composite parts, such as the costs of transport, costs of keeping supplies in transit, the costs of supplies held by an enterprise, the costs of realizing an order, the costs of wrapping or the costs of „lost possibilities of sale“²³

When performing transport processes, managers seek the methods which help achieve immediate and noticeable improvement in company's management, including cost reduction. Achievement of this goal can be supported by cooperation based on outsourcing, which allows for organizational access to experts and increasing strategic value of the enterprise through implementation of best practices and improvement in the quality of services²⁴. Outsourcing consists in using goods and services which are offered by an external contractor, being the subject of market transactions. The outsourcing proved to be one of the most competitive concepts of business management since it enables to obtain optimal efficiency with consideration of flexibility and quick response to the customers' needs²⁵.

When making a decision on outsourcing, one should start with revision of transport needs, both in terms of their content and size and hierarchy of importance. It is also essential that the gradation of the functions was continuously updated as a result of moving the needs from one group of priority to the other, appearance of new or giving up the previous ones. Therefore, choosing a suitable service provider should be based on the steps taken in order to recognize the market, using generally available information resources about the market or preparing the ranking of suppliers with consideration of such criteria as price, reliability of performance, range of services. These activities might be a guarantee of making right decision which should be a resultant of striving towards minimization of the likelihood of financial loss in the case of improper supplier²⁶.

²³ M. Nowicka-Skowron, M. Smolnik, *Role of Transport Services* ..., op. cit., p. 202.

²⁴ A. Wodecka-Hyjek, *Outsourcing i co-sourcing jako forma współpracy dostawcy i odbiorcy usług*, Zeszyty Naukowe Akademii Ekonomicznej w Krakowie Nr 670, Kraków 2005, p. 77.

²⁵ A. Brzozowska, *Organizacja procesu outsourcingu*, [w:] Brzeziński S., *Globalne wyzwania logistyki*, Prace Wydziału Zarządzania Politechniki Częstochowskiej, Częstochowa 2006, p. 79.

²⁶ Dembińska-Cyran I., Gubała M., *Podstawy zarządzania transportem* ..., op. cit., p. 203.

An inherent element of decision process is economic and comparative analysis. The subject of this analysis can be the confrontation between:

- the needs of the enterprise and range of products of a service provider
- costs of internal and external services
- quality of internal and external services
- price of purchase of foreign services and their quality.

Outsourcing might become an effective tool for realization of transport processes. The cost reduction forces enterprises to take actions which consist in that all possible logistic functions are contracted out to one entity and a one-step warehousing is created at the interface of supplier-customer. One example is automotive industry, where a function of lead logistics provider (LLP) is emerging. The LLPs perform the functions of logistics integrator which takes over possibly maximal scope of logistics process from the enterprise. Their role consists in taking over full responsibility for particular logistics activities within the process chain or in appropriate coordination of other logistics operators and suppliers. Ideally, LLP is the only contractor of the enterprise in terms of logistics at regional or even global level²⁷.

Scania, a leading global level manufacturer of lorries, decided to employ a lead logistics provider, and the scope of duties of the LLP were divided into the following groups:

- supply logistics
- distribution logistics
- flow of materials between manufacturing plants
- return services

The project assumed that two logistics operators will establish a separated daughter company designed only to provide logistics services for Scania and being the only contractual partner in this area. The daughter company, based on technical resources of both parent companies, with uniform system of flow of goods and information, is aimed at offering highest possible quality of services available in the market.

Performance of transport processes in the aspect of making decision on outsourcing means valuation of both costs and the quality. Comparison of the costs of internal and external production is possible through e.g. MOB (make or buy) algorithm²⁸ i.e. break-even analysis. This method takes into consideration the scale of transport activities expressed with the size of deliveries. This means that a size of deliveries should be defined at which it is justified to transport goods using internal resources and the size of deliveries at which one should employ outside transport services. In this case, in consideration of the variant of self-services, both fixed and variable costs of transport should be considered. In the case of buying transport services, the extent of internal transport needs and transport charges should be taken into consideration. Analysis of break-even point is based on comparison of total costs of internal and external production. The diagram below presents the make-or-buy analysis in transport.

²⁷ Wodecka-Hyjek A., *Outsourcing i co-sourcing jako forma współpracy ...*, op. cit., p. 84.

²⁸ www.logistyka.net.pl

Form of the cargo in transport process	From the stand point of: • technical transport susceptibility • natural transport susceptibility
Transport routes	• national routes • international routes • national/international routes
Used means of transport	• adjusted to the type of cargo? • meeting ecological requirements? • degree and scale of physical wear?
Optimal use of vehicles (ratio analysis)	• ratio of vehicle/rolling stock use • average daily working time • ratio of working day utilization • ratio of mileage covered • vehicle effectiveness • cost of vehicle-kilometre • cost of tonne-kilometres
Current and forecast demand for means of transport with particular parameters	Determination of transport needs with respect to: • cargo weight • distance from customers • cargo batch size (also including the question of: uniform cargo or grouped cargo which requires completion)
Analysis of the market of transport services	Characterization of carriers: • available means of transport – parameters • organization of cargo and tariffs • quality of services and opinion about the carrier among the customers.

