

LOGISTICS DIGITALIZATION DEVELOPMENT TRENDS

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The article describes the main trends in the development of logistics digitalization in modern conditions of globalization of the economy, reveals their role and place in increasing the efficiency of management of logistics specific areas, draws the appropriate conclusion regarding further development of logistics digitalization to ensure the competitiveness of this most important area of the economy.

Today it is difficult to imagine the viability of any sphere of human activity without the use of information technology, and logistics is not an exception. In modern conditions of globalization of the economy, logistics is unthinkable without the active introduction of information systems and technologies into it.

Digital transformation is a key and inevitable feature of the digital economy. Many processes are being reengineered due to the transfer of traditional business processes to automated or even automatic.

Note that logistics is introducing digital innovation more slowly than in some other industries. This slower pace of digital adoption carries enormous risks that, if ignored, could have potentially catastrophic consequences even for the largest incumbents in the global business.

As other sectors of the economy closely related to logistics, such as retail, undergo a digital revolution, the chances of digital disruption sweeping the logistics industry increase. For example, the rise of e-commerce has led to new digital entrants on the last mile.

More importantly, digital platforms will become increasingly important in the logistics industry, allowing small companies to have global reach and compete with established industry giants. Over the next few years, the race to build a dominant global platform will change the way customers think about logistics and become a central question in determining which businesses will be winners and losers in a truly digital logistics industry.

Speaking about the digitalization of logistics, the following technologies can be distinguished: 3D printing, Big Data, Internet of things, Blockchain, Cloud services, E-Commerce, etc. Let's take a look at some of them below.

Internet of things in logistics. Technological solutions based on the concept of the Internet of things are widely used in logistics. The Internet of things is a system of interconnected computing devices that allows data to be transmitted over a network without manual input. The Internet of things helps organizations to control and manage stocks, optimize cargo transportation routes, and more.

With the advent of the Internet of things, logistics can finally become a fully controlled area, where all factors that can negatively affect the delivery process can be neutralized or avoided.

In short, the benefits of using the Internet of things as an example of transport are as follows:

- reliable vehicle tracking. The Internet of things helps businesses track the location of each vehicle and compare the most economical route with the route the driver has taken;
- reduction of delivery costs. Automatic order processing and status updates help companies reduce the number of delivery staff, which reduces overall operating costs;
- improved supply chain planning. The Internet of things provides businesses with versatile data - how long it takes to sell a certain amount of goods in inventory, what are the ways to optimize supplies, which employees have the best track record;
- prevention of theft of products and control of transportation conditions. The range of the Internet of things and logistics anti-theft devices is huge - connected intrusion detection equipment, sensors for real-time asset tracking, alarm systems, smart fences, and more. A business manager will be able to find the Internet of things logistics solution that provides increased inventory and supply chain transparency, and protects against fraud, product theft or counterfeiting [1].

And what is important, the Internet of Things can allow you to reduce manual control to a minimum. According to PwC (PricewaterhouseCoopers - an international network of companies offering consulting and audit services), the economic impact of the introduction of the Internet of things in logistics in the future will be significant. The Internet of Things will enable organizations to control inventory, automate inventory reordering, and track shipments in real time. For example, sensors will be able to track the wear of equipment, which will allow timely ordering of spare parts and prevent breakdowns and carry out repairs on condition, without wasting extra resources [2].

International Data Corporation (IDC) has identified the main factors affecting the development of the Internet of things market:

- the formation by the state of strategic initiatives to build digital enterprises;
- optimization of business processes;
- integration of information technology with the operating activities of companies;
- increased competition within industries.

Thanks to the introduction of the Internet of things in logistics, we can talk about the emergence of such new services as fleet management system through connected sensors in transport; automatic dispatching systems that allow you to manage traffic flows and keep track of goods and vehicles throughout the supply chain using RFID-tags. Projects of the uberization of freight transportation (GoCargo and iCanDeliver) provide carriers and customers with a transparent tool for establishing contact without intermediaries in the face of forwarding companies.

