

Yuliya Tkachuk

LOGISTICS IN A TOURISM MARKET

Bachelor's Thesis
Business Logistics

April 2017



Author (authors) Yuliya Tkachuk	Degree Bachelor of Business Logistics	Time April 2017
Title of Thesis Logistics in a Tourism Market		47 pages
Commissioned by		
Supervisor Juhani Heikkinen, Senior Lecturer		
<p>Abstract</p> <p>The objective of the thesis was to analyze the role of the logistics concepts applied for the tourism market. The thesis covers methods and algorithms used for formation a tour package and building a route of the trip, means of transport used for transportation of tourists, information systems in a tourism logistics and sustainability aspect of a tourism logistics.</p> <p>For theoretical framework, a desk research method was used which included an analysis of service logistics, transportation, information systems, tourism related literature, reports and web-sources.</p> <p>The result of the research can be used for studying the logistics of tourism services as, in contradistinction to manufacturing sector, there is not much literature related to logistics in service-oriented businesses, particularly, in a tourism sector. Thus, the objective was achieved, although the investigation of implementation of logistics concepts on the example of a travel company or the organization of a tourist event would increase the applicability of the study.</p>		
<p>Keywords</p> <p>logistics, tourism, transportation, tour, tourist, route</p>		

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1. INTRODUCTION

Logistics is a vast and diversified field of business which can be external as well as internal and that it is why it is included in almost all companies' activities. Most people think that logistics only includes transportation of goods, but such a significant sphere of economics as services should not be left without attention.

As it is commonly known, the scope of services reaches 60-80% of the economy in highly developed countries. Consequently, we can not underestimate the service branch of logistics. As list of services is rather long, and therefore there are objective reasons for investigation the logistics of tourism service.

Tourism is a many-sided developed economy sector that plays an important role in the economy of particular countries. Tourism contributes, for example, to the development of means of transport and road construction, the exchange of people among countries and creation of new working places. In modern world, trips to other countries, both individual traveling and business, trips take a significant part of the people's lives. Thereby, the tourism market is growing fast.

In the thesis, the vast market is examined from the logistics' point of view which aims at the continuous optimization of material and information flow management, defining any kinds of peculiarities of these flows. (Kochadze T., Dangadze I., Zaqareishvili V, 2013, p.1).

Main objective

The main objective of this thesis is to analyze how logistics applies in the tourism market.

For achieving this objective, several sub-questions need to be considered:

- What is tourism from the logistics' point of view?
- What is the difference between productive goods and tourism services?
- Which components does tourism supply chain include?
- Which factors should be taken in consideration for demand forecasting?
- What role does logistics play in formation of a tour?

- Which transport means are used for tourist transportation?
- What is the information flow in tourism logistics?

Research methods

For theoretical framework, the most appropriate research method is a desk research which means an analysis of service logistics, transportation, tourism related literature, reports and other sources of data.

The result of the study could be used as a textbook on the logistics of tourism services, as not much attention is paid to the role of logistics in service-oriented businesses, and there are not much existing information particularly about logistics in tourism services.

2. TOURISM LOGISTICS

Much more attention is dedicated to the manufacturing industry in literature about logistics and supply chain than to the service sector. Tourism is not an exception: application of logistics in this industry is neglected and the situation doesn't change despite the rapid development of the industry.

Thereby, to analyze the role and application of logistics in tourism, the concept of tourism logistics should be defined. It is reasonable to start with logistics and tourism separately. Logistics is the science which investigates the flow of goods, services and related information flow starting from the point of origin at the suppliers and finishing with the point of consumption and post-service in order to fulfill customers' needs and requirements. (Ghani G., Laporte G., Musmanno R., 2013, p.1).

Revealing tourism, it is possible to consider it from different aspects. First of all, tourism is a sector of economy that includes a variety of activities, millions of people and tremendous sums of money (Sinclair M. T., Stabler M., 2002, p. 58). Secondly, tourism is a market of international service trade where a producer and a vendor is a tourist agency that sells tourist service to a tourist who takes the role of a customer or a consumer of a service.

In this way, tourism logistics is a discipline that studies the flow of tourist products based on the sales of a certain tourist resource and the tourist flow

consuming the product. The main aim is traditional which means meeting tourists' needs.

Logistics can't be discussed in isolation from the concept of a supply chain. As a supply chain is a network of an organization, suppliers and customers that is created in order to deliver goods for customers, a tourism supply chain (TSC) can be defined as an integration of business processes among tourism organizations supplying different components of tourist products that result in the consumption of the final tourist service at a particular tourism destination. (Song H., 2012, p.3-6).

A tourism supply chain is a complicated concept because of the nature of the product and its distribution. A tourist product has its own distinguished characteristics and, being a service, differs from productive goods. First of all, a tourist service is a complex product consisting of many components such as transportation, accommodation, entertainments, sightseeings, shopping, dining, health and safety issues and other facilities and services.

Secondly, the process of delivery differs. Goods are delivered either to a shop where a customer can buy them or directly to the customer. In case of tourist services, a tourist must first be delivered to a specific destination where he/she can consume a tourist product. (Figure 1).

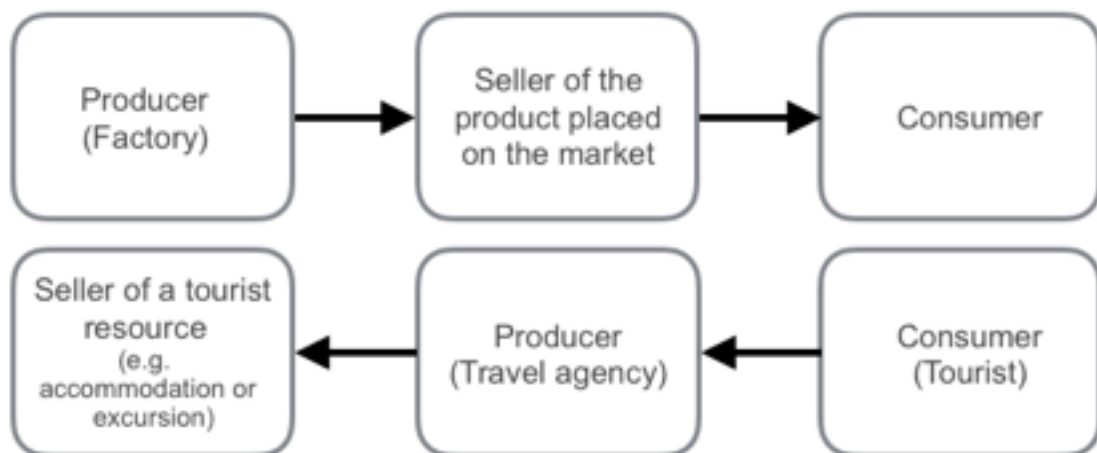


Figure 1. The difference between productive goods and tourism services

Thirdly, it's a quickly expiring and one-off product, which means it can't be stored for usage more than one time.

The fourth point is that describing a product is information dependent (Song H., 2012, p.6-7). Since a customer can't examine the features of the product

until he tries it, advertisement, feedback from other customers and other sources of product presentation and information about it play a great role.

The last characteristics are dynamics and variability of a tourist product as its components are changeable and highly variable depending on such factors as season and climate, popularity, economic and political situation.

2.1. Components of tourism supply chain

The main figure in a supply chain is the customer (tourist) who causes demand and whose needs effective supply chain management is trying to meet. In order to spend his/her holiday traveling, a tourist can address a travel agent or directly a tour operator that can be united or separate business institutions. A travel agent in this case takes the role of a retailer of the tourist product between a tourist and tour operator. The tour operator's function is purchasing different travel services and forming from them holiday packages, and they can provide tourists with advice about services and products at the destination as a part of post-sales service.

As it was already said, the tourist service is a complex product, and, consequently, for assembling a package tour for one trip, operator comprises a wide range of suppliers. A holiday package includes many components such as accommodation, transport and excursions, but also restaurants, bars, shopping mall and souvenir shops, hospitals in cases of emergency in destinations (Figure 2). In relation with all this, the tour operator enters into contractual relations with the first tier suppliers such as airlines, hotel operators and transfers operators. The direct suppliers in their turn contract the second tier suppliers that provide services for meeting their business needs, for example: airline leasing companies, food manufactures, furniture manufactures. With so many organizations involved, information exchange plays an essential role in effective supply chain functioning. (The supply of tourism, p.5-7).

