Chapter 17
Information Systems in Transport and Forwarding Activities

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Abstract Information technology has become an integral part of the provision of transport services. This has ambiguous consequences on the management of transport services—they change the service provision environment, mutual relationship between consumers and service providers, pricing, etc. Customers request actual information from companies at a specific time and prior knowledge of what is happening to the goods during their carriage. Therefore, the quality of this information is very important. Activities of transport and logistics companies are very receptive to information technology—these companies work with large amounts of information, the management of which requires a quick response. Companies are convinced that new technologies have a positive impact on activities of their company, so they are rapidly implementing specialized programmes, although until a few years ago, technology was valued by the number of available computers only. This section will address issues related to the use of IT in transport and forwarding activities.

Keywords Transportation process · Forwarding · Information systems · Transport chain

17.1 Good Foreign Practice of IT Application in the Process of Transportation

The analysis of IT transportation process revealed that not only each mode of transport has different systems, but also each country has a variety of applied IT. Here are examples of some countries:

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- Belgium. Given the small size of the country but it is very densely populated area, annual traffic growth in Belgium cities has been about 3%, leading to traffic congestion during peak hours in case of accidents or road repairs. This is due to a large number of people who commute to work in cities by car. Belgium has been using various intelligent transport systems to combat these problems. For example the following ITS systems have been used in Brussels:
  - MORBIRIS is a mobility management centre, which sends all the collected information on traffic regulation and management of districts to intermediate users (administrations, operational services or radio stations).
  - SERBRU, which measures the load on the main sections of the road network and indicates travel time on information boards.
  - CORBU regulates regional traffic lights and controls regional traffic lighting.
- Croatia. There is a lack of modern national and regional road corridors in Croatia, and there is only one road link between Western and South-Western Europe, and South-Eastern Europe and Asia. Highway routes have not been completed in full, and the implementation of information and telecommunications technologies needs to be improved. Croatia has worked to address these issues. For example there are five video surveilled tunnels and ten viaducts in the 9-km section between Split and Zagreb also using traffic management systems in this section. The other section between the towns of Kupjak and Rijecka is equipped with surveillance systems, information boards and meteorological sensors. Telematics in the local road system has been introduced on roads of local significance to improve the interaction between roads and maritime transport in the city of Split. Also, Croatia has used semi-automated tax collection systems.
- Czech Republic. Road transport takes up a significant share in the Czech Republic, while cars are seen as a symbol of good life, therefore the use of public transport and rail transport has declined. The telematics project ATRACTIC targeted at the city of Prague consists of several interconnected systems. These include traffic adaptation regulation system MOTION, congestion and accident management, information boards for car navigation to parking garages, and informal information displays. Road tax collection has also been developed in the Czech Republic. Czech highways have used warning systems, speed control equipment, special signs and illuminated signs, information boards and video tracking and surveillance cameras.
- Denmark. About 90% of passengers travel by road in Denmark. Freight carriage by road has also been growing compared to water and rail transport. As a result, road traffic loads have also been growing rapidly. The TRIM traffic information system used in Copenhagen allows providing travellers with information on radio and during major repairs on highways. Meteorological stations have been used on the major road network to help with proper road maintenance or to provide 3-h weather forecasts to drivers.
- Finland. Metropolises of Finland face traffic congestion problems. Road and water transport are the main forms of transport in the country. There are also 25 airports in Finland, with Helsinki's Vantaa being the most important. Finland

also uses a traffic and road meteorological monitoring system that provides real-time information on meteorological conditions. Various signs and signals (VMS) provide information on dangerous driving conditions (slippery or snowy roads), road congestions and animals on the road. Water traffic uses the PortNet vessel traffic management system, which aims to generate one report on a vessel's departure and arrival only. This system is linked to other systems and is also used by Finnish customs, ports, ship operators and others. VTMIS (Vessel Traffic Management and Information System) is particularly common and useful in the Gulf Stream section of Finland.

