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FROM THE

EDITOR

It is with great pleasure that the team and I bring you this second e-book in preparation for the Smart Ports & Supply Chain Technologies conference, which will be taking place in Rotterdam on 2-3 October 2018.

We decided that our energy should go into shining the spotlight on what could potentially be the logistics industry's greatest technological revolution.

With the advent of A.P.Moller-Maersk and IBM's TradeLens blockchain solution entering the global supply chain, it's now evidently clear to every logistics professional that the digital ledger's baby steps into the industry are becoming great strides.

Wolfgang Lehmacher, WEF; Matt Kuperholz, PwC; Deanna MacDonald and Katherine Foster, BLOC; Darko Djuric, CargoX and Dean Croke, BiTA have all made excellent contributions to this e-book.

However, as is often the case with all emerging technologies, I suspect that even after reading these technical papers, many of you will still question the credibility of blokchain.

Even if you're not convinced, I hope this e-book, along with the supply chain focus of 'The Path to Intelligence', will develop your understanding of blockchain and generate questions for the conference.

The 'Blockchain and Data Sharing: Capitalising on the Blockchain Opportunity' session at the upcoming conference ticks all the boxes for me, and I've featured a wonderfully insightful CargoX technical paper to provide you with a taste of what Igor Jakomin, the company's COO, has in store as a speaker.

These e-books act as a foundation for the journey that both the industry and Port Technology is taking, so please read the papers and get involved in the conversation in whatever capacity you can.

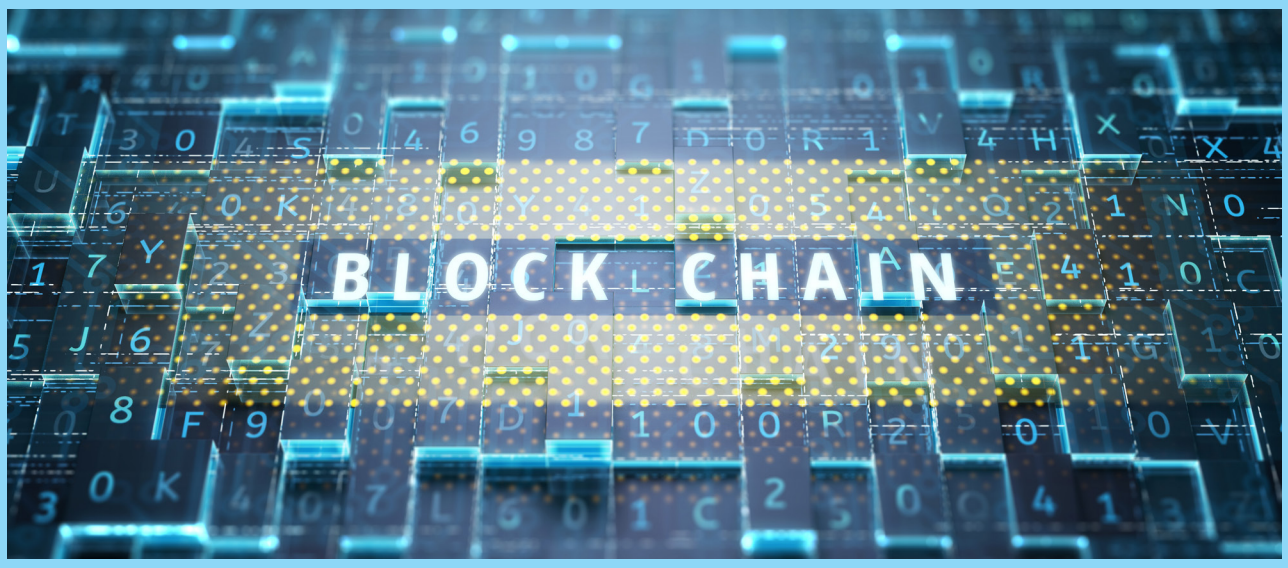
Join the discussions on Port Technology's social media channels with #SPSC18 or by commenting directly on our content via the new commenting function released on the PTI website.

Going forward, Port Technology plans to transform the journal by maximizing its e-interactivity.

It is important that you, our loyal subscribers who help us to create this amazing content, see even more benefits.

Please feel free to send me any feedback about how you would like to see the journal develop directly by email to info@porttechnology.org.

Laurence Doe
Editor



BLOCKCHAIN

POWERING PORT COLLABORATION

Wolfgang Lehmacher, Head of Supply Chain and Transport Industries,
The World Economic Forum (WEF)

The world has become a system of interconnected systems brought on by the Fourth Industrial Revolution (4IR). Extensive connectivity should, in principle, improve and reinforce collaboration. Advantages and benefits of business collaboration, whether vertically, horizontally or in geographic areas, have been demonstrated. Vertical collaboration, i.e. the alignment along the chain of suppliers, manufacturers, sales channels, customers and consumers is simply a necessity. Geographic collaboration, e.g. in cities and corridors, is promising but in its digital infancy. Horizontal collaboration is an exception with high potential. In the port industry collaboration can reduce congestion, improve safety and security, and make the flow of goods more even and fluid.

Our new interconnected environment needs one ingredient as old as time: Trust. Blockchain, the most well-known of enablers of distributed ledger technology (DLT) is seen as the agent of trust in the digital world.

MERITS OF COLLABORATION

Working together is the very nature of business – whether within organizations or between partners along the supply/value chain. Also, competitors collaborate, as liner alliances exemplify. While vertical collaboration is well advanced, horizontal collaboration remains largely untapped. Collaboration, in particular the sharing of transport capacity, can bring opportunities and significantly reduce costs and carbon emissions. While we require a reduction of 40-70% to keep the increase in average global temperature below 2°C, total annual transportation emissions are expected to increase by 70% by 2050, when compared to 2010.

Collaboration in the context of smart city concepts and along corridors can yield significant economic benefits and improve quality of life. Cyber resilience also benefits from collaboration. Exchanging information about risk and mitigation measures is an important part of cyber-strategies, and the better the knowledge and use of digital tools the better our protection.

In ports, collaboration helps to ease congestion. By addressing uneven cargo flows as a collective supply chain issue – caused by weekly manufacturing cycles, the rush in cargo volumes before rate increases, wrongly declared weights, and so forth – collaboration and information sharing platforms can become a significant part of the solution.

HOW BLOCKCHAIN CAN HELP

Game theory demonstrates that it is trust which sits at the centre of successful collaboration. Only trust allows you to maximize the outcome for everyone. Trust is the result of good faith, transparency and integrity, and that's precisely where blockchain and DLT come into play.

As DLT enables the transparency of the transfer of assets and immutability of records within the chain, the distributed ledger can bring a new quality of trust to the cyber-physical world. Transparency ensures the enforceability of rights. Yet 'work in progress' is often the digital identity of goods. It can, however, be ensured when

goods own unique characteristics, such as laser-graved serial numbers or specific chemical compositions.

Blockchain is one type of DLT. In this paper, the terms blockchain and DLT are used interchangeably. They stand for the concept of immutable distributed ledgers. Blockchain can be private and public. The focus here is on the public blockchain/DLT.

DLT-POWERED COLLABORATION

Vertical collaboration is a necessity in business. Dell was the first to promote the deep integration of all parties along the supply chain. Since then, vertical collaboration has been further developed thanks to information and communication technology (ICT). The 4IR technologies at large, including blockchain/DLT, will help to bring collaboration to the next level. Information such as the provenance of goods, classification data, tariff codes, import/export data and certificates, manifests and loading lists, customs values, status information, and all other information about goods within the supply chain ecosystem, will be available for all parties involved at any time and place (through computers or mobile devices).