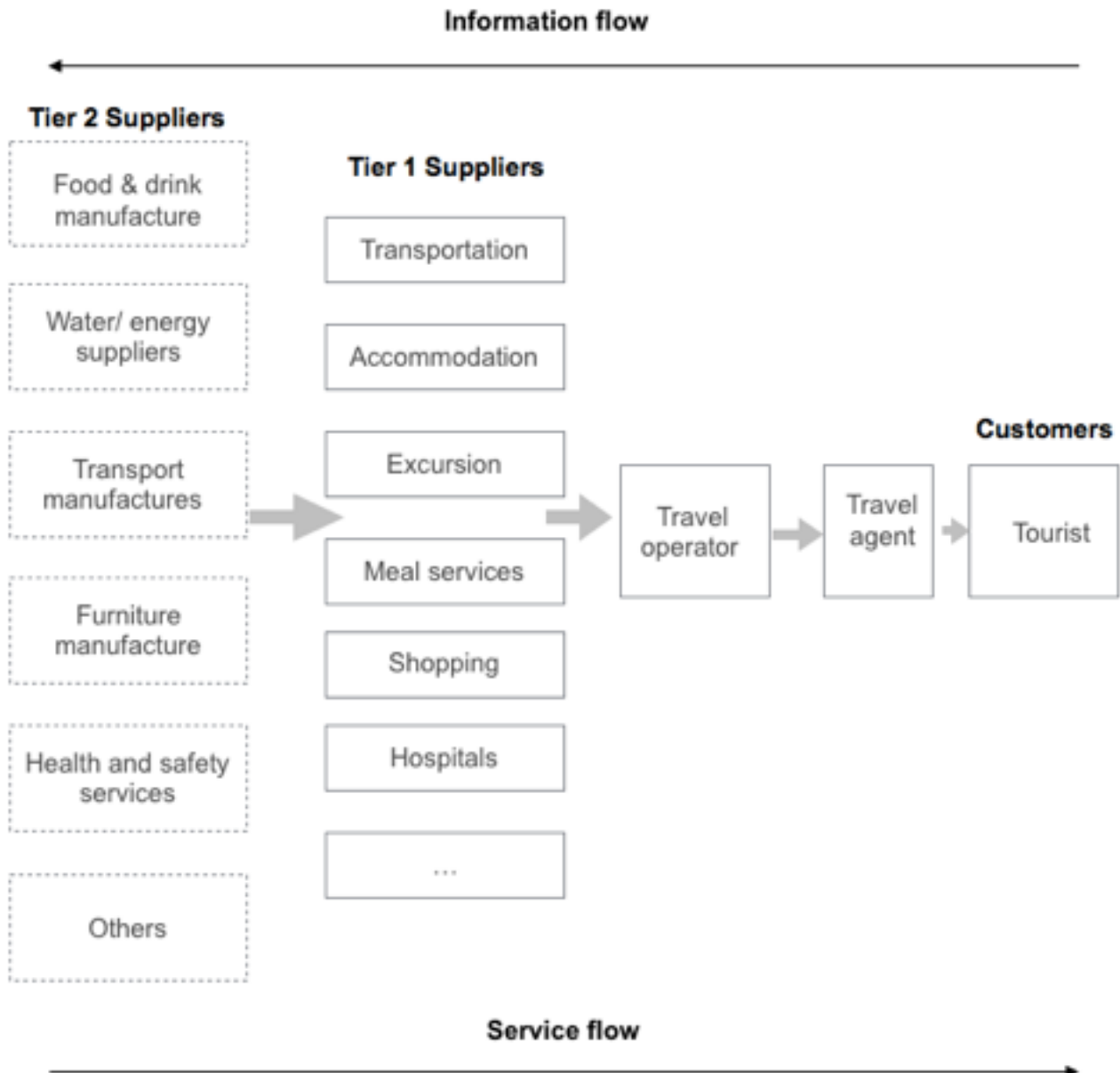


Figure 2. Classical tourism supply chain (Song H., 2012, p.20)

2.2. Logistics structure

Tourism logistics structure covers its component, regional and functional framework. The complexity of tourist product influences the component structure which includes:

- 1) logistics of recreation and tourism resources (the resource base of tourism);
- 2) logistics areas of tourist accommodation (hotel industry) and food (restaurant business);
- 3) information infrastructure (information logistics in tourism);
- 4) transportation infrastructure logistics;

- 5) logistics of excursion service;
- 6) logistics of related services in tourism;
- 7) logistics of production and marketing of tourism products.

Functional tourism logistics structure includes traditional components: supply logistics, and the logistics of production and marketing.

Logistics structure of regional tourism reflects the regional (geospatial) system of four levels: 1) the local (logistics of the tour); 2) micro (travel agencies logistics); 3) meso level (logistics of tourist resorts); 4) the macro level (logistics of the tourism industry of the country). It's important to distinguish the levels of logistics from the regional structure in order to define the objectives of each level. While the principles of logistics management in the travel agency assist in costs reduction and efficiency improvement, the implementation of logistic approaches to higher levels makes it possible to ensure the sustainable development of tourism business within a region or country. (Smirnov I.G., 2009).

2.3. Tourist flow

As tourism is a service that involves the movement of people from the place where demand emerges to the production and consumption zone, it is fair to regard the tourist flow as the main object of study in tourism logistics. It should be mentioned that there exist two types of tourist flows: regular that includes organized tourist groups and single tourist, and irregular that includes amateur or so called «wild» tourists. While the latter one causes difficulties in statistics, the former is an object of logistics.

Tourist flow means the constant arrival of tourists in a country or region. That is why it can be characterized with:

- total number of tourists (M)
- duration of stay of all tourists (number of tour days, to be more accurate overnight stays) (D)
- average duration of stay of one tourist(T)

The duration of stay of all tourists in a country or region for some period of time is calculated by multiplying the number of tourists that arrive in the country/region with the average duration of stay of each tourist:

$$D=M \times T$$

As it was said, tourist product is dynamic, changeable and dependent on many factors, and, consequently, illustrating the tourist flow, its irregularity cannot be left without attention. Tourist flow irregularity is expressed by

$$K_1 = \frac{T_{\max}}{T_{\min}} \times 100\%$$

$$K_2 = \frac{T_{\max}}{T_y} \times 100\%$$

$$K_3 = \frac{T_{\max}}{T_{am}} \times 100\%$$

$$T_{am} = \frac{T_y}{12}$$

irregularity coefficients which are calculated by the following formulas:

where K_1 , K_2 , K_3 - the irregularity coefficients of tourist flow,

T_{\max} is the number of tour days during the month with maximum tourist flow, man-days;

T_{\min} is the number of tour days during the month with minimum tourist flow, man-days;

T_y is the yearly number of tour days, man-days;

T_{am} is the average monthly number of tour days, man-days.

(Kochadze T., Dangadze I., Zaqareishvili V, 2013, pp.1-2).

3. LOGISTICS OF PLANNING TRIPS AND THE FORMATION OF A TOUR

At first sight, it seems clear why people travel. However, as the area is vast there is a diverse range of motivations and reasons stimulating people to become tourists, for instance: leisure time, business. It is evident that an accurate forecast of tourism demand is necessary for tourism-related companies in a decision-making process and essential to succeed on the market.

Tourism demand is defined as a measure of tourists' use of tourism services such as passenger transportation, visiting destinations and tourism expenditures. (Frechtling D., 2011).

There are three elements of tourism demand:

- *actual or effective demand* which consists of number of travelers and is counted in tourism statistics as amount of departures from countries and arrivals at destinations;
- *potential demand* which is the part of people who is unable to travel because of the circumstances in case of change of which the demand will turn to actual;
- *no demand* which contains population that is unable to travel because of the circumstances which cannot be changed or does not wish to travel. (Page S. J., 2011. pp. 56-59).

Among the main market factors affecting demand for tourism products as well as supply chain effectiveness are the following:

- consumers' requirements and their awareness about tourism possibilities;
- effective destination planning and further development;
- service development in the private sector;
- trends in the structure of the tourism sector;
- marketing;
- skilled human resources as in the sphere of services it is impossible to neglect experienced staff. (Horner S., Swarbrooke J., 2016. pp. 157-161).

The function of the demand for tourism product in the destination country i that is visited by tourists from country j looks like:

$$Q_{ij} = f(P_i, P_s, Y_j, T, A_{ij}, \varepsilon),$$

where Q_{ij} is the quantity of demanded tourism product in the destination i by tourists from the country j ;

P_i is the price of tourism in the country i ;

P_s is the price of tourism in substitute travel directions;

Y_j is the level of average income in the country j ;

T is tastes of consumers from the country j ;

A is advertisement expenses for tourism to country i in country j ;

ε is other factors that may influence volume of tourism demand. (Haiyan Song H., Witt S.F., 2011. pp.2-12).

The important aspect to take into consideration for tourism-related companies is such an inherent feature for the tourism industry as seasonality that, consequently, influences the demand. The Eurostat online publication «Tourism trips of Europeans» gives a clear picture of tourism demand in the European Union. The statistics is following:

- approximately one of four trips of EU residents was made in July and August: in 2014 «the number of trips in the peak month (August) was 2.5 times higher than the number of trips in the weakest month (January)»;
- seasonal issue is more important for planning long trips than short ones: 18 % of all long trips were made through 2014 year, while more than half of all long trips in the same year were made from June to September, during the warmest months that provide revenue due to resorts;
- Christmas time is a peak for traveling as well as summer months, moreover mentioned tourism seasons were more significant for domestic trips in 2014;
- business trips were circa 11 % of all trips made by EU residents in 2014. The proportion ranged from «nearly 8 million business trips in August to nearly 15 million business trips in September», which shows the difference between business trips and private trips distribution over the year when the first ones compensate the weak period of the last-mentioned ones. (Eurostat Statistics Explained, 2016).

According to Cambridge Dictionary, tour is «*a visit to a place or area, especially one during which you look around the place or area and learn about it*» (Cambridge Dictionary, 2017).

Specifying a tour in business, the definition changes. Tour is a main product offered by a tour operator and made as a finished traveling program according to the wishes of a customer. From the logistics point of view, tour can be defined as organized tourist traffic according to the preliminary route in waypoints of which tourist consume certain tourist services in conformity with a price of the tour.

There are many features according to which tour are divided into various types, for example:

- aim: vacation, family trip, business trip, studying, treatment, etc.;

- geographic feature: domestic, international;
- transportation type: hiking, sea transport, land transport, avia transportation, combined;
- seasonality: seasonal, year round;
- duration: weekend, short-term, mid-term, long-term.

