Expedited delivery

How transportation companies can thrive with blockchain

IBM Institute for Business Value
survey conducted by
The Economist Intelligence Unit

In this report

How blockchain technology can help transportation companies increase security, trust in data and logistics management

How transportation companies will use blockchain to improve existing operational processes

How blockchain can reduce frictions that impede progress

Recommendations about how to start implementing blockchain

How IBM can help

As one of the world's leading research organizations, and one of the world's top contributors to open source projects, IBM is committed to fostering the collaborative effort required to transform how people, governments and businesses transact and interact. IBM provides clients the blockchain technology fabric, consulting and systems integration capabilities to design and rapidly adopt distributed ledgers, digital identity, blockchain solutions and consortia. IBM helps clients leverage the global scale, business domain expertise and deep cloud integration experience required for the application of these technologies. Learn more at **ibm.com**/blockchain.

To succeed in today's hyper-competitive world, travel and transportation companies need to solve increasingly complex problems and seize new and exciting opportunities faster than their competitors. They must continue to drive operational excellence and enable collaboration across enterprise functions and between members of emerging ecosystems. Above all, industry leaders must run the business well amidst constant change. The IBM Travel and Transportation practice understands these challenges and brings its extensive industry experience, business insight and technical prowess to bear on them. For more information, visit **ibm.com**/industries/traveltransportation

Full speed ahead

Few industries can benefit more from blockchain than transportation. With multiple modes of conveyance, numerous intermediaries, varied regulations and complicated accounting practices, it would seem that blockchain technology should race through this industry like a high-speed train. Yet, antiquated processes and organizational inertia have combined to make transportation lag behind. First Movers in transportation realize time is running out. Adopting new technologies and processes, such as blockchain, can be the difference between flying high or getting grounded.

The transformational potential of blockchain

The transportation industry has a long history of resisting all but the most essential innovations. In the face of security threats, logistics inefficiencies, and general uncertainty and volatility, transportation companies have moved at a snail's pace – if at all – to digitize processes, incorporate emerging technologies, such as cloud and the Internet of Things (IoT), or increase connectivity and automation.

This historical reticence aside, transportation companies are realizing the status quo is no longer sustainable. The profound implications of security and transparency in the digital age are requiring even the most reluctant organizations to adopt new technology. Both transportation service buyers and end users are demanding more accountability from the companies and institutions with which they do business. Correspondingly, transportation companies are beginning to invest in digitization for faster, more seamless supply chain operation. They are increasing connectivity and collaboration and are embracing automation.

Blockchain is a natural fit for inherently fragmented industries, such as transportation, in which close coordination with multiple parties is essential. A distributed ledger technology, blockchain provides a more transparent and secure way to conduct business, resulting in immutable transaction records, finality in tracing ownership and payment, and substantially improved coordination and efficiency. It has the potential to mitigate some of the transportation industry's most persistent challenges. For example, blockchain technology can help provide:

Enhanced security – The ability to access key transaction information through a private, secure and transparent shared ledger can allow transportation companies insight into those parts of their businesses where fraud and manipulation are routine – service contracts in the shipping container industry, for example. Blockchain also can help reduce

14%

of transportation industry executives surveyed, the First Movers, are working with and investing in blockchain today

77%

of all transportation executives surveyed expect to have a blockchain network in production in one-to-three years

7 in 10

First Movers anticipate that blockchain will help reduce cost, time and risk

fraud and manipulation of contract terms through the immutable recording of conditions agreed upon by all parties.

Trust in digitized data – By digitizing important data and posting to a blockchain, companies can decrease, or even eliminate, the need for unnecessary paperwork. A streamlined, digitized process can provide all parties safe and secure access to information, prevent fraudulent activity and increase trust.

Improved logistics management across the ecosystem – Leveraging blockchain technology increases visibility and transparency along the entire supply chain for all stakeholders, allowing companies insight into chain of custody, payments information and the location of goods from initial acceptance to delivery. The increased tracking capabilities allow companies to more accurately assess and react to unforeseen circumstances that could potentially affect the supply chain.

