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Digital Twins in Logistics

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In the modern world, there are more and more new technologies that are gradually being introduced into various areas of production, and logistics is no exception. Manual processing of information is replaced by a computer, in the world, there are automated systems that make it possible to simplify the process of work in enterprises. With the use of these technologies, production processes are optimized, the data processing time is reduced and the efficiency of enterprises is increased. One of such technologies is digital twin technology [1].

A digital twin is a representation of a physical object, process or service, such as a jet engine or wind farms, or even larger items such as buildings, or even whole cities and supply chains.

The digital twin technology using for copying processes to help a company to predict how these processes will perform. These programs can integrate the internet of things, artificial intelligence and software analytics to improve the results.

With the progress of machine learning and factors such as big data, these virtual models have become a big step in modern engineering to drive innovation and improve performance [2].

Creating a digital twin can allow avoiding costly failures in physical objects, by using advanced analytical, test processes and services, monitoring and predictive capabilities.

The lifecycle of a digital twin starts with experts in applied mathematics, data science researching the physics and operational data of a physical object to develop a mathematical model that simulates the original.

The developers who create digital twins have a warranty that the virtual computer model can get feedback from sensors that gather information from the real world version. This lets the digital version simulate what is happening with the original version in real time, creating opportunities to collect insights into performance and any other potential problems.

A digital twin can be as complex or as simple, with differing amounts of data determining how clearly the model simulates the real world physical object [5].

The twin can be used with a prototype to offer feedback on the product as it can even act as a prototype in its own right to model what could happen with a physical object when built.

Since it can be used across a wide range of industries, from healthcare to automotive and power generation, it has already been used to solve a large number of problems. A digital twin allows users to explore solutions for product lifecycle increase, manufacturing and process improvements, and product development and prototype testing. The digital twin can virtually show a problem so that a solution can be invented and tested in the program rather than in the real world.

Digital twins help companies to solve problems by simulating all assets in a complex supply chain. A company can make decision across multiple planning horizons:

–short-term planning and realization;

–sales and operations planning;

–longer-term planning.

Designing, monitoring, and managing packaging and containers create a number of challenges for the industry. The growth of e-commerce such as packaging variety and driving up demand. This produces significant reduces operational

efficiency through poor volume utilization. The application of material digital twins could help the development of better and more environmentally friendly packaging materials. In efforts to improve stability, companies are exploring the application of a range of new materials including compostable plastics and materials with a high percentage of post-consumer recycled content. Material digital twins could help companies understand and forecast the performance of new materials in packaging applications, could model material behavior under the temperature, vibration, and shock loads experienced in transit [4].

Digital twins could also help logistics participants manage container fleets more efficiently. Reusable containers are an industry standard in multiple logistics flows. They include standard ocean containers, reusable crates to transport car parts between factories, and containers for food and drinks delivery to retail stores and consumer homes.

Nowadays, the engineering, manufacturing, energy, and automotive industries are leading the way in impact digital twins to manage their most critical assets, followed by healthcare, logistics and even supply chain. As the necessary technologies continue to become more available, the logistics sector is only just now beginning its digital twin way and early examples of the first supply chain facilities using digital twins are beginning to appear. Perhaps more important for logistics professionals to consider in the near term is not how to use digital twins for direct management of supply chain operations, assets, and facilities but rather how to develop the supply chain [3].

For digital twins and their physical twins to work together optimally, there is an increasing need for logistics professionals to improve sensitivity, service quality, availability, and delivery accuracy to ensure the thing performs in optimal harmony with its intended design and performance.

The most successful retailers are those that are already recognizing and implementing technologies such as digital twins, artificial intelligence and machine learning – they are the ones that are staying ahead of the curve in tough times. If businesses are to survive and thrive in the new normal, they must implement the right enabling technology that will help them gain insights into their supply chains and make them more agile to respond to rapidly changing conditions [6].

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