Such variety assumes complex working-out process of the tour which includes

- 1) marketing research for defining the company's target market;
- 2) defining the tour operator's possibilities of development on a target market;
- 3) logistics of the tour route.

The last point is a compound stage consisting of recreation resource base, material resource base, transportation structure and information structure.

Tour route classification is directly connected with tour classification. The only difference is a form classification feature under which routes are divided into line, ring/circular, radial and combined types. Choosing a tour form is an essential part of designing a tour because it determines the sequence and way of visiting destinations by tourist traffic in a certain area planned by tour and transportation options used to reach these destinations.

Every tour route has its start and end points that are the waypoints where tourists receive the first and the last tourist service, respectively.

Line route is a way of tourist movement when the start and end points are situated at different geographical locations (Figure 3a).

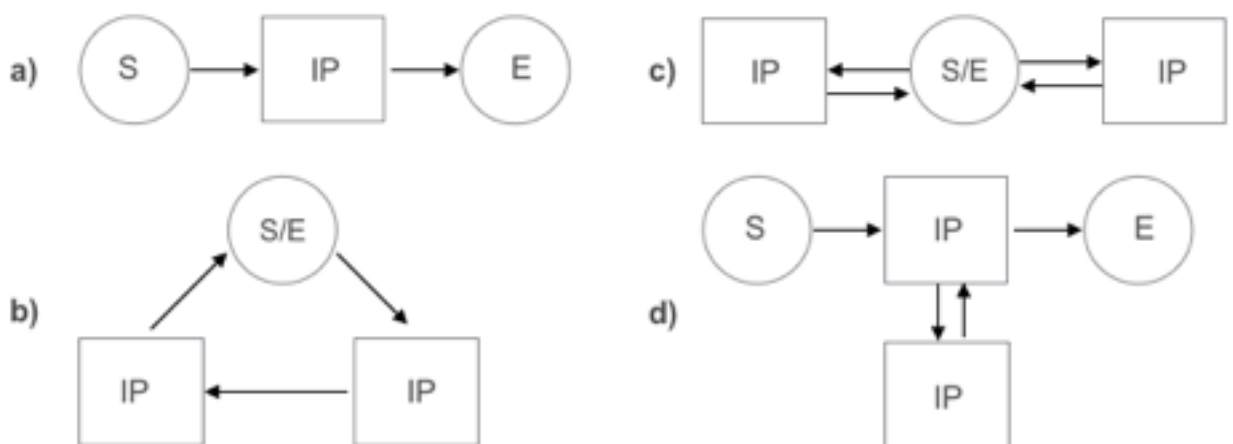


Figure 3. Route form classification. (S-start point, E-end point, IP-the intermediate point of the route)

Ring route originates and ends in the same geographical location (Figure 3b).

Balloon route takes place when the beginning and end of the trip are situated in one geographical location from which transit follows to the rest of the route where other services are provided (Figure 3c). (Sarkar P.K., Maitri V., Joshi G.J., 2015. pp.388-389).

The combined route is a way of tourist movement which includes the components of a line, ring and radial routes in various combinations (Figure 3d).

The building of the route starts with choosing the waypoints of the trip such as stops and places to visit which are added to the route according to the level of their attractiveness. An attractiveness for tourists reflects the socio-economic value of the place or object, possibility to provide various activities at the destination and transport accessibility. The index of destination attractiveness (IDA) of the object can be defined as a set of esthetic values and volume of information about the route point:

$$IDA=(E+V) \cdot K, \quad K=\frac{W \cdot N}{T \cdot t}$$

where IDA is index of destination attractiveness, E is esthetic value, V is the volume of information, K is the coefficient of attractiveness, W is tourists number visited the object, N is the number of days needed for analysis, T is the time when the object is available for visiting (min), t is time spent for visiting (min). (Krešić D., Prebežac D., 2011. pp.497-517).

According to attractiveness evaluation, the transport accessibility and hospitality level of the object and places to visit are chosen to be included in the tour route. They should be harmonized with the tour type and budget. The main criteria for choosing the start and end points are transport accessibility with the permanent residence of the tourist in the area where a certain travel company operates.

After the points of trip are chosen, the stage of building a scheme of the route starts. This stage is significantly influenced by transport which tour operator is able to provide, configuration of transport network, the technical condition of transport routes. The main rule for drawing up the route scheme is to cover as many objects as possible in order to provide the best level of informativeness

and entertainment and to reach the highest utility of a tourist product, minimizing traveling time between route points.

Most of the tours provided by tour operators are built as ring routes, for the optimization of which mathematical modeling is used.

Mathematical modeling with elements of a graph theory for the shortest path is the most commonly used method for solving vehicle routing problems. Simplified algorithms will be described below in the thesis.

There are start/end points and a network of nodes $N := \{1, \dots, N\}$ which represent the points of the tour that must be visited. Distances (l) between nodes are known and the aim is to find n paths l_1, l_2, \dots, l_n from a common point S/E to satisfy the following condition:

$$\sum_{k=1}^n l_k \rightarrow \min.$$

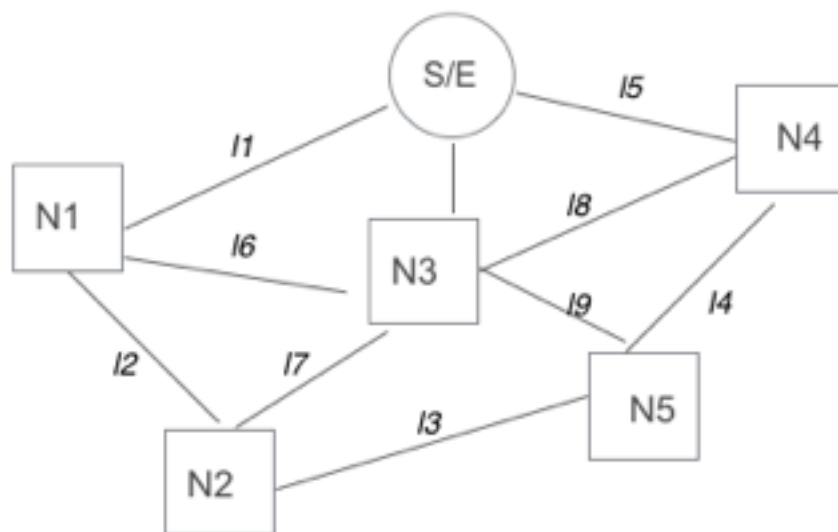


Figure 4. Sample of a scheme map with route point. (S/E-start/end point, N-node, l-distances between nodes)

In order to construct the route, the following next steps should be taken:

- a) selecting two points with the shortest distance between them;
- b) adding in each next step the next element with the smallest length, the connection of which does not form a closed loop. The shortest network of n items will be $(n - 1)$ paths.

If all the points of the route are united in short connective network, it forms a ring route. Formation of routes should be distant from the starting point. After

that, three nodes with the longest total distance, which are included in the original route, are chosen. Afterwards, the node with the longest total distance of those that are left is added to the route. In order to prioritize the sequence of route points visited by tourists, the last added node should be put between each pair of points of the original route. In each case, the increase of the route length is calculated by the formula:

$$\Delta l = l_2 + l_3 - l_1,$$

where Δl is the increase of the route length (km), l_1 is the distance between the 1st and the 2d points, l_2 is the distance between the 1st point and the last added point, l_3 is the distance from the added point to the 2nd point.

If the result $\Delta l = 0$ is obtained, calculation is stopped because in this case the point attached to the route is located in its original location. Then there is again the step of adding to the resulting route the next node with the longest total distance of those that remain. Calculations are continued until the route does not include all the points.

The advantage of this method is to perform a simple algorithm that can be used in practice, while the disadvantage is time-consuming calculations caused by a large number of points on the route. However, this disadvantage can be reduced by reference to the schematic map layout. In this case, some options become unacceptable without calculations. For the practical application of this method and the formation of a sequence of waypoints visited, it is recommended to make a matrix where the main diagonal includes the starting point and route points, and in the appropriate cells, the distances between them are given. (Pohjolainen S., Heilio M, and others, 2016. pp. 28-29.; Guze S., 2014).

When the route is build, it should be provided with a certain travel program consisting, for example, of objects to visit, places to eat and receive entertainment, accommodation stops for tourists. and suit the aim of the trip, budget and wishes of customers. Each trip program includes primary activities and support or additional activities. The last option is value-added services that is a highly used concept in logistics and supply chain management. Companies that aim to have a competitive advantage should provide added value to their customers.

As the tourism industry is complex and covers many sectors with numerous organizations contributing to the production of one tourism product, there is vast area to create value-added services and provide benefits for clients. For example, a customer can choose the class of the accommodation, visit additional excursions or rent a car. Both inbound and outbound logistics should be effectively managed in relation to suppliers and customers, and relationships between a organization and its suppliers should be properly coordinated in order to provide customers with a finish product of high quality from the value network perspective. (Oriade A., Cameron H., 2016. pp.5-6).

4. TRANSPORTATION

Transport is the core of logistics and all business activities. In the manufacturing sector, goods are delivered to the place of consumption via different means of transport. As it was already said before, the difference between the tourism and manufacturing industry is that consumers are transported to the destinations where they absorb tourist products and services. Besides, in comparison to manufacturing goods, tourists have to return back to the country of origin after a period of time, so there appears a two-way element of transportation. Indeed, the emergence of organized tourism as a separate sphere of human activity is conditioned by the emergence of transport. In addition, transportation of material is also involved in tourism operations. (Page S. J., 2011. p.80).