Blockchain can be used to execute smart contracts. Once data intakes prove that the conditions which are captured in the database/contract have been met, payment can be authorized. DLT promises groundbreaking advances in trade and supply chain finance, resulting in reduced costs, to the benefit of small-ticket transactions and SMEs. Crowdfunding platforms have emerged. Tradeshift, a procure-to-pay supply chain management platform, announced an innovation lab and incubator that will focus on transforming supply chains through emerging technologies, such as distributed ledgers, artificial intelligence (AI) and the Internet of Things (IoT).

While startups are on the rise, traditional incumbents are not inactive. Maersk Line and IBM have announced their blockchain-powered trade platform. Hyunday Merchant Marine has completed its first blockchain voyage. Marine Transport International (MTI), in conjunction with Agility Services, has conducted a pilot of blockchain technology which saw a new 'Container Streams' system based on the sharing of data on suppliers, shippers, load points, customs and terminals on a shared blockchain ledger. PSA International, Pacific International Lines, and the Port of Antwerp have also carried out blockchain tests. So, it is clear that DLT-based vertical collaboration tests are in full swing.

GEOGRAPHIC COLLABORATION

Ports are an integral part of their host cities. Central to the smart city concept is the existence of platforms which connect all intelligent things. The aim is to provide

benefits for the collective and the individual parties operating in the city, as well as the city dwellers. Citizens expect a high level of service, flexibility and transparency, which requires data flows, integration, and sharing with confidence across the private and public sectors.

Emerging corridors such as China's Belt and Road Initiative (BRI) require 4IR technology to ensure a new quality of growth. Upgraded technology along the BRI could, for example, level the playing field. SMEs could create market intelligence reports based on real-time market data enabled by the IoT and cloud services. This would help them understand product supply-and-demand dynamics and quickly adjust production plans, track pricing, predict future price trends, as well as identify and react to new market demands that are not fully satisfied. DLT could help these smaller and medium-sized companies reduce counterparty risk and minimize fraud. In all, the market access gains made by SMEs are expected to boost GDP in BRI countries by 4%-7%.

HORIZONTAL COLLABORATION

BCO's can significantly reduce shipping costs and emissions by collaborative shipping, i.e. by pooling their transport needs either on the same lane (bundling volumes) or in opposite directions. When Ocean Spray shifted 80% of its shipping on the New Jersey-Florida route off trucks and into Tropicana's rail cars, the company reduced carbon emissions by 20% and transport costs by 40%. In the US, 15% of trucks run empty while the remaining 85% run at an average capacity utilization of 64%. Global shipping is a US$60 billion business with enormous potential to move goods cheaper and with less carbon emissions within and between countries and continents.

Leveraging the potential requires that companies overcome inertia, corporate beliefs and risk aversion, and move towards actively exploring collaboration opportunities. While leaders will continue to push digital integration and startups offer match-making and collaboration platforms, industry digitization will help to find the right collaboration partners. Leadership has to face the fear of giving away valuable information to competition, as well as stress the factors companies really compete on. Which is usually product and service design, performance, access, price and after sales and customer service.

A SUPER ROBOT IN THE MAKING

As several examples show, progress is not only driven by blockchain. 4IR technologies rarely come alone. Blockchain reinforces the links created by IoT and DLT sits at the heart of the platform economy, allowing data to flow securely. The platform is the link and structure that connects all intelligent things. It is the medium which allows IoT to exchange and transact. AI improves the quality of DLT data intake and gives the global 'super robot in the making' its brain. AI decodes text and voice, checks inputs and authenticity, and computes small and big data. For example, IBM Watson helps third parties to optimize their supply chains. Platforms are not just digital anymore. They offer shipping, warehouse space and digital storage capacity – as demonstrated by Ebay and Amazon.

In ports, digital platforms connect people, goods and equipment. All port-related information can be handled on a platform too. Blockchain allows for distributed and real-time multi-party tracking, digitized bill of landings and letters of credit, machine-to-machine (M2M) interactions, and helps to establish a new level of visibility of assets, movements and liabilities.

Blockchain-powered trade platforms, smart contracts, digital wallets and secure digital asset and information transfer, ease maritime operations, as well as unlock new opportunities for all parties and reduce risk. Significant amounts of paper and time can be cut out of administrative and handling processes within the port and in the interplay with the world beyond the gate. Without the concept of blockchain it would be hard to imagine an autonomous supply chain, economy or port.

A PINCH OF SALT

Blockchain is not beyond criticism, however. Some claim that after years of relentless efforts and billions of dollars invested, the technology has not yet reached scale. That its 'success' is largely limited to bitcoin and currency speculations. Further, the high number of blockchain startups can be seen as sign of its immaturity.

But business lacks trust and inclusiveness. Blockchain is able to fix this. It is a concept which allows peer-to-peer transactions – a surefire route to a more inclusive world. DLT is an idea which is here to stay, independent of its final form, as the burgeoning cyber-physical world requires reliable tools of trust.

Blockchain/DLT is a disruptive 4IR technology attracting many entrepreneurs and significant funding. It will disrupt all industries. It is just a question of time. Other industries have shown how new entrants and technologies can dramatically change the game, so the private and public sectors need to prepare for change and its consequences.

CONCLUSIONS

With its dynamics and speed, 4IR leaves no room for inaction. But what measures are appropriate to stay in the game without doing too much harm to culture, people and finances? What should businesses and governments do to set themselves up for long-term success? There are myriad directions leaders can opt for. However, before they do, they need to upgrade their legacy IT systems and define a DLT and 4IR technology roadmap, explore strategic partnerships, and design an operating model that allows swift adaptations.

Blockchain is a key enabler of trust and inclusiveness. Two qualities desperately required in today's fractured and volatile world. BCOs, government agencies, carriers, and all the other service providers and players operating in ports, will have an increasingly hard time ignoring the risks and new possibilities brought by the 4IR. Most of us are not only interconnected, but increasingly interdependent. Digitally enabled collaboration might be forced on us as the new paradigm of doing business. Blockchain is key to this new reality.

ABOUT THE AUTHOR

Wolfgang Lehmacher is an author, global executive, advisor, entrepreneur, and expert in the field of supply chains, transport and logistics. Lehmacher has been involved in various major change initiatives in the supply chain. He has been President and CEO of GeoPost Intercontinental and a Member of the Executive Board, as well as Director: Supply Chain and Transport Industries at the World Economic Forum.

ABOUT THE ORGANIZATION

The World Economic Forum (WEF) engages with political and business leaders within the world society to shape global, regional and industry agendas. It was established in 1971 as a not-for-profit foundation and is headquartered in Geneva, Switzerland. It is independent, impartial and not tied to any special interests. The Forum strives in all its efforts to demonstrate entrepreneurship in the global public interest while upholding the highest standards of governance. Moral and intellectual integrity is at the heart of everything it does.

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DEVELOPING A NATIONAL TRADE COMMUNITY SYSTEM

Matt Kuperholz, Partner and Chief Data Scientist,
PwC Australia, Australia, Melbourne

Motivated by concerns over Australia's worsening position in the World Bank's Trading Across Borders rankings, The Australian Chamber of Commerce and Industry, Port of Brisbane and PwC Australia are seeking to bring Australian international trade to the 21st Century.

Our vision is to remove complexity and overcome inefficiencies in the supply chain through a 'Trade Community System' (TCS) which links key supply chain information and ensures trust in that information through distributed ledger (or 'blockchain') technology.

LEGACY SYSTEM WEBS

Businesses and their international supply chains are becoming increasingly complex.

To drive new efficiency gains, there is a need for industry leaders to develop mechanisms which facilitate the integration and interoperability of commercial operators across the supply chain and logistics sector.

