OP-ED

The Physical Internet: A potential game changer for cross-border logistics

By Daniel Covarrubias

A couple of weeks ago, my esteemed colleague, Dr. Gaston Cedillo, project manager for the Texas A&M International University (TAMIU) Texas Center for Border Economic and Enterprise Development (TCBEED), introduced me to the concept of the Physical Internet (PI or ℗).

Like many, the name of this concept drew me to think about the World Wide Web, communicating between friends, family, and peers, email and messaging apps, and everything that works within the Digital Internet. But far from just sharing a name, PI is a system replicating the idea behind the World Wide Web to build a network where goods, services, and logistics processes move through supply chains the same way data travels through the web.

Benoit Montreuil, Russell D. Meller, and Eric Ballot developed PI. They define it as an open global logistics system built on operational, digital, and physical interconnectedness. Montreuil et al. view the PI as a constantly evolving system due to technical, infrastructure, and corporate innovation. PI focuses on applying the Internet's architecture to rethink logistics and improve the economic, environmental, and sustainability impacts of moving, storing, handling, and supplying physical goods. This restructuring of logistics processes is based on two central precepts: 1.- the migration from proprietary networks to open and shared networks, and 2.- a new form of goods containerization.

Let's discuss these two principles.

Current logistics and supply chain networks are very diverse, globalized, and have little to no interconnectedness. Data-sharing mechanisms and standards to increase traceability are minimal, and usually sector or company-specific. Current logistics and supply chain networks are defined by the companies using them and designed for the shipment of goods within closed logistic networks -- consisting of warehouses and transport links between its plants and warehouses, and those same warehouses and its customers.

The PI proposes to restructure logistics networks by creating a global logistics system to interconnect these networks, creating a set of standardized collaboration protocols, modular containers, and smart interfaces. The PI focus is on transporting containers instead of goods through open and shared logistics networks based on many companies working together and sharing their space, infrastructure, and equipment to create logistic networks of scale, greater efficiencies, and improvements in sustainability.

The second principle upon which the PI system is based is a new form of goods containerization. In the 1950s, the maritime shipping industry revolutionized its productivity by standardizing shipping containers that could be efficiently managed at all ports through handling

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systems and equipment and transported in container ships. The PI system proposes its own smart, world-standardized, modular containers to route, store and manage logistics flows more efficiently. These smart PI containers are designed modularly in different dimensions to achieve better space utilization rates, increase load factors, reduce the number of trips needed, reduce freight costs, and make the distribution of goods more efficient. PI containers can reduce vehicular traffic and carbon emissions, and now that many cities restrict the mobility of freight transport within urban areas, these containers make the distribution of goods more efficient. With the focus being on transporting the container instead of goods, deliveries made by last-mile urban logistics providers will be more sustainable and cost-friendly, while at the same time leaving a smaller environmental footprint.

In response to rising international conflict, logistical challenges, and environmental concerns, globalization is moving toward regional production chains. Global trade models are trending toward regionalization. The United States' global economic leadership will now be based on innovations, sustainable technologies, and highly reliable supply chains. Two new regionalization trends are appearing: nearshoring and allyshoring.

Nearshoring or allyshoring refers to the increase of foreign direct investments through which companies move their production centers and processes closer to their target market. These strategic moves take advantage of the favorable market and international trade conditions in their new country of destination, for example, tariff preferences and new rules of origin established by the United States-Mexico-Canada Agreement (USMCA, formerly NAFTA).

Companies are exploring nearshoring and allyshoring strategies in search of at least three goals: first, reducing disruption risk probability by securing their supplier's proximity. Second, increasing the sustainability of their supply chains by lowering freight transport distances and their carbon footprint. Third, increasing financial effectiveness by reducing inventory levels by adopting approaches such as "just-in-sequence," and enabling their industrial process to flow as a "work-in-process" with local suppliers. However, to achieve this synchronization and reliability, exponential logistics technologies and state-of-the-art logistics organizational processes, such as the PI, are essential. While the PI concept is not new and much research has been done on it, particularly in Europe, little research has been undertaken on a cross-border PI system.

Within a radius of 35 miles, the cross-border region of Port Laredo includes over 500 custom broker firms, more than 500 transportation companies, and at least 300 logistics warehouses and storage facilities. This logistics ecosystem is responsible for processing $250 billion of trade, 4.5 million commercial truck crossings, and 500,000 railroad cars each year. With the magnitude of importance that this port represents to North America, it just makes sense to research whether the conceptual framework of the PI can be “borderized” and applied to cross-border international trade logistics.

Our research aims to explore the possibilities and challenges of the PI in cross-border areas. Different questions need to be answered, such as: what are cross-border PI's particular qualities, prospects, and limitations? Under which conditions can a cross-border PI emerge and develop dynamically over time? And what are the roles of the private and public sectors and academia in advancing the development of cross-border PI?

The PI represents a paradigm shift in logistics and supply chain management by opening existing assets, infrastructure, and services so that all logistics companies can use them with fluidity and efficiency. The PI looks to reorganize freight transport and handling by establishing a system of interconnected and collaborative logistics networks, where users and service providers share assets, routes, and nodes to achieve greater efficiency. The PI system focuses on increasing freight transport efficiency and load factors, reducing empty truck trips, increasing the number of units delivered per stop, or minimizing vacancy in warehouses and terminals.

While the PI may be a conceptual system and much work is still needed for its implementation, it is these groundbreaking concepts that Dr. Cedillo and I will continue to explore in the TAMIU Logistechs Living Lab.

The Physical Internet represents an excellent opportunity for companies to organize their logistics according to this new principle. It ensures greater transparency and efficiency within logistics and improves connectivity with customers and suppliers.

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