Nowadays, different types of transport are provided for the client. The train began to be used by tourists in the 1840s, and during the 20th century aircraft became popular among them. At that time, passengers were concerned only about the safety of the trip, when today's tourists expect a certain level of comfort and may pay extra for it. Though the customer is ready to pay for the comfort trip, he/she does not have interest to be included in the process of carrying the personal goods, only until he/she cannot find it on the luggage claim at the destination.

The transportation of materials includes the movement of food, equipment and supporting infrastructure for trains and aircraft. Operators have to consider the quantity of food required for one flight, store conditions before the trip and

storage of equipment for service and maintenance. (Oriade A., Cameron H., 2016. p.7).

Transport systems around the world have their own characteristics taking into account such factors as geographical location, natural resources, climate, landscape. Therefore, different countries have a different structure of the transport complex. For example, the flat countries primarily develop rail and road transport. Countries that have access to the seas and oceans use sea transport.

Currently, the transport system of the world covers six types of transport: road, rail, sea, river, air and pipeline. The first five means of transport are actively used in tourism.

Standard classification of modes of transport formulated by Statistics Division of Department of Economic and Social Affairs (2010. p.28) divides transport means into:

1. *«Air*

- 1.1. *Scheduled flight*
- 1.2. *Unscheduled flight*
- 1.3. *Private aircraft*
- 1.4. *Other modes of air transport*

2. *Water*

- 2.1. *Passenger line and ferry*
- 2.2. *Cruise ship*
- 2.3. *Yacht*
- 2.4. *Other modes of water transport*

3. *Land*

- 3.1. *Railway*
- 3.2. *Motor coach or bus and other public road transportation*
- 3.3. *Vehicle rental with driver*
 - 3.3.1. *Taxis, limousines and rental of private motor vehicles with driver*
 - 3.3.2. *Rental of man or animal drawn vehicles*
- 3.4. *Owned private vehicle (with capacity for up to 8 persons)*
- 3.5. *Rented vehicle without operator (with capacity for up to 8 persons)*
- 3.6. *Other modes of land transport: horseback, bicycle, motorcycle, etc*
- 3.7. *On foot.»*

Bus, aircraft and railway are the most popular means of transport for traveling and reach approximately 90% of the total volume. The percentage of the transport component in the price of tour varies from 20 to 60%. (Smirnov I.G., 2009).

4.1. The choice of the mode of transport and the company-carrier in the logistics of tourism

Selections of a transport mode and carrier are interrelated processes, as carrier selection follows after choosing the mode of transport. Nowadays, there is the alternative of outsourcing to a third party logistics company. (Meixell M.J., 2008. pp.183 - 211).

When planning a trip, the tourist takes into consideration such factors as the cost, the speed of arrival to the destination, the comfort of travel, the possibility of carrying luggage and its weight, the ability to stop while driving, the conditions for sleep/rest, safety. (Shahrin N., Puad. A., others, 2014. pp. 3-4). It is evident that the more positive characteristics the choice of transport has, the higher the cost will be. The ranking of transport modes in tourism logistics according to their characteristics is shown in Table 1.

Evaluation criteria	Mode of transport					
	Aircraft	Water transport		Land		
		River	Sea	Railway	Bus	Passenger car
Safety	7	7	5	6	4	5
Environmental safety	8	6	6	7	5	6
Transportation costs*	1	8	6	9	8	2
Operational rate	10	1	2	6	4	6
Mobility	5	1	1	1	8	10
Ability to stop during trip	1	2	1	1	8	10
Health support during trip	5	8	10	5	3	2

Evaluation criteria	Mode of transport					
	Aircraft	Water transport		Land		
		River	Sea	Railway	Bus	Passenger car
Capacity	7	7	10	6	4	1
Capital costs*	2	2	1	5	8	10
Comfort level	6	8	10	2	4	6
Frequency of departures	6	2	2	5	8	10
Reliability of compliance with the schedule	7	5	5	8	4	3
Total	65	57	59	61	68	71

***The lowest score correspond to the highest cost.**

Table 1. Ranking of transport modes in tourism logistics (Self-modified from Monczka R.M., Handfield R.B., others, 2010. p.425)

As seen from Figure 5, there is no vehicle able to satisfy all the requirements of a tourist and travel agency. For example, the high passenger capacity and comfort of sea transport contrast with its low mobility and speed of movement, while the high speed and passenger capacity provided by airplanes entail high tariffs.

The choice of mode of transport depends on defining the arrival time of tourists as well. It can be calculated through the operating speed of each mode of transport applying the following formulas:

1) Automobile transport:

$$T_a = t_{ie} + \frac{L}{V_o}$$

2) Railway transport:

$$T_{rw} = t_{ie} + \frac{L}{V_n} + t_{ad}$$

3) River transport:

$$T_r = t_0 + \frac{L}{V_n} + t_{ad}$$

4) Sea transport:

$$T_s = \frac{L}{V_c}; \quad V_c = \frac{L}{\left(\frac{L}{V_{od}} + 2 \cdot l \cdot \frac{D}{M} + t_{ad} \right)};$$

where T_a , T_{rw} , T_r , T_s - time of arrival of tourists by corresponding mode of transport, L - distance in km or miles;

T_{ie} is the time for initial-end operations;

V_n is the norm of run of the train or the boat per day;

t_{ad} is the time for additional operation for railway, river or sea transport;

V_o is the operational speed of the bus (km / h);

V_c is the commercial speed of the ship (miles / day);

V_{od} is the operational speed of the ship (miles / day);

l is the coefficient of load capacity utilization (%);

D is the tonnage of the vessel (tons);

M is the average daily norm of cargo works (ton / day);

T_0 is the time for the accumulation, formation and dispatch of goods (days)

In tourism T_{ie} , t_{ad} and T_0 is 0, as instead of cargo people are delivered.

(Smirnov I.G., 2009.).

According to Coronado J.M. (2013, pp.161-175), the efficiency of the chosen mode is measured by dividing the time at the destination (t) and the associated costs (C):

$$E = \frac{t}{C}.$$

After a mode of transport for comfort traveling has been chosen, there is the step of selecting a service provider. There exist several options such as public carries, contract carriers or private carrier.

Public or common carriers are common transport companies that offer their services on a regular basis with fixed rates influenced by market competition. Due to the competition, there are numerous variants to choose a carrier.

For travel agencies which arrange frequent tours, it is reasonable to select a contract carrier, as it is a company only offering transportation services based on a long-term contact. Besides, benefits such as negotiations about rates

and higher level of quality than the one provided by common carriers are included.

Private carriers are travel agencies which have their own transport fleet, therefore it is obvious that only large companies can afford them as there is need for high capital investment. The advantages of owning one's own vehicles are reliable service, control over material movements and effective cost management. (Monczka R.M., Handfield R.B., others, 2015. p.674)

According to a market economy, a travel agency which takes the role of the vendee of transport services does not have to cooperate with certain carriers. A travel agency can choose companies-carriers guided by the analyses of their performance based on criteria such as safety, the cost of transportation services, the speed of arrival of tourists, reliability, technical and service potentials. Other rank determinants include the willingness of the carrier to negotiate rate charges, financial stability, availability of special equipment, quality of service, availability of additional services, qualification of personnel, flexibility of route schemes. (Reji I., 2008. p.113).

The procedure for assessing carriers in order to select the appropriate one involves the following stages:

1. formation of a list of factors that should be taken into account when choosing a carrier;
2. determination of the significance and ranking of each factor, by calculating the weight of the factor, so that the sum of the factors is equal to 1 or 100%. Ranking is mostly performed by the method of expert assessments.
3. evaluation of carriers in terms of the identified factors on a 5-point scale, that shows level of satisfaction with the indicator provided by the carrier;
4. calculation of carrier ratings through multiplying the weight of the factor by the factor estimation.
5. summarization of the integrated ratings, the total rating is compared and according to the result, the most suitable carrier is chosen. (Carrier selection. Lecture notes for students' usage).

4.1. Air transportation in tourism

Air transport occupies a strong position in the world transport system. There are more than one thousand airlines and airports operating worldwide. In 2015, more than 3.4 billion people traveled by air. (Air transport, passengers carried, 2016).

Thus, in Finland, 20.1 million passengers traveled by air transport including domestic and international routes in 2015. (Statistics Finland, 2016).

The Finnish airport network of civil transport includes 20 airports providing scheduled flights. According to the Finnish state-owned corporation Finavia, the largest airport is Helsinki-Vantaa Airport, where the volume of passengers reaches 17.2 million of the overall volume of 20.8 million passengers in 2016 and Helsinki Airport provides 135 routes. In total, six of the airports are situated in Lapland. Leading carriers for domestic flights are Finnair, Nordic Regional Airlines and Norwegian Air Shuttle in Finland. (The largest companies by turnover in Finland in the industry Air transport, 2016).

