THE SMART OPTIMIZATION AND AUTOMATION FOR SUPPLY CHAIN MANAGEMENT IN LOGISTICAL INDUSTRY USING SUPPLY CHAIN DEEP LEARNING MODEL

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Abstract

In general, tasks such as optimizing the loading of transport units and transport routes, online tracking of goods throughout the entire journey require processing speed, high accuracy and consistency in supply chains. Only modern innovative ICTs make it possible to carry out tasks of this scale. Nowadays, there are many box solutions that allow you to reduce the delivery time of goods and the associated costs, optimally plan and monitor the movement of goods. Such solutions exist for all types of transport, but especially this area has been widely developed in motor transport with the introduction of GPS navigation, which allows you to monitor the location of each transport unit in real time. In this paper, the smart optimization and automation for supply chain management was proposed using deep learning model. Due to the standards prevailing in various transport sectors, logistics work is relevant in the area where docking occurs in the transport of goods between different modes of transport. Modern innovations in the form of GPS tracking, virtual distributed computing or cloud computing and Internet services make it possible to implement modern logistics tasks.

Keywords:

Optimization, Loading, Transport, Routes, Online, Tracking, Journey, Processing, Speed, Accuracy, Consistency, Supply Chain

1. INTRODUCTION

Information technology is particularly important in passenger transport and in the transportation of goods abroad. Only a free transport corridor ensures timely delivery of goods and is the key to increasing the competitiveness of companies. The creation of a single transport system, an open information space based on the Internet, common standards for information processing and exchange are the basis for global integration in the field of transport logistics [1]. Transport logistics is no longer seen without specialized web services that allow you to design delivery channels for goods and supply chains, prototypes of virtual forwarding services, and transport route planners that allow you to create interactive routes. Web video windows enable shippers to monitor conditions at border areas, reloading points, and control traffic on demand. TEDIM is an international logistics and telemetric program and is widely implemented [2].

Within the framework of the project, it is planned to implement a unified automatic control system for the transport complex, which will allow the integration of information from all sectors of related to the transport of people and goods. Implementation of electronic document management between departments and organizations of the Ministry of Transport was seen as an important process. In line with the overall strategy, all transport departments have been developing information and communication development programs over the years. The server has high performance and fault tolerance [3]. High performance is ensured by embedded resources, a 20-core Intel Xeon scalable processor and 768 GB of RAM. In addition, the system has support for USB adapters, which allows data transfer at high speed, thus saving time. The server offers a more affordable alternative to traditional offerings for growing businesses and branch offices without sacrificing performance. For more intensive workloads, this system supports up to 3TB of internal storage [4].

Information in transportation continues to grow. Software products and hardware are being improved, new technologies are being introduced, and the Internet is being used more and more intensively. Electronic commerce (e-commerce), internet technologies, automated control based on modern technical and software tools have opened up new opportunities for improving the economy of transport and logistics systems. This is largely facilitated by modern telecommunication systems and, firstly, a mobile communication system based on the GSM (Global System for Mobile Communication) standard [5]. Most important for automation in all modes of transport is the Global Positioning System (GPS) of vehicles based on satellite communications. To a large extent, automation and information in transportation has been facilitated by new radio frequency identification technologies using transponders and advancements in the field of identification of goods and carriers based on barcodes.

2. RELATED WORKS

The Convenient interfaces are provided to communicate with logistics and resources. The development of logistics in recent years is associated with the use of information technology and the emergence of electronic business technology (e-business). It specializes in the development of e-commerce technology and software based technologies. In particular, the company develops and provides software for the automated management of material and financial resources of industrial enterprises [6]. Some software packages can be effectively used to optimize and manage the procurement of raw materials and logistics related items of the companies. Concepts and Solutions is known for its conceptual developments in the field of IT in industry, transportation and logistics [7]. Based on a thorough study of the local characteristics of the company, the company develops a conceptual approach to choosing an information option and ensures the development, implementation and maintenance of the system. Convenient interfaces connect new software products to already implemented SAP software packages, etc. The success of automation of various logistics systems depends on the collection, processing and transfer of data using modern hardware and software [8]. Mobile and portable terminals and software are used in warehouses and industrial enterprises, providing automated management of reliable data needed to make the right management decisions. LANs are created based on the use of radio communication for

