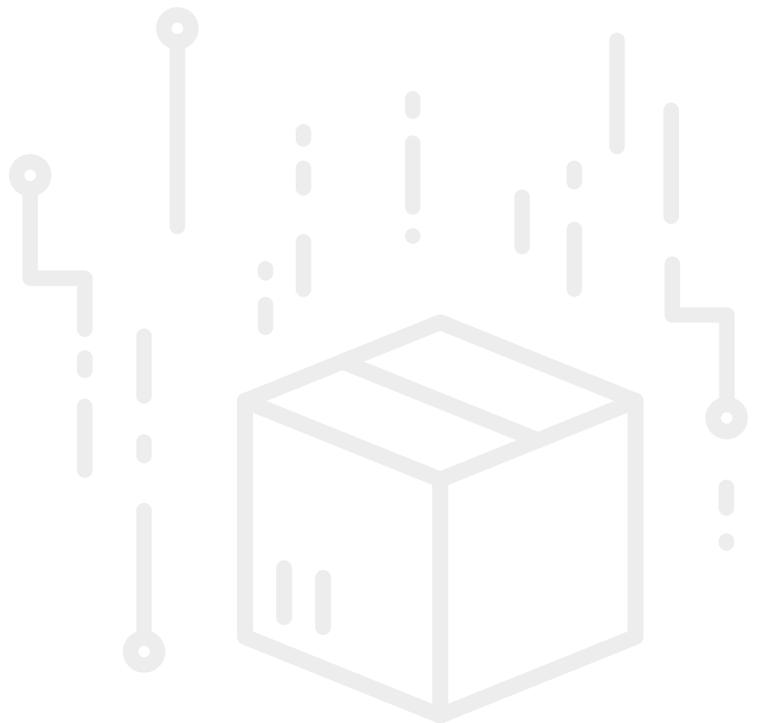

THE FUTURE OF LOGISTICS: HOW THE PHYSICAL INTERNET WORKS



The world of shipping and logistics is at a turning point. New innovations, growing technologies and expanding ideas geared toward efficiency are causing established companies to make huge leaps that smaller e-commerce businesses can't always match.

To help you remain competitive in a shifting market, we've crafted this report to introduce you to the theory of the Physical Internet and look at a possible future for logistics. You can use the information to stay on the forefront of these sprouting innovations and be a step ahead of the competition.



WHAT DOES THE FUTURE OF LOGISTICS LOOK LIKE?

It's a million-dollar question: What will your industry look like five, 15 or 50 years down the road?

With advancements in robotics and artificial intelligence, shipping and logistics are poised for revolutionary growth. Technology will make each part of the shipping process more sustainable and streamlined.

Imagine autonomous trucks, optimally packed to carry the perfect number of boxes, traveling to and from hubs rather than distant distribution centers. Those hubs will be stocked with exactly the right amount of product from e-commerce businesses across the globe.

Trips will be shorter. Trucks will be packed and routed based on maximum efficiency. Communication between businesses, fulfillment hubs, trucks and customers will be seamless.

This is the concept behind the Physical Internet. Originated in 2006 by Professor Benoit Montreuil, the theory of the Physical Internet takes the practices that made the Digital Internet free and applies them to the physical process of shipping logistics.¹



WHAT IS THE PHYSICAL INTERNET?

To best understand the Physical Internet theory, it's helpful to first look at the Digital Internet.

The Internet we use every day for searching, networking, emailing and more is a collaborative, cooperative space. It isn't governed by any one website or corporation controlling how information is delivered and received.

Instead, different companies and people share information across a network of different data paths. For example, if you and a friend use different email providers, you can still send emails to one another quickly and efficiently.

The idea of the Physical Internet proposes that the material world should also work that way: things should be delivered as quickly and as efficiently as possible.

Thinking of logistics, if two friends living in the same town both ordered the same brand of socks from two different big-box stores, those socks should come from one localized distribution center rather than from two distant centers specific to the two stores from which they ordered.

The Physical Internet aims to make that high-efficiency model a reality. It pictures a future where we send goods through open channels as simply as we send information through the “tubes” of the Digital Internet; it is an open, global system founded on the idea of physical, digital and operational interconnectivity.

WHERE DID THIS CONCEPT COME FROM?

