APPLICATION OF IoT IN TRANSPORT AND WAREHOUSE LOGISTICS

Kovalenko O.[1], Sagynbaev S.[1], Vorobiova O.[2], Kovalenko V.[2], Stryzhak V.,[2] Turchyn O.[2]

[1] Staff-eye GmbH, Chemnitz, Germany,
[2] National Technical University «Kharkiv Polytechnic Institute», Kharkiv, Ukraine

Industry 4.0 is a new stage of the industrial revolution based on the merging of the physical and digital worlds with the help of modern technologies. It is based on the application of the Internet of Things, artificial intelligence, cloud services and cyber-physical systems that enable real-time process control.

In transportation and warehousing logistics, IoT technologies make it possible to monitor cargo and vehicles at any moment. GPS trackers monitor the route and condition of the cargo, providing transparency in the logistics chain. Artificial intelligence is used for route optimization, demand forecasting and risk analysis. Big Data helps to make informed management decisions based on in-depth analysis of information.

Benefits include cost reduction through automation, minimization of errors by eliminating human error, increased speed of service and transparency of processes, allowing customers to track orders in real time.

Roboticization and automation of logistics is becoming the norm. Smart warehouses use sensors to monitor inventory and robots to sort, speeding up processing. Autonomous transportation, including unmanned trucks and drones, is already being tested and helping to reduce shipping costs. Smart containers record temperature, humidity, and location, keeping cargo secure.

However, the digital transformation of logistics comes with challenges. Implementing technology requires significant investment, which may not be affordable for small businesses. Skilled professionals are needed, as well as robust cyber defenses. Integrating new solutions with legacy systems is a complex and resource-intensive process.

Industry 4.0 in logistics is not just about modernization, but about rethinking processes. Digital platforms automate orders and deliveries, digital twins simulate logistics operations in a virtual environment, and smart delivery using autonomous transport reduces costs and speeds up order fulfillment.