In logistics, the introduction of the Internet of things technologies makes it possible to solve such urgent problems for the industry as reducing the cost of cargo transportation and delays on the way, increasing the transparency of transportation (including using RFID-tags) and minimizing the influence of the human factor. Internet-connected vehicles and remote monitoring of the vehicle fleet will reduce operating costs by optimizing the repair and maintenance of equipment. In addition, the uberization of cargo transportation is widely spread, which makes it possible to refuse the services of forwarding companies [3].

Next, let's take a look at the blockchain. When the blockchain is mentioned, people mostly think of cryptocurrency - digital money. However, the technology is used in many areas; one of them is logistics.

Blockchain is a way of storing information in which data is written to blocks in a distribution ledger. Information is stored by more than one person; it is duplicated for each member of the system.

It is worth replacing that having an effective, trustless automated system enables other areas to be introduced and improved, such as micropayments, certificate validation, digital identity, and document integrity. For example, logistics providers rely on drivers, and nowadays paper certificates are easy to counterfeit. With blockchain, learning organizations can replace outdated paper-based systems with a digital version that is tamper-proof. In addition to logistics services related to identification, this can also disrupt the current business practices of other organizations.

Here are the main advantages of blockchain technology in logistics:

- allows you to reduce the cost of logistics;
- excludes the possibility of data falsification;
- eliminates unnecessary intermediaries;
- allows you to reduce by an order of magnitude the time for document circulation, quickly find the link of transportation where a mistake was made, and reduce business costs due to losses.

As you know, blockchain technology is used by many companies, further let us turn our attention to several examples of using blockchain technology.

American company that operates the world's largest wholesale and retail chain, WalMart, is using blockchain technology to improve supply chain transparency and to track provenance. Since last year, WalMart requires lettuce and spinach suppliers to use a blockchain database. In the event of contamination by food borne illnesses, WalMart can identify through the blockchain the precise point of contamination.

The world's largest Danish company specializing in sea freight and port terminal services, Maersk, is utilizing smart contracts and blockchain to digitize international trade. Their tested system allows each participant in the supply chain to view the progress of a transaction through the supply chain without compromising the integrity, privacy or confidentiality of the transaction. This makes it easier for shippers, freight forwarders, port operators, customs regulators and all others to know where a container is in transit and allows for direct interaction through real-time access to data and documents. All while providing a tamper proof system less reliant on intermediaries. Maersk expects this solution to reduce friction, saving them billions of dollars annually [4].

Summarizing the above, we can break down the development of blockchain logistic technology by time periods:

- 2018-2025: The beginning of the process of mass implementation of blockchain logistic technology; a sharp increase in the number of organizations using blockchain technology, up to 25%; a widespread reduction of jobs associated with the use of new technologies. At the same time, reducing logistics costs, simplifying logistics;
- 2026-2035: An increase in the number of organizations using blockchain logistics technologies, up to 70% leaving the communications market with the inability to compete in the market;
- 2036-2050: The use of blockchain technologies as an everyday tool, the emergence of competitive digital technologies that further simplify logistics processes.

The introduction of blockchain logistic technology makes it possible to save data in a small amount, protect documents from fraudsters, and prevent the possibility of changing digital information about the transportation process. This system can definitely reduce the delivery costs of suppliers and reduce the likelihood of fraudulent actions, while saving financial resources for all participants in logistics processes.

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Thus, the technology opens up new opportunities that allow business owners not to worry about product delivery, but to optimize the process in order to significantly reduce operating costs. Technology is able to solve all the existing problems that slow down the development of a business. If its capabilities are ignored further, shippers and carriers will continue to lose money or, at the very least, miss an opportunity to become more efficient.

And the last technology to consider is cloud services. Cloud services are used in all sectors of the economy, including logistics. Correctly built logistics at the enterprise, supported, among other things, by the use of online resources, will help not only reduce production costs, but also increase employee productivity, optimize work with buyers and suppliers of goods, and properly organize accounting and control of operations.

