

COOPERATION POSSIBILITIES AND DISTRIBUTED RESOURCE MANAGEMENT IN LOGISTICAL NETWORK OF DECENTRES

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Abstract: The paper summarises the cooperation possibilities of small and medium-sized logistics service providers to improve competitiveness. Different cooperation forms are elaborated and a virtual logistical network structure for the coordination of activities is introduced. Typical and different hierarchical levels of cooperation appeared in controlling of basic logistical activities are detailed, which provides more and more information and authority for the Virtual Logistical Centre (VLC) which coordinates the cooperation. The ratio of autonomous and cooperative basic activities of service providers (thereby tasks of VLC) has a significant influence on the utilization of advantages of cooperation.

Keywords: virtual logistical network, cooperation, distributed resource management

1. Introduction

The globalization of the production and service activities in the last decades had the important effect, that the demand for high quality logistical services increased very fast. Of course, the competition of logistical service providers in field of this logistical tasks and market became more and more stronger. The globalisation has the same effect on the logistical service market like on the production or service area: buying up of companies, price competition, cooperation, etc.

Especially the small and medium-sized logistical service providers which are scarcity of capital have a limited prospect for the long term successful participation on the logistical service market (to stabilise or increase their own market-value), because this providers individually have not enough capital, logistical capacities, order-volume, market position to conform to the market challenges (competitive prices, high tech resources, know-hows and expertise, etc.). In this business environment the logistical small and medium sized enterprises have only chance if they give up their individual market activities and join into a network-like organisation to coordinate the common activities and to manage the shared resources for the cost efficient and long term successful market position.

Cooperation of smaller logistical service providers and logistical centres has more advantages, which are the followings:

- the surrounding areas of the service providers and logistical centres give together a volume of logistical task which is enough for the profitable operation of the network, the payback period of investments to modern equipment can be reduced,
- the organization of the transportation activity between the surrounding areas can be held in one hand, the management of the network can help to coordinate the

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activities of the providers, so it can support the managing of a product supply chain partially or totally,

- the shared control of the logistical resources (vehicles, equipment, etc.) managed by the network can provide a higher utilization and a lower specific operating costs of it, so the providers can operate efficiently on lower cost level,
- the investment costs can be reduced by the harmonization of the developments projects of the decentres,
- although the establishment and operation of the information infrastructure require investments, the ability to fast information collection, communication and coordination through this infrastructure improves the competitiveness of the logistical providers of network.

The keeping of high quality level of services, the profitable operation of the network and the developments in the network can be realised only, if the expenses of operation and additional costs of logistical resources are minimised. The above mentioned cost-efficiency of the operation basically depends on which cooperation fields are chosen by the logistical providers of the network, what kind of information and logistical resources are shared to realise the cooperation in the network.

2. The model of the logistical network

The connection structure of the logistical network follows the classical star topology (Figure 1.), where the Virtual Logistical Centre (VLC) plays the main role (hub), the Logistical Decentres (LD) play the role of peripheral nodes (spokes) [1, 4].

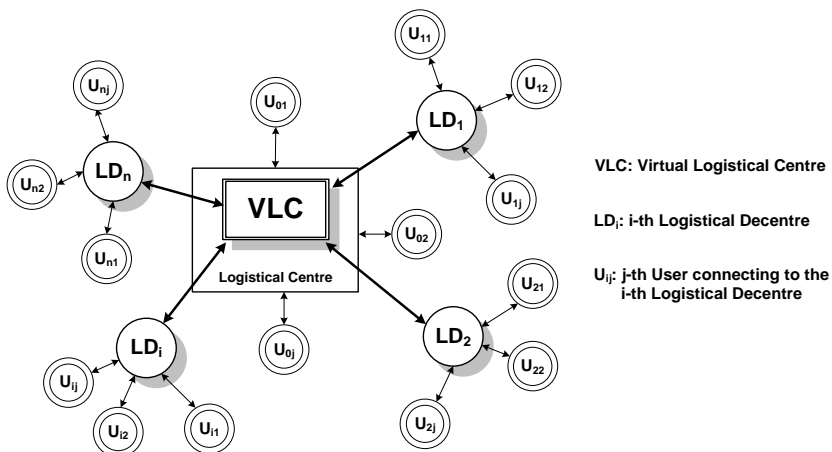


Figure 1. The elements and the structure of the logistical network

Only the Logistical Centre (LC) and Decentres (LD) as logistical service providers have logistical resources (mobile and located equipment, devices) in the network. The members of the network (LC, LD) organize and execute the logistical and other tasks partially autonomously, partially cooperatively. The VLC coordinates the cooperation of elements and the sharing of information and resources in the network.