More efficient industry interactions – Smoother, more efficient interactions among suppliers, freight forwarders, consumers and other stakeholders can be facilitated by blockchain. For instance, accessing the same source of truth for all counterparties can improve dispute resolution and foster a sense of trust and collaboration among industry players.

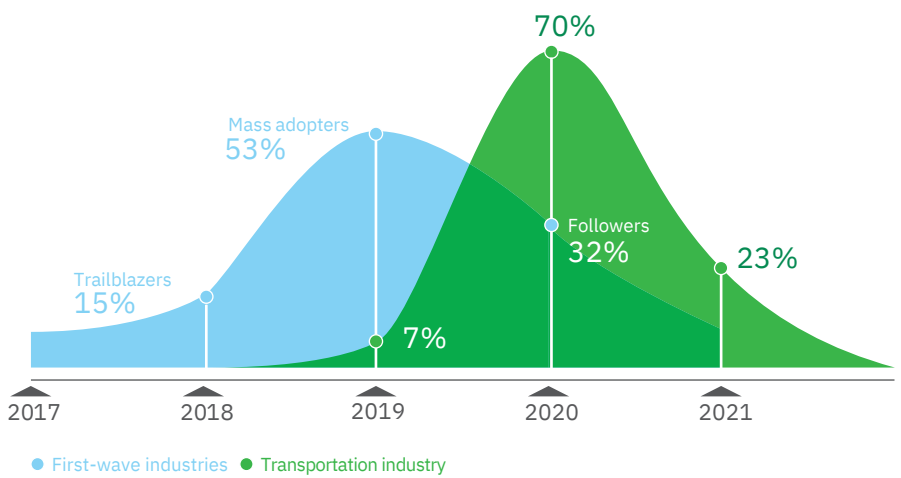
To understand how blockchain can revolutionize the transportation industry, the IBM Institute for Business Value surveyed 202 transportation executives in 16 countries. The study, conducted in collaboration with the Economist Intelligence Unit (EIU), included chief financial officers (CFOs), chief operating officers (COOs), chief technology officers (CTOs) and chief information officers (CIOs). Those participating had to meet specific criteria: they were either working with – or planning to work with – blockchains in the next 12 months, and they needed to be familiar with the blockchain strategies of their organizations.

Gaining traction

Blockchain has already established a foothold in several industries. In the first wave of industries we surveyed – banking, financial markets, healthcare, government and electronics – a cumulative 15 percent of organizations surveyed planned to have commercial blockchain solutions at scale by the end of 2017, and a significant majority said they expected to have such a solution in production by 2019 (see Figure 1).

Figure 1

Climbing high: Transportation industry adoption rate compared to the first wave of industries (banking, financial markets, healthcare, government, electronics). Transportation has the greatest number of respondents who expect to have a blockchain solution in production in three years



Source: IBM Institute for Business Value analysis.

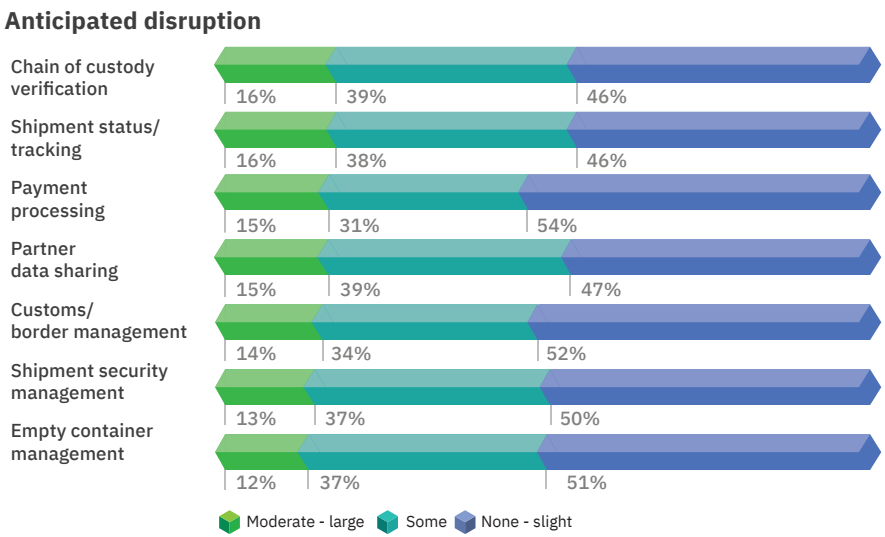
In transportation, progress, as might be expected, has been slower. Only 7 percent of transportation executives say they expect to have a commercial solution in place by 2019. But once started, companies expect to move quickly. Interestingly, 70 percent of transportation respondents expect to have a blockchain production network in one-to-three years, the highest number among all the industries we surveyed.