Air service is divided into charter and scheduled operation, the former has subcategories as well. Charter airline services provide flights on a specific routes for tourists on the basis of contracts with third parties. The schedule of such airlines and tickets for the flight are not available for public. In contrast, scheduled air services provide published schedules according to which airline operates and tickets sale for the public. Scheduled full service airlines (FSA) offer international and intercontinental flights of two or three classes, i.e. economy, business and the first class. Tickets are sold directly to the public or through travel agencies. Examples of FSAs are British Airways, Lufthansa, United Airlines, Delta. The cabins of the economy class are only furnished by so called scheduled low cost airlines (LCAs) that are no-frill airlines. It means that there is no catering or entertainment included in the price of ticket. LCAs usually operate on domestic or short-haul international routes from secondary airports. Tickets are mostly sold via the Internet. Such airlines are, for example, Ryanair and Easyjet. The last type of scheduled airlines is all business class airlines which according to their name have business class cabins only. They operate on limited routes from Europe to the USA. (Inkson C., Minnaert L., 2012. p.110-111).

Since air transport system plays a significant role in the world transport system, there exists need for coordination and regulation by the states that are connected by international airlines. The states provide such links as well as international organizations in the field of air transport do, whose purpose is to ensure its effective functioning and security. Thereby, the regulation of air transport consists of:

- 1) national air law (licensing of air carriers operating both on domestic and international routes);
- 2) international law (tariffs for scheduled flights are established on the basis of mutual agreements between participating airlines with the mediation of the IATA, implementation of air traffic control practices adopted by ICAO). (Gleich R., Wald A., 2010. p.286-288).

International regulation is executed by the international aviation organizations ICAO and IATA. International Civil Aviation Organization (ICAO) is a specialized agency of the United Nations, which works with the Convention's 191 Member States to work out international civil aviation Standards and Recommended Practices (SARPs) for safe, efficient and sustainable civil aviation sector. (ICAO, 2017). International Air Transport Association (IATA) is a union of airlines representing 265 airlines or 83% of total air traffic. Functions executed by IATA are the coordination and unification of rules and procedures for airline operations and establishment of tariffs. Travel agencies operate in IATA in its wholly owned subsidiary IATAN - International Airlines Travel Agent Network. (IATA, 2017).

An integrated air transport system is a process of organizing airlines' resources, personnel and business operations and movement of passengers and cargoes in order to meet customers' and company's needs in a most efficient way. (Page S. J., 2011. pp.115). The logistics chain of the air transportation sector includes the organizational block (ICAO, IATA, state regulatory bodies), the production block (airports, aviation service enterprises, other airlines), the service provision unit (customs, transport enterprises, insurance organizations, banks) and a block for sales of air transport products (automated systems for selling and booking tickets, sales through travel companies, etc.). (Smirnov I.G., 2009). Passengers, airport personnel and

airline crews constitute another block of airport users. (Page S. J., 2011. pp. 119-123).

The sales of air transport products may be accomplished through the cooperation between travel agencies and airlines, which has several modes, such as:

- 1) tickets sale through airline agencies;
- 2) tickets sale through reservation systems;
- 3) quota of seats on regular airlines fixed by an agreement with an airline;
- 4) agency agreement allowing the sale of air tickets for its tourists;
- 5) organization of charter flights. (Smirnov I.G., 2009).

The logistics system of aviation sector is complex and starts when tourists enter the airport of departure and ends at the point of landing at the destination airport. Thus, the system covers preflight, flight and post flight services. (Page S. J., 2011. pp.115-123).

The first stage of the pre-flight tourist services is providing sufficient information about the possibilities of a particular airline such as the regularity of flights to desirable destinations, types of the airline's fleet, the benefits and discounts, the services provided on board in accordance with the booking class. Accordingly, the preflight service is responsible for convincing the potential passenger to become a client of a particular airline. After the formation of the route, i.e. choosing the most convenient flight and the date and time of departure and arrival, determining the class of service and the airport, and selecting the method of payment, the passenger receives a ticket which is the contract between the passenger and the carrier. After the client becomes a passenger, he is included in the logistic chain of passenger traffic. (Smirnov I.G., 2009).

The second part of the pre-flight service stands for the efficient management of passenger traffic and organization of registration. At this stage, the speed of check-in and passport control, efficient passage of customs clearance, quarantine control and other types of controls, luggage retrieval, availability of shops and entertainment services as well as a comfortable waiting area prior to boarding may influence a passenger's perception of the terminal. The presence of the mentioned attributes identifies customer-oriented performance

by creating passenger-friendly environment. Flight services include provision the arrival of customers to the airport of destination with the provision of flight safety, the appropriate comfort and service during the trip (Page S. J., 2011. pp.115-123). Post-flight service involves the provision of comfort at the destination airport. Furthermore, airlines which have entered into an alliance have collaboration partners, due to which the provision of additional services such as booking hotel rooms or ordering a taxi can be executed by airlines. (The supply of tourism, web. pp.14-15).

The criteria for assessing the level of interaction of the stages of the logistics chain of air transportation is the same as the main target of logistics, i.e. achievement of tourist satisfaction at the lowest costs.

4.2. Railway transportation in tourism

Historically, the railways took an active part in the development of tourism since the first tourist trip which was organized by the father of modern tourism Thomas Cook in 1841 was arranged by train (Norah J. and L., 2013).

Rail travel in tourism includes the transportation of tourists by regular trains and scenic trains.

Traveling by a regular train, tourists receive the rights of ordinary passengers; having bought a ticket, the tourist must comply with the rules for the carriage of passengers and baggage.

The second form provides traveling along alternative train routes with increased comfort ("hotel on wheels») (Personal, Social and Humanities Education Section Education Bureau. Wan Chai, 2013. p.103). An example of a "five-star hotel on wheels" is Blue Train in South Africa. It is one of the popular entertainments among wealthy tourists in South Africa. There are two Blue Train sets. The first one can accommodate 52 guests, while the second one is for 80 guests. Each cabin includes a big bed, shower, kitchen and there is a club in the train and different entertainment services. A daily trip costs approximately 3000 euros. (The Blue Train, 2017).

With the intensive development of road and air transport, the railway is losing leadership as the tourist choice of means of transport. For example, at a pan-

European level, air and car transport exceeds the volume of passenger kilometers travelled by railway by approximately 2–4 per cent per annum. However, the construction of high-speed railway has restored the competitiveness of this transport mode, although only 13 per cent of all European rail passengers are transported by high-speed rail services. Nowadays, within such European countries as Italy, France, Spain, Germany, Great Britain it is more convenient to travel between capitals and tourist centers by train than by buses or by plane (Page S. J., 2011. p.103-105). The organization of such trips involves signing an agreement between the travel agency and the corresponding railway. (Smirnov I.G., 2009).

4.3. Road transportation in tourism

Road transportation via automobile can be organized in several ways, the most popular of which are the organization of coach or bus trips and car rental.

First of all, there is a need to clarify the definitions of «bus» and «coach» services. Bus service can be defined as urban or rural passenger transport used by tourist for short distances at the destinations (Page S. J., 2011. p. 101). With the development of technologies, road traveling has become more comfortable and faster due to coach services. There are buses with a capacity up to 79 passengers, a sleeping place for the second driver, wi-fi, air-conditioning and other on-board facilities provided. Another advantage of the service is the cheaper price per passenger caused by increased capacity.

On a par with air transportation services, coach services are distinguished between scheduled and chartered ones, where scheduled coach services operate to published timetable with public available tickets on domestic and international routes, while chartered buses offer specific trips according to the contract with a third party (Inkson C., Minnaert L., 2012. p. 110).

In the course of time, the legislation and rules of international road transport have been moderated. Thus, Regulation (EC) No 1073/2009 of the European Parliament and of the Council of 21 October 2009 on common rules for access to the international market for coach and bus services simplifies «*the rules for the international carriage of passengers by road within the territory of*

the EU and the conditions under which non-resident carriers may operate national transport services within an EU country.» (Regulation No 1073/2009. October 2009).

Bus or coach services may be organized on an own bus of a travel agency or on a rented one. In order to determine the mode of the organization the the service, a graphical method known in logistics as «Make or Buy» can be used.

The graphics helps to compare the cost of renting a vehicle and the total costs of obtaining an own bus of a travel agency. The total costs consist of fixed costs (for example, administrative expenses) and variables (for example, fuel).