We have identified a range of inefficiencies, which can be addressed through visibility and secure sharing of largely existing supply chain data.

At present, the current inefficiency across Australian supply chains occurring through lack of visibility can create up to $450 in cost per container. We are observing similar costs across the 36 Organisation for Economic Co-operation and Development (OECD) member countries.

Underpinning these costs are a range of factors, including:

- Varying levels of integration and digitization across international supply chains which constrain the efficient flow of goods and information
- Conflicting commercial interests which create inefficiencies across the whole supply chain
- The predominant use of manual transactions to communicate across supply chains
- Entrenched legacy systems with limited integration, which can reduce visibility, and hamper innovation;
- Excessive levels of double handling of information and data between parties
- Significant red tape, which can restrict and delay the fluid movement of goods and services.

The increasing volume of trade that hits borders corresponds with equal pressure on both ports and border authorities to process, screen and clear goods into the economy.

To reduce this pressure on both the public and private sector, we intend to transform the way supply chain participants interact.

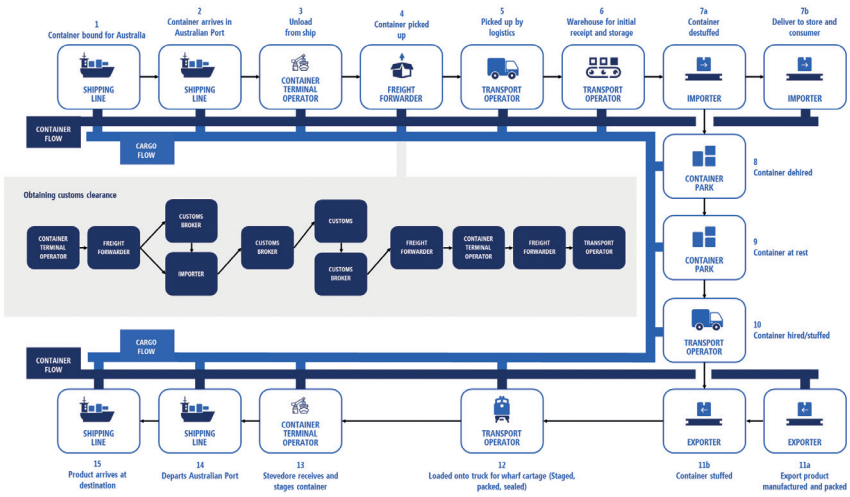
END-TO-END DIGITIZATION

We are building a TCS platform which will digitize the end-to-end supply chain and the flow of associated trading information, improve connectivity for supply chain participants and reduce supply chain costs.

Trust and traceability will be enabled in the platform through the deployment of distributed ledger and a range of other technologies.

The next pilot phase will involve building out the platform to handle live data and running in parallel with real supply chains of selected partner organizations to validate and refine the benefits, costs and risks of building the platform to national level.

In building the TCS platform, we have established four guiding design principles which form the centre of our approach.



1. **An open, secure and trusted data sharing platform**
   - The data is owned and governed by its creator
   - The platform is operated independently of established supply chain interests
2. **Easy to integrate and start using**
   - It augments not replaces the systems that are already part of Australia's supply chains
   - Users access directly through a web portal or indirectly through their existing systems
3. **Low to no cost to participate**
   - The platform does not make money from charging users to access data about the goods they are managing
   - The platform's revenue comes from the productivity and service innovations that the data unleashes
4. **Visibility that delivers velocity and efficiency**
   - The platform will enable goods to flow through the supply chain more quickly and manage avoidable costs and fees.

TRADE COMMUNITY SYSTEMS

The port, whether sea or air, is the first and last point of domestic contact in the international supply chain and the point at which all significant supply chain participants converge.

There is an abundance of information created before the border, at the port and behind the border, which when integrated, becomes more meaningful and of greater importance to government and downstream supply chain stakeholders and service providers.

A TCS will increase trade competitiveness by improving the connectivity facilitated through port community systems into a platform that fosters increased visibility beyond the port through the entire landside supply chain.

By including air freight and air cargo into our TCS platform, we hope to provide comprehensive coverage to all corners of the supply chain.

The primary benefits supply chains would offer are the efficiencies borne from access to accurate, timely and traceable supply chain data, improving the flow of goods from producers through ports and across borders and into consumers hands.

TECHNICAL FUNCTIONALITY

The aim of the TCS is to complement the needs of today's businesses operating in global trade and logistics.

Our goal is to render the international supply chain faster (velocity), more efficient (efficiency), and host to information that is more secure and yet open or transparent to permitted users (visibility).

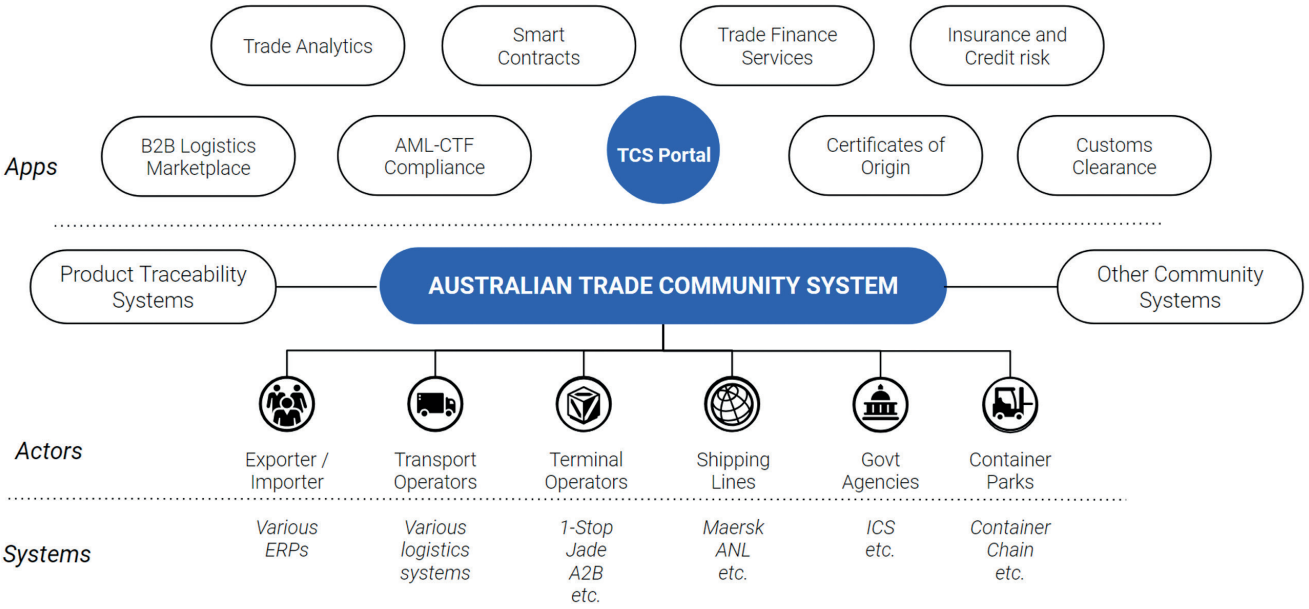
Technologically, this TCS solution is designed to be agile and able to adapt to the business environment in which it operates.

PwC's previous work on product traceability and the digitization of supply chains has considered that there are nine different technology groups that interact to create a trade community system.

To date, our work on the technical challenges to be solved has principally focused on the data layer, consisting of:

- **Asset Tagging and Nesting -** How assets in the physical and digital worlds are identified to the platform and linked to each other over time, including complex dilulation, mixing, repacking, and joining
- **Chain Of Custody protocol -** How the events that occur to assets are interpreted, assessed against business process rules and recommendations for actions made
- **Distributed Ledger -** How to create and access an immutable record of events so that all users can implicitly trust the integrity of data that is put into the platform.