The immediate focus for transportation executives will be to use blockchain to improve existing operational processes. For example, 26 percent of respondents cited shipment status and tracking as a key investment area, while 21 percent are putting their money in payment processing. Empty container management and shipment security management were each selected by 20 percent of surveyed executives.

However, respondents also said that blockchain disruption opportunities exist across several areas of the transportation value chain (see Figure 2).

Overall, our survey reveals that, while slow to implement, the transportation industry has ambitious expectations for blockchain. Because of the industry's inherent resistance to innovation, however, many of the expected improvements are considered disruptive. For example, while the ability to completely trust blockchain-verified data might be considered an improvement for many industries, for transportation, with so much data about shipping status, it is nothing short of a game-changing level of disruption.

Figure 2
Disruption across the value chain: Transportation industry executives say multiple blockchain disruption opportunities exist



Source: IBM Institute for Business Value analysis.

Insights from blockchain early adopters

We previously noted that a total of 77 percent of transportation respondents – the most of any industry we have surveyed – plan on having blockchain in production in three years. Fourteen percent of those we surveyed are working with and investing in blockchain now. These "First Movers" are investing in blockchain solutions in one or more of these business areas:

- Shipment status/tracking
- Payment processing
- Shipment security management
- Customs/border management
- Empty container management
- Partner data sharing
- Chain of custody verification.

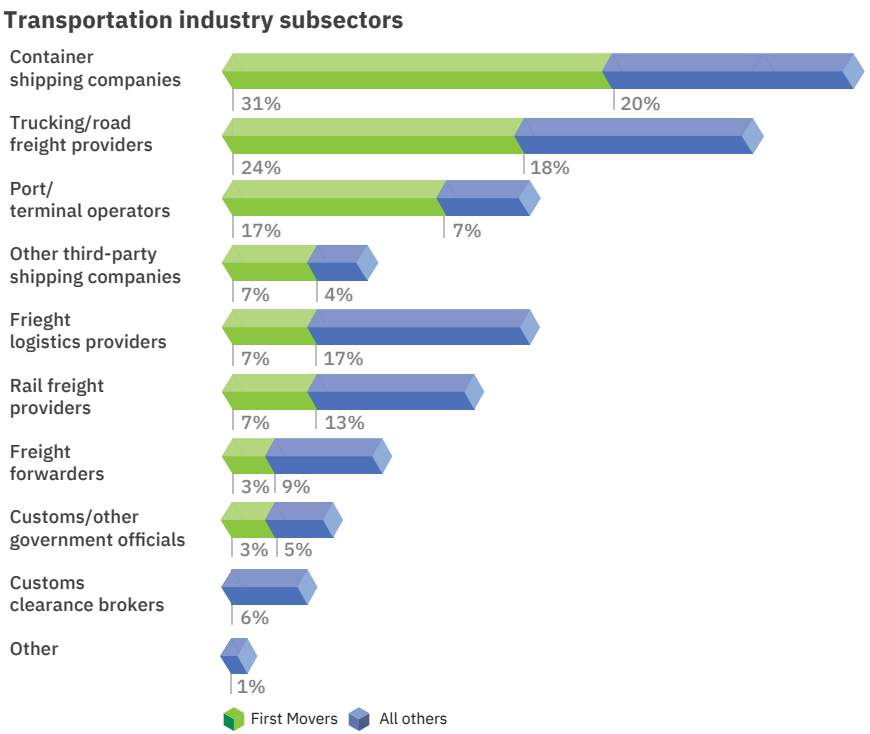
First Movers will set the stage for those that follow. But the initial learning curve is steep. Our survey reveals that more First Movers have more business expertise than technical knowledge. Further, our experience within the industry indicates that business professionals, such as those in strategy and finance, are much more open to the potential impact of blockchain than their technological counterparts. Perhaps the technologists do not fully understand or appreciate how blockchain technology can improve the provenance and traceability of the shipment data their systems provide. Blockchain means more than just having data: it means having data that can be trusted.