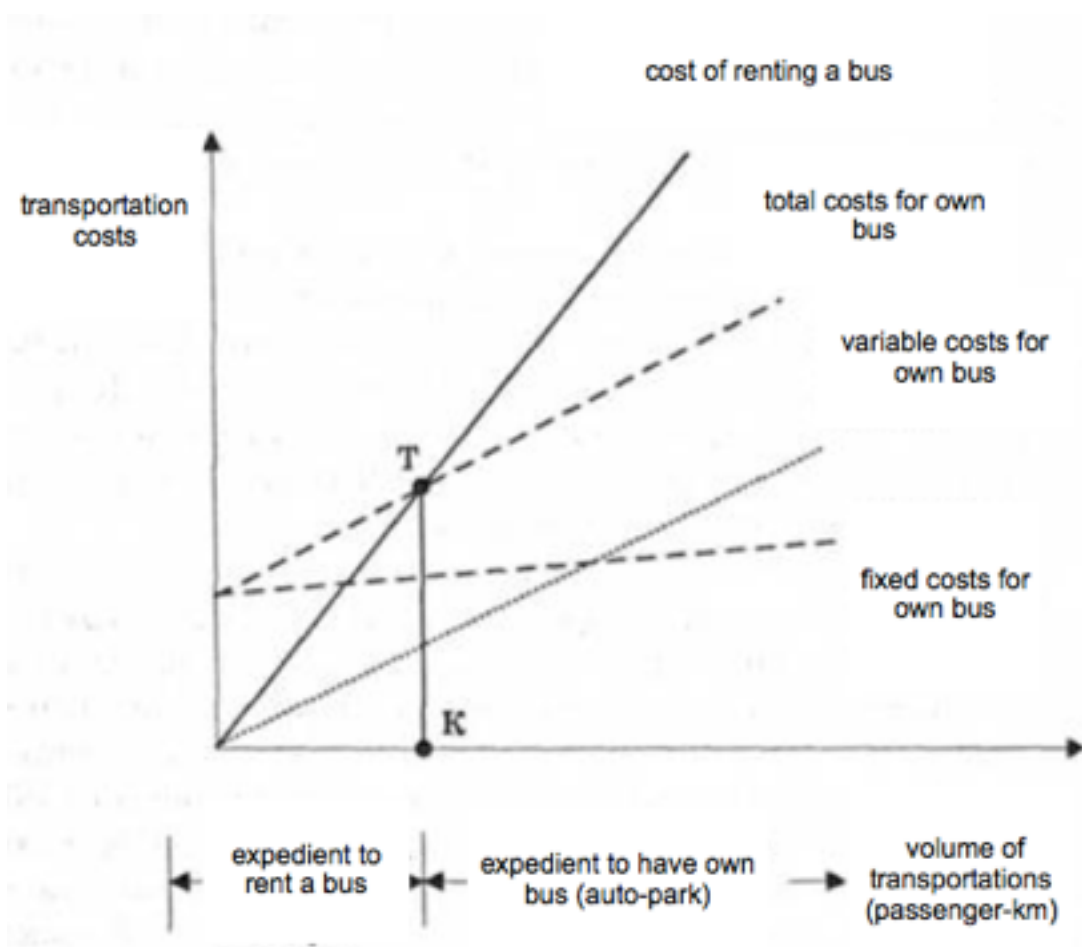


Figure 5. Expediency of renting or buying a bus

As seen from Figure 5, from the interjection of the line of renting cost and the line of total costs for own fleet, the projection on the horizontal axis (point K) can be built (point K). The point determines the limit of the utility of renting a bus, after which it is more profitable to have one's own car park. This option is expedient for large companies with high volumes of passengers and frequency of trips. (Smirnov I.G., 2009).

The dense worldwide road network has made tourist traveling more flexible. It has influenced the development of special kind of traveling, car rental service. The essence of the service is to satisfy a tourist's need to stay flexible at the destination area by hiring a car for temporary use. The choice of the location of the rental agency depends on the volume of tourists, that is why most agencies are located at the customers' arrival points such as airports, railway stations or sea and river terminals. Other segments of car rental companies are situated in cities or provide replacement of vehicles that are temporary repaired or serviced (Page S. J., 2011. p.94-97). Air travel is crucial for a car rental business as the revenues from airport taxes make up most of the total car rental. (Goeldner C.R., Ritchie B., 2012. p.113).

The leading car rental companies on the modern market are Hertz (USA), Europcar (Germany), Avis (Sweden), Alamo (USA) and Sixt (Germany). (Rental Cars, 2017).

4.4. Water-based transportation

Water-based transportation has developed in modes of crossing water on ferries and cruising.

Despite the fact that ships have been used for transportation since early times, the cruise industry as a tourism sector is rather new and constantly developing. Nowadays, according to Cruise Lines International Association (CLIA), it is the most dynamic branch of tourism with permanent increase in the volume of cruise lines' fleet and passengers involved.

The essence of cruising is to provide a tourist a resort trip by sea or river on board of a special equipped passenger vessel rather than transportation from one point to another (Goeldner C.R., Ritchie B., 2012. pp. 115-117). The most expensive cruising vessels are so called «floating cities» with accommodation for over 300 passengers, numerous restaurants, shops, cinemas, clubs, water pool, wi-fi and other facilities. Thereby, according to information given by various cruise lines, the basic cost of the cruise usually includes transportation by ship or ocean, ship accommodation in a cabin of the appropriate class, meals and entertainment onboard.

Cruises are divided by type into river and sea cruises. River cruising implies one day of traveling on smaller ships on local regular routes. River and lake cruises are in demand in countries and tourist regions, where navigable rivers and large lake systems, for example rivers of China, Egypt, Russia or Brazil. Special attention should be paid to water resources of Finland where there are 188,000 large and small lakes with 56 ports and harbours. The largest cruise line is named «Viking» which was founded in Helsinki in 1959. (Goeldner C.R., Ritchie B., 2012. p. 119).

Numerous types of sea/ocean cruises can be distinguished, including even so called "cruises to nowhere" or "nowhere voyages» which mean round voyage of two to three nights without calls at any port. (Types of cruises, s.a.).

The North America attracts the highest percentage, surpasses 55%, of the cruise passengers from all over the world. «*The leading destinations according to CLIA are: The Caribbean (37%), The Mediterranean (19%), Northern Europe (11%), Australia/New Zealand (6%), Alaska (5%), Asia (4%), South America (3%)*». (Westcott M., s.a.).

The world's largest cruise vessel is the liner "Freedom of the Seas", built in Finland at the request of the Norwegian-American cruise company Royal Caribbean International. (Plush H., 2016).

Leaders in the cruise industry are the corporations Carnival and Royal Caribbean (Statistics and facts on the Cruise Industry, 2016).

From 1 March 2015 to 31 December 2016, a project which was aimed at the creation of solid and profitable cruise business in Kotka - Hamina region and the enhancement of tourism awareness was implemented by Cursor Oy. The budget of the project was € 306,845. As a result, 15 companies joined the project in order to increase the number of visits of cruise ships in the region by 2020. (Cranston P., 2016).

Ports of Finland are becoming more popular for hosting marine events which attract tourism, for example, in July 2017 Kotka will be visited by participants of The Tall Ships Races 2017, although the port was included into the route of international regatta only in 1992 and 2007. (The Tall Ships Races Kotka 2017).

A more functional mode of water-based traveling are ferries which provide port-to-port transportation on domestic and international routes. Ferries can accommodate passengers as well as vehicles, cars and even trucks. (Inkson C., Minnaert L., 2012. p.110).

4.5. Intermodal transport

The same way as cargo transportation sometimes cannot be fulfilled with one mode of transport, the transportation of passengers requires transfers among several means of transport. Intermodal transportation is a transportation via the most appropriate modes of transport for each stage of trip with transfers among them. This means the transportation can be executed by several carriers. (Monczka R.M., Handfield R.B., others, 2015. p.673).

Air transportation has the main role in the overall structure of transport services since most tourists choose this type of transport especially for long-distance trips. Thus, bus and automobile transport is a local and intra-regional tourist transport. These modes of transport are used in tourism for transfers, excursions and other internal route transportations. Bus sightseeing tours with visiting several cities and memorable places have gained high popularity. The main competitor of buses is the railway. However, at long distances, road and rail transport cannot compete with air transport. Water transport is associated with a special type of tourism called cruising. It has advantages as high level of comfort, a high capacity as well as disadvantages such as low speed, high tariffs, low mobility or "sea sickness" for some tourists.

5. INFORMATION FLOW AND INFORMATION SYSTEMS IN TOURISM LOGISTICS

Today's world is constantly changing under the influence of information technology. Tourism industry is not an exception and two main trends of the industry may be mentioned:

1. generation of large tourist concerns which concentrate on all stages of production and marketing of tourist services;
2. development of e-commerce.

Information technologies play significant role in management of large concerns and the operative satisfaction of customer's needs. In order to cope with these tasks, the company's internal information system (intranet) and the Internet which unite the whole network of tourists, hotels, restaurants, transport, information and other companies, can help. The usage of such technologies makes business electronic. (Smirnov I.G., 2009.).

As nowadays all travel agencies are automatized, they should have in their disposition effective information technologies to succeed in the competition for customers in order to satisfy their needs at the lowest costs. From a logistics perspective, the usage of IT brings benefits such as reduction of distribution costs and time required to reach suppliers and clients directly and quickly, increased control over actual and potential customers. (Oriade A., Cameron H., 2016. pp.11-13).

Information plays important role in the performance of tourism operators, as at the time of purchase a tourist product is an information product. A tourist only buys a right for the avia ticket, room in a hotel or an excursion which will be used in the future. In addition, information is a tool to provide efficient service for the tourist by monitoring the tourist flow and the material and financial flows servicing the tourist flow. This can be reached by integrating all parts of the chain into a unified logistics information system that is a complex of organized and connected computers that control the movement of tourist, material and financial flows. It includes two subsystems: the functional system which solves the functional tasks of a travel agency, and the procuring system which provides the technical, information, material and program infrastructure. (Smirnov I.G., 2009).

The logistics information system of a typical tour operator contains a database, performs planning, coordination and customer service communication and provides control functions. A brief description of each of aspects is given below.

1. Database function includes control over external (customer bookings, inbound shipment) and internal (service process, management statistics) data.
2. Planning function is subdivided into
 - stock management

- demand forecasting
 - strategy planning
 - supply arrangement
3. Co-ordination functions are marketing planning and package scheduling.
 4. Customer service communication functions cover informing customers about a product, reservation and confirmation, giving travel advice, gaining feedbacks and complaints, etc.
 5. Control function aims to monitor the level of a customer service, retailer and system performances.

It goes without saying that each of the functions should be performed in an appropriate way as they influence customer satisfaction as well as the achievement of the company's targets. (Oriade A., Cameron H., 2016. pp. 11-13).

