Brave New Logistics: How Blockchain will Enable the Physical Internet

Written by Horst Treiblmaier
Modul University Vienna

For the majority of end consumers it might be hard to get overly excited about logistics. As long as their desired products are in stock or can be easily ordered online (ideally to be delivered within 24 hours), questions are seldom raised about how the individual components are shipped, stored, and manufactured. If at all, logistics receives public attention only if a major calamity occurs, such as the accidental blockade of Egypt's Suez Canal by a container ship. However, such events remain in the public eye only for a short amount of time.

Companies whose business depends on the physical transportation of raw materials, components, and products understand how important logistics is and that it can be a major cost factor. In many cases, though, it is perceived merely as a cost driver whose overall contribution to value generation seems limited.

However, such perspectives might be shortsighted both from a company as well as from a macroeconomic perspective, as is evidenced by the huge costs and other externalities that are caused by shipping raw materials, subproducts or finished products all over the world. Even worse, transport capacities are frequently left unused and the trucks that congest public roads while burning diesel are often (half-)empty. According to Statista (2021) the worldwide costs for the logistics industry are steadily growing and increased from 6.9 to 9.3 trillion dollars in the decade spanning 2010 to 2019.

In order to remedy the situation, the European Union has set up a European Technology Platform called ALICE (Alliance for Logistics Innovation through Collaboration in Europe) that propagates the vision of the so-called Physical Internet. Originally conceived by university professor Benoit Montreuil, this comprehensive concept strives to overcome existing inefficiencies in logistics by creating a modular system that tackles all pending issues of modern logistics at once. Figure 1 briefly outlines the vision of ALICE and highlights the various areas that are simultaneously improved.
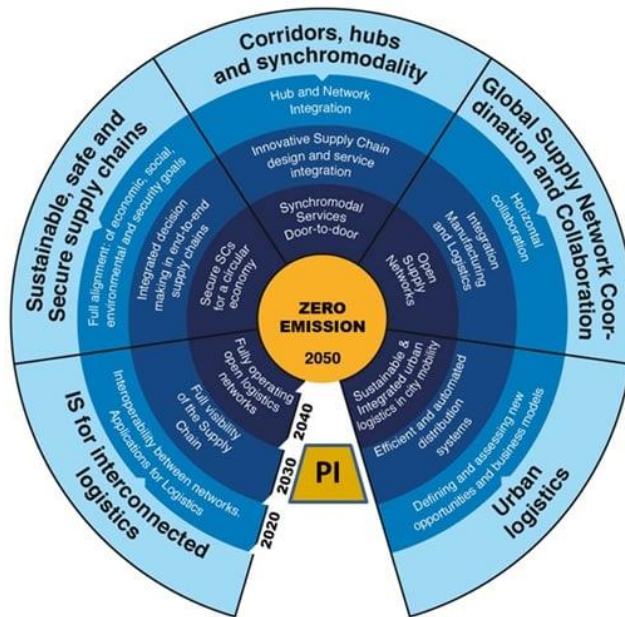
Figure 1: The Physical Internet (Source: https://www.etp-logistics.eu/)

As can be seen in Figure 2, the Physical Internet is a layered concept that integrates all aspects of logistics, ranging from containers that are modular and can be transported and stored in a space-saving manner to sophisticated business models that disrupt current informational silos and foster collaboration among partners, but also potential competitors, in value networks. In between lie several layers that deal with the optimization of vehicle usage, transit centers, and data exchange as well as the creation of legal frameworks that are conducive to fostering transportation and trade within and across national boundaries.

In light of this grand vision, it is no surprise that blockchain technology is recognized as a heaven-sent opportunity for the architects of the Physical Internet. Complex supply chain networks not only comprise physical flows but also heavily depend on the seamless exchange of data, be it in the form of consignment notes that track shipments or financial information to clear and settle transactions. Blockchain or, more generally, distributed ledgers, store data in an append-only structure which makes it easy to share complete information in real-time among authorized participants. Furthermore, the immutability of the data facilitates auditability and increases trust among all network participants. Innovative business models, for example in the food supply chain, also enable end consumers to access information regarding the origin of their products, thus fostering credibility and customer loyalty.
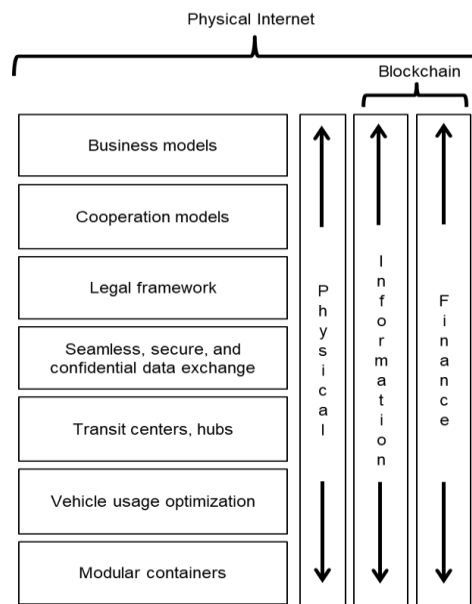
Figure 2: Integrating Blockchain and the Physical Internet (Source: Treiblmaier (2019) MDPI logistics)

Blockchain technology emerged after the original idea of the Physical Internet was conceived, but it can be easily integrated into its overall vision and can work out many problems that were hitherto thought to be impossible to solve. It is currently predicted that blockchain will help to substantially reduce the amount of compulsory paperwork, especially for cross-national trade, that often complicates or delays shipments. Gaining speed is especially critical for products that are perishable and therefore the food supply chain will benefit substantially from these developments. However, this does not mean that the upcoming changes will be straightforward and easy to achieve. The Physical Internet is still an ambitious vision and, from today's perspective, some layers seem easier to perfect than others. Interestingly, this especially pertains to technical problems that can either be solved by clever engineering (e.g., the construction of robust, modular and "intelligent" containers that are equipped with technology to enable tracking and tracing) or mathematical algorithms (e.g., the optimization of transportation capacities and the operation of distribution hubs). In this respect, blockchain is but another technology consisting of numerous components that are currently being further developed by computer scientists and cryptographers.

As opposed to engineering and technological challenges, the "human factor" currently seems to be the most unpredictable aspect of a future Physical Internet. A crucial prerequisite for effective transportation is collaboration, which at times might also include the cooperation of competitors, called coopetition. On an international level, logistics efficiency entails the simplification of customs procedures and the exchange of information between authorities. Technology only provides the means to streamline existing processes, but at the end of the day it will be humans who ultimately decide on how the logistics of the future will look and if the Physical Internet enabled by blockchain will become reality by 2050, as currently envisioned by the European Union.

The full article on how blockchain technology and the Physical Internet can be integrated is available at:

https://www.mdpi.com/2305-6290/3/1/10

References

Statista. 2021. "Logistics Industry- Global Costs 2019." Statista. 2021.
        https://www.statista.com/statistics/943500/logistics-industry-costs-worldwide/.