More than half of First Movers in transportation work directly with physical assets that move through multiple intermediaries (see Figure 3). For transportation companies, tremendous benefit can be gained by the immutability of transactions built into blockchain – assuring that the product shipped is the product received, providing tamper resistance and much more. Consider, for example, the numerous transactions surrounding container shipping, which is multi-modal and involves multiple parties at many different shipping stages and locations.

With the complexity of these various transactions that span multiple intermediaries, First Movers expect blockchain to help remove transactional inefficiencies from the transportation ecosystem. As one respondent told us, “There will be transparency for customers, who will be able to see every part of the journey their products took before arriving in their hands, allowing the customer to make better informed decisions.” Another blockchain executive said organizations will see “secure settlement of commercial transactions across borders, often in otherwise illiquid markets.”

Figure 3

Multiple intermediaries: More than half the First Movers in transportation work directly with physical assets that move through multiple intermediaries



Source: IBM Institute for Business Value analysis.

Reducing the frictions that impede progress

Growth requires a steady march against friction. Today, friction adds costs and remains a drag on global business. It has the power to slow progress and sometimes stop it cold. In our initial blockchain study, we defined three friction domains that blockchains can help overcome: information, interaction and innovation (see Figure 4).[1]

Within those three domains, First Movers in transportation expect to use blockchain to diminish four specific frictions that impact regulatory restraints and facilitate fluidity across the supply chain – restrictive regulations, imperfect information, too many intermediaries, and risk of new entrants to the industry (see Figure 5).

Figure 5

Greasing the wheels: Top four frictions transportation First Movers expect to diminish using blockchain

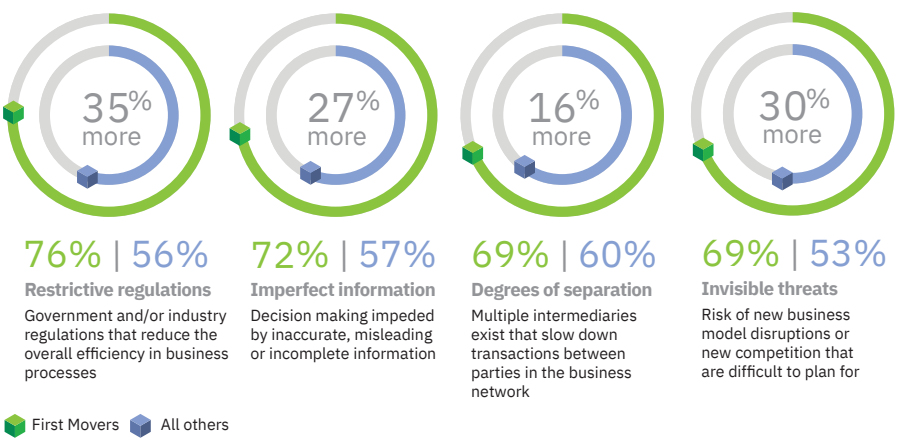
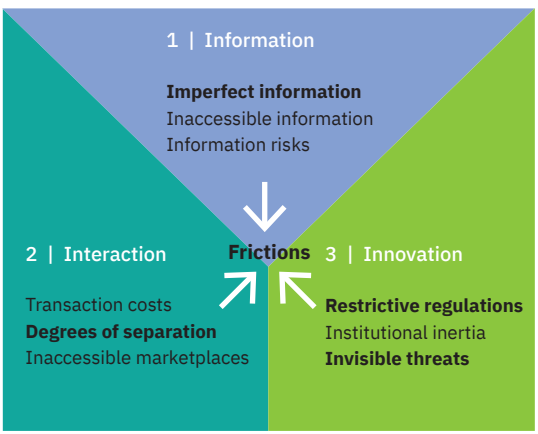