data transmission. A significant amount of work is being done in the field of identification systems for goods, carriers and vehicles [9]. Transportation costs, especially international, can be significantly reduced by proper selection of transportation and route, taking into account the characteristics of transit countries and regions. Modern computer technologies have come to the aid of logistics managers in solving these problems. Motor transport companies and ECMTs that have acquired or acquired permits have not been able to enable efficient use of the fleet [10]. The gaps, apart from technology, were linked to drivers who could not be on business trips continuously for 5-6 months and began to leave in droves. Due to lack of qualified drivers, many vehicles are idle. Thus, the need to create remote offices is linked to the need to replace vehicle fleets [11].

3. PROPOSED MODEL

The use of driverless trucks and robot carts provide flexible automation of assembly and disassembly and other types of work. Honeywell developed robotic vehicles with two-zone laser navigation and a traffic safety system to produce gasoline four-cylinder engines for passenger cars at the Opel plant. Robot cars provide flexible automation of motor assembly, navigation system provides reliable overview of carts path within 10m radius. It runs without drivers. Such trolleys and robotic carts are equipped with modern simple navigation systems that operate with high levels of reliability and safety. Also provides comprehensive logistics services to the car plant. The warehouse of the logistics company is located 10 km from the company. Between the company and the warehouse, 240 road trips are made daily to ensure the delivery of packaged goods. Transportation is arranged on a just in time basis. This is facilitated by a specially developed automatic loading and unloading system. For unloading, the warehouse provides 14 unloading stations from which further transportation of goods is carried out by belt conveyors with automatic control. The introduction of the system allowed the company to increase its productivity by 50%. The proposed logistical management was demonstrated the Fig.1.

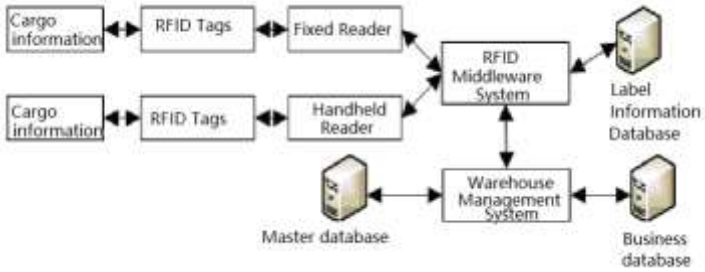

Fig.1. Proposed logistical management

It is used to transport goods on pallets between production and the newly built warehouse, with the participation of co-managers. The car body is made of sheet steel and can accommodate 14 pallets with cargo, loading and unloading of which is carried out automatically by an integrated roller conveyor. Cars operate without drivers. They are equipped with a laser navigation system, a safety bumper and a scanning device to detect obstacles in motion. The annual volume of cargo transportation is 120 thousand tons. Provides an automated system to ensure the safety of cranes and prevent collision situations in the construction industry. The system is based on the use of the Navigator 2000 on-board computer, special sensors and radar. The on-board computer can be connected to the company's control computer with the ability to control its operation in real-time (on-line) via the Internet. The RWV-RF series offers built-in scales for forklift equipment with a load capacity of up to 5 tons, with an accuracy of 0.1% determining the mass of materials. Radio communication is used to transfer data from weight sensors to an on-board unit with a display. Toad, net weight and gross weight can be defined.