A distributed ledger makes up only one important component part of the technology stack - engendering greater trust in information and events associated with the supply chain by creating an immutable record or digital signature of every data and hand off point.



At this time, it is not feasible to store all supply chain data 'on chain,' so our solution is a hybrid one leveraging an off chain graph database to manage storage of data mass efficiently and effectively.

Using flexible graph schemas to represent the information provides for easier integration with existing data models in place within the user environment.

Graph databases naturally accommodate complex interrelationships, and are 'future proof' to cater for increases in related data fields with the wider and greater adoption of IoT devices in the supply chain.

We believe this approach can address traditional challenges associated with trust and information asymmetry between supply chain operators, importers and exporters- or what we refer to as the trust leap.

Without traditional intermediaries like government regulators, banks and insurers, businesses are reluctant to take trust leaps and forge new transnational business relationships.

This is where distributed ledger technology plays a pivotal role in our solution- it digitizes and automates this trust leap, lowering the barriers to trade and participation in international supply chains.

The other significant technical challenge to be solved relates to handling, reading and understanding disparate supply chain data ontologies.

This is a problem as old as trade (how for example could Marco Polo communicate and trade with Kublai Khan when they fundamentally speak different languages), and one we have spent considerable time and effort understanding.

It forms a core objective across our asset tagging and nesting and chain of custody protocol technology groups.

Efforts to standardize and harmonize datasets across commercial operators and governments are longstanding - and are yet to fully mature.

SUCCESSFUL VISION

Our future vision with TCS is to facilitate the secure linking of data between all supply chain participants and between other supply chain platforms that are developing across the globe to build an ecosystem which drives productivity and service innovation.

ABOUT THE AUTHOR

Matt Kuperholz is a partner and chief data scientist at PwC Australia.
Formally trained in actuarial science and computer science, Matt honed and expanded these technical skills with more than 20 years consulting experience for top-tier companies.
An expert in planning, executing and communicating the results of advanced analytics projects, Matt's area of specialization is the application of artificial intelligence and machine learning technologies to detailed and complex data.
Matt is currently Australia's top ranked Analytics Leader according to IAPA, the peak body for analytics professionals in Australia.
Matt was also recently honoured by Malcolm Turnbull and Australian Chief Scientist Alan Finkel as one of the Knowledge Nation 100, a group of innovators and entrepreneurs helping to shape Australia's new economy.

ABOUT THE ORGANIZATION

PwC is one of Australia's leading professional services firms, bringing the power of our global network of firms to help Australian businesses, not-for-profit organizations and governments assess their performance and improve the way they work. Having grown from a one-man Melbourne accountancy practice in 1874 to the worldwide merger of Price Waterhouse and Coopers & Lybrand in 1998, PwC Australia now employs more than 7,000 people.

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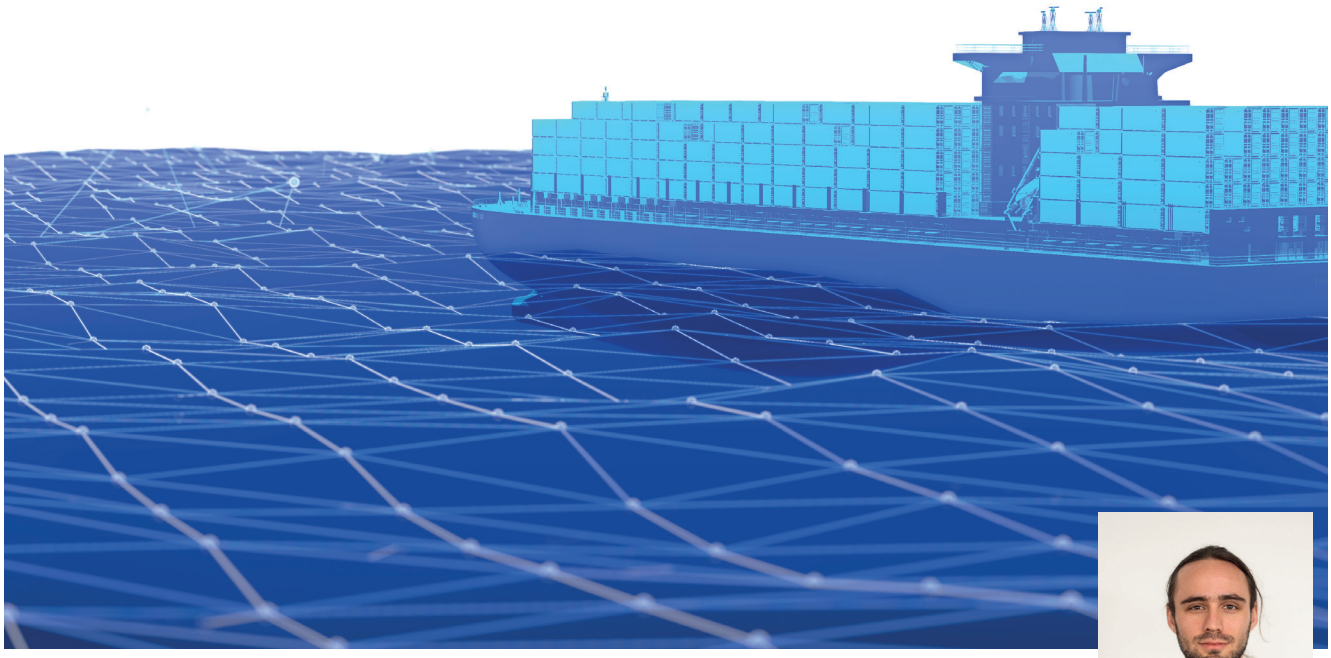

BLOCKCHAIN FOR MARITIME

SECURING THE CYBER ENVIRONMENT

Darko Djuric, Blockchain Business Integration Advisor, CargoX, Ljubljana, Slovenia

Blockchain is being introduced in an already fragile digital landscape, with reports of hacking being ubiquitous. A single cyberattack in late June last year cost Maersk up to $300 million. Maersk responded with “different and further protective measures” to contend with a “new type of malware”. This highlighted a growing problem for the shipping industry. Blockchain is hailed as a safe, robust alternative to existing systems with central points of failure. If this claim is factual, could the maritime sector be facing an inevitable transition to such solutions? As a provider of a blockchain-based platform for trade related documentation processing, CargoX has put extensive thought into the sensible adoption of blockchain for the maritime industry. Many of the concerns around adopting blockchain regard the peripheral points of failure rather than blockchain as a protocol itself.

THE EARLY DAYS OF INTERNET

This is not the first time industries have faced these questions. In the very beginnings of the internet there existed a dichotomy of the two widely diverging attempts at cyber security that are still being used and played out on the stage of society; security either by isolation or obscurity.

In the early 90s, companies and banks were deciding on the best way to integrate emails into their corporate structure. The innovation was met with many of the same critiques that blockchain-based solutions for data flows are facing today; “None of our clients are using it, who are we going to transact with using blockchain?”, “The implementation looks daunting and overridden with complexities that might be risky and require scrutiny”.

But the veracity of blockchain as a technical impetus of innovation continues to beckon us, as providers of commerce, into examining all possible modes of operation. Additionally, in the context of cyber security, it calls us to re-examine the practices of previous decades, which should serve as a testing ground from which conclusions can be derived for the creation of differing approaches to information security. Not only do systems need to be updated, but the calibration of solutions for organizations handling large transactions must be in sync with the current flows of technical evolution. This evolution sync must also encompass the minds of talented individuals who are pushing the fronts of digital boundaries — the cyber experts who are seeing a picture much more troubling than unsuspecting users do, as well as the wide range of hacker types, some of whom simply like to discover systemic faults in new hardware and are very important in driving the discovery of the weaker elements of the current digital landscape.