Figure 4

Frictions framework: Blockchains are expected to greatly reduce frictions



Restrictive regulations – Within transportation, moving goods across multiple borders is common. This entails dealing with multiple customs agencies, government entities and other regulatory bodies. In reality, this is often more about coordination in and around borders than specific laws and regulations.

Imperfect information – Decision making is impeded by inaccurate, misleading or incomplete information, or by information that is inaccessible because of non-standard processes or shortage of scalable computing power and storage. Further potential disruptions include the unpredictability of technology breaches and tampering.

Degrees of separation – This is the distance from the company to the end-user. For example, consider the complexities behind ocean freight. It is estimated that a simple shipment of refrigerated goods from East Africa to Europe can go through nearly 30 people and organizations, with more than 200 different interactions and communications among these parties.[2]

Invisible threats – These are risks and threats that are difficult to detect or plan for, such as new business model disruptions or new competition. Some large retailers, often frustrated with the data they receive from transportation service providers, are beginning to invest in private transport networks, obviating the need for transport services. Amazon, for example, recently invested in thousands of tractor-trailer trucks, painted in the company's well-known livery, to move products between sorting and fulfillment centers.[3]

Balancing blockchain's potential

According to one estimate from the World Economic Forum, reducing supply chain barriers to trade and increasing efficiency could increase global gross domestic product (GDP) by nearly 5 percent and global trade by 15 percent.[4] Since 1998, for example, 20 percent of all containers handled by ports have been empty.[5] The estimated cost of repositioning these empty containers around the globe exceeded USD 15 billion.[6] Inefficiencies abound as well. Some 80 percent of transportation executives, according to IBM benchmarking data, said it takes an average of 28 days or more to receive payment after the sale of goods or services.[7] These same executives say it takes 45 days or more to pay their own invoices.

Blockchain technology offers the means to help reduce cost, time and risk (see Figure 6). Transportation executives say the top three ways blockchain can help in these areas is by creating efficiencies in payment processing, partner data sharing and shipment status and tracking.

Transportation executives are keenly focused on digital interactions – ostensibly because the industry has been so slow in moving in this direction. Transportation First Movers are rolling out interrelated blockchain initiatives to improve their existing businesses and transform their ecosystems. Initial efforts are concentrated on digitizing and standardizing the processes and systems – a prerequisite for setting up a fully functional blockchain solution. As a first step, these First Movers are looking to improve the efficiency and veracity of the supply chain.

Figure 6
Blended benefits: Transportation executives expect blockchain to reduce cost, time and risk

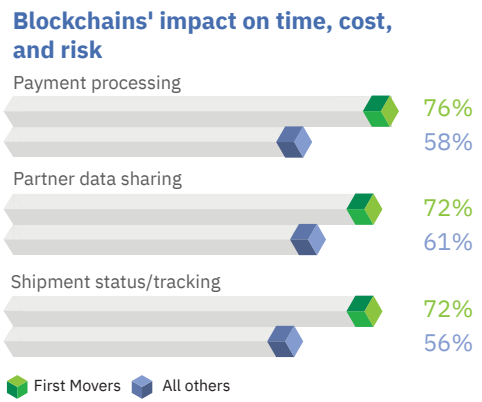
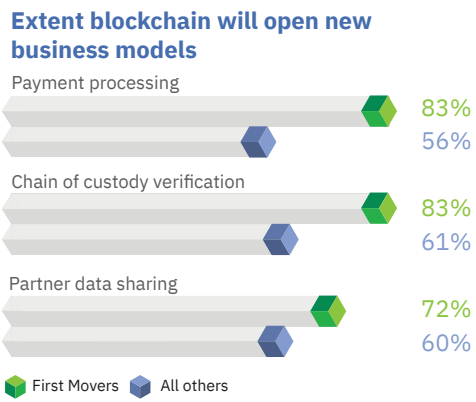


