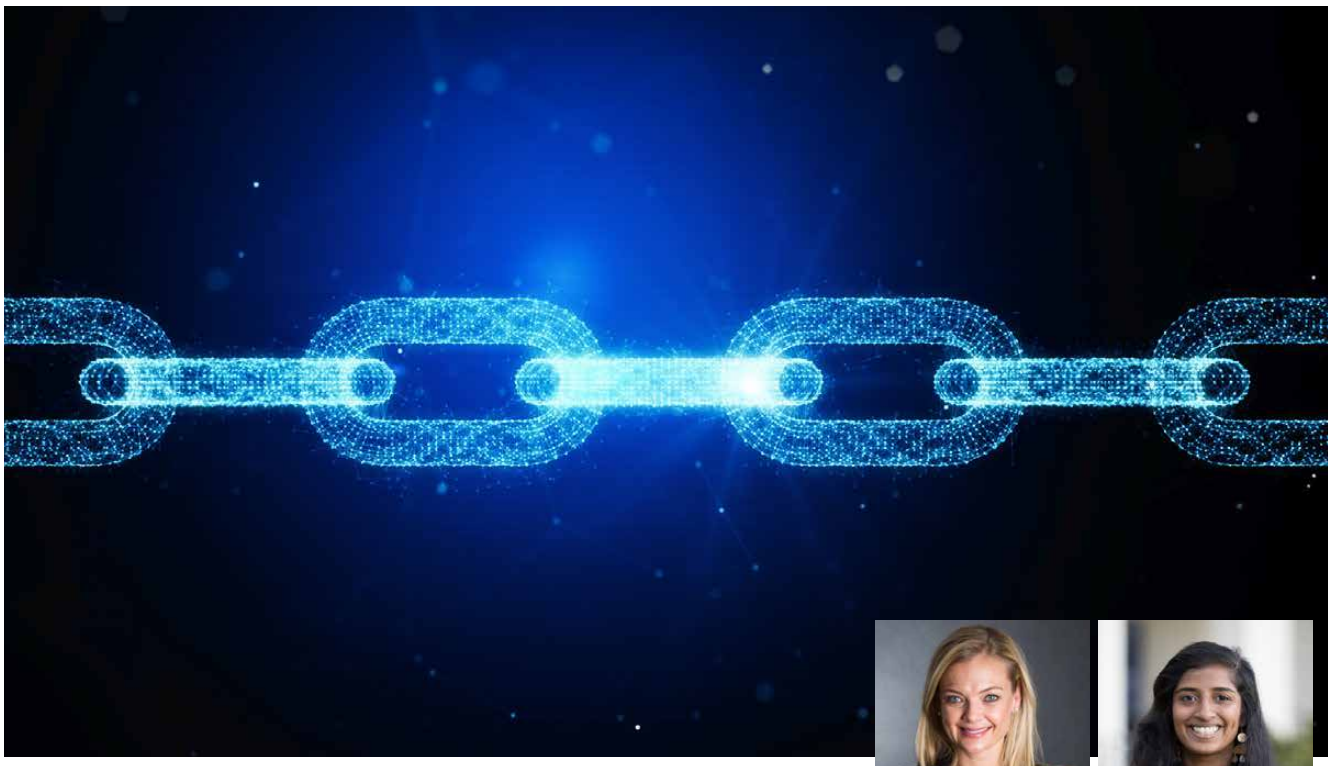

CHOOSING A FIT-FOR-PURPOSE BLOCKCHAIN STRUCTURE

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As ports and other supply chain players move from theory to practice in their distributed ledger and blockchain deployments, one of the first decisions that arises is how the blockchain should be structured. This often boils down to "Should we use a public blockchain or private blockchain – and how should the permissions be structured"? As with most technologies, there are several ways to design a solution to best suit the needs of the organization. However, given the early stages of the technology and the strong philosophical debates still present within this space, these decisions can be daunting and difficult to navigate. How can ports and their port community systems think through this process?

Industry decision-makers need to be able to sort through marketing hype to pick the best solution. For instance, some blockchain technology providers in the industry have made claims such as "We're the first ever truly neutral system" or "We're the only public solution" or "Our private blockchain is best positioned to protect your data". Port professionals understandably need help evaluating such claims, some of which are inevitably misleading or inaccurate.

A BRIEF PRIMER – AND THE IMPORTANCE OF PRECISION IN BLOCKCHAIN TERMINOLOGY

Note: This is not an exhaustive primer. For a more detailed overview of blockchain in supply chains, see the World Economic Forum's paper, "Inclusive Deployment of Blockchain for Supply Chains – Part 1: Introduction published in April of this year.":

As blockchain is a nascent technology, the exact categorization and definitions of different blockchain structures and types are subject to some debate, and the terms are in flux. Typically, the technology is divided into two broad categories: private and public. The distinction is based on access – in other words, who can read and submit transactions to a blockchain and participate within the consensus process.