Fig. 2. Area of MoB analysis in transport

Source: logistyka.net.pl

MOB algorithm determines the following method of calculation of break-even point:

Purchase of transport services in a transport enterprise:

$$KC_1 = P \times D$$

Maintaining internal division:

$$KC_2 = (V+D) + FC$$

where:

KC - total costs,
 P - transport charge,
 D - goods batch size,
 V - variable costs,
 FC - fixed costs.

The break-even analysis demonstrates that higher scale of demand corresponds to higher profitability of internal production. In the case of transport process, more transport performed in time unit causes that maintaining internal transport services becomes more economically justified.

When making decision on whether to use internal transport system or employ external services, the enterprises which implement transport processes use the discussed algorithm. These activities can be described using the practical example²⁹:

Pentex, a clothes manufacturer, subcontracts transport services of deliveries to customers to a transport enterprise. Average annual costs of transport amount to 5,795,000 zlotys. Assuming the strategy of expansive development and, consequently, assuming gradually increasing customer base, including increase in the number of deliveries, the enterprise started to consider whether they should start using the system of their own transport services through purchase of vehicle stock and building transport facilities. In order to verify this, the enterprise ordered collection of information about annual fixed costs and variable costs of operation of this system in other clothing enterprises in order to assess the size of deliveries which determines profitability of this solution. The following data were determined (see table below):

Table 2. Data for the example

Average Costs per Year		
Total Costs PLN	Fixed Costs PLN	Variable Costs PLN
5,439,000	4,030,000	1,409,000

Source: I. Dembińska-Cyran, M. Gubała, *Podstawy zarządzania transportem w przyszłości*, Biblioteka Logistyka, Poznań 2005, pp. 207-208

The fixed costs (FC) represent this part of costs of operation in the enterprise which are not changed in particular ranges of production size i.e. capacity of production or services. The costs calculated per unit of the goods transported by the enterprise will decrease with an increase in demand for transport. The following are the examples of the fixed costs: depreciation/amortization, taxes, costs of leasing, rents, costs of research and development, health and safety costs, interest rates on investment credits, physical and non-physical services, office materials and material for general purposes.

The variable costs (V) rise with an increase in transport activities. Variable costs include, for example, the costs of fuel, consumables such as oils or lubricants, costs of energy, remuneration directly connected with transport, costs of purchase of tires.

In order to determine the size of deliveries which determines the break-even point for operation of internal transport base, Pentex compared costs incurred in the outside of the enterprise with fixed and variable costs of transport activities calculated for clothes sectors.

²⁹ I. Dembińska-Cyran, M. Gubała, *Podstawy zarządzania transportem ...*, op. cit., p.207-208.

Calculations according to the method of MOB algorithm demonstrated that it will be profitable for the enterprise to transport goods using their own transport services if the size of deliveries exceeds 1,408 tonnes.

These solutions and examples show that effective and efficient logistics management is a fundamental part of strategic management of enterprises, with particular focus on transport enterprises.

Summary

Transport management is undoubtedly connected with the problems of logistics. The paper focused on two stages of transport management. A very important thing in the first of them, i.e. the stage of planning of transport processes, is early planning of the scope of transport with respect to space and time so that it functions effectively. Planning of urban transport seem to be slightly different; however, it was also demonstrated in this case how the model planning of transport with consideration of economic, social and cultural conditions in the area of a particular city should be implemented.

The second stage, concerning the implementation of transport processes, is aimed at efficient implementation of the transport of goods and people. At this stage, managers focus on maximization of profits, maintaining the quality while striving for the lowest possible costs of these processes. The paper discussed the methods of management of costs, prices, external services during performance of transport processes with examples of transport enterprises.

Both efficient planning followed by the implementation of transport processes directly affect their quality and profitability and constitute the clearly defined methods of transport management.

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ASPEKTY ZARZĄDZANIA TRANSPORTEM W ODNIESIENIU DO ZAGADNIEŃ LOGISTYKI

Streszczenie: Logistyka we współczesnym świecie obejmuje coraz więcej obszarów działania niż w jej tradycyjnym ujęciu. Logistyka w głównej mierze dotyczy przemieszczania towarów czy osób. Stąd jednym z zagadnień znajdującym się w obrębie logistyki jest transport, a w szczególności zarządzanie transportem. Zarządzanie transportem to wiele czynności, mających na celu poprawę jakości przewozu, wzrost konkurencyjności usługi transportowej, redukcję kosztów usługi oraz jej obsługi, czyli poprawę jakości procesów transportowych. Czynności te dotyczą zarówno sektora prywatnych przedsiębiorstw, jak też sektora transportu publicznego. Na obydwu poziomach działają te same mechanizmy zarządzania transportem z uwzględnieniem danej specyfiki. Zarządzanie transportem można podzielić na dwa etapy, kolejno po sobie postępujące: etap planowania i projektowania procesów transportowych oraz etap realizacji tych procesów. Etap planowania oznacza czynności określania obszaru działania, wyznaczania tras, określania opłacalności przewozu ładunków czy osób, a w odniesieniu do transportu publicznego wyznaczanie planów w obrębie miast czy regionów na przestrzeni lat. Z kolei etap realizacji charakteryzuje się między innymi skutecznym posługiwaniem się narzędziami służącymi do zwiększania jakości usługi transportowej. Do takich należą koszty procesów transportowych, ich cena, a także korzystanie z usługi zewnętrznej, czyli outsourcingu.

Słowa kluczowe: transport, zarządzanie transportem, planowanie i realizacja, procesy transportowe, koszty transportu, outsourcing w transporcie