3. Cooperation fields in the logistical network

One of the important tasks at the establishment of the network is to decide consensually by the members that what are the planned cooperation fields. After this decision there is also important to define the form of the cooperation on every chosen field (what kind of tasks have to do by the members; what kind of information, resource, etc. must be shared for the cooperation; what kind of activities should be done or coordinated by the VLC; what kind of authority has the VLC over the above mentioned tasks).

The possible tasks of VLC during the cooperation are the followings:

- supporting of marketing activities of the members to improve the market position:
 - common advertising activities, brochures, ad-cards, TV or radio-spots, etc. completed by an advertising agency,
 - common performing of publicity campaign in local, regional or national advertisement mediums (newspapers, journals, radio, TV),
 - common creation, operation, updating of member's homepages and propagation of these on internet (placing the links on thematical portals, on homepages of local governments, professional organisations, etc.);
- supporting of administrative activities (financial, counting, legal, etc.) of the members, e.g.:
 - help to look for and select a counting-house, advocate bureau, bank, insurance office, etc.,
 - help to build up and operate the communication with public administration;
- supporting the human resource management of the members, e.g.:
 - help to look for and select new employees with the required qualifications/skills,
 - help to organize continuative educations of employees (common trainings);
- supporting the resource-management of the members, e.g.:
 - help to organize operation and maintenance activities related to existing resources (mobile and located devices), help to look for and select companies to serve this activities,
 - help to build up and operate the communication with licensing authorities,
 - help to plan a resource development strategy,
 - help to manage and harmonize the realisation processes of resource development plans of the members;
- supporting of basic logistical activities of the members, e.g.:
 - help to prepare short-, middle- or long-term contracts with users of services (help to elaborate and evaluate of legal, technical, financial conditions, etc.),
 - help to schedule logistical tasks and help to allocate resources to tasks,
 - help to communicate with executive elements (collection of actual parameters of elements, forwarding of instructions, following of execution, etc.),
 - help to organize controlling/accounting activities;
- supporting of establishment, operation and development of IT and communication systems by the members.

The cooperation fields and forms declared at the establishment of the network are changeable depending on the success of those and depending on actual market challenges.

4. Cooperative controlling of the logistical resources

The most important part of the basic logistical activities of service providers is the handling of logistical resources, that means on the one hand the operation and development of equipment park, on the other hand the organization and control of execution of logistical tasks. This points to the fact that scheduling of logistical tasks, allocation of resources to tasks and controlling of execution of tasks are the fields of cooperation, where the common coordination of that activities can serve significantly a higher efficiency of operation.

There are typical and different hierarchical levels of cooperation in controlling of basic logistical activities, which detailed soon, provide more and more tactical and operation information for VLC to coordinate the common basic activities. As the cooperation level became higher in the network the role and authority of VLC will be more important in collection and confirmation of logistical orders, in management and coordination of execution, which results higher utilization of cooperation advantages [2].

Typical and different hierarchical levels of cooperation appearing in controlling of basic logistical activities are the followings:

1. Common information database established and managed by VLC for collection of information about non-handled logistical orders and task-free logistical resources (closed electronic market place for members of the network):

This is the lowest hierarchical level of cooperation in controlling of basic logistical activities. The service providers operate autonomously, they share voluntarily only the information, that have no risk to their market position (e.g.: information about not accepted logistical orders, information for searching for a subcontractor to help to execute a logistical task, information about actual parameters of task-free capacities (searching for logistical orders), etc.). The role of VLC on this cooperation level is only to serve this internal, secure electronic market place for the members of network.