STIGMATIZED OR NECESSARY?

Barnaby Michael Douglas Jack, a hacker and cyber-security expert who famously demonstrated an ATM exploit in 2010, once commented: “Sometimes you have to demo a threat to spark a solution”. We live in a time when companies will no longer be able to rely on the good will of white hat' hackers, and trying to repressively fight all hacking comes at the cost of stifling innovation. This is an element of society we simply cannot control. Last year, over 2 billion records were lost or stolen, and in many cases it takes months for the news of these attacks to reach the

public. The UN estimates that 80% of these attacks are committed by ultra-sophisticated criminal organizations. If correct, this would represent one of the largest illegal economies in the world, with a capitalization of over $400 billion, greater than the GDP of many nations. To call them criminals falls short as a designation of their relevance, given the complexity of these issues.

We innovate, learn and recreate our systems, until they become so advanced that we maximize our potential as a civilization. Blockchain is only at the beginning of this larger societal pursuit of technical eminence, which would signify an era of no further obsolescence. But today we are far from that point in time. We must consider the reality that cyber security is inadequate today. Saying "our current systems of old are impenetrable" should be weighed against the measure of rationality which is attained only by being constantly up to date. New ways of hacking, and along with it the process of discovering obsolescence of our technical solutions, are emerging with certainty and traces of the effects they have on the shipping industry.

LESSONS FROM PAST MISTAKES?

As large corporations first attempted to join the internet revolution, they did not just blindly connect straight to TCP/IP and build applications on top of it. They built firewalls, using military analogies such as perimeter security to wall themselves in. The prevailing idea was that this made their organization more secure.

Today, we see a rising trend of permissioned ledgers and isolated blockchains. The problem with private blockchains is that at some point the system which existed in isolation gets exposed to the outside world, and it may have such low resilience that it is not immune to real world peculiarities of the internet. If it has any bugs, we will not know about them until exposing it to external variables. A public blockchain exposed to attacks all the time however, is one where bugs are constantly found and fixed, making the system more resilient.

The digital products and services of the past few decades were designed to exist within a wall. But the problem with walls is that we cannot trade through them easily. As businesses we do commerce, and commerce cannot happen if we are walled in. We implement all modern prerequisites of cyber security, but what is the salesperson going to use on the field? A laptop, which is vulnerable to external threats or infection, which can then distribute malware within the confines of the firewall and the full trust of his colleagues.

HARD-WIRED PROBLEM?

Malicious data-harvesting is a reality all businesses must face. We tend to underestimate hackers, be they of a malicious or benevolent sort. Wireless devices are still very vulnerable to exploits. How many OEMs are still flooding the markets with obsolete Wireless Modules? And how conscientious are they in rectification of known issues, when capital losses are taken into consideration?

The design parameters of general purpose PC hardware is arguably the most concerning area of cyber security development we face today. Intel and AMD hold the vast majority of the market share, and both currently ship their hardware with back doors that have been exploited by professionals to various degrees of concern.

Modern intrusion methods enable hackers to perform exploits without the need to sneak into your offices. One of the most vulnerable devices today are printers. An exploit can be delivered to the printer via a resume, which is designed to re-write the firmware to do basically whatever the hacker wants, including taking control of webcams, phones and microphones in the room.

HOW SECURE ARE OUR COMPUTERS?

Employees handling sensitive data need to be well informed about information security fundamentals. More emphasis should be directed at projecting the importance of these concerns, even demonstrating how easy it is to collect network packets on an open public network using a cheap WiFi adapter from Amazon and Kali Linux operating system.

At this time we cannot think of personal computers as secure. By definition, trust implies that there is a way to compromise the system. We generally want to avoid trust in anything — trusted 3rd parties, certificates etc. This 'trustless' functionality can be thought of as an intrinsic characteristic of blockchain applications.

BLOCKCHAIN TO THE RESCUE?

A viable solution to cyber threats today is something for which the blockchain seems to be ideal: a strict separation of the trusted element from the hardware. Crucial information should be kept apart from the computer — think along the lines of cloud computing. However, cloud computing still relies on data centers — critical centralized infrastructure that is demonstrably inferior to blockchain in terms of data integrity.

Modern encryption techniques and the advent of decentralized computing underlying blockchain have brought about a torrent of innovation at the foundation of which is digital data integrity that, ideally, we can trust. In the current landscape, we are still faced with many questions which will surely be resolved in the coming years.

One of the qualities of businesses that succeed in challenging times is that they have a rational paranoia of failure. The question of why some companies should take the leap into the wild west of digital frontiers bears with it a reminder that success is a struggle, and fleeting once we attain it. Blockchain may be indistinguishable from inevitable digital progress. Technical adaptation to blockchain and all related security and management concerns can be perceived as markers of innovative success in the future. We do not want to be absolutely certain of any claim of security today, besides the fact that we have done our due diligence to be contemporaneous with emerging predicaments. Yet this is not to be construed as a lack of trust fatal to blockchain adaptation, but rather as a rational assessment of the integral parts of future innovation.

ABOUT THE AUTHOR

With more than seven years experience in the CNC machining industry at Danfoss, Darko recognized blockchain as a viable alternative to existing ERP systems such as SAP which he used on a daily basis. Studying and writing papers about supply chain applications of blockchain, he crossed over into logistics in 2018 as a Blockchain Business Integration Advisor for CargoX, providing educational and technical support for clients and early adopters of the technology.

ABOUT THE ORGANIZATION

CargoX is an independent supplier of blockchain-based Smart B/L solution that enables extremely fast, safe, reliable and cost-effective global Bill of Lading processing for the logistics industry and supply chains. The company has developed a decentralized platform based on the Ethereum network, and they have a pipeline of future products for the supply chain industry. They have introduced their working solution, live, on stage, in front of 250+ experts and managers, and their respected partners are already testing their solution. CargoX has been founded in 2017 by a group of professionals in logistics and software development industries, and whose aim is is transform the global shipping industry by securing the Bill of Lading documents using blockchain technology.