Figure 7
New business models: Transportation executives expect blockchain to create new opportunities



Case study: IBM and Dnata use blockchain for cargo service delivery[8]

Dnata, in conjunction with Emirates Innovation Lab, flydubai Cargo and IBM, has successfully tested the use of blockchain technology for airfreight transportation in Dubai. The proof of concept proves blockchain's potential to eliminate data redundancy and improve transparency for all stakeholders, leading to the cargo operations process being more streamlined and simplified.

The cargo industry is traditionally a paper-based process. Even when the system is electronic, the process requires multiple parties to sign off on the cargo load. Although electronic, this can lead to a lengthy administrative process. Blockchain can help digitize this supply chain. The consensus mechanism and ability to create a trusted source of data makes blockchain and attractive choice for the industry.

The ability to enable permissioned parties in a private blockchain and safely share data create endless opportunities for logistics/supply chain applications. The possibilities include better tracking of orders to better fraud detection.

Transportation industry First Movers also expect blockchain to open new business models, particularly surrounding payment processing, chain of custody verification and partner data sharing, each of which was cited by more than 70 percent of respondents (see Figure 7). These three topics are closely interrelated, as companies that doubt the veracity of the data they are given from partners are likely to dispute payments. Blockchain could enable all parties in the transportation ecosystem to share the same

360-degree view of each and every shipment, thus making it almost impossible to doubt the validity of charges found in an invoice. Viewed from the perspective of an existing transportation service provider, this might be seen as a process improvement. But, because an external provider could just as easily deploy a similar solution, this blockchain-driven change might also create a new business model in the industry.

Case study: IBM and Maersk building a global logistics platform for the shipping container ecosystem[9]

Maersk and IBM announced the intention to establish a joint venture to provide more efficient and secure methods for conducting global trade using blockchain technology. The new company aims at bringing the industry together on an open global trade digitization platform that offers a suite of digital products and integration services.

Global supply chains are clogged with inefficiencies, heavily reliant on complex paper-based systems, and poorly connected. By removing these types of inefficiencies, experts believe global trade volume could increase by 15 percent, boosting economies and creating jobs.

Through initial pilots, IBM and Maersk have successfully demonstrated the ability of blockchain to tackle two of global trade's most costly and frustrating realities: the lack of event transparency as a shipment moves through the supply chain, and the web of paper-based documentation and processes that complicate every shipment from origin to destination. They are now working to scale the solution to a group of global corporations, many of which have already expressed interest.

Recommendations

First Movers are intentionally focusing their initial blockchain efforts in transportation areas with higher potential for digitization of transactions among all parties involved. Transport companies that understand blockchain's transformational potential must lead the industry to reap the rewards of disruption:

Learn intentionally – 52 percent of transportation organizations surveyed identified immature technology, and 50 percent picked inadequate blockchain skills as deterrents to blockchain adoption. While 14 percent expect to have blockchain production in progress by 2020, very few companies will have developed the skills, insights, and organizational agility to leverage blockchain's true transformational potential.

Case study: OriginTrail developing a blockchain protocol connecting IT systems with any blockchain[10]

OriginTrail protocol is designed to tackle the prime challenges limiting the exchange and integrity of data in product supply chains. It is a unique protocol enabling IT providers in the supply chain industry quick implementation of blockchain supported data sharing in multi-organizational environments.

OriginTrail aims to overcome two primary challenges impeding sharing in supply chains, fragmented data and centralized data. It enables seamless data connection and interoperability between different IT systems in multi-organizational supply chains with consensus mechanisms to maintain data integrity.

It enables peers on the network to negotiate services, transfer, process and retrieve data, verify its integrity and availability, and reimburse the provider nodes. This solution aims to minimize the amount of data stored on the blockchain to reduce cost and inefficiency.