- Sweden. Sweden is a country that uses many different intelligent transport systems. High road traffic flows and difficult traffic conditions in winter cause problems for the country's population and lead to a large number of accidents. The RwiS system is a multi-meteorological information system that uses cameras and automatic meteorological stations and provides real-time information. The traffic information support system allows to manage traffic data that are received from SOS alarm and the police. Another service is provision of information on road surface and temperature, which provides real-time information. The following are traffic management systems widely used in Sweden:
  - MCS system that warns of congestion on highways using detectors installed on road surface.
  - "Go Green" system allows cyclists and pedestrians to take advantage of green traffic lights that stay on longer.
  - The Red Check system "sees" cars that are overspeeding when approaching intersections keeping red light on longer to reduce the speed of such cars. Sweden also has an integrated and automatic billing system that allows to pay the required road tolls without stopping. There also is an important system related to drunk-driving, the alcohol interlock system (HMI), the operation of which is linked to electronic equipment in the car, which is connected to the ignition system. Thus, if the alcohol content of the metre exceeds the permissible limit, the car does not start, and the driver cannot use his car.
- Germany. German road network covers over 600,000 km, interconnecting densely populated areas of the country. Passenger carriage and freight carriage account for the major transport load of the country (80% and 70%, respectively). Some vehicles in Germany have been equipped with navigation systems. The cities have intersections and traffic lights that regulate traffic, while pedestrian crossings have special signals. Dynamic car parking systems are used in major German cities. There are information signs with information boards providing information on meteorological conditions, traffic jams, speed or certain directions. Also, radio stations provide information on congestion or accidents and the necessary detours.

17.2 Information Technology Used in Forwarding

The application of information technology in forwarding activities is directly related to the obligations which the freight forwarder assumes by signing contracts with customers. Forwarding activities are associated with freight.

Coyle et al. (2011) say that forwarding activities can be divided into import and export forwarding. Authors state that the following actions are performed in the course of import forwarding: completing customs documents, paying taxes, participation in the inspection of goods and their accounting together with customs officials. By providing additional services, freight forwarders ensure efficient organization of cargo transportation in the local and foreign markets, arranging freight carriage and cooperating with other companies providing forwarding services. The following is the processing procedure of freight for export when arranging export forwarding activities:

- Preparation of documents for customs
- Completion of freight export declarations

Freight forwarders can also provide other services related to the payment for export transactions under separate freight carriage authorizations.

For example many Lithuanian forwarding companies are small, and the assets they manage are usually defined by office-type premises, computers and other information technology (Turbienė & Jurevičius Jurkevičius, 2018).

Areas of use of information technology (Briuchoveckaja et al., 2013):

- Acceptance of orders
- Document management
- Identification of goods, transport and drivers
- Locating transport and freight
- Selection of the optimal route
- Search for freight and available vehicles

Many freight forwarders work with electronic transport exchange. Currently, there are many electronic transport platforms on the market, and their developers receive income for their use. Such electronic exchanges as Trans.eu, Cargo.lt, Ati.su, Lardi-trans.com, TimoCom can be distinguished (Turbienė & Jurevičius Jurkevičius, 2018).

Information technology in forwarding activities includes not only computer software, but also communication equipment, smartphones, headphones. Such programmes as Skype or Viber, also e-mail and social networks (like Facebook) have also been used in these activities. When transport logistics companies provide additional services provided for in the freight forwarding contract, computer programmes such as Klevas or Speda are used. Software Muitinė (English: Customs) can be used to complete documents and customs registers, while Nano Warehouse and other specially developed programmes adapted for the company's needs. Transport service companies also use international intelligent technologies:

- CRM is a set of business model, business process methodologies and duly prepared interactive technologies. CRM is also a concept used in the information technology industry defining methods, software, Internet capabilities, and solutions that help companies manage customer relationships in an organized way.
- TRIS means Transportation Research Information Services. TRIS provides access to more than 450,000 bibliographic records, including transport research published in books, journal articles, reports, and the media.

According to Batarlienė (2011), this allows "freight forwarders to join the information space of stevedoring companies". In this information system, the freight forwarder places orders with a stevedoring company or warehouse, monitors order processing, tracks freight movement, and can make requests.

DAKOSY is another system. As one of the leading suppliers of logistics platforms and software, it has been offering promising solutions since 1982. Communicating between companies, these digital platforms allow all participating authorities and companies to plan and effectively manage processes of transport. DAKOSY also offers digital customs and freight forwarding formalities. This includes, in particular, CargoSoft for international forwarding (by air, land, sea) and ZODIAK for customs formalities in Belgium, Germany (ATLAS), Austria, Switzerland, and the Netherlands. More than 2800 companies across Europe use state-of-the-art DAKOSY data centres. These companies include world-renowned trading houses, freight forwarders, industrial companies, shipping companies, airlines, carriers, liner agents and various institutions (https://ipcsa.international/about/members/members-europe-and-north-america/dakosy/).