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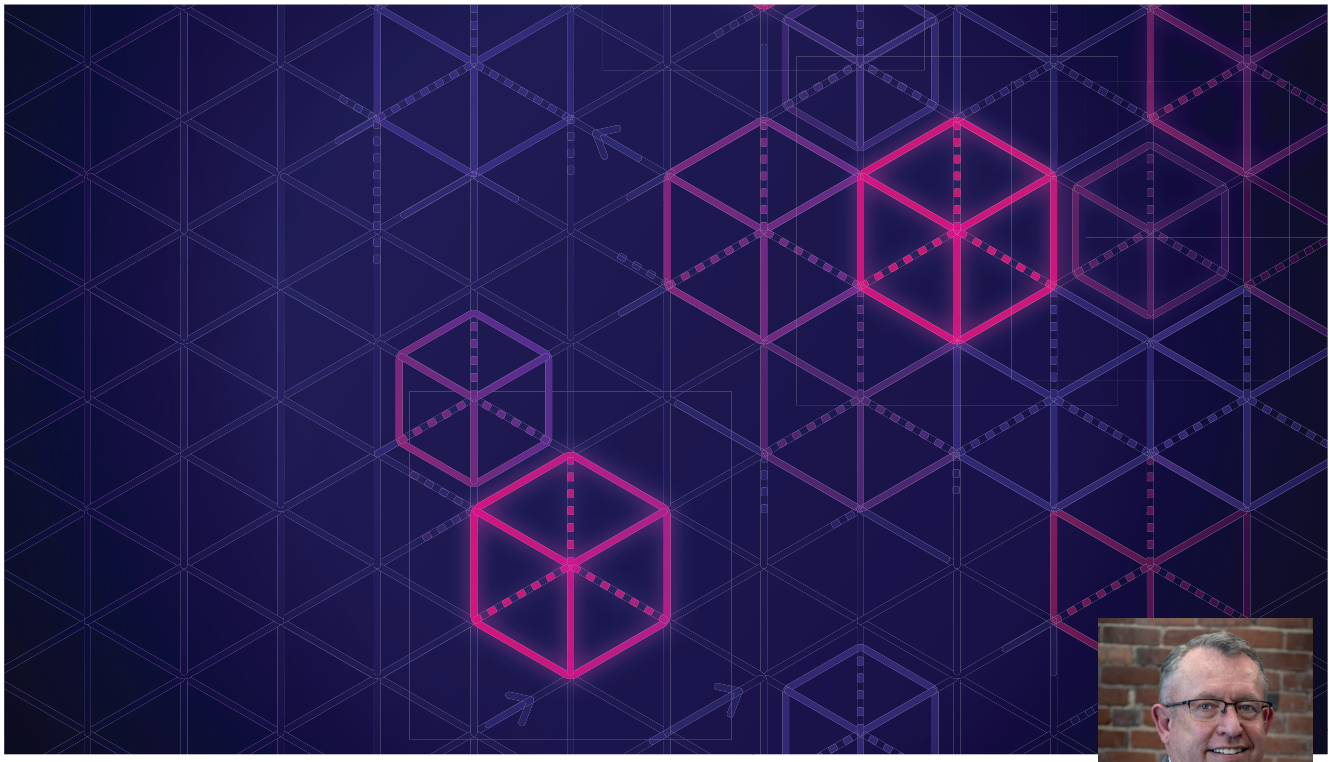


WHAT BLOCKCHAIN HAS IN STORE FOR LOGISTICS

THE DIGITAL FUTURE OF TRANSPORT

Dean Croke, Chief Analytics Officer,
FreightWaves and Blockchain in Transport Alliance (BiTA), Tennessee, USA

The Blockchain in Transport Alliance (BiTA), established in August 2017, has not only picked up considerable traction as a forum for promotion and education, but also encouraged the development and adoption of blockchain applications in the supply chain industry.

Thousands of companies are applying for membership, and industry leaders such as UPS, Google and Uber Freight are already a part of our movement, which means the momentum is only increasing as technology producers connect with market partners.

BiTA's 400-plus members are participating in discussions with the goal to create and adopt industry standards for blockchain applications and bring about its commercialization.

A core belief at BiTA is that a market is only as strong as its educational foundation, which is why industrywide, enthusiastic participation is key to extracting the full potential of benefits that blockchain technology promises.

GLOBAL SUPPLY CHAIN INVITATION

Shipper supply-chains are impacted by their ability to get access to data from across the freight landscape. Blockchain technology may provide a chain of custody and usher in a world of full transparency.

This provides BiTA member companies with the opportunity to create new business offerings, channels, and commercial outcomes as transactions go from being strictly analog to digital.

For many members, the adoption of blockchain standards opens up new markets and creates new revenue streams.

Innovation is the heartbeat of any emerging technology and startups are frequently the drivers, which is why BiTA invites startups to participate as full members that can collaborate, partner and network.

PROOF OF DELIVERY DOCUMENTATION

OpenPort is a Hong Kong-based multinational logistics technology provider using blockchain technology to solve one of the biggest challenges in the modern supply chain – the cash flow problem.

The heart of the problem OpenPort is using blockchain to address is the paper-based Proof of Delivery (PoD) system of record-keeping.

They have developed a blockchain-enabled Proof of Delivery (PoD) by using OpenPort's smart contract platform to determine exactly what was delivered, when, and by whom.

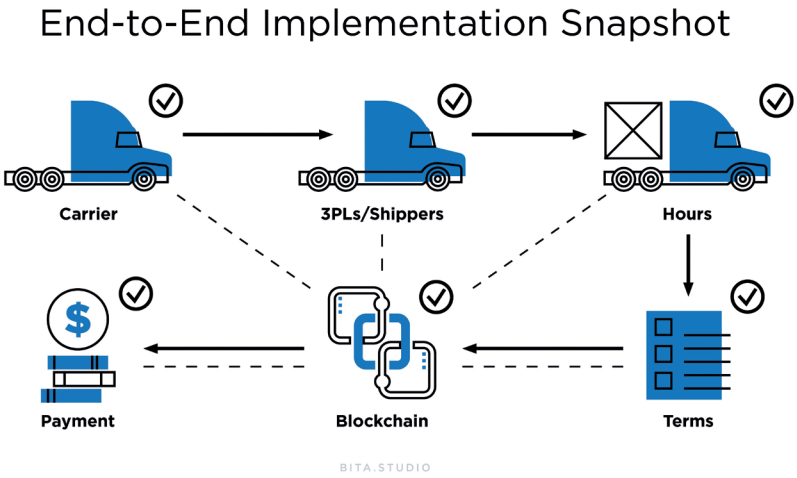
Currently, payments to shippers of B2B goods are backlogged by days and even weeks due to the wait for PoDs and the disputes that arise from the delay, which then has a knock-on effect on transporters' payments.

The system requires too much working capital for businesses to scale effectively.

OpenPort intends to use its blockchain-enabled PoD – available from any transporter – to drive increased cash flow and liquidity in the supply chain.

The immutable data in the blockchain PoD creates a low-risk situation for financial providers to provide favorable invoice factoring to transporters, and on goods value to shippers, moving the payment cycle from weeks to days.

Preliminary findings indicate benefits in a number of ways including enhanced security and trust using a validated, consensus-driven and immutable public ledger, simplified payments and clearance processes using smart contracts, and vastly increased cash flows from faster payments.



EMPLOYEE DIGITAL RECORDS

Learning Machine Technologies is a global provider of blockchain-based records and has developed blockchain-based credentials for the digital identity of heavy equipment operators in the supply chain.

In conjunction with MIT Media Lab, an antidisciplinary research laboratory at the Massachusetts Institute of Technology, Learning Machine Technologies has developed 'Blockcerts', an open standard for anchoring academic achievements, which licenses certification records to the blockchain in a manner that is operator-owned and vendor-independent.

With Blockcerts, operators own private copies of their digital records, which they can share with anybody they choose—like a prospective employer.

That individual or company can then verify the authenticity of the records with the click of a button, without having to consult the organization that issued it.

Preliminary findings indicate Blockcerts saves time and money during the employment application process while providing a high level of certainty that documentation has not been forged or tampered with during the applicant screening process.

It's been found that operators feel much more in control of their data via their tamper-proof records and convenient peer-to-peer sharing platform.

FINANCIAL TRANSACTIONS

Triumph Business Capital is a Dallas-based financial institution providing invoice factoring and freight payment solutions to trucking companies, freight brokers and staffing agencies.

Their blockchain use case centers on using blockchain to streamline the freight payment system to take advantage of the lessons learned from the 30-year-old Electronic Data Interchange (EDI) process — a computer-to-computer exchange of business documents in a standard electronic format between business partners.

Triumph has focused its early blockchain initiative on improving back-office functions like treasury, invoicing, collection, and payment, and believe that blockchain technologies that use a shared ledger for systems integration will be more efficient and transparent than EDI since both parties have visibility to the same information.

Preliminary findings indicate that blockchain technology has the potential to reduce the cost of capital, provide better visibility into cash flow, and reduce the frequency of short pays, resolve discrepancies faster, shorter processing times and higher degrees of verifiability.

MEMBER CHALLENGES

Blockchain technology can be best described as a digital ledger that uses blocks of information linked and secured by cryptography.

This means that once data is entered into a blockchain it cannot be modified.

BiTA believes that not only should an industry trust the data being entered into a blockchain, an industry must first address the decades-old problem of cleaning up disparate legacy data systems before data is added to any blockchain technology.

In the rush to commercialize blockchain technology, some industry participants have done so without regard to data standards and interoperability.

This could render proprietary blockchain solutions as unusable and unsustainable if there isn't interoperability between competing technologies.

THE FUTURE

BiTA sees the future of blockchain technologies in three phases.

Education, Case Studies, and Early Adoption (2018-2020):

- Industry-wide education on use cases outside of crypto-currency
- Development of industry-wide standards and application to specific use cases
- Early adoption within innovative startups and pilot programs at large corporations with extensive resources
- Regulatory authorities develop auditing and compliance practices.

Growth (2021-2025):

- Early adopters and standards activity provide greater clarity and minimize uncertainty, driving widespread adoption.

Maturity (2026 and beyond):

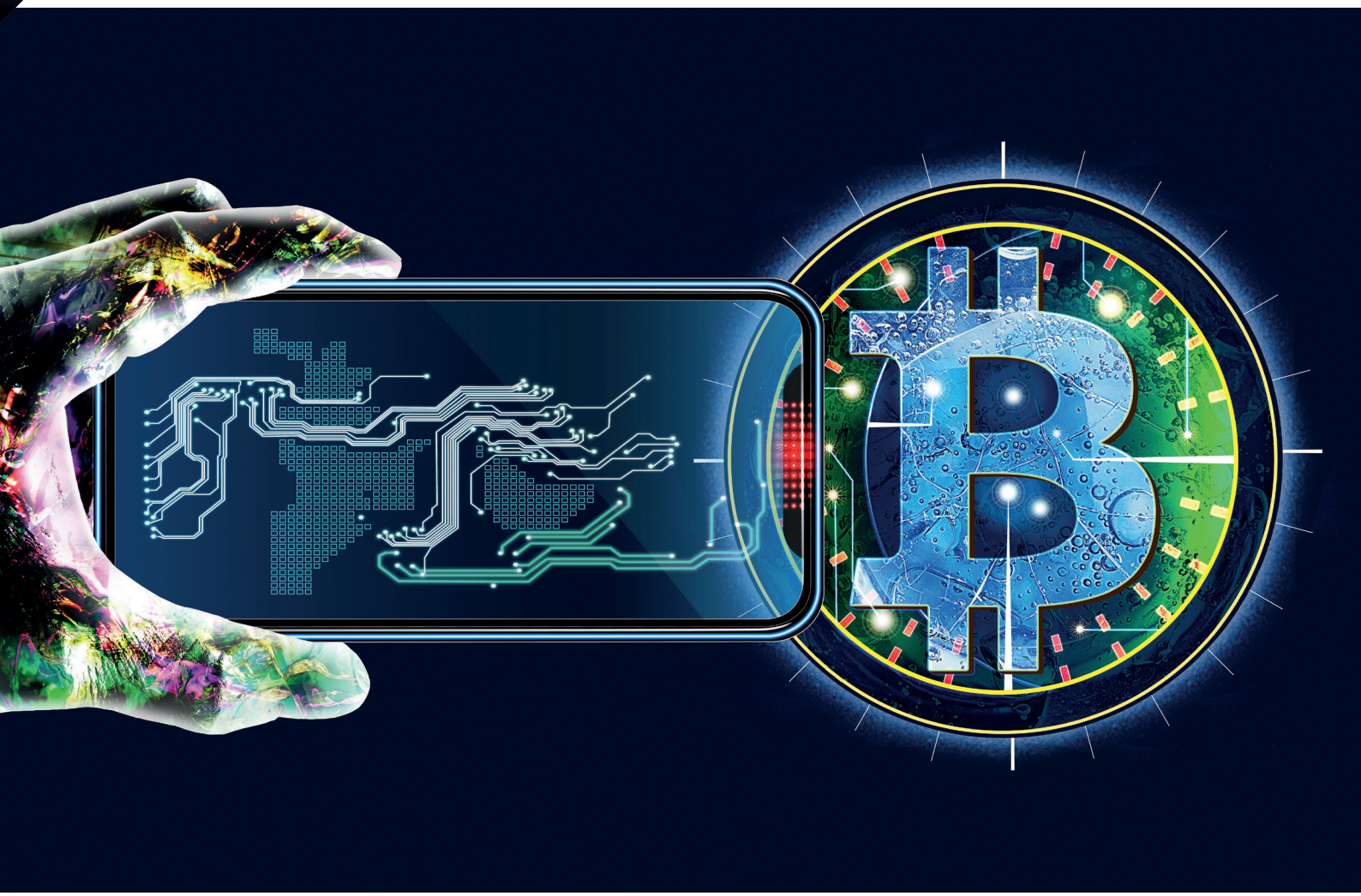
- Blockchain technology is widely adopted and considered an integral part of the supply chain ecosystem.

BITA STANDARDS COUNCIL

Industry standards developed by BiTA are managed via the BiTA Standards Board of Management and are intended to create a common framework in order to assist members and industry participants with their organization's decision to develop and adopt blockchain technology.

The Standards Board has established three technical committees addressing the following topics:

- Data Formats: Focused on format templates and standard fields for invoicing, asset location, payments and contracts
- Blockchain Interoperability: Focused on interoperability across different blockchain platforms
- Financial Compliance: Focused on ensuring adopted blockchain solutions will pass financial audits.



To build upon these initiatives, BiTA members will create a forum and develop a dialogue around blockchain technology in the supply chain from a thought leadership panel of influential entities.

For some industry alliances, the objective is to produce blockchain technology together, but BiTA has larger members that act as the technology developers, and our role as an enabler, rather than a producer means we are agnostic about software platforms.

We believe that our organization's structure and approach is crucial to unlocking what blockchain has to offer, which, according to a Deloitte finding from May 2017, is a market that will support 10% of global GDP due its transformative nature.

For logistics and transportation, with companies such as OpenPort, Learning Machine Technologies, Triumph Business Capital behind the wheel, blockchain will have a bigger impact, and will truly shake up this $8 trillion industry.

ABOUT THE AUTHOR

Prior to joining FreightWaves and BiTA as Chief Analytics Officer, Croke was Vice President of Data Products at Spireon where he headed up the development of new high-frequency telematics data products in the trucking, passenger automotive and insurance markets.

Croke also ran Lancer's long-haul truck insurance business after spending many years as Vice President of Omnitracs Analytics (formerly Qualcomm) where he developed Data Science technologies including machine learning, complex business rules engines and data analytics for transportation companies.

Croke was one of the original founders of Atlanta-based FleetRisk Advisors (purchased by Qualcomm and now called now Omnitracs Analytics) and has 35 years of experience in data analytics, transportation, supply chain management, mining and insurance risk management.

ABOUT THE ORGANIZATION

BiTA was formed by experienced tech and transportation executives to create a forum for the development of blockchain standards and education for the freight industry.

Our goal is to bring together leading companies in the freight technology industries that have a vested interest in the development of blockchain technology.

BiTA membership is limited to companies that are in the supply chain ecosystem and have an interest in blockchain applications.

BiTA has no direct commercial interests.

Our requirements for membership are to complete and submit an application which will be reviewed by our membership committee.

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SMART REGULATION IN MARINE FUELS

THE ROLE OF BLOCKCHAIN

Deanna MacDonald and Katherine Foster,
Blockchain Labs for Open Collaboration (BLOC), Copenhagen, Denmark

In the midst of tremendous issues and challenges facing the marine and energy sectors, much has been made of the potential for blockchain protocols and distributed ledger technology to provide alternative solutions. However, technology in isolation cannot change inefficiencies and inequalities in our global value chains; governance including participation and engagement of stakeholders in its creation is an essential element in making sure technology is developed and used effectively, just as is the governance and regulation of the industry itself.

One of the key challenge areas within the maritime sector is the quality and sustainability of marine fuels. This is made all the more evident in the wake of what many in the industry are calling a 'global epidemic of bad bunkers' flowing through terminals that are affecting the safety of hundreds of vessels worldwide and which is expected to grow as the industry struggles to meet the impending IMO 2020 global sulphur cap.

While the new sulphur cap could be a regulatory driver for change in terms of fuel quality and sustainability, implementation and transitional issues loom large with an even greater risk to the issue of unsafe fuels. As the blending of fuels to meet the sulphur limits increases, an increased risk of unsafe fuel will be driven further by the lack of purchasing and decision making power of vessel operators for compliance and safe fuels. This barrier is underpinned by a lack of timely and accessible fuel quality data or even fuel accounting systems.

Compounding the risk of unsafe fuels, and the inherent jurisdictional law issues and harmonization gaps in the maritime regulatory environment, a lack of accurate and verifiable data and traceability of fuels means port states will inevitably be confronted with high costs and barriers associated with enforcing the new regulations. At the heart of these challenges faced by the industry lies operational inefficiencies including a lack of global coordination and standardization of data collection, inaccurate data, a lack of transparency and inconsistent and non-binding regulation.

BLOCKCHAIN IN MARINE FUELS

Due to these issues and inefficiencies, we believe that the marine fuels sector is an area ripe for innovation, technological upgrading and collaboration. Moreover, the nature of the challenges facing this sector make it particularly ripe for blockchain innovation. To start, the ability to create a chain of custody of information with, for example, fuel quality tests that are immutable and cannot be tampered with or altered, creates a basis for verified data and traceability.

This will not be an easy feat, however. Because everything along the supply chain is a manual process, no data exists on fuel transfers, such as where the fuel comes from, who's been handling the fuel nor on the quality of the fuel itself, including particulate matter and contamination. The IMO's fuel use data collection scheme will make the ship the responsible entity with regard to compliance via their accounting. As these new regulations come into force, pressures will be felt by suppliers, terminals and vessel operators as non-compliant fines are introduced and insurance providers stop covering engine failures that could have been prevented through the purchase of cleaner fuels.

How do ship owners mitigate these risks? As it stands, the majority will choose the bunker delivery note (BDN) along with periodic stock takes of fuel tanks. However, as quality tests are not currently certified, there is no official process or oversight and information such as levels of catalytic fines, and sulphur content is not captured until after the purchase of bunkers. The consequences of which again lead to a lack of any validated data points, varying quality of fuels, no decision support system for buyers as to which terminals and suppliers to trust, engine problems and failures and a lack of compliance with current regulations.

To address these systemic challenges with blockchain as an emerging technology, including the potential to address them from concept to reality through applying and integrating it in the industry, a demonstrator lab to address the assurance of marine fuels is currently underway in Maritime Blockchain Labs by BLOC. Funded by Lloyd's Register Foundation to utilize blockchain to address risks and safety of engineered systems, this is the first true industry collaboration with a consortium that represents all key actors from the bunkering supply chain.

SINGAPORE FUELS ASSURANCE

Currently, Singapore is the only port with regulations on fuel suppliers due to economic objectives. They have adopted Mass Flow Meters (MFMs) to certify the quantity data of fuel supply, however, while MFMs have helped to address quantity issues associated with fuel delivered in Singapore, quality assurance (QA) data points from fuel sources remain scant.

Therefore, the scope of the demonstrator will include gathering QA data in the form of a Certificate of Quality and bunker drip sample, as assurance of the quality of bunker delivered from the terminal to the barge, and gathering of data from the quality test currently performed from independent third party testing labs and, if possible, at the manifold between barge and vessel. The proposed system will make test result data pertaining to the content of a given bunkering barge available to the chief engineer of the vessel purchasing the bunker oil, prior to connecting with this barge for bunkering.

The objective is to demonstrate a beta version of a system, to be later scaled, that will provide transparency and accountability around the bunkering supply chain and will inform the buyers of bunker fuels about the quality and compliance levels of the fuels prior to purchase. It will also serve to provide regulators and port authorities with trusted and traceable data to inform enforcement.

In this demonstrator, we will be placing this quality data in a blockchain system, and making it accessible to relevant users, in conjunction with a derived reputation system. This will allow insurance brokers, financiers and other stakeholders to access QA data in order for them to make better decisions on price and risk, as well as to gauge environmental impact. The technical solution will therefore center around the barge and its operations while loading and delivering bunker.

LONG TERM GLOBAL POTENTIAL

Thus, in the long-term, a system for informed decision making, monitoring, reporting and verification of the fuel accounting system and emissions data will emerge. This will allow vessel operators to have better insight into the quality of which potential bunkers to purchase and regulators better insights into compliance. Furthermore, this could translate into differentiated pricing schemes and insurance policy levels depending on what barge operator or terminal is used.

In order for this system and digital solutions generally to succeed and have a significant global impact for the maritime industry, a coordinated approach with all industry actors in the supply chain must be taken. This type of system will only succeed if the industry backs it, has the ability to shape it, and is able to access and utilize it as opposed to a closed system where the rules are dictated by one actor. Therefore, in creating this solution, we apply as much emphasis to building consortia, demonstrating and testing, as to building the technology itself. It is in this spirit of open, inclusive and co-creative design of these solutions that we, as an industry, will be able to progressively move forward and adapt to the changes and challenges we are collectively facing.

ABOUT THE AUTHOR

Deanna MacDonald is the Co-founder and CEO of BLOC, Blockchain Labs for Open Collaboration. A global political economist, she has over a decade of industry experience in developing, applying and scaling technology within trade, energy, health and agriculture sectors. Deanna is a keynote speaker, workshop facilitator, guest lecturer on blockchain and new forms of governance and business models needed to support the transition into a new paradigm. She also contributes to online courses offered through MIT, Columbia Business School and Wharton and is an expert reviewer and contributor for the World Bank, United Nations, World Wildlife Fund and World Economic Forum.

Katherine Foster has spearheaded innovative partnerships, and financial and technical solutions on climate change for almost 30 years. A former diplomat, Katherine became Business Development Lead for the EU's flagship innovation program Climate-KIC, contributing to the acceleration of its 900 startups and 300 innovation projects, before becoming CSO of Blockchain Labs for Open Collaboration. She is consultant for the World Bank's Blockchain and Carbon Markets Framework, advisor to the UNDP Accelerate2030 and the Consensys Blockchain for Social Impact Incubator, a member of the UNFCC sponsored Climate Chain Coalition and a lecturer, facilitator and contributor to graduate, executive and online education courses and workshops.

ABOUT THE ORGANIZATION

BLOC is the leading service provider for digital solutions bridging the digital and the physical divide and solving for global challenges facing critical infrastructure. BLOC has a systemic approach to building technology facilitating a process whereby industry identifies, designs and refines its own solutions. The Maritime Blockchain Lab (MBL) launched in partnership with Lloyd's Register Foundation, is the first true industry collaboration for the creation of blockchain technology in the maritime space. BLOC is headquartered in Copenhagen and works with experts spanning maritime, energy, cybersecurity, distributed ledgers, global capital markets, and sustainable development, located in Singapore, Washington DC, Bangkok and London.

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