In a general sense, cloud services (technologies) can be understood as a model for providing network access to a common pool of configurable computing resources (servers, applications, storage systems, etc.) that can be quickly provided and released with minimal efforts to manage and the need to interact with the provider.

There are currently three models cloud computing services:

1) software as a service (Software as a Service, SaaS): the consumer is provided with software - provider applications running on the cloud infrastructure;

2) platform as a service (Platform as a Service, PaaS): the consumer is provided with tools for deploying their applications on the cloud infrastructure, developed using the tools and programming languages supported by the provider;

3) infrastructure as a service (IaaS) - the consumer is provided with data processing, storage, networks and other basic computing resources on which he can deploy and run arbitrary software, including operating systems and applications [5].

The cloud market has grown steadily over the past few years. According to information technology market research and consulting company "Gartner", the global cloud adoption market exceeded a total of US \$ 330 billion in 2020.

In 2020, companies are moving en masse to the cloud to save money, become more agile, and drive innovation. According to analysts, this trend will continue next year. The cloud technology market will grow by 30% every year until at least 2025. Global cloud spending will grow 7 times faster than total information technology spending.

The advantage of the cloud space is that it allows you to be fast and mobile, which is especially important when you need to process a large flow of information in the shortest possible time. For example, an employee goes on a business trip to another city and receives up-to-date information and information that occurs in the company in his absence, he performs tasks promptly, there is no need to waste time - everything can be done here and now.

So, in 2021-2025, the main trends in the development of the cloud market will be:

1. Flexible serverless computing. The cloud serverless method is a technique for implementing functions in the cloud on a required basis. Enterprises rely on serverless computing because they are able to run the core product without the need to operate or manage servers;

2. Hybrid cloud. The hybrid cloud will take center stage. According to Gartner, the global public cloud services market is expected to grow by almost 17 percent, with a total market size of US \$ 266.4 billion by 2022. This is a staggering increase from US \$ 227.8 billion in the previous year;

3. Containers and Kubernetes (open source orchestration software for containerized applications). For many years, containers have been the standard for developing applications in the public cloud. Gartner predicts that by 2023 most organizations will have more than two centralized applications.

Thus, cloud logistics is developing and will develop very quickly. So due to the fact that a pandemic happened in 2020, it was necessary to go online, many companies realized that it was time to move the entire infrastructure to the cloud, the need for capacity increased, and it was necessary to find a way to reduce costs, therefore, all factors point to the development of cloud servers.

Summing up, we come to the conclusion that modern information technologies will maximize the automation of decision-making at all stages of logistics and supply chain management. Their development and implementation in the logistics system is an integral part in the 21st century. Using the example of trends, one can understand that without cooperation of information technology and logistics, a good result of supplying products to the consumer today is impossible, but logistics keeps up with the times and gradually introduces information technologies to ensure the effectiveness of its development. Logistics is a complex and multifunctional process, and the introduction of information technologies in logistics and chain management in the 21st century is inevitable, as they fulfill their main tasks, namely, order management.

REFERENCES

1. Logistic Industry Innovations with IoT [Electronic resource]. – Access mode: <https://www.digiteum.com/internet-of-things-logistics/>. – Date of access: 2021.04.03.

2. Efficiency in a Challenging Environment: Why Supply Chain Transformation Is Necessary for Businesses [Electronic resource]. – Access mode: <https://www.pwc.ru/ru/assets/pwc-tseepochki-postavok.pdf>. – Date of access: 2021.04.03.
3. "Internet of Things" (IoT) in Russia, Technology of the future, available now [Electronic resource]. – Access mode: <https://www.pwc.ru/ru/publications/iot/iot-in-russia-research-rus.pdf>. – Date of access: 2021.04.03.
4. Blockchain in Logistics [Electronic resource]. – Access mode: <https://medium.com/gochain/blockchain-in-logistics-e06c023d042e>. – Date of access: 2021.04.03.
5. Cloud technologies in logistics: a brief overview and the possibilities of domestic Internet resources [Electronic resource]. – Access mode: <http://elib.mitso.by/bitstream/edoc/184/1/26-30.pdf>. – Date of access: 2021.04.03.