According to Hileman and Rauchs (2017), blockchain can be further segmented by distinguishing between different types of permission model granted to participants of a blockchain network.

- Read: Who can access the ledger and see transactions
- Write: Who can generate transactions and send them to the network
- Commit: Who can update the state of ledger

Though this may suggest that there are clear categories for decision-making, it is important to reiterate that definitions of 'public,' 'private,' and even 'blockchain' can mean different things to different people.

			Read	Write	Commit
Blockchain types	Public	Public permissionless	Open to anyone	Anyone	Anyone
		Public permissioned	Open to anyone	Authorized participants	All or subset of authorized participants
	Private	Consortium (multiple organizations)	Restricted to an authorized set of participants	Authorized participants	All or subset of authorized participants
		Enterprise (different units within a single organization)	Fully private or restricted to a limited set of authorized nodes	Network operator only	Network operator only

A summary of the potential structures is summarized in the table below.
Source: Inclusive Deployment of Blockchain for Supply Chains – Part 1: Introduction, World Economic Forum

Determining the facts, understanding the variants, and effectively communicating the capabilities of the technology can be challenging when terms are misleading or used out of context. As such, it is important to align on the terminology used for blockchain structures in any discussion of the topic.

THE PUBLIC VERSUS PRIVATE DEBATE IN THE SUPPLY CHAIN LANDSCAPE

Research done by the World Economic Forum (Inclusive Deployment of Blockchain for Supply Chains: Part 3 – Public or Private Blockchains – Which One Is Right for You? published in July 2019) as part of the Redesigning Trust: Blockchain for Supply Chains project – a multi-stakeholder effort of 100+ organizations creating guidance for the responsible deployment of blockchain for supply chains – found:

- Both public and private versions of blockchain technology have been useful in achieving different objectives and project requirements in supply chain experiments to-date.
- Industry veterans believe supply chain actors are generally cautious in adopting new technologies, such as blockchain. Since collaboration and data sharing have traditionally not been the norm, those encouraging blockchain adoption are likely to face challenges. Many see private technologies as a near-term solution with the potential to increase the use of public chains – as appropriate – in the longer-term.
- As the industry explores private blockchain solutions, it is important to distinguish the benefits of blockchain technology from that of traditional databases. In use-cases where the unique advantages of blockchain aren't particularly helpful, providers may opt to stay with, for example, an SQL or NoSQL database or similarly traditional solution.

KEY CONSIDERATIONS FOR BLOCKCHAIN STRUCTURE IN PORT USE CASES

As port ecosystems weigh the public versus private question, they must consider several factors that may vary greatly from port to port. Decision makers must look at the context of their selected use case and distinct requirements. The Port of Valencia, one of Spain's busiest ports, is exploring blockchain and distributed ledger technology for addressing pain points and improving logistics. Ramón Gómez-Ferrer, Head of Strategy and Innovation at the Valencia Port Authority explains the factors they considered to determine the optimal blockchain structure in a recent proof of concept:

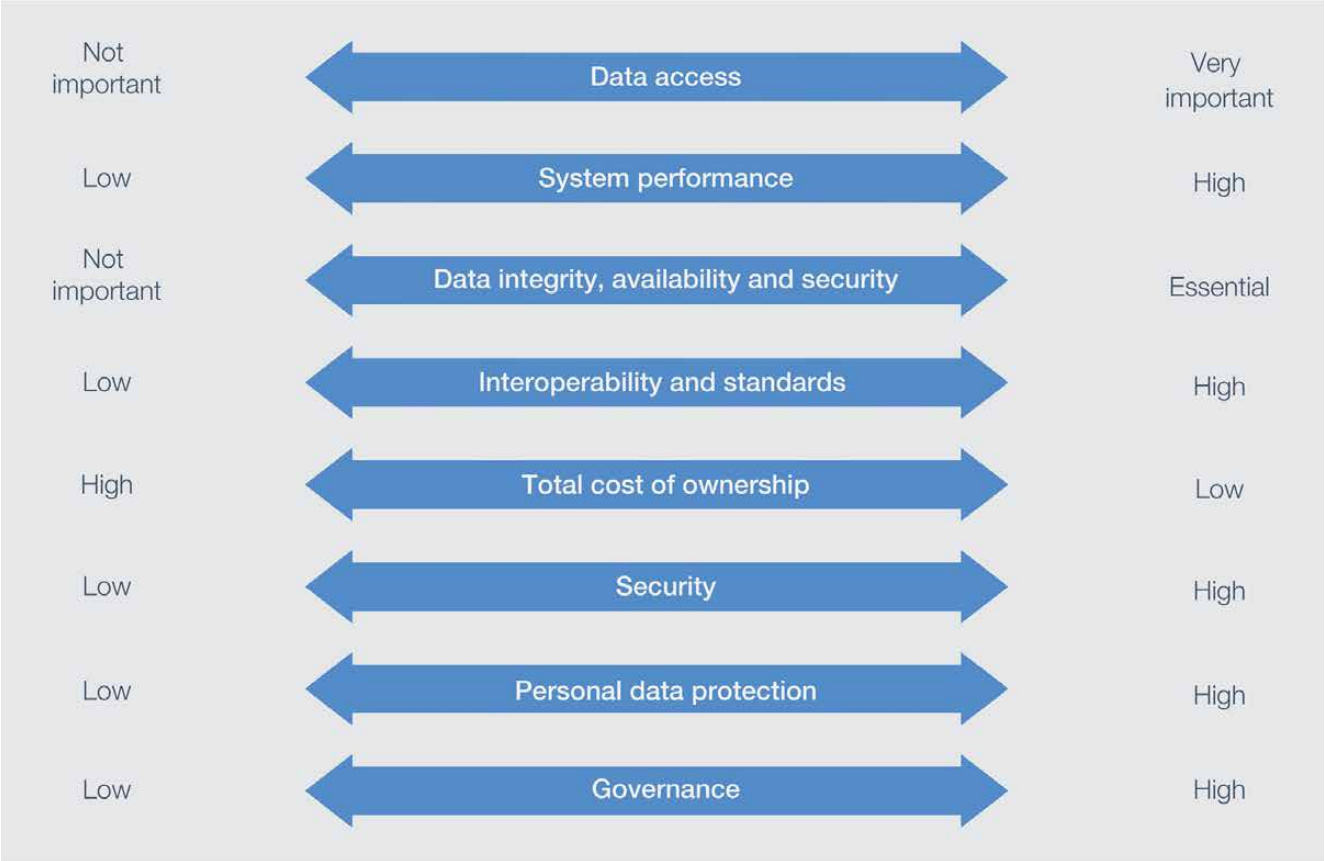
"The Port of Valencia solution, called GESPORT 4.0, aims to digitize documentation, increase process efficiency and ease communication. The port experimented with private and public chains and recently developed a private permissioned solution for container management that is based on Hyperledger Fabric. While a host of factors came into play, our approach was primarily driven by the existence of sensitive data, the need for governance via a community of stakeholders, the ability to store data and the avoidance of convoluted consensus mechanisms. In addition, decision-makers investigated performance, transaction volume, system saleability and security prior to their commitment to Hyperledger Fabric."

As with this blockchain experiment from the Port of Valencia, the choice of a public or private blockchain depends heavily on the use case in question. Within heavily regulated industries, for instance, private chains will tend to be more prevalent, since data can be protected in a more tightly controlled way for compliance purposes. An example is Corda, a permissioned blockchain platform which enables privacy and finality across any agreement or asset type.

As Corda was originally built to meet the stringent requirements of highly-regulated industries – financial services, in this instance –it deployed a private chain. It aimed to enable businesses to transact directly with complete privacy, using smart contracts to streamline business operations. This key privacy feature is applicable to supply chains under stricter levels of regulation, such as pharmaceuticals and aerospace and automotive sectors.

However, a public blockchain may be a better fit for use-cases that require open distribution of records or public verifiability – for instance, government agencies that must respect public-records.

Given the variance in requirements across the supply chain, it has been an area ripe for experimentation and productions. "Different examples of applications



The research done by the World Economic Forum identified typical requirements that supply chain operators have for blockchain solutions. The importance and priority of these features differ depending on the use case in question:
Source: Inclusive Deployment of Blockchain for Supply Chains: Part 3 – Public or Private Blockchains – Which One Is Right for You?, World Economic Forum

built by supply chain service providers include Evrythng, which uses a public version, to consumers of FMCGs to access provenance data for a product. Another example is the IBCS Group that has designed a solution for tracking recyclable racks among a large group of users without the need for a central database, where competitors could find information about each other's' supply chain" explains Jens Munch Lund-Nielsen, Head of Global Trade & Supply Chains at IOTA Foundation, which produces a private, permission less distributed ledger system

There is no silver bullet to enable organizations to choose between public and private blockchain. Stakeholders first need to understand the characteristics, advantages and drawbacks that each type of structure offers before making an educated decision. A proactive approach to understanding the technology is a must, as the structure affects supply chain stakeholders strategically and operationally.

ABOUT THE AUTHORS

Nadia Hewett has an extensive background in supply chain and logistics, having worked on major supply chain initiatives across Asia, Americas, Europe and Africa. She is currently working on Blockchain and Distributed Ledger at the World Economic Forum's Centre for the Fourth Industrial Revolution where she leads Blockchain related projects.

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ABOUT THE ORGANIZATION

The World Economic Forum is the international organization for public-private cooperation. The Forum engages the foremost political, business and other leaders of society to shape global, regional and industry agendas. The Forum's Centre for the Fourth Industrial Revolution is a newly established focal point within the international community dedicated to shaping how we use emerging technology. Teams bring together the public and private sector to co-design new rules that maximizing the benefits and minimizing the risks for technologies such as blockchain.

ENQUIRIES

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