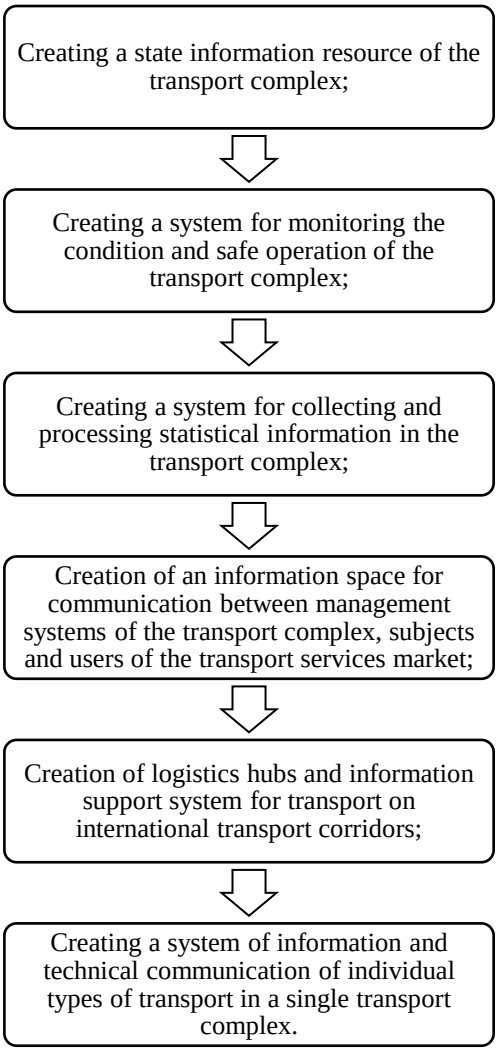

Fig.2. flow of the proposed model

This was shown in the Fig.2

- Optimizing and creating a state information resource of the transport complex;
- Creating a system for monitoring the condition and safe operation of the transport complex;
- Creating a system for collecting and processing statistical information in the transport complex;
- Creation of an information space for communication between management systems of the transport complex, subjects and users of the transport services market;
- Creation of logistics hubs and information support system for transport on international transport corridors;

- Creating a system of information and technical communication of individual types of transport in a single transport complex.

The scales are equipped with a battery that has a battery life of up to 30 hours without charging. The use of built-in scales significantly increases the productivity of forklifts, as it eliminates special runs on scales for weighing materials. Many interesting technological solutions have been adopted in the design and construction of new automated warehouses and container terminals. In the automatic metal-roll warehouse, an automatic overhead crane operates with an automatic positioning accuracy of up to 3 mm. The lifting capacity of the crane is 13 tons. The positioning system works reliably over the entire length of the warehouse, which is 170 m. The ASC system provides optimization of the crane operating system.

It should be noted that the main direction in the development of communication in modern conditions is telemetric, i.e. Coordination of information flows and communication support for transportation of goods - in it faces many problems such as quality of equipment, coordination of information processes and qualification level of personnel. The issue of high-quality software with complex issues stands out.

These include the lack of demand for programmers' work, the uniqueness of logistics plans, the difficulties of protecting programmers' intellectual property, and the operational problems of integrating accounting and financial transactions. The financial costs required to implement integrated control automation programs are still high, which, in addition to the high cost of computer and peripheral equipment and communication devices, make them inaccessible to most logistics companies. And for large enterprises, the software cost-effectiveness problem is intractable.

The Electronic information flows are used in tracking systems to control the movement of goods. Among the technologies was open to customers for tracking the movement of goods through the number of shipping documents over the Internet. These technologies are document tracking systems that do not operate in on-line mode, but through a consignor/consignee request to the consignor of the carrier who sends a request to the driver or terminal during import and export of cargo. Data transfer occurs through the systems of commercial and non-commercial telecommunication networks such as CompuServe, Online, Relcom and mobile operators.

It should be noted that documentary tracking of traffic is very difficult. The information flows accompanying individual activities in a logistics system, for example operational production procedures, customs clearance of goods and transport, order and inventory management, document flow volume and plans, can be very complex in terms of the number and detail of documents.