2. Common information database established and managed by VLC for collection of information about accepted logistical orders and information about scheduling and executing of logistical tasks:

On this higher hierarchical level of cooperation the members open their own databases for VLC to read information related to their basic logistical activities. The VLC can analyse the logistical tasks on network's level and can propose practical solutions to members for the cooperation to increase profitability of operation (e.g. common execution of a task, reallocation of resources to tasks, give over a task to an other provider, etc.). The members evaluate the proposals of VLC and decide on it (acceptation, rejection). The management of basic logistical activities still belongs to the member's duties.

3. Delegating of decision powers to VLC by the members on coordination of common logistical tasks:

On this hierarchical level of cooperation the VLC gets authority over coordination of common logistical tasks accepted by members to provide a higher level of quality and efficiency of execution. VLC and members who provide resources, continuously discuss the actual conditions and actions during the execution of common logistical task. The communication with users still belongs to the member's duties.

4. Delegating of decision powers to VLC by the members on communication with potential users:

On this highest hierarchical level of cooperation the VLC gets also authority over communication with users, the VLC plays an active role to enlarge the order-volume of the network (e.g.: the VLC supports the logistical providers in contracting with users, accepts autonomously logistical orders, etc.).

The cooperation supported by integration of information system can be more efficient in field of resource controlling of logistical networks, if optimization algorithms will be used for management of the appeared logistical tasks. Two aspects should be taken into consideration during the planning of realisation of logistical tasks which are the followings:

- the elaborated alternatives used for realisation the given tasks should be evaluated by the help of objective function,
- the utilisation of available resources should be taken into consideration during the allocation of tasks, balanced capacity loading should be realised during the schedule planning of capacity demand.

An efficient resource management (for both of quantity of resources and costs) can be achieved on a required quality level taking into simultaneous consideration of the before mentioned two aspects.

The efficient resource management on network level can be realised by the coordination of VLC if the members complete their tasks by the aid of a well structured, safety and common operated information system. The members provide and share their own data on the before mentioned information system to realise the cooperation.

5. The informational aspects of the logistical network

The VLC controlling the logistical network is a coordinating organisation based on an IT network which is able to control the coordination of logistical providers, manufacturers, data and knowledge providers to improve the efficiency of organisation and realisation of logistical tasks. The role of the VLC is the coordination of logistical tasks not the realisation. The material and information (telecommunication) flow can be separated, the VLC has network-like relation with logistical providers operating on different scattering sites and system elements and persons completing logistical tasks. VLC have to communicate with the following partners [3]:

- founder organizations (e.g. investors, local governments, real estate agents, logistics providers, non-profit organisations, etc.),
- organisations which have demand for services of the network (e.g. trading companies, manufacturers, assemblers, service providers, etc.),
- service providers out of the network (e.g. banks, assurance companies, financial experts, local governments, chambers, real estate agencies, R+D providers, educational organisations, IT and communication companies, etc.).

The structure of the information system and the elements of the system will be heterogeneous due to the complex relation of huge number of partners (traditional and software supported data management and communication solutions are used in communication between the different partners).

At least the following information groups should be flown between the partners in computer network:

- business data of logistics service providers and companies which have demand for services,
- data relating to logistical tasks (mandator of the task; type of tasks; quantity, quality spatial and scheduling parameters, cost parameters),
- characteristics and state of logistical resources (technical and financial properties of resources, state parameters),
- relation of logistical tasks and their disposed resources and data relating to process of task realisation.

6. Summary

The paper summarises the cooperation possibilities of small and medium-sized logistical service providers supported by virtual logistical network to improve competitiveness. Different cooperation forms are elaborated and a virtual logistical network structure for the coordination of activities is introduced. Typical and different hierarchical levels of cooperation appeared in controlling of basic logistical activities are details, which provides more and more information and authority for the Virtual Logistical Centre (VLC) which coordinates the cooperation. As the cooperation level became higher in the network the role and authority of VLC will be more important in collection and confirmation of logistical orders, in management and coordination of execution, which results higher utilization of cooperation advantages. Finally the relationship of partners of network-like operation and the information requirement for efficient coordination of basic activities were elaborated.

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