Professor Montreuil developed this concept after seeing that shipping and logistics were wholly unsustainable in their current states.²

The current models are:

- **Costly:** The processes are financially and environmentally expensive—trucks alone consume enormous amounts of energy and are a principal source of pollution.²
- **Wasteful:** Trucks often travel at around 60% capacity and make return trips with empty trailers.²
- **Inefficient:** Products are shipped from suppliers to distribution centers, then shipped again to reach customers who are often far away.²

By evaluating these and a number of other unsustainable practices, the theory of the Physical Internet suggests a solution. If businesses could all work together at their logistical cores to employ smart automation and technology, they could create a united open-source community that reinvents and streamlines shipping.



HOW WOULD THE PHYSICAL INTERNET WORK?

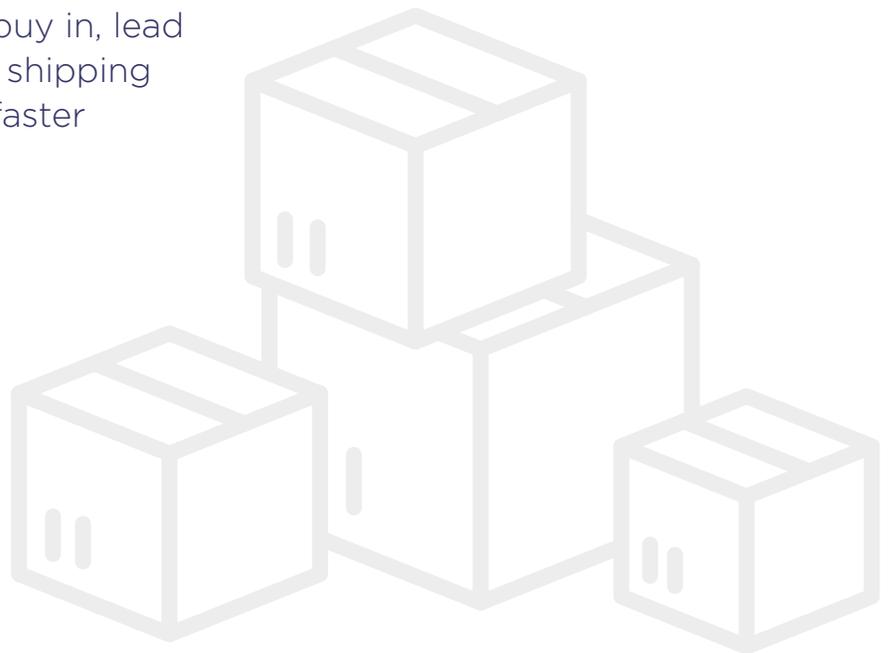
For this theory to become reality, there would need to be global cooperation and standardization.

STEP 1:

Standardization

The Physical Internet theory calls for a universal model for delivery, not unlike the way the Digital Internet standardized the delivery of information using URLs.

Standardization—like using universally-sized shipping containers and parcel boxes—would make it easier for businesses to buy in, lead to a higher carrying capacity for shipping vehicles and ultimately result in faster movement of products.



STEP 2:

Globalization

If distribution centers function more like digital cloud storage—which isn't discriminatory about which websites can store information within it—wasteful redundancies can disappear.

Orders could come in to a local distribution hub rather than a business-specific warehouse. Items may ship out more quickly under this system, theoretically traveling with other shipments from a number of businesses on the same delivery route.

Costs may drop and efficiencies skyrocket if businesses share trucks and warehouses across the globe.



STEP 3:

Smart Transportation

From autonomous delivery vehicles to adaptive driving routes to optimally connected distribution hubs, transportation plays a huge role in making the Physical Internet theory a reality.

A driverless vehicle optimized for shipping could carry more inventory and respond automatically to routing updates.

With hubs positioned along optimal routes, trucks could quickly start longer-distance travel, connect with other modes of transportation or enter and maneuver in dense cities.



STEP 4:

Continuous Innovation

If this global standard of shipping and logistics is realized, what will come next?

Think a step ahead about what business models could dominate in a Physical Internet era.

This innovative thinking could assert your business as a company that reshapes the global business landscape in this possible future.