- Control costs for fuel, tires, maintenance, repairs and spare parts.
- Control uptime and minimize downtime for maintenance and repairs.
- Track drive time
- Calculate travel expenses
- Take into account the validity period of visas and issue new ones on time,
- Dispatch drivers to shift change locations,
- Receive driver reports on completed flights

This arranges a document exchange point at the point of transfer of road transport goods. For example, at a truck stop. A car from the west meets a car from the east and the trailers are exchanged. At the same time, drivers submit a report and obtain documents for a new trip. Since the tractor drivers are on a long-term business trip, it is possible to change groups of cars at this stage. The advantage of such a strategy is the minimum investment in the formation. An outpost. The disadvantage of synchronizing trips is that often the drivers of the cars have to wait for each other. If one of the cars is late, the second car is idle. Some surplus semi-trailers are being purchased. Areas in Protected Area (TSW) are rented out. A car coming from the west leaves its trailer, picks up the next one for delivery to the west, and gets the paperwork and leaves. The engine from the east does the same. The main advantages of this approach provide the maximum revenue of machines. Downtime occurs for a semi-trailer, not for a full hitch, which is more profitable. The disadvantage is the high cost of maintaining the parking lot and purchasing an additional number of semi-trailers. The choice of scenario depends on the specific conditions of the business. But, in any case, there is a need to create remote offices of the head office

The system allows customers to request the location of cargo using a password in the form of an SMS message sent to the dispatch center. A reply containing information about the location of the vehicle and the expected time of arrival at the specified destination will be sent as an SMS message to the authorized phone. Distribute access rights to information to company employees and external subscribers. It allows you to flexibly distribute fleet management functions among dispatchers and manage information flows to external subscribers. The decision on the availability of data for a particular subscriber is taken by the system administrator based on the instructions of the administration.

The dispatcher system is based on the principle of sending information directly from the vehicle to the dispatch center. All information flows into the transport company, and it is decided there which part of it can be transferred to external consumers, to whom, when and to what extent. A cellular operator is the only intermediary in communication. It is very difficult to intercept information in GSM network. In addition, the information from the vehicle is transmitted in a packaged form; the packaging parameters are not disclosed.

Even the developers of the system are unlikely to get information about the location of the vehicle. This is provided intentionally so that no one has the chance to force the developers to display information about the vehicle movement. It is very easy to check information security by viewing an automatically generated report on messages sent from the vehicle, which indicates the connection time and the number of the receiving phone. Therefore, the problem of protecting traffic information becomes an organizational measure that determines the company information policy related to the operation of the system: what information to save, where to archive it, delete it immediately after reading, etc.

4. RESULTS AND DISCUSSION

The proposed supply chain deep learning model (SCDLM) was compared with the existing artificial intelligence in automation of supply chain management (AIASCM), machine learning model for supply chain management (MLMSCM), machine learning techniques in supply chain optimization (MLTSCO) and Mobile Radio Model (MRM).

The development of key information approaches in logistics - telemetric, coordination of information flows and communication support for transport, is associated with many problems due to low quality equipment, its poor-quality service, spread of fake software products and insufficient user training. The comparison of Logistics management was shown in the Table.1.

The problem of low-quality software is particularly acute in connection with the exceptional complexity and uniqueness of logistics projects, the problems of protecting the intellectual property of programmers, and the high cost of licensed programs, which makes high-quality software inaccessible to most carriers.

Efforts by agencies and major players in the transport services market to improve information technologies are not excluded, but on the contrary, it suggests an increase in the activity of individual business enterprises in the field of introducing IT approaches to solving logistics problems. The comparison of Improve information management was shown in the Table.1.