17.3 IT System Compatibility in the Transport/Logistics Area

Each transport company chooses IT systems depending on its needs. Smaller companies choose simpler ones, while larger companies need more functionalities so they choose more advanced applications. However, every modern system provides the ability to exchange data with other systems. Methods such as EDI and API are used to accomplish this task:

1. EDI is a method of exchange of electronic data. When creating EDI between company A and company B, information to be transferred and its compatibility between two systems must be assessed to see if all the data sent will fill up the recipient's programme boxes. Having analysed the amount of information to be transferred, the development of a supplement to the system is started for processing the information received and assigning each variable to the required field. Usually, such supplements are called engines in English. Electronic data exchange has many standards, including AS1, AS2, HTTP, FTP, etc. (E-Procurement–Electronic Data Integration Comes of Age–Finance Director Europe (the-financedirector.com)). The following are the data exchange options:

   a) Consignor—consignee (when all information is sent directly)
   b) Value-added network (when there is one consignee but many consignors)
   c) Internet (document with information is sent and integrated into the system)

   Advantages of Electronic Data Exchange:

- Lower employee time costs as less data has to be entered manually.
- Environmental friendliness, as there is no need to print information on a sheet of paper.
- Quality, as it reduces the human factor when employees can make mistakes.
- Speed, as important data is quickly exchanged over long distances.
- Flexibility, as an EDI interface, can be created for almost any application.

2. API is a programming interface of applications. API allows to integrated of additional functions and tools in the company's IT programme, thus ensuring faster and higher quality work. Most popular integrations for logistics companies include: Google Maps, interface with e-mail, SMS sending and more.

Despite these systems, the issue of how to ensure the dissemination of all the necessary information in order to make the movement of material flows as efficient as possible remains sensitive in the transport chain.

17.4 Needs for Information Systems in the Transport Chain

Today, transport information systems connect several independent systems: data banks, information data exchange system, system for locating transport and freight vehicles, and satellite communication systems. Therefore, interoperability of the dissemination of information and information systems also plays an important role in ensuring the smooth running of the process.

Information on the location of freight and its condition in the transport chain is very important in any case. In the transport chain, especially if mixed (multimodal) transport is used, the work of separate sections must be coordinated, inter alia: ordering road transport, loading onto a vessel and carrying in it, unloading at another port, customs clearance procedures, ordering transport to carry from port to the

consignee, cargo insurance, payment for freight and separate transport and procedure services (Paulauskas et al., 2001). In order to guarantee the safety of freight during transportation, it is very important to have all the information about the location of freight and its condition any time in the carriage process. When accurate information is not available, it takes a lot of time and money to deal with problems that arise, such as customs procedures (Jankauskaitė, 2010).

Information integration is essential to create a single information space in the transportation and logistics chain that ensures the required speed under the current conditions and a comprehensive and accurate information in transport services. The complexity of information integration into transport logistics is determined by many information channels and information flows of mutual cooperation. Information integration into transport logistics at the global level has been implemented according to international programmes. The formed excess information or system incompatibilities and duplication of work hinder business processes due to the need to process a lot of unnecessary data and to re-enter, additionally enter or check them. This task is just as important as the lack of information. Optimizing the flow of information to transport and logistics systems is possible through a new modelling of the information system, which is still being worked on in the field of research.

Information technology is very important in optimizing the operation of transport systems. Efficient use of information technology can improve the quality, safety, and efficiency of transport systems and increase their permeability, and reduce travel times without significant investment in new infrastructure. It can also help to use energy more rationally and reduce environmental pollution. Information technologies are used to make multimodal transport more efficient.

The development of multimodal transport requires to expand and integrate logistics centres in terms of various organizational forms and content. Using modern information technologies, logistics centres traditionally perform the following functions: reloading freight from one mode of transport to another, freight warehousing, customs operations, distribution of cargo in small consignments and delivery to their end recipients (Paulauskas, 1998, 2015). Information technology can improve the efficiency of all modes of transport and promote the sustainable use of services.

The problem of information in transport logistics is defined in the following directions:

- Analysis of information flows, which is dynamically exchanged with information on changes in the form of ownership in business, providing opportunities to compete in open transport services markets.
- Development of information and software equipment and systems to make decisions on business planning, activities of transport, freight forwarding and agent companies.
- Improvement of mobile communication systems in transport.
- Implementation of Internet technologies in organizations improving transport management processes.

17.5 Conclusions

Information technology is also becoming an integral part of the provision of transportation and its services (especially forwarding). Despite the fact that different modes of transport, companies and participants in the transport process use their own information technology, each country is characterized by the uniqueness of IT in this sector (e.g. Belgium: MORBIRIS, SERBRU, etc., Czech Republic–MOTION, etc.).

IT used in forwarding companies is more focused on process management solutions. Transport exchanges or freight and transport platforms such as Trans.eu, Cargo.lt, Ati.su, Lardi-trans.com, TimoCom, and so on are also applicable.

Despite the wide choice of IT, both the transportation process and the forwarding activity face a major problem due to the interoperability of these systems.

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