WHAT ARE THE BENEFITS AND CHALLENGES OF THE PHYSICAL INTERNET?

The Physical Internet theory could potentially revolutionize the way that shipping and logistics work around the world, but there are hurdles to making it a reality.

BENEFITS:

- **Speed.** Sharing localized warehouse space and routed transportation vehicles will make picking, packing and shipping to customers faster.
- **Efficiency.** Using data and analytics to guide inventory, packing, transportation and more will optimize performance to maximum efficiency.
- **Democratization.** Small and large businesses both can make huge gains from the Physical Internet model, as there is little barrier cost to participation.
- **Innovation.** With a wide range of businesses participating, and technology's valuable role in the process, this will be a richly competitive and creative environment.

CHALLENGES:

- **Publicity.** Businesses will have to forfeit some measure of privacy and control by entering into a system of shared distribution centers and transportation vehicles.
- **Global standardization.** Standard protocols for containers, transport, production, storage and more are vital to the functioning of this open market.
- **Unified participation.** Across the globe, there has to be widespread acceptance of these protocols. Many for-profit businesses may not want to give up control and scale, which is crucial to the theoretical functioning of the Physical Internet.
- **Regulation.** Rules and specifications must be dictated and enforced by a neutral organization. That controlling body may not yet exist, and developing it would delay the realization of this theory.

WHERE IS THE PHYSICAL INTERNET THEORY BEING APPLIED?

The Physical Internet as a whole is still highly theoretical, but it is on the horizon. **The Alliance for Logistics Innovation through Collaboration (ALICE) in Europe is working to make the Physical Internet a reality by 2050.**³

Today, the principles that make up the theoretical Physical Internet are growing in popularity and possibility. Numerous companies have invested in building autonomous vehicles, and it's predicted that self-driving long-haul trucks will enter the mainstream in five to ten years.⁴ There is also research and, in some areas, on-road testing of driverless vehicles for local shipments.

Trucks aren't the only vehicles learning to navigate themselves: Research is being conducted and tested on making ships autonomous as well. Sensors and wireless monitoring help the vessels collect real-time data to navigate the seas, as well as monitor necessary maintenance.

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The shipping industry is also researching advanced materials that can make ships lighter and stronger, able to self-repair and resist damage, rust and marine growth.⁵

There are also advancements being made on the services side. Applications, websites and platforms dedicated to organizing logistics data and creating a more open, shared marketplace are making strides toward realizing the Physical Internet.

KEY TAKEAWAYS

The theory of the Physical Internet faces many hurdles to becoming a reality, from developments in technology to broad buy-in from retailers and shipping partners across the globe. In the short term, it is an important study in what the future of logistics could look like.

Take these actionable steps, boiled down from the high-level theory, to set your business up for future success:

- 1. Regularly optimize your technologies.**
Are you using up-to-date warehouse technology, such as wireless sensors and hands-free scanners, to make sure your distribution center is as functional as it can be? Audit your processes to see which things slow you down or burn through money. Then, see which options are currently available that could help you move toward being fully efficient.
- 2. Re-evaluate your shipping logistics.**
If all of your shipments are still coming from distribution centers scattered throughout the country, take a look at how much you're spending on transportation. Depending on where your orders come from and where your suppliers are located, you could consider in-store fulfillment or other localized options.
- 3. Invest in or follow innovations.**
Keep an eye on what's developing for the future of logistics. When you can, invest in new technologies or experiment with prototypes and software applications in beta. Continue to think a few steps ahead of the competition about where you'd like your business to be in the next year, 10 years, 50 years and so on.

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SOURCES:

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² Benoit Montreuil, "Toward a Physical Internet: Meeting the global logistics sustainability grand challenge," Bundesvereinigung Logistik (BVL), 2011.

³ Maria Jesus Saenz, "The Physical Internet: Logistics Reimagined?" Zaragoza Logistics Center, Feb. 26, 2016.

⁴ David H. Freedman, "Tractor-trailers without a human at the wheel will soon barrel onto highways near you. What will this mean for the nation's 1.7 million truck drivers?" *MIT Technology Review*, March/April 2017.

⁵ "Global Marine Technology Trends 2030," University of Southampton, QinetiQ and Lloyd's Register, Aug. 15, 2015.