Table.1. Results of Improvement

Inputs	AIASCM	MLMSCM	MLTSCO	MRM	SCDLM
Logistics management					
100	45.22	69.07	74.27	55.49	92.83
200	44.64	70.21	72.13	58.73	92.78
300	44.06	71.35	69.99	61.97	92.73
400	43.48	72.49	67.85	65.21	92.68
500	42.90	73.63	65.71	68.45	92.63
600	42.32	74.77	63.57	71.69	92.58
700	41.74	75.91	61.43	74.93	92.53
Improve information management					
100	43.11	64.35	82.40	48.59	93.00
200	44.77	66.21	81.56	49.00	92.90
300	46.43	68.07	80.72	49.41	92.80
400	48.09	69.93	79.88	49.82	92.70
500	49.75	71.79	79.04	50.23	92.60
600	51.41	73.65	78.20	50.64	92.50
700	53.07	75.51	77.36	51.05	92.40
Supply chain management					
100	40.14	71.09	73.70	58.01	92.74
200	40.30	72.29	75.32	57.88	92.71
300	41.04	73.94	77.12	59.15	92.71
400	41.39	75.29	78.80	59.49	92.69
500	41.84	76.71	80.51	60.06	92.67
600	42.29	78.14	82.22	60.63	92.66
700	42.74	79.56	83.93	61.20	92.64
Information integration					
100	41.65	76.91	81.67	53.81	95.65
200	41.32	75.41	81.08	51.94	94.61
300	39.98	74.30	80.10	51.11	94.48
400	39.31	72.93	79.38	49.59	93.74
500	38.48	71.62	78.59	48.24	93.16
600	37.64	70.32	77.81	46.89	92.57
700	36.81	69.01	77.02	45.54	91.99
GMC Management					
100	38.84	73.92	78.89	50.20	93.52
200	37.79	72.91	77.75	49.28	93.95
300	37.08	71.98	76.64	47.95	92.71
400	35.78	70.98	75.94	47.08	92.60
500	34.90	70.01	74.81	45.95	92.19
600	33.91	69.03	73.82	44.89	91.79
700	32.92	68.06	72.82	43.82	91.39

Currently, virtual networks of transport sharing, continuous monitoring of the status of vehicles and cargo and information support for intermediate transport operators have become common.

Effective collaboration of supply chain participants is impossible without intensive operational information exchange, which necessitates the use of information systems and software systems for analysis, planning and decision support in logistics systems. Mobility, the use of Internet technologies and multimodality are recognized as priorities in the development of global logistics. The comparison of Supply chain management was shown in the Table.1.

As a manifestation of the gradual transition from competition between individual transport modes to their interaction based on diversity, a single system of international transport corridors is emerging, as well as the Internet, an information space based on uniform standards.

Information integration based on telemetric is well suited to ensure continuous global Trans monitoring of movement of goods. The development of high-speed toll plazas with remote payment systems has become widespread. The comparison of Information integration was shown in the Table.1.

A remote non-stop payment system for travel using satellite traffic control and microwave and infrared information reading systems on highways has been arranged. Efforts are being made to address the problem of long transit delays at borders by introducing green custom technology based on Electronic Document Interchange (EDI).

Global mobile communications provided by low-orbit satellite systems of the Global star type, have become ubiquitous among carriers. New directions in the development of logistics are related to the means of distributing mobile management based on continuous information and resource support for the life cycle of goods and services based on WAP technologies (m-logistics) and CALS technologies. The comparison of GMC Management was shown in the Table.1.

5. CONCLUSION

In the conditions of the development of the economy and its restructuring, it will slow down the implementation of the socio-economic policy of the state. Among them, it should be noted that the fixed assets of transport have been updated at a sufficient speed for a long time, so there is a tendency to increase the level of their physical and moral deterioration. Unfortunately, the strategic planning of transport as a single complex has not received sufficient development in the general context of the development of productive forces. Finally, there is a significant lag in the level of use of modern logistics technologies and transport communications. Large foreign companies today are guided by complex integrated information systems with appropriate logistics management modules. In addition to tracking systems, there are specialized software products on the market for transportation, logistics, and forwarding companies. Many companies are involved in developing and selling specialized programs for routing and costing of transportation and other logistics activities, selection of vehicles and optimal loading. An important place among such information products is occupied by software products for setting up routes and professional electronic atlases.

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