Similar to other systems, it consists of vertical integration that connects the tour operator with travel agencies and suppliers of the tourist service components and horizontal integration that connects tourist companies. (Smirnov I.G., 2009).

A tourism network includes numerous suppliers whose operations require enormous volume of information. For example, airlines handle flights, seat inventories, passengers, cargoes and luggage. In order to improve the processing of information, this data is transmitted through CRS or GDS. (Song. H., 2012. p.166).

«Computerized Reservation System (CRS): a computerized system containing information about, inter alia, air carriers' schedules, availability, fares and related services with or without facilities through which reservations can be made or tickets may be issued to the extent that some or all of these services are made available to subscribers», who use, under contract with a system vendor, a CRS for the sale of air transport products directly to individual members. (European Parliament. The Rights of Airline Passengers.).

Thus, CRSs were pioneered by airlines and since the mid 1980s they have been extended into global distribution systems (GDSs) by expanding the geographical scope and integrating horizontally with other airline systems. Due to vertical integration with accommodation, train and ferry tickets,

entertainment services and others, modern global distribution systems offer users hotel booking, car rental, airline tickets, railway and bus reservations, various activities and tours. (Buhalis D., Jun S.H., 2011. p.6.). With the help of the historical records, demand forecasts and market situation which can be examined by dint of GDS, suppliers may be able to regulate their prices and capacities (Song. H., 2012. pp.167-168). The structure of the GDS is introduced in Figure 6.

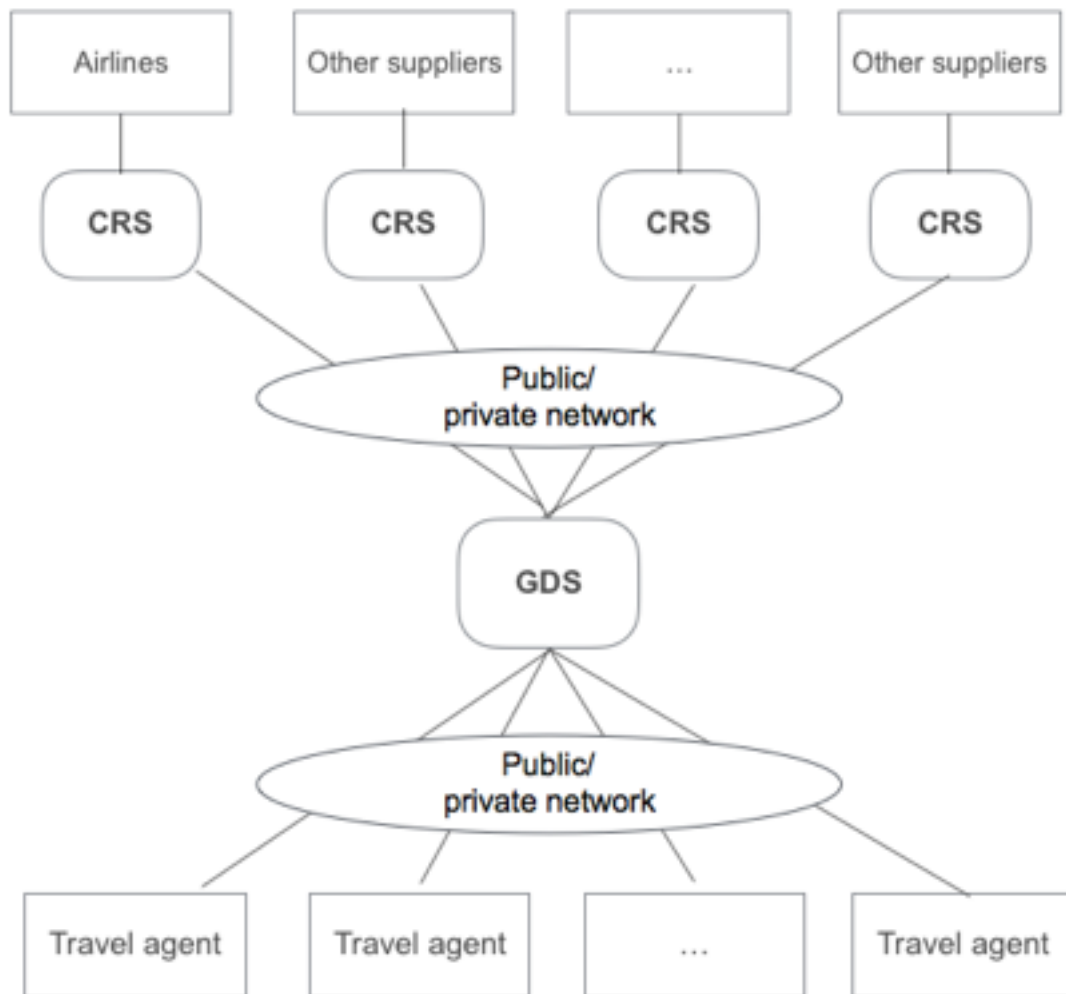


Figure 6. Structure of GDS (Buhalis D., Jun S.H., 2011. p.6.)

Nowadays, Sabre, Galileo, Amadeus and Worldspan are the leaders among GDSs.

In 1987, a global distribution system «Amadeus» was set up by Air France, Iberia, Lufthansa and SAS. Its products and solutions allow to make traveling easier and quicker by providing search, pricing, booking, ticketing and other processing services in real-time. Its customers are located in more than 190 countries and include the whole range of operators in the tourism industry:

travel agencies, airlines and cruise and ferry lines, airport and rail operators, car rental companies, tour operators and insurance provider groups.

According to the statistics given on Amadeus website, over 124 of the world's leading airlines use the Amadeus e-Commerce Airline Suite in more than 110 markets.

The company upholds the innovative way of development and in 2014 and 2015 Amadeus was recognized as the leader in R&D in the field of travel and tourism in the EU. Amadeus offers the mobile app «CheckMyTrip» that is a trip manager allowing users to check their reservations. (Amadeus, 2017).

Galileo was formed in 1987 by British Airways, KLM Royal Dutch Airlines, Swissair and nowadays is owned by Travelport. Today, it is one of the major reservation systems which provides the flight schedule, availability of seats and tariff information and allows the booking of flights, hotels, cruises, car rental and railway tickets and offers the travel services of the world's largest tour operators. Its network covers 540 airlines, 48,000 hotels, 368 transport companies, 9 cruise corporations and 50 auto rental companies. (Garrison W.L., Levinson D.M., 2014. p.269).

The solutions and products offered by Travelport are numerous, for example CETS, a platform developed in Austria that provides access to the tourist packages of the largest European tourist companies as long as the travel agency signs a contract with Galileo to use this service, Travelport ViewTrip that is the public site for viewing reservations made through Galileo computer reservations system and Smartpoint, a system allowing to determine the most relevant travel offers while searching flights or booking hotels and increases the productivity of travel agents' work. (Travelport, 2017).

5.1. Aviation sector

Information technologies are used by airlines at all stages of organizing a trip and ensure the efficient performance of airlines.

The core of the aviation IT system is airline reservation systems that have been already mentioned above. The application is essential for any airline nowadays as it performs the following functions:

- provides passenger and intermediaries with flight schedule and seat availability for a particular route;
- provides connections with airline's website, GDSs, mobile apps, travel agencies, etc.;
- includes Fare Control System that contain fare quotes and rules upon booking deadlines, period of stay, stops-off, etc. in conformity with cabin class;
- accommodates information about passengers in a passenger name record (PNR), which contains passenger's name, contacts, payments details, a record locator required for operational procedures and service requests like preferable seats, choice of meal on-board, etc.;
- provides ticketing, including e-tickets.

In 2008, IATA obliged all airlines that joined the Association to provide for the passenger electronic tickets, or e-tickets which allow them to check-in online or to receive boarding pass at the airport (Benckendorff P., Sheldon P., Fesenmaier D., 2014. pp. 178-182).

For establishing schedules and control, Decision Support Systems (DSSs) based on Operations Research are implemented for fleet management, crew scheduling, revenue management and flight operations.

Fleet management consists of fleet procurement depending on the operating costs, profitability of different types of aircraft and passenger preferences, fleet allocation on the routes in order to maximize profits and customers' satisfaction and establishing and monitoring maintenance schedule for each aircraft.

Fleet management is connected to the flight scheduling system which is responsible for planning routes according to the desired level of profitability, terminal facilities and airport restrictions, alliance partners' flights, contingencies, human resources and passenger demand maximizing revenue and minimizing costs per available seat mile.

There are no flights without a crew which helps to provide a high level of service and safety for passengers. A pairing optimizer is an application for the allocation of crew members to a particular flight schedule depending on preferred routes, base city.

The target of the revenue management is to maximize profit from sold seats that can be executed by using price differentiation and yield management.

Price differentiation means that seats on the same flight are sold with different prices and features. Yield management involves determining the number of seats to be sold for each fare class calculated by Revenue Management Systems (RMSs). Booking limits for future demand are defined in order to guarantee the highest possible revenue for each seat.

Airlines implement flight operations systems as well, among which there are flight catering systems for ordering, storing and delivering meals on-board, radio frequency identification (RFID) chips for tracking and reducing losses and Safety Management Systems to monitor and manage food safety, malfunctions, fluid leaks and other incidents.

Departure Control Systems (DCS) are crucial in the management of the passenger flow. It regulates the check-in that can be made by an airline representative, in del-service kiosks or through mobile or online services, identifies passengers and allocates them to their seats and issues boarding passes, checks luggage and inspects the aircraft. The majority of North American airlines use DCSs while European and Asian use applications provided by Amadeus, Travelport or SITA. (Benckendorff P., Sheldon P., Fesenmaier D., 2014. pp. 187-188). For tracking baggage and reducing losses of passengers' luggage which cost the aviation sector approximately € 2.6 billion a year, baggage handling systems were created as a result of airlines and airports collaboration. (Benckendorff P., Sheldon P., Fesenmaier D., 2014. p.198).

IT tools for the calculations of the required amount of fuel, the flight distance, weather conditions, prediction of arrival and departure times, determination of delays or cancelling of the flights and other tasks are used by an airline dispatcher for planning and controlling the flight (Benckendorff P., Sheldon P., Fesenmaier D., 2014. p.189).

Information technologies are used by airlines and airports in order to control and reduce environmental impacts, for example air and water samples or energy usage are analyzed by various IT tools that switch off unusable at the moment systems and computerized spraying systems are used to reduce pollution of waterways (Benckendorff P., Sheldon P., Fesenmaier D., 2014. p. 200).

5.2. Road transport technologies

As the traffic volume is constantly increasing and traffic congestions occur on roads all over the world, there emerges a strong necessity in a system allowing to plan efficient, safe and sustainable trips. Intelligent Transportation Systems (ITSs) are implemented for achieving this objective and include a complex of technologies which improve the transport performance on the road by informing drivers about detected dangers and traffic situation, connecting vehicles to supportive infrastructure or suggesting routes. (Benckendorff P., Sheldon P., Fesenmaier D., 2014. p.208).

For detecting the location of the vehicle, Automated Vehicle Location (AVL) technology is applied.

5.3. Vehicle rental companies

Vehicle rental companies implement reservation systems allowing customers to choose the type of the vehicle, price range, pick-up and drop-off locations and times, and allowing companies to analyze the demand, availability and market trends. The systems are offered by multiple providers for a monthly fee. A system which is used only by a company's personnel but not customers is vehicle control system. By implementing bar codes, each vehicle is identified, and the information about the type, capacity, mileage records, rate and other details is stored. The vehicle control system provides features for ordering fleet, tracking movement and performing maintenance. (Benckendorff P., Sheldon P., Fesenmaier D., 2014. pp. 215-217).

5.4. Rail transport

Computer reservation systems are used also by rail companies to provide passengers with trip information and schedules and to allow them to choose and book seats. Some companies have joined GDSs and provide their services for travel agencies who take the role of intermediaries. Cross-border rail ticketing has appeared recently since international rail companies link their

CRSs, for example in Europe. (Benckendorff P., Sheldon P., Fesenmaier D., 2014. p.219).

5.5. Water transport

The reservation systems are also used in water-based transportation by cruise lines and ferries. However, the difference from other modes of transport is that some types of ferries provide passengers' vehicle transportation as well, which requires a reservation system not only for people but also for vehicles. The information about the length, weight and type of the vehicle has to be stored to provide space on the deck. Although reservations can be made by online portals such as Travelocity or Expedia, only 10% of bookings are made online. More than 40 cruise companies including Royal Caribbean Cruise Lines or Azamara Club Cruises are connected with travel agencies via CruiseMatch booking system.

Royal Caribbean International provides their customers with an application for a quick search of the needed ship in the port. This application is called Wayfinder. As there are restaurants, shops, clubs and other facilities on board, inventory control systems of the range of products are installed.

For navigation, global navigation systems and GPS technology are implemented on the vessel. As far as cruises imply multi-day stay in the ocean, the Global Maritime Distress and Safety Systems are implemented to provide online medical assistance in case of an emergency, to accelerate search and rescue of the ship in case of malfunctions or shipwreck. (Benckendorff P., Sheldon P., Fesenmaier D., 2014. pp. 219-221).

Constantly emerging new technologies are causing revolution in the the processing of information and logistics operations supply chain management. As the speed of data collection is high and customer reviews via the Internet are instantaneous, tour operators have to continually engage with new technologies to win on the full of competitors on the market. (Oriade A., Cameron H., 2016. pp.11-13).

6. SUSTAINABILITY

In order to contribute to the high level of tourism management and tourists satisfaction, the formation of the route and the way of reaching destinations should be competently planned at all levels. A tour operator should take into consideration that without good planning development of tourism can result in environmental and social problems in highly popular areas. (Chai W., 2013. pp. 191-192).

Tourism plays significant role and can be seen as an alternative economic means of development in countries such as Spain, Thailand or Italy. Thereby, tourism acts a resource of motivation and money for the preservation and maintenance of natural monuments, archaeological sites. for both tourists' and local residents' satisfaction. Being attractive for tourists and having economical support provided by them, some areas are not brought to industrial development. (Chai W., 2013. pp. 191-193).

At the same time, there are large tourist flows and enormous transport volumes going side by side with tourism and affecting the environment by causing all kind of pollution such as air, water, soil, noise pollution and disrupting vegetation and wildlife one way or another.

Sustainable tourism is a concept according to which business performance aims at the reduction of environmental impacts, improvement of social development and harmonization between environmental conservation and local economies. This concept is broad and is being achieved by various means nowadays. A similar but narrower concept is ecotourism gaining popularity in the last decade.

International Ecotourism Society (TIES) suggests the following definition of ecotourism: "Responsible travel to natural areas that conserves the environment, sustains the well-being of the local people, and involves interpretation and education». (What is the difference between green, eco-, and sustainable tourism, 2016).

Transport is an inseparable component of tourism that allows to connect regions of one country, different countries, attractions and various services at destinations. Consequently, the growth of the number of vehicles and changes in transport infrastructure directly depend on the increasing number of

travelers that is forecasted to rise to 1.5 billion per year by 2020. Making long distance transportation of tourists sustainable is a rather challenging issue, if not to consider technology development and national policies and restrictions about environmental pollutions. However, the environmental impact can be reduced by promoting sustainable transport solutions such as cycling, mountain cycling and hiking that are gaining popularity in a list of countries. For example, 5 million Germans chose cycling holidays in 2014. It goes without saying that the promotion of these forms of tourism requires appropriate infrastructure (Dupeyras A., Eggler M., Glaesser D., McKellar A. and others., 2015).

In order to provide sustainable business development, companies turn to different methods of green logistics including reverse logistics. According to Business Dictionary, reverse logistics is a *«flow of surplus or unwanted material, goods, or equipment back to the firm, through its logistics chain, for reuse, recycling, or disposal»* (Business Dictionary, 2017).

The tourism industry is not an exception in implementing reverse logistics and being a service industry has its specialities related to this rather new trend. Reverse flows in tourism consists of tangible and intangible flows. The former includes products returns (returns of food and drinks, accommodation complaints), waste (packaging, water and sewage), re-usable service components such as bedclothes or tablecloths, returnable packages such as bottles, customer «returns» in the form of loyal customers and financial flow as revenue. The latter is not less important in the concept of reverse logistics. There are feedback with information about a company's performance such as complaints about meal or service, customer reviews and satisfaction/dissatisfaction feedback, customers' suggestions and recommendations about service design. The peculiarity of tourism in reverse logistics in comparison with manufacturing industries that should be noticed is the short time lag of the formation of a reverse flow which occurs almost immediately after a service is provided. (Škapa R., 2014. pp.135-155).

Social sustainability can be described as an ability of a society to receive inputs such as new people with their own behavior and traditions without creation social disharmony (Mowforth M. and Munt I., 2016. pp.104-112).

7. CONCLUSION

The main objective of the thesis was to investigate the application of logistics concepts in the tourism market which relates to the service sphere. For this reason, firstly, the difference between services and productive goods was defined in order to further study the role of logistics in delivering tourist products to customers. The thesis provides information about the methods and criteria used for planning a trip and building a route, means of transport used for delivering tourists to the place of consumption of the service and information systems applicable to them and sustainability aspect of tourism logistics.

In this way, the main feature of a tourist product that was found. Unlike manufactured items that are delivered to a customer, in respect to a tourist product, a customer is transported to the place where the service is created. Thus, the logistics of tourism resembles cargo transportation, and the logistics concepts of effective transportation of tourists can be applied for the delivery of cargo, and vice versa.

The other distinguishing features are complexity and seasonality. In order to create a tour package, the aims of the trip, tourism demand, attractiveness of places, availability of transport and roads in the region are defined, and contracts for the transport, accommodation, food and health service suppliers are made by tour operators. From the whole variety of transportation modes, only pipe transportation is not implemented in a tourism sphere. This means tour operators provide the possibility to travel by air, road, railway or water-based transport among which air transportation is the most popular, especially for long distances. In the era of information society, it is crucial to stay up to date and use the latest informational system which noticeably simplify the performance of companies. Global distribution systems are used for providing schedules and prices, booking seats on planes or trains, reserving entertainment services and rooms in hotels and renting cars. Other information systems are applied for a particular transportation sector. Sustainability concepts are implemented in the tourism market through the application of reverse logistics.

Thus, the objectives of the thesis were achieved, and the provided theory can be used for studying logistics in the service sphere, especially because there

is little professional literature on the topic of tourism logistics. However, the application of the theoretical framework mentioned in this study on the example of a travel company or the organization of a tourist event would greatly improve the understanding of the topic and increase the applicability of the thesis.

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