Invest wisely – 52 percent of transportation organizations surveyed lack executive buy-in to kick off or fund blockchain engagements. Leaders will dedicate resources to proven blockchain improvements, but transformation requires enterprise-wide investment in fundamentals, including digitizing and instrumenting transport operations.

Case study: Blockchain platform linking the entire supply chain, from the factory to the consumer[11]

ShipChain aims to create a fully integrated system that operates across the entire supply chain from the moment product leaves the factory to delivery to the final customer or destination.

The ShipChain protocol is expected to provide end-to-end tracking and transparency, asset security, decentralized brokerage, trustless incentives, and unified management.

ShipChain will provide an app for cargo booking, which will serve as an open marketplace connecting shippers to carriers, reducing the need for brokers. Shippers will be able to place an order from "Point A" to "Point B" using suggested routing and shipping methods, while carriers can find and route multimodal transportations.

Recently ShipChain partnered with CaseStack, a provider of supply chain management services to some of the world's largest retailers, to integrate tracking and tracing on ShipChain's blockchain-based platform.

Disrupt strategically – 52 percent transportation organizations surveyed see regulatory constraints that will prevent them from adopting blockchain. Supply chains are inherently collaborative, so companies seeking to optimize the disruptive potential of blockchain will work across the transportation ecosystem to develop usable blockchain industry standards.

Case study: Helbiz aims to create an integrated mobility market ecosystem[12]

Helbiz is a peer-to-peer marketplace that makes renting a car, motorcycle or bicycle convenient, affordable, and instant. Helbiz builds on the sharing economy concept popularized by Uber and Airbnb.

The three components driving the marketplace are the Helbiz app, coin, and mobility platform. Blockchain technology serves to facilitate the registration of all products and services. It also allows the different members of the ecosystem such as owners, operators, and third-party services interact and conduct transactions. The mobility platform is an open platform that mobility-related services can use to build decentralized applications.

The ultimate goal for Helbiz seems to be to establish a fully integrated mobility market ecosystem which revolves around the consumer. Its unique proposition lies in its use of blockchain technology to store information and conduct transactions, resulting in lower transaction fees and transaction costs.

To best extract value from blockchain technology, we recommend organizations answer three questions:

1. *How fast should I move?* Before taking off, it is essential to have a few key prerequisites in place, such as digitization and consistent standards across the supply chain. The scale and pace of blockchain investments will be guided by an organization's appetite and need for transformation.

2. *Can I achieve network-wide standards?* Organizations, particularly First Movers, must work to establish consortia and blockchain protocols to prevent competing and conflicting standards that will delay blockchain benefits. The Blockchain in Transportation Alliance (BiTA) is a consortium of tech and transportation firms formed to create blockchain standards for the freight industry. BiTA is engaged in providing open forums and educational resources to help those leading the evolution of the transportation industry through the benefits offered by blockchain technology.[13]

3. *How can I scale with new revenue models?* So far, most of the disruptive new business models are being developed and improved by small-scale, start-up types that are leveraging available data to improve existing processes. Larger transport companies that want to use blockchain to improve digital transactions have the potential to transform the global transportation ecosystem with bold and ambitious investments and considered cooperation with other members of the transportation ecosystem.

Study team
Keith W. Dierkx, Global Industry Leader, Rail, Freight and Logistics, IBM

Steve Peterson, Global Transportation Research Leader, IBM Institute for Business Value

Veena Pureswaran, Global Research Leader, Blockchain, IBM Institute for Business Value

Stephen Rogers, VP Blockchain Initiatives for Supply Chain, IBM

Smitha Soman, Blockchain Business Research, IBM Institute for Business Value

Contributors
The study team would like to thank the following for their contributions to this executive report:

Vijay Anand, Catriona Ewing, Dirk Michelsen, Naman Modi, Mario Louca, Vinit Shah, Carsten Stoerner, and Dee Waddell.

For more information

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Armonk, NY 10504

Produced